Guilford County's General Terms and Conditions

1. This bid package serves as official notice that GUILFORD COUNTY is soliciting and will receive bids for the item(s) and/or service(s) stated on the event cover page and outlined in the Bid specifications. Bids shall be submitted electronically via the Purchasing Department's Strategic Sourcing website: www.co.guilford.nc.us/sourcing **by the event close date and time specified.**

2. All addenda to this bid package will be issued electronically. No oral changes by anyone shall affect this bid package.

3. The official bid price, quote, response for RFP, RFQ, or otherwise instructed; shall be signed by a duly authorized person acknowledging full understanding of the bid information and all addenda. The signature shall be witnessed and the Corporate Seal affixed if a corporation. The exact legal name of the corporation or other entity shall be provided

4. Price quotes shall be net, to include all discounts and delivery charges to GUILFORD COUNTY. In cases of difference between unit price and total price, unit price shall prevail unless otherwise noted.

5. Bid event submittal schedules are fixed and will not be amended unless Guilford County determines the County has given cause to extend the event.

6. Items and services bid are for delivery or completion as soon as possible unless otherwise stated. Delivery or completion dates could therefore be important in making the award.

7. With the exception of construction bids, state and local sales taxes are not to be included in quotes, but they are to be added later to all invoices shown as a separate line item for payment. Federal sales-excise) taxes, where applicable, are to be included in quotes as they are a part of the purchase price. See the construction bid specifications in the event for construction and repair sales tax instructions.

8. All Formal Bids will be publicly opened and recorded at the date and time specified by and in the Purchasing Department. It is GUILFORD COUNTY's policy to announce the award electronically. All other information, except that specifically noted by the Supplier as being of a Confidential nature, becomes public record in accordance with GS 132 and other applicable North Carolina laws. All interested parties are invited to attend any Formal Bid opening.

9. GUILFORD COUNTY will have a period of thirty (30) days, unless otherwise stated, after opening to analyze and award to lowest responsive and responsible bidder based on service, quality, delivery date, performance data and price. The successful supplier shall promptly enter into a contract acceptable to Guilford County.

10. All Events/Bids in the Formal Range require the final approval of the GUILFORD COUNTY Board of Commissioners who normally meet in open session two times each month, the first and third Thursday at 5:30 PM. Everyone is invited to attend those meetings.

11. A Bid Deposit may be required. If this is the case, it will be clearly stated in the Event specifications for each package. If a bid deposit is required, it should be no less than 5% of the total bid in cash, cashier's check, certified check, or a Bid Bond. The checks shall be drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation; and, the bond shall be a corporate surety licensed under the State of North Carolina. The obligee in either check or bond shall be Guilford County.

12. If Bid Deposit Checks are received, they will be returned to all suppliers when the

successful supplier has been selected and the contract awarded by Guilford County. The successful deposit check will be returned when the required contract has been executed.

13. In addition to the bid deposit or bid bond, some supplier's may require a separate Performance Bond and/or laborers-materials men's bond as provided by law in the amount of the contract by the awarded supplier(s). If this is required, it will be clearly stated in the bid specifications. In place of a bond; cash, cashiers check, certified check or government securities shall be acceptable.

14. Guilford County reserves the right to reject any or all bids if in the best interest of the County.

15. In case of default by the Supplier, Guilford County shall retain the Bid Deposit or call upon the Bid Bond surety unless otherwise provided by Law.

16. Guilford County's policy is normally Net 30 days upon completion and acceptance. In the case of some longer term projects, Guilford County may choose to release partial payments to the supplier each month based on 90% of the estimated value of the work completed. The final payment will be released within thirty (30) days or less after the satisfactory completion of all work, its acceptance by Guilford County and the settlement of all other claims and accounts.

17. In the case of Continuing Service Type Contracts, payment will be made monthly or as otherwise agreed upon.

18. It is Guilford County's Purchasing Policy to conduct all purchasing within the North Carolina Laws and Guilford County Purchasing Policy, to provide each supplier/contractor an equal opportunity to participate, and to award on a best value basis. In order to accomplish our policy, we intend to make every supplier/contractor aware of each purchasing opportunity. Contracts shall be awarded to the lowest responsive and responsible bidder(s) based on quality, performance and the time specified in the proposal for the performance of the contract. Suppliers/contractors should register online at www.co.guilford.nc.us/sourcing.

19. A Material Safety Data Sheet (MSDS) shall be furnished to Guilford County for all products purchased that contain hazardous material and/or components.

20. Any supplier/contractor performing work on GUILFORD COUNTY property is required to have adequate Liability and Workers Compensation Insurance that will fully protect GUILFORD COUNTY from any damages to property and/or persons caused by the supplier/contractor.

21. The successful supplier shall be required (and is responsible) to take Affirmative Action to employ Disabled Veterans and Veterans of the Viet Nam era, including listing vacancies with the North Carolina Employment Security Commission, under 42 US Code 4212 and applicable regulations thereafter.

    The successful supplier shall be required to employ in the workforce only those laborers whose employment is consistent with all applicable State and Federal Laws. The successful supplier, and each subcontractor, shall prior to performance of the work receive clear written evidence from each laborer that said laborer may lawfully be employed. Said evidence shall immediately be submitted to the County. Failure of said Supplier or Subcontractor to receive, retain and/or provide to the County such evidence shall constitute a material breach of the Contract with the County.

22. The Supplier shall take Affirmative Action in complying with all Federal and State requirements concerning fair employment without regard to discrimination by reason of race, color, religion, sex, national origin or physical handicap.

23. The successful Supplier is responsible for compliance with all applicable Local, State and Federal Laws, including all state and local permits, licenses and fees.

24. If the Supplier/Contractor should undergo merger, acquisition or any change in their ownership or their name for any reason, the provider shall immediately notify Guilford County in writing of these changes and provide Guilford County with legal documentation supporting these changes, such as an Assumption Agreement, Bill of Sale, Articles of Incorporation, Articles of Amendment, sales contract, merger documents, etc. Further, the Supplier/Contractor shall submit the name and address of their registered agent for Service of Process and/or all notices required under the contract(s). This contract shall not be assumed or otherwise transferred to another party by the Supplier/Contractor without the express written consent of Guilford County, which said consent will be evidenced by acceptance memo, letter or e-mail from the Guilford County Manager, or designee, to the original Supplier/Contractor under the contract and the assuming Supplier/Contractor.

25. Provider shall operate as an independent contractor for all purposes. The Parties agree to each be solely responsible for their own acts or omissions in the performance of each of their individual duties hereunder, and shall be financially and legally responsible for all liabilities, costs, damages, expenses and attorney fees resulting from, or attributable to any and all of their individual acts or omissions to the extent allowable by law.

26. Guilford County and the awarded Vendor shall comply with Equal Employment Opportunities (EEO) requirements, and to take affirmative action to ensure that all individuals have an equal opportunity for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, disability, genetic information, or veteran status under the Guilford County EEO Plan, as amended, implemented pursuant to 41 CFR Part 60-2.10(a)(3), 41 CFR §60-741.44(a) and 41 CFR §60-300.44(a), and in accordance with the following laws, as amended: Title VII and Title IX of the Civil Rights Act of 1964; The Equal Pay Act of 1963; Executive Order 11246; the Age Discrimination in Employment Act of 1967; the Rehabilitation Act of 1973, as amended (Section 503); the Americans with Disabilities Act of 1990; the Vietnam Era Veterans' Readjustment Assistance Act of 1974 (VEVRAA); the Civil Rights Restoration Act of 1988; NC General Statutes Chapters 116 and 126 and Title II of the Genetic Information Nondiscrimination Act of 2008, the North Carolina Equal Employment Opportunity Policy effective June 1, 2015, along with all other applicable federal and state laws governing equal employment opportunities.

27. This contract is governed by the Laws of the State of North Carolina.

Project Manual

Request for Proposal

Event # 608

Greene Street Center

201 South Greene Street

Greensboro, NC 27401

HVAC Renovations

for:

County of Guilford , North Carolina
Facilities, Property Management and Parks Department
Greensboro, NC

April 24, 2018

R. C. Pritchard Engineering Services
212 Kirk Road
Greensboro, NC 27410
Project # 2017-0107

Prepared for:

GUILFORD COUNTY FACILITIES AND PARKS
Terri Hall, Administrative Officer
Old County Courthouse
301 W. Market St.
Greensboro, NC 27401
336.641.3314

Project Manual

Request for Proposal

Event # 608

Greene Street Center

201 South Greene Street
Greensboro, NC 27401

HVAC Renovations

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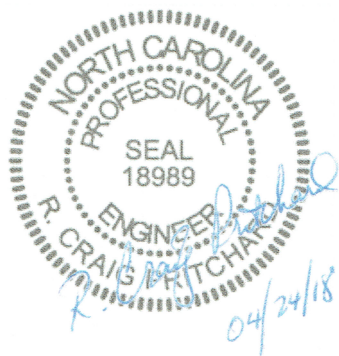

DRAWINGS *INCLUDED BY REFERENCE*

END OF CONTENTS

DOCUMENT 00100 – INVITATION TO BID

Guilford County Facilities is seeks Proposals from individuals or firms interested in providing services for the HVAC renovations at the Greene Street Center.

Scope of Work – Base Bid

The contractor is to provide all required labor, tools, material and equipment for the selective demolition of existing HVAC equipment, piping, and ductwork, and install new equipment with integral microprocessor controls, piping, and ductwork, and new DDC controls for control of the outdoor air air handling unit at the Greene Street Center in Greensboro, NC. The base bid work includes, but is not limited to:

1. Removal of existing air handling unit cooling coil, control valves, and selective demolition of hydronic piping, supply air ductwork, and controls.
2. Demolition of existing natural gas piping.
3. Installation of one (1) new natural gas, direct-vented condensing boiler complete with factory microprocessor controls, boiler pump, circulating pump, storage tank, and related accessories.
4. Installation of one (1) new AHU chilled water cooling coil with control valve and piping.
5. Installation of one (1) new AHU hot water preheat coil control valve and associated piping.
6. Installation of one (1) new AHU hot water reheat coil with control valve and associated piping.
7. Installation of one (1) new AHU outdoor air and one (1) new return air control dampers.
8. Installation of one (1) new barometric relief damper.
9. Installation of two (2) new fire dampers.
10. Installation of one (1) new chilled water storage tank.
11. Installation of new CO2 and humidity sensors on each floor of the building.
12. Installation of new occupancy sensors in the first floor classrooms and entry.
13. Installation of new DDC controls for complete control of the outdoor air air handling unit with demand controlled ventilation and dehumidification.
14. Installation of new gas piping, hot water piping, chilled water piping, and control wiring.
15. Testing, balancing, adjusting, and commissioning of the dedicated outdoor air system.
16. Testing, balancing, and adjusting of the toilet exhaust system.
17. Repair and restoration of the building to original or better condition at the completion of the project.

Respondents or their subcontractors must be licensed to perform all fields of required work in North Carolina. Participation of minority-owned and woman-owned businesses is encouraged but is not an evaluation factor. It is prohibited to pay any fee, commission, percentage, or brokerage fee to any person or firm contingent upon or resulting from award of a contract for this project.

Mandatory prebid walk-through/site access for Contractors (except for previous 3/22/18 prebid meeting attendees) of the Greene Street Center HVAC Renovations located at 201 S. Greene Street, Greensboro, NC will be conducted by Guilford County Facilities and Parks on **May 10, 2018 @ 10:00 AM**.

Bids Responses must be received by the event close date and time of May 22, 2018 @ 3:00 PM (est).

Bids received after the bid date and time may not be considered. Faxed bids will not be accepted.

Submitt Bids for Greene Street Center HVAC Renovations in a sealed envelope containing one (1) original Document 00300-FORM OF PROPOSAL, with all required attachments.

DOCUMENT 00100 – INVITATION TO BID

Submit bids in the manner designated on the form and required by the Project Manual to the address listed below:

Guilford County Facilities Department
Attn: Terri Hall, Administrative Officer
Old County Courthouse, 301 W. Market Street,
Greensboro, North Carolina 27401

The bid envelope(s) shall clearly indicate that the enclosed bid is for:

PROPOSAL FOR EVENT # 608
Greene Street Center HVAC Renovations
201 S. Greene Street
Greensboro, NC 27401

DOCUMENT 00100 – INVITATION TO BID

Submissions will not be retained or returned. No bid may be withdrawn for a period of 60 days after the bid opening date.

Bids must be accompanied by the following documents in duplicate:

1. Minority Business Participation Requirements and Affidavits
2. Document 00335 - E-Verify Affidavit
3. Document 00480 - Non-Collusion Affidavit.
4. Document 00486 - Consent of Surety
5. Document 00490 - Contractor's Qualification Statement (AIA A305)
6. Bid bond – Not required.
7. Any other bid forms required by the Document 00200 INSTRUCTIONS TO BIDDERS.

During the Bidding Period, questions will be taken until 3:00 P.M., 7 (seven) days prior to bid due date.

Any and all DOCUMENT CLARIFICATION REQUEST concerning the bid documents are to be emailed to the office of the Engineer, at **rcpritchardpe@gmail.com** to the attention of: **R. Craig Pritchard**.

Telephone inquiries concerning the bid documents will not be responded to by the Engineer or Guilford County Purchasing Department. *Responses will be distributed to all bidders by Addendum as required.*

Bidding documents, drawings and specifications are available for viewing at the Guilford County E-Procurement website. Contact Purchasing Department at 336-641-3314 with website questions. Guilford County registered vendors will receive email notifications of all revisions to the drawings and specifications issued by addenda through E-Procurement. All addenda will be posted to the E-Procurement website.

END OF DOCUMENT 00100

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

PART 1 - PRE-BID REQUIREMENTS

1.1. INTENT

A The Engineer has made every effort to set forth in the Bid Documents the complete scope of the Work. Nevertheless, minor omissions and discrepancies shall not excuse the Bidder from providing a price to totally complete the project in accordance with the intent of these documents.

1 Bring any conflicts, omissions, or discrepancies to the attention of the Engineer prior to submission of an executed bid form.

2 After execution of the Contract, no extra charges will be allowed for items of work where such are concluded to conform to normal construction practices and methods.

1.2 CONFIRMATION

A Inquiries: Notify the Engineer if the meaning of the documents is in doubt, or if discrepancies or omissions are noted. An Addendum clarifying the issue in question will be sent to all Bidders.

1 All inquiries are to be submitted on Document Clarification Request Form located in Section 00215. Submit all inquiries to the Engineer.

2 If any bidder is in doubt as to the true meaning of any part of the Documents, he shall request an interpretation from the Engineer. Requests shall be made in time to allow the Engineer to evaluate the request and to issue a formal clarification no later than seven (7) working days prior to scheduled bid date.

3 Whenever there are discrepancies between Drawings, or between the Drawings and Specifications, or conflicts within the Specifications, and such discrepancy is not called to the Engineer's attention in time to permit clarification by Addendum, the bidder shall base his bid upon providing the better quality or greater quality of work or material called for, shall submit a written statement with his proposal noting such discrepancies, and shall so furnish and install such better quality or greater quantity unless otherwise ordered in writing.

B Site Inspection: Visit the location where the Work is to be performed, become thoroughly familiar with all conditions affecting the work, and compare conditions with the Bid Documents. No consideration will be granted for any misunderstanding of existing conditions resulting from failure to visit the site.

1.3 CONTRACT FORMS

A Read carefully and become familiar with the forms identified in the List of Contract Forms.

1 Should the Owner elect to enter into an agreement to execute the Work, the listed forms shall be used.

2 Applicable forms are bound into the Project Manual.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

1.4 LAWS AND REGULATIONS

A All applicable federal, state, and local laws and ordinances, as well as the rules and regulations of the jurisdiction where the work is to be executed, shall apply to the Contract throughout. These will be deemed to be included in the Contract to the same extent as though herein written, including, but not limited to the following:

1 Rules and regulations issued by the Health Hazard Control Unit of the NC Dept of Health & Human Services, Division of Public Health.

2 Rules and Regulations issued by the NC Department of Labor, Occupational safety and Health Division.

3 Rules and regulations issued by the N.C. Department of Environment and Natural Resources.

4 Rules and regulations issued by the Guilford County Planning & Development Department, Permitting and Inspections and Soils and Erosion Control Sections.

1.5 COMPLETION TIME

A Evaluation of each Bid will include serious consideration of the time of completion. The Bidder shall be prepared to execute the Contract to accommodate the Owner's commitments and shall govern himself accordingly in completing the Bid Form. This project is scheduled to be completed in 90 calendar days from Notice to Proceed.

1.6 SUBSTITUTIONS

A It shall not be incumbent upon the Owner and/or the Engineer to consider any items submitted for substitution but only those, in their judgment, meriting consideration. All requests for substitution by Sub-contractors or Material Suppliers will be considered only when made and approved through a qualified Bidder and when submitted with sufficient information to evaluate the product/materials being considered. All requests shall comply with the following:

1. The equipment and/or product submitted must equal in all ways to the specified equipment or product. The Engineer will make the final decision in conjunction with HMS-Host.
2. The proposer of the substitution of equipment or product shall identify any delay to the schedule for work, inspections, or tests which might result from the use of the proposed substitution."

PART 2 - BID PROCEDURES

2.1 PREPARATION OF BIDS

A The Bid shall be prepared using the Bid Form template forwarded electronically by the Engineer; no other forms will be considered.

1 Bids shall be submitted as directed by the INVITATION TO BID.
2 Bids shall include the Bidder's legal name, fully written.
3 Oral, telegraphic, or other modifications will not be considered.

B. Bid Forms shall be sent to the Owner as indicated in the Invitation to Bid Letter.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

2.2 OWNER'S RESPONSE TO BIDS

A Submitted Bid Forms will NOT be opened and read publicly on the date indicated in the Invitation to Bid Letter. Notice of award will be made by the Owner after consideration of Bids received.

C The Owner reserves the right to respond to the Bids as follows:

1 Reject any or all Bids without explanation.
2 Waive non-material technicalities.
3 Advertise for new bids.
4 Proceed to do the work otherwise.

D The following Bids may be rejected as being informal:

1 Bids that fail to meet the requirements of these instructions.
2 Bids that are incomplete, conditional, or obscure.
3 Bids that contain additions not called for, erasures, alterations, or other irregularities.
4 Bids that contain abnormally high or abnormally low prices for any class or item of work.

PART 3 - CONTRACT EXECUTION

3.1 POST-BID SUBMITTALS

A After notification of selection as apparent lowest responsive, responsible bidder of a Contract, the Bidder shall submit the following to the Owner 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.
3 Names of persons or entities proposed for the execution of principal portions of the Work.

B The Engineer will notify the Bidder in writing if either the Owner or Engineer has reasonable objection to a Subcontractor proposed by the Bidder. If the Owner or Engineer has reasonable objection to a proposed Subcontractor, the Bidder may, at the Bidder's option:

1 Withdraw the bid.
2 Submit an acceptable substitute subcontractor with an adjustment in the Bid to cover the difference in cost. NOTE: Withdrawal of bid may lead to a forfeiture of Bid Bond where appropriate.

C The Owner may accept the adjusted Bid Price or disqualify the Bidder. Persons and entities accepted by the Owner and Engineer 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 Engineer.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

3.2 INSURANCE AND BONDS

A Insurance: Upon receipt of a written "Letter of Intent", the Bidder shall furnish to the Owner a certificate of insurance in compliance with the requirements of the following:

1 General Conditions of the Contract.
2 Supplementary Conditions of the Contract.

B Performance and Payment Bonds: Upon receipt of a Construction Contract, the Bidder shall furnish to the Owner a Performance Bond and Labor & Materials Payment Bond, both for the full amount of the Contract.

1 The bonds shall be provided by a properly qualified surety company.
2 The cost of the Performance and Payment Bonds shall be indicated on the Bid Form and shall be included in the total proposed Contract Amount.

3.3 LABOR FORCE

A Non-Discrimination: The Bidder is advised that the Owner will not tolerate any discrimination on the basis of age, gender, race, national origin, or sexual orientation by the Bidder or Subcontractors.

END OF BID INSTRUCTIONS

DOCUMENT 00215 – DOCUMENT CLARIFICATION REQUEST (DCR)

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Specified in This Section:
1. This Section specifies administrative and procedural requirements for disposition of Document Clarification Request (DCR's) during the Bidding Phase.

1.2 SUBMITTALS

A. Submit each request (DCR) on the form included in this Section.

B. Provide only one request on each form.

C. Email DCR form to R. C. Pritchard Engineering Services, 212 Kirk Road, Greensboro, NC 27455 at **rcpritchardpe@gmail.com**.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CONDITIONS

A. Submit requests to the Engineer as soon as possible.

B. DCR's will be received up to (7) calendar days prior to the Bid date. DCR's received after that date will not be reviewed.

3.2 ENGINEERS ACTION:

A. The Engineer will review the information requested.

B. The Engineer's response will be in the space provided on the DCR form included in this Section.

DOCUMENT 00215 – DOCUMENT CLARIFICATION REQUEST (DCR)

Contractor DCR #: **Date:**

Submitted By:

Attention: **R. Craig Prithard, PE**

Subject:

Specification Reference:

Drawing Sheet Number/Detail Reference:

INFORMATION REQUESTED

Signed:_____

RESPONSE **By:** **Date:**

☐ See Drawings/Specifications:

☐ See Addenda to be issued:

☐ Other

☐ See attachments

END OF DOCUMENT 00215

DOCUMENT 00300 – FORM OF PROPOSAL

Attention: Terri Hall, Administrative Officer – Guilford County Facilities and Parks

Event Number: _____

Bidder: _____

Address: _____

Telephone #: _____

Bid Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder, by signing below, in consideration of the mutual promises, contained herein and other good and valuable consideration, the receipt and sufficiency hereby acknowledged, agrees to the terms and conditions set out herein.

Bidder agees that upon acceptance the Guilford County, this Bid Package shall be deemed as a binding contract subject to the terms set out herein. It is acknowledged that the terms in the Section 00500-1 *et seq.,* entitled Contract, shall be binding should any issues arise over possibly inconsistent or conflicting language. This Contract shall be in full force and effect upon execution by all parties for the terms as set forth in Section 4, of the Contract found in Section 00500.

Bidder further agree to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the:

Event # 608
Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the

GUILFORD COUNTY FACILITIES AND PARKS DEPARTMENT and R. C. Pritchard Engineering Services

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:

DOCUMENT 00300 – FORM OF PROPOSAL

SINGLE PRIME CONTRACT:

BASE BID:

_____Dollars($)_____

GENERAL CONTRACTOR:

_____Lic_____

ELECTRICAL SUBCONTRACTOR:

_____Lic_____

MECHANICAL SUBCONTRACTOR:

_____Lic_____

_____Lic_____

GUILFORD COUNTY:

_____

ATTEST:

_____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

DOCUMENT 00300 – FORM OF PROPOSAL

PROJECT DURATION

Bid Project Duration is 90 Calendar days from notice to proceed).

ATTACHMENTS TO BE INCLUDED WITH PROPOSAL

1. **Minority Business Participation Requirements and Affidavits**

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

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

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

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

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

2. **Document 00335 - E-Verify Affidavit**
3. **Document 00480 - Non-Collusion Affidavit.**
4. **Document 00486 - Consent of Surety**
5. **Document 00490 –Contractor's Qualification Statement (AIA A305)**
6. **Bid bond – Not required.**
7. **Any other bid forms required by the Document 00200 INSTRUCTIONS TO BIDDERS.**

DOCUMENT 00300 – FORM OF PROPOSAL

PROPOSAL SIGNATURE PAGE

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

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By:_____
Signature

Name: _____
Print or type

Title_____
(Owner/Partner/Pres./V.Pres)

Address_____

_____

ATTEST:

By:_____

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

License No._____

Federal I.D. No. _____

Email Address: _____

(AFFIX CORPORATE SEAL)

Acknowledge of mandatory prebid walk-through/site access attendance (either 3/22/18 or 5/10/18):
General Contractor (Y) (N)

Acknowledge attachments included with proposal:

Attachment No. 1 A___, B___, C___, D___ *(check all that apply)*

Attachment No. 2_____, Attachment No. 3_____, Attachment No. 4_____, Attachment No. 5_____,
Attachment No. 6_____, Attachment No. 7 (List Other) _____

Acknowledge 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_____

END OF DOCUMENT 00100

DOCUMENT 00311 – SCHEDULE OF VALUES

Division	Discription	Scheduled Amount
DIVISION 0	**PROCUREMENT**	
Document 00820	GENERAL CONDITIONS OF THE CONTRACT	$ _____
	BONDS	$ _____
DIVISION 1	**GENERAL REQUIREMENTS**	
SECTION 01310	PROJECT COORDINATION	$ _____
SECTION 01450	QUALITY CONTROL/QUALITY ASSURANCE	$ _____
SECTION 01500	TEMPORARY FACILITIES	$ _____
SECTION 01740	FINAL CLEANING	$ _____
SECTION 01781	PROJECT CLOSEOUT	$ _____
SECTION 01788	WARRANTIES	$ _____
DIVISION 9	**FINISHES**	
SECTION 095113	CEILINGS (REPAIR AND REPLACE)	$ _____
SECTION 099123	PAINTING	$ _____
DIVISION 23	**MECHANICAL**	
SECTION 230500	HVAC DEMOLITION	$ _____
SECTION 230553	IDENTIFICATION	$ _____
SECTION 230593	TESTING ADJUSTING AND BALANCING	$ _____
SECTION 230593	COMMISSIONING	$ _____
SECTION 230713	DUCT INSULATION	$ _____
SECTION 230719	PIPING INSULATION	$ _____
SECTION 230923	DDC CONTROLS (& CONTROL VALVES)	$ _____
SECTION 231123	NATURAL GAS PIPING	$ _____
SECTION 232113	HYDRONIC PIPING (& SPECIALTIES)	$ _____
SECTION 232123	HYDRONIC PUMPS	$ _____
SECTION 233113	METAL DUCTS	$ _____
SECTION 233300	AIR DUCT ACCESSORIES	$ _____
SECTION 233713	DIFFUSERS, REGISTERS AND GRILLES	$ _____
SECTION 235216	CONDENSING BOILER	$ _____
SECTION 238126.13	HYDRONIC AIR COILS	$ _____
DIVISION 26	**ELECTRICAL**	
SECTIONS 260519 to 264313	POWER AND LOW VOLTAGE WIRING	$ _____
ALLOWANCE	PROJECT CONTINGENCY	**$ 10,000.00**
TOTAL	**BASE BID**	**$** _____
ALTERNATE #1	**BMS INTEGRATION**	**$** _____

END OF SECTION 00311

DOCUMENT 00330 – MBE GUIDELINES AND AFFIDAVITS

COVER PAGE INCLUSIVE OF

1. REQUIREMENTS PERTAINING TO THE PARTICIPATION OF MINORITY BUSINESSES IN BUILDING (CONSTRUCTION – REPAIR) CONTRACTS FOR GUILFORD COUNTY, NC

2. IDENTIFICATION OF MINORITY BUSINESSES PARTICIPATION *(Attach to Bid)*

3. AFFIDAVIT A – LISTING OF THE GOOD FAITH EFFORT *(Attach to Bid)*

4. AFFIDAVIT B - INTENT TO PERFORM CONTRACT WITH OWN WORKFORCE *(Attach to Bid)*

5. AFFIDAVIT C – PORTION OF THE WORK TO BE PERFORMED BY MINORITY FIRMS (Do not submit with *bid)*

6. AFFIDAVIT D – GOOD FAITH EFFORTS *(To be submitted only by the apparent lowest responsible, responsive bidder)*

7. APPENDIX E – MBE DOCUMENTATION FOR CONTRACT PAYMENTS *(To be submitted with each pay request – Final Payments – Final Reports by awarded bidder)*

REQUIREMENTS PERTAINING TO THE PARTICIPATION OF MINORITY BUSINESSES IN BUILDING (CONTRUCTION - REPAIR) CONTRACTS FOR GUILFORD COUNTY, N.C.

Date 1-1-02

One primary responsibility of Guilford County (GC) government is the proper use of public revenue to purchase the various items, services, construction and repairs needed to operate. All expenditures of county funds must be in accordance with the NC laws. Construction contracts are subject to applicable laws, including Article 8, N.C.G.S. Chapter 143, which shall control in the event of any conflict.

For building (construction - repair), whose estimated total cost is $500,000 or more, a formal bid process is required. This generally consists of written specifications, advertisement, bid bond, usually a prebid meeting, at least three responses on the first opening, public opening of bids, Commissioners' approval, notice of award to all participants, and written contract.

Specifications for building (construction - repair) projects requiring an expenditure of $500,000 or more requires separate specifications for the following areas of work:

Heating, Ventilating and Air Conditioning (HVAC)
Plumbing
Electrical
General

and may be bid separate-prime (allowing bids for each of the above categories), single- prime (a bid for the total project), or dual-prime, as provided in Article 8, N.C.G.S. Chapter 143. Award is made to the lowest responsive, responsible bidder(s), as provided by law.

Contractors who bid single-prime must identify in their bid response the names of each sub-contractor for HVAC, Plumbing and Electrical.

For building (construction - repair) projects requiring an expenditure of $100,000 or more, state law (G.S. 143-128.2) requires the public government (awarding authority) involved to adopt, after a public notice and a public hearing, an appropriate verifiable percentage goal for participation by minority business in the total value of work for each building (construction - repair) contract awarded. G.S. 143-128.2 must be read, understood, and complied with by each bidder.

Guilford County has established its verifiable minority participation goal on 3-5-90 at ten (10) percent.

In addition, each separate-prime and single-prime contractor must establish its own goal when dealing with sub-contractors and provide appropriate documentation to the awarding authority.

In each case, the responsibilities of auditing and compliance with this law is that of the awarding authority, which in this case is Guilford County.

A minority business is defined as ownership of 51% or more by a minority. Minorities are officially defined as:

(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, in South or Central America, or the Caribbean Islands, regardless of race;
(c) Asian American, that is, a person with origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, or the Pacific Islands;
(d) American Indian, that is, a person having origins in any of the original Indian peoples of North America; or
(e) Female.

(Requirements - continued)

The Guilford County method of compliance is basically as follows:

1. For any expenditure of funds, including building construction and repair, it is GC's policy to give every supplier, business or contractor in Guilford County an equal and fair opportunity to participate. In order to accomplish this, we maintain a list of all suppliers, businesses and contractors. We have also identified all minorities on this list and we update this list on a continuous basis.

2. When bids are needed for any item, service, construction or repair, we make sure that all on our list are contacted by mail and/or phone. Larger expenditure items requiring formal bids are advertised.

3. All building construction and repair contracts over $500,000 would be in the formal bid range requiring the mailing of bid packages (specifications), advertising and prebid meetings. All contractors on our list will either be mailed a copy of the bid package or notified in writing as to how a bid package can be obtained. All contractors on our list will also be invited to our prebid meetings.

4. In our bid package and at our prebid meeting, we explain that every contractor will be given an equal opportunity to obtain all or part of the contract award. Guilford County is ready and willing to work with any contractor to help it understand and properly compete for contract awards. The other requirements of G.S. 143-128.2 and G.S. 143-128.3 will be complied with by the County, when applicable.

5. Guilford County maintains a record as to who was awarded contracts and with the minority identification GC can state the percentage of minority participation.

6. This goal of ten (10) percent is a goal, and is not a requirement, demand, set aside or guarantee to minorities. It is, however, a serious goal and we seek to achieve this goal, as explained above, by continuing to give every supplier, business and contractor an equal opportunity to participate but to make all purchases and to award all contracts on the basis of best value.

7. All bidders shall make the minority participation disclosures required by G.S. 143-128.2(c) and comply with the other requirements of G.S. 143-128.2.

The state law requires and Guilford County expects its contractors to deal with their sub-contractors in the same manner and the state law and Guilford County require verification that this approach is being followed. The minority percentage goal set by each contractor for their sub-contractors is up to them and does not necessarily have to agree with the ten (10) percent which has been set by Guilford County. The method in which all prime contractors plan to attain this goal is, however, very important to GC and must be fully explained and it will be audited by GC.

Guilford County will help any contractor in this effort by supplying a list of all minority suppliers by trade category. Guilford County will consider a "good faith" effort by the contractor involved if the contractor makes a positive effort to contact each minority supplier and to allow each an equal opportunity to quote on the particular work involved.

If anyone has questions concerning GC's approach to the minority participation percentage goal, what is covered here, what is covered by the GC resolution, or the NC laws, they should contact Guilford County Purchasing at 336-641-3226.

(Requirements - continued)

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

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

Note: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of the participation form and Affidavit (**A)** required above.

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

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

OR

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must submit **with their bid** the Identification of *Minority Business Participation* list and *Affidavit A* **or** *Affidavit B* as applicable. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder may be grounds for rejection of the bid.

R09-02

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

Attach to Bid **Attach to Bid** **Attach to Bid** **Attach to Bid** **Attach to Bid**

Identification of Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

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

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

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

R09-02

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Attach to Bid **Attach to Bid** **Attach to Bid** **Attach to Bid** **Attach to Bid**

State of North Carolina - AFFIDAVIT A - Listing of the Good Faith Effort

County of _____

Affidavit of _____
(Name of Bidder)

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30A .0101, et seq.)

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

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d). Failure to abide by this statutory provision will constitute a breach of the contract.

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

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires _____

R09-02

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Attach to Bid **Attach to Bid** **Attach to Bid** **Attach to Bid** **Attach to Bid**

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

County of _____

Affidavit of _____
(Name of Bidder)

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

_____contract.
(Name of Project)

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

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

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

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires _____

R09-02

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Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

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

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

County of _____

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

If the portion of the work to be executed by 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
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

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

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

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

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

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

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires _____

R09-02

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Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

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

State of North Carolina - AFFIDAVIT D - Good Faith Efforts

County of _____

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

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

Affidavit of _____

(Name of Bidder)

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

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

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

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

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State or local government for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

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

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of _____

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

Notary Public _____

My commission expires _____

R09-02

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APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ **Period:** _____

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

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

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

Approved/Certified by:

_____ _____
(Name) (Title)

_____ _____
(Date) (Signature)

SUBMIT WITH EACH PAY REQUEST-FINAL PAYMENT-FINAL REPORT

(Revised on 2/5/2008)

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DOCUMENT 00335– E-VERIFY AFFIDAVIT

COVER PAGE

STATE OF NORTH CAROLINA

AFFIDAVIT

COUNTY OF GUILFORD

****

I, _____(the individual attesting below), being duly authorized by and on behalf of _____ (the entity bidding on project hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. Mark “Yes” or “No”:

   a. YES _____; or,

   b. NO _____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This ____ day of _____, 2015.

_____
Signature of Affiant
Print or Type Name: _____

State of North Carolina County of Guilford

Signed and sworn to (or affirmed) before me, this the _____

day of _____, 2015.

My Commission Expires:

_____. _____
Notary Public

(Affix Official/Notarial Seal)

DOCUMENT 00480 – NON-COLLUSION AFFIDAVIT

STATE OF (North Carolina)
( )SS.
COUNTY OF ( )

I, _____, of the Municipality of _____, In the County of _____ and the State of _____, of full age, being duly sworn according to law on my oath depose and say that:

I am _____, of the firm of _____, making the Proposal for the above- named authority.

My submission of a response to this event certifies that I agree to the non-collusion agreement contained below:

1. The submitter of this document is acting as an agent for their company who is the respondent that has submitted the attached bid response.
2. The undersigned person is fully informed concerning the preparation and contents of the attached response and of all pertinent circumstances related to it, and is authorized to sign this affidavit. This affidavit is given under penalty of perjury as provided by law.
3. Such bid response is genuine and is not collusive or sham in anyway whatsoever.
4. Neither the person responding nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including the signer of this affidavit, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other respondent, firm or person to submit collusive or sham response in connection with the contract for which the attached response has been submitted or to refrain from responding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other responder, firm or person to fix the price, or cost to secure through collusion, conspiracy, connivance or unlawful agreement any advantage against the Board of County Commissioners, Guilford County or any person interested in the proposed contract.
5. The price or prices quoted in the attached response are fair and proper and are not derived by any collusion, conspiracy, connivance or lawful agreement and on the part of the respondent or any of its agents, representatives, owners, employees, or parties in interest.

_____
(Name of Contractor)

_____
Signature (Type or Print Name) Title Date

Subscribed and sworn to before me on this _____day of _____, 20 ___.

_____
Signature (Type or Print Name)

Notary Public of the State of _____

My Commission expires _____, 20_____.

END OF DOCUMENT 00480

SECTION 00481 – STATEMENT OF OWNERSHIP

I certify that the list below contains the names and home addresses of all stockholders holding 10% or more of the issued outstanding stock of the undersigned corporation. If one or more such stockholder or partner is itself a corporation or partnership, the stockholder holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, are also listed.

_____
Corporate Name

Attest: _____ Date: _____

_____ _____
Secretary Officer

_____ _____
(Also, Print/Type Name) (Also, Print/Type Name)

Affix Corporation Seal

Stockholders:

Name: _____

Home Address: _____

_____

Name: _____

Home Address: _____

_____

Name: _____

Home Address: _____

_____

END OF DOCUMENT 00481

SECTION 00486 – CONSENT OF SURETY

The _____

_____
(Name and address of Bidder)

a corporation existing under the Laws of the State of

_____

and authorized to do business under the Laws of the State of North Carolina, hereby certifies that application has been made to us by

_____

_____
(Name and address of Bidder)

and satisfactory arrangements have been completed by which we have and do now agree to furnish a Performance Bond equal to 100% of the Contract to ensure the faithful performance on the part of the Bidder of the terms and conditions of the contract, and a labor and materials bond to ensure the payment of all persons furnishing labor and materials in accordance with the contract.

Title of Work: **Greene Street Center**

Location of Project: 201 S. Greene Street, Greensboro, North Carolina

This proposition is made with the understanding that any change made in the specifications or agreements without the consent of the bondsmen shall in no way vitiate the bond.

WITNESS:

_____

SURETY COMPANY

_____

Title: _____

Attorney-In Fact

By: _____

Date: _____

(Affix corporate seal)

END OF DOCUMENT 00486

DOCUMENT 00490 – CONTRACTOR'S QUALIFICATION STATEMENT

A305™–2010-Contractor's Qualification Statement

(Included by reference)

OBTAIN AND COMPLETE AN ORIGINAL COPY OF AIA A305 AND ATTACH TO BID DOCUMENTS 00300 – FORM OF PROPOSAL AND 00310 - COMBINED FORM OF PROPOSAL.

Original Copies of AIA A305 may be ordered from:

AIA North Carolina
A Chapter of the
American Institute of Architects
14 E. Peace Street
Raleigh, NC 27604
Tel: 919-833-6656 or
On-line: http://www.aianc.org/order-documents

(Search Keyword: A305 - Usually ships within 3 business days)

DOCUMENT 00500 – CONTRACT BETWEEN COUNTY OF GUILFORD AND PROVIDER

CONTRACT
COVER PAGE

NORTH CAROLINA

GUILFORD COUNTY

THIS CONTRACT is hereby made, entered into, and effective as of this _____ day of _____, 201___, by and between GUILFORD COUNTY, a body politic and corporate of the State of North Carolina, hereinafter referred to as the "COUNTY," and _____, a _____ **[insert type of entity: sole proprietorship, corporation, limited liability company, professional limited liability company, etc.]** with a place of business in _____, _____, **[insert city & state of company location]** hereinafter referred to as the "PROVIDER," and also collectively referred to as the "Parties."

W I T N E S S E T H :

WHEREAS, for the purpose and subject to the terms and conditions hereinafter set forth, the COUNTY hereby contracts for the items, goods, service or services of the PROVIDER and the PROVIDER agrees to provide the items, goods, service or services to the COUNTY in accordance with the terms of this Agreement.

WHEREAS, the COUNTY is in need of **[insert brief description of goods and/or services]** _____ _____; and,

WHEREAS, the PROVIDER has submitted a proposal to provide such goods and/or services.

NOW, THEREFORE, in consideration of promises mutually exchanged the Parties agree as follows:

1. Goods and/or Services. PROVIDER will provide the goods and/or services as set forth in the **Specifications (Attachment A)** and **Proposal (Attachment B)**, attached hereto and incorporated herein by reference. All items and/or services shall be provided in a competent, workmanlike and professional manner acceptable to the COUNTY. Should there be any discrepancy between the PROVIDER'S Proposal (Attachment B) and the Specifications (Attachment A) and/or the first ___ pages of this Contract, the first ___ pages of this Contract and/or the Specifications (Attachment A) shall prevail and control.

2. Pricing. As full compensation for the PROVIDER'S delivery of the goods and/or services, the COUNTY agrees to pay the amounts for the goods and/or services as set out in Attachment B. Payment will be made by the COUNTY to PROVIDER within thirty (30) days of receipt of a correct invoice and proper documentation that the goods and/or services have been delivered or provided in accordance with this Contract.

PROVIDER'S Base Bid $_____
Alternates $_____ (alternates, unit prices and schedule of values on attached sheet)
County's Contingency $_____
The maximum financial exposure to the COUNTY under this Contract will not exceed $_____.

3. Appropriation. This Contract is subject to annual appropriation of funds by the Guilford County Board of Commissioners or other funding source, pursuant to N.C.Gen. Stat. Chapter §153A-13.

4. Effective Date. The Notice to Procced will be issued by the GUILFORD COUNTY Facilities Department within approximately two (2) weeks of full execution of this Contract. The effective (starting) date of work to be performed under this Agreement will be set forth in the Notice to Proceed. The construction should be completed within _____ **[insert number of days, months or years]** from the date of the Notice to Proceed**.**

5. Addendum. The terms of this Agreement may only be modified or revised with a written Contract executed by both Parties.

6. Termination. The COUNTY may at any time and for any reason terminate PROVIDER'S services and work at the COUNTY'S convenience, after written notification to the PROVIDER via certified mail. Upon receipt of such notice, PROVIDER shall, unless the Notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, PROVIDER shall be entitled to payment only as follows; (1) the actual cost of the work completed in conformity with this Agreement and (2) plus such other costs actually incurred by PROVIDER as approved by the COUNTY. The amount of any payments made to PROVIDER prior to the date of termination of this Agreement shall be deducted from such sums as provided in this subparagraph.

7. Notices. All notices pursuant to this Agreement shall be in writing and delivered personally or mailed by certified mail, registered mail, postage prepaid, with return receipt requested, at the addresses appearing below, but each Party may change such address by written notice in accordance with this paragraph. Notices delivered personally will be deemed communicated as of actual receipt. Mailed notices will be deemed communicated as of three (3) days after mailing.

Marty K. Lawing
Guilford County Manager
GUILFORD COUNTY
P.O. Box 3427 (zip code 27402)
301 West Market Street
Greensboro, NC 27401

_____
President/Title
PROVIDER Co Name _____
PROVIDER Co Address _____
PROVIDER City State; Zip _____

8. Independent Contractor/Indemnification. PROVIDER shall operate as an independent contractor for all purposes. Nothing in this Agreement shall be interpreted or construed as creating or establishing the relationship of employer and employee between the COUNTY and either the PROVIDER or any employee or agent of PROVIDER. PROVIDER is an independent contractor and not an employee, agent, joint venture or partner of the COUNTY.

The Parties agree to each be solely responsible for their own acts or omissions in the performance of each of their individual duties hereunder, and shall be financially and legally responsible for all liabilities, costs, damages, expenses and attorney fees resulting from, or attributable to any and all of their individual acts or omissions to the extent allowable by law.

9. GUILFORD COUNTY LIABILITY INSURANCE REQUIREMENTS

WORKERS COMPENSATION
PROVIDER agrees to maintain coverage to apply for all employees for statutory limits in compliance with the applicable state and federal laws. The policy must include employer's liability with a limit of $1,000,000 for each accident, $1,000,000 for each employee, with a $1,000,000 aggregate policy limit.

COMMERCIAL GENERAL LIABILITY
PROVIDER does hereby agree to maintain minimum limits of $1,000,000 per occurrence, per location, single limit for bidily injury liability and property damage liability, with a $2,000,000 aggregate limit, per location. This shall include premises and/or operations, independent contractors, products and/or completed operations, broad form property damage and explosion, collapse and underground damage coverage, and a contractual liability endorsement.

BUSINESS AUTO POLICY
PROVIDER does hereby agree to maintain limits of $1,000,000 per accident combined single limit for bodily injury liability and property damage liability. This shall include: owned vehicles, plus hired and non-owned vehicles.

GUILFORD COUNTY shall be named as an additional insured on the PROVIDER'S general liability insurance policy, which shall be primary and n ot contrbutory to any other insurance that may be available to the county. PROVIDER will also secure its general liability insurance from an A rated insurance company acceptable to the COUNTY.

Upon the COUNTY'S offer of award of this Agreement, PROVIDER will provide Certificates of Insurance for meeting the required insurance provisions. **The Certificate of Liability statement shall state, "GUILFORD**

COUNTY is added as an additional insured as evidenced by the endorsement attached to this certificate." PROVIDER will also provide a copy of the additional insured endorsement to the COUNTY with their award package.

All insurance documents required under this Contract shall be forwarded to;

GUILFORD COUNTY
Attention: Risk Management
301 West Market Street Suite B-2
Greensboro, NC 27401
Reference: GUILFORD COUNTY CONTRACT NO. _____
With PROVIDER NAME

In the event PROVIDER fails to maintain and keep in force for the duration of this Contract the insurance required herein, the COUNTY may cancel and terminate this Contract without notice.

10. Assumption. If PROVIDER should undergo merger, acquisition, bankruptcy or any change in their ownership or their name for any reason, PROVIDER must immediately notify GUILFORD COUNTY in writing of these changes and provide the COUNTY with legal documentation supporting these changes, such as an Assumption Agreement, Bill of Sale, Articles of Incorporation, Articles of Amendment, sales contract, merger documents, etc. Further, PROVIDER will submit the name and address of the assuming PROVIDER'S registered agent for service of process and/or all notices required under this Contract.

11. Severability. If any provision of this Contract is held unenforceable, then such provision will be modified to reflect the Parties' intention. All remaining provisions of this Contract shall remain in full force and effect.

12. Force Majeure. Neither Party shall be liable to the other Party for any failure or delay caused by events beyond such Party's control and not due to its own negligence, provided that such Party uses commercially reasonable efforts to resume performance as soon as reasonably practicable. The non-performing Party shall notify the other Party of the force majeure event within twenty-four (24) hours of the onset thereof. In the event that a force majeure event precludes PROVIDER from performing services and/or providing goods for a period of ten (10) consecutive business days, the COUNTY shall have the right to: (a) procure replacement goods and/or services from an alternative source and/or (b) terminate the Contract or portion(s) of Contract upon written notice to PROVIDER.

13. Headings/Titles/Wording. Inclusion of titles of paragraphs or section headings, capitalization of certain words or phrases and/or bold face typestyle of certain words or phrases in this Contract are for convenience purposes only and shall not be used to interpret or construe the provisions of this Agreement. The terms "Contract" and "Agreement" have the same meaning and may be used interchangeably throughout this document. The terms "Attachment" and "Exhibit" have the same meaning and may be used interchangeably throughout this document.

14. Entire Agreement. This Contract, including the Exhibits and/or Attachments, if any, sets forth the entire Agreement between the Parties. All prior conversations or writings between the Parties hereto or their representatives are merged within and extinguished. This Contract shall not be modified except by a writing subscribed to by all the Parties.

15. Jurisdiction. The Parties agree that this Contract is subject to the jurisdiction and laws of the State of North Carolina. The CONTRACTOR will comply with bid restrictions, if any, and applicable laws, including N.C. Gen. Stat. §143-129(j) regarding E-Verify. Any controversies arising out of this Contract shall be governed by and construed in accordance with the laws of the State of North Carolina. An Affidavit Regarding E-Verify is attached hereto and incorporated herein by reference as **Exhibit I.**

16. Iran Divestment Act of 2015. Whereas, N.C. Gen. Stat. §147-86.59 requires that a State agency or political subdivision of the State must require persons attempting to contract therewith, including contract renewals or assumptions, to certify that the person or the assignees are not identified on the list created by State Treasurer pursuant to N.C. Gen. Stat. §147-86.58. Effective as of the date of this Contract, and in accordance with N.C. Gen. Stat. §147, Article 6E entitled "Iran Divestment Act," each Party hereby certifies that it is not identified on the Final

Divestment List created by the State Treasurer, which list of persons the Treasurer has determined engage in investment activities in Iran, including any subcontractors of eith Party.

WITNESS the following signatures and seals all pursuant to authority duly granted, effective as of the day and year first above written.

GUILFORD COUNTY

_____
Marty K. Lawing, Guilford County Manager

ATTEST:

_____
Guilford County Clerk to Board

(COUNTY SEAL)

[Insert PROVIDER'S legal name. – This should match with their name in the introductory paragraph of this contract.]

_____
President

Printed Name:_____

ATTEST:

_____
Corporate Secretary

Printed Name: _____

(CORPORATE SEAL)

or

No Corporate Seal Exists:

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

_____
Guilford County Finance Director

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

Table of Contents

DOCUMENT 00821 – SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

Article 1 Scope

This section of the Contract defines the Supplementary General Conditions governing the performance of the Contract between the OWNER and the Contractor (collectively, the "Parties").

Article 2 Definitions

A. ADDENDA (AMENDMENT, paragraph 5 of the Contract): Any written or graphic instrument issued prior to the opening of bids which clarifies, corrects, or changes any part of the bidding documents or the Contract Documents.

B. AS BUILT DRAWINGS: Detailed drawings that accurately and clearly indicate in detail the actual Work performed on the Project.

C. CHANGE DIRECTIVE – A written order to the Contractor signed by the Owner directing an addition, deletion, or revision in the Work after execution of the Construction Agreement, in circumstances when the parties have been unable to agree on an adjustment to the Contract Price or the Contract Time, but the Owner requests that the Contractor proceed with said Work subject to adjustment of the Contract Price and/or Contract Time under the procedures described herein.

D. CHANGE ORDER - A written order to the Contractor signed by the Owner and the Designer authorizing an addition, deletion, or revision in the Work and/or an adjustment in the Contract Price and/or the Contract Time issued after execution of the Construction Agreement.

E. COMPLETION DATE - Those dates identified as Completion Dates in the Contract Construction Schedule or elsewhere in the Contract Documents.

F. CHANGE OF CONTRACT: A written order, issued after the effective date of the Contract, and executed by the OWNER and Contractor, which authorizes an addition, deletion or revision in the Work and which may include an adjustment in the Contract Sum or the time of performance of the work. Construction Manager(s) - The person or firm designated as the Construction Manager in the Contract Documents, or their authorized representatives. The Construction Manager(s), as referred to herein, will be referred to hereinafter as if each were of the singular number, masculine gender.

G. CONSTRUCTION PROGRESS SCHEDULE: The Construction Progress Schedule or Schedule.

H. CONTRACT: That certain document (of which these General Conditions are a part), and all of its schedules, exhibits and subsequent amendments, which defines the scope of the Contractor's Work and specifies the Contract Sum.

I. CONTRACT DOCUMENTS: The Contract Documents are as defined in the Contract between the OWNER and the Contractor. The Contract Documents shall include all other documents issued after execution of the Contract, including, without limitation, Changes of Contract, Change Directives and contract modifications that are intended to bind the Parties hereunder. All of the documents that make up the Agreement, plus the Drawings and Specifications that describe the scope of the Work, plus allowable Modifications to the Contract Documents.

J. CONTRACT TIME - The number of calendar days stated in, or computed from, the Contract Documents for the completion of the Work, or any portion thereof. The contract time is 90 days in consecutive calendar days, beginning on the date of the Commencement as specified in the written Notice-to Proceed.

K. CONTRACT SUM: The total monies payable to the Contractor under the Contract Documents pursuant to paragraph 15.1 of the Agreement.

L. CONTRACTOR: The entity that executed the Contract and is identified therein, which has agreed to assume the responsibility of undertaking the execution of the Work under the terms of the Contract Documents and to be liable for the acceptable performance of the Work and for the payment of all legal debts pertaining thereto. The term Contractor also means the Contractor's representative.

M. DAY: Unless otherwise specified, the words "day" or "days" shall mean calendar day or calendar days.

N. DRAWINGS: The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, and dimensions of the Work, and generally including plans, elevations, sections, details, schedules and diagrams. Drawings may also be referred to as "Plans".

O. FINAL PAYMENT: shall follow Guilford County Policy per Guilford County's General Terms and Conditions article 15. The point at which the Contractor has, as determined by the Owner, completed the Work, with the exception of guaranty and warranty obligations, and becomes entitled, upon the recommendation of the AE and determination by the Owner, to receive final payment.

P. FINAL PUNCHLIST: shall have the meaning set forth in Paragraph 9.D.

Q. FORCE MAJEURE: Shall have the same meaning set forth in paragraph 11 of the Contract.

R. The words "furnish," "furnish and install," "install," and "provide" or words with similar meanings shall be interpreted, unless otherwise stated, to mean furnish and install complete, in place and ready for service.

S. HAZARDOUS MATERIALS: Any substance or material containing one or more of any of the following: "hazardous material," "hazardous waste," "hazardous substance," "regulated substance," "petroleum," "pollutant," "contaminant," "polychlorinated biphenyls," "lead or lead-based paint" or asbestos" as such terms are defined in any applicable federal, state and local laws, rules and regulations (now or hereafter in effect) dealing with the use, generation, treatment, storage, disposal or abatement of hazardous materials.

T. LAW(S): All federal, state, local or quasi-governmental laws, statutes, ordinances, codes, orders, rules, restrictive covenants, regulations and other requirements applicable to performance of the Work or construction or operation of the Project, including, without limitation: building codes; environmental laws; social security and unemployment compensation laws; workers' compensation laws; safety laws; archaeological and paleontological preservation laws; requirements of local utility companies and of local and national fire protection associations; zoning and setback or other locational requirements of applicable Laws; the Americans with Disabilities Act; and federal, state and local employment laws. Laws shall also include any covenants, conditions or restrictions applicable to or affecting the Project or the Site.

U. LIQUIDATED DAMAGES – The Liquidated Damages is the amount stipulated in the Supplementary General Conditions per day per Prime Contractor as Liquidated Damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the Work within the time specified, such time being in the essence of this contract and a material consideration thereof.

V. OWNER: County of Guilford, its successors and assigns (including any person designated by the OWNER International as a Project representative), acting as agent for the OWNER for purposes of administering the Contract.

W. MODIFICATION: (1) a written amendment to the Contract signed by both parties which clarifies, revises or changes the Contract Documents, (2) a Change of Contract or Change Directive or (3) any written

interpretation, clarification or amplification issued by the OWNER pursuant to the terms hereof.

X. NOTICE TO PROCEED: A written notice given by the OWNER to the Contractor fixing The Date of Commencement on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

Y. PRODUCT DATA: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams or other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

Z. PROJECT: The total construction of which the Work performed under the Contract Documents may be the whole or a part.

AA. REQUEST FOR INFORMATION (RFI): A written communication from the Contractor to the AE for any interpretation of, or information needed, required, or desired under the Contract Documents. The Owner reserves the right to determine the reasonable format and contents required for a Request for Information. In any Request for Information, the Contractor shall state a reasonable date by which a response is necessary in order to avoid delay in progress on the Work and shall make such request sufficiently in advance of such date as to avoid any such delay. The AE shall respond in writing to the Request for Information by the date stated by the Contractor unless he cannot reasonably do so, in which case he shall prior to that date notify the Contractor of the date by which he can reasonably respond. The Contractor shall not be entitled to any additional time for the completion of the Work or any portion thereof by reason of the AE's failure to respond.

BB. SHOP DRAWINGS: Drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the Work required by the Contract Documents.

CC. SITE: The physical area where the Work is to be done.

DD. SPECIAL PROVISIONS: That part of the Contract Documents which amends or supplements these General Conditions and other requirements of the Contract Documents.

EE. SPECIFICATIONS: Those portions of the Contract Documents consisting of written technical descriptions, provisions or requirements pertaining to the materials and workmanship applicable to the Work to be performed under the Contract Documents, including, but not limited to, the quantities or quality of materials, equipment, construction systems or applications.

FF. SUBCONTRACTOR: Any person or organization having a direct contract with the Contractor (or any wholly owned or affiliated entity thereof) to perform a portion of the Work or provide materials for the Project.

GG. SUBMITTALS: Shop drawings, product data, samples, and other documents required by the Contract Documents to be submitted by the Contractor to the AE.

HH. SUBMITTAL REGISTER: Submittal Register is a listing all Submittals the Contractor is required to make or proposes to make under the Contract Documents with the dates on which the Contractor proposes to make such Submittals and the dates by which the Contractor reasonably requires a response from the Designer with respect to each Submittal.

II. SUBSTANTIAL COMPLETION: The completion of the Work to the point that (i) the OWNER, in its reasonable judgment, can use the Project for its intended use, (ii) the Project has been issued a permanent certificate of occupancy or a temporary certificate of occupancy where a permanent certificate of occupancy can reasonably be obtained upon completion or correction of minor Work and (iii) the Work

has been completed except for those items specifically identified in the Final Punch list. (iv) All operations and maintenance manuals, Owner training, and as-built drawings must be submitted prior to Substantial Completion being achieved.

JJ. SUPPLIER: Any party supplying, by sale or lease, directly or indirectly, any materials or construction equipment for the Contractor's Work and includes distributors, material men, vendors and manufacturers.

KK. UNIT PRICE: The standard, uniform price which the Contractor has provided for a specific item or type of Work which may be required for the Project. A Unit Price constitutes the Contractor's entire compensation for performing that item of Work.

LL. WORK: As farther described in the Contract Documents, all construction and other services necessary to complete the Project as required by the Contract Documents, except to the extent specifically indicated to be the responsibility of the OWNER or others, and includes all labor, materials, equipment, supplies, permits, licenses and services provided or to be provided by the Contractor to fulfill its obligations. The Work may constitute the whole or part of the Project.

Article 3 Execution, Correlation And Intent Of Documents

A. COMPLEMENTARY: Throughout the Contract Documents, various requirements have been specified for performance by the Contractor. Each such Contract item is mandatory and shall be performed by the Contractor. Contract Documents are complementary and shall be used as a whole and not separately. If any item of the Work is shown on any of the Contract Documents, it shall be executed and is binding as if shown and contained on all Contract Documents.

B. ORDER OF PRECEDENCE: If any portion of the Contract Documents conflict with any other portions, the following order of precedence shall control:

1. Modifications to the Contract
2. Contract between the OWNER and Contractor (including Exhibits and Schedules thereto);
3. Addenda to the Contract;
4. Special or Supplementary Conditions;
5. General Conditions;
6. Scope of Work;
7. Modifications to the Specifications;
8. Addenda to the Specifications;
9. Specifications;
10. Modifications to the Drawings;
11. Addenda to the Drawings;
12. Drawings, in the following order of precedence;
    a) Notes on Drawings;
    b) Large-scale Drawings;
    c) Large-scale details;
    d) Small-scale Drawings;
    e) Small-scale details;
    f) Figured dimensions;
    g) Scaled dimensions;
13. All other documents, terms and conditions of the Contract;
14. If any uncertainty remains after reference to the above precedence, the Contractor will then confer with and be governed by the interpretation(s) of the OWNER.

C. INTEGRATION CLAUSE: The Contract Documents constitute the entire agreement between the Parties and supersede all previous discussions, negotiations, agreements and understandings with respect to the subject matter hereof No verbal agreement or conversation with any officer, agent or employee of the OWNER or Contractor, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations in the Contract Documents. The Contract Documents may only be changed in writing as specified herein.

D. REFERENCED SPECIFICATIONS AND STANDARDS: Where standard specifications issued by a recognized industry association or regulatory body are referenced, the reference shall be interpreted as incorporating the standard specifications in total unless otherwise noted in the Contract.

E. INTENT OF CONTRACT DOCUMENTS: It is the intent of the Specifications and Drawings and other Contract Documents to describe a complete Project in accordance with the Contract Documents. Where the Contract Documents describe portions of the Work in general terms, but not in complete detail, the best general practice shall be followed and only new materials and workmanship of best standard quality shall be used unless otherwise directed. Omissions from the Contract Documents or the inadequate description of details of the Work which are manifestly necessary to carry out the intent of the Contract Documents, or which are customarily performed, shall not release the Contractor from performing such necessary or customary details of the Work at no extra cost to the OWNER. In general, the Drawings shall be considered as establishing location, quantity and relationship of materials and the Specifications shall be considered as defining type and quality of materials and workmanship requirements. The requirements for the greatest quantity and the highest quality to be interpreted from those documents shall govern. All questions regarding the Drawings and Specifications and the interpretation thereof and the resolving of conflicts or inconsistencies contained therein shall be determined by the OWNER upon written request from Contractor.

F. The Work of all trades under the Contract Documents shall be coordinated by the Contractor in such a manner as to obtain the best workmanship possible for the entire Project and all components of the Work shall be installed or erected in accordance with the best practices of the particular trade.

Article 4 Contractor's Representations

A. CONTRACTOR REPRESENTATIONS: By executing the Contract, the Contractor represents and warrants that it has had ample opportunity to, and by careful examination has, satisfied itself as to the nature and location of the Work, the conditions of the Site(s), the character, quality, and quantity of the materials to be encountered, the equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, including weather, and all other matters which can in any way affect the Work under the Contract Documents, and has, as necessary, consulted with the OWNER 's Engineer or other consultants to obtain any and all clarifications necessary to establish the Contract Sum and the time for performance of the Work.

B. REVIEW OF CONTRACT DOCUMENTS: Contractor further warrants that it has reviewed the Contract Documents and acknowledges and declares they are adequate, full, complete and correct, are sufficient to have enabled the Contractor to determine the cost of the Work therein and that the Drawings, the Specifications, and all Modifications and Addenda are sufficient to enable the Contractor to construct the Work outlined therein in accordance with applicable Laws and otherwise to fulfill all its obligations hereunder. The Contractor shall not proceed with the Work if any error, omission or inconsistency appears within the Contract Documents, but shall immediately submit a written request for an explanation or decision to the OWNER. Should Contractor proceed without a written response by the OWNER, it shall do so at its own risk and expense.

C. DIFFERING SITE CONDITIONS: Contractor understands and acknowledges that any hazardous material report(s) it has received from the OWNER concerning the Project Site are for informational purposes only, that the OWNER does not warrant the contents or accuracy of such report(s). Contractor represents that it

shall verify the report prior to commencement of the Work. Contractor shall be solely responsible for any concealed or unknown conditions. The presence of such concealed or unknown conditions shall not be the basis for any extension of time or adjustment in the Contract Sum.

D. BUSINESS AND FINANCIAL DOCUMENTAION: Contractor shall provide the OWNER with Contractor's (i) contractor license, (ii) business license and (iii) other business or professional documentation reasonably requested by the OWNER. In the event that any of the foregoing documents expire during the term of this Contract, Contractor shall provide the OWNER with evidence that such documents have been renewed. Upon request by the OWNER, Contractor shall also provide the OWNER with all financial documentation and information reasonably requested by the OWNER, including, without limitation, AIA Document A305 (Contractor's Qualification Statement) and audited financial statements. To the extent Contractor has provided the foregoing documents and information to the OWNER prior to execution of the Contract, Contractor shall update such documentation and information as reasonably requested by the OWNER.

E. SUPERINTENDENT: The Owner shall have the right to approve the Contractor’s project superintendent proposed for this project and shall have the right to require removal of the Contractor’s key personnel from the job site if their performance is not satisfactory.

Article 5 Contractor’s Duties And Responsibilities

A. The Contractor shall supervise and direct its portion of the Work using its best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for coordination of all portions of the Work under its Contract. All Work performed pursuant to the Contract Documents shall conform in all respects to the North Carolina State Building Code and all other state, local, and national codes in effect at the time of and applicable to this Work.

B. The Contractor shall be responsible to the OWNER for the acts and omissions of its employees, subcontractors, and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.

C. The Contractor shall provide, pay for and maintain all labor, materials, equipment, tools, machinery and services necessary for the proper execution and completion of the Work. All materials and equipment furnished by the Contractor shall be new, free from faults and defects, of good quality, and conform to the requirements of the Contract Documents.

D. The Contractor shall not be relieved from its obligations to perform Work in accordance with the Contract Documents either by the activities or duties of the OWNER in the administration of this Contract, or by inspections, tests, acceptances, or approvals required or per-formed by persons other than the Contractor.

E. In performing its obligations hereunder, Contractor shall, at a minimum, conform to the standards of other professional contractors performing similar work in the locale in which the Project is located.

F. The Contractor shall, prior to commencement of the Work, submit to the OWNER, for its approval, the name and experience resume of Contractor's proposed project manager and/or superintendent. The Contractor shall also submit the names of key members of its firm who will be directly connected with the Project and outline the duties and authority of each.

G. The Contractor shall have at the Project site, during the full term of the Contract, an approved, competent, full-time superintendent fluent in the English language, and any necessary assistants, all satisfactory to the OWNER. Contractors' superintendent shall represent the Contractor and all directions given such superintendent by the OWNER shall be as binding as if given to the Contractor. The Contractor shall at all times enforce strict discipline and good order among its employees and

shall not employ on the Work any unfit person, anyone not skilled in the work assigned to him or her and anyone who is not satisfactory to the OWNER.

H. Contractor acknowledges that the OWNER's consultants (including, without limitation, its Engineer) do not have the authority, either explicit or implied, to act on behalf of the OWNER to approve, disapprove, accept or reject any documentation, submission, request or proposal submitted by Contractor, unless and only to the extent that the OWNER has in writing authorized such consultant to perform the foregoing.

I. All correspondence from Contractor to the OWNER shall identify the OWNER's project number and name.

J. The Contractor shall provide sufficient competent and suitably qualified personnel, equipment, and supplies to lay out the Work and perform construction as required by the Contract Documents. The Contractor will at all times maintain good discipline and order at the site, and will comply with all applicable OSHA standards.

K. Any person employed by the Contractor, any Subcontractor, or any sub-subcontractor who, in the opinion of the Designer or the Owner, does not perform his Work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Owner or Designer, be removed forthwith by the Contractor, Subcontractor, or sub-subcontractor employing such person without cost to the Owner, and shall not be employed again in any portion of the Work without the written approval of the Owner or Designer.

L. Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work within three (3) days after written order, the Owner may withhold further payment by written notice until compliance with such order.

M. When the methods and equipment to be used by the Contractor accomplishing the Work are not prescribed in the Contract Documents, the Contractor shall be free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

N. The Contractor shall attend job progress conferences and all other meetings or conferences as directed by the Designer. The Contractor shall be represented at these job progress conferences by a representative having the authority of the Project Manager and by such other representatives as the Designer may direct. Job progress conferences shall be open to Subcontractors, suppliers and any others who may contribute beneficially toward maintaining required job progress, and such personnel shall be encouraged by the Contractor to attend. It shall be the principal purpose of job progress conferences to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Work and the Project by the specified Completion Dates. The Contractor shall be prepared to assess progress of the Work as required in the Contract Documents and to recommend remedial measures for correction of progress as may be appropriate. The Designer shall preside as chairman and arrange for minutes to be taken and circulated.

O. The Contractor shall pay all license fees and royalties, and assume all costs incident to the use of any invention, design process, or device which is the subject of patent rights or copyrights held by others, except for inventions, design processes, or devices specified by the Designer in the Contract Documents. The Contractor shall indemnify and hold harmless the Owner, the Designer, and anyone directly employed by either of them, from and against all claims, damages, losses and expenses, including attorney's fees and costs of defense, arising out of any infringement or alleged infringement of such rights during or after completion of the Work, and shall defend all such claims in connection with any actual or alleged infringement of such rights.

P. The Contractor shall secure and pay for all permits, including without limitation construction permits and licenses, and will pay all governmental charges and inspection fees necessary for the prosecution of the Work.

Q. The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the Work and shall protect and indemnify the Owner and the Owner's officers, agents, or

servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or by the Contractor's employees, Subcontractors, sub-subcontractors, or their employees.

R. The Contractor shall indemnify and hold the Owner, the Designer, the Designer's consultants, and their officers, agents, and employees harmless against all costs, damages, and expenses, including attorney's fees and costs of defense, arising out of claims by any separate contractor or by any Subcontractor, sub-subcontractor, or supplier engaged by or employed by the Contractor or employed by any of the Subcontractors claiming through him, including without limitation damages, losses, and expenses arising out of or relating to any inconvenience, delay, interference, or other action or non-action of the Contractor or the Contractor's Subcontractors on the Project.

S. Any land disturbing activity performed by the Contractor in connection with the Project shall comply with all erosion control measures set forth in the Contract Documents and any additional measures which may be required in order to ensure that the Project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15 North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 NCAC 4A, 4B, and 4C), and as may be revised or amended in the future. Upon receipt of notice that a land-disturbing activity is in violation of said Act, the Contractor shall be responsible for ensuring that all steps or actions necessary to bring the Project in compliance with said Act are promptly taken. The Contractor shall be responsible for all penalties assessed pursuant to N.C. Gen. Stat. 113A-64 with respect to its Work, and shall indemnify and hold harmless the Owner from all costs and expenses, including attorney's fees and costs of defense arising out of or related to the enforcement of the Act against any party or person described in this Article.

Article 6 Substitutions

A. SUBSTITUTION: The Contractor may offer a substitution of a specified or indicated method if it presents to the OWNER complete information concerning the substitution and the benefits thereof to the OWNER by reason of lower cost or improved performance, or both, over the specified or indicated method. However, such submission of a proposed substitution does not relieve the Contractor from its obligations under the Contract. In proposing a substitution, the Contractor warrants that the substitution is, at a minimum, equivalent in performance to the specified or indicated item. A substitution shall not be effective unless accepted in writing by the OWNER. Unless expressly authorized in writing by the OWNER, the OWNER's consultants do not have the authority to approve proposed substitutions.

B. ADDITIONAL COST AND TIME: Any additional costs and time and changes to the Work (including, but not limited to the work of other contractors and additional design costs which may be affected thereby) which may result from the proposed substitution shall be disclosed at the time the substitution is proposed to the OWNER. Changes to the Work and any additional costs or time there from which are not disclosed in advance to the OWNER shall be the sole responsibility of the Contractor and shall not increase the Contract Sum or the time for performance of the Work. All redesign costs incurred by reason of an approved substitution shall be paid by the Contractor.

C. APPLICATION: Requests for review of substitute demolition methods will not be accepted by the OWNER from anyone other than the Contractor. If the Contractor wishes to furnish or use a substitute demolition method, the Contractor shall make written application to the OWNER in accordance with specification.

D. REPRESENTATIONS: By submitting an application pursuant to Paragraph 7(D), the Contractor:

1. Represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
2. Represents that it will provide the same warranty for the substitution as the original product specified;
3. Certifies that the cost and schedule data presented is complete and includes all related costs and schedule adjustments under the Contract Documents, and waives all claims for additional

costs and schedule adjustments related to the substitution which subsequently become apparent; and

4. Agrees to coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

E. UNAPPROVED SUBSTITUTIONS: The OWNER reserves the right to reject any unapproved substitution without explanation or formality, and to require the replacement of an unapproved substitution with the specified and/or indicated items at no expense to the OWNER, and to require compensation to the OWNER for loss of use time during replacement.

Article 7 Submittals

A. SUBMITTALS: Upon the earlier of: (1) the execution of the Contract; or (2) receipt of a Notice to Proceed, the Contractor shall immediately begin developing all Submittals required by the Contract Documents. The Contractor shall submit to the Designer within fourteen (14) days all Submittals required by the Contract Documents. The Contractor shall submit three (3) reproducible prints of all shop drawings plus the number of copies sufficient for his requirements. The Contractor shall submit samples in quantities required by the Contract Documents. The Contractor shall submit product data in five (5) copies, plus the number of copies sufficient for the Contractor's requirements. Each item submitted shall be thoroughly reviewed by the Contractor and shall include a stamp or note describing the Contractor's action signed by the person authorized by the Contractor to conduct the review with that person's name clearly printed. Submittals shall be submitted in such time as to cause no delay to the Work or any part thereof and in accordance with the Contract Construction Schedule and Submittal Register. The Designer shall review the submittal with reasonable promptness, noting desired corrections, if any. The Designer shall retain two (2) copies of the submittal and shall return the balance of the reviewed submittal to the Contractor for action. The Contractor shall furnish any corrected submittal to the Designer. The Designer shall retain two (2) copies of the corrected submittal and will return the balance of the reviewed submittal to the Contractor.

B. CONTRACTOR REVIEW: Contractor shall review each submittal for completeness, conformance to the Contract Documents and coordination with other parts of the Work and the Construction Progress Schedule. By providing and submitting to the OWNER or, if otherwise specified in the Contract Documents, to the OWNER 's designee, Shop Drawings, Product Data, warranties and Samples, the Contractor will be deemed to represent that it has determined and verified (1) the availability of all materials, and (2) field measurements and field construction criteria related thereto, and that it has checked and coordinated the information contained within such Submittals with the requirement of the Work, the Contract Documents and the Construction Progress Schedule and that such Shop Drawings, Samples, warranties and Product Data conform to the Contract Documents.

C. APPROVAL: Contractor shall not proceed to perform Work related to a Submittal until the Submittal has been approved by the OWNER (for purposes of this Article 7, approval by the OWNER's designated consultants shall be deemed to be approval by the OWNER); such Work shall thereafter be performed in accordance with the Contract Documents and the approved Submittal.

D. INCOMPLETE SUBMITTALS: The OWNER may return incomplete Submittals with no action taken. The Contractor shall have no claim for any damages or for an extension of time due to delay in the Work resulting from the rejection of materials or from the rejection, correction, and resubmittal of Shop Drawings, Samples and Product Data, or from the untimely submission thereof

E. ACCEPTANCE: Acceptance by the OWNER is for general demolition intent only. Quantities, size, field dimensions and locations are some of the required characteristics which are not part of the OWNER's acceptance and will not be checked. Accordingly, the OWNER's limited acceptance shall in no way relieve the Contractor from its obligation to conform its Work to required characteristics, to Project specifications and to the Contract Documents. Review of submittal by the Designer shall not be construed as relieving

the Contractor from responsibility for compliance with terms or designs of the Contract Documents nor from responsibility for errors of any sort in the submittal.

F. DEVIATIONS: The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the OWNER's approval of Submittals, unless the Contractor has specifically informed the OWNER in writing of such deviation at the time of submittal and the OWNER has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Submittals by the OWNER's approval thereof.

G. SUBMISSION SCHEDULE: Contractor shall submit a schedule showing dates for submission, review and approval of its Submittals. This schedule will be reviewed by the OWNER and any and all changes required by the OWNER shall be made by the Contractor. The final schedule shall be as approved by the OWNER. The schedule shall take into account the order of Work and the time required to prepare and approve the various Submittals. Such schedule shall ensure that all Contractor submissions are timely and that the dates set forth for each Submittal do not adversely affect the requirements of the Work, the Construction Progress Schedule or the time for completion set forth in this Contract.

H. RIGHTS IN SHOP DRAWINGS: The OWNER may duplicate, use and disclose in any manner and for any purpose Shop Drawings delivered under this Contract. This "Rights in Shop Drawings" Subparagraph shall be included in all subcontracts hereunder of any tier.

I. COORDINATION DRAWINGS: If requested by the OWNER, Contractor shall submit drawings demonstrating coordination of the various portions of the Work, in such form and with such detail as required by the OWNER.

Article 8 Standards, Tests And Inspections

A. REFERENCE SPECIFICATIONS OR STANDARDS: Quality and high standards are of the essence for the Work. Various standards and specifications are incorporated by reference in the technical section of the Specifications. In all such instances, the reference shall mean the latest edition, including the amendment or revision in effect as of the date of the Contract unless a specific issue is otherwise identified. If referenced specifications or standards contain requirements at variance with the individual sections of the Specifications, the more stringent provision shall govern. The Contractor shall have the responsibility of making any specified standard available at the Project Site, including, but not limited to, any sample or mock-up rooms required by the OWNER, as set forth in the Special Provisions.

B. INSPECTIONS AND TESTS

1. *Testing*. An independent laboratory and field tests firm is to be hired to determine compliance of construction with the Contract Documents. The test shall be made by a testing consultants employed by the Contractor. The costs and expenses of providing samples for and assistance in any testing shall be borne by the Contractor and are included in the Contract Price. Any Work in which untested materials are used without approval or written permission of the Designer shall be removed and replaced at the Contractor's expense. Work found to be unacceptable or unauthorized will not be paid for and, if directed by the Designer shall be removed and replaced at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of ASTM or other generally recognized or specifically authorized methods which are current on the date of advertisement for bids shall be made at the expense of the Contractor; provided, however, in the event that after such testing any Work is found to be defective or does not meet the requirements of the Contract Documents, the costs of retesting such Work and the costs of inspection services shall be paid by the Contractor. Samples shall

be taken by a testing laboratory employed by the Owner. All materials being used are subject to inspection, tests, or rejection at any time prior to or during incorporation into the Work. Copies of Contractor test reports shall be furnished to the Designer and Owner.

2. *Re-Testing.* The Owner shall have the right to re-test and if the test fails the Owner can deduct the costs of additional testing from any money due the Contractor; or if no money is due the Contractor, the Owner shall have the right to recover these costs from the Contractor, from its sureties, or from both.
3. *Layout and Surveys*. All layouts and surveying shall be accomplished by properly qualified personnel duly licensed in the State of North Carolina.
4. *Concealed Work*. If the OWNER has notified Contractor of its intent to test and/or inspect a portion of the Work, then, if such Work is concealed before such tests are performed or before approval is given, it shall be exposed, tested and restored at the Contractor's expense. Notwithstanding the foregoing, even if the OWNER has not notified Contractor of its intent to test and/or inspect a portion of the Work, the OWNER may require the Contractor to expose concealed Work for the purpose of testing and/or inspection. If the Work so exposed falls to meet the requirements of the Contract Documents, the Contractor shall be responsible for all costs associated with exposure, testing and/or inspection, replacement, and reconstruction or restoration. If the Work so exposed meets the requirements of the Contract Documents, the OWNER shall be responsible for all such costs.
5. *Performance Testing.* Witnessed performance tests, inspections and approvals shall occur when required by governing authorities or when required by the Contract Documents. The Contractor shall notify the OWNER at least three (3) business days in advance of the date the equipment will be ready for the final shop or field inspection or for performance tests. These tests, and any required retests, shall be performed at the Contractor's expense. The Contractor, at its cost, shall promptly obtain and provide the OWNER with all certificates and approvals.
6. *Obligation To Furnish For Testing*. The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the OWNER. All inspections and tests by the OWNER shall be performed in such a manner as to not unnecessarily delay the Work. The OWNER reserves the right to charge to the Contractor any additional cost of inspection or test, when material or workmanship is not ready by the Contractor for inspection or test at the time specified, or when reinspection or retest is necessitated by prior rejection.

C. CORRECTION OF WORK

1. Any deficiencies identified by the OWNER will be noted for correction by the Contractor in a notification from the OWNER. Correction of such deficiencies shall be in addition to and not in lieu of punch list(s) of deficiencies submitted to the Contractor by the OWNER or prepared by the Contractor. Receipt of any such notification shall not be construed as the OWNER’s qualified acceptance of the Work nor shall it waive the OWNER’s night to require the Contractor to remedy, at the Contractor's sole expense, any other deficiencies which may not be listed on such notification.
2. In the event that the Contractor receives from the OWNER a notification of faulty or unacceptable Work, the Contractor shall promptly remove from the premises all Work condemned as failing to conform to the requirements of the Contract Documents, whether incorporated in the Work or not. The Contractor shall then promptly replace and re-execute its own Work in accordance with the Contract Documents without change to the time of completion and without expense to the OWNER and shall bear the expense of making good all Work of other contractors destroyed or damaged by such removal or replacement. In addition, the Contractor shall perform all cutting and fitting for other trades necessitated by the Contractor's errors.

3. Should the Contractor refuse to correct faulty or damaged Work, or should the OWNER consider it inadvisable for the Contractor to do so, the OWNER may either (a) authorize another contractor to correct the Work at the Contractor's expense or (b) accept the faulty or damaged Work and obtain from the Contractor a credit, contained in a Change of Contract, representing the diminished value of the Work accepted.

D. FINAL INSPECTION AND FINAL PUNCH LIST: In addition to any punch list(s) prepared by Contractor and any unacceptable Work previously identified by the OWNER, the OWNER shall, prior to Substantial Completion, make a final inspection of all Work and prepare a final punch list ("Final Punch list") of Work that does not conform with the Contract Documents. Contractor shall correct all non-conforming Work identified in the Final Punch list within thirty (30) days after Contractor's receipt of the Final Punch list. Correction of all faulty or unacceptable Work by the Contractor, including, without limitation, correction of all items specified in the Final Punch list, shall be a condition precedent to Final Payment.

E. NON-WAIVER OR ACCEPTANCE: Any inspections or tests conducted by the OWNER shall be for the sole benefit of the OWNER and shall not relieve Contractor of the responsibility of providing quality assurance control measures to assure that the Work strictly complies with the requirements of the Contract Documents. The performance of any inspections or tests, or the omission of any inspections or tests, or a decision not to perform any inspection or test, by the OWNER, any agent, employee or consultant of the OWNER, shall not be a waiver of any of the Contractor's obligations hereunder and shall not be construed as constituting or implying approval or acceptance of the Work or any part thereof. No payment to the Contractor (including Final Payment) or approval or acceptance by the OWNER of any Work shall constitute final acceptance of the Work if it is later discovered that such Work was not performed in accordance with the requirements of the Contract Documents.

Article 9 Inspection And Use Of Premises

A. The OWNER and all persons specified by the OWNER shall have safe access to the Work at all times for inspection purposes. Notwithstanding the foregoing, the OWNER, and its representatives shall not be responsible for, or have control or charge of, any construction means, methods, techniques, sequences or procedures or for safety and security precautions or progress in connection with the Work, nor shall they be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

B. The OWNER reserves the right to occupy and use, for itself or any of its affiliates, any portion of the Project and operate any equipment that is part of the Project without constituting acceptance of the Contractor's Work or material involved either in whole or in part, unless the OWNER, in its sole discretion, expressly accepts portions of the Project or pieces of equipment by written notice to the Contractor.

C. The Contractor shall confine its apparatus, the storage of materials and the operations of its workmen to limits indicated by Laws and directions of the OWNER. The Contractor shall not encumber the Site with its material except for such material as is absolutely necessary for the Contractor to perform the Work without interruption and as approved by the OWNER.

D. The Contractor shall enforce the instructions of the OWNER regarding signs, advertisement and smoking. No advertising signs, name signs or logos of any sort shall be displayed on the Project site, except those that the OWNER may elect to display and those provided for herein.

E. Throughout the term of this Contract, and as required by the OWNER, Contractor shall provide the OWNER, its representatives and their employees with access to Contractor's trailer(s), telephone(s) and restroom facility(ies) at the Project Site.

F. The Contractor shall be responsible for permanently fixed service facilities and systems in use during progress of the Work and shall strictly adhere to the following procedures:

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

2. Temporary filters shall be installed in each of the heating and air conditioning units, return air grilles, and other locations to prevent intrusion of dust, dirt, and debris during construction. Temporary filters shall be removed and replaced with new filters immediately prior to Substantial Completion.

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

4. When the permanent lighting system is used during construction, lamps shall be replaced and shall be new on the date of Substantial Completion.

Article 10 Protection Of Work And Property; Safety; Existing Utilities

A. PROTECTION OF WORK: The Contractor shall continuously maintain adequate protection of all Work from damage due to any cause, including inclement weather, and shall protect all property of the OWNER from damage or loss. The Contractor shall adequately protect improvements within public rights-of-way and property of adjacent land the OWNERs. The Contractor shall protect and secure its Work and materials and the Project against loss by theft or otherwise. The obligations of this Article shall apply, regardless of whether the property in the Contractor's possession was purchased by the OWNER or the Contractor.

1. The Contractor shall be responsible for the entire site of the Project and for its reasonable and necessary protection and security, as required by laws or ordinances governing such conditions, or by custom or sound construction practices, and shall share such responsibilities as may be agreed upon among them, or in the absence of such agreement, as may be directed by the Contract Documents, Owner, or Designer.
2. The Contractor shall be responsible for any damage to the Owner's property, or that of others, by the Contractor or the Contractor’s employees, Subcontractors, sub-subcontractors, or their employees or agents, and shall make good such damages. The Contractor shall be responsible for and pay for any such claims against the Owner.
3. The Contractor shall protect all landscaping designated to remain in the vicinity of the operations and barricade all walks, roads, and areas as necessary to keep the public away from the construction.
4. The Contractor shall provide cover and/or protect all portions of the Work and provide all materials necessary to protect the Work whether performed by the Contractor or any of the Subcontractors or sub-subcontractors. Any Work damaged through the lack of proper protection, or from any other cause, shall be repaired or replaced without extra cost to the Owner or extension to the Contract Time.

B. SAFETY: Contractor shall be responsible for preparing, implementing, maintaining and supervising all safety and security precautions and programs in connection with its Work, the Project and the Site. Contractor shall take all necessary precautions for the safety of its employees and all other persons who may be affected by Contractor's Work. All safety measures and safety programs shall fully comply with Federal, State, and local laws, rules, regulations, and building code requirements relating to the prevention of accidents or injuries to persons on or about the location of the work.

1. The Contractor shall designate a responsible officer or employee as safety inspector, whose duties shall include accident prevention on the Project as well as implementation of the

Contractor's safety measures and safety programs on the Project. The name of the safety inspector shall be made known to the Designer and the Owner at the pre- construction conference.

2. The Contractor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor's Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926 as adopted in 13 NCAC 07F.0201, including 29CFR Part 1910 General Industry Safety and Health Standards applicable to construction) and N.C. Gen. Stat. §95-126 through 155 (Occupational Safety and Health) as well as all revisions and amendments to such standards or statutes as may occur throughout the performance of the Work.

C. ACCIDENTS: In case of an accident involving an injury to an employee (including any employee of anyone working under Contractor), Contractor shall notify the OWNER within eight (8) hours and shall file a fully detailed accident report as soon as possible and not later than twenty-four (24) hours after such accident. Contractor shall also file promptly such reports as are required by its insurance carrier and such other civil authorities as might govern and simultaneously provide copies to the OWNER.

D. EMERGENCIES: In an emergency affecting the safety of life or the Work or of adjoining property, the Contractor is hereby permitted to act in its discretion to prevent such threatened loss or injury, and it shall so act without appeal if so authorized or instructed. Any costs incurred by the Contractor because of emergency work shall be determined by agreement of the Parties hereto and confirmed by a Change of Contract.

E. UTILITIES: The Contractor shall establish and maintain direct and continuous contact with local utilities before commencing any Work. The OWNER will provide the Contractor, for its general information only, records in the OWNER's possessions with regard to the nature and location of known utilities but does not warrant or represent that the information is accurate and complete. The Contractor shall verify the locations of any utilities which may be affected by its operations (and, if any variations are found to exist from the information supplied by the OWNER, the Contractor may be entitled to a Change of Contract for additional time or costs resulting from such deviations). At least fourteen (14) days prior to the anticipated Work, Contractor shall submit in writing to the OWNER and to utility the OWNER's for their review and approval of its plan for 1) performing the Work, and 2) promptly resolving any utility conflicts to avoid delay. No Work in the vicinity of, or which may affect utilities, shall be started until approved by the OWNER and the utilities. The Contractor shall prepare and maintain an updated list of information on all Project-related utilities including company names, addresses, contact persons and types of utility. During the course of the Work, Contractor shall supply, at its own cost, all temporary utilities necessary for performance of the Work. Contractor shall be responsible for connecting to all necessary permanent utilities for the Project and shall file and process all applications for all such permanent utilities on behalf of the OWNER. Hookup fees for such permanent utilities shall be paid by the Contractor.

Article 11 Hazardous Materials And Pollution Controls

A. HAZARDOUS MATERIALS: In the event the Contractor encounters on the site previously unidentified material reasonably believed to be a Hazardous Material which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the OWNER in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the OWNER and Contractor if in fact the material is a Hazardous Material and has not been rendered harmless. The Work in the affected area shall be resumed after abatement of the Hazardous Material, or when it has been rendered harmless, as agreed in writing between the OWNER and Contractor.

B. POLLUTION CONTROLS: Contractor shall not burn waste without prior written permission from the OWNER. Contractor shall control the generation of dust resulting from the Work and shall undertake such

dust controls as are required by the OWNER. Contractor shall undertake reasonable efforts to minimize the amount of noise and light generated by the Work and the adverse affects of such noise and light on adjacent property the OWNER's and the public. Contractor shall at all times comply with the Laws applicable to the foregoing activities.

Article 12 Clean-Up

A. Daily Clean-Up

1. At all times, Contractor shall keep the Site and adjacent property free from accumulation of trash and debris that results from the operations of the Contractor, and its subcontractors. Contractor shall provide for all clean-up and offsite disposal of all such trash and debris.
2. If the Contractor falls to clean up as provided in this Paragraph, the OWNER reserves the right, upon eight (8) hours written notice to the Contractor, to proceed to remove the debris, the cost of which will be charged against the Contractor.

B. Final Clean-Up & Site Restoration

1. Prior to Substantial Completion, the Contractor shall employ experienced persons to make a final clean-up of the Project site or such portions of the Project as the OWNER may designate.
2. At the completion of the Work, Contractor shall remove all trash, waste and debris from the Site as well as its tools, temporary facilities, construction equipment, machinery and surplus materials and shall deliver the site in a ready to use condition.

Article 13 Construction Progress Schedule

A. Not later than thirty (30) days following execution and delivery of the Construction Agreement by Owner to Contractor, the Owner shall deliver to the Contractor a Notice to Proceed. The Notice to Proceed shall state a commencement date on which it is expected that the Contractor will begin the Work to be performed under the Agreement. The Contract Time shall be measured from said specified commencement date. The commencement date stated in the Notice to Proceed shall not be earlier than three (3) days after the Notice to Proceed is served on the Contractor. No Work shall be done prior to the date specified in the Notice to Proceed.

B. SCHEDULE: Within fourteen (14) days after receipt of the Construction Agreement by the Contractor for signatures, the Contractor shall prepare and submit to the Designer and Owner for review and approval a preliminary progress schedule for the Work pursuant to the requirements stated in the Contract Documents. The Contractor shall prepare and submit a calendarized Critical Path Method ("CPM") schedule (the "Construction Progress Schedule" or "Schedule") to the OWNER within thirty (30) days of the execution of the Contract. The Schedule shall contain a detailed graphic representation of all activities that could affect the progress of the Work, including a schedule of Submittals, shall become a Contract Document and may be revised only with the written consent of the OWNER. The Contractor agrees to comply with the Construction Progress Schedule, as revised as provided herein, and agrees that the Work shall be prosecuted regularly, diligently and without interruption, within the time specified.

C. THE CONTRACT CONSTRUCTION SCHEDULE IS A CONTRACT DOCUMENT: The Contractor represents that the Contract Construction Schedule has been reviewed in detail, that the Contractor participated in its preparation, that all of the activities which impact, limit, or otherwise affect the time of completion of the Work are shown in the Contract Construction Schedule and that all of the activities of others which impact, limit, or otherwise affect the start, duration, or completion of the Contractor's activities are also shown. The Contractor further represents that the Contractor can and will complete each activity within the time shown for that activity. Time is of the essence with respect to each such activity and Completion Date.

D. SCHEDULE UPDATES AND REVISIONS: The Schedule will be revised, updated and submitted by the Contractor at least the first of each month. However, the OWNER reserves the night to require Contractor to update the Schedule as often as the OWNER deems reasonably necessary. Any revisions to the Schedule shall be accompanied by a written explanation of the reasons for such revisions and no such revision shall be incorporated into the Schedule without the OWNER's written consent. A copy of the Schedule shall be maintained at all times on the Site, and revised and updated copies shall be provided to the OWNER at any time if requested. Failure of the Contractor to deliver an initial Schedule within the time specified above or to deliver timely updates of such Schedule upon request by the OWNER, or as provided for above, may be grounds for the OWNER to withhold progress payments for the work completed until such time as the Schedule(s) are delivered to the OWNER.

E. ADDITIONAL WORK TO COMPLY WITH SCHEDULE: In the event that the Contractor or any of its Subcontractors on their own initiative changes the sequence or duration of any of the construction activities from such sequences or durations as indicated on the Schedule established at the commencement of the Work, the OWNER, unless agreed in writing otherwise, will not be liable for any claims for any direct or indirect costs, delay costs, costs related to loss of efficiency, resequencing of work or extension of time or any other costs which may result from such actions by the Contractor or its Subcontractors. In addition, Contractor shall not be entitled to any change in the terms of this Contract relating to the foregoing changed sequences or durations without the OWNER's prior written approval of such changed sequences or durations. Although Contractor may finish early, Contractor agrees that it has no right to finish early or to file a claim for any alleged delay to its right to finish early. Should the progress or conditions of the Work require Work to be performed after regular hours, or should the Contractor elect to perform Work after regular working hours, the additional cost of performing such Work shall be borne by the Contractor.

F. The Contractor may be entitled to an extension of the Contract Time (but no increase in the Contract Sum) for delays arising from unforeseen causes beyond the control and without the fault or negligence of the Owner, the Contractor or the Contractor's Subcontractors as follows:

1. Labor disputes and strikes that directly impact the critical path activities of the Contract Construction Schedule;
2. Acts of God, tornado, fire, hurricane, blizzard, earthquake, typhoon, or flood that damage completed Work or stored materials.
3. Acts of the public enemy; acts of the State, Federal, or local government in their sovereign capacities.
4. Abnormal inclement weather as defined below
   Force Majeure. Neither Party shall be liable to the other Party for any failure or delay caused by events beyond such Party's control and not due to its own negligence, provided that such Party uses commercially reasonable efforts to resume performance as soon as ressonably practicable. The non-performing Party shall notify the other Party of the force majeure event within twenty-four (24) hours of the onset thereof.
   In the event that a force majeure event precluded PROVIDER from performing services and/or providing goods for a period of ten (10) consecutive business days, the COUNTY shall have the right to: (a) procure replacement goods and/or services from an alternative source and/or (b) terminate the Contract or portions(s) of Contract upon written notice to PROVIDER.

G. If the Contractor submits a construction schedule, progress report, or any other document that indicates or otherwise expresses an intention to achieve completion of the Work prior to any Completion Date required by the Contract Documents or prior to expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.

H. Should the Contractor fail to start any activity on the start date shown in the Contract Construction Schedule or become delayed, the Contractor shall, without being entitled to any increase in the Contract Price or other compensation, work overtime, increase labor forces or take such other action as may be

necessary or appropriate to complete the activity by the Completion Date shown on the Contract Construction Schedule, or as such Completion Date may have been adjusted.

I. Should any monthly revision of any Contract Construction Schedule show that the Contractor is behind on any activity, the late completion of which could delay Substantial Completion of the Work, the Owner shall be entitled to withhold from the next Progress Payment due the Contractor an amount not exceeding the amount the Owner would be entitled to in Liquidated Damages, should Substantial Completion be delayed by the same number of days that the Contractor is currently behind schedule. If, subsequently, the Contractor's progress, as shown by any succeeding monthly revision to the Contract Construction Schedule, is such that the anticipated delay no longer exists, the Owner shall pay with the Progress Payment next due to the Contractor such amounts as have been withheld in accordance with this paragraph.

J. All time limits stated in the Contract Documents are of the essence. The time of beginning, rate of progress, and time of completion are essential conditions of the Contract Documents. If the Contractor refuses or fails to prosecute the Work with such diligence as will ensure its completion pursuant to the Progress Schedule, as modified hereunder, or if the Contractor abandons the Work or if it falls to complete the Work within said time, or if the Contractor falls to maintain the progress of the Work in accordance with the Progress Schedule, the Contractor shall be liable for all direct and indirect damages sustained by the OWNER until all the Work required by the Contract Documents is complete and accepted by the OWNER or for the liquidated damages provided for in the Contract. In the event of a default termination, the Contractor's liability may also include termination for default damages. The OWNER may deduct from subsequent payments due the Contractor under this or any other contract with Contractor or from any sums retained, all or such part of these sums as may be required to pay the aforesaid damages, with the Contractor being responsible for any deficiency which it shall pay the OWNER upon demand.

K. On any day that the Contractor considers that the Project is delayed by adverse weather conditions, the Contractor shall identify in writing to the Designer and the Owner the adverse weather conditions affecting each activity, the specific nature of the activity affected, the number of hours lost, and the number of and identity (by responsibility or trade) of workers affected and shall obtain from the Designer written recognition of the delay. The time for performance of this Contract includes an allowance for a number of calendar days which may not be suitable for construction Work by reason of adverse weather. The Contract Time will be extended only if the number of calendar days of adverse weather recognized by the Designer exceeds the number of inclement weather days set forth below, and the Contractor demonstrates how this adverse weather impacts activities on the critical path of the Contract Construction Schedule.

Month	Number of Inclement Weather Days
January	15
February	15
March	10
April	10
May	9
June	9
July	9
August	8
September	9
October	9
November	10
December	12

L. If the Contractor believes that the progress of the Work has been adversely affected by adverse weather recognized by the Designer during a particular month, the Contractor shall submit a written request for extension of time to the Designer. Such a request for time extension of the Contract Time

shall be submitted by the tenth (10th) day of the month following that month in which the adverse weather is encountered. The request shall include, but is not limited to, the following information:

1. Detailed description of weather's effect on scheduled activities and its net effect on the critical path of the Project, and
2. Weather records from the official weather station nearest the Project site and records of actual observation as contained in daily reports, correspondence, or other documentation.

M. The Contractor specifically recognizes that a delay by the Contractor in achieving any Completion Date can have the effect of delaying the Substantial Completion of the Project, that such delay in Substantial Completion of the Project will necessarily cause damages, losses, and expenses to the Owner, including, but not limited to and by way of illustration only, increased capitalized costs and interests for the Project, increased and extended Project overhead, Designer's and Consultant's fees, increased costs of construction, increased and extended operation costs of other facilities, and inefficiency and loss of productivity, and that such damages, losses, and expenses may not be readily identifiable or ascertainable at the time they are incurred or at any time. Therefore, and in recognition of these factors and the likelihood that actual damages from his delay will not be readily ascertainable, the Contractor agrees to pay to the Owner, **$250 per calender day** as **Liquidated Damages** and not as a penalty, the sum identified in the Supplemental Conditions hereto as the Liquidated Damages per Day, for each day by which the failure to meet any Completion Date shown in the Contract Construction Schedule, adjusted in accordance with this Article, delays the Substantial Completion of the Project.

Article 14 Reports And Meetings

A. The Contractor shall each day prepare and deliver to the OWNER a Weekly Report showing the number of foremen, journeymen mechanics, and other personnel employed at the Project that day, and the location and nature of the Work performed. Concurrently therewith, if requested by the OWNER, the Contractor shall deliver to the OWNER the various Subcontractors' Daily Reports.

B. Not more than thirty (30) days following execution of the Contract, but prior to commencement of demolition, the Contractor and representatives of all Subcontractors designated by the OWNER shall attend a pre-demolition meeting scheduled by the OWNER. The Contractor shall be represented by its Project Manager, General Superintendents and other persons designated by the OWNER; Subcontractors shall be represented by their supervisory personnel. The purpose of the meeting will be to discuss matters relating to the Project.

C. Each week during the progress of the Work, the Contractor will conduct a Progress Meeting at a time and place agreed upon by the Contractor and the OWNER, during which the Contractor shall review the progress of the Work relative to the Demolition Progress Schedule and discuss ways of maintaining the progress of the Work. The Contractor shall require Subcontractors who are active on the Project at the time the meeting is held to be present and be represented by a person authorized to commit their company. If requested by the OWNER, the Contractor shall require Subcontractors who are not active on the Project to be present and be represented by a person authorized to commit their company. The Contractor shall keep accurate minutes of each meeting and, if requested by the OWNER shall deliver a signed copy of each set of minutes to the OWNER within seventy-two (72) hours of each meeting. The OWNER shall be entitled to attend and participate in all such Progress Meetings.

D. By the fifth (5th) day of each month, the Contractor shall submit to the OWNER a written Contract Status Report, which report shall, at a minimum, show, in detail, the progress of the Work relative to the approved Demolition Progress Schedule; a listing of outstanding Submittals, requests for information or proposals upon which the Contractor is awaiting response from the OWNER, or its consultants, and the impact, if any, such Submittals, requests for information or proposals have on the Construction Progress Schedule; the Contract Sum, including additions or deductions arising out of accepted Changes of Contract; and a

listing of pending or outstanding approved and proposed Changes of Contract (Change Order log) and Contractor's claimed cost and/or extension of time resulting there from.

E. Failure of the Contractor to timely deliver the reports required or requested by the OWNER pursuant to this Article or to schedule and hold the meetings required by this Article shall constitute cause for the withholding of payments by the OWNER.

Article 15 Delays

A. FORCE MAJEURE AND CLAIMS FOR DELAYS: As defined by paragraph 11 of the Contract.

B. SUSPENSION OF WORK:

1. Generally – After Work has started, the Contractor shall not suspend Work without written permission of the OWNER. When under suspension, the Work shall be put in proper and satisfactory condition, and properly protected, including as directed by the OWNER. In all cases of suspension, the Work shall not again be resumed until permitted by written order of the OWNER.
2. The owner's right to suspend – the OWNER reserves the right at any stage of the Work, to suspend operations thereon, or upon any part thereof, either for a time named or indefinitely, by giving the Contractor written notice.
3. Extension of time – if the OWNER's rights of suspension are exercised, the OWNER shall grant to the Contractor an extension of time for the performance of the Work equal to the time of such suspension. However, no adjustment shall be made under this Paragraph for any suspension to the extent that (a) performance would have been suspended, delayed or interrupted by any other cause, including the fault or negligence of Contractor; or (b) equitable adjustment in the time for performance of the Work is provided for or excluded under any other provision of this Contract.
4. Adjustment To Contract Sum – if the OWNER suspends the Work pursuant to this Paragraph, and such suspension impacts the critical path costs of the Work for an aggregate of thirty (30) days, then Contractor shall be entitled to extended general condition for each additional day that the Work is so suspended in excess of the thirty (30) days.

Article 16 Minority Business Enterprise Program

The Contractor shall at all times comply with the latest edition of the Guilford County Minority Business Enterprise Policy. All documentation substantiating compliance with the requirements of this program shall be delivered to the Owner as stipulated in the Contract Documents. A copy of the Guilford County Minority Business Enterprise Policy is included in the Project Manual.

Article 17 Measurement Of Quantities

All Work completed under the Contract Documents shall be measured by the Contractor using United States customary units of measurement. The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed under the Contract Documents shall be those methods set forth in the Contract Documents or, if not specifically set forth therein, the method generally recognized as conforming to good engineering practice.

Article 18 Subcontractors

A. The Contractor shall furnish the OWNER, prior to execution of the Contract, a complete list of all major Subcontractors and Suppliers and such other Subcontractors or Suppliers as may be requested by the OWNER, who are proposed for the execution of the Work (including address, phone number and contact

name for each such Subcontractor and Supplier). At any time, upon request of the OWNER, Contractor shall make available to the OWNER copies of all bids, proposals, contracts, subcontracts or other information concerning the Subcontractors and Suppliers, including financial statements, which may be helpful to the OWNER, or any person or entity providing financing on behalf of the OWNER, in evaluating any of the Subcontractors proposed to perform any part of the Work. Contractor may also be required to make available to the OWNER with respect to the proposed Subcontractors and Suppliers such other proof of their financial stability and experience, lists of completed projects and letters of reference as may be required by the OWNER.

B. The Contractor shall not assign any portion of this Agreement nor subcontract the Work in its entirety without the prior written consent of the Owner. Except as may be required under terms of the bonds required by the Contract Documents, no funds or sums of money due or to become due to the Contractor under the Contract Documents may be assigned.

Article 19 Measurements

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 and shall be responsible for the correctness of same. No consideration will be given for any claim based on differences between the actual dimensions and those indicated in the Contract Documents. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the Designer for adjustment before any Work affected thereby is begun.

Article 20 Cutting, Patching And Fitting

The Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and fit it to receive or to be received by Work shown in or which can be reasonably implied from the Contract Documents.

Article 21 Warranties And Guarantees

A. The Contractor warrants to the OWNER that all Work furnished under this Contract will be of good quality, free from faults and defects and in strict conformance with the Contract Documents for a period of one (1) year from the date of Substantial Completion of the entire Project or for a longer period if so specified elsewhere in the Contract Document. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. This warranty or any other warranty provided by the Contractor pursuant to the Contract Documents shall not be limited by the provisions of Paragraph 21(B).

B. The Contractor shall require the warranty contained in Paragraph 21(A) in all subcontracts and shall include the requirement that the OWNER be reimbursed for any unsuitable Work or to other work resulting from such defects. The Contractor agrees, at its expense and without cost to the OWNER as part of its guarantee under this Article 21 to repair or remove or replace, as directed by the OWNER, all Work which proves defective during the warranty period or which falls to conform to the Contract Documents; to repair, remove, and replace, as directed by the OWNER, all unsuitable portions of the Work resulting from or which is incidental to defects in the Work as stated in this Article 21, or which are damaged by the repair of such defects. All repairs, removals and replacements must be commenced upon receipt of written notice from the OWNER at times approved in advance by the OWNER.

C. The Contractor shall furnish sufficient workers and materials to ensure prompt completion thereof. Should the Contractor fall to proceed in accordance with the provisions of this Article 21, the OWNER, without further notice to the Contractor, may furnish all labor and material necessary for said repairs, or removals and replacements; all costs associated with such repair or replacement work shall be charged to the Contractor.

D. Upon Substantial Completion of the Project and prior to Final Payment, the Contractor shall prepare, organize, assemble and transmit to the OWNER two (2) complete sets, including one original set, of all written warranties and guarantees of others applicable to the Work or required by the Contract Documents and for all restored surfaces. All warranties and guarantees of others with regard to services or materials shall be made for the benefit of the OWNER and the Contractor and shall be enforceable by either the OWNER or the Contractor. The Contractor shall execute any documents or take such action as may be necessary to ensure that the OWNER receives the benefits thereof. Should the Contractor or a Subcontractor replace any part of the Work, all warranties or guarantees applicable to the component replaced shall begin anew from the date of the OWNER's acceptance of the replacement.

E. No contract or purchase pertaining to the Project shall allow for waiver of warranties or guarantees.

F. Nothing contained in this Article 21 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor may have under the Contract

G. The Contractor's guarantees and warranties under this Article shall not be construed to limit the OWNER's right of recovery for defects in the Contractor's Work or the items provided by the Contractor, whether in warranty, contract or any other applicable legal theory, which may arise under other provisions of the Contract or under law.

Article 22 Project Record Documents

A. The Contractor shall keep one record copy marked "As-Built" of all Specifications, Drawings, Addenda, Modifications, and Submittals at the Project in good order and annotated at least monthly to show all changes made during the construction process. Such monthly annotations and their approval by the Designer shall be a condition precedent to approval by the Designer of each monthly Request for Payment. Said record copy shall be stored at the Project and fully protected from damage by fire or other hazard. This record copy shall be available to the Designer and Owner for inspection at all times and shall be delivered to the Designer for the Owner's purposes prior to the Designer's certifying Substantial Completion of the Work.

B. The Contractor shall check all sections of the Specifications for specific references to maintaining record drawings and diagrams (the "Project Record Documents"). These references are intended to clarify record documentation for particular items and are not intended to limit requirements generally.

C. The Contractor shall ensure that each of the Project Record Documents shall be clearly marked "As-Built Drawings" and shall be maintained in good condition and available at all times for inspection by the OWNER. The Contractor shall mark up the most appropriate documents to record significant changes during the construction process and significant details not shown in the original Contract Documents.

D. The Contractor shall ensure that the information given shall include, but not be limited to, the actual location of the underground utilities and appurtenances, referenced to permanent surface improvements scheduled to remain.

E. At the completion of the Project, the OWNER will furnish the Contractor with a complete set of current Contract Drawings. The Contractor shall transfer the recorded changes to the Drawings neatly with a permanent line of sufficient weight to clearly show the record changes. The Contractor shall stamp and sign a certification statement on each Drawing and page that the Drawings as submitted are correct and accurately depict the Work as it has been constructed. These drawings (the "As-Built Drawings") shall be submitted to the OWNER prior to acceptance of the Project by THE OWNER and prior to the release of the Contractor's Final Payment.

Article 23 Disputes

A. Any and all disputes arising hereunder which are not otherwise amicably resolved by mutual agreement shall be resolved by the courts of competent jurisdiction located in the state in which the Project is located.

B. The presence of claims, disputes or controversies between the Contractor and any other party, including the OWNER, over any matter whatsoever, or legal proceedings arising from such claims, disputes or controversies, shall not relieve the Contractor of its obligation, during the resolution of any such claims, disputes or controversies, to continue to perform its Work properly and timely and to comply with all of the terms and conditions of the Contract.

Article 24 Separate Contracts

It is expressly understood that the Owner may deploy the Owner's own employees or engage other separate prime contractors to perform Work as a part of the Project whose work will be performed simultaneously and sequentially with the performance of the Work by the Contractor. It shall be necessary for the Contractor to coordinate construction activities with such other contractors, particularly with respect to access to work areas, storage of materials, and use of elevators and other common facilities. The Contractor shall diligently and in good faith cooperate with the Owner, the Designer, and all other contractors with respect to such matters and shall regularly and faithfully attend any and all meetings called by the Owner or the Designer with respect to such matters. Any disputes between the Contractor and any other separate prime contractor with respect to such matters shall be resolved in accordance with the claim and dispute resolution procedures in the Agreement.

Article 25 Changes In The Work

A. Without invalidating the Contract Documents, the Owner may, at any time, or from time to time order additions, deletions, or revisions in the Work. Said additions, deletions, or revisions shall be authorized only by written Change Orders, Construction Change Directives or Field Orders. Upon receipt of a Change Order, Construction Change Directive or Field Order, the Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any change causes an increase or decrease in the Contract Price and/or an extension or shortening of the Contract Time, adjustments shall be made as provided in these Articles.

B. In order to expedite the Work and avoid or minimize delay in the Work that might affect the Contract Price or Contract Time, the Designer may issue a Change Order in the form of a Construction Change Directive which when signed by the Owner and Designer, directs the Contractor to proceed promptly with the Work involved. Any claim for an adjustment in Contract Price or Time, if not defined in the Construction Change Directive, shall be promptly made in writing in accordance with the procedures defined these Articles.

C. The Designer may authorize minor changes or alterations in the Work not involving change in the Contract Price or in the Contract Time and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. Such alterations shall not invalidate the Contract Documents nor release the surety. If the Contractor believes that any minor change or alteration authorized by the Designer entitles him to an increase in the Contract Price and/or an extension of Contract Time, he may make a claim therefore as provided in these Articles.

D. Except in an emergency endangering life or property, no change shall be made by the Contractor except upon prior written Change Order, Directive or Field Order authorizing such Change.

E. Increases in the Contract Price and/or extensions of the Contract Time for additional Work performed by the Contractor shall only be in accordance with a written Change Order signed by the Owner. The Contractor shall not be entitled to additional time or to additional compensation for any Work performed or material supplied which is claimed to have been authorized or settled by an "oral" change, or by a "constructive" or "implied" change, or by a course of conduct, or by any action or non-action by the Owner,

Designer, or any other persons, or by any means whatsoever other than by a written Change Order for such Work or material signed by the Owner.

F. Changes in the Work resulting from emergency shall not invalidate the Contract Documents nor release the surety.

G. Neither the Owner nor the Designer shall be responsible for verbal instructions which have not been confirmed in writing, and in no case shall such instructions be interpreted as permitting a departure from the Contract Documents unless such instruction is confirmed in writing and supported by a proper Change Order, Construction Change Directive or Field Order, whether or not the cost is affected.

H. The Owner, in its sole discretion, may require that the Contractor notify the Contractor's sureties of any changes affecting the general scope of the work or change in the Contract Price, and that the amount of applicable bonds shall be adjusted accordingly. If this requirement is exercised, the Contractor shall furnish proof of such adjustment to the Designer and the Owner.

1. If this requirement is exercised, the Change Orders shall require written consent of the Contractor's surety. At the time of signing a Change Order, the Contractor shall be required to certify as follows:

   "I certify that all sureties have been notified that my contract has been altered by the amount of this Change Order, and that a copy of the approved Change Order will be mailed to all sureties upon its receipt by me."

2. If this requirement is exercised, no payment to the Contractor on account of any Change Order shall become due or payable until written evidence of the surety's consent to the Change Order has been furnished to the Designer and to the Owner, and the furnishing of such written consent is a condition precedent to such payment.

I. The Contractor shall support all requests for Change Orders with a detailed cost breakdown showing cost of materials, labor, equipment, transportation, other items, Contractor's overhead and profit, and total cost, in accordance with methods defined in this Article, and, if the request seeks an extension of the Contract Time, with a time-related diagram which demonstrates specifically why an increase in construction time is needed.

J. When a request for a Change Order involves a Subcontractor, the Contractor shall provide quotation from same on Subcontractor's letterhead. The Subcontractor's quote shall list materials, equipment, and labor separately, and show overhead and profit in the manner provided in paragraph 14.8.

Article 26 Changes Of The Contract Price

A. The Contract Price constitutes the total compensation payable to the Contractor for performing all Work under the Contract Documents. All duties, responsibilities, and obligations assigned to or undertaken by the Contractor shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order.

B. Any claim for an adjustment in the Contract Price shall be in writing and written notice of any event, action, or non-action which may become the basis of a claim shall be delivered to the Owner and the Designer within three (3) days of the occurrence, or the beginning of the occurrence, of any such event, action or non-action giving rise to the claim. Such written notice is a condition precedent to the making of a claim, and such notice shall describe the basis of the potential claim with reasonable detail and clarity.

C. A claim shall be made in writing and shall be delivered to the Designer and the Owner no later than fourteen (14) days after such notice. The claim shall describe in detail the basis for the claim, with specific reference to any provisions of the Contract Documents, by paragraph, drawing number, or other specific identification, and shall state the amount claimed and how it is calculated. If the Contractor, at the time the claim is made, is unable to state the amount claimed with accuracy, the Contractor shall so state and provide the estimated amount and the basis on which the amount is to be calculated. At the earliest date

practicable, but in no event more than thirty (30) days after Contractor's notice of claim, the Contractor shall supplement the claim with an accurate statement of the amount claimed and how it has been calculated. The Contractor shall provide, in writing, in support of the claim all such explanations, arguments, data, receipts, expert opinions, or other documents or information as the Contractor deems appropriate to be considered in support of the claim. A claim may properly be rejected by the Owner by reason of the Contractor's failure to submit adequate or accurate documentation or information, except that within seven (7) days after being given notice that the claim has been rejected on this basis, the Contractor may submit additional documentation or information. No claim for a change of the Contract Price shall be considered or granted (except solely at the discretion of the Owner) unless a claim is so made, nor shall the Contractor be entitled to any increase in the Contract Price unless the Contractor has given notice and made such a written claim within the times required. The Owner shall decide, after obtaining the advice of the Designer, whether an increase in Contract Price is warranted, and the amount of such increase shall be determined as provided in paragraphs below. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

D. The Owner shall advise the Contractor of its decision with respect to the claim within fourteen (14) days of its receipt, or of the receipt of additional documentation or information if the absence of such has previously been the basis of rejection of the claim; provided, however, that if, in its sole discretion, the Owner deems that review or consideration of any part of the claim or any matter related thereto by its governing Board is necessary or appropriate, it shall so advise the Contractor and shall provide its decision to the Contractor within seven (7) days after such Board consideration, review or action. Any claim on which the Owner has not provided its decision to the Contractor within the applicable time period shall be deemed denied.

E. If the Contractor is not satisfied with the decision of the Owner, the Contractor may within seven (7) days of receipt of the Owner's decision initiate the mediation process as described in Appendix A to the General Conditions of the Contract for Construction.

F. In determining the amount of a Contract Price adjustment, the parties shall apply the following methods, as appropriate:

1. Change in Work: The Owner and Contractor shall negotiate in good faith and attempt to agree upon the value of any change (extra or decrease) in Work prior to the issuance of a Change Order covering said Work. Such Change Order shall set forth the corresponding adjustment to the Contract Price. In the event the Owner and the Contractor are unable to agree, the Owner shall grant an equitable adjustment in the Contract Price.
2. Emergency Work: In the event of emergency endangering life or property, the Contractor may be directed by the Designer to proceed on a time and material basis, whereupon the Contractor shall so proceed and keep accurately, in such form as may be required by the Designer, a correct account of costs together with all proper invoices, payrolls, and supporting data therefore.

G. Where the Contract Price is to be adjusted, the following limitations shall apply in determining the amount of adjustment:

1. In the case of extra or emergency work, the Contract Price shall not be increased by more than the reasonable, actual, and documented net cost of the extra or emergency work plus ten percent (10%) of such net cost on Work performed by the Contractor and five percent (5%) thereof on any subcontracted Work for overhead and profit combined.
2. In the case of a decrease in Work, the Contract Price shall not be decreased by less than the net cost of the deleted Work plus five percent (5%) of such direct net cost for profit and overhead.
3. The term 'net cost' as used herein shall include, as applicable, and shall be limited to, all direct labor, direct material, direct equipment, labor burden, sales taxes, shipping and handling charges, permits and fees, and insurance and bond premium adjustments, if any, attributable to the change. All other items of cost shall be considered as overhead and covered by the percentages allowed in sections A and B of this paragraph.

4. The Contractor shall provide worksheets or tabulations describing the method by which the direct net cost was calculated, and shall provide all data needed to support the calculation of the direct net cost, all in a form acceptable to the Owner.

H. Where the Contract Price is to be adjusted by negotiation, the Owner may authorize and designate the Designer to negotiate with the Contractor on behalf of the Owner; provided, however, any agreement reached between the Contractor and Designer shall be subject to approval by the Owner.

Article 27 Unforeseen Conditions

Should the Contractor encounter unforeseen conditions at the Project 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 Agreement, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of such conditions before they are disturbed. The Owner and the Designer 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 in the Contract Price 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 Designer shall be liable or responsible for additional work, costs, or changes to the Work that could have been reasonably determined from any reports, surveys, and analyses made available for the Contractor's review or that could have been discovered by the Contractor through the performance of its obligations pursuant to the Contract Documents.

Article 28 Correction Of Work Before Final Payment

A. The Owner has the authority to stop or suspend work, and the Designer has the authority to order Work removed or to order corrections of defective Work or Work not in compliance with the Contract Documents where such action may be necessary to ensure successful completion of the Work.

B. Any work, materials, fabricated items, or other parts of the Work which have been found by the Designer to be defective or not in accordance with the Contract Documents shall be condemned and shall be removed from the Project by the Contractor, and immediately replaced by new Work in accordance with the Contract Documents at no additional cost to the Owner. Work or property of the Owner or others damaged or destroyed by virtue of such condemned Work shall be made good at the expense of the Contractor.

C. Correction of condemned Work described above shall be commenced by the Contractor within twenty-four (24) hours after notice from the Designer or the Owner and shall be pursued to completion. Should the Contractor fail to proceed reasonably with the above- mentioned corrections, the Owner may, three (3) days after the notice specified in the preceding sentence, proceed with correction, paying the cost, including costs of uncovering such condemned Work, of such corrections from amounts due or to become due to the Contractor.

D. Condemned Work removed shall be the property of the Contractor and shall be removed from the Project by him within ten (10) days after notice to remove it, and if not then removed, thereafter may be disposed of by the Owner without compensation to the Contractor and the cost of such disposal shall be deducted from amounts due or to become due to the Contractor.

E. Should the cost of correction of the Work and, if applicable, disposal of the condemned Work by the Owner exceed amounts due or to become due the Contractor, then the Contractor and the Contractor's sureties shall be liable for and shall pay to the Owner the amount of such excess.

Article 29 Correction Of Work After Substantial Completion; Warranties And Guaranties

A. Neither the final certificate, Final Payment, occupation of the premises by the Owner, nor any provision of the Contract Documents, nor any other act or instrument of the Owner or the Designer shall relieve the Contractor from responsibility for negligence, defective material or workmanship, or failure to comply with the Contract Documents.

B. The Contractor shall, at the Contractor's sole cost and expense, make all necessary repairs, replacements, and corrections of any nature or description, interior or exterior, structural or non-structural, that shall become necessary by reason of defective workmanship or materials which appear within a period of one (1) year from the date of Substantial Completion; provided, however that notwithstanding the preceding, if any longer guarantee period is specified for any particular materials or workmanship under the Contract Documents, or under any subcontract, or in connection with any manufactured unit which is installed in the Project, or under the laws of the State of North Carolina, the longer guarantee period shall govern.

C. If, within any guarantee period, repairs or changes are required in connection with the Work, which are rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Designer and without expense to the Owner:

1. Completely repair or replace the Work so that it conforms to the Contract Documents;
2. Correct all defects therein;
3. Make good all damage which, in the opinion of the Designer, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents; and
4. Make good any Work or material, or any equipment or contents disturbed in fulfilling any such guarantee.

D. If, in fulfilling the requirements of the Contract Documents or of any guarantee embraced therein or required thereby, the Contractor disturbs any work, facility, premises, or construction belonging to the Owner, the Contractor shall restore such disturbed work to a condition satisfactory to the Owner, and shall guarantee such restored work to the same extent as if it were Work under the Contract Documents.

E. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected, and the Contractor and the Contractor's sureties shall be liable for all expenses incurred. "Promptly" is defined as within twenty-four (24) hours for systems necessary to normal operation of the building and within seventy-two (72) hours for all other items. All special guarantees applicable to definite parts of the Work that may be shown in or required by Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee. Manufacturer's standard guarantees or warranties which do not comply with the time limit specified herein shall be extended by the Contractor automatically without further action on the part of the Owner or the Designer.

F. In the eleventh calendar month after the date of Substantial Completion, and at the request of the Owner, the Contractor, the Owner and the Designer shall make an inspection of the Work for the purpose of identifying defective workmanship and/or materials. If the Contractor, having been requested to do so by the Owner, fails to participate in such inspection, the Contractor shall be conclusively bound by any decision or ruling by the Designer as to any defective workmanship or material and as to the Contractor's responsibility for its repair or replacement.

Article 30 Owners Right To Do Work

A. If, during the progress of the Work or during any period of guarantee, the Contractor fails to prosecute the Work properly or to perform any provision of the Contract Documents, the Owner, after three (3) days written notice to the Contractor from the Designer, or from the Owner after Final Payment, may perform or have performed that portion of the Work and may deduct the cost thereof from any amounts due or to become due the Contractor. Notwithstanding any action by the Owner under this paragraph, all warranties and bonds given or to be given by the Contractor shall remain in effect or shall be given by the Contractor.

B. Should the cost of such action by the Owner exceed the amount due or to become due the Contractor, the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of such excess.

Article 31 Partial Payments

A. Payments shall follow Guilford County Policy per Guilford County's general Terms and Conditions.

B. Schedule of Values – before the first application for payment ("Application for Payment"), the Contractor shall submit to the OWNER a schedule of values ("Schedule of Values") allocating the Contract Sum to the various portions of the Work and to the portions of the Work performed by each Subcontractor. The Schedule of Values shall contain single line item entries, identified for each major item of Work and each subcontracted item of Work, referenced to the number and titles of the specification section applicable for each item. The Schedule of Values shall be prepared on a form as set forth by the OWNER or on another form approved by the OWNER.

C. Schedule of Allowances – a Schedule of Allowances shall be submitted with all pay requests in accordance with SECTION 01210-ALLOWANCES,SCHEDULE OF ALLOWANCES.

D. Within thirty (30) days after his initial receipt of the Construction Agreement for signatures, the Contractor shall submit to the Designer a Schedule of Values. The Schedule of Values shall indicate the value of the Work, including applicable overhead and profit, for each Division and section of the Project Specifications. The Designer and Owner shall be provided with the Contractor's estimate papers, Subcontractor agreements, supplier quotes, or other documents substantiating these values if so requested in writing by the Designer. The Contractor shall provide the requested documentation within seven (7) days after receipt of the Designer's written request. The Schedule of Values shall be subject to approval by the Owner, and if the Owner and the Contractor cannot agree upon the Schedule of Values, the Designer shall prepare it, and the Schedule of Values as prepared by the Designer shall be binding on the Owner and the Contractor. No Request for Payment shall be certified by the Designer until the Designer has issued approval of said Schedule of Values.

E. Not later than the fifth (5th) day of each calendar month the Contractor shall submit to the Designer a Request for Payment for Work done during the previous calendar month. The Request for Payment shall be in form of AIA Document G702 (latest edition) and shall show substantially the value of Work done (including the value of material delivered to the Project or stored by the Contractor at another site, subject to the conditions hereinafter set forth) during the previous calendar month, and shall sum up the financial status of the Work with the following information:

- Total Contract Price, including any adjustment thereto made pursuant to the Contract Documents
- Value of Work completed and materials properly stored to date
- Less amount retained
- Less previous payments
- Current amount due
- Balance remaining

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

G. When payment is requested or made on an account of stored materials, such materials must be stored on the Owner's property at such places and in such a manner as may be designated by the Designer. However, in the sole discretion of the Owner, with permission in writing from the Designer and Owner and under such circumstances as may be determined by the Owner, such materials may be stored in a bonded warehouse. The location and conditions for storage of such materials away from the Owner's property in a bonded warehouse shall be within the sole discretion of the Owner. Requests for Payment on account of stored materials shall be accompanied by paid invoices, bills of sale, warehouse receipts, or other documentary evidence establishing Owner's title to such materials, evidence that the stored materials are insured against loss and damage, and such other documentation as required by the

Designer. Responsibility for the quantity, quality, and condition of such stored materials, whether stored on the Owner's property or away from the Owner's property, shall remain with the Contractor regardless of ownership or title. No payment shall be made on account of materials stored in a bonded warehouse unless the Contractor has acquired written permission from the Designer for such storage of materials and has complied with all conditions set forth in such permission regarding such storage of materials in a bonded warehouse.

H. Any Request for Payment received by the Designer on or before the fifth (5th) of the calendar month shall be certified for payment or returned for re-submission to the Contractor on or before the fifteenth (15th) of the calendar month. The Designer's certification shall be for the amount which was requested or that which the Designer has decided was justly due, and shall state in writing to the Contractor and Owner the reasons for withholding payment of any or all of the amount requested.

I. The Designer may fail to certify all or part of any payment requested for any of the following reasons:

1. Defective Work not corrected.
2. Suits, actions, or claims of any character filed against the Contractor, or due to the operations of the Contractor, or information or notice that a suit, action, or claim will be filed or has been made.
3. Information or notice that a Subcontractor or a supplier has not received payment.
4. The balance unpaid of the Contract Price is insufficient to complete the Work in the judgment of the Designer or Owner.
5. Damage to the Owner or another contractor.
6. Inability of the Contractor to meet a Completion Date, including an anticipated failure to meet a Completion Date entitling the Owner to withhold anticipated Liquidated Damages.
7. Failure to furnish Submittal as required by the Contract Documents on a timely basis in accordance with the Submittal Register.
8. Such other reason as to the Designer may appear prudent, proper, or equitable. When grounds for withholding certification have been corrected, the Designer shall so certify to the Owner and the Owner shall make any payment due with respect to such certification as a part of his next payment after such certification.

J. No certificate issued or progress payment made shall constitute an acceptance of the Work or any part thereof.

K. The amount certified by the Designer for payment shall be ninety percent (90%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified, and this amount shall be paid by the Owner on or before the last business day of the month, but payment shall not be past due until not paid within fifteen (15) days thereafter.

Article 32 Final Payment

A. If the Work of the Contractor is limited to demolition, pilings, caissons and/or structural steel, the remaining unpaid balance of the Contractor’s Contract Price, less a sum equal to five-tenths percent (0.5%) of the Contract Price, shall be paid within sixty days following receipt of the following documents, all of which must be received before payment shall become due: (i) request for payment from the Contractor; (ii) receipt of consent from the Contractor’s surety to the payment; and (iii) approval or certification from the Designer that the work performed by the Contractor is acceptable and in accordance with the Contract Documents.

B. Except as set forth in paragraph A above, within forty five days after Substantial Completion of the Project, the remaining unpaid balance of the Contract Price shall be paid to the Contractor, less an amount equal to two and one-half times the value of punch list work or other work remaining to be completed or corrected, as reasonably estimated by the Owner.

C. Upon Substantial Completion, the Designer shall prepare and submit to the Contractor a deficiency list identifying all portions of the Work which are known by the Designer at that time to be incomplete or defective. Within thirty (30) days of receipt of this deficiency list, the Contractor shall complete and

correct all items on that list along with all other Work required to achieve Final Completion of the Work. At any time prior to completion of the period of warranty, the Designer may submit to the Contractor a supplemental deficiency list, in which case the Contractor shall complete or correct any and all new items identified on the Supplemental deficiency list within the time period stipulated.

D. Final Payment of any remaining balance of the Contract Price shall not be due to the Contractor until the Contractor achieves Final Completion of the Project.

E. The making and acceptance of Final Payment shall constitute a waiver of all claims by the Owner except:

1. Claims arising from unsettled liens or claims against the Contractor.
2. Defective Work or materials appearing after Final Payment.
3. Failure of the Contractor to perform the Work in accordance with the Contract Documents.
4. As conditioned in the Performance Bond.
5. Claims made prior to Final Payment which remain unsettled.
6. Claims for recovery of overpayment based upon incorrect measurement, estimate, or certificate.

F. The making and acceptance of Final Payment shall constitute a waiver of all claims by the Contractor except those claims previously made in writing and not finally resolved.

G. The Designer shall not authorize Final Payment until all of the Work under the Contract Documents has been certified by the Designer as completed, proper and suitable for occupancy and use, and has been approved by all federal, state and local agencies having jurisdiction.

H. The final Request for Payment shall be identified on its face as such and shall be presented by the Contractor to the Designer within thirty (30) days of completion of the Work. Final payment of the retained amount due the Contractor shall be made by the Owner within thirty (30) days after the later of (i) full and Final Completion of all Work required by the Contract Documents, and certification of such Work; (ii) submission of the affidavits of other documentation required by Article 33; (iii) submission by the Contractor of a Request for Payment identified on its face as final and including the Designer's certification.

Article 33 Contractor, Subcontractor And Supplier Affidavit

A. The Contractor shall comply with the applicable laws and regulations of the state of North Carolina regarding the liability of the OWNER for mechanics' liens.

B. The Final Payment due the Contractor on account of the Contract Documents shall not become due until the Contractor has furnished to the Owner through the Designer: (A) an affidavit by the Contractor signed, sworn, and notarized to the effect that all payments for materials, services, or for any other reason in connection with the Work or performance of the Contract Documents have been satisfied and that no claims or liens exist against the Contractor in connection with the same; (B) affidavits from each Subcontractor and supplier signed, sworn, and notarized to the effect that (i) each such Subcontractor or supplier has been paid in full by the Contractor for all Work performed and/or materials supplied by him in connection with the Project, and (ii) that all payments for materials, services, and for any other reason in connection with the subcontract or supply contract have been satisfied and that no claims or liens exist against the Subcontractor or supplier in connection therewith; and (C) the written consent of the Contractor’s sureties to Final Payment. In the event that the Contractor cannot obtain an affidavit, as required above, from any Subcontractor or supplier, the Contractor shall state in the Contractor’s affidavit that no claims or liens exist against such Subcontractor or supplier to the best of the Contractor's knowledge, and that if any appear afterwards, the Contractor shall save the Owner harmless for all costs and expenses, including attorneys fees, on account thereof.

Article 34 Contractor And Subcontractor Relationships

A. RELATIONS: The Contractor agrees to bind every Subcontractor and every Subcontractor shall agree to be bound by the terms of the Contract Documents.

B. Within thirty (30) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer and Owner for acceptance a current list of the names of Subcontractors and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for any and all portions of the Work. The Contractor shall provide this list at this time even if the Contractor was required to submit a list of proposed Subcontractors with the Contractor's bid. The Designer shall promptly reply to the Contractor in writing stating whether or not the Owner or the Designer, after due investigation, has objection to any such proposed person or entity or if it needs additional information to evaluate the persons on the list. Failure of the Designer to reply within ten (10) days after the Contractor has furnished all required information shall constitute notice of no objection.

C. The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Designer has made reasonable objection. If the Designer or Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner and the Designer have no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person, or entity previously allowed without first notifying the Designer and Owner in writing and no substitution may be made if the Owner or Designer makes a reasonable objection to such substitution.

D. The Contractor agrees that the terms of the Contract Documents, including all portions thereof, shall apply to all Subcontractors of the Contractor as if they were the Contractor, and that the Subcontractors of the Contractor shall, by means of their subcontracts, be bound by all the terms of the Contract Documents including, but not limited to, Article 26 of these General Conditions.

E. Payments to Subcontractors shall be made in accordance with the provisions of N.C. Gen.Stat. §143-134.1.

Article 35 Use Of Premises

A. The Contractor shall confine apparatus, the storage of materials, the operations of workers, and the disposal of material to limits indicated by law, ordinances, permits, and directions of the Designer, if any.

B. The Contractor shall not load or permit any part of the Work to be loaded with a weight that will endanger its safety, intended performance, or configuration.

C. The Contractor shall enforce all of the Designer's instructions, including, but not limited to, those regarding signs, advertisements, fires, eating, and smoking.

Article 36 Dispute Resolution

A. The laws of the State of North Carolina shall apply to the interpretation and enforcement of this Agreement. Any and all suits or actions to enforce, interpret, or seek damages with respect to any provision of, or the performance or nonperformance of, this Agreement shall be brought in the General Court of Justice of North Carolina sitting in Guilford County, North Carolina, and it is agreed by the parties that no other court shall have jurisdiction or venue with respect to such suits or actions. Appendix A shall be a part of the Contract Documents. Prior to initiating an action under this Article, any party to this Agreement shall initiate the mediation process as provided in Appendix A to these General Conditions of the Contract for Construction.

B. Any person or firm that expressly or impliedly agrees to perform labor or services or to provide material, supplies, equipment, work, performance or payment bonds, insurance or indemnification for the construction of the Project or the Work shall be deemed a party to this Agreement solely for the purpose of this Article. The Contractor, by means of its subcontracts, shall specifically require its Subcontractors to be bound by this Article.

Article 37 Taxes

A. The Contractor is to include in the Contract Price and shall pay all taxes assessed by any authority on the Work or the labor and materials used therein. The Contractor shall maintain all tax records during the life of the Project and furnish the Owner with a complete listing of all taxes paid by taxing authority, invoice number, date, amount, etc. in a form acceptable to the Owner. The Contractor is required to maintain a file showing taxes paid on the Project for three (3) years after Final Payment or turn said documents over to the Owner for his files.

B. The following is a list of requirements to be followed by the Contractor in maintaining proper records and reporting the North Carolina Sales and Use Tax and Local Sales and Use Tax. The Contractor shall comply fully with the requirements outlined below, in order that the Owner may recover the amount of the tax permitted under the law.

1. It shall be the Contractor's responsibility to furnish the Owner documentary evidence showing the materials used and sales and use tax paid by the Contractor and each of his Subcontractors. Such evidence shall be transmitted to the Owner with each pay request irregardless of whether taxes were paid in that period.
2. The documentary evidence shall consist of a certified statement by the Contractor and each of the Contractor's Subcontractors individually, showing total purchases of materials from each separate vendor and total sales and use taxes paid to each vendor. Certified statements must show the invoice number, or numbers, covered, and inclusive dates of such invoices.
3. Materials used from Contractor's or Subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.
4. The Contractor shall not be required to certify the Subcontractor's statements.

Article 38 Operation Of Owner Facilities

The Contractor agrees that all Work done under the Contract Documents shall be carried on in such a manner so as to ensure the regular and continuous operation of the adjoining or adjacent facilities. The Contractor further agrees that the sequence of operations under the Contract Documents shall be scheduled and carried out so as to ensure said regular and continuous operation. The Contractor shall not close any areas of construction until so authorized by the Designer. The Contractor shall control operations to assure the least inconvenience to the public. Under all circumstances, safety shall be the most important consideration.

Article 39 Third Party Beneficiary Clause

It is specifically agreed between the parties executing the Agreement that, hereof, and that exception only, the Contract Documents and the provisions therein are not intended to make the public, or any member thereof, a third-party beneficiary of the Agreement, or to authorize anyone not a party to the Contract Documents to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of the Contract Documents.

Article 40 Termination By The Owner For Cause

If the Contractor fails to begin or complete the Work under the Contract Documents within the time specified, or fails to perform the Work with sufficient labor and equipment or with sufficient materials to insure the prompt completion of said Work, or shall perform the Work unsuitably or shall discontinue the prosecution of the Work for three (3) days, or if the Contractor shall become insolvent, be declared bankrupt, commit any act of bankruptcy or insolvency, allow any final judgment to stand against the Contractor or its affiliated companies unsatisfied for a period of forty-eight (48) hours, make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the Work in an acceptable manner, the Owner may give notice in writing to the Contractor and the Contractor's sureties of such delay, neglect, or default, specifying the same, and if the Contractor within a period of three (3) days after such notice shall not proceed in good faith and with reasonable speed to correct such delay, neglect, or default in accordance with such notice, the Owner shall have full power and authority, to the extent permitted by law, without violating the Contract Documents, to take the prosecution of the Work out of the hands of the Contractor, to appropriate or use any or all materials and equipment at the Project as may be suitable and acceptable, and may enter into an agreement for the completion of the Work or pursue such other methods as in the Owner's opinion shall be necessary or

appropriate for the completion of the Work in an acceptable manner. All costs and charges incurred by the Owner in proceeding in accordance with the preceding sentence, including attorney's fees, and all costs incurred by the Owner in completing the Work shall be deducted from any money due or which becomes due the Contractor. If such costs and expenses incurred by the Owner shall be less than the sum which would have been payable under Contract Documents if it had been completed by the Contractor, then the Contractor shall be entitled to receive the difference, but if such costs and expenses shall exceed the sum which would have been payable under the Contract Documents, the Contractor and the Contractor's surety shall be liable to the Owner for and shall pay to the Owner the amount of such excess.

Article 41 Termination Or Suspension By The Owner For Convenience

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

B. If the Contractor is subsequently ordered by the Owner to resume the Work, any cost or expenses to which the Contractor may be entitled by reason of the suspension, delay, or interruption shall be recovered by means of a Change Order and the Contract Construction Schedule shall be adjusted.

C. The Owner shall terminate the Work or portion thereof by written notice when the Contractor is prevented from proceeding with the Work as a direct result of an executive order of the President with respect to the prosecution of war or in the interest of national defense.

D. In the event of termination by the Owner under this Article, the Contractor shall be entitled to receive the reasonable and documented direct costs incurred prior to termination, including the cost of materials purchased for the Work which purchases cannot be canceled or which material cannot reasonably be used by the Contractor on other work, and the cost of closing down the Project in a safe and efficient manner, plus ten percent (10%) thereof for overhead and profit, subject to the following conditions:

1. When the Contract is terminated before completion of all items of Work, payment shall be made for the actual number of units or items of Work completed at the applicable contract prices, or as mutually agreed for items of Work partially complete. If a mutual agreement cannot be reached, the Owner shall have the authority to make such equitable adjustment as it deems warranted and the Final
2. Payment shall be made accordingly.
3. Reimbursement for organization of any Work and moving equipment to and from the job shall be considered when not otherwise provided for in the Contract Documents where the volume of completed Work is too small to compensate the Contractor for those expenses under unit prices. If a mutual agreement cannot be reached, the Owner will have the authority to make such equitable adjustments as it deems warranted and the Final Payment will be made accordingly.
4. Materials obtained by the Contractor for the Work that have been inspected and accepted by the Designer and that are not incorporated in the Work shall, at the request of the Contractor, be purchased from the Contractor at the Contractor's actual cost as shown by receipted bills and actual costs records at such points of delivery as may be determined by the Owner.
5. No payment shall be made by Owner to Contractor except as herein above provided. No claim for loss of anticipated profits shall be considered or allowed.
6. Termination of the Contract shall not relieve the Contractor of his responsibilities for any completed portion of the Work nor shall it relieve his sureties of their obligation for and concerning any just claims arising out of the Work performed.

The Contractor shall not be entitled to any other compensation, including compensation for lost profit, lost opportunity, or any other direct or consequential cost, loss, or damage.

END OF DOCUMENT 00821

DOCUMENT 00938 – REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Specified in This Section:
   1. This Section specifies administrative and procedural requirements for disposition of Request for Information (RFI's) during the Construction Phase.

B. Related Work Specified Elsewhere:
   1. General Conditions Of The Contract (00820)

1.2 SUBMITTALS

A. Submit each request (RFI) on the form included in this Section, and in accordance with procedures stipulated below.

   1. Identify the issue, fabrication, or installation method in question in each request. Include related Specification Section and Drawing numbers. Provide complete documentation stating the issue. Include copies of Product Data, Drawings, descriptions of products, fabrication details, installation procedures or other information to help clarify the Contractor's request.

B. Submit only one request on each form.

C. Email RFI form to **rcpritchardpe@gmail.com.**

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CONDITIONS

A. Submit any such requests to the Engineer as early as possible so as to cause no delay in the progress of the Work and enough in advance to allow the Engineer reasonable and adequate time to provide a full and proper response. If the information being requested from the Engineer can not be reasonably determined by information contained within the Contract Documents, and/or original construction documentation, then the Contractor shall reimburse the Engineer for time spent researching the RFI at the Engineer's current hourly rate.

3.2 ENGINEERS ACTION:

A. After receipt of the request for information, the Engineer may request additional information or documentation necessary for evaluation of the request. After receipt and review of all pertinent information and documentation, the Engineer will issue his response. Such response may be written form or drawings as the Engineer shall determine.

DOCUMENT 00938 – REQUEST FOR INFORMATION (RFI)

Contractor RFI #: **Date:**

Submitted By:

Attention: **R. Craig Pritchard, PE**
(rcpritchardpe@gmail.com)

Subject:

Specification Reference:

Drawing Sheet Number/Detail Reference:

INFORMATION REQUESTED

Signed:_____

RESPONSE **By:** **Date:**

☐ See Drawings/Specifications:

☐ See Addenda to be issued:

☐ Other

☐ See attachments

END OF DOCUMENT 00938

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: HVAC Renovations

1. Project Location: 201 S. Greene Street, Greensboro, NC 27401
2. Owner: County of Guilford, North Carolina.
3. County Department: Facilities and Parks

B. Engineer Identification: R. C. Pritchard Engineering Services

C. Scope or Work – Base Bid:

1. The contractor is to provide all required labor, tools, material and equipment for the selective demolition of existing HVAC equipment, piping, and ductwork, and install new equipment with integral microprocessor controls, piping, and ductwork, and new DDC controls for control of the outdoor air air handling unit at the Greene Street Center in Greensboro, NC. The base bid work includes, but is not limited to:
   a. Removal of existing air handling unit cooling coil, control valves, and selective demolition of hydronic piping, supply air ductwork, and controls.
   b. Demolition of existing natural gas piping.
   c. Installation of one (1) new natural gas, direct-vented condensing boiler complete with factory microprocessor controls, boiler pump, circulating pump, storage tank, and related accessories.
   d. Installation of one (1) new AHU chilled water cooling coil with control valve and piping.
   e. Installation of one (1) new AHU hot water preheat coil control valve and associated piping.
   f. Installation of one (1) new AHU hot water reheat coil with control valve and associated piping.
   g. Installation of one (1) new AHU outdoor air and one (1) new return air control dampers.
   h. Installation of one (1) new barometric relief damper.
   i. Installation of two (2) new fire dampers.
   j. Installation of one (1) new chilled water storage tank.
   k. Installation of new CO2 and humidity sensors on each floor of the building.
   l. Installation of new occupancy sensors in the first floor classrooms and entry.
   m. Installation of new DDC controls for complete control of the outdoor air air handling unit with demand controlled ventilation and dehumidification.

n. Installation of new gas piping, hot water piping, chilled water piping, and control wiring.
o. Testing, balancing, adjusting, and commissioning of the dedicated outdoor air system.
p. Testing, balancing, and adjusting of the toilet exhaust system.
q. Repair and restoration of the building to original or better condition at the completion of the project.

1.3 CONTRACT

A. This work will be under a General construction contract.

1.4 WORK COMPLETION

A. The Work shall be complete within **90 Calendar days**, the contracted number of days, commencing from the date of the Owner's written notice to proceed

1.5 USE OF PREMISES

A. General: Contractor shall have use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises will be limited to work described in the Project Manual and Drawings.

B. Coordination: Contractor shall coordinate the Work with the Owner's schedule in order to maintain use of the premises for scheduled events. Those areas to be in use for scheduled events shall have means for maintaining comfort conditions by either manual or automatic control.

1.6 WORK UNDER OTHER CONTRACTS

A. Separate Contract: In the event the Owner awards separate contracts for performance of certain construction operations at Project site. Those operations may be conducted simultaneously with work under this Contract.

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "Master Format" numbering system.
1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections applicable to the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as

appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances required ***when certain items are identified in the Contract Documents as allowances.***

1. Allowances are established in lieu of additional requirements and to defer selection of actual materials, equipment, and demolition method to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.
5. Testing and inspecting allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
2. Division 1 Section "Unit Prices" for procedures for using unit prices.
3. Division 1 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
4. Divisions 2 through 16 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. Fourteen (14) days after award of the Contract, advice Engineer of the date when final selection and purchase of each materials, equipment, and demolition method described by an allowance must be completed to avoid delaying the Work.

B. At Engineer's request, obtain submittals for each allowance for use in making final materials and or demolition method selections. Include recommendations that are relevant to performing the Work.

C. Purchase materials, equipment and demolition method selected from the designated supplier.

1.4 SUBMITTALS

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

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

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

1.5 COORDINATION

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

1.6 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

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

1.8 TESTING AND INSPECTING ALLOWANCES

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

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

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

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

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

1. If requested by Engineer, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. In the event that allowances are issued, a schedule of Allowances shall be submitted with all pay requests to include Allowance No., Allowance Description as specified in relevant Division Section and as shown on Drawings.

B. Contingency allowance: Include a project **contingency allowance of $10,000.00**.

END OF SECTION 01210

SECTION 01230

ALTERNATES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: Alternates to be submitted to Guilford County with Proposal.
   1. Submission procedures.
   2. Documentation of changes to Contract Sum/Price and Contract Time.

B. Related Documents: The Contract Documents, as defined in Section 011004 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.2 DEFINITIONS

A. Alternate: The net amount to be added to or deducted from the Base Proposal Price for work identified in Schedule of Alternates.

1.3 SUBMISSION REQUIREMENTS

A. Extent of Alternates:
   1. Determine the full extent of Work affected by proposed Alternates.
   2. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.
      a. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Submission Form: Complete Schedule of Alternates below and attach to Proposal.
   1. Substitutions are permitted unless prohibited by a relevant specification section for that product or material. Submit a request for substitution for any manufacturer not named in accordance with Section 016000 - Product Requirements.

C. Schedule: The Alternates consist of the items included, or attached and incorporated by reference in Section B, The Contract, B. 1500 Attachments. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.
   1. Alternates describe environmental requirements.

2. Conform to Contract Documents for requirements for performance, appearance, workmanship and materials not modified under the Alternate Bids.

1.4 SELECTION AND AWARD OF ALTERNATES

A. Acceptance or Rejection: Alternates quoted on Schedule of Alternates and attached to Proposal will be reviewed and accepted or rejected at Guilford County's option. None, any, or all Alternates may be accepted or rejected by Guilford County.

B. Accepted Alternates will be identified in the Contract.

C. Some Alternates and respective pricing will survive the Contract and will remain valid for the period stated in the Schedule of Alternates below.

SCHEDULE OF ALTERNATES

A. Alternate Number 1: BMS Integration.
Fully integrate the base bid control system into the Owner's County Wide Alerton Energy Management System (EMS). This shall include the capability to monitor and control all inputs and outputs through the existing Energy Management System. Furnish the necessary programming and graphics for integration. All graphics shall match the existing EMS graphics in both appearance and functionality. Owner shall furnish the necessary license key for access to the existing Alerton system.

Add:_____dollars, or Deduct:_____dollars.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Included In This Section:
   1. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections Specified Elsewhere:
   1. Allowances (01210)

1.2 CHANGE OF CONTRACT PROPOSAL REQUEST (CCPR):

A. Prior to incorporation in a Change Order each proposed change in the Work, adjustment to the Contract Sum, or adjustment to the Contract Time will be identified as a Change of Contract Proposal Request (CCPR) each of which will be assigned by the Architect.

B. Change proposal requests are for pricing only. Do not consider them instruction either to stop work in progress or to execute the proposed change.

C. Proposals shall be submitted to the Architect in accordance with Document 00821, Article 16-CHANGE OF CONTRACT.

D. At the time of signing a Change Order, the Contractor shall notify his Surety that the Contract Sum has been changed by the amount of this Change Order and he shall furnish his Surety with a copy of the approved Change order.

E. Change Proposal Request Format:
   1. Use the format included at the end of this Section for submittal of CCPR's.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SEE (CCPR) FORMAT NEXT PAGE

END OF SECTION 01250

COST CHANGE PROPOSAL

Project	*Project No.*	*Modification No.*
Contractor	*Contract No.*	*RFP No.*

A. Scope of Change

B. For Change Work Performed Directly by the Undersigned Contractor:

1.	Direct Labor: (attach supporting detailed estimates w/ man-hours & rates. Include labor fringes.		$
2.	Insurance:	$	
3.	Materials and Equipment: (attach supporting detailed estimate with quantities and unit costs)		$
4.	Deduction of offsetting debit or credit for materials, labor, and equipment: (attach supporting estimate)		$
5.	Overhead: ____ % (max 10%)		$
6.	Profit: ____ % (max 10%)		$
7.	Other:	$	
8.	TOTAL DIRECT COST		$

C. For Change Work Performed by Subcontractors, per Proposals and Detailed Breakdowns attached: (excluding FICA/FUTA)

1.	Subcontractor Name:	Category of Work:	$
			$
			$
			$
			$
			$
			$
2.	Subtotal Subcontractor Amount (including All Subcontractor Costs):		$
3.	Contractor's Commission on Total Subcontractor Amount: ____ % (Do not exceed 10%)		$
4.	Other:		$
5.	TOTAL SUBCONTRACTED COST (C2 + C3 + C4):		$

D. Total Cost of this Change (B8 + C5):	$
E. Contract Time Extension in Calendar Days (Attach supporting Documentation):	

Contractor Authorization:

Printed Name of Person Authorized to Sign Proposal	*Signature*	*Date*

SECTION 01310 - PROJECT COORDINATION

PART I - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:

1. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
   a) Coordination.
   b) Administrative and supervisory personnel.

B. Related Work Specified Elsewhere:

1. Project Meetings(01315)
2. Submittals(01330)

1.2 COORDINATION:

A. The Contractor shall:

1. Schedule the work of all sub-contractors; maintain a progress schedule for all sub-contractors for this project; notify the Engineer of any changes in the progress schedule; and be responsible for providing adequate notice to all sub-contractors to insure efficient continuity of all phases of the project work.
2. Hold meetings with the various major sub-contractors as required to coordinate work and provide work progress reports.
3. The Contractor shall provide for scheduling of all testing as required by this contract. Such testing for each item shall be indicated on the construction schedule.
4. The Contractor shall coordinate the securing of all final certificates of inspection, the Certificate of Occupancy, and other inspections that may be required by authorities having jurisdiction over the Work. He shall deliver same to the Engineer upon completion of the Work.

1.3 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General:

1. The Contractor shall Appoint a single representative, i.e. Project Manager, fluent in the English language, to be the single contact person with the Owner and/or Engineer. The Project Manager shall have experience on at least two projects of similar scope, size and complexity.
2. The Contractor shall be responsible for supervising and expediting the project work with an on-site supreintendent in accordance with Document 00821, Article 5 paragraph F.

3 . In addition to the Project superintendent, the Contractor shall give his superintendent enough support staff that his ongoing presence can be maintained on site so that errands to secure materials etc. will be carried out by others and others will receive deliveries to site.
4. The on site project superintendent shall have a minimum of five (5) years experience in hospitality facilities similar in scope to this project.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01310

SECTION 01315 – PROJECT MEETINGS

PART I - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Included This Section:

1. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
   a. Pre-Consturction Conference.
   b. Coordination Meetings.
   c. Progress Meetings.

B. Related Work Specified Elsewhere:

1. ProjectCoordination (01310)
2. Progress Schedules (01325)

1.2 PRE-CONSTRUCTION CONFERENCE

A. A pre-construction conference shall be scheduled by the Engineer and held at the Project site or other convenient location after execution of the Agreement or Notice To Proceed, whichever comes first, and prior to commencement of construction activities.

B. Attendees:

1. The Owner, Engineer, the Contractor(s), and its superintendent(s) shall each be represented at the conference by persons authorized to conclude matters relating to the Work.

C. Agenda:

1. Discuss items of significance that could affect progress including such topics as:
   a. Work sequencing.
   b. Safety.
   c. Security.
   d. Tentative Progress Schedule.
   e. Designation of responsible personnel.
   f. Procedures for processing CCPR’s and Change orders.
   g. Procedures for processing Applications for Payment.
   h. Submittals.
   i. Use of the premises.
   j. Staging areas.
   k. Housekeeping.

1.3 COORDINATION MEETINGS

A. The Contractor shall conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special Pre-installation meetings.

B. Bi-Weekly Progress Meetings

1. To enable orderly review of progress during construction and to provide for systematic discussion of problems, project meetings shall be held throughout the construction period.
2. The Contractor and his superintendent shall attend and participate the monthly project meetings.
3. The Owner will conduct the meetings and AE will compile minutes of each meeting and will distribute copies. The Contractor(s) shall distribute such other copies as required. The Contractor shall assign the same person to represent the Contractor at project progress meetings throughout the construction period.
4. Schedule Updating: Revise and update the construction schedule after each progress meeting where revisions to the schedule have been made or recognized, including all approved CCPR'S.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01315

SECTION 01330 - SUBMITTALS

PART 1-GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:

1. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;

   a. Submittal schedule.
   b. Construction Method Description.

B. Administrative Submittals:

1. Refer to Division- I and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

   a. Permits.
   b. Applications for payment.
   c. Performance and payment bonds.
   d. Insurance certificates.

1.2 SUBMITTAL PROCEDURES

A. Submittal Preparation:

1. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
2. Include the following information on the label for processing and recording action taken:

   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name and address of Contractor.
   e. Name, phone number and address of subcontractor.
   h. Number and title of appropriate Specification Section.

3. As a result of the Contractor's review, the Contractor shall indicate that the result of his review was:

   a. "Reviewed and Approved"
   b. "Reviewed and Disapproved"
   c. "Reviewed - Revise and Resubmit"
   d. "Reviewed - Approved As Noted"

B. If appropriate, and/or permitted by the Contract Documents, the Contractor may stamp the Submittal information “Received for Record Purposes only”, if no review of the material by the Contractor is required by the Contract Documents.

C. Provide a space aproximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.

D. Submittal Review by Contractor:

1. The Contractor is required to review each submittal, including, but not limited to, demolition method description and similar submittals.
2. Submittals on items, or materials, that are not specified or indicated on the drawings will be considered substitutions. and as such, must comply with provisions of Section 01631 - Product Substitutions, of this Project Manual.
3. Following the Contractor review of the submittal, the Contractor will place a "review stamp" on each copy of each submittal, and sign, date and indicate action taken in conformance with the "Submittal Preparation" sub-section of this Section. The same information indicated on the Contractor's review stamp will also be indicated on the "Submittal Transmittal" form included with this Section.
4. By approving and submitting demolition method descriptions and similar submittals, the Contractor represents that he has determined, or will do so, the suitability of, and has checked and coordinated the information contained within such submittals, with the requirements of the Work and the Contract Documents.
5. The responsibility for coordinating the Shop Drawings, including technical data, capability (warranted and implied), etc. shall be the sole responsibility of the Contractor. The coordination between subcontractor and/or materials supplier shall be the responsibility of each Contractor/Prime Contractor.
   The Project Coordinator, as defined in the Specifications, shall be responsible to supervise this activity.
6. Submittals that do not comply with provisions of this sub-section will be returned not reviewed, not logged and will be considered non-responsive.

D. Partial Submittals:

1. Partial or incomplete submittals are not acceptable. Any submittal received by the Engineer that does not contain all portions required by each Section of the Specification, will be returned not reviewed, not logged and will be considered non-responsive.
2. Exceptions will be considered on a case by case basis, such as on multi-level, or multi phased projects. Requests for exceptions must be submitted in writing by the Contractor for evaluation and response, a minimum of 30 days prior to the submittal date indicated on the Contractor’s Approved/updated Submittal Schedule.

E. Submittal Review by Engineer:

1. The Engineer will review each of the Contractor's submittals one initial time, and, should resubmittal be required, one additional time to verify that the reason(s) for re-submittal have been addressed by the Contractor and corrections made. Any review required by the Engineer other than the two (2) indicated above, will be considered additional scope of work for the Engineer, and the Contractor shall reimburse the Owner for all costs incurred, including the cost of the Engineer's services made necessary to review such additional re-submittals.

1.3 SUBMITTALS

A. General

1. Each submittal shall be complete with a "Submittal Data" sheet completely filled out with all requested information including the Contractor's stamp. A sample "Submittal Data" sheet is included at the end of this section.
2. All submittals shall be dated and shall contain the project name; description or names of equipment; materials or equipment which are to be installed, reference to the Section of Specifications where it is specified and Drawing number where shown.
3. The use of Contract Documents for submittal of shop drawings is prohibited.

1.6 MATERIAL SAFETY AND DATA SHEETS (MSDS)

A. Provide MSDS sheets as follows:

1. One set to keep on site at all times.
2. Send one set the OWNER as required by Article 18 of the Guilford County's General Terms and Conditions.
3. One set to be submitted for final close-out documents. See Section 0I700-Project closeout for more information.
3. Do not forward MSDS to the Engineer for Review or distribution.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL:

A. Contractor shall provide one certification form for each item submitted. All certification forms not properly signed shall be returned stamped Rejected.

SEE LAST PAGE FOR CONTRACTOR'S CERTIFICATION FORM

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CONTRACTOR'S CERTIFICATION FORM

NAME OF PROJECT:

PROJECT NUMBER:

OWNER:

ENGINEER: R. Craig Pritchard, PE
R. C. Pritchard Engineering Services
212 Kirk Road
Greensboro, NC 27455

SPECIFICATION DIV. NO. _____

SPECIFICATION PARA. NO._____

DRAWING REFERENCE: _____

OTHER: _____

CONTRACTOR'S CERTIFICATION

I certify that I have checked this submittal for accuracy, dimensional conformance, completeness and compliance with the requirements of the Contract Documents, and it has been coordinated with the work of this contract and the work of other contractors as applicable. No deviations are included unless specifically noted and listed in separate correspondence.

_____ _____
Contractor Date

END OF SECTION 01330

SECTION 01352 - GENERAL PROJECT PROCEDURES

PART 1-GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies requirements for general project procedures.

1.2 BURNING ON SITE

A. Open fire, for any purpose, will not be pemitted within the building enclosure or on the project site.

1.3 CLEANLINESS DURING CONSTRUCTION

A. Maintain the site of the Project free of debris, scattered materials, and equipment.

B. Remove all construction equipment, scaffolding, barricades, tools, surplus materials, etc. no longer required at the site. Remove all debris from building and grounds, and in general do all sweeping, brushing, cleaning, polishing, dusting, etc, required to present project in completely finished state. Refer to various sections of specifications for specific cleanup requirements.

C. Provide refuse containers located so as to be easily accessible to all worlanen at the site. These containers shall be for the deposit of garbage, refuse from meals, and other trash which might attract verinin. Containers shall have properly fitting lids which shall be maintained normally closed. Containers shall be emptied regularly, and their contents removed from the site. No open accumulation of refuse will be permitted.

D. Provide walk-off mats for all personnel designed to pick-up dust and construction particles at all transfer points going between construction and non-construction areas.

1.4 CONSTRUCTION DOCUMENTS

B. Additional Drawings and/or Specifications may be obtained at a Cost of reproduction and handling for plans and specifications shall be paid by the Contractor.

1.5 SITE SECURITY

A. The employment by the Contractor of his own security forces, should he deem it necessary, shall be at the Contractor's option.

1.6 USE OF CONSTRUCTION CHEMICALS AND MISCELLANEOUS FUME PRODUCING MATERIALS

A. Contractor shall take precautions as necessary to prevent migration of noxious, irritating or hazardous fumes and gases. Provide fresh air ventilation as required to work safely in confined areas.

1.7 APPROPRIATE DRESS

A. While on Owner's property, construction personnel shall wear pants, shirts, shoes, and required safety equipment at all times. The Owner reserves the right to direct the Contractor to immediately eject any person violating this requirement from the property.

1.8 DELIVERIES:

A. All deliveries shall be addressed to the Contractor at the job site.

1.9 MUD AND DUST FROM MOVEMENT OF VEHICLES:

A. The Contractor shall not allow mud, earth-droppings and dust to accumulate for more than one day before removing such from paved areas. At no time shall any accumulation be allowed.

B. The measures to be used to prevent littering the pavement shall include, but are not limited to the following:

1. Maintain dust control.
2. Sweeping and washing paved areas as required.
3. Picking-up droppings as they occur.

1.10 FIREARMS AND ILLEGAL DRUGS:

A. At no time shall any firearms (with or without permit) or illegal drugs be allowed on the project site.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01352

SECTION 01421 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. General:
1. Definitions contained in this Section are in addition to those include in the Conditions of the Contract.

B. Indicated:
1. The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed:
1. Terms such as "directed," "requested," "authorized," "selected," "approved," and “permitted” mean “directed by the Engineer,” “requested by the Engineer”, and similar phrases.

D. Approve:
1. The term "approve" and "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer’s duties and responsibilities as stated in the Conditions of the Contract.

E. Satisfactory:
1. The words "satisfactory", submitted", "reported", and similar words and phrases shall be presumed to be followed by "to the Engineer."

F. Equal To:
1. "Equal To", "Or Engineer Approved Equal", and "Or Approved Equal" shall mean products by manufacturers other than those described or listed in the Contract Documents which the Contractor has submitted for substitution prior to bid and have been approved for use by the Engineer in Addenda issued prior to execution of the Contract.

G. Regulations:
1. The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

H. Furnish:
1. The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. Install:
1. The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, fabrication, placing, anchoring, connecting, applying, working to dimension, fmishing, curing, protecting, adjust

and test except where otherwise specified, cleaning, and similar operations."

J. Provide:
1. The term "provide" means "to furnish and install, complete and ready for the intended use or operation."

K. Installer:
1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular constriction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
2. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the requirements indicated, and having complied with requirements of the authority having jurisdiction.

L. Trades:
1. Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

M. Assignment Specialist:
1. Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
2. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

N. Project Site:
1. Project site is the location of the project.

O. Contract Limits:
1. Contract Limits is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Contract Limit is shown on the Drawings and may not be identical with the description of the Project Site.

P. Testing Agencies:
1. A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.2 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content:
1. This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explaned as follows:
a. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interperted as singular where applicable as the context of the Contract Documents indicates.
b. Streamlined Language: The Specifications generally use the imperative mode and streamlined language. Requirements expressed in the imperative mode are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
2. The words “shall be” are implied where a colon (☺ is used within a sentence or phrase.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards:
1. Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates:
1. Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements:
1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall refer requirements that are different but apparently equal, and uncertainties to the Engineer for a decision before proceeding.
2. Minimum Quanity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum. To comply with these requirements, indicated numberic values are minimum or maxiumu, as appropriate, for the context of the requirements. Refer undertainties to the Engineer for a decision before proceeding.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01421

SECTION 01450 - QUALITY CONTROL/QUALITY ASSURANCE

PART 1-GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies administrative and procedural requirements for quality control/assurance services.
2. Quality assurance services, by the Contractor, include inspections and tests and related actions including reports, performed by Independent Testing Laboratories (ITL) to verify compliance with requirements specified or indicated.
3. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
4. Specific quality control requirements for individual construction activities are specified in the Sections for those activities.
5. Requirements for the Contractor to provide quality control services required by the Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 QUALITY ASSURANCE:

A. Qualification for Service Agencies:
1. An Independent Testing Laboratory (IT'L) which specializes in the types of inspections and tests to be performed and which is acceptable to the Owner and the Engineer will be engaged by the Owner.

1.3 RESPONSIBILITIES:

A. Contractor Responsibilities:
1. Quality control is the sole responsibility of the Contractor, and shall cover the activities of the General Contractor, his subcontractors, and their suppliers as required to assure compliance with the Contract Documents that constitute the contract between the Contractor and the Owner. The Contractor shall submit a proposed quality control plan at the pre-construction meeting, indicating the volume of test and test frequencies. The Engineer will review the submitted Contractor's quality control program prior to construction.

B. Coordination:
1. The Contractor shall cooperate with the ITL performing required tests and similar services and provide equipment, access, or other means required by the ITL to facilitate performnance of their services. Notify

the ITL sufficiently in advance of operations to permit assignment of personnel.

C. Duties of the ITL:
   1. The ITL engaged to perform sampling and testing of materials specified in the Specifications shall cooperate with the Engineer and Contractor in performance of its duties, and shall provide qualified personnel to perform required tests.
   2. The ITL shall immediately notify the Engineer, Owner and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
   3. The ITL shall not perform any duties of the Contractor.

1.4 SUBMITTALS:

A. The ITL shall submit a certified written report of each test or similar service, to the Contractor. The Contractor shall, submit a certified written report of each inspection, test or similar service as noted below..

B. The ITL shall send copies of test and inspection reports to the following parties:
   1. 2 copies to the Owner or his Representative.
   2. 2 copies to the General Contractor.
   3. 1 copy to the Engineer.

C. The Contractor shall be responsible for notifying the Owner, Engineer, Engineer, and ITL when the source of any material is changed after the original tests have been made.

D. If, in the opinion of the ITL, any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Engineer deem available to determine its proper construction in conformance with the Contract Documents.

E. Retesting is the responsibility of the Contractor when initial tests indicate work does not comply with the requirements of the Contra Documents.

PART 2 - PRODUCTS (Not Applicable).

PART 3 – EXECUTION (Not Applicable).

END OF SECTION 01450

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1.2 QUALITY ASSURANCE

A. Regulations:
1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.

B. Electrical Service:
1. Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70) and all regulatory state agencies.

1.3 PROJECT CONDITIONS

A. Conditions of Use:
1. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures.
2. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Sanitary Facilities:
1. Provide and maintain in a neat and sanitary condition chemical type toilet Facilities which comply with the requirements and regulations of the Department of Health or of other bodies having jurisdiction. These facilities shall be available to all workers on the job.

B. Drainage:
1. Keep excavations, pits, trenches, footings, and floors free from water to protect all work and to afford satisfactory working conditions. Provide any temporary ditches, sumps, pumps, or drains necessary for this purpose.

C. Offices:
1. Provide an office facility as required at the site which shall be large enough for the Contractor's use, for use as a coordination office, and for the Engineer's and Owner's use.

D. Water Service:
1. Provide, protect, and maintain a system of temporary water service.

E. Light and Power Service:
1. Make all arrangements and pay all charges to provide, protect,and maintain a system of temporary light and power in a safe operating condition and in compliance with applicable State requirements.
2. Service shall be minimum 200 amp, 110-220 volt, and single phase, properly grounded in accordance with NEC requirements.

G. Barricades, Warning Signs and Lights:
1. Comply with standards and code requirements for erection of structurally adequate barricades. Provide warning signs to inform personnel and the public of the hazard being protected.against. Where appropriate and needed provide lighting, including flashing red or amber lights.

H. Construction Fence:
1. Provide a suitable construction fence around work area (entire site), located so as to permit sufficient area for storage of materials and conduct of work by all trades.
2. Materials and methods of fence construction shall be adequate to provide for the safety and security of the project site and shall be the Contractor's responsibility to select; however as a minimum standard, fence shall be chain link type, minimum six feet high, consisting of 9 gauge galvanized wire fabric supported on galvanized posts set firmly in the ground at 10 feet o.c. horizontally, maximum.
3. Provide gates as required.
4. No barbed wire will be permitted.
5. Remove and relocate fence when it interferes with the work of any trade or Interfere with the use of the new addition when occupied.
6. Keep gates closed at all times and locked during non-working hours.

I. Temporary Parking:
1. A location for parking of construction personnel vehicles or the Contractor's company vehicles shall be determined at the pre-construction meeting.

J. Temporary Storage:
1. Only the areas as directed by the Owner may be used for storing materials including stockpiling topsoil.
2. At the Owner's option, any stored materials including stockpiled soil in violation of this requirement will be removed at the Contractor's expense.

K. Payment of Utility Bills:
1. By the Contractor.

2.2 DUST AND PARTICULATE CONTROL:

A. The project site shall be completely contained

B. Debris removal from the construction site shall be in accordance with requirements of Governing Authorities.

2.8 PROJECT SITE SIGN

A. Project signs on this project will be as approved by the Owner and as approved by local zoning jurisdinction.

B. No other exterior signage may be placed unless approved by the Owner or required by law.

C. The Contractor shall provide temporary directional signage around construction areas which block normal pedestrian or vehicular traffic.

PART 3 – EXECUTION

3.1 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion.

END OF SECTION 01500

SECTION 01740 - FINAL CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:
1. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

B. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 2.

C. Environmental Requirements:
1. Conduct cleaning and waste disposal operations in compliance with all laws and ordinances. Comply fully with federal and local envirotanental and anti-pollution regulations.
2. Burning or burying of debris, rubbish or other waste material on the premises shall not be permitted.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General:
1. Employ experienced workers or cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a professional building cleaning and maintenance program. Comply with manufacturer's instructions.
2. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project:
   a. Clean the Project site, yard and grounds, in areas disturbed by demolition activities of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
   b. Remove tools, construction equipment, machinery and surplus material from the site.

END OF SECTION 01740

SECTION 01781 - PROJECT CLOSEOUT

PART 1-GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:
   1. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
      a. Inspection procedures.
      b. Project record document submittal.
      c. Submittal of warranties.
   2. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2.

1.2 SUBSTANTIAL COMPLETION

A. General:
   1. The Work or designated portion thereof will not be considered suitable for Substantial Completion until all systems are operational as designed; all designated or required governmental inspections or certifications have been made and posted.
   2. As a further condition of Substantial Completion, the Contractor(s) shall certify that all remaining work will be completed within 30 consecutive calendar days following the Date of Substantial Completion.
   3 . Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and recommendation by the Engineer, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

B. Forms:
   1. All forms to be used shall be as indicated in the project manual.

1.3 FINAL ACCEPTANCE

A. At the completion of the Project prior to receiving final payment, the Contractor shall furnish the Owner, through the Engineer, properly signed and notarized waivers of lien from all subcontractors employed and material suppliers furnishing materials for the Project. Such waivers shall be submitted before final payment will be certified by the Engineer to the Owner.

1.4 RECORD DOCUMENT SUBMITTALS

A. General:
1. The Contractor(s) shall record on the Record Drawings maintained at the site all changes and selections made during construction and shall locate by dimensions showing actual field measurements of all major items which will be concealed in the completed Work.

B. Record Drawings:
1. Record drawings shall be provided in the form of reproducible drawing sheets (reproducible vellum) and reflect locations of concealed items that remain after Work is complete.

D. Submittals:
1. Deliver Contractor's approved copy of all submittals provided during the course of the project.

E. Miscellaneous Record Submittals:
1. Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the owner’s records.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable

END OF SECTION 01781

SECTION 01788 - WARRANTIES AND BONDS

PART 1- GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:
   1. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents.
   2. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2.
   3. Certifications and other commitments and agreements for continuing services to Owner are specified in the Contract Documents.

B. Disclaimers and Limitations:
   1. At no time shall any warranties/guaranties be submitted to the Owner for this project which supercedes or voids any of the Owners rights as established by the state's General Statutes for which the project is located.
   2. Failure of the Contractor and/or its suppliers, and its subcontractors to enter into such warranties as required by the Contract Documents shall be considered a breach of contract.

1.2 WARRANTY REQUIREMENTS

A. Related Damages and Losses:
   1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work. Do not reuse damaged materials.

1.3 SUBMITTALS

A. Written Warranties:
   1. Submit written warranties to the Engineer prior to Substantial Completion. The Engineer’s Certificate of Substantial Completion designates a commencement date for warranties.

B. Form of Submittal:
   1. At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, or supplier. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual. Deliver all warranties to the Engineer before or with the Request for Substantial Completion.

C. Reinstatement of Warranty:
   1. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
   2. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost:
   1. Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.
   2. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of Work through a portion of its anticipated useful service life.

E. Owner's Recourse:
   1. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

F. Rejection of Warranties:
   1. The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

PART 2 - PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

SECTION 230050 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION

A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 1 - General Requirements.

B. The "Instructions to Bidders", "General Conditions", “Supplementary General Conditions,” and "General Requirements" of the Project Specifications govern work under this section.

C. It is understood and agreed that the mechanical contractor has, by careful examination of the plans and specifications, and the site where appropriate, satisfied him as to the nature and location of the work and all conditions which must be met in order to carry out the work under this section of the contract.

1.2 SCOPE:

A. The Contractor shall furnish all labor, materials and equipment and perform all operations necessary for installation of complete hvac systems as indicated on the drawings and as specified herein. It is the intention of these specifications and drawings to provide finished work, tested, and ready for operation.

B. The scope of the work shall include but not be limited to the following: furnish and install hvac equipment, ductwork, air distribution, piping, insulation, controls, and equipment connections.

C. Any apparatus, appliance, material, or work not shown on 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 expense to the owner.

D. 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.

E. With submission of bid, the mechanical contractor shall give written notice to the Engineer 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.

1.3 CONTRACT DOCUMENTS:

A. Contractor shall maintain on the job site one complete set of contract documents of all trades, and shall coordinate with other trades so as to avoid conflicts.

B. Indicated locations of equipment, ductwork, piping, equipment connections and access, etc. are approximate and shall be verified by reference to related documents. (i.e. building drawings, equipment shop drawings, etc.).

C. The mechanical drawings are diagrammatic and indicate the general arrangement of fixtures, equipment and work included in the contract. Where provided, consult the building drawings and details for the exact location of fixtures and equipment; otherwise, coordinate final locations with the drawings, actual building conditions, and required clearances.

D. 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 Engineer shall be notified before proceeding with installation.

E. If directed by the Engineer, 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.

1.4 RECORD DRAWINGS

A. During construction of this project, the contractor shall maintain one complete set of mechanical contract drawings, on which shall be recorded all significant changes in equipment locations, ductwork, piping, etc. This set of drawings shall be used for no other purpose. Upon completion of the work, contractor shall submit these drawings to the Engineer for approval and presentation to the Owner.

B. Upon completion of the project, contractor shall prepare an operation and maintenance manual, which shall include catalog data, equipment information, wiring diagrams, warranty information, etc. for the mechanical installation. Submit in three copies to the Engineer for approval and presentation to the Owner.

1.5 REFERENCES

A. The latest adopted standards referenced by the applicable regulatory codes are included herein. Where specific standards are not given, the latest applicable standards of listed organizations shall apply.
   1. ADC – Air Diffusion Council
   2. AHRI – Air Conditioning, Heating, and Refrigeration Institute
   3. AMCA – Air Moving and Conditioning Association
   4. ANSI – American National Standards Institute

5. ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers
   a. ASHRAE 90.1, 62.1, 189.1
6. ASME – American Society of Mechanical Engineers
7. ASTM – American Society of Testing and Materials
8. AWS – American Welding Society
9. NFPA – National Fire Protection Association
   a. NFPA 54, 70, 90A, 90B, 211
10. SMACNA – Sheet Metal and Air Conditioning Contractors Association

1.6 SUBMITTALS

A. Submit under provisions of General Conditions of the Contract Documents.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.

C. Mark dimensions and values in units to match those specified.

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

1.7 INFORMATIONAL SUBMITTALS

A. Where required for proper installation of the work, the mechanical contractor shall furnish coordination drawings in conjunction with other trades. The mechanical contractor shall be the lead coordinator of the work. When coordination drawings are not furnished, the mechanical contractor shall nevertheless be responsible for coordination of the work with the building and other trades including the cost of altering or relocating work when required for the proper installation of the work.

B. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other using input from installers of items involved such that equipment, ductwork, piping, electrical systems, and plumbing can installed for proper functioning, operation and access including, but not limited to:
   1. Structural members
   2. Equipment
   3. Ductwork
   4. Piping
   5. Conduit and panels
   6. Plumbing
   7. Sprinkler systems
   8. Common supports

C. Qualification Data: For professional engineer.

D. Source quality-control reports.

1.8 REGULATORY REQUIREMENTS

A. It is the responsibility of the electrical contractor to notify the local inspector, to schedule required inspections including rough-in, above ceiling and final inspections.

B. The latest adopted editions of Mechanical Code, Fuel Gas Code, Plumbing Code, Energy Code, National Electrical Code and any other state or local codes or ordinances governing this work. All their requirements shall be satisfied.

C. The requirements of the following regulatory agencies are included herein. The requirements of agencies not listed, but having jurisdiction shall be followed as if included herein.
1. OSHA – Occupational Safety and Health Administration
2. UL – Underwriter's Laboratories
3. ETL – Entertek Testing Services
4. CSA – Canadian Standards Association
5. EPA – Environmental Protection Agency
6. State and local planning and inspection departments and agencies having jurisdiction
7. Local utility companies

D. This Contractor shall secure and pay for all permits, fees, inspections and licenses required. Upon completion of job he shall present to the Engineer a certificate of inspection and approval from inspection authorities.

E. Conform to NC Uniform Statewide Building Code (IBC) – 2012.

1.9 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on the Drawings, unless prevented by Project conditions. The drawings show the general arrangement of equipment and devices and shall be followed as closely as actual building construction will permit.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

C. Where conflicts occur between field conditions and Project Drawings, obtain Engineer and Owner direction and approval in writing prior to proceeding with work.

1.10 SUBMITTALS

A. Submit manufacturer's data and specification sheets for the following items: all scheduled equipment, ductwork and accessories, piping and accessories, insulation.

B. Submit electronically in PDF format.

C. Mark each copy to identify applicable products, models, options, and other data – submittals without such identification shall be returned without review. Supplement manufacturers' standard data to provide information unique to this Project.

D. Submit supplemental sketches, to scale, showing Contractor's proposed arrangement of equipment if arrangement differs from contract documents and/or if proposed equipment footprint differs from that specified.

1.11 SHOP DRAWINGS

A. Submit ductwork shop drawings showing the detailed arrangement of the work including dimension, gauges, joint lengths, joint types, and location and type of accessories.

B. Submit electronically in PDF format.

C. Ductwork installed without approved shop drawings may be rejected by the Engineer.

1.12 GUARANTEE

A. All materials and workmanship shall be guaranteed to be free from defects for a period of one (1) year from date of acceptance and Contractor shall make good, without additional cost to the Owner, any defects which may appear within that period. Furnish manufacturer's warranties extending beyond one year where specified.

B. Contractor shall guarantee the work done in accordance with the Drawings and Specifications, and to be free of imperfect materials and defective workmanship. Anything unsatisfactory shall be corrected immediately and at contractor's expense.

1.13 INSPECTIONS

A. The contractor shall be responsible for testing and proper operation of all systems specified in Division 23. The contractor shall perform interim quality control inspections to ensure the work is installed per the contract documents and that the work of other trades does not conflict with the work still to be installed. The contractor shall inspect all work prior to substantial completion and final completion inspections and shall generate punch lists from those inspections.

1.14 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.15 OPERATION AND MAINTENANCE DATA (FOR FURNISHED EQUIPMENT)

A. Submit data bound in 8-1/2 x 11 inch (216 x 279 mm) text pages, three ring binders with durable plastic or cloth covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper, in three parts as follows: Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following: Significant design criteria, Parts list for each component, Operating instructions, and Maintenance instructions for equipment and systems. Part 3: Project documents and certificates, including the following:
   1. Shop drawings and product data (latest approved copy with contractor’s and Engineer’s approval stamp signed and dated).
   2. Certificates.
   3. Photocopies of warranties.

E. Submit one draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned with Engineer comments. Revise content of all document sets as required prior to final submission.

F. Submit three (3) sets of revised final volumes, within 10 days after final inspection.

1.16 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

B. Provide Table of Contents and assemble in binder with durable plastic or cloth cover.

C. Submit prior to final Application for Payment.

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.17 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections. Include complete list of items.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Dimensions: The Contractor shall ensure that items to be furnished will fit in the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections and shall furnish and install such sizes and shapes of equipment so that the final installation shall suit the true intent and meaning of the drawings and specifications. Should he conclude that there is insufficient space for installation of specified materials, he shall immediately notify the Engineer of the conflict and shall stop affected work until he receives instructions from the Engineer as to proceed.

B. Trade names and catalog numbers shall be interpreted as establishing a general design and standard of quality and shall not be construed as limiting competition. Unless stated otherwise, the contractor may use any article which, in his judgment, and with written comment from the Engineer indicating no objection, is equal or superior to that specified. Drawings showing changes or revisions required by the substitution for specified items shall be submitted with the shop drawing data, and the costs of all such changes shall be borne by the Contractor.

C. Equipment or Connections Different from Those Shown: Where equipment requiring different arrangement of connections from those shown is proposed by the Contractor and is not objected to by the Engineer, it shall be the responsibility of the Contractor to install the equipment to operate properly and in harmony with the intent of the drawings and specifications. The Contractor shall make all incidental changes in ductwork, piping, controls, and accessories to maintain compliance with the Codes and the intended operation of involved systems. He shall provide all additional equipment required for proper operation of the system, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing-in and connections. All such changes shall be made at no increase in the contract price to the Owner.

PART 3 EXECUTION

3.1 DIVISION OF WORK BETWEEN ELECTRICAL DIV 23 AND MECHANICAL DIV 26

A. This section delineates the division of work between Division 23 and Division 26.

B. Specific work to be done under Division 23 is hereinafter listed or described. All other work necessary for the operation of Division 23 equipment shall be performed under Division 26.

C. All individual motor starters and drives for mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Division 23 unless indicated as a part of a motor control center. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Division 26.

D. Under Division 26, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter, VFD or disconnect switch. Under Division 26 line side terminations shall be provided. Wiring from the termination point to the mechanical equipment, including final connections, shall be provided under Division 23.

E. Duct smoke detectors, if provided per NFPA 90A requirements, shall be furnished and installed by Division 23, wired by Division 26. Fire alarm AHU shut down circuits shall be wired from the fire alarm control panel to a termination point, adjacent to the AHU control, under Division 23. AHU control wiring from the termination point to the equipment shall be under Division 23.

F. Equipment less than 110 volt, all relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 23 shall be furnished, installed and wired under Division 23.

G. Low-voltage transformers shall be furnished and installed under Division 23.

H. All wiring required for controls and instrumentation not indicated on the drawings shall be furnished and installed by Division 23.

I. The sequence of control for all equipment shall be as indicated on the Division 23 Drawings and specified in Section 23, HVAC Control System.

J. Horsepower for all motors shall be indicated on the Division 23 and Division 26 Drawings.

K. Where electrical wiring is required by trades other than covered by Division 26, specifications for that section shall refer to same wiring materials and methods as specified under Division 26. No Exceptions.

END OF SECTION 260050

SECTION 230500 – HVAC DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Owner will occupy portions of building during construction. Carefully stage and conduct selective demolition so Owner's operations will not be disrupted.

B. Pre-demolition Photographs: Show existing conditions and site improvements. Submit before Work begins.

C. Carefully remove existing equipment, in a manner to prevent damage, and deliver equipment to an on-site location designated by the Owner. Dispose of any equipment not accepted by the Owner. Provide to the Owner requested components of existing equipment including but not limited to: motor starters, controls, gages, and valves. Include fasteners or brackets needed for reattachment elsewhere.

D. It is not expected that hazardous materials will be encountered in the Work. If hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Restore, repair, and replace existing wall finishes and ceilings where such as been damaged or removed as necessary for installation of new HVAC systems. Return building finishes to pre-existing conditions at the completion of the project.

F. Where ceilings in entire rooms have been removed, install new ceiling grid and tile to match existing conditions.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with EPA regulations and with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Locate, identify, shut off, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

D. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

E. Protect walls, ceilings, floors, and other existing finish work that are to remain. Erect and maintain dustproof partitions.

F. Provide temporary weather protection to prevent water leakage and damage to structure and interior areas.

G. Requirements for Building:

1. Maintain existing building structure (including structural floor and roof decking) and envelope (including exterior skin and framing, window assemblies, and nonstructural roofing material except as required for installation of new equipment) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

H. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

I. Remove demolition equipment and deliver to an on-site designated by the Owner. Provide to the Owner requested components of existing equipment including but not limited to: motor starters, controls, gages, and valves. Include fasteners or brackets needed for reattachment elsewhere.

J. Remove any recyclable equipment and components not accepted by the Owner and legally dispose of it at an EPA approved recycling or recovery center.

K. Remove all recyclable materials and dispose of them at an EPA approved recycling center.

L. Furnish delivery receipts with the quantities of recycled equipment and material to the Owner.

M. Remove any non-recyclable equipment and components not accepted by the Owner and legally dispose of them at an EPA approved waste disposal site.

N. Remove any non-recyclable materials and legally dispose of them at an EPA approved waste disposal site.

O. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

P. Restore, repair, and replace existing wall finishes and ceilings where such as been damaged or removed as necessary for installation of new HVAC systems. Return building finishes to pre-existing conditions at the completion of the project.

Q. Where ceilings in entire rooms have been removed, install new ceiling grid and tile to match existing conditions.

3.2 ITEMS TO BE REMOVED

A. Existing Mechanical Equipment:

1. Remove existing equipment in the designated areas including, but not limited to: air handling unit cooling coil, indicated hot water and chilled water piping, indicated ductwork, natural gas piping, and selected controls.
2. Note: existing boiler, chiller, hot water pump, and chilled water pump controls to remain.

B. Existing Ductwork:

1. Remove ductwork in the designated areas along with associated hangers, and insulation.
2. Where existing ductwork is to remain for connection to new work, remove ductwork only to the point of connection to new work.

C. Existing Piping:

1. Remove indicated hot water, chilled water, and natural gas piping in the designated areas along with associated specialties, valves, hangers, and insulation.

D. Controls:

1. Remove indicated control devices and control valves.
2. Note: existing boiler, chiller, hot water pump, and chilled water pump controls to remain.

END OF SECTION 230500

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and poly- phase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on AC power systems up to 600V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Efficiency of motors for HVAC equipment shall be in compliance with the provisions of the North Carolina Energy Code and ASHRAE 90.1.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 104 degrees F and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1, including applications of premium efficiency motors.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors 1/6 HP and larger shall EC, brushless DC electronically commutated, motors to suit starting torque and requirements of specific motor application.

B. Motors larger than 1/20 HP and less than 1/6 HP shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 230513

SECTION 230517 – SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 GYPSUM WALL SLEEVES (NON-RATED WALLS)

A. Galvanized-Steel-Sheet Sleeves: 24 gauge minimum thickness; round tube closed with lock-seam or welded longitudinal joint.

B. Sealants:

1. GE or equal silicone (Acceptable alternates: Dow, Tremco).

2.2 MASONRY WALLS ABOVE GRADE (NON-RATED WALLS)

A. PVC Sleeves: Schedule 40 PVC sleeves, flush with wall.

B. Sealants:

1. Sonneborn NP-1 or equal polyurethane (Acceptable alternates: 3M, Fastenal, Sika).
2. GE or equal silicone (Acceptable alternates: Dow, Tremco).

2.3 MASONRY WALLS BELOW GRADE

A. PVC Sleeves: Schedule 40 PVC sleeves, flush with wall.

B. Sealants:

1. Sonneborn NP-1 or equal polyurethane (Acceptable alternates: 3M, Fastenal, Sika).
2. Hydraulic cement grout. See paragraph 2.6 this section.

2.4 SLAB ON GRADE CONCRETE FLOORS

A. PVC Sleeves: Schedule 40 PVC sleeves, flush with top of floor, and extending below gravel subgrade.

B. Sealants:

1. Sonneborn NP-1 or equal polyurethane (Acceptable alternates: 3M, Fastenal, Sika).

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout; nonshrink; recommended for interior and exterior applications; design Mix: 5000 psi 28-day compressive strength; and premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install sleeves for piping passing through penetrations in partitions and walls.

B. Sleeve annulus shall provide a minimum of 1/4 inch and no more than 1/2 inch of clear space between the sleeve and pipe or pipe insulation.

C. Existing masonry and concrete walls may be core drilled to a provide a sleeve annulus with a minimum of 1/4 inch and no more than 1/2 inch of clear space between the core wall and pipe or pipe insulation in lieu of installing a sleeve.

D. Install sleeves in concrete walls and masonry walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with exposed surfaces.
2. Grout space outside of sleeves.
3. Pack annular space between pipe and sleeve for pipes penetrating concrete and masonry walls with mineral wool.
4. Seal both ends of sleeves with polyurethane sealant.

E. Seal core drilled penetrations as for sleeved penetrations.

F. Install galvanized sheet steel sleeves for pipes penetrating non-rated gypsum walls. Draft stop penetration with mineral wool insulation and silicone caulk.

G. Fire-Barrier Penetrations: Maintain indicated fire rating at pipe penetrations. Seal pipe penetrations with firestop materials per UL drawing details.

END OF SECTION 220517

SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.
2. Hangers and Supports:

    a. Shop Drawings for Fabricated Hangers and Supports: Signed and sealed by a qualified professional engineer.
    b. Welding certificates.
    c. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
    d. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Supports for multiple pipes shall be capable of supporting combined weight of supported systems, and system contents.
2. Equipment supports shall be capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 HANGERS AND SUPPORTS FOR HVAC PIPING EQUPMENT

A. Insulated Carbon-Steel and Copper Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Insulation Shields: Galvanized shields to protect insulation at hanger bearing point with rigid insulation block at shield.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of zinc-plated carbon steel.

B. Uninsulated Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

C. Fastener Systems:

1. Fasteners for Wood Members: Lag screws, bolts, wood screws, and timber connectors for use with structural wood members with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
2. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
3. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

D. Miscellaneous Materials:

1. Structural Steel: ASTM A 36 / A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
2. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

    a. Properties: Nonstaining, noncorrosive, and nongaseous.
    b. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 GENERAL PIPING INSTALLATIONS

A. Install piping free of sags and bends.

B. Install fittings for changes in direction and branch connections.

3.2 HANGERS AND SUPPORTS

A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.

B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.

C. Install powder-actuated fasteners and mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches thick.

D. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

E. 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 noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
4. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

END OF SECTION 230529

SECTION 230553 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.

a. Samples: For color, letter style, and graphic representation required for each identification material and device.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Pipe Labels and Tags: Seton, Brady, Brimar or equal.

B. Duct Labels: Pipe Marker by Brimar Industries or equal (Acceptable alternates: Seton, or Brady).

2.2 PIPE LABELS

A. Material: Multilayer, multicolor, vinyl plastic self-adhesive pipe markers.

B. Letter Color: Comply with ANSI A13.1-2007 pipe marking guidelines.

C. Background Color: Comply ANSI A13.1-2007 pipe marking guidelines.

D. Maximum Temperature: Able to withstand temperatures up to 175 deg F.

E. Minimum Label Size: Length and width vary based on pipe size.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Flow Direction: Use arrows roll tape to for flow direction and to secure label.

2.3 DUCT LABELS

A. Material: Multilayer, multicolor, vinyl plastic self-adhesive pipe markers.

B. Letter/Background Color: White on Blue or Green, and Black on Yellow.

C. Maximum Temperature: Able to withstand temperatures up to 175 deg F.

D. Minimum Label Size: Length and width vary based on pipe size.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.4 EQUIPMENT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Label Content: Equipment mark and description.

2.5 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Comply with ANSI Z535.

C. Background Color: Comply with ANSI Z535.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information plus emergency notification instructions.

2.6 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Size: 1-1/2 inches round.
3. Fasteners: Brass beaded chain.
4. Color: Natural.

B. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

A. Install pipe labels 10 feet on center indicating service and flow direction.

3.3 DUCT LABEL INSTALLATION

A. Install labels 10 feet on center on supply, return, exhaust, outside and transfer air ducts on the sides and bottom of rectangular ducts, and at 45 degrees from the bottom on each side of round ducts.

B. Label Schedule:

1. Supply Air: White letters on green background.
2. Return Air: White letters on blue background.
3. Outside Air: White letters on green background.
4. Exhaust Air: Black letters on yellow background.
5. Transfer Air: White letters on blue background.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme.

3.5 EQUIPMENT TAG INSTALLATION

A. Identify each piece of equipment per drawing schedule with description.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Certified TAB reports.
2. Standards to be used for TAB Section 3.2.A.
3. Documentation of work performed per ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
4. Documentation of work performed per ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."
5. Certified Commissioning reports.

B. TAB and Commissioning Firm Qualifications: AABC, NEBB, or TABB certified.

C. TAB Report Forms: Standard TAB contractor's forms approved by Architect.

D. Perform TAB after leakage and pressure tests on air, water, and refrigerant distribution systems have been satisfactorily completed.

E. Conduct commissioning of HVAC system including verification of installed equipment, review of test and balance procedures and reports, and verification of control sequence of operation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB and Commissioning of systems and equipment.

B. Examine the approved submittals for HVAC systems and equipment.

C. Examine systems for installed balancing devices, such as test ports, gage cocks, flow-control devices, balancing valves and fittings, manual volume dampers, and fire and smoke dampers. Verify that locations of these balancing devices are accessible.

D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

F. Examine terminal units, such as fan coil units, and verify that they are accessible and their controls are connected and functioning.

G. Examine all fans and motors for correct rotation.

H. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of dampers and valves for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in dedicated outdoor air systems, fan coil unit systems, and variable-air-volume terminals.
4. Refrigerant branch controller piping and distribution valves.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

I. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Verify and report all installed equipment. Report deviations from the equipment schedules.

E. Review and report test and balance procedures.

F. Take and report testing and balancing measurements in inch-pound (IP) units.

G. Take and report final voltage and amperage on all HVAC equipment.

H. Review test and balance reports.

I. Verify and report control sequences of operation.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare schematic diagrams of systems' "as-built" duct layouts.

B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

C. Verify that motor starters are equipped with properly sized thermal protection.

D. Check for airflow blockages.

E. Check condensate drains for proper connections and functioning.

F. Check for proper sealing of air-handling unit components.

G. Check for proper sealing of air duct system.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data; number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Set system controls so automatic valves are wide open to heat exchangers.
5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

D. Balance the variable flow hydronic system proportionally such that the critical circuit balance valve is fully open.

E. Trim pump impellers if necessary to remove unnecessary head at the pump to minimize speed and brake horsepower at full flow.

3.5 MOTORS

A. Take and report final voltage and amperage on all HVAC equipment and the hot water recirculation pump.

3.6 TOLERANCES

A. Set HVAC system airflow within the following tolerances:

1. Supply, Return, Outdoor Air, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 5 percent.
4. Chilled-Water Flow Rate: Plus or minus 5 percent.

END OF SECTION 230593

SECTION 230713 – HVAC DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. For adhesives and sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Indoor Insulation and Related Materials: To be factory-labeled designating maximum flame-spread index of 25 or less and smoke-developed index of 50 or less according to ASTM E 84.

B. Outdoor Insulation and Related Materials: To be factory labeled designating maximum flame-spread index of 75 or less and smoke-developed index of 150 or less according to ASTM E 84.

2.2 INSULATION MATERIALS

A. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

B. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.

C. Mineral-Fiber Board Insulation: Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications provide insulation with factory-applied FSK jacket on interior applications and field-applied jacket on exterior applications.

D. Foam Board Insulation: Comply with ASTM C 578. For duct and plenum applications, provide insulation without field-applied jacket.

2.3 ADHESIVES

A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less.

2.4 SEALANTS

A. Joint Sealants for Cellular-Glass Products:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

A. When field-applied jackets are indicated, comply with the following:

1. SEA: Stucco-embossed aluminum, 0.020 inch thick, with pre-formed factory fitting covers.
2. When specifications differ from existing conditions, match existing conditions.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions. Install flashing angles or rings to close off opening gaps on both sides of penetration.

C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously to connections to fire and combination fire and smoke dampers.

D. Installation Methods:

1. Insulation Installation on Straight Rectangular and Round Ducts: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
4. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
5. For ducts and plenums with surface temperatures below ambient, install a continuous, unbroken vapor barrier.

E. Plenums and Ducts Requiring Insulation:

1. Concealed and exposed supply, return, and outdoor air ducts located in non-conditioned space or exposed to the exterior of the building.

2. Concealed and exposed air handling unit supply and return air ducts and plenums located in non-conditioned space including mechanical rooms.
3. Concealed and exposed exhaust between isolation damper and penetration of building exterior.

F. Plenums and Ducts Not Insulated:

1. Exposed supply and return air duct in located in conditioned space.
2. Return duct located in a designated ceiling plenum return.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.2 EQUIPMENT INSULATION SCHEDULE

A. All HVAC equipment shall be factory insulated to the minimum standards of the North Carolina Mechanical Code, Fuel Gas Code, and the North Carolina Energy Code.

3.3 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 2 lb/cu. ft. nominal density.

B. Exposed duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches and 2 lb/cu. ft. nominal density with field-applied aluminum jacket.
2. Foam Board: 1-1/2 inches thick and 1.4 lb/cu. ft. nominal density with field-applied aluminum jacket.

3.4 NOTE ON INTERNAL DUCT LINER

A. Internal duct liner shall not be used.

END OF SECTION 230713

SECTION 230719 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.
2. For adhesives and sealants, documentation including printed statement of VOC content and chemical components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less according to ASTM E 84.

B. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less according to ASTM E 84.

2.2 INSULATION MATERIALS

A. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

B. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. Insulation shall be suitable for installation in rated ceiling plenums.

C. High Temperature Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials suitable for temperatures up to 300°F. Insulation shall be suitable for installation in rated ceiling plenums.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

E. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ or FSK complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.

2.3 ADHESIVES

A. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less.

2.4 SEALANTS

A. Joint Sealants for Cellular-Glass Products:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

A. When field-applied jackets are indicated, comply with the following:

1. Interior Piping - ALU: Mill finished aluminum, 0.020 inch thick, with pre-formed factory fitting covers.
2. Exterior Piping - SEA: Stucco-embossed aluminum, 0.020 inch thick, with pre-formed factory fitting covers.
3. When specifications differ from existing conditions, match existing conditions.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

PART 3 - EXECUTION

3.1 PIPE INSULATION INSTALLATION

A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations.

D. Flexible Elastomeric Insulation Installation:

1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

E. Mineral-Fiber Insulation Installation:

1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

F. Interior Piping System Applications: Insulate the following piping systems:

1. Chilled water and hot water hydronic piping.
2. Condensate piping.
3. Refrigerant suction and hot gas piping.

G. Exterior Piping System Applications: Insulate the following piping systems:

1. Chilled water and hot water hydronic piping.
2. Refrigerant suction and hot gas piping.

H. Do not apply insulation to the following systems, materials, and equipment:

1. Natural gas piping.
2. Exterior condensate piping.

3.2 EQUIPMENT INSULATION SCHEDULE

A. All HVAC equipment shall be factory insulated to the minimum standards of the North Carolina Mechanical Code, Fuel Gas Code, and the North Carolina Energy Code.

3.3 PIPING INSULATION SCHEDULE

A. Unless otherwise indicated, do not install insulation on the following:

1. Refrigerant liquid lines.
2. Natural gas piping.

B. Chilled Water Piping:

1. All Pipe Sizes:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

C. Hot Water Piping:

1. 1-1/2 inch NPS and Smaller:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

2. 2 inch NPS and Larger:

    a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inch thick.

D. Refrigerant Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Flexible Elastomeric or High Temperature Flexible Elastomeric (As required by manufacturuer): 3/4 inch thick.

2. Apply aluminum jacket to exterior refrigerant pipe insulation.

E. Condensate Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Flexible Elastomeric: 1/2 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

END OF SECTION 230719

SECTION 230923 – DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 Section Includes:

A. Products furnished but not installed under this section

B. Products not furnished or installed under but integrated with the work of this section

C. Related sections

D. Control system description

E. Approved control system manufacturers

F. Quality assurance

G. Codes and standards

H. System performance

I. Submittal requirements

J. Warranty

K. System maintenance

L. Ownership of proprietary material

M. Definitions

1.2 Existing Equipment to Remain Un-Integrated and Under Standalone Control:

A. Existing Raypack boiler and associated hot water pump

B. Existing Carrier air-cooled chiller and associated chilled water pump

C. Existing building chilled water fan coil units

1.3 Products furnished but not installed under this section:

A. Section 232113 “HYDRONIC PIPING”

1. Control valves
2. Flow switches
3. Temperature sensor wells and sockets

1.4 Products Not Furnished or Installed Under But Integrated With The Work of This Section:

A. Section 235216 “CONDENSING BOILERS”

1. Condensing boiler associated pump controls

B. Section 233300 “AIR DUCT ACCESSORIES”

1. Control dampers

1.5 Related Sections

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents. Consult the above for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

B. Section 230993.11 “SEQUENCE OF OPERATION FOR HVAC DDC”

1.6 General Description

A. The intent of these specifications is to indicate the minimum requirements for the Building Automation System only. The BAS contractor shall furnish all of the necessary control system components for a complete system, except for components explicitly stated as furnished by others. It is the intent of these specifications that application and system specific functionality be furnished for all indicated building HVAC systems. Unless noted otherwise, where functionality is provided for one system, provide it for all as applicable.

B. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer’s factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment associated with the dedicated outdoor air system into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer’s responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency. Note: existing boiler and chilled water controls shall remain as unmonitored standalone controls.

C. The BAS shall meet both BACnet and LonTalk communication standards to ensure the system maintains “interoperability” to avoid proprietary arrangements that will make it difficult for the Owner to consider other BAS manufacturers in future projects. These open protocol communication standards are discussed in more detail later in this specification.

D. BAS controllers shall be listed by BACnet Testing Laboratories (BTL) with appropriate classification.

E. System controller shall be BTL listed BACnet Building Controller (B-BC)

F. Equipment Controllers shall be BTL listed BACnet Application Specific Controller (B-ASC) or BACnet Advanced Application Controller (B-AAC), as appropriate for the purpose of the controller. Furnish and install the necessary components required for communication with factory furnished equipment controllers.

G. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.

H. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

I. Communication between DDC controllers and all workstation(s) shall be over a high-speed network. All nodes on this network shall be peers. The operator shall not have to know the controller identifier or location to view or control a point (object). Application Specific Controllers shall be constantly scanned by the Building Controllers to update point information and alarm information globally.

J. The BAS manufacturer shall provide all hardware and software necessary to implement the functions and sequence of operations specified. Furnish and install a port with a patch cable for a portable workstation to be furnished by the Owner at a location in the building to be determined by the Owner for access to the BAS with graphics provided under item 1.5.K.

K. Furnish a totally native BACnet-based system with all necessary graphics per the following specifi-cation. The operator's workstation, all building controllers, application controllers, and all in-put/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135, BACnet. This system shall be a fully functioning and networked con-trol system with all necessary unit graphics, floor plans, schedules, trendlogs, and alarms. It shall be capable of future integration into the Owner's existing Energy Management Server.

Alternate 1:

Fully integrate the base bid control system into the Owner's County Wide Alerton Energy Management System (EMS). This shall include the capability to monitor and control all inputs and outputs through the existing Energy Management System. Furnish the necessary programming and graphics for integration. All graphics shall match the existing EMS graphics in both appearance and functionality. Owner shall furnish the necessary license key for access to the existing Alerton system.

L. Installed BAS system controls shall be designed and installed to allow for future integration of hot water and chilled water systems for monitoring and scheduling.

1.7 Approved Control System Manufacturers

A. The following are approved control system manufacturers:
   1. Alerton
   2. Trane
   3. Schneider Electric

1.8 Quality Assurance

A. BAS Manufacturer Qualifications

1. The BAS manufacturer shall have an established business office within 50.00 miles of the project site and must provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.
2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and commissioning field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.
3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment must consist of operator workstation software, Web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, actuators, etc.) need not be manufactured by the BAS manufacturer listed in this specification.
4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor must be corporate owned entity of BAS manufacturer.
5. Installer shall have successfully completed 10 Control Systems of similar style and complexity.

1.9 Codes and Standards

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to the receipt of bids of the following codes:

1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
2. National Electrical Code -- NFPA 70.
3. Federal Communications Commission -- Part J.
4. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.
5. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.
6. EIA-709.1 LonTalk Standard and EIA 901.2 (LonMark Certification) - (Unit Level Devices) - Custom Application Controllers and Application Specific Controllers shall use FTT-10A transceivers and support the LonTalk communication protocol utilizing Standard Network Variable Types (SNVT) as defined by Echelon Corporation. This standard communication protocol provides interoperability with hundreds of other various building system manufacturers' control systems and devices.

1.10 System Performance

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 10 sec. and shall automatically refresh every 15 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
5. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 10 seconds.
6. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 10 sec.
7. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
8. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per 5 sec. The controller shall scan and update the process value and output generated by this calculation at this same frequency. Select execution times consistent with the mechanical process under control.
9. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
10. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
11. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

B. Table-1: Reporting Accuracy

Measured Variable	**Reported Accuracy**
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15º (±0.25ºF)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)

Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO2)	±50 ppm

1. Accuracy applies to 10%–100% of scale
2. For both absolute and differential pressure
3. Not including utility-supplied meters

C. Table-2: Control Stability and Accuracy

Controlled Variable	**Control Accuracy**	**Range of Medium**
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0–1.5 kPa (0–6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1–150 psi), 0–12.5 kPa (0–50 in. w.g.) diff.

1.11 Submittals

A. Product Data and Shop Drawings: The contractor shall provide shop drawings or other submittals on hardware, software, and equipment to be installed or provided. No work may begin on any segment of this project until submittals have been approved for conformity with design intent. SUBMITTAL SHALL CLEARLY INDICATED DEVIATIONS FROM THE SPECIFICATIONS. Provide drawings as AutoCAD 2010 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and three 11” x 17” prints of each drawing. When manufacturer’s cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. DDC System Hardware

    a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.

b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:

1) Direct digital controllers (controller panels)
2) Transducers and transmitters
3) Sensors (including accuracy data)
4) Actuators
5) Valves
6) Relays and switches
7) Control panels
8) Power supplies
9) Batteries
10) Operator interface equipment
11) Wiring

c. Wiring diagrams and layouts for each control panel. Show termination numbers.
d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams showing control network layout, communication protocol, and wire types.

2. Central System Hardware and Software

a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:

1) Central Processing Unit (CPU) or web server
2) Monitors
3) Keyboards
4) Power supplies
5) Battery backups
6) Interface equipment between CPU or server and control panels
7) Operating System software
8) Operator interface software
9) Color graphic software
10) Third-party software

c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.
d. Network riser diagrams of wiring between central control unit and control panels.

3. Controlled Systems

a. Riser diagrams showing control network layout, communication protocol, and wire types.

b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
c. A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
d. An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
e. A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
g. A point list for each control system. List I/O points and software points specified in Section 230993. Indicate alarmed and trended points.

4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
5. Description of process, report formats, and checklists to be used in Section 230923 (Control System Demonstration and Acceptance).
6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

B. Schedules
1. Within one month of contract award, provide a schedule of the work indicating the following:
a. Intended sequence of work items
b. Start date of each work item
c. Duration of each work item
d. Planned delivery dates for ordered material and equipment and expected lead times
e. Milestones indicating possible restraints on work by other trades or situations

2. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

C. Project Record Documents. Upon completion of installation, submit three copies of record (as-built) documents of the documents shall be submitted for approval prior to final completion and shall include:

1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2010 (or newer) compatible files on magnetic or optical media (file format: .DWG, .DXF, .VSD, or comparable) and as 11" x 17" prints.
2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 23 09 23 Article 3.16 (Control System Demonstration and Acceptance).
3. Operation and Maintenance (O&M) Manual.
4. As-built versions of submittal product data.

5. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
6. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
7. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
8. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
9. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
10. Graphic files, programs, and database on magnetic or optical media.
11. List of recommended spare parts with part numbers and suppliers.
12. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
13. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
14. Licenses, guarantees, and warranty documents for equipment and systems.
15. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.12 Warranty

A. Warrant work as follows:
1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
3. If the engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, the engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve the contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
5. Provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.
6. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.13 System Maintenance

A. Perform Building Automation System preventative maintenance and support for a period of 1 year (beginning the date of substantial completion).

1. Make a minimum of 2 complete Building Automation System inspections, in addition to normal warranty requirements. Inspections to include:

   a. System Review – Review the BAS to correct programming errors, failed points, points in alarm, and points that have been overridden manually.
   b. Seasonal Control Loop Tuning – Control loops are reviewed to reflect changing seasonal conditions and / or facility heating and cooling loads.
   c. Sequence of operation verification – Systems all verified to be operating as designed and in automatic operation. Scheduling and setpoints are reviewed and modified.
   d. Database back-up
   e. Operator coaching

2. Technician shall review critical alarm log and advise owner of additional services that may be required.
3. Technician shall provide a written report to owner after each inspection.

B. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of owner.

1.14 Ownership of Proprietary Material

A. Project specific software and documentation shall become the owner's property upon project completion. This includes the following:

1. Operator Graphic files
2. As-built hardware design drawings
3. Operating & Maintenance Manuals
4. BAS System software database
5. Controller application programming databases
6. Application Specific Controller configuration files

7. Required Licensed software

1.15 Definitions

Term	Definition
BACnet Interoperability Building Blocks (BIBB)	A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
BACnet/BACnet Standard	BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.
Control Systems Server	A computer(s) that maintain(s) the systems configuration and programming database.
Controller	Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.
Direct Digital Control	Microprocessor-based control including Analog/Digital conversion and program logic.
Gateway	Bi-directional protocol translator connecting control systems that use different communication protocols.
Local Area Network	Computer or control system communications network limited to local building or campus.
Master-Slave/Token Passing	Data link protocol as defined by the BACnet standard.
Point-to-Point	Serial communication as defined in the BACnet standard.
Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.
Protocol Implementation Conformance Statement	A written document that identifies the particular options specified by BACnet that are implemented in a device.
Router	A device that connects two or more networks at the network layer.
Wiring	Raceway, fittings, wire, boxes and related items.

PART 2 - PRODUCTS

2.1 Materials

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations that have been used in at least 10 installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 Communication

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Use existing Ethernet backbone for network segments marked "existing" on project drawings.

D. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

E. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 23 09 93. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

F. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.

G. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.3 Operator Interface

A. Furnish the necessary programming, graphics, ethernet port and cable for the operator interface as required by paragraph 1.6 K. Owner shall furnish a portable building workstation for both remote and on-site access to the control system. Owner shall furnish the necessary license key for access to the existing Alerton EMS system as required by paragraph 1.6 K. Furnish programming and graphics on the portable operator interface for both the local building automation system, and where required by paragraph 1.6 K - Alternate 1, for integration with the existing EMS.

B. The Operator Workstation or server shall conform to the BACnet Operator Workstation (B-OWS) or BACnet Advanced Workstation (B-AWS) device profile as specified in ASHRAE/ANSI 135 BACnet Annex L.

C. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.

D. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.

~~E.~~ [NOT REQUIRED] ~~Hardware. Each workstation or web server shall consist of the following:~~

~~1. Computer. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified elsewhere in this document. The following hardware requirements also apply:~~

~~a. The hard disk shall have sufficient memory to store:~~

~~1) All required operator workstation software.~~
~~2) A DDC database at least twice the size of the delivered system database.~~
~~3) Five years of trend data based on the points specified to be trended at their specified trend intervals. Minimum of 250 points.~~

~~b. Provide additional hardware (communication ports, video drivers, network interface cards, cabling, etc.) to facilitate all control functions and software requirements specified for the DDC system.~~
~~c. Minimum hardware configuration shall include the following:~~

~~1) 4th gen. i7 Intel core processor~~
~~2) 8 GB RAM~~
~~3) 500 GB hard disk providing data at 3.0 Gb/sec~~
~~4) 16x DVD-RW drive~~
~~5) 27" color LCD display~~
~~6) Serial, parallel, and network communication ports and cables as required for proper DDC system operation~~
~~7) UPS – 650 va, approved manufactures – APC~~
~~8) 6 ft. Folding Table and 2 chairs.~~

F. System Software.

1. Operating System. Web server or workstation shall have an industry-standard professional-grade operating system. Operating system shall meet or exceed the DDC System manufacturer's minimum requirements for their software. Typically acceptable systems include Microsoft Windows 10 Pro, Windows Server 2003 or 2008.
2. System Graphics. The operator interface software shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

    a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of

equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.

c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).

3. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in the same formats as are used for system graphics.

4. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.

G. System Applications. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Manual Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. The workstation software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection. Operators shall be able to configure the system.

4. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.

5. Security. Each operator shall be required to log on to the system with user name and password in order to view, edit, add, or delete data.

a. Operator Access. The user name and password combination shall define accessible viewing, editing, adding, and deleting privileges for that operator. Users with system administrator rights shall be able to create new users and edit the privileges of all existing users.

b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. This auto logoff time shall be user adjustable.

c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the operator.
7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Section 230993 (Sequences of Operation). Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
8. Alarm Messages. Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms.
9. Alarm Reactions. Operator shall be able to configure (by object) what, if any actions are to be taken during an alarm. As a minimum, the workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm and Event log. Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms, and archive closed alarms to the workstation or web server hard disk.
11. Trend Logs. The operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Section 23 09 93 (Sequences of Operation). Trends shall be BACnet trend objects.
12. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object or property in the system. The status shall be available by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        1) Alarm History.
        2) Trend Data. Operator shall be able to select trends to be logged.
        3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm

acknowledgment and deletion. System shall date and time stamp logged activity.

H. Workstation Application Editors. Each PC or browser workstation shall support editing of all system applications. The applications shall be downloaded and executed at one or more of the controller panels.

1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.
2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays shall be shown clearly on the calendar. The start and stop times for each object shall be adjustable from this interface.
3. Custom Application Programming. Provide the tools to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

    a. Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."
    b. A full-screen character editor programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete custom programming code. It also shall incorporate features such as cut/ paste and find.
    c. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.
    d. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and observe any intermediate values and/or results.
    e. The programming language shall support conditional statements (IF/THEN/ELSE/ ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
    f. The programming language shall support floating-point arithmetic using the following operators: +, , ÷, ×, and square root. The following mathematical functions also shall be provided: absolute value and minimum/maximum value.
    g. The programming language shall have predefined variables that represent time of day, day of the week, month of the year, and the date. Other predefined variables shall provide elapsed time in seconds, minutes, hours, and days. These elapsed time variables shall be able to be reset by the language so that interval-timing functions can be stopped and started within a program. Values from all of the above variables shall be readable by the language so that they can be used in a program for such purposes as IF/ THEN comparisons, calculations, etc.
    h. The language shall be able to read the values of the variables and use them in programming statement logic, comparisons, and calculations.

i. The programming language shall have predefined variables representing the status and results of the system software and shall be able to enable, disable, and change the setpoints of the system software described below.

2.4 Portable Operator's Terminal

A. Provide and install all necessary software to configure a portable laptop furnished by the Owner for use as a Portable Operator's Terminal.

1. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.
2. OWS shall auto configure sizing to display appropriate information.

2.5 Controller Software

A. Furnish the following applications for building and energy management. All software application shall reside and operate in the system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. System Security. See Paragraph 2.3.E.5 (Security) and Paragraph 2.3.E.14.c.iii (Operator Activity).

C. Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule shall provide the following schedule options as a minimum:

1. Weekly Schedule. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system shall discard and replace the exception schedule with the standard schedule for that day of the week.
3. Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator shall be able to define the length of each holiday period.
4. Optimal Start. The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less then and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

D. Trend Log Application
1. Trend log data shall be sampled and stored on the System Controller panel and shall capable of being archived to a BACnet Workstation for longer term storage.
2. Trend logs shall include interval, start-time, and stop-time.
3. Trend log intervals shall be configurable as frequently as 1 minute and as infrequently as 1 year.

E. Trend Logs
   1. The system controller shall create trend logs for defined key performance indicators for each controlled HVAC device and HVAC application.
   2. The trend logs shall monitor these parameters for a minimum of 7 days at 15 minute intervals. The automatic trend logs shall be user adjustable.

F. The following is a list of key measurements required to be trended by the system.
   1. Air Systems
      a. Air Handling Unit (VAV) Discharge Air Temperature
         1) Discharge Air Temperature Setpoint Active
            a) Cooling Coil Discharge
            b) Reheat Coil Discharge
         2) Space Temperature Active
         3) Space Humidity Active
         4) Space CO2 Active
         5) Cooling Capacity Status

G. Alarm/Event Log
   1. Any object in the system shall be configurable to generate an alarm when transitioning in and out of a normal or fault state.
   2. Any object in the system shall allow the alarm limits, warning limits, states, and reactions to be configured for each object in the system.
   3. An alarm/event shall be capable of triggering any of the following actions:
      a. Route the alarm/event to one or more alarm log
      b. The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself.
      c. Route an e-mail message to an operator(s)
      d. Log a data point(s) for a period of time
      e. Run a custom control program

H. Point Control. User shall have the option to set the update interval, minimum on/off time, event notification, custom programming on change of events.

I. Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, building operator interface, or the local operator display. The amount of time that the override takes precedence will be selectable from the building operator interface.

J. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

K. Binary Alarms. Each binary object shall have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.

L. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.

M. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.

N. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.

O. Maintenance Management. The system shall be capable of generating maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in 230993.11 (Sequences of Operation).

P. Sequencing. Application software shall sequence chillers, boilers, and pumps as specified in Section 230993.11 (Sequences of Operation).

Q. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters shall be adjustable by a user with the correct security level.

R. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

S. Energy Calculations.

1. The system shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.
2. The system shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

T. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

U. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm shall be direct-acting or reverse-acting.

V. Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Section 23 09 93 (Sequence of Operations).

W. VAV Air Systems Application

1. The BAS shall provide an Air Systems application program that coordinates air handlers (AHU) and Exhaust Fans (EF)
2. The Air Systems application shall perform the following functions:

a. Startup and shutdown the air handler safely. Ensure the return air or outdoor air dampers are open sufficiently when the air handler is running to prevent damage to the ductwork.
b. Ensure the toilet exhaust fan is energized when the air handler is running to prevent building overpressurization.
c. Ventilation Optimization (ASHRAE 62) – properly ventilate all spaces while minimizing operating energy costs, using measured outdoor air flow. Dynamically calculate the system outdoor air requirement based on "real time" conditions in the spaces (i.e., number of occupants, CO2 levels, etc.) minimizing the amount of unconditioned outdoor air that must be brought into the building.
d. Demand Controlled Ventilation – the active ventilation setpoint shall modulate between the occupied ventilation and occupied standby ventilation setpoint; Resetting the setpoint based on CO2 levels in the space.

3. The Air Systems application shall provide a user interface that includes status of current system operation with real time data of key operating parameters. Key operating parameters include:

    a. Outdoor Airflow
    b. Ventilation Optimization Setpoint

4. The Air Systems status screens shall explain what optimization calculations are occurring, critical parameters, and source equipment members. The optimization status, inputs, and results shall be displayed for VAV Ventilation Optimization (calculating proper outside air intake).
5. The Air Systems application shall provide a user interface that enables configuration changes made by swipe and type fields, selection list, and check box entry for feature definition:

    a. Changeover System control
    b. Start/Stop Delay operation
    c. Enable/Disable Optimization Strategies (Ventilation Optimization)

6. The Air Systems application shall provide a user interface that enables setup modifications made by entry field, check box, and selection fields for configuration and troubleshooting:

    a. VAV System definition and operational parameters
        1) RTU or AHU members
    b. VAV Ventilation Optimization parameters
        1) Maximum RTU/AHU percentage outdoor air intake
        2) Maximum VAV percentage Outdoor air request
        3) Reset interval
    c. Area (occupant space representation) definition and operation parameters
        1) RTU or AHU members (if constant volume)
        2) VAV box members (if VAV system)
        3) Enable Economizer mode operation, and settings
        4) Enable Night Purge operation, and settings
        5) Enable Humidity Control operation, and settings
        6) Optimal Start/Stop

7) Timed Override

7. The Air Systems application vendor shall provide a published applications guide that details the air system application operation, configuration, setup, and troubleshooting. The applications guide documentation shall be maintained under version control, and updated by the manufacture to reflect most recent feature updates as made available. Contents of the guide shall include:

   a. Description of System Operation
   b. Required Components
   c. Sequences of Operation
   d. Installation
   e. Controller Setup
   f. Required Programming
   g. Commissioning
   h. Optimization Strategies
   i. Special Applications
   j. Troubleshooting

2.6 Controllers

A. General. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 230923 Article 1.9 (System Performance).

B. **It is intended that each piece of equipment be controlled by only one controller.** If the equipment has points that extend beyond the point counts of a controller, move up to the next size. Should the manufacturer not have one that can handle all points, provide an additional BC (Ethernet level) just for that piece of equipment to ensure fast communications and minimal latency between controllers and logic within the two controllers.

C. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L.

D. All controllers shall have the capability to store trend data onboard. This data shall be written to serial type memory and has to persist through loss of power.

E. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
4. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
5. BACnet Communication.

    a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
    b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
    c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
    d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
    e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
    f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

6. Building Controller (BC)

    a. Provide a fully programmable, BTL listed, UL 916 certified, expandable modular style native BACnet® Building Controller, (BACnet Device Profile B-BC), which supports the following minimum communications methods as standard: BACnet/IP, BACnet over Ethernet and BACnet MS/TP.
    b. The controller shall be expandable in functionality and shall consist of a main control unit and multiple DIN rail mounted, removable plug in modular component units which shall include the following:
    c. The Manager section shall include as minimum an integrated 4.3” Active Matrix, 16bit Color, 480x272 resolution LCD touchscreen to provide local interface capabilities. This unit shall contain the primary 32 – bit RISC CPU, 64 MB flash memory and 32 MB SDRAM storage memory with SD/SDIO card slot for memory expansion, a real-time clock (temperature compensated), as well as Ultracap power backup for real time clock & memory.
    d. Standard Communications ports shall include as minimum external 3 Port 10/100 Ethernet Switch communication ports, (2) RS-485 Ports (up to 76800 bps) as well as 2 USB host ports. The manager unit shall communicate and provide the control logic for the plug in I/O modules via expansion backplanes. The manager must be able to communicate with sufficient plug in modules to accommodate 500 connected I/O points at one time.
    e. Controller activity of power/scan and Ethernet ports shall be indicated through face mounted LED status light indications.
    f. The modular I/O components shall be hot swappable and provide a variation of input or output ranges by positioning of jumpers located on each module.

g. Inputs. Modular controller input/output unit shall support dry contact, RTD, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution shall be minimum 10-bit A to D.

h. Outputs. Modular controller input/output unit shall have or built in Hand-Auto-Off (HAO) modules configured with manual-auto-off override switch, potentiometer and input channel for feedback status and/or unrelated analog or digital input. Outputs supported shall be 0-10 VDC, internal SPST relays, Triac, and internally powered current loop control from 0-20mA .

i. All HAO's shall be supervised.

j. Diagnostics. Modular controller input unit shall have variable intensity LEDs providing analog input status indication or configurable tri-color LEDs for binary input status indication. Outputs shall have variable intensity LEDs indicating the output voltage with Color indication of HAO's status when present.

k. Bump-less Transfer. On outputs with override switches, provide an HAO switch either built-in or external to the board that allows for manual positioning of the output, then transferring the output to automatic without any "bump" in the output voltage, (don't go through off before transferring from manual to auto).

l. Provide 2 spare Ethernet ports at each Building Controller (may use an external Ethernet switch, no hubs allowed).

m. Building and Advanced Application Controllers noted on the plans shall have 25% spare input/output capacity available for future point additions. The future additions may require additional point modules to accommodate specific I/O configuration but may not require additional controllers, memory, or processor upgrades to accomplish the new work.

F. Communication

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
4. Stand-Alone Operation. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

G. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

~~H.~~ [NOT REQUIRED] ~~Touch Keypad. Provide a local touch keypad and color display for each BC. Operator shall be able to use keypad to view and edit data. Keypad and color display shall require password to prevent unauthorized use. If the manufacturer cannot provide above for the BC, provide the software, any interface cabling needed and an additional Portable Operator's Terminal to be permanently mounted at each cabinet for the system.~~

I. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

J. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to a field-removable modular terminal strip or to a termination card connected by a ribbon cable. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

K. Memory.

1. Controller memory shall support operating system, database, and programming requirements.
2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

L. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

M. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.7 Input and Output Interface

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.

C. Binary Inputs. Binary inputs shall allow the monitoring of ON/OFF signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall also accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall provide for ON/OFF operation or a pulsed low-voltage signal for pulse width modulation control. **Binary outputs on Building Controllers shall have three-position (on-off-auto) override switches and status lights.** Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system

2.8 Power Supplies and Line Filtering

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

    a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
    b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

    a. Dielectric strength of 1000 V minimum

b. Response time of 10 nanoseconds or less
c. Transverse mode noise attenuation of 65 dB or greater
d. Common mode noise attenuation of 150 dB or greater at 40–100 Hz

2.9 Smart Sensor (SS):

A. Provide zone sensors (thermostats) which provides information to the BAS via network connection rather than a binary or analog signal. (0-10000 ohm, 4-20mA, dry contact, etc.). **Note: Zone sensors shall be wireless.**

B. Thermostat backlight shall illuminate automatically based on user interaction. Where motion detection option is specified, backlight shall activate automatically based on user approach. In both cases, backlight shall dim based on programmable timeout.

C. The thermostat backlight shall signify when the controlled equipment has been commanded into heating, cooling or economy mode with a red, blue and green light respectively.

D. Local annunciation at or near the room sensor is required for the "natural ventilation" mode of operation. Provide LED annunciator, indicator light or other means of displaying the status of the system. LCD icons alone are not sufficient. Indicator must be clearly visible 50' away from the room sensor. Overhead LED annunciator is acceptable.

E. Provide room sensors with ivory plastic housing and use the backlit color schemes that match the paint color within that zone. Faux finishes applied in the field are NOT acceptable. If Custom thermostat enclosures are used, provide a minimum of 25% spare enclosures for future use.

F. CO2 shall be provided as a field replaceable component to the thermostat or where specified already, as an existing field replaceable component.

G. Humidity measurement shall be provided at all locations.

2.10 Auxiliary Control Devices

A. Motorized Control Dampers, unless otherwise specified elsewhere, shall be as follow.

1. Type. Control dampers shall be the parallel or opposed-blade type as specified below or as scheduled on drawings.

a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
b. Other modulating dampers shall be opposed-blade.
c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.

2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (⅛ in.) extruded aluminum with reinforced corner bracing.

3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m2(10 cfm per ft2) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).
6. Sections. Individual damper sections shall not exceed 125 cm × 150 cm (48 in. × 60 in.). Each section shall have at least one damper actuator.
7. Modulating dampers shall provide a linear flow characteristic where possible.
8. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and Valve Actuators.

1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
3. Signal and Range. Proportional actuators shall accept a 0–10 Vdc or a 0–20 mA control signal and shall have a 2–10 Vdc or 4–20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Binary Temperature Devices.

1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C–30°C (55°F–85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C–30°C (55°F–85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

D. Temperature Sensors.

1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.

2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m2(10 ft2) of duct cross-section.
3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
5. Differential Sensors. Provide matched sensors for differential temperature measurement.

E. Humidity Sensors.

1. Duct and room sensors shall have a sensing range of 20%–80%.
2. Duct sensors shall have a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20%–95% RH and shall be suitable for ambient conditions of -40°C–75°C (-40°F–170°F).
4. Humidity sensors shall not drift more than 1% of full scale annually.

F. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.
2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

G. Relays.

1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

H. Override Timers.

1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

I. Current Transmitters.

1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation on existing wiring.

J. Current Transformers.
1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

K. Voltage Transmitters.

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.
2. Adjustable full-scale unit ranges shall be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

L. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C–55°C (40°F–130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

M. Power Monitors.

1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 amp current inputs or 0–0.33 volt inputs.
2. 1.0% full-scale true RMS power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.
3. Under voltage/phase monitor circuitry.
4. NEMA 1 enclosure.
5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

N. Current Switches.

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

O. Pressure Transducers.

1. Transducers shall have linear output signal and field-adjustable zero and span.

2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4–20 mA output, suitable mounting provisions, and block and bleed valves.
4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.)Transducer shall have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.

P. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

Q. Occupancy Sensors. Occupancy sensors shall utilize Passive Infrared (PIR) and/or Microphonic Passive technology to detect the presence of people within a room. Sensors shall be mounted as indicated on the approved drawings. The sensor output shall be accessible by any lighting and/or HVAC controller in the system. Occupancy sensors shall be capable of being powered from the lighting or HVAC control panel, as shown on the drawings. Occupancy sensor delay shall be software adjustable through the user interface and shall not require manual adjustment at the sensor.

R. Local Control Panels.

1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch. A single key shall be common to all field panels and subpanels.
2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

2.11 Wiring and Raceways

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26. Steel compression, with insulated throat. Minimum conduit size, ¾”.

1. Provide conduit for all wiring in exposed areas.
2. Provide conduit for all wiring in concealed areas.
3. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.
4. All low voltage cable shall be plenum rated.

PART 3 - EXECUTION

3.1 Examination

A. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

B. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

3.2 Protection

A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.

B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 Coordination

A. Site
1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Submittals. See Section 23 09 23 Article 1.10 (Submittals).

C. Test and Balance.
1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.

D. Life Safety.
   1. Duct smoke detectors required for air handler shutdown are provided under Division 28. Interlock smoke detectors to air handlers for shutdown as specified in Section 23 09 93 (Sequences of Operation).
   2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 23. Interlock smoke dampers to air handlers as specified in Section 23 09 93 (Sequences of Operation).
   3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 28.
   4. All fire and/or smoke dampers are to be wired by Division 26.

E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
   1. All communication media and equipment shall be provided as specified in Section 23 09 23 Article 2.2 (Communication).
   2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described in Section 23 09 93.
   3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
   4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
   5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4 General Workmanship

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 Field Quality Control

A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Section 23 09 23 Article 1.8 (Codes and Standards).

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.6 Wiring

A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification, Where the requirements of this section differ from Division 26, the requirements of this section shall take precedence.

B. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to NEC and Division 26 requirements.

C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.

D. All wiring shall be installed in raceway.

E. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

F. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

G. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.

H. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.

I. Install conduit in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.

J. Size of raceway and size and type of wire type shall be the responsibility of the contractor in keeping with the manufacturer’s recommendations and NEC requirements, except as noted elsewhere, minimum ¾”.

K. Use color-coded conductors throughout with conductors of different colors.

L. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

M. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).

N. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

O. Adhere to this specification's Division 26 requirements where raceway crosses building expansion joints.

P. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.

Q. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

R. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

S. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.7 Communication Wiring

A. The contractor shall adhere to the items listed in the "Wiring" article in Part 3 of the specification.

B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling

C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to manufacturer’s instructions.

G. All runs of communication wiring shall be unspliced length when that length is commercially available.

H. All communication wiring shall be labeled to indicate origination and destination data.

I. All communication wiring shall be labeled to indicate origination and destination data.

J. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

K. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:

1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
4. An MS/TP EIA-485 network shall have no T connections.

3.8 Installation of Sensors

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequately for environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.

D. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.

E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m2(1 ft2) of coil area.

G. Do not install temperature sensors within the vapor plume of a humidifier. If installing a sensor downstream of a humidifier, install it at least 3 m (10 ft) downstream.

H. All pipe-mounted temperature sensors shall be installed in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

I. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

J. Differential Air Static Pressure.

1. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the height-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.
2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
3. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.

K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

L. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft) downstream of the humidifier. Do not install filters between the humidifier and the sensor.

3.9 Flow Switch Installation

A. Use correct paddle for pipe diameter.

B. Adjust flow switch according to manufacturer's instructions.

3.10 Actuators

A. General. Mount and link control damper actuators according to manufacturer's instructions.

1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
3. Provide all mounting hardware and linkages for actuator installation.

B. Electric/Electronic

1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted

with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer's recommendations.

2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.11 Warning Labels

3.12 Identification of Hardware and Wiring

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.

E. Identify room sensors related to terminal boxes or valves with nameplates.

F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

G. Identifiers shall match record documents.

3.13 Controllers

A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed in Section 23 09 93 (Sequences of Operation).

3.14 Programming

A. Provide sufficient internal memory for the specified sequences of operation and trend logging.

B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See Section 23 09 93 (Sequences of Operation). If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix B to Section 23 09 93 may be used. Where multiple points with the same name reside in the same

controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

C. Software Programming.

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

   a. Text-based:
      1) Must provide actions for all possible situations
      2) Must be modular and structured
      3) Must be commented

   b. Graphic-based:
      1) Must provide actions for all possible situations
      2) Must be documented
   c. Parameter-based:
      1) Must provide actions for all possible situations
      2) Must be documented.

D. Operator Interface.

1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the applicable Points List in Section 230993.
2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.15 Control System Checkout and Testing

1. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.
2. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.

3. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
4. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
5. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
6. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
7. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
8. Alarms and Interlocks:
    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.16 Control System Demonstration and Acceptance

A. Demonstration.

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1, "System Performance."
7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Demonstrate complete operation of operator interface.

9. Additionally, the following items shall be demonstrated:

    a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
    b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
    c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
    d. Interface to the building fire alarm system.
    e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.
11. Acceptance.

    a. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
    b. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

3.17 Cleaning

A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.18 Training

A. Provide training for a designated staff of Owner's representatives. Provide minimum of (4) classroom training sessions, and (4) hours for each session, throughout the contract period. The training will be provided for personnel designated by the Owner.

B. Additional training may be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.

C. Training shall enable students to accomplish the following objectives.

1. Day-to-day Operators:
2. Proficiently operate the system
3. Understand control system architecture and configuration
4. Understand DDC system components
5. Understand system operation, including DDC system control and optimizing routines (algorithms)
6. Operate the workstation and peripherals
7. Log on and off the system
8. Access graphics, point reports, and logs
9. Adjust and change system set points, time schedules, and holiday schedules
10. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
11. Understand system drawings and Operation and Maintenance manual
12. Understand the job layout and location of control components
13. Access data from DDC controllers and ASCs
14. Operate portable operator's terminals

D. Provide course outline and materials according to the "Submittals" article in Part 1 of this specification. Provide one copy of training material per student.

E. The instructor(s) shall be factory-trained and experienced in presenting this material.

3.19 Controls Communication Protocol

A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135.

B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.

C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.

D. The Controller shall have a physical connection for a laptop computer or a portable operator's tool.

E. Environment. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°C to 60°C (40°F to 140°F).
2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

F. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

G. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.

H. Power. Controller shall be able to operate at 90% to 110% of nominal voltage rating.

I. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.20 Start-Up and Checkout Procedures

A. Start up, check out, and test all hardware and software and verify communication between all components.

1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
2. Verify that all analog and binary input/output points read properly.
3. Verify alarms and interlocks.
4. Verify operation of the integrated system.
5. Turn over documentation with the individual's signature acknowledging testing of each device.

END OF SECTION 230923

SECTION 230993.11 – SEQUENCE OF OPERATION FOR HVAC DDC

PART 1 - GENERAL

1.1 SUMMARY

A. Section include sequences of operation for each type of HVAC system for the DDC controls.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

PART 2 - SEQUENCES OF OPERATION

2.1 RELATED DOCUMENTS

A. Refer to mechanical drawing M3-1 for sequences of operation.

END OF SECTION 230923.11

SECTION 231123 – NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Shop Drawings: For facility natural-gas piping layout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 2 psig minimum unless otherwise indicated.
3. Service Meter Minimum Operating Pressure: 2 psig.

B. Natural-Gas System Pressure within Building: One distribution pressure. More than 0.5 psig, but not more than 2.0 psig.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

2.3 SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.

B. Strainers: ASTM A 126, Class B, cast-iron body, Y-pattern, full size of connecting piping, CWP rating of 125 psig. Include 60-mesh startup strainer and perforated stainless-steel basket.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

D. Service Meters: Existing.

2.4 MANUAL GAS-SHUTOFF VALVES

A. General Requirements for Metallic, Manual Gas-Shutoff Valves: Comply with ASME B16.33.

1. CWP Rating: 125 psig.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturer: Nibco, Crane, Apollo, or equal.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded body packnut design with adjustable stem packing.
7. CWP Rating: 600 psig.
8. Listing: Valves 1 inch NPS and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

C. Bronze Plug Valves: MSS SP-78.

1. Manufacturer: Resun, Milliken, Homestead, or equal.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig.
6. Listing: Valves 1 inch NPS and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements: Single stage, steel jacketed, and corrosion resistant. Include elevation compensator.

B. Appliance Pressure Regulators: ANSI Z21.18:

1. Manufacturer: Maxitrol, Itron, Fisher, or equal.
2. 2 psig maximum inlet pressure. Regulator may include vent-limiting device, instead of vent connection, if approved by authorities having jurisdiction.

2.6 SLEEVES AND SLEEVE SEALS

A. See Section 230517 (Sleeves and Sleeve Seals for HVAC Piping).

2.7 TEST PLUGS

A. Test Plugs: Corrosion-resistant brass or stainless-steel body with two self-sealing rubber core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Minimum pressure and temperature rating of 500 psig.

PART 3 - EXECUTION

3.1 DEMOLITION OF EXISTING GAS PIPING

A. Vent and purge all gas piping to be removed per Section 406.7 of the North Carolina Fuel Gas Code.

3.2 PIPING INSTALLATION

A. Install piping free of sags and bends.

B. Install fittings for changes in direction and branch connections.

C. Install inside piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

E. Install gas stops for shutoff to appliances with low-pressure gas supply.

F. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

G. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

H. Connect branch piping from top or side of horizontal piping.

I. Install unions in pipes 2 inches NPS and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

J. Final connections to appliances from the appliance branch line shutoff valve shall be made by the contractor installing the appliance or equipment.

K. Connect gas piping to equipment and appliances with shutoff valves and unions. Install gas valve upstream from and within 72 inches of each appliance using gas. Install union or flanged connections downstream from valves.

L. Do not use natural-gas piping as grounding electrode.

3.3 PIPING JOINT CONSTRUCTION

A. Threaded Joints: Thread pipe with tapered pipe threads complying with ASME B1.20.1.

B. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" chapter.

D. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

E. Flared Joints: Cut tubing with roll-cutting tool. Flare tube end with tool to result in flare dimensions conforming to SAE J513. Tighten finger tight; then use wrench. Do not overtighten.

3.4 VALVE INSTALLATION

A. Install manual gas-shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.5 ABOVEGROUND, MANUAL GAS-SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes 2 inches and smaller shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Valves in branch piping for single appliance shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

END OF SECTION 231123

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. For solvent cements and adhesive primers, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 150 psig at 250 deg F.
2. Chilled-Water Piping: 150 psig at 250 deg F.
3. Makeup-Water Piping: 100 psig at 150 deg F.
4. Condensate-Drain Piping: 150 deg F.
5. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

B. ASME Compliance:

1. ASME B16 standards for pipe and fittings.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.3 for malleable iron threaded fittings.
4. ASME B16.5 for pipe flanges and flanged fittings.
5. ASME B16.9 for wrought steel butt welded fittings.
6. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
7. ASME B16.18 for solder-joint connections.
8. ASME B16.25 for butt weld pipe connections.
9. ASME B1.20.1 for threads for threaded end valves.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53, Schedule 40, plain ends with malleable iron threaded fittings, Class 150.

B. Steel Pipe: ASTM A 53, Schedule 40, plain ends with wrought steel butt welded fittings.

C. Unions: ASME B16.39, malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

D. Hard Copper Tubing: ASTM B 88 Type L with ASME B16.22 wrought-copper solder fittings.

E. Soft Copper Tubing: ASTM B 88 Type L with ASME B16.22 wrought-copper solder fittings.

F. Solder: 95% tin, 4% copper, 0.5% silver with non-acid lead-free flux.

G. Silver Solder: BUP-5 15% silver, 80% copper, 5% phosphorous.

H. Unions: ASME B16.22, bronze, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

I. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150 psig minimum working pressure, 250 deg F maximum operating temperature.

J. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded ends.

2.3 GENERAL-DUTY VALVES

A. Valve Sizes: Same as upstream piping unless otherwise indicated.

B. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim for Pipe NPS 3 inches or less in diameter:

1. Manufacturers: Nibco, Watts, Apollo, or equal
2. Standard: MSS SP-110.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Bronze.
6. Ends: Threaded and soldered.
7. Seats: PTFE.
8. Stem: Bronze or brass.
9. Ball: Chrome-plated brass.
10. Port: Full.

C. Ductile-Iron Butterfly Valve for Pipe NPS 4 inches and larger in diameter:

1. Manufacturers: Nibco, Apollo, Ohio, or equal
2. Standard: MSS SP-67/25.
3. CWP Rating: 200 psig.
4. Body Design: Two piece.
5. Body Material: Ductile iron.
6. Ends: Flanged.
7. Seats: EPDM.
8. Stem: 416 stainless steel.
9. Disc: Ni-coated ductile iron.

10. Port: Full.

D. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Nibco, Crane, Apollo, or equal
2. Standard: MSS SP-80, Type 3.
3. CWP Rating: 200 psig.
4. Body Design: Horizontal flow.
5. Body Material: ASTM B 62, bronze.
6. Ends: Threaded or soldered.
7. Disc: Bronze.

E. Class 125, RS, Bronze Gate Valves:

1. Manufacturers: Nibco, Crane, Apollo, or equal
2. Standard: MSS SP-80, Type 2.
3. CWP Rating: 200 psig.
4. Body Material: Bronze with integral seat and screw-in bonnet.
5. Ends: Threaded or solder joint.
6. Stem: Bronze.
7. Disc: Solid wedge; bronze.
8. Packing: Asbestos free.
9. Handwheel: Malleable iron, bronze, or aluminum.

2.4 SPECIAL-DUTY VALVES

A. Autoflow Pressure Independent, Automatic, Flow Limiting Valves:

1. Manufacturers: Bell & Gossett, Taco, Conbraco, or equal.
2. Body: Brass.
3. Ball: Chrome plated brass.
4. Ball Seal: PTFE.
5. Stem: Blowout proof.
6. O-Rings: EPDM.
7. Cartridge: Removable, flow-limiting diaphragm brass cartridge allowing easy access.
8. Pressure/Temperature Ports.
9. CWP Rating: Minimum 400 psig.
10. Maximum Operating Temperature: 250 deg F.
11. Valve shall have integral pointer and calibrated scale to register degree of valve opening.
12. Optional: Autoflow pressure independent flow limiting balance valves.

B. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Bell & Gossett, Taco, Conbraco, or equal.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Pressure-Gage Connections: Integral seals for portable differential pressure meter.
4. CWP Rating: Minimum 125 psig.
5. Maximum Operating Temperature: 250 deg F.

6. Valve shall have integral pointer and calibrated scale to register degree of valve opening.
7. Use in lieu of autoflow valves only where shown.

C. Triple Duty Valves:

1. Manufacturers: Bell & Gossett, Taco, Armstrong, or equal.
2. Straight pattern, non-adjustable design.
3. Globe valve design.
4. Spring-loaded check valve design to prevent gravity circulation and backflow.
5. Calibrated nameplate with multi-turn stem.
6. Rubber memory button to allow the valve to be re-balanced to its original position after shut-off or maintenance.
7. Fully backseating disc to allow the valve packing to be replaced while under pressure.
8. Cast iron or ductile iron.
9. Valve disc shall be made of brass with an EPDM rubber seat.
10. Valve stem shall be made of stainless steel.
11. Valve spring shall be made of stainless steel.
12. Valve shall be available with either flanged end connections or grooved end connections.
13. Flange end connections should be designed according to ANSI Class 150 Standards.
14. Valve models with flange x flange end connections shall be rated for 175 psi maximum working pressure.
15. The valve shall have a maximum temperature rating of 250°F.

2.5 HYDRONIC SPECIALTIES

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturer: Watts or equal.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 13 psig maximum, through middle third of flow range.
5. Size: NPS 3/4 inch – 10 gpm.
6. Body: Bronze for NPS 2 inch and smaller.
7. End Connections: Threaded for NPS 2 inch and smaller.
8. Configuration: Designed for horizontal, straight-through flow.
9. Accessories:

    a. Valves NPS 2 inch and Smaller: Quarter-turn ball type with threaded ends on inlet and outlet.
    b. Inlet Strainer.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Water Regulators:

1. Manufacturer: B&G or equal.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: NPS 3/4 inch.
5. Design Flow Rate: 10 gpm.

6. Design Inlet Pressure: 100 psig.
7. Design Outlet Pressure Setting: 12 psig.
8. Body: Bronze for NPS 2 inch and smaller
9. Valves for Booster Heater Water Supply: Include integral bypass.
10. End Connections: Threaded for NPS 2 inch and smaller.

C. Chilled Water Storage Tank:

1. Manufacturer: Cemline or equal.
2. Standard: ASME Code, stamped in accordance with Section VIII and registered with the National Board of Boiler and Pressure Vessel Inspectors.
3. Pressure Rating: Initial working pressure of 125 psig.
4. Size: 42” diameter by 90” high
5. Capacity: 500 gallons.
6. Air Vent: 3/4 inch.
7. Connections: 4 inch flanged.
8. Insulation: 1/2 inch black elastomeric.
9. Drain: 1-1/2 inch.
10. Manhole: 12” x 16”.
11. Internal baffle.
12. Four leg stands.

D. Hot Water Storage Tank:

1. Manufacturer: Lochinvar BVU or equal.
2. Standard: ASME Code, stamped in accordance with Section VIII and registered with the National Board of Boiler and Pressure Vessel Inspectors.
3. Pressure Rating: Initial working pressure of 125 psig.
4. Size: 32” diameter by 59-1/2” high
5. Capacity: 120 gallons.
6. Air Vent: 3/4 inch.
7. Connections: 3 inch NPT.
8. Insulation: 2 inch foam with pre-painted jacket.
9. Drain: 1 inch.
10. Internal baffle.
11. Four leg stands.

E. Hot Water Expansion Tank (Bladder Type):

1. Manufacturer: Bell & Gossett B-LA or equal.
2. Standard: ASME Code, stamped in accordance with Section VIII and registered with the National Board of Boiler and Pressure Vessel Inspectors.
3. Pressure Rating: Initial working pressure of 125 psig at 240°F.
4. Size: 34 gallons.
5. Acceptance Volume: 27 gallons.
6. Connections: 1 inch NPT.
7. Drain: 3/4 inch.
8. Insulation: 2 inch foam with pre-painted jacket.
9. Drain: 1 inch.
10. Base mounted.

F. Relief Valve:

1. Manufacturer: B&G or equal.
2. Standard: ASME Section IV.
3. Pressure Rating: Maximum working pressure of 125 psig at 250°F.
4. Size: NPS 3/4 inch.
5. Body: Bronze for NPS 2 inch and smaller.
6. Rating: 500,000 BTUH.

G. Manual and Automatic Air Vents:

1. Manufacturers: Bell & Gossett, Taco, Amtrol, or equal.
2. Bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew, or automatically operated where indicated; with 1/8 inch discharge connection and NPS ½ inch inlet connection.

H. Y-Pattern Strainers: 125 psig working pressure; cast-iron body (ASTM A 126, Class B), flanged ends for NPS 2½ and larger; bronze body (ASTM B584), threaded connections for NPS 2 and smaller, bolted cover, perforated Type 304 stainless-steel basket, and bottom drain connection.

I. Ball-Valve-Type, Hose-End Drain Valves:

1. Manufacturer: Nibco or equal.
2. Standard: MSS SP-110 for standard-port, two-piece ball valves.
3. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
4. Size: NPS 3/4 inch.
5. Body: Copper alloy.
6. Ball: Chrome-plated brass.
7. Seats and Seals: Replaceable.
8. Handle: Vinyl-covered steel.
9. Inlet: Threaded or solder joint.
10. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7.
11.

J. Hose-Connection Vacuum Breakers:

1. Manufacturer: Watts or equal.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded, complying with ASME B1.20.7.
5. Finish: Chrome or nickel-plated bronze.

2.6 THERMOMETERS

A. Red Liquid in Glass All-Purpose Vertical Sensing Tube Thermometer

1. Standard: ASME B40.200 / ASTM E2511.
2. Case: 5” black ABS.

3. Scale: Aluminum, painted white with black markings.
4. Lens: Glass.
5. Tube: Glass.
6. Sensing Liquid: Kerosene, tinted red.
7. Stem: Brass.
8. Thermowell: 1/2” NPT brass.
9. Operating Pressure: 710 psi maximum.
10. Ambient Temperature: -40°F to 122°F.
11. Process Temperature: 30°F to 240°F (dual °F & °C scale).
12. Warranty: 5 year.

2.7 PRESSURE GAGES AND TEST PLUGS

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Sealed, [solid-front, pressure-relief, cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
3. Movement: Mechanical, with link to pressure element and connection to pointer.
4. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
5. Pointer: Dark-colored metal.
6. Window: Plastic.
7. Ring: Metal.
8. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
9. Warranty: 5 year.

B. Test Plug: Corrosion-resistant brass or stainless-steel body with two self-sealing rubber core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Minimum pressure and temperature rating of 500 psig at 200 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping free of sags and bends and install fittings for changes in direction and branch connections.

D. Use the fewest number of joints belowground and within floor slabs.

E. Install piping at a uniform slope of 0.2 percent upward in the direction of flow.

F. Make reductions in pipe sizes using eccentric reducer fitting installed with level side up.

G. Install branch connections to mains using T-fittings in main with takeoff out the bottom of the main, except for up-feed risers, which shall have swing joint and takeoff out the top of the main line.

H. Install unions in pipes adjacent to each valve, at final connections with each piece of equipment, and elsewhere as indicated.

I. Install flexible connectors at inlet and discharge connections to pumps (except in-line pumps) and other vibration-producing equipment.

J. Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before soldering or brazing.

3.2 VALVE INSTALLATIONS

A. Shutoff Duty: Use gate, ball, or butterfly valves.

B. Throttling Duty: Use globe or ball valves.

C. Install shutoff-duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.

D. Install throttling-duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.

E. Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.

F. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage, consisting of a T-fitting, NPS ¾ ball valve, and short NPS ¾ threaded nipple with hose end connection.

G. Install check valves on each pump discharge and elsewhere as required to control flow direction.

H. Install safety relief valves on hot-water generators and elsewhere as required by authorities having jurisdiction. Pipe discharge to floor drain without valves.

I. Install automatic air vents at high points in the system, and manual air vents at heat-transfer coils, and elsewhere as required for system air venting. Pipe vent drain to nearest condensate drain.

J. Install valves with stem up. Allow clearance above stem for check mechanism removal.

3.3 SPECIALTIES INSTALLATIONS

A. Vent and purge air from hydronic system; charge tank with proper air charge to suit system design requirements.

B. Install control valves, flow switches, temperature sensor wells and other control devices furnished by others.

C. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated.

3.4 TESTING, ADJUSTING, AND BALANCING

A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens.

B. Hydrostatically test completed piping at a pressure one and one-half times operating pressure. Isolate equipment before testing piping. Repair leaks and retest piping until there are no leaks.

C. Balance water flow within distribution system, including submains, branches, and terminals, to indicated quantities as required by Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.5 PIPING SCHEDULE

A. Chilled Water:

1. Schedule 40 black steel pipe.
2. Alternate: Drawn-temper copper tubing with brazed or press-fit joints.

B. Hot Water:

1. Schedule 40 black steel pipe.
2. Alternate: Drawn-temper copper tubing with brazed or press-fit joints.

C. Condensate Drain Lines:

1. Drawn-temper copper tubing with soldered, brazed, or press-fit joints.

END OF SECTION 232113

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data. For each type of pump including certified pump-performance curves, furnished specialties, motor horsepower and electrical characteristics.
2. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with UL 778 for motor-operated water pumps.

B. Furnish and install pumps with performance characteristics as shown on plans. Pumps shall be base mounted, single stage, end suction design with a foot mounted volute to allow removal and service of the entire rotating assembly without disturbing the pump piping, electrical motor connections or pump to motor alignment.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. The pumps shall be close-coupled, inline for vertical or horizontal installation, in cast iron stainless steel fitted construction specifically designed for quiet operation. Suitable standard operations at 225°F and 175 PSIG working pressure. Working pressures shall not be de-rated at temperatures up to 250°F. The pump internals shall be capable of being serviced without disturbing piping connections.

B. As an option an EPR/Carbon/Tungsten/Carbide/SS seal (250°F maximum operating temperature), FKM/Carbon/Ceramic/SS seal, or EPR-Silicon Carbide/Silicon Carbide/SS seal may be used in lieu of the standard Buna/Carbon/Ceramic/SS seal (225° F maximum operating temperature).

C. The pumps shall have a solid alloy steel shaft that is integral to the motor. A non-ferrous shaft sleeve shall be employed to completely cover the wetted area under the seal.

D. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

E. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have a stainless steel housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face

rotating against a stationary ceramic face. (As an option, a stuffing box designed may be used in lieu of the traditional internally flushed mechanical seal design. Pump shall be flushed single seal, flushed double seal, or packing gland type seal arrangements.)

F. Pump shaft shall connect to a stainless steel impeller. Impeller shall be hydraulically and dynamically balanced to Hydraulic Institute Standards ANSI/HI 9.6.4.5-2000. The allowable residual imbalance conforms to ANSI grade 6.3, keyed to the shaft and secured by a stainless steel locking capscrew or nut.

G. Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.

H. Pump volute shall be of a Class 30 cast iron design for heating systems rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. Volute shall include gauge ports at nozzles, and vent and drain ports. The volute shall be designed with a base ring matching an ANSI 125# flange that can be used for pump support.

I. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed-coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.

J. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

K. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.

L. Pump manufacturer shall be ISO-9001 certified.

M. Each pump shall be factory tested and name-plated before shipment.

N. As an option, the pump may include an internal stainless steel casing wear rings.

O. Where noted on schedule pumping equipment may require one or all of the following optional tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.

2.3 ACCESSORIES

A. Where noted on the schedule provide one mechanical seal for each model type of primary pump.

2.4 INTEGRATED VFD WITH SENSORLESS PUMP CONTROL

A. Integrated Pump Controller shall be factory mounted, wired, with a mains disconnect switch and menu-driven graphical interface.

B. Integrated Pump Controller shall provide near unity displacement power factor (cos Ø) without need for external power factor correction capacitors at all loads and speeds using VVC-PWM type integrated controls.

C. Integrated Pump Controller shall include dual DC link reactors equivalent to 5% impedance line reactors, for reduction of mains borne harmonic currents and DC link ripple current to increase DC link capacitor lifetime.

D. Integrated Pump Controller shall have EMI/RFI filters conforming to DIN EN61800-3 to ensure integrated controls meets low emission and immunity requirements.

E. System pressure to be maintained: 30 feet head minimum.

F. Integrated Pump Controller orientation shall be specified as [VL1], [VL2], [VL3], [VL4]

G. Integrated Pump Controller shall support direct communication with the building management system (BMS) with built-in support for the following protocols: [Modbus RTU] [BACnet™ MS/TP] [Metasys N2]

H. Integrated Pump Controller shall be provided in an Enclosure rated to UL Type 12 suitable for indoor operation.

I. Integrated Pump Controller shall support Programmable skip Frequencies and adjustable switching frequency for noise and vibration control.

J. Integrated Pump Controller shall provide a temperature controlled Fan for cooling of the heat sink in the back panel.

K. Integrated Pump Controller shall be rated to operate in ambient working conditions of [14°F to +113°F], up to [3300] feet above sea level.

L. Integrated Pump Controller shall provide 2 Analog inputs (current or voltage) and 1 current output.

M. Integrated Pump Controller shall provide 6 programmable Digital inputs with 2 configurable as outputs.

N. Integrated Pump Controller shall support 2 programmable pulse inputs

O. Integrated Pump Controller shall provide 2 programmable relay outputs

P. Integrated Pump Controller shall provide 1 RS485 communication port

Q. Integrated Pump Controller system software shall be capable of sensorless control in variable volume systems without need for pump mounted (internal/external) or remotely mounted differential pressure sensor.

R. Integrated Pump Controller Sensorless control shall operate under Quadratic Pressure Control (QPC) to ensure head reduction with reducing flow conforms to quadratic control curve.

S. Integrated Pump Controller shall support a minimum head of 40% of design duty head.

T. Integrated Pump Controller shall provide user adjustable control mode settings and minimum/maximum head set points using built-in programming interface.

U. Integrated Pump Controller integrated control software shall be capable of controlling pump performance for non-overloading power at every point of operation.

V. Integrated Pump Controller integrated control software shall be capable of maintaining flow rate data.

2.5 MOTORS

A. Comply with NEMA MG 1 unless otherwise indicated

1. Less than 1/2 HP: Built-in thermal-overload protection.
2. 1/2 to 3 HP: Permanently lubricated ball bearings.
3. 5 HP and Larger: Grease-lubricated ball bearings.
4. Motor shall be non-overloading within full range of pump performance.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pumps with access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

B. Support pumps and piping so weight of piping is not supported by pump volute.

C. Install electrical connections for power, controls, and devices.

D. Connect piping with valves that are at least the same size as piping connecting to pumps.

E. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

F. Install shutoff valve and strainer on suction side of pumps. Install non-slam check valve and shutoff valve, or triple duty valve as indicated on the plans on discharge side of pumps.

END OF SECTION 232123

SECTION 232923 – VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes variable-frequency AC drives (VFDs).

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26, Electrical

1.3 REFERENCES

A. IEEE: Institute of Electrical and Electronics Engineers
   1. IEEE 519: Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

B. NEC: National Electrical Code

C. NEMA: National Electrical Manufacturers Association

1.4 SUBMITTALS

A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

   1. Product Data: Include dimensions, weight, schematic and single-line diagram, total harmonic distortion (THD), standard functions, features, capacities, and details of construction.

1.5 WARRANTY

A. VFDs shall have a minimum warranty of 12 months from the date of certified startup and not less than 18 months from date of manufacture. The warranty shall include all parts, labor, travel time, and expenses. The Contractor shall inform the Port of any extended warranty programs offered by the manufacturer for consideration by the Port.

B. The Contractor shall coordinate with the VFD manufacturer and be responsible for the VFD warranty and all VFD problems incurred during and after installation at the work site, as well as provide and warranty any individual VFD units sent to the manufacturer for required equipment

run testing. Supply technical assistance during testing at the manufacturer's factory, coordinate shipping, and pay for all costs.

PART 2 - PRODUCTS

2.1 VARIABLE-FREQUENCY MOTOR CONTROLLERS

A. Acceptable Manufacturers: Allen Bradley, Robicon, ABB, or equal.

B. General Description:

1. AC motor variable frequency controller (VFC) shall be of pulse width modulated (PWM) inverter type. The VFC shall be designed to convert 60 Hz input power to adjustable frequency output power to provide positive speed control to standard induction motors. The VFC shall be dedicated variable torque design for specific use with centrifugal loads.
2. Provide complete solid state variable frequency power and logic unit.
3. Frequency control shall be stepless throughout the range under variable torque load on a continuous basis. Frequency controlled by remote building energy management system providing 4-20MA input signal to drive and remote start/stop signal. Coordinate with other work of Division 23.
4. Provide adjustable frequency control with diode bridge/capacity input designed to provide high, constant power factor of 0.95 regardless of load or speed and eliminate SCR line noise.
5. Each VFD shall contribute no more than 5 percent total harmonic voltage distortion at the VFD input terminals while operating under full-load conditions. If proposed VFD equipment is anticipated to exceed these limits, multi-pulse converters and/or harmonic filtering devices shall be provided.
6. Equipment shall be designed and manufactured in accordance with applicable NEMA and IEEE recommendations and be designed for installation in accordance with NEC. Equipment shall have UL and/or CSA approval.
7. Control shall be suitable for operation in ambient temperatures of 0 to 40ºC.
8. Every VFD shall be factory tested with an AC induction motor 100 percent loaded and temperature cycled within an environmental chamber at 104ºF.

C. Self Protection and Reliability Features:

1. Adjustable current limit from 60 to 110 percent of drive rating.
2. Adjustable instantaneous over current trip.
3. Under voltage trip.
4. Over temperature trip.
5. Short circuit protection phase to phase and phase to ground faults phase rotation insensitive.
6. Momentary power loss, more than 17 milliseconds.
7. Transient protection against all normal transients and surges in incoming power line.
8. Orderly shutdown in event of any of above conditions, drive shall be designed to shut down safely without component failure.
9. Provide visual indication and manual reset.

D. Standard Features:

1. Drive logic shall be microprocessor based. Control logic shall be isolated from power circuitry.
2. Standalone operation to facilitate startup and troubleshooting procedures.
3. VFD shall have a lockable circuit breaker disconnect and be UL 508C listed for use on distribution systems with 22,000 AIC.
4. Door interlock protection which shall be defeatable by qualified personnel to troubleshoot during operation as required.
5. Input power 460V 60 Hz, 3-phase output voltages shall be equal to applied input voltage.
6. Isolated signal inputs.
7. Frequency Stability: Output frequency shall be held to +0.1 percent of maximum frequency regardless of load, +10 percent input voltage change or temperature changes within ambient specification.
8. Built-in digital display located in panelface shall indicate output frequency, voltage and current and shall provide indication of over current, over voltage, current limit, ground fault, over temperature, input power on, minimum or maximum speed adjustment, power on, and fault condition.
9. Start/Stop Control: Controlled decelerated stop.
10. Primary and secondary fused for a control circuit transformer.
11. Minimum and maximum speed control.
12. Adjustable Accel/Decel: Independently adjustable 10-100 second.
13. Hands-off auto switches.
14. Programmable auto restart after power outage.
15. Fused disconnects shall include auxiliary contacts to isolate control circuit when disconnect is in “off” position.
16. Remote contacts for fault, and on/off status.
17. Adjustable motor output voltage.
18. Analog output voltage of 0-10 VDC, 4-20MA proportional to control output frequency.
19. RS232 communications port, and programming software capability.

E. Additional Features:

1. NEMA 1 enclosure shall isolate each motor starter and control section with its associated disconnect switch.
2. Manual speed control for each motor.
3. Manual bypass shall provide ability to service control while motor is operational.
4. Provide radio frequency and electromagnetic interference noise suppression network to limit radio frequency and electromagnetic interference.
5. Provide isolated analog output signals for volts, amps, and frequency, from each VFD for connection to the building energy management system.
6. Provide line (input) reactors.
7. Provide output filters for all VFD’s located more than 150 conductor feet from the motor they serve.
8. VFD shall be designed to catch a spinning load in forward and reverse direction.
9. Harmonic calculations shall be performed on a manufacturer-supplied harmonic analysis program for conformance with IEEE 519.

F. CSA, ETL, or UL label.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall coordinate with the VFD manufacturer to provide and be responsible for all coordination, application engineering, and startup support to ensure that the VFD is properly selected for each piece of equipment.

3.2 VARIABLE SPEED CONTROLLER INSTALLATION

A. Mount on walls in accordance with the manufacturer's instructions.

B. Coordinate input/output power connections with Division 26.

C. Coordinate control signal with other work of Division 23.

D. Provide startup service by factory authorized technician.

3.3 TESTING

A. Check out, start up, and test systems, equipment, and components specified herein.

B. The Port reserves the right to witness any or all of the aforementioned tests. Provide notice at least 24 hours before testing.

C. Provide, at no additional cost to the Port, any technical assistance or support to ensure the proper testing/performance of the VFD and of the system as a whole. This includes programming of the VFD to coordinate with the manufacturer's operating requirements. Allow 2 hours of startup time per VFD.

D. Provide complete programming information for startup for each VFD. These parameters shall be provided in writing to the Port prior to the startup of the VFD and shall cover the protection, ramp up, ramp down, carrier frequency, and all other necessary parameters.

END OF SECTION 230500

SECTION 233113 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall spiral seam round and flat-oval ducts and fittings.

1.2 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Documentation indicating that duct systems and accessories comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
3. Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning" and Section 6.4.4 - "HVAC System Construction and Insulation."
4. Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-up."
5. For adhesives and sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

F. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems" and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

G. Comply with UL 181 for ducts and closures.

2.2 DUCTS

A. Galvanized-Steel Sheet: ASTM A 653 / A 653M, with G90 hot-dip galvanized coating.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

B. Joint and Seam Tape, and Sealant: Comply with UL 181A.

C. Single-Wall Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Single-Wall Spiral Seam Round Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Single-Wall Spiral Seam Flat-Oval Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Pressure Class: +/- 2 inches w.g.

G. Pressure Class: +/- 3 inches w.g.

H. Fibrous-Glass Liner: Do Not Use.

2.3 ACCESSORIES

A. See Section 233300 “Air Duct Accessories.”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Outdoor, Supply-Air Ducts: Seal Class A.
2. Outdoor, Exhaust Ducts: Seal Class C.
3. Outdoor, Return-Air Ducts: Seal Class C.
4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.

6. Unconditioned Space, Exhaust Ducts: Seal Class C.
7. Unconditioned Space, Return-Air Ducts: Seal Class B.
8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher than 2-Inch wg: Seal Class B.
10. Conditioned Space, Exhaust Ducts: Seal Class B.
11. Conditioned Space, Return-Air Ducts: Seal Class C.

C. Conceal ducts from view in finished and occupied spaces.

D. Avoid passing through electrical equipment spaces and enclosures.

E. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."

F. Fastener Systems for Attachment to Building Structure:

1. Fasteners for Wood Members: Lag screws, bolts, wood screws, and timber connectors for use with structural wood members with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
2. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
3. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

G. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts. Install dampers on all branches where required to balance the system.

H. Install fire and smoke dampers according to UL listing and manufacturer’s installation instructions. Install transformers for 24V actuators.

I. Install fusible links in fire dampers and verify smoke damper control wiring is installed.

J. Insulate ductwork per Section 230713 “HVAC Duct Insulation.”

K. Clean new duct systems before testing, adjusting, and balancing.

3.2 TESTING, ADJUSTING, AND BALANCING

See Section 230593 “Testing, Adjusting, and Balancing.” Balance airflow within distribution systems, including submains, branches, and terminals, to indicated quantities.

END OF SECTION 233113

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air- Conditioning Systems.
3. NFPA 92A - Recommended Practice for Smoke-Control Systems.

C. Sheet Metal and Air Conditioning Contractors' National Association:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 555 - Standard for Safety for Fire Dampers.
2. UL 555C - Standard for Safety for Ceiling Dampers.
3. UL 555S - Standard for Safety for Smoke Dampers.

PART 2 - PRODUCTS

2.1 BACK-DRAFT and RELIEF DAMPERS

A. Manufacturer: Greenheck, Ruskin, Air Balance, or equal.

1. Description: Gravity balanced.
2. Frame: 22 ga. galvanized steel.
3. Blades: 28 ga. galvanized steel.
4. Shaft: Synthetic or stainless steel shaft.
5. Linkage: Galvanized tie bar linkages.
6. Counterweight: As needed for 0.05 in. w.g. relief duct pressure.
7. .

2.2 MANUAL VOLUME DAMPERS

A. Manufacturer: Greenheck, Ruskin, Air Balance, or equal.

B. Round Dampers:

1. Material: 20 ga. galvanized steel.
2. Shaft: 3/8” square plated steel shaft.
3. Quadrant: Factory-mounted with 2” standoff bracket.
4. Suitable for spiral duct applications.

C. Rectangular Multi-Blade Dampers:

1. Material: 22 ga. galvanized steel.
2. Shaft: 3/8” square plated steel shaft.
3. Quadrant: Factory-mounted with 2” standoff bracket.

2.3 CONTROL DAMPERS

A. Manufacturer: Greenheck, Ruskin, Nailor, or equal.

B. Round Dampers:

1. Leakage: 5.7 CFM/SF at 6” wg for 24” damper.
2. Differential Pressure: 10” wg maximum for 6” damper.
3. Velocity: 4,000 fpm maximum for 6” damper.
4. Temperature: 200F maximum.
5. Frame Material: 20 ga. galvanized steel frame
6. Blade Material: 14 ga. galvanized double skin.
7. Finish: Mill finish.
8. Shaft: 1/2” square plated steel shaft.
9. Linkage: Concealed out of air-stream, plated steel, within damper frame.
10. Bearings: Stainless steel.
11. Seals: Full circumference, fire resistant, mechanically fastened EPDM, UL94, 5903 rated.
12. Orientation: Vertical, Horizontal.

C. Rectangular Multi-Blade Dampers:

1. Leakage: 5.4 CFM/SF at 1” wg for 12” damper.
2. Differential Pressure: 5” wg maximum for 12” damper.
3. Velocity: 3,000 fpm maximum for 12” damper.
4. Temperature: -25F to 185F.
5. Material: 16 ga. galvanized steel frame and blades.
6. Finish: Mill finish.
7. Shaft: 1/2” square plated steel shaft.
8. Linkage: Concealed out of air-stream, plated steel, within damper frame.
9. Bearings: Stainless steel, self-lubricating.
10. Seals: Fire resistant, mechanically fastened EPDM, UL94, 5903 rated.
11. Action: Parallel.
12. Orientation: Vertical, Horizontal.

D. Actuators

1. Manufacturer: Belimo or equal.
2. Electric: 24V modulating.
3. Mounting: External side plate.
4. Transformer: Rated for power supply and actuator watts.

2.4 FLANGE CONNECTORS

A. Manufacturer: Ductmate, Durodyne, Cleats, or equal.

B. Manufactured rectangular roll-formed flanged connection system with flanges, corner pieces, gasket, and cleats.

1. Model: 25/35/45
2. Material: Galvanized steel.
3. Cleats: Galvanized
4. Quadrant: Factory-mounted with 2” standoff bracket.
5. Suitable for spiral duct applications.

C. Select system to match duct gauge and class conforming to SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

2.5 TURNING VANES

A. Manufacturer: DuroDyne Inc., Ductmate, Sheetmetal Connectors, or equal.

B. Manufactured Turning Vanes for Metal Ducts: Double wall curved blades of galvanized steel, aluminum or stainless steel sheet, to match duct material; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

2.6 DUCT-MOUNTED ACCESS DOORS

A. Manufacturer: Greenheck, Ruskin, Ductmate, or equal.

B. Insulated Metal Access Doors: Insulated access door constructed of 24 ga. galvanized steel for sizes up to 12 in x 12 in, and 22 ga. galvanized steel for larger sizes.

1. Type: Cam style access door.
2. Rating: Max differential pressure of 4.5 in w.g.
3. Insulation: 1 in fiberglass.
4. Gasket: ½ in wide dual compressible synthetic gasket at door to frame and frame to duct.
5. Latches: plated steel with galvanized steel strikes.

6. Finish: Mill finish.

7. UL tested to 25/50 flame and smoke spread.

2.7 FLEXIBLE CONNECTORS

A. Manufacturer: DuroDyne Inc., Ductmate, Carlisle, or equal.

B. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
2. Net Fabric Width: Approximately 3 inches wide.
3. Metal: 3 inch wide, 24 gauge galvanized steel.

2.8 FLEXIBLE DUCTS: INSULATED

A. Manufacturer: Flexmaster 6M or equal. (Acceptable alternates: Thermaflex, JPL).

B. Insulated Acoustic Flexible Duct.

1. Fabric: Spunbound nylon mechanically locked to duct helix without adhesives.
2. Helix: Galvanized steel.
3. Insulation: Owen's Corning R-6.0.
4. Vapor Barrier: Fire retardant, reinforced aluminum. Resistant to age hardening.
5. Working Pressure: 6" w.g. positive, 5" w.g. negative.
6. UL tested to 25/50 flame and smoke spread.

C. Comply with UL 181, Class 1.

2.9 FIRE DAMPERS

A. Manufacturer: Greenheck, Ruskin, Nailor, or equal.

B. Fire Rating: UL 555 classified, curtain type, and labeled as a 1-1/2 hour static fire damper.

C. Air Flow Rating: UL approved for dual directional air flow.

D. Galvanized steel construction.

E. Rectangular Damper:

1. Blades: Curtain style, out of airstream.
2. Sleeve: Integral sleeve and factory matched one-piece roll formed retaining angles.

F. Round Damper:

1. Blades: Round, in airstream.
2. Frame: Galvanized cinch plates with extended duct connections.

2.10 SMOKE DETECTORS

A. Manufacturer: System Sensor or equal.

B. Photoelectric duct smoke detector, UL listed per UL 268A for use in air handling systems.

1. Velocity: 100 fpm to 4,000 fpm.
2. Testing: Local magnetic switch, or test button on cover.
3. Power: 24VAC, 120VAC.
4. Terminals: 12-18AWG.
5. Air sampling tube with exhaust tube.
6. Annunciator: Peizo type with audible alarm, red alarm LED, green power LED.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install control dampers at roof outside air intake and roof return duct.

B. Install barometric relief damper in roof return duct.

C. Install duct smoke detector, if required, in return duct ahead of outside air intake.

D. Access Doors:

1. Install access doors at the following locations:

a. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
b. At each change in direction and at maximum 50-foot spacing.
c. Upstream from turning vanes.
d. Control devices and equipment requiring inspection, including smoke detection heads.

2. Install access doors with swing against duct static pressure.
3. Access Door Sizes:

a. One-Hand or Inspection Access: 8 by 5 inches.
b. Two-Hand Access: 12 by 6 inches.
c. Head and Hand Access: 18 by 12 inches.

4. Label access doors according to indicate the purpose of access door.

E. Mark access doors for fire and smoke dampers on outside surface, with minimum 1/2 inch high letters reading: FIRE/SMOKE DAMPER, SMOKE DAMPER, OR FIRE DAMPER.

F. Flexible Connectors:

1. Install flexible connectors at duct connections to equipment, at building expansion joints.
2. Install flexible connections with 2 inches slack in fabric and minimum movement of 1 inch.

G. Flexible Ducts:

1. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
2. Connect diffusers with maximum 12 foot lengths of flexible duct clamped or strapped in place.
3. Connect flexible ducts to metal ducts with Panduit strap and foil faced duct tape. Attach to supply air duct with low entrance lass, bellmouth type connector at air inlet end.

H. Install temporary duct test holes and required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

I. Install fire dampers and combination fire and smoke dampers at required locations. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
2. Install dampers square and free from racking with blades running horizontally.
3. Do not compress or stretch damper frame into duct or opening.
4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
6. Install test switch in electrical room near FACP (Fire Alarm Control Panel).

J. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts and as indicated. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install volume dampers at the following locations:
2. At all splits.
3. In ducts serving single supply, return and exhaust outlets.
4. Where required for balancing.
5. Install steel volume dampers in steel ducts.

END OF SECTION 233300

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated, including color charts for factory finishes.

PART 2 - PRODUCTS

2.1 DIFFUSERS

A. Square Ceiling Diffusers:

1. Manufacturer: Price, Titus, Nailor, or equal.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Mounting: T-bar or surface.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Grille:

1. Manufacturer: Price, Titus, Nailor, or equal.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Mounting: Duct or surface.

B. Fixed-Face Grille:

1. Manufacturer: Price, Titus, Nailor, or equal.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Mounting: Duct or surface.

C. Perforated grille:

1. Manufacturer: Price, Titus, Nailor, or equal.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Mounting: T-bar.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel unless otherwise indicated. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 235216 - CONDENSING BOILERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.

B. Related Sections:

1. Section 23113 “HYDRONIC PIPING” for specialties.
2. Section 23123 “HYDRONIC PUMP” for hot water system pump.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. Minimum Efficiency: Comply with ASHRAE/IESNA 90.1 and 10 CFR 430, Subpart B, Appendix N. Boiler shall operate at a minimum of 97% combustion and thermal efficiency at full fire.

D. Low NOx: Boiler shall certified by an independent test laboratory to meet the requirements of the SCAQM in Southern California for NOx emissions.

E. Approvals: Boiler shall be manufactured, configured, and certified for installation in North Carolina.

F. Warranties: Submit a written warranty executed by Contractor agreeing to repair or replace heat exchangers that fail in materials or workmanship within [**10**] years from date of Substantial Completion.

2.2 PULSE-COMBUSTION CONDENSING BOILERS

A. Manufacturer: Lochinvar or approved equal.

B. Description: Factory-fabricated, -assembled, and -tested, pulse-combustion condensing boiler with heat exchanger sealed pressure-tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

C. Boiler Characteristics and Capacities:

1. Heating Medium: Hot water.
2. Maximum Design Pressure Rating: 160 psig.
3. Entering-Water Temperature: 100 deg F.
4. Leaving-Water Temperature: 140 def F.
5. Water Flow Rate: 75 GPM.
6. Maximum Pressure Drop: 2.2 psig.
7. Minimum Efficiency: 97%.
8. Water Capacity: 11.9 gallons.
9. AGA Output Capacity: 489,000 BTUH.
10. Turndown Ratio: 10:1.

D. Features:

1. ASME stainless steel heat exchanger.
2. ASME pressure relief valve.
3. Direct spark ignition.
4. Low NOx operation.
5. Microprocessor controls with touch screen LCD display.
6. Modbus protocol.
7. Outdoor temperature reset.
8. 0-10 VDC input.
9. 5 pump control
10. Pump relay with freeze protection.
11. Low water cutoff.

E. Accessories:

1. Boiler pump rated for 75 GPM at 18 FT HD.
2. Condensate neutralization kit.
3. Double wall stainless steel gas vent: Heatfab Saf-T-Vent or equal.
4. Galv. Intake vent.
5. Intake hood and exhaust cap.
6. Storage tank with ASME relief valve.
7. High capacity air vent.
8. Automatic air vent.
9. Pressure reducing valve.
10. ASME bladder type expansion tank.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install boiler per manufacturer's instructions.

B. Install boilers level on and anchor to concrete base.

C. Install gas-fired boilers according to NFPA 54. Connect gas piping full size to boiler gas-train inlet with union.

D. Connect piping to supply and return boiler tappings with shutoff valves.

E. Connect air intake and vent to boiler.

F. Install control wiring for operation of boiler pump and related accessories.

END OF SECTION 235216

SECTION 238216.11 - HYDRONIC AIR COILS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
2. Include rated capacities, operating characteristics, and pressure drops for each air coil.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Factory tested and rated according to AHRI 410 and ASHRAE 33 to 300 psig.

B. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325 deg F.

C. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.2 HYDRONIC AIR COILS

A. Manufacturer: Greenheck, Precision Coil, USA Coil & Air, or equal.

B. Components:

1. Copper Tubes: ASTM B 743, 0.020” tube wall minimum.
2. Aluminum Fins: 0.006”, sine type.
3. Headers: Copper with drain and air vent tappings.
4. Connections: MPT same end.
5. Frames: 16 ga. galv. flanged mounting.

C. Chilled Water Coil Characteristics:

1. Number of Rows: 8 row minimum.
2. Number of Fins: 10 fpi minimum.
3. Refer to schedule for capacities and pressure drops.

D. Hot Water Coil Characteristics:

1. Number of Rows: 1 row minimum.
2. Number of Fins: 13 fpi minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install coils, level and plumb, in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

B. Verify size and installation requirements for air handling unit chilled water cooling coil prior to submitting coil for approval.

C. Install chilled water cooling coil in existing outdoor air air handling unit.

D. Install new stainless steel drain pan under cooling coil. Construct drain pan with connection for drain; complying with ASHRAE 62.1.

E. Install reheat coil in ductwork with flanged connections.

F. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

G. Install piping adjacent to coils to allow service and maintenance.

H. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping.

END OF SECTION 238216.11

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

2.2 CONDUCTORS AND CABLES

A. Conductors and Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW, Type THHN/THWN, or Type XHHW.

B. Cable Type SEU: Comply with UL 854, with Type THHN/THWN conductors complying with UL 83 or Type XHHW2 conductors complying with UL 44.

C. Cable Type UF-B: Comply with UL 493, with Type THHN/THWN conductors complying with UL 83.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Feeders and Branch Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Service Entrance: Type THHN/THWN, single conductors in raceway

C. Class 2 Control Circuits: Type THHN/THWN, in raceway.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

B. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

C. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

D. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

E. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

F. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

G. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Use manufacturer-approved pulling compound or lubricant where necessary.

H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

I. Make splices, terminations, and taps that are compatible with conductor material. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors. Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

J. Identify conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Contractor will engage a qualified testing agency to perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding all critical equipment and services for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Cables will be considered defective if they do not pass tests and inspections.

B. Test and Inspection Reports: Prepare a written report showing procedures used, results complying with requirements, and corrective action taken to achieve compliance.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of product indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Industry standard.

2.3 GROUNDING MATERIALS

A. Conductors: Solid for No. 8 AWG and smaller; stranded for No. 6 AWG and larger unless otherwise indicated.

1. Insulated Conductors: **Copper** wire or cable insulated for 600 V unless otherwise required by applicable code or authorities having jurisdiction.
2. Bare, Solid-Copper Conductors: Comply with ASTM B 3.
3. Bare, Stranded-Copper Conductors: Comply with ASTM B 8.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Underground Grounding Conductors: Install bare copper conductor, sized per N.E.C. Bury at least 24 inches (600 mm) below grade.

B. Pipe and Equipment Grounding-Conductor Terminations: Bolted.

C. Underground Connections: Welded.

D. Connections to Structural Steel: Bolted.

E. Install grounding conductors routed along shortest and straightest paths possible unless otherwise indicated or required by code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

F. Install ground rods driven into ground until tops are 2 inches (50 mm) below final grade or 4 inches (100 mm) above finished floor slab unless otherwise indicated.

G. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape.

H. Make connections without exposing steel or damaging coating if any.

I. Install bonding straps and jumpers in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

J. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

K. Bond to equipment mounted on vibration isolation hangers and supports so vibration is not transmitted to rigidly mounted equipment.

L. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding-conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

M. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.

1. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
2. Perform tests by fall-of-potential method according to IEEE 81.
3. Report measured ground resistances that exceed 25 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data for steel, slotted support systems.
2. Shop Drawings signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents. The rated strength of supports are to be adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

B. Comply with NFPA 70.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16” diameter holes at a maximum of 8” o.c., in at least one surface.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings.

E. Mounting, Anchoring, and Attachment Components:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.

C. Raceway Support Methods: In addition to methods described in NECA 1, EMT,IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

D. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.

E. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lbs.

F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded, threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69. Spring-tension clamps.
6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.2 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Shop Drawings for custom enclosures and cabinets.

B. Seismic qualification certificates for enclosures, cabinets, conduit racks, and mounting provisions.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Galvanized Rigid Conduit: Comply with ANSI C80.1 and UL 6.

C. Intermediate Metal Conduit (IMC): Comply with ANSI C80.6 and UL 1242.

D. Electrical Metallic Tubing (EMT): Comply with ANSI C80.3 and UL 797.

E. Flexible Metal Conduit (FMC): Comply with UL 1; zinc-coated steel.

F. Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, complying with UL 360.

G. Raceway Fittings: Specifically designed for raceway type used in Project.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Electrical Nonmetalic Tubing: Comply with NEMA TC 13 and UL 1653.

C. Rigid Nonmetallic Conduit (RNC): Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Raceway Fittings: Specifically designed for raceway type used in Project.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, and Type 12 unless otherwise indicated, and sized according to NFPA 70.

1. Fittings: Specifically designed for raceway type used in Project.
2. Covers: [**Hinged type**] [**Screw-cover type**] unless otherwise indicated.
3. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy , Type FD, with gasketed cover.

C. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural-load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Outdoor Raceways Applications:

1. Exposed or Concealed: IMC.
2. Underground, Single Run: RNC.
3. Connection to Vibrating Equipment: LFMC.

4. Boxes and Enclosures: Metallic, NEMA 250, Type 3R or Type 4.

B. Indoor Raceways Applications:

1. Exposed or Concealed: EMT.
2. Connection to Vibrating Equipment: FMC; in wet or damp locations, use LFMC.
3. Damp or Wet Locations: IMC.
4. Boxes and Enclosures: Metallic, NEMA 250, Type 1, unless otherwise indicated.

C. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

E. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch thick concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch (27-mm) trade size, parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

F. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

G. Install pull wires in empty raceways.

H. Connect motors and equipment subject to vibration, noise transmission, or movement with a 72-inch (1830-mm) maximum length of flexible conduit.

I. Install raceways and cables concealed within finished walls, ceilings, and floors unless otherwise indicated.

J. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

K. Installation of Hangers and Supports:

1. Comply with NECA 1 and NECA 101 for installation requirements, except as specified in this article.

2. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
3. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, as permitted in NFPA 70.
4. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.
5. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
6. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated or required by Code:

    a. To Wood: Fasten with lag screws or through bolts.
    b. To New Concrete: Bolt to concrete inserts.
    c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    d. To Existing Concrete: Expansion anchor fasteners.
    e. To Steel: Welded, threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 Spring-tension clamps.
    f. To Light Steel: Sheet metal screws.
    g. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

7. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

END OF SECTION 260533

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each product indicated.
2. Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 2.

C. Comply with NFPA 70.

D. Comply with UL 891.

E. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 SWITCHBOARDS

A. Sq D, Siemens, G.E. or equal.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Front-Connected, Front-Accessible Switchboard: Fixed, individually mounted main device, panel-mounted branches, and rear-aligned sections.

D. Nominal System Voltage: 480Y/277.

E. Main-Bus Continuous: 600.

F. Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260500 "Common Work Results for Electrical."

G. Enclosures: Steel, NEMA 250, Type 1.

H. Enclosure Finish: Manufacturer's standard gray finish.

I. Utility Metering Compartment: Fabricated barrier compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

J. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

K. Phase and Neutral Buses and Connections: Three phase, four wires unless otherwise indicated.

1. Ground Bus: 1/4-by-2-inch (6-by-50-mm) minimum size, copper.
2. Neutral Buses: 100 percent of the ampacity of phase buses.

L. Future Devices: With mounting brackets, supports, bus connections, at full rating of compartment.

2.3 SURGE- PROTECTIVE DEVICES

A. Sq D, Siemens G.E. or Equal

B. Integrally mounted, complying with UL 1449 Type 1, surge-protection device.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with root-mean-square sensing, field-replaceable rating plug or field-replicable electronic trip, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I2t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

C. Insulated-Case Circuit Breaker: 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I2t response.

4. Remote trip indication and control.

D. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.

1. Sq. D, Siemens, G.E., or Equal

2. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

    a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
    b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

3. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
4. Service-Rated Switches: Labeled for use as service equipment.
5. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

    a. Configuration: [**Integrally mounted**] [**Remote-mounted**] relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

6. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

    a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
    b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

7. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.

8. Service-Rated Switches: Labeled for use as service equipment.

9. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

E. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.5 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1 and the following:

1. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems, to include the following:

1. Phase Currents, Each Phase: Plus or minus 1 percent.
2. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
3. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
4. Megawatts: Plus or minus 2 percent.
5. Megavars: Plus or minus 2 percent.
6. Power Factor: Plus or minus 2 percent.
7. Frequency: Plus or minus 0.5 percent.
8. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.
9. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent. Accumulated values unaffected by power outages up to 72 hours.
10. Communications Interface: Comply with ASHRAE 135. The communication interface shall enable the BAS operator to remotely select, monitor, and record metered values.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store, and install switchboards and accessories according to [**NECA 400**] [**NEMA PB 2.1**].

B. Install and anchor switchboards level on concrete bases, 4-inch (100-mm) nominal thickness.

1. For switchboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Set field-adjustable switches and circuit-breaker trip ranges.

3.2 IDENTIFICATION

A. Switchboard Nameplates: Label each switchboard compartment.

3.3 FIELD QUALITY CONTROL

A. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Acceptance Tests:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

END OF SECTION 262413

SECTION 262713 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Shop Drawings.

B. Coordinate with utility companies for services and components they furnish.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

C. Meter Sockets: Comply with requirements of electrical power utility company.

D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

E. Modular Meter Center: Factory-coordinated assembly of a main service terminal box with lugs only, wireways, tenant meter socket modules, and tenant feeder circuit breakers arranged in adjacent vertical sections. Assembly shall be complete with interconnecting buses and other features as specified below:

1. Manufacturers: Square D, Siemens, Cutler Hammer or equal.

2. Comply with requirements of utility company for meter center.
3. Housing: NEMA 250, Type 3R enclosure.
4. Minimum Short-Circuit Rating: 65,000 A symmetrical at rated voltage.
5. Main Disconnect Device: As indicated on plans.
6. Surge Protective Device: Integrally mounted, complying with UL 1449 Type 1.
7. Tenant Feeder Circuit Breakers: Series-combination-rated molded-case units, rated to protect circuit breakers in downstream tenant and to house loadcenters and panelboards that have 10,000-A interrupting capacity.

    a. Identification: Provide legend identifying tenant's address.
    b. Physical Protection: Tamper resistant, with hasp for padlock.

8. Meter Socket: Rating coordinated with indicated tenant feeder circuit rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install equipment for utility company metering. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads, and extend grounding connections as required by utility company.

C. Install modular meter center according to NECA 400 switchboard installation requirements.

END OF SECTION 262713

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product.
2. Maintenance Material Submittals: Quantity equal to **10** percent of each fuse type and size, but no fewer than two of each type and size.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIRMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

2.2 CARTRIDGE FUSES

A. Manufacturers: Bussman, Littlefuse, Shawmut

B. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

A. Cabinet: Gray, baked-enamel finish; wall-mounted, steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 10 percent spare capacity minimum.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class L, time delay.

B. Feeders: Class RK1, time delay.

C. Motor Branch Circuits: Class RK5, time delay.

D. Large Motor Branch (601-4000 A): Class L, time delay.

E. Power Electronics Circuits: Class J, high speed.

F. Other Branch Circuits: Class RK1, time delay.

G. Control Transformer Circuits: Class CC, time delay, control-transformer duty.

3.2 INSTALLATION

A. Install fuses so rating information is readable without removing fuse.

B. Install labels indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

C. Install spare-fuse cabinet(s).

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMNTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Fusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, Type GD, that accommodate specified fuses, and with lockable handle interlocked with cover in closed position.

1. Manufacturers: Sq.D, Siemens, Cutler Hammer, or approved equal

B. Nonfusible Switches, 600 A and Smaller: UL 98 and NEMA KS 1, [Type GD] [Type HD], with lockable handle interlocked with cover in closed position.

1. Manufacturers: Sq.D, Siemens, Cutler Hammer, or approved equal

C. Shunt-Trip Switches: Comply with UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

1. Manufacturers: Sq.D, Siemens, Cutler Hammer, or approved equal

2.3 MOLDED-CASE CIRCUIT BREAKERS

1. Manufacturers: Sq.D, Siemens, Cutler Hammer, or approved equal

B. ption: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with field-adjustable instantaneous trip settings.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
5. GFEP Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Features and Accessories:

1. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
2. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.4 ENCLOSURES

A. NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.5 SUPPORT AND ANCHORAGE COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.

1. Channel Dimensions: Selected for structural loading.

B. Raceway and Cable Supports: As described in NECA 1.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and fittings.

D. Mounting, Anchoring, and Attachment Components:

1. Powder-Actuated Fasteners: Threaded-steel stud.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated, for use in hardened portland cement concrete.
3. Concrete Inserts: Steel or malleable-iron, slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, high strength; complying with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.
8. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings and matched to type and size of anchor bolts and studs used.

9. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings and matched to type and size of attachment devices used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

C. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.

D. Install electrical equipment to allow right of way for piping and conduit installed at required slope.

E. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.

F. Install required supporting devices in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

G. Install fuses in fusible devices.

H. Comply with NECA 1.

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections, and prepare test reports:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

END OF SECTION 262816

SECTION 264313 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Comply with IEEE C62.41.2, and test devices according to IEEE C62.45.

C. Comply with UL 1449.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Manufacturers: ABB, Leviton, Bussman, or approved equal.

B. Surge Protective Devices (SPD): Field mounted, complying with UL 1449 Type 1.

1. Comply with IEEE C62.41, Category C, 200-kA short-circuit current rating.
2. Non-modular type with the following features and accessories:

    a. Integral disconnect switch.
    b. LED indicator lights for power and protection status.

C. Protection modes and UL 1449 voltage protection rating (VPR) for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall be as follows:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1800 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

D. Protection modes and UL 1449 Vpk for 240/120 V, single-phase, three-wire circuits shall be as follows:

1. Line to Neutral: 600 V.
2. Line to Ground: 1000 V.
3. Line to Line: 1000 V.

2.3 PANELBOARD SUPPRESSORS

A. Manufacturers: ABB, Leviton, Bussman, or approved equal.

B. SPDs: Field-mounted, complying with UL 1449 Type 1.

1. Comply with IEEE C62.41, Category C, 200-kA short-circuit current rating.
2. Non-modular type with the following features and accessories:

a. Integral disconnect switch.
b. LED indicator lights for power and protection status.

C. Protection modes and UL 1449 Vpk for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall be as follows:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1800 V for 480Y/277 V.
3. Neutral to Ground: 1000 V for 480Y/277 V.
4. Line to Line: 2000 V for 480Y/277 V.

D. Protection modes and UL 1449 Vpk for 240/120-V, single-phase, three-wire circuits shall be as follows:

1. Line to Neutral: 600 V.
2. Line to Ground: 1000 V.
3. Neutral to Ground: 600 V.
4. Line to Line: 1000 V.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1 .

B. Outdoor Enclosures: NEMA 250, Type 3R .

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not energize or connect service entrance equipment or panelboards to their sources until transient-voltage surge-suppression devices are installed and connected.

END OF SECTION 264313

HVAC RENOVATIONS

FOR THE

GREENE STREET CENTER

201 S. GREENE STREET, GREENSBORO, NORTH CAROLINA

DESIGN PROFESSIONALS

MECHANICAL ENGINEER: R. CRAIG PRITCHARD, PE

R. C. PRITCHARD ENGINEERING SERVICES
212 KIRK ROAD
GREENSBORO, NC 27455
336-382-3831

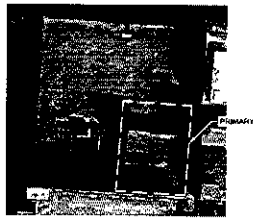
ELECTRICAL ENGINEER: DAN O. CAMPBELL, PE

DAN CAMPBELL ENGINEERING, PA
911 SOUTH CHAPMAN STREET
GREENSBORO, NC 27403
336-370-4980

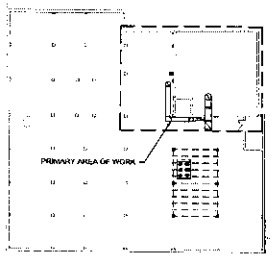
DRAWING INDEX

APPENDIX B BUILDING CODE SUMMARY NOTE

THE APPENDIX B BUILDING CODE SUMMARY SHEET IS NOT BEING PROVIDED AS THERE ARE NO CHANGES TO THE BUILDING OCCUPANCY CLASSIFICATION, FLOOR PLAN, OR RATED WALLS. THE WORK OF THIS PROJECT IS HVAC RENOVATIONS ONLY.



1 / G0-1 SITE PLAN
NO SCALE



2 / G0-1 KEY PLAN
1/32" = 1'-0"

R. C. PRITCHARD
ENGINEERING SERVICES
212 KIRK ROAD
GREENSBORO, NC 27455
PHONE: 336-382-3831

02/23/2018

GREENE STREET CENTER - HVAC RENOVATIONS
201 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

REV	DATE	DESCRIPTION
0	02/23/18	ISSUED FOR CONSTRUCTION

PROJECT #:	2017-0107
AHR PROJECT #:	NA
SCG ID:	NA
SCALE:	AS NOTED
DRAWN BY:	MDH
CHECKED BY:	RCP
DATE:	02/23/2018

SHEET TITLE
COVER

SHEET
G0-1

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608

MECHANICAL NOTES

GENERAL

[illegible]

EQUIPMENT

[illegible]

MATERIALS

[illegible]

HVAC CONTROLS

[illegible]

EXECUTION

[illegible]

MECHANICAL SUMMARY

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT

METHOD OF COMPLIANCE: PRESCRIPTIVE
CLIMATE ZONE: 4A

EXTERIOR DESIGN CONDITIONS
- WINTER: [illegible] DB
- SUMMER: [illegible] DB / [illegible] WB

INTERIOR DESIGN CONDITIONS
- WINTER: 70F DB
- SUMMER: 72F DB/50% RH

BUILDING LOADS
- COOLING LOAD: 1,200.9 MBH (107.8 TONS)
- HEATING LOAD: 631.2 MBH

MECHANICAL SPACE CONDITIONING SYSTEM
- AIR HANDLING UNIT HOT WATER BOILER
  - DESCRIPTION: NOMINAL 500 MBH NATURAL GAS FIRED DIRECT-VENTED CONDENSING BOILER
  - HEATING EFFICIENCY: 97.7% THERMAL EFFICIENCY
  - HEATING OUTPUT: [illegible] MBH
  - SIZE CATEGORY: [illegible]
- BUILDING HEATING BOILER
  - DESCRIPTION: EXISTING 1,500 MBH NATURAL GAS BOILER; PRIMARY BUILDING HEAT AND AHU BACKUP HEATING
  - HEATING OUTPUT: 1,[illegible] MBH
- CHILLER
  - DESCRIPTION: EXISTING NOMINAL 100 TON AIR-COOLED CHILLER

EQUIPMENT EFFICIENCIES: EXISTING FAN MOTORS (VARIOUS)

DESIGNER STATEMENT
TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE DESIGN OF THIS BUILDING COMPLIES WITH MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT REQUIREMENTS OF THE ENERGY CODE.

SIGNED: SEE SEAL SIGNATURE
NAME: R. CRAIG PRITCHARD PE
TITLE: ENGINEER

RATED WALL LEGEND

——— — — — — ———	4 HOUR RATED WALL
——— — — ——— — — ———	2 HOUR RATED WALL
——— — ——— — ——— — ———	1 HOUR RATED WALL

RATED WALL NOTES

1. RATED WALL LIMITS ARE BASED ON AS-BUILT DOCUMENTS FURNISHED BY THE OWNER AND LIMITED VISUAL INSPECTION. RATED WALLS ARE SHOWN ONLY IN THE AREA OF THE WORK. WHERE SHOWN ON THE PLANS, RATED WALLS ARE SHOWN FOR REFERENCE ONLY. VERIFY ALL EXISTING CONDITIONS AND REPORT ANY DEVIATIONS TO THE ENGINEER BEFORE BEGINNING THE WORK.
2. THERE ARE NO CHANGES TO EXISTING WALLS OTHER THAN THE INSTALLATION OF TWO FIRE DAMPERS IN THE BREAKROOM CORRIDOR ON THE FIRST FLOOR FOR THE PURPOSE OF TRANSFER AIR.
3. MAINTAIN ALL RATED WALLS AND ASSEMBLIES.

NOTE ON EXISTING CONDITIONS

1. EXISTING CONDITIONS SUBJECT TO LIMITED VISUAL INSPECTION. VERIFY ALL DIMENSIONS AND SIZES PRIOR TO BEGINNING THE WORK. REPORT ALL DEVIATIONS AFFECTING THE WORK TO THE ENGINEER.
2. VERIFY EXISTING TRANSFER GRILLES ARE IN PLACE TO ALLOW FOR FLOW OF OUTDOOR AIR TO ALL CEILING PLENUMS. REPORT OBSTRUCTIONS TO THE ENGINEER PRIOR TO COMPLETION OF THE WORK AND TESTING AND BALANCING.

MECHANICAL LEGEND

SUPPLY DUCT
RETURN DUCT
EXHAUST DUCT
FIRE DAMPER
MANUAL DAMPER
SUPPLY DIFFUSER - LAYIN
RETURN GRILLE - LAYIN
EXHAUST GRILLE - LAYIN
SUPPLY GRILLE - SURFACE MOUNT
RETURN GRILLE - SURFACE MOUNT
EXHAUST GRILLE - SURFACE MOUNT
EXHAUST FAN - TOILET
MARK / SIZE / CFM — AIR DISTRIBUTION TAG
ANNUNCIATOR (SMOKE DETECTOR)
HUMIDISTAT
HUMIDITY SENSOR
OCCUPANCY SENSOR
SENSOR
THERMOSTAT
TEMPERATURE SENSOR
PUMP
GATE VALVE
BALL VALVE
CHECK VALVE
TRIPLE DUTY VALVE
TWO-WAY CONTROL VALVE
THREE-WAY CONTROL VALVE
RELIEF VALVE
PRESSURE REDUCING VALVE
BACKFLOW PREVENTER
AIR RELIEF VENT
FLOW SWITCH
THERMOMETER / PRESSURE GAUGE
STRAINER
REDUCER
UNION
ELL DN
ELL UP
TEE DN
TEE UP
CONNECT TO EXISTING

ABBREVIATIONS

AAV	AUTOMATIC AIR VENT
AHU	AIR HANDLING UNIT
BP	BOILER PUMP
BFP	BACKFLOW PREVENTER
CD	CONDENSATE PIPE
CT	CONDENSATE TANK
CW	CITY WATER
CWP	CONDENSER WATER PUMP
CWS/R	CONDENSER WATER SUPPLY / RETURN
CHWP	CHILLED WATER PUMP
CHWS/R	CHILLED WATER SUPPLY / RETURN
CWT	CONDENSER WATER TANK
CHWT	CHILLED WATER TANK
EA	EXHAUST AIR
FD	FLOOR DRAIN
HCAV	HIGH CAPACITY AIR VENT
HWP	HOT WATER PUMP
HWS/R	HOT WATER SUPPLY / RETURN
MAV	MANUAL AIR VALVE
NG	NATURAL GAS
OA	OUTDOOR AIR
PNL	PANEL
PRV	PRESSURE REDUCING VALVE
L/S/T R	REFRIGERANT PIPE - LIQUID & SUCTION
RA	RETURN AIR
RL	RELIEF
RLV	RELIEF VALVE
RPZ	REDUCED PRESSURE ZONE (BFP)
SA	SUPPLY AIR
TDV	TRIPLE DUTY VALVE
XT	EXPANSION TANK
VFD	VARIABLE FREQUENCY DRIVE

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04/24/2018

GREENE STREET CENTER - HVAC RENOVATIONS
201 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

REV	DATE	DESCRIPTION
0	[illegible]	ISSUED FOR CONSTRUCTION
1	[illegible]	ADDED ALTERNATE #1

PROJECT #:	2017-0107
ARHQJECT #:	NA
SCO ID:	NA
SCALE:	AS NOTED
DRAWN BY:	RCP
CHECKED BY:	RCP
DATE:	02/23/2018

SHEET TITLE
MECHANICAL NOTES

SHEET
M0-1

EXISTING AIR HANDLING UNIT SCHEDULE

MARK	MFR	MODEL	SUPPLY FAN CAPACITY – DESIGN SA CFM	DESIGN MAX OA CFM	DESIGN MIN OA CFM	ESP (IN WG)	TSP (IN WG)	RPM	MAX HP	HP	VOLTAGE
AHU1	TRANE	CLCH50	7,245	7,245	0	N/A	2.75	881	9.93	10.0	460/60/3

MARK	NEW COOLING COIL (8 ROW / 10 FPI MINIMUM) AIR TEMP. °F ENT. DB	ENT. WB	LVG. DB	LVG. WB	CAPACITY TOTAL BTUH	CAPACITY SENSIBLE BTUH	MAX GPM	MAX COIL PD (FT HD)	MAX AIR PD (IN WG)	CONTROL VALVE (Cv)
AHU1	94.0	74.0	49.6	49.5	570,500	354,500	113.7	15.8	0.80	44.4

MARK	HEATING COIL (2 ROW / 8 FPI MINIMUM) AIR TEMP. °F ENT.	AIR LVG.	WATER TEMP. °F ENT.	WATER LVG.	CAPACITY SENSIBLE BTUH	MAX GPM	MAX COIL PD (FT HD)	MAX AIR PD (IN WG)	MAX VALVE (Cv)	FLAT FILTER SECTION (~~MERV 8~~ MERV 13) PD (IN WG) PRE-FILTER INT.	PRE-FILTER FINAL	FINAL INT.	FINAL FINAL
AHU1	15.0	70.0	140.0	100.0	434,337	21.7	N/A	N/A	10.4	0.25	0.75	——	——

DESCRIPTION:

EXISTING TRANE CLCH50 CLIMATE CHANGER.

NOTES:

1. PERFORMANCE AND CAPACITY DATA SUBJECT TO LIMITED VISUAL INSPECTION AND BASED ON LIMITED FACTORY DATA.
2. REPLACE FAN DRIVE AS NEEDED TO ADJUST AIR FLOWS TO NEW DESIGN.
3. MEASURE AND VERIFY MOTOR AND COIL PERFORMANCE.
4. INSTALL NEW CHILLED WATER COOLING COIL PER SCHEDULE.

COOLING COIL:

NEW COOLING COIL TO BE PRECISION COIL CW58S08S10-30x98 LH OR EQUAL WITH 2½" CONNECTIONS, ⅝" COPPER TUBES, 8 ROWS, 0.006 ALUMINUM FINS, 10 FPI

AHU1 CONTROL VALVES

MARK	SIZE	GPM	Cv
CHILLED WATER	2"	113.7	44.4
HOT WATER	3/4"	21.7	10.4
REHEAT	1/2"	7.6	3.8

NOTES:

1. HOT WATER VALVES TO BE 2-WAY.
2. CHILLED WATER VALVE TO BE 3-WAY.
3. VALVES TO BE CHARACTERIZED LINEAR RESPONSE

BOILER SCHEDULE

MARK	MFR	MODEL	BURNER MFR	BURNER MODEL	GAS INPUT	OUTPUT	BOILER HP	FUEL	GAS INLET PR.	GAS MAN. PR.	KVA	FAN HP	MCA	MOCP	VOLTAGE	REMARKS
B1	RAYPACK	H-1631A	PER MFR	PER MFR	1,630 SCFH	1,304 MBH	38.95 BoHP	NAT. GAS	7" - 14" W.C.	PER MFR	——	——	——	——	120/1/60	EXISTING BUILDING HEATING BOILER
B2	LOCHINVAR	FTXL - FTX500N	PER MFR	PER MFR	500 SCFH	489 MBH	14.61 BoHP	NAT. GAS	7" - 14" W.C.	PER MFR	——	½	6.0	20	120/1/60	NEW CONDENSING BOILER FOR AHU1

DESCRIPTION (B2):

LOCHINVAR FTXL SERIES OR EQUAL HIGH EFFICIENCY NATURAL GAS CONDENSING BOILER WITH 10 YEAR LIMITED WARRANTY.

GENERAL FEATURES:

CONDENSING DESIGN WITH UP TO 98.0% THERMAL EFFICIENCY
10:1 TURNDOWN RATIO
ASME STAINLESS STEEL HEAT EXCHANGER
DIRECT SPARK IGNITION
ASME PRESSURE RELIEF VALVE
LOW NOx OPERATION

CONTROL FEATURES:

MICROPROCESSOR CONTROLS WITH TOUCH SCREEN LCD DISPLAY
MODBUS PROTOCOL
OUTDOOR TEMPERATURE RESET
0-10 VDC INPUT
5 PUMP CONTROL
PUMP RELAY WITH FREEZE PROTECTION
LOW WATER CUTOFF

ACCESSORIES:

PUM3001 BOILER PUMP - ½ HP, 115V, 75 GPM @ 18FT
KIT3087 CONDENSATE NEUTRALIZATION

PUMP SCHEDULE

MARK	MFR	MODEL	LOCATION	TYPE	SERVICE	GPM	FT HD	RPM	HP	VOLTAGE
HWP2	B&G	e-80 1.5x1.5x7C	B2	INLINE	HOT WATER	30	30	1800	1.0	208/60/3

DESCRIPTION:

B&G OR EQUAL INLINE HIGH EFFICIENCY VARIABLE SPEED DRIVE CENTRIFUGAL PUMPS.

ACCEPTABLE ALTERNATE MFR'S:

TACO, ARMSTRONG

FEATURES:

VARIABLE SPEED DRIVE AND SENSORLESS CONTROL TECHNOLOGY
CAST IRON BODY / CARBON STEEL SHAFT
VERTICAL MOUNTING
BUNA CARBON-CERAMIC SEALS
5.75" SS IMPELLER / SS PARTS
PREMIUM EFFICIENT MOTOR
175 PSIG WORKING PRESSURE

ACCESSORIES:

TRIPLE DUTY VALVE

VARIABLE FREQUENCY DRIVES

MARK	MFR	MODEL	HP	VOLTAGE	REMARKS
AHU1	ABB	ACH550-UH-07A5-2	10.0	460/60/3	MOUNT ON WALL NEXT TO CONTROL PANELS
HWP2	B&G	WITH HWP2	1.0	208/60/3	PUMP MOUNTED

NOTE:

ABB OR EQUAL STANDARD VARIABLE FREQUENCY DRIVES WITH BACNET INTERFACE

REHEAT COIL

MARK	MFR	MODEL	TYPE	UNIT SERVED	HEATING CAPACITY (MINIMUM) AIR FLOW	VELOCITY	AIR PD	EAT	LAT	GPM	EWT	LWT	WPD	HEATING OUTPUT
RHC1	GREENHECK	HW58F01S13-RH	1 ROW - 13 FPI CU TUBE / AL FIN	AHU1	7,245 CFM	603.8 FPM	0.11 IN W.G.	52°F	70°F	7.1	140°F	100°F	5.0 FT	142,147 BTUH

DESCRIPTION:

GREENHECK OR EQUAL HORIZONTAL AIR FLOW HOT WATER COIL WITH 0.020" COPPER TUBES, 0.006" ALUMINUM FINS, AND GALVANIZED CASING.

FEATURES:

HORIZONTAL AIR FLOW / VERTICAL INSTALLATION
⅞" CONNECTIONS
1½" CASING FLANGES

ACCESSORIES:

AUTOMATIC AIR VENT
CIRCUIT SETTER

ACCEPTABLE ALTERNATE MFR'S:

PRECISION COIL, USA COIL & AIR

SMOKE DETECTORS

SD SYSTEM SENSOR OR EQUAL DH100ACDCLP DUCT MOUNTED WITH SAMPLING TUBE

AN SYSTEM SENSOR OR EQUAL APA451 PEIZO ANNUNCIATOR WITH AUDIBLE ALARM

NOTES:

1. INTERLOCK SMOKE DETECTOR TO THE ANNUCIATOR LOCATED IN THE MECHANICAL ROOM.
2. VERIFY EXISTING SMOKE DETECTOR AND INSTALL NEW SMOKE DETECTOR AND ANNUNICIATOR AS REQUIRED.

CONTROL DAMPERS

MARK	MFR	MODEL	SIZE	REMARKS
D1, 2	RUSKIN	CD-36	PER PLAN	16 GA. GALV. FRAME, EPDM SEALS, BELIMO 24V ACTUATOR

DESCRIPTION:

RUSKIN OR EQUAL LOW LEAKAGE CONTROL DAMPER.

ACCEPTABLE ALTERNATE MFR'S:

GREENHECK, NAILOR

OUTDOOR AIR SCHEDULE

ZONE	SPACE	CLASSIFICATION	NO. OCC	OA/OCC	AREA SF	OA/SF	OA (Vbz)	ZONE (Vbz)	ZONE (Voz)	REMARKS
BASE-MENT	ENTRY LOBBY	LOBBY	4	5.0	410	0.06	44.6			
	RECEPTION	RECEPTION	16	5.0	515	0.06	110.9			
	OFFICES	OFFICE	35	5.0	5283	0.06	492.0			
	CONFERENCE ROOMS	CONFERENCE ROOM	14	5.0	270	0.06	86.2			
	BREAK ROOM	BREAK ROOM	12	5.0	237	0.12	84.4			
	STORAGE & FILE STORAGE	STORAGE	——	——	3724	0.06	223.4			
	CORRIDORS	CORRIDORS	——	——	2730	0.06	163.8			
	FUTURE	ALLOWANCE	15	5.0	——	——	75.0	1280.3	1600.4	1620 CFM ACTUAL
FIRST FLOOR	ENTRY LOBBY	LOBBY	9	5.0	902	0.06	99.1			
	RECEPTION	RECEPTION	24	5.0	799	0.06	168.0			
	OFFICES	OFFICE	26	5.0	4128	0.06	377.7			
	CONFERENCE ROOMS	CONFERENCE ROOM	31	5.0	615	0.06	191.9			
	CLASSROOMS	LECTURE CLASSROOM	32	7.5	1434	0.06	326.0			ACTUAL SEATING CAPACITY
	BREAK ROOM	BREAK ROOM	21	5.0	419	0.12	156.3			
	WORK - COPY ROOM	COPY ROOM	3	5.0	533	0.06	47.0			
	STORAGE	STORAGE	——	——	565	0.06	33.9			
	CORRIDORS	CORRIDORS	——	——	1655	0.06	99.3			
	FUTURE	ALLOWANCE	21	5.0	——	——	105.0	1603.2	2004.0	2100 CFM ACTUAL
SECOND FLOOR	ENTRY LOBBY	LOBBY	6	5.0	586	0.06	65.2			
	RECEPTION	RECEPTION	24	5.0	772	0.06	166.3			
	OFFICES	OFFICE	45	5.0	4898	0.06	518.9			
	CONFERENCE ROOMS	CONFERENCE ROOM	13	5.0	256	0.06	80.4			
	BREAK ROOM	BREAK ROOM	14	5.0	278	0.12	103.4			
	WORK - COPY ROOM	COPY ROOM	1	5.0	139	0.06	13.3			
	STORAGE	STORAGE	——	——	110	0.06	6.6			
	CORRIDORS	CORRIDORS	——	——	3402	0.06	204.1			
	FUTURE	ALLOWANCE	10	5.0	——	——	50.0	1208.2	1510.3	1525 CFM ACTUAL
THIRD FLOOR	ENTRY LOBBY	LOBBY	7	5.0	631	0.06	72.9			
	RECEPTION	RECEPTION	15	5.0	496	0.06	104.8			
	OFFICES	OFFICE	52	5.0	9032	0.06	801.9			
	CONFERENCE ROOMS	CONFERENCE ROOM	46	5.0	890	0.06	283.4			
	BREAK ROOM	BREAK ROOM	10	5.0	186	0.12	72.3			
	WORK - COPY ROOM	COPY ROOM	2	5.0	341	0.06	30.5			
	STORAGE	STORAGE	——	——	660	0.06	39.8			
	CORRIDORS	CORRIDORS	——	——	1835	0.06	110.1			
	FUTURE	ALLOWANCE	14	5.0	——	——	70.0	1585.7	1982.1	2000 CFM ACTUAL
AHU1 TOTAL									7096.8	ACTUAL AHU1 O.A. = 7245 CFM

NOTES:

ZONE AIR DISTRIBUTION EFFECTIVENESS - E_z = 0.80 PER NC MC TABLE 403.3.1.2 WITH $V_{oz} = V_{bz} / E_z$.

ADJUST ZONE OUTDOOR AIR RATES AS SHOWN.

FIRE DAMPER SCHEDULE

MARK	MFR	MODEL	STYLE	SIZE	RATING	REMARKS
FD	GREENHECK	IBD2A	CURTAIN	PER PLAN	1½ HR	UL555 RATED WITH FIELD INSTALLED SLEEVE

NOTES:

GREENHECK OR EQUAL 1½ HR FIRE DAMPER WITH FIELD INSTALLED SLEEVE.

ACCEPTABLE ALTERNATE MFR'S:

RUSKIN, NAILOR

RELIEF DAMPER (RETURN DUCT)

MARK	MFR	MODEL	SIZE	REMARKS
RD1	GREENHECK	WD-320	(2) 38"x24"	GALV. FRAME, ALUMINUM BLADE - MOUNT IN EXISTING DAMPER SLEEVE

DESCRIPTION:

GREENHECK OR EQUAL BACKDRAFT DAMPER FOR RELIEF APPLICATION.

ACCEPTABLE ALTERNATE MFR'S:

RUSKIN, NAILOR

HYDRONIC SPECIALTIES SCHEDULE

MARK	ITEM	MFR	MODEL	DESCRIPTION	MCA	MOCP	VOLTAGE	REMARKS
BFP1	RPZ BACKFLOW PREVENTER	WATTS	LF009M2QTS	WATTS OR EQUAL ¾" RPZ BACKFLOW PREVENTER WITH QUARTER-TURN BALL VALVES, BRONZE STRAINER, AIR GAP AND ELBOW AS REQUIRED FOR DRAIN TO EXTERIOR, 10 GPM @ 12 PSIG DIFFERENTIAL, ASSE 1013 (ALT: AMES, WILKINS)				INSTALL IN EXISTING CITY WATER LINE FOR MAKEUP WATER TO CHILLED WATER AND HOT WATER SYSTEMS PER LATEST CITY OF GREENSBORO RPZ BACKFLOW PREVENTER STATEMENTS.
CT1	CHILLED WATER STORAGE TANK	CEMLINE	V500CWB-4F-C-05-1	CEMLINE OR EQUAL 42"Øx90"H STEEL 500 GAL. CHILLED WATER BUFFER TANK, ASME STAMPED FOR 125 PSIG WORKING PRESSURE, WITH 12"x16" MANHOLE, ¾" AIR VENT, ½" ELASTOMERIC INSULATION, INTERNAL BAFFLE, 4" FLANGED INLET AND OUTLET, 1½" DRAIN, AND 4 LEG STANDS.				INSTALL DRAIN VALVE AND PIPE DRAIN TO NEAREST FLOOR DRAIN. PIPE AIR VENT DISCHARGE DOWN TO FLOOR WITH ⅜" O.D. COPPER TUBING.
HWT1	HOT WATER BUFFER TANK	LOCHINVAR	BVU120	LOCHINVAR OR EQUAL 120 GAL ASME HEATING BUFFER TANK WITH (4) 2" NPT TAPPINGS				INSTALL DRAIN VALVE AND PIPE DRAIN TO NEAREST FLOOR DRAIN. PIPE AIR VENT DISCHARGE DOWN TO FLOOR WITH ⅜" O.D. COPPER TUBING.
HCAV	HIGH CAPACITY AIR VENT	B&G	107A	B&G OR EQUAL HIGH CAPACITY CAST IRON AIR VENT (AIR SEPARATOR?)				
AAV	AUTOMATIC AIR VENT	B&G	87	B&G OR EQUAL AUTOMATIC AIR VENT				
XT	EXPANSION TANK	B&G	B-130LA	B&G OR EQUAL 34 - 27 GAL ASME BLADDER TYPE EXPANSION TANK (VERIFY SIZE)				
PRV	PRESSURE REDUCING VALVE	B&G	B7-12	B&G OR EQUAL ¾" PRESSURE REDUCING VALVE FOR CITY WATER, 12 PSIG OUTLET PRESSURE				
RLV	RELIEF VALVE	B&G	790-125	B&G OR EQUAL 125 PSIG ASME PRESSURE RELIEF VALVE				HT1
TDV	TRIPLE DUTY VALVE	B&G	3DS-2S	B&G OR EQUAL 2" STRAIGHT PATTERN TRIPLE DUTY VALVE				HWP2

EXHAUST AIR SCHEDULE

ZONE	SPACE	CLASSIFICATION	CLASS	NO. FIX'S	EA/FIX	AREA SF	EA/SF	EA CFM	DESIGN	ZONE TOT	REMARKS
BASE-MENT	GROUP RESTROOMS	TOILET ROOM - PUBLIC	2	6	70	——	——	420.0	420.0		
	INDIVIDUAL RESTROOMS	TOILET ROOM - PUBLIC	2	2	75	——	——	150.0	150.0		
	JANITOR'S CLOSET	JANITOR CLOSET	2	——	——	26	1.0	26.0	50.0		
	MECHANICAL ROOM	GENERAL	2	——	——	444	1.0	444.0	450.0	1070.0	CONNECT TO EXISTING DUCT
FIRST FLOOR	GROUP RESTROOMS	TOILET ROOM - PUBLIC	2	9	70	——	——	630.0	630.0		
	JANITOR'S CLOSET	JANITOR CLOSET	2	——	——	26	1.0	26.0	50.0	680.0	
SECOND FLOOR	GROUP RESTROOMS	TOILET ROOM - PUBLIC	2	8	70	——	——	560.0	560.0		
	INDIVIDUAL RESTROOMS	TOILET ROOM - PUBLIC	2	4	75	——	——	300.0	300.0		(3) EXHAUST DIRECT TO EXTERIOR
	JANITOR'S CLOSET	JANITOR CLOSET	2	——	——	26	1.0	26.0	50.0	910.0	
THIRD FLOOR	GROUP RESTROOMS	TOILET ROOM - PUBLIC	2	9	70	——	——	630.0	630.0		
	JANITOR'S CLOSET	JANITOR CLOSET	2	——	——	26	1.0	26.0	50.0	680.0	
AHU1 TOTAL										3340.0	ACTUAL EXHAUST RATE

NOTE:

ADJUST EXHAUST RATES AS SHOWN.

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SEAL — 02/23/2018

GREENE STREET CENTER - HVAC RENOVATIONS
221 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

REV	DATE	DESCRIPTION
0	02/23/18	ISSUED FOR CONSTRUCTION

PROJECT #:	2017-0107
APROJECT #:	NA
SCO ID:	NA
SCALE:	AS NOTED
DRAWN BY:	RCP
CHECKED BY:	RCP
DATE:	02/23/2018

SHEET TITLE
MECHANICAL SCHEDULES

SHEET
M0-2

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608

MECHANICAL NOTES

GENERAL NOTES:

1. MECHANICAL PLANS ARE PARTIAL. NOT ALL EXISTING DUCTWORK AND AIR DISTRIBUTION IS SHOWN.
2. RATED WALLS SHOWN FOR REFERENCE ONLY, THERE ARE NO CHANGES TO EXISTING WALLS.
3. FIRE DAMPERS ARE EXISTING UNLESS NOTED OTHERWISE.
4. INSTALL NEW FIRE DAMPERS WITH SLEEVES FOR TRANSFER AIR WHERE INDICATED.
5. INSPECT CEILING PLENUM WALLS AND NOTIFY ENGINEER OF ANY OBSTRUCTIONS THAT WOULD IMPEDE THE FLOW OF OUTDOOR AIR TO THE SPACES.
6. INSTALL BALANCE DAMPERS AS SHOWN.
7. BALANCE SUPPLY AIR, RETURN AIR, AND EXHAUST AIR TO INDICATED RATES.
8. INSTALL OCCUPANCY SENSORS AND SPACE CO_2/HUMIDITY SENSORS AS SHOWN FOR DEMAND CONTROLLED VENTILATION AND CONTROL OF SPACE HUMIDITY.

KEYED NOTES:

1. INSTALL NEW BALANCE DAMPER AS NEEDED.
2. INSTALL SLEEVE WITH FIRE DAMPER FOR TRANSFER AIR.
3. INSTALL SLEEVE FOR TRANSFER AIR IN NON-RATED WALL.
4. INSTALL OCCUPANCY SENSOR FOR DEMAND CONTROLLED VENTILATION AND CONTROL OF TOILET EXHAUST FAN.
5. INSTALL CO_2 / HUMIDITY SENSORS.
6. INSTALL OCCUPANCY SENSORS FOR CONTROL OF CLASSROOM EXHAUST.
7. INSTALL PRICE MODEL 530D 12x12 OR EQUAL EXHAUST GRILLE IN MECHANICAL ROOM. ADJUST EXHAUST RATE TO 450 CFM.
8. TIE 12x10 EXHAUST RISER FROM ABANDONED LAB HOOD TO 24x10 EXHAUST RISER IN DUCT CHASE. REMAINDER OF 12x10 RISER TO BE ABANDONED.

NATURAL GAS NOTES

GENERAL NOTES:

1. NATURAL GAS PIPING DESIGN IS BASED ON LESS THAN 2 PSIG LOW PRESSURE SUPPLY. NOTIFY THE ENGINEER IF PRESSURE IS OTHER THAN LOW PRESSURE.
2. VERIFY EXISTING METER CAPACITY AND PRESSURE WITH THE UTILITY COMPANY PRIOR TO BEGINNING THE WORK.
3. NEW GAS PIPING TO CONNECT TO CONNECT TO EXISTING METER AND RUN TO NEW CONDENSING BOILER IN THE MECHANICAL ROOM.
4. GAS PIPING TO BE REMOVED OR ALTERED SHALL BE VENTED TO THE OUTDOORS AND PURGED IN ACCORDANCE WITH SECTION 406.7 OF THE NC FUEL GAS CODE. INSTALL ¾" CAPPED PURGE/TEST PORT NEAR CONNECTION TO METER.
5. SUPPORT NEW PIPE WITH CODE APPROVED SUPPORTS CONFORMING TO NC FUEL GAS CODE SECTION 407.2 AND MSS SP-58. ATTACH TO EXTERIOR WALL WITH ANGLE BRACKETS OR UNISTRUT.
6. SPACE SUPPORTS PER NC FUEL GAS CODE TABLE 415.1.
7. NATURAL GAS PIPING SHALL BE PAINTED BY THE CONTRACTOR INSTALLING THE PIPE. PAINT PIPE WITH TWO COATS OF RUSTOLEUM SYSTEM 5200 DTM ACRYLIC ENAMEL SAFETY YELLOW OR EQUAL.
8. IDENTIFY EXPOSED GAS PIPING WITH YELLOW LABELS WITH BLACK LETTERS MARKET "GAS" AT INTERVALS NOT EXCEEDING 5 FT PER NC FUEL GAS CODE SECTION 401.5.

NATURAL GAS CALCULATIONS

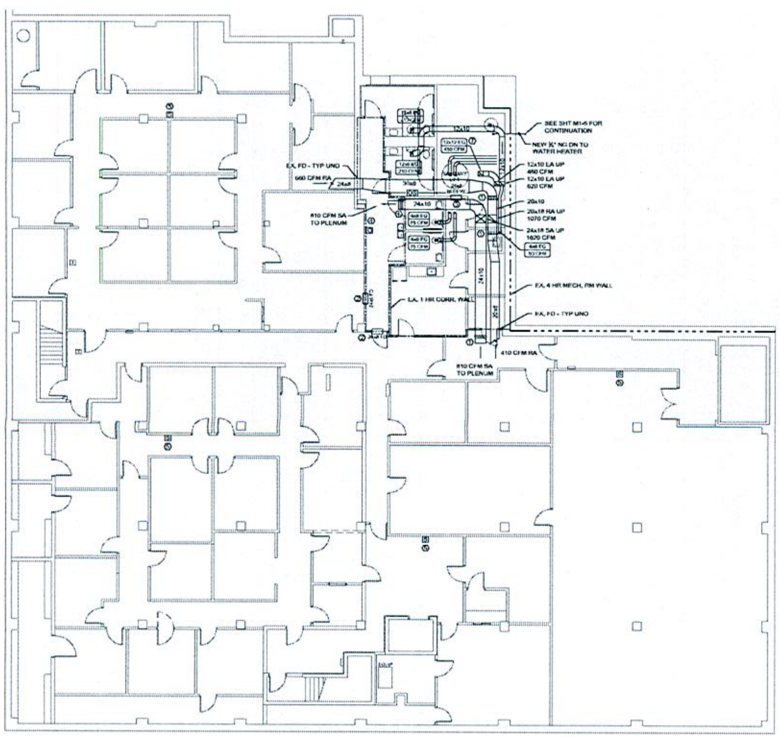
NATURAL GAS EQUIPMENT SCHEDULE:

EXISTING RAYPACK BOILER	@ 1,630 MBH
NEW CONDENSING BOILER	@ 500 MBH
TOTAL DEMAND	2,130 MBH

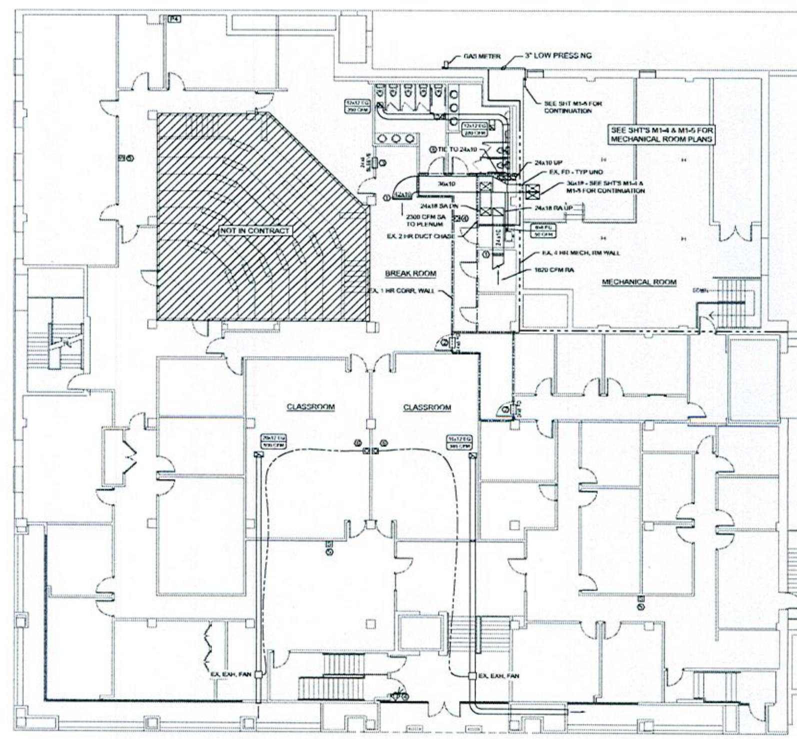
NATURAL GAS PIPING CALCULATIONS:

EQUIVALENT LENGTH TO NEW BOILER = 200 FT
3" PIPE CAPACITY @ < 2 PSIG INLET PRESSURE = 2,240 SCFH
2" PIPE CAPACITY @ < 2 PSIG INLET PRESSURE = 794 SCFH

PIPE CAPACITIES EXCEED REQUIREMENTS PER NC FGC TABLE 402.4(2)



1 M1-1 PARTIAL BASEMENT MECHANICAL PLAN
3/32" = 1'-0"



2 M1-1 PARTIAL FIRST FLOOR MECHANICAL PLAN
3/32" = 1'-0"

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02/23/2018

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GUILFORD COUNTY FACILITIES AND PARKS
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DRAWN BY:	RCP
CHECKED BY:	RCP
DATE:	02/23/2018

SHEET TITLE
BASEMENT & FIRST FLOOR MECHANICAL PLANS

SHEET
M1-1

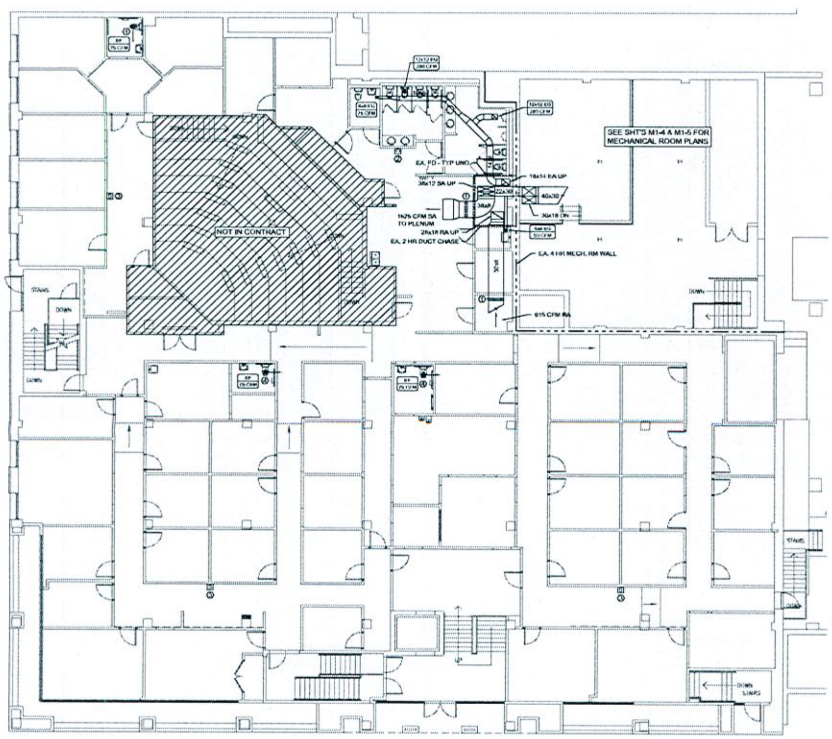
MECHANICAL NOTES

GENERAL NOTES:

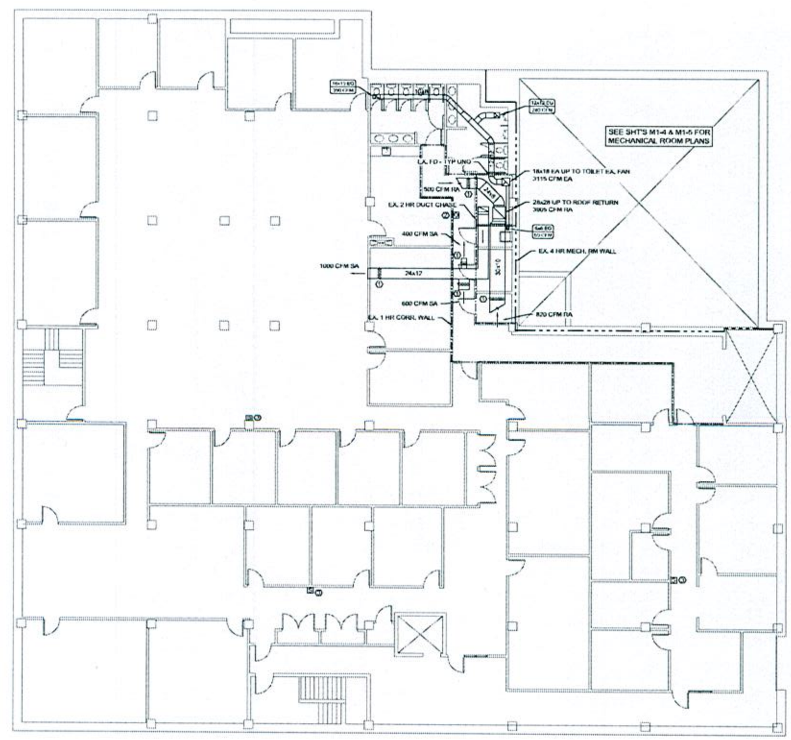
1. MECHANICAL PLANS ARE PARTIAL. NOT ALL EXISTING DUCTWORK AND AIR DISTRIBUTION IS SHOWN.
2. RATED WALLS SHOWN FOR REFERENCE ONLY. THERE ARE NO CHANGES TO EXISTING WALLS.
3. FIRE DAMPERS ARE EXISTING UNLESS NOTED OTHERWISE.
4. INSPECT CEILING PLENUM WALLS AND NOTIFY ENGINEER OF ANY OBSTRUCTIONS THAT WOULD IMPEDE THE FLOW OF OUTDOOR AIR TO THE SPACES.
5. INSTALL BALANCE DAMPERS AS SHOWN.
6. BALANCE SUPPLY AIR, RETURN AIR, AND EXHAUST AIR TO INDICATED RATES.
7. INSTALL OCCUPANCY SENSORS AND SPACE CO_2/HUMIDITY SENSORS AS SHOWN FOR DEMAND CONTROLLED VENTILATION AND CONTROL OF SPACE HUMIDITY.

KEYED NOTES:

(1) INSTALL NEW BALANCE DAMPER AS NEEDED.
(2) INSTALL OCCUPANCY SENSOR FOR FOR DEMAND CONTROLLED VENTILATION CONTROL OF TOILET EXHAUST FAN.
(3) INSTALL CO_2 / HUMIDITY SENSORS.
(4) DIRECT EXHAUST TO EXTERIOR OF BUILDING.



1 M1-2 PARTIAL SECOND FLOOR MECHANICAL PLAN
3/32" = 1'-0"



2 M1-2 PARTIAL THIRD FLOOR MECHANICAL PLAN
3/32" = 1'-0"

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02/23/2018

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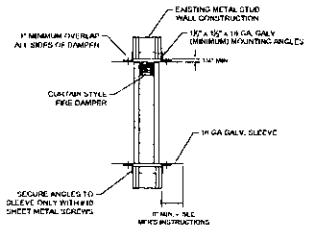
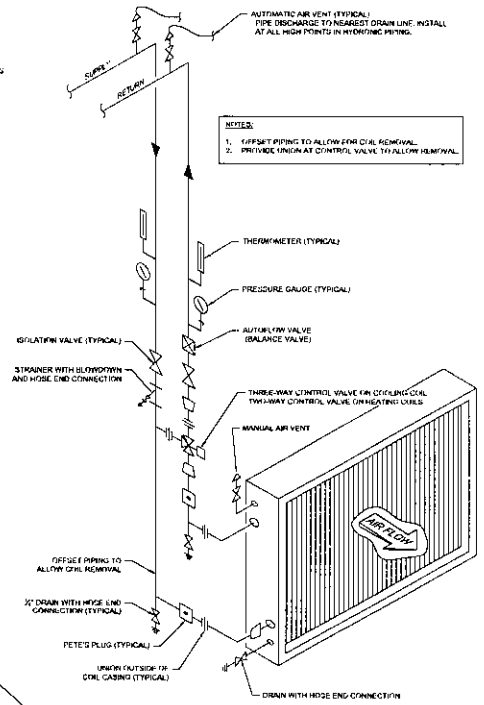
CHECKED BY:	RCP
DATE:	02/23/2018

SHEET TITLE
SECOND & THIRD FLOOR MECHANICAL PLANS

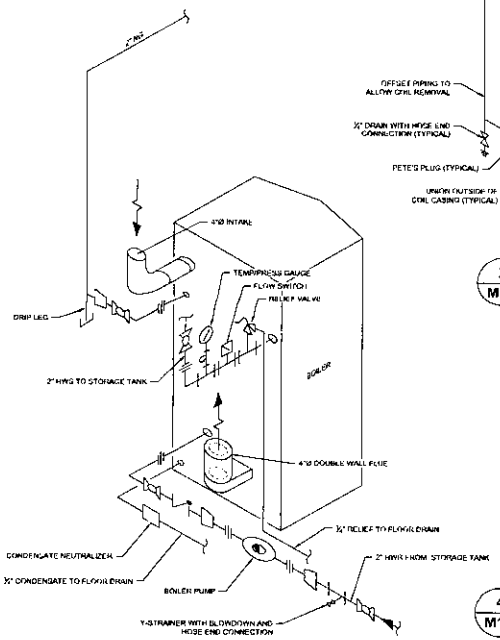
SHEET
M1-2



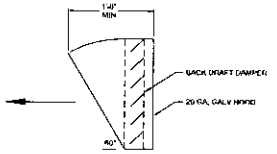
1 M1-3 **TYPICAL FIRE DAMPER**
NTS



2 M1-3 **TYPICAL COIL CONNECTION**
NTS



3 M1-3 **BOILER PIPING DETAIL**
NTS



4 M1-3 **RELIEF DAMPER HOOD DETAIL**
1" = 1'-0"

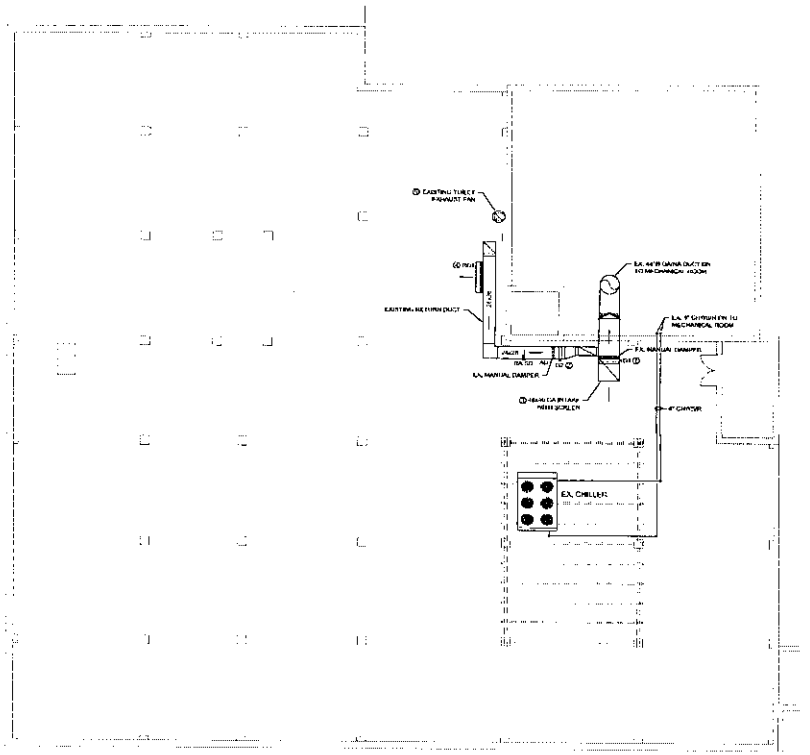
MECHANICAL NOTES

GENERAL NOTES:

1. INSTALL CONTROL DAMPERS AND RELIEF DAMPERS AS SHOWN ADJUST AIR FLOWS TO INDICATED RATES. REFER TO SHEET M0-2 AND M2-1 FOR DETAILS.

KEYED NOTES:

1. INSTALL NEW OUTDOOR AIR CONTROL DAMPER.
2. INSTALL NEW RETURN AIR CONTROL DAMPER.
3. BLANK OFF BOTTOM OF OUTSIDE AIR INTAKE 12" TO ALLOW INSTALLATION OF CONTROL DAMPER.
4. INSTALL NEW RELIEF DAMPER IN HOOD 12"W. FROM EXISTING ELL. SEE DETAIL THIS SHEET.
5. ADJUST TOILET EXHAUST FAN MATL AS INDICATED ON SHEETS M0-2 AND M2-1 AFTER BALANCING EXHAUST RATES ON EACH FLOOR.



1 M1-3 **PARTIAL ROOF MECHANICAL PLAN**
3/32" = 1'-0"

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09/25/2018

GREENE STREET CENTER - HVAC RENOVATIONS
201 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

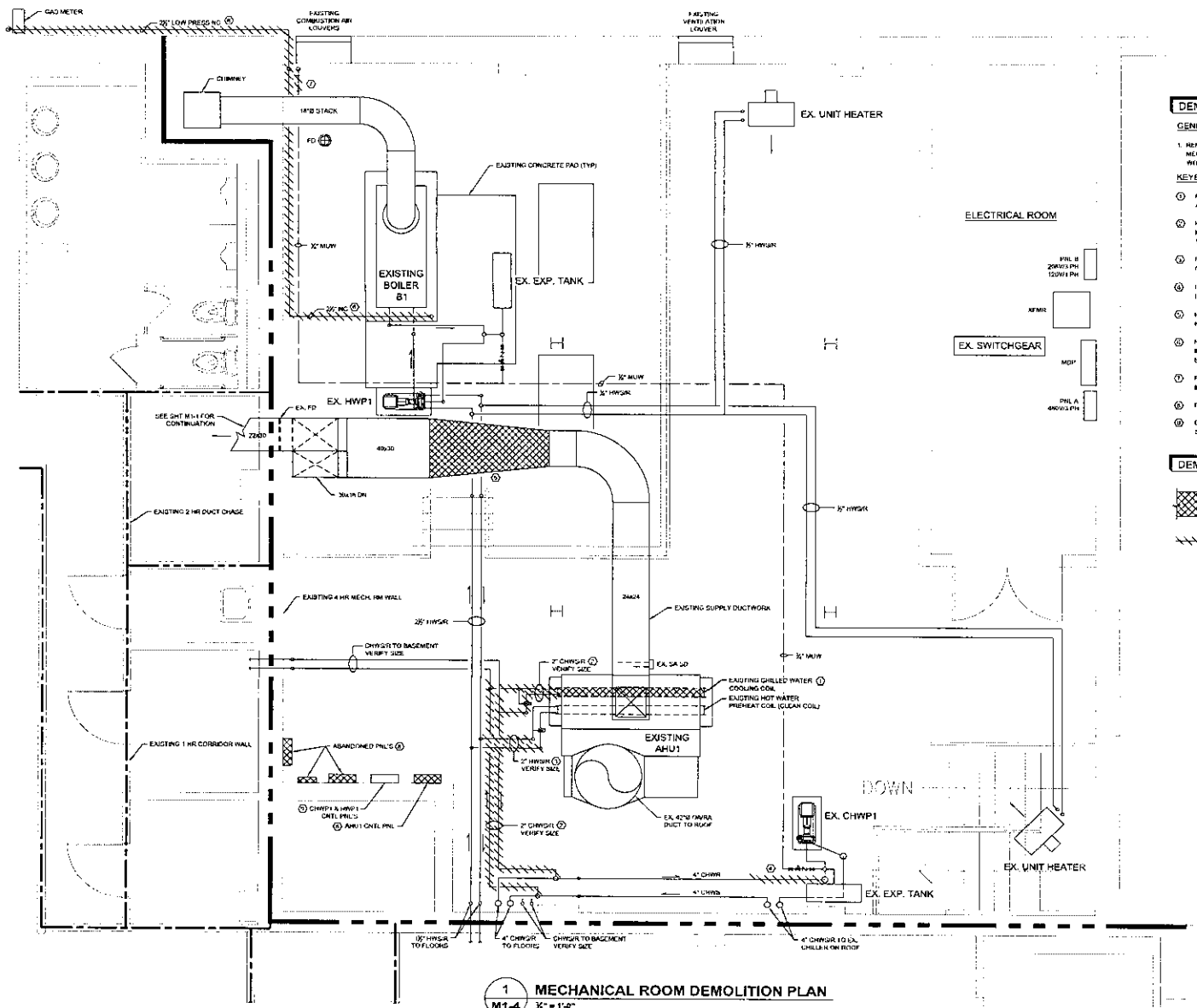
REV	DATE	DESCRIPTION
0	10/21/18	95% ED FOR CONSTRUCTION

PROJECT #:	2017-4107
ARCHITECT #:	NA
BCID ID:	NA
SCALE:	AS NOTED
DRAWN BY:	MTH
CHECKED BY:	RCP
DATE:	09/25/2018

SHEET TITLE
ROOF MECHANICAL PLAN & DETAILS

SHEET
M1-3

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608



1 M1-4 **MECHANICAL ROOM DEMOLITION PLAN**
3/4" = 1'-0"

DEMOLITION NOTES

GENERAL NOTE:

1. REMOVE EXISTING EQUIPMENT, DUCTWORK, AND PIPING IN THE MECHANICAL ROOM AS SHOWN. COORDINATE THE TIMING OF THE WORK WITH THE OWNER'S SCHEDULE.

KEYED NOTES:

1. REMOVE EXISTING CHILLED WATER COIL FROM AIR HANDLING UNIT AHU1.
2. REMOVE EXISTING CHILLED WATER PIPING TO ALLOW FOR INSTALLATION OF NEW CHILLED WATER COIL, PIPING, AND CONTROL VALVES. CLEAN EXISTING PREHEAT COIL.
3. REMOVE EXISTING HOT WATER PIPING TO ALLOW FOR CONNECTION OF NEW HOT WATER PIPING AND CONTROL VALVES.
4. REMOVE EXISTING CHILLED WATER PIPING TO ALLOW FOR INSTALLATION OF NEW CHILLED WATER BUFFER TANK.
5. REMOVE EXISTING DUCTWORK TO ALLOW FOR INSTALLATION OF NEW HOT WATER REHEAT COIL.
6. REMOVE EXISTING NATURAL GAS PIPING TO ALLOW FOR INSTALLATION OF LARGER NATURAL GAS PIPE TO FEED EXISTING BOILER AND NEW BOILER.
7. REMOVE EXISTING CITY WATER PIPING TO ALLOW FOR INSTALLATION OF NEW RPZ BACKFLOW PREVENTER.
8. REMOVE EXISTING CONTROL PANELS.
9. EXISTING CHWP1 AND HWP1 CONTROL PANEL TO BE RELOCATED. SEE SHEET M1-2.

DEMOLITION LEGEND

DUCT OR EQUIPMENT TO BE REMOVED

PIPING TO BE REMOVED

R. C. PRITCHARD
ENGINEERING SERVICES
RCPE
212 KIRK ROAD
GREENSBORO, NC 27455
PHONE: 336-282-9831

03/25/2019

GREENE STREET CENTER - HVAC RENOVATIONS
221 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

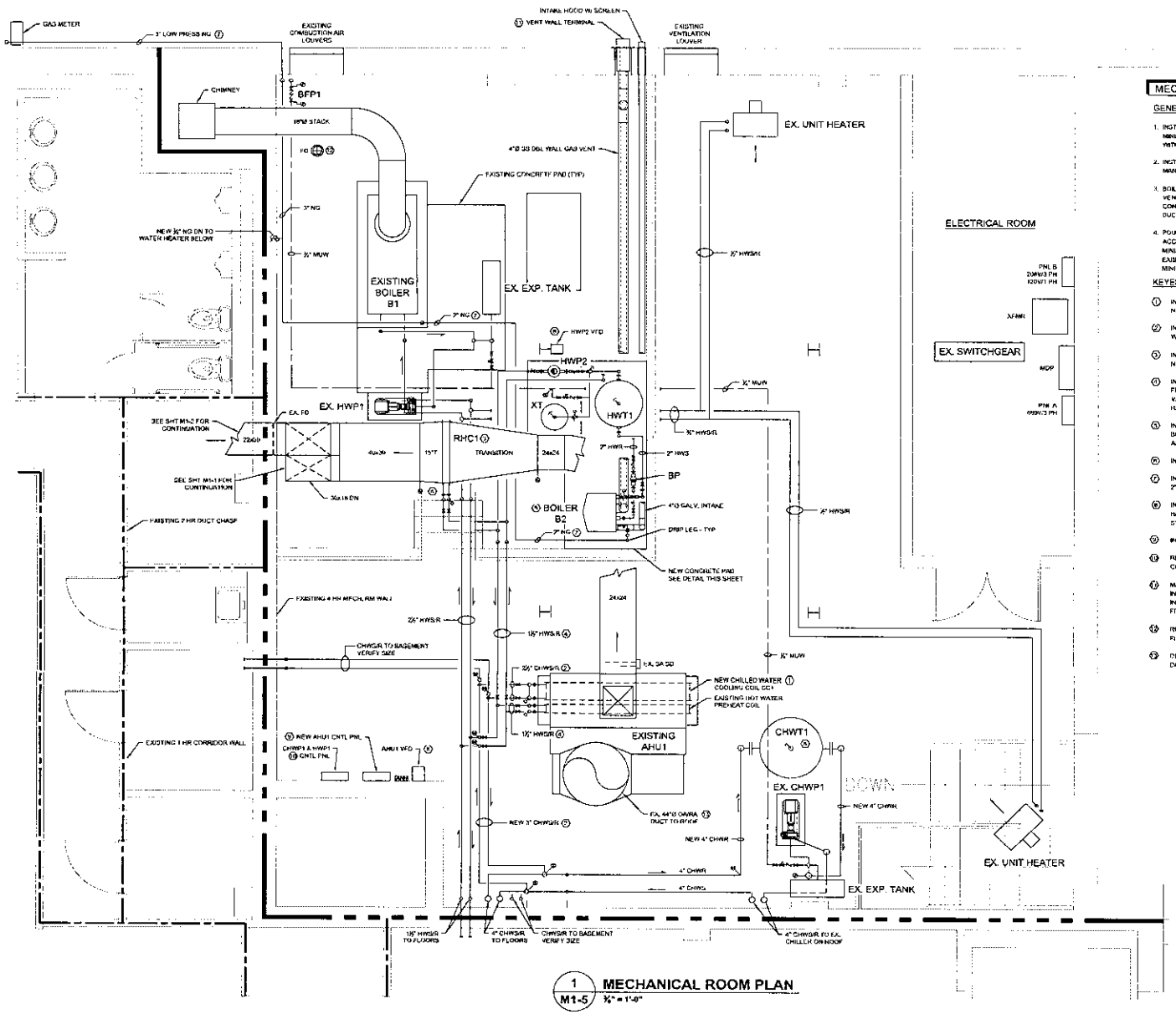
REV	DATE	DESCRIPTION
0	02/21/19	ISSUED FOR CONSTRUCTION

PROJECT #:	2017-0107
APPROJECT #:	NA
SCD ID:	NA
SCALE:	AS NOTED
DRAWN BY:	NCH
CHECKED BY:	RCP
DATE:	02/25/2019

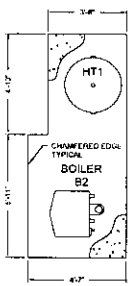
SHEET TITLE:
MECHANICAL ROOM DEMOLITION PLAN

SHEET
M1-4

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608



1 M1-5 **MECHANICAL ROOM PLAN** ¾" = 1'-0"



2 M1-5 **EQUIPMENT PAD** ¾" = 1'-0"

MECHANICAL NOTES

GENERAL NOTES:

1. INSTALL NEW EQUIPMENT IN MECHANICAL ROOM IN A MANNER TO MINIMIZE SYSTEM DOWNTIME. COORDINATE THE TIMING OF THE WORK WITH THE OWNER'S SCHEDULE.
2. INSTALL NEW EQUIPMENT WITH REQUIRED CLEARANCES AND IN A MANNER ALLOWING FOR ACCESS TO THE EQUIPMENT FOR SERVICING.
3. BOILER VENT TO BE HEATFAB CI PLUS SS DOUBLE WALL SPECIAL GAS VENT, OR EQUAL ACCEPTABLE BY MFR. FOR CAT III USE WITH CONDENSING APPLIANCES. BOILER INTAKE TO BE 29 GA. GALV. SPIRAL DUCT.
4. POURED THICK MINIMUM CONCRETE PAD FOR BOILER B2 AND RELATED ACCESSORIES, SEE DETAIL THIS SHEET. CONCRETE TO BE 3000 PSI MINIMUM WITH #4 REBAR 24" O.C. EACH WAY AND #4 DOWELS TO EXISTING CONCRETE FLOOR. THICKNESS AND DIMENSIONS ARE MINIMUM. COORDINATE FINAL LAYOUT WITH EXISTING CONDITIONS.

KEYED NOTES:

1. INSTALL NEW CHILLED WATER COIL IN AIR HANDLING UNIT AHU1 WITH NI-WPU1 SLIP-39/39 DRAIN PAN.
2. INSTALL NEW CHILLED WATER PIPING FROM MAIN TO NEW CHILLED WATER COIL WITH NEW THREE-WAY CONTROL VALVE.
3. INSTALL NEW HOT WATER REHEAT COIL IN SUPPLY DUCTWORK WITH NEW TRANSITIONS.
4. INSTALL NEW HOT WATER PIPING FOR AIR HANDLING UNIT AHU1 FROM NEW BOILER B2 WITH NEW CONTROL TWO-WAY CONTROL VALVE(S) FOR THE EXISTING HOT WATER PREHEAT COIL AND NEW REHEAT COIL.
5. INSTALL NEW NATURAL GAS FIRED AND RELATED ACCESSORIES INCLUDING BOILER PUMP, HOT WATER STORAGE TANK, SYSTEM PUMP, AND ASSOCIATED PIPING AND VENTING.
6. INSTALL NEW CHILLED WATER BUFFER TANK WITH ASSOCIATED PIPE.
7. INSTALL NEW 3" NATURAL GAS LINE TO MECHANICAL ROOM AND 2" NATURAL GAS LINE TO NEW BOILER B2.
8. INSTALL VARIABLE FREQUENCY DRIVES FOR THE EXISTING AIR HANDLING UNIT AHU1 SUPPLY FAN MOTOR AND FOR THE NEW SYSTEM PUMP HWP2.
9. INSTALL NEW AHU1 CONTROL PANEL.
10. RELOCATE EXISTING CHILLED WATER PUMP AND HOT WATER PUMP CONTROL PANEL.
11. MAINTAIN ALL CLEARANCES AT VENT TERMINATION PER MFR. INSTRUCTIONS. TERMINATE VENT A MIN. OF 3 FT ABOVE FORCED AIR INTAKES WITHIN 10 FT, 7 FT MIN. ABOVE SIDEWALKS, AND 12" MIN. FROM GRAVITY INTAKES.
12. ROUTE BOILER RELIEF AND CONDENSATE PIPING (NOT SHOWN) TO FLOOR DRAIN.
13. DISCONNECT EXISTING RETURN DAMPER ACTUATOR AND LOCK DAMPER FULLY OPEN.

R. C. PRITCHARD ENGINEERING SERVICES
RCPE
317 KIRK ROAD
GREENSBORO, NC 27455
PHONE: 336-383-3811

GREENE STREET CENTER - HVAC RENOVATIONS
215 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 403
GREENSBORO, NORTH CAROLINA 27410

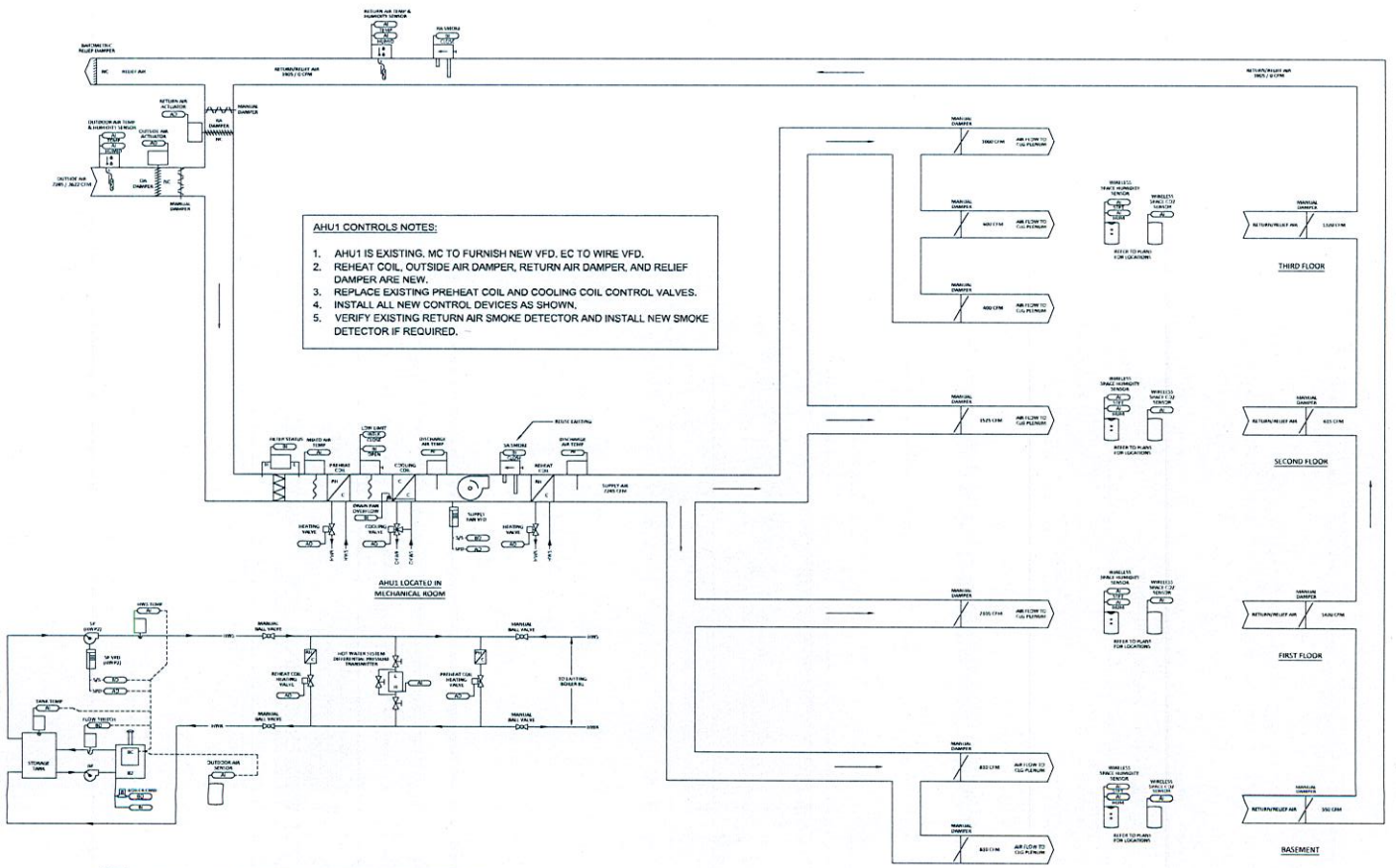
REV	DATE	DESCRIPTION
0	10/03/18	ISSUED FOR CONSTRUCTION

PROJECT #:	2017-4107
A/H PROJECT #:	NA
SCD ID:	NA
SCALE:	AS NOTED
DRAWN BY:	HCP
CHECKED BY:	RCP
DATE:	10/03/2018

SHEET TITLE
MECHANICAL ROOM PLAN

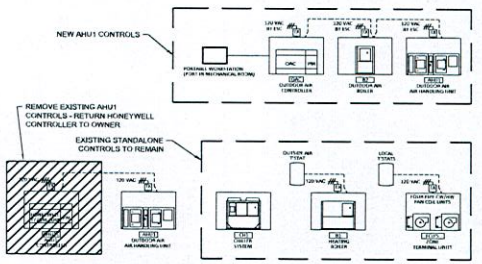
SHEET
M1-5

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608



2 M2-1 **AHU1 HOT WATER SYSTEM CONTROLS**
NTS

1 M2-1 **AHU1 CONTROLS**
NTS



3 M2-1 **BAS SYSTEM & OUTDOOR AIR CONTROLLERS**
NTS

SEQUENCE OF OPERATION

1. EQUIPMENT
   A. LOCATE ALL CONTROLLERS, REMOTE SENSORS, OCCUPANCY SENSORS, SMOKE DETECTORS AND ANNUNCIATOR AS SHOWN ON THE PLANS.
2. AHU1 - OUTDOOR AIR AIR HANDLING UNIT
   A. OCCUPANCY: BUILDING OCCUPANCY SHALL BE DETERMINED BY THE OCCUPANCY SCHEDULE. OCCUPANCY SENSORS SHALL BE LOCATED NEAR THE PRIMARY RESTROOM ON EACH FLOOR AND THE MAIN ENTRY. DURING UNOCCUPIED PERIODS, OCCUPANCY DETECTION SHALL OVERRIDE UNOCCUPIED MODE AND THE SYSTEM SHALL BE IN OCCUPIED MODE FOR A PERIOD OF 30 MINUTES FROM THE LAST DETECTION. OCCUPANCY SENSORS SHALL ALSO BE LOCATED IN THE FIRST FLOOR CLASSROOMS FOR CONTROL OF CLASSROOM EXHAUST.
   B. SUPPLY FAN: DURING OCCUPIED MODE, THE AHU1 SUPPLY FAN SHALL RUN CONTINUOUSLY WITH A MAXIMUM AIRFLOW OF 7245 CFM AND A MINIMUM OF 3622 CFM (50%). FAN SPEED SHALL BE MODULATED UTILIZING A DEMAND CONTROLLED VENTILATION PROTOCOL. THE OUTDOOR AIR DAMPER SHALL BE FULLY OPEN, AND THE RETURN AIR DAMPER SHALL BE FULLY CLOSED. DURING UNOCCUPIED MODE THE SUPPLY FAN SHALL CYCLE AS NEEDED TO MAINTAIN THE SPACE RELATIVE HUMIDITY SETPOINT WITH A FIXED AIRFLOW OF 3622 CFM (50%). THE OUTDOOR AIR DAMPER SHALL BE FULLY CLOSED AND THE RETURN AIR DAMPER SHALL BE FULLY OPEN.
   C. SUPPLY AIR SETPOINTS: CONTROLS SHALL MAINTAIN A MAXIMUM SUPPLY AIR DEWPOINT OF 55°F. THE DISCHARGE SUPPLY AIR TEMPERATURE SHALL BE 67°F WHEN THE OUTDOOR AIR TEMPERATURE IS LESS THAN 50°F, AND 65°F WHEN THE OUTDOOR AIR TEMPERATURE IS GREATER THAN 50°F.
   D. TOILET EXHAUST FAN: DURING UNOCCUPIED MODE THE TOILET EXHAUST FAN EF1 SHALL BE OFF. DURING OCCUPIED MODE, THE TOILET EXHAUST FAN EF1 SHALL BE ON CONTINUOUSLY.
   F. DEMAND CONTROLLED VENTILATION (DCV): DURING OCCUPIED MODE THE SUPPLY AIR VOLUME SHALL BE MODULATED BASED ON A SIGNAL FROM THE SPACE CO_2 SENSORS. ON A RISE IN THE CO_2 LEVEL ABOVE 800 PPM IN THE ZONE WITH THE HIGHEST CO_2 LEVEL, THE OUTDOOR AIR SUPPLY AIRFLOW SHALL INCREASE PROPORTIONALLY FROM THE MINIMUM POSITION OF 3622 CFM TO A MAXIMUM OF 7245 CFM AT 1000 PPM. WHEN THE RELATIVE HUMIDITY OF THE HIGHEST ZONE EXCEEDS THE HUMIDITY SETPOINT BY 3%, DEHUMIDIFICATION CONTROL SHALL OVERRIDE DEMAND CONTROLLED VENTILATION. ONCE THE HUMIDITY SETPOINT IS SATISFIED, DEMAND CONTROLLED VENTILATION SHALL RESUME. THE DURATION OF DCV OVERRIDE SHALL NOT EXCEED 30 MINUTES.
   G. DEHUMIDIFICATION DURING UNOCCUPIED MODE THE SUPPLY FAN SHALL BE CYCLED AS NEEDED TO MAINTAIN THE SPACE RELATIVE HUMIDITY SETPOINT. THE SUPPLY AIRFLOW SHALL BE FIXED AT 3622 CFM (50%). THE OUTDOOR AIR DAMPER SHALL BE FULLY CLOSED, AND THE RETURN AIR DAMPER SHALL BE FULLY OPEN. THE SUPPLY AIR DEWPOINT MAY BE RESET LOWER TO MAINTAIN THE RELATIVE HUMIDITY SETPOINT.
   H. DEHUMIDIFICATION OVERRIDE: WHEN THE RELATIVE HUMIDITY OF THE HIGHEST ZONE EXCEEDS THE HUMIDITY SETPOINT BY 3%, CONTROLS SHALL MODULATE THE OUTDOOR AIR RATE LOWER TO NO LESS THAN THE OCCUPIED MINIMUM POSITION UNTIL THE HUMIDITY SETPOINT IS SATISFIED. DCV OVERRIDE SHALL NOT EXCEED 30 MINUTES. DEHUMIDIFICATION OVERRIDE SHALL NOT RESUME UNTIL THE SPACE CO_2 LEVEL FALLS BELOW 800 PPM.
   I. ECONOMIZER: WHEN THE OUTDOOR AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, CONTROLS SHALL MODULATE THE OUTDOOR AIR DAMPER TO THE FULLY OPEN POSITION AND THE RETURN AIR DAMPER TO THE FULLY CLOSED POSITION TO REDUCE THE COOLING/DEHUMIDIFICATION LOAD.
   I. HOT WATER SYSTEM PUMP (HWP2): ON A CALL FOR PREHEATING/REHEATING, THE HOT WATER SYSTEM PUMP SHALL BE ENERGIZED. PUMP SPEED SHALL BE MODULATED TO MAINTAIN A FIXED DIFFERENTIAL PRESSURE AS REQUIRED FOR PROPER OPERATION OF THE TWO (2) HEATING COIL CONTROL VALVES.
   J. ALARMS:
      i. HIGH DISCHARGE TEMP: 10°F + SETPOINT
      ii. LOW DISCHARGE TEMP: 10°F + SETPOINT
      iii. SUPPLY FAN:
         a. SUPPLY FAN FAILURE: COMMANDED ON, STATUS OFF
         b. SUPPLY FAN FAILURE: COMMANDED OFF, STATUS ON
      iv. EXHAUST FAN:
         a. EXHAUST FAN FAILURE: COMMANDED ON, STATUS OFF
         b. EXHAUST FAN FAILURE: COMMANDED OFF, STATUS ON
      v. CO_2: READING GREATER THAN 1200PPM IN ANY ZONE
      vi. RH: RELATIVE HUMIDITY GREATER THAN 65% IN ANY ZONE
      vii. RETURN AIR SMOKE DETECTION
3. HOT WATER BOILER (B2)
   A. CONDENSING BOILER B2 AND ITS ASSOCIATED BOILER PUMP SHALL BE CONTROLLED BY FACTORY FURNISHED MICROPROCESSOR CONTROLS TO MAINTAIN A HOT WATER SETPOINT OF 140°F.
4. CLASSROOM EXHAUST FANS
   B. THE CLASSROOM EXHAUST FANS SHALL BE ON CONTINUOUSLY WHEN THE CLASSROOMS ARE OCCUPIED.

R. C. PRITCHARD ENGINEERING SERVICES
RCPE
212 KIRK ROAD
GREENSBORO, NC 27455
PHONE: 336-393-3831

02/23/2018

GREENE STREET CENTER - HVAC RENOVATIONS
201 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401

GUILFORD COUNTY FACILITIES AND PARKS
301 W. MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410

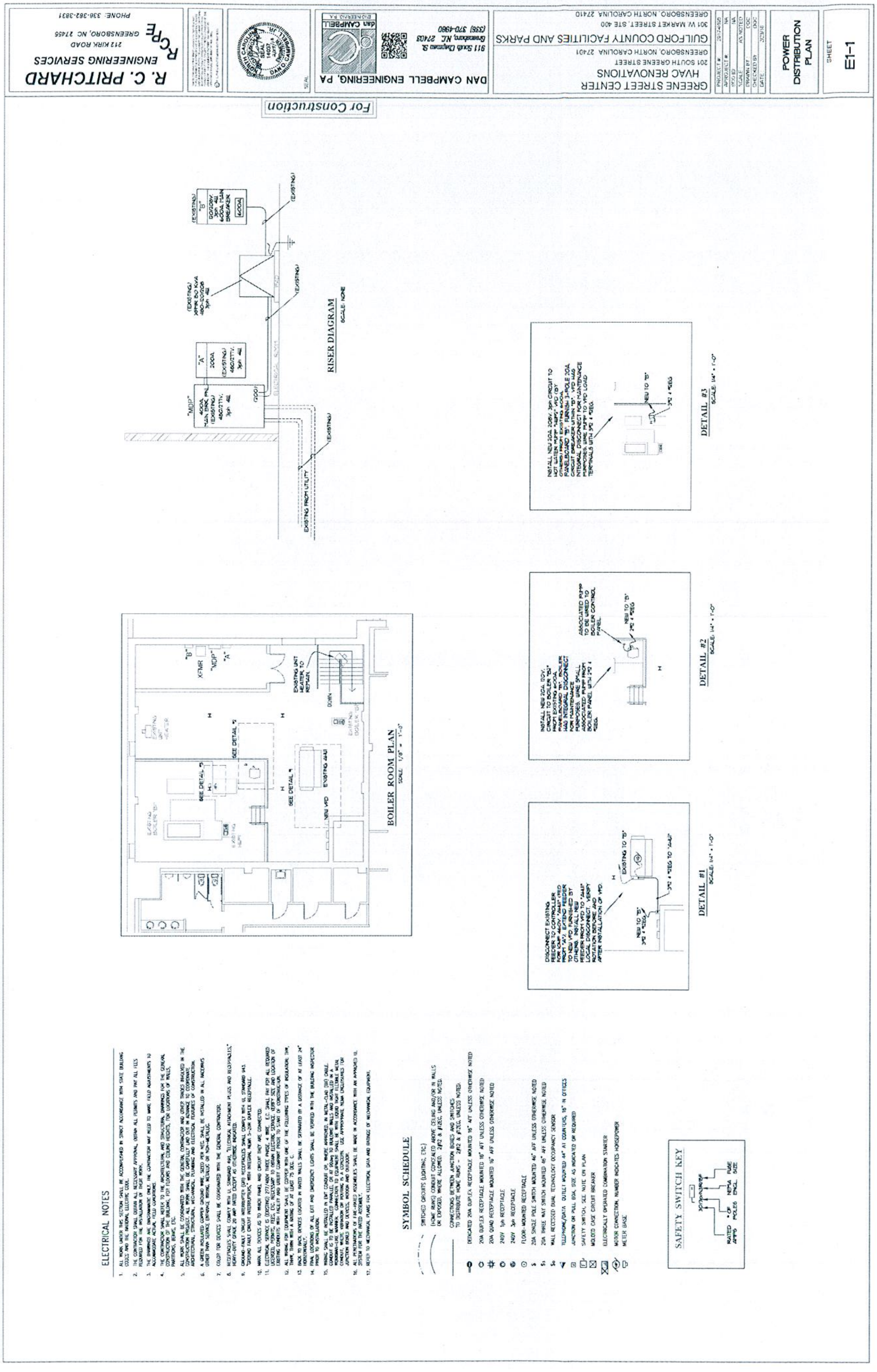
REV	DATE	DESCRIPTION
0	12/21/18	ISSUED FOR CONSTRUCTION

PROJECT #:	2017-0107
APROJECT #:	NA
SCD ID:	NA
SCALE:	AS NOTED
DRAWN BY :	RCP
CHECKED BY :	RCP
DATE :	02/23/2018

SHEET TITLE
CONTROL DIAGRAMS SEQ. OF OPERATION

SHEET
M2-1

ATTACHMENT A TO CONTRACT NO. 914 - BID EVENT NO. 608


R. C. PRITCHARD
ENGINEERING SERVICES
212 KIRK ROAD
GREENSBORO, NC 27455
PHONE: 336-382-3831
DAN CAMPBELL ENGINEERING, PA
GREENE STREET CENTER
HVAC RENOVATIONS
201 SOUTH GREENE STREET
GREENSBORO, NORTH CAROLINA 27401
GUILFORD COUNTY FACILITIES AND PARKS
301 W MARKET STREET, STE 400
GREENSBORO, NORTH CAROLINA 27410
POWER DISTRIBUTION PLAN
SHEET
E1-1
For Construction
RISER DIAGRAM
BOILER ROOM PLAN
DETAIL #1
DETAIL #2
DETAIL #3
ELECTRICAL NOTES
SYMBOL SCHEDULE
SAFETY SWITCH KEY

HVAC Renovations
Greene Street Center / Guilford County

R. C. Pritchard Engineering Services / 2017-0107
Event # 608

ADDENDUM #1

R. Craig Pritchard, PE
R. C. Pritchard Engineering Services
212 Kirk Road
Greensboro, NC 27455
rcpritchardpe@gmail.com

Project: HVAC Renovations
Greene Street Center
201 South Greene Street
Greensboro, NC 27410
Event # 598

No document clarification requests were received.

The following are clarifications and responses to questions received during the May 10, 2018 pre-bid meeting:

1. Davis Bacon wage regulations do not apply to this project.
2. The existing AHU preheat coil does not get replaced. The coil should be cleaned prior to installation of the new chilled water cooling coil. The hot water piping connections and control valve are to be replaced as shown on the plans.
3. Chemicals and chemical treatment are not a part of this contract. However, add two (2) Neptune FTF-5HP chemical bypass filter feeders with mounting legs – one (1) for chilled water and one (1) for hot water – including the necessary bypass piping and valves in the base bid.
4. Include the cost of furnishing and installing outside air duct balancing dampers as shown on the plans. Contractors shall survey the existing conditions before ordering dampers. Furnish a unit price deduct for dampers which are not needed.
5. Division 9 specifications were not provided for Division 9 Schedule of Values items. These items are provided as prompts only to insure bidders include costs to repair any damage done to the building during construction and return it to preconstruction condition. The value included is to be based on contractor judgment. Repair costs exceeding scheduled values are the responsibility of the contractor and will be not recovered via changeorders. Note: include general construction costs related to equipment installation, e.g. concrete pads or wall openings, with the item being installed.
6. The new chilled water cooling coil stainless drain pan required as noted on drawing M1-5 shall be 20 gauge 304 SS minimum – welded construction.

Guilford County
STATE of NORTH CAROLINA

FACILITIES, PROPERTY MANAGEMENT & PARKS DEPARTMENT
301 West Market Street Suite 400
Greensboro, North Carolina 27401

Proposal Review Findings/Recommendations

5/23/2018

Marty Lawing
Guilford County Manager

Project Information:
HVAC Renovations
Greene Street
201 S Greene St
Greensboro, NC 27401

On May 10, 2018 at 1O:OOAM a mandatory pre-bid meeting was held at the Greene Street site. At the bid opening on May 10, 2018 we received two (2) bid proposals for the Greene Street HVAC Renovations.

Below are the proposals received:

Firm	Base Bid	Minority Participation	
AirCon Carolina Inc.	$279,897.00	4.1%	$11,639.00
H.M. Kern Corp.	$363,000.00	0%	$0

Of these two proposals received AirCon Carolina Inc. appears to be the low responsive and responsible bidder. The estimated cost for this project was $270,000.00.

Recommendations:

I have reviewed the bid proposals from all the bidders and find AirCon Carolina Inc. to be the low responsive and responsible bidder. Due to this being a renovation project it is recommended that we add a 10% contingency to this project for unforeseen conditions in the amount of $28,000.00. Therefore, I recommend that a Purchase Order/Contract be issued to AirCon Carolina Inc. in the amount of $307,897.00 ($279,897.00 base bid plus $28,000.00 contingency) for the HVAC renovations at the Greene Street Building.

Michael Reed
Assistant Facilities Project Manager

Concurrence
Marty Lawing, Guilford County Manager

www.co.guilford.nc.us

GUILFORD COUNTY
FACILITIES, PROPERTY MANAGEMENT & PARKS DEPARTMENT

June 7, 2018

AirCon Carolina, Inc
704 Carnegie Place,
Greensboro, NC 27409
Attn: Hadi H. Dabar

Re: HVAC Renovations
GC Greene Street Center
201 S. Greene Street
Greensboro, NC
Event # 608

Dear Mr. Dabar

This letter is your formal "Intent to Award" for the construction on this project. Please proceed to provide the following information to Guilford County:

1. Performance and payment bonds. (Total Contract amount $307,897.00)
2. Insurance information as indicated in the Contract/specifications.
3. MWBE information as required in section 00330 of the specifications.

Guilford County is accepting your base bid in the amount of $279,897.00. Guilford County is including in the contract a 10% contingency for a contract total of $307,897.00 ($279,897.00 base and $28,000 Contingency). A formal Contact will be issued once the above information is received and processed.

If you have any questions pertaining to this matter, please contact Jim Halberg at 336.641.3762.

Sincerely,

Marty Lawing, County Manager
Guilford County

cc: Susan Crotts, Purchasing Director
Craig Pritchard, R.C. Pritchard Engineering Services

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00300 – FORM OF PROPOSAL

Attention: Terri Hall, Administrative Officer – Guilford County Facilities and Parks

Event Number: **608**
Bidder: **AirCon Carolina, Inc.**
Address: **704 Carnegie Place, Greensboro, NC 27409**
Telephone #: **336.852.6552**
Bid Date: **05/22/2018**

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder, by signing below, in consideration of the mutual promises, contained herein and other good and valuable consideration, the receipt and sufficiency hereby acknowledged, agrees to the terms and conditions set out herein.

Bidder agees that upon acceptance the Guilford County, this Bid Package shall be deemed as a binding contract subject to the terms set out herein. It is acknowledged that the terms in the Section 00500-1 *et seq.,* entitled Contract, shall be binding should any issues arise over possibly inconsistent or conflicting language. This Contract shall be in full force and effect upon execution by all parties for the terms as set forth in Section 4, of the Contract found in Section 00500.

Bidder further agree to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the:

Event # 608
Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the

GUILFORD COUNTY FACILITIES AND PARKS DEPARTMENT and R. C. Pritchard Engineering Services

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:

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00300 – FORM OF PROPOSAL

SINGLE PRIME CONTRACT:

BASE BID:

Two Hundred Seventy Nine Thousand Eight Hundred Ninety Seven Dollars($) **279,897.00**

GENERAL CONTRACTOR:

AirCon Carolina, Inc. Lic **68949**

ELECTRICAL SUBCONTRACTOR:

LDR Technologies, LLC Lic **29961U**

MECHANICAL SUBCONTRACTOR:

AirCon Carolina, Inc. Lic **15268**

_____ Lic _____

GUILFORD COUNTY:

_____

ATTEST:

_____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00300 – FORM OF PROPOSAL

PROJECT DURATION

Bid Project Duration is 90 Calendar days from notice to proceed).

ATTACHMENTS TO BE INCLUDED WITH PROPOSAL

1. **Minority Business Participation Requirements and Affidavits**

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

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

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

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

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

2. **Document 00335 - E-Verify Affidavit**
3. **Document 00480 - Non-Collusion Affidavit.**
4. **Document 00486 - Consent of Surety**
5. **Document 00490 –Contractor's Qualification Statement (AIA A305)**
6. **Bid bond – Not required.**
7. **Any other bid forms required by the Document 00200 INSTRUCTIONS TO BIDDERS.**

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00300 – FORM OF PROPOSAL

PROPOSAL SIGNATURE PAGE

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

Respectfully submitted this day of **May 22, 2018**

AirCon Carolina, Inc.
(Name of firm or corporation making bid)

WITNESS:

By: _____
Signature

_____
(Proprietorship or Partnership)

Name: **Hadi H. Dabar**
Print or type

Title **President**
(Owner/Partner/Pres./V.Pres)

Address **704 Carnegie Place, Greensboro, NC 27409**

ATTEST:

By: _____

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

License No. **68949**

Federal I.D. No. **56-2416011**

Email Address: **hdabar@ldrcompanies.com**

(AFFIX CORPORATE SEAL)

Acknowledge of mandatory prebid walk-through/site access attendance (either 3/22/18 or 5/10/18):
General Contractor (Y) (N) **Yes**

Acknowledge attachments included with proposal:

Attachment No. 1 A___, B___, C___, D___ *(check all that apply)*

Attachment No. 2_____, Attachment No. 3_____, Attachment No. 4_____, Attachment No. 5_____,
Attachment No. 6_____, Attachment No. 7 (List Other) _____

Acknowledge addendum received and used in computing bid:

Addendum No. 1 **X** Addendum No. 3 _____ Addendum No. 5_____ Addendum No. 6_____
Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7_____

END OF DOCUMENT 00100

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00311 – SCHEDULE OF VALUES

Division	Discription	Scheduled Amount
DIVISION 0	**PROCUREMENT**	
Document 00820	GENERAL CONDITIONS OF THE CONTRACT	$ 19,964.00
	BONDS	$ 5,325.00
DIVISION 1	**GENERAL REQUIREMENTS**	
SECTION 01310	PROJECT COORDINATION	$ INCLUDED W/ GENERAL CONDITIONS
SECTION 01450	QUALITY CONTROL/QUALITY ASSURANCE	$ INCLUDED W/ GENERAL CONDITIONS
SECTION 01500	TEMPORARY FACILITIES	$ INCLUDED W/ GENERAL CONDITIONS
SECTION 01740	FINAL CLEANING	$ INCLUDED W/ GENERAL CONDITIONS
SECTION 01781	PROJECT CLOSEOUT	$ INCLUDED W/ GENERAL CONDITIONS
SECTION 01788	WARRANTIES	$ INCLUDED W/ EQUIPMENT
DIVISION 9	**FINISHES**	
SECTION 095113	CEILINGS (REPAIR AND REPLACE)	$ 6,930.00
SECTION 099123	PAINTING	$ INCLUDED W/ CEILINGS
DIVISION 23	**MECHANICAL**	
SECTION 230500	HVAC DEMOLITION	$ 11,203.00
SECTION 230553	IDENTIFICATION	$ INCLUDED W/ PIPE AND DUCT
SECTION 230593	TESTING ADJUSTING AND BALANCING	$ 2,634.00
SECTION 230593	COMMISSIONING	$ 3,687.00
SECTION 230713	DUCT INSULATION	$ 19,750.00
SECTION 230719	PIPING INSULATION	$ INCLUDED W/ DUCT INSULATION
SECTION 230923	DDC CONTROLS (& CONTROL VALVES)	$ 74,526.00
SECTION 231123	NATURAL GAS PIPING	$ 7,209.00
SECTION 232113	HYDRONIC PIPING (& SPECIALTIES)	$ 57,069.00
SECTION 232123	HYDRONIC PUMPS	$ 10,044.00
SECTION 233113	METAL DUCTS	$ 4,584.00
SECTION 233300	AIR DUCT ACCESSORIES	$ 6,975.00
SECTION 233713	DIFFUSERS, REGISTERS AND GRILLES	$ 214.00
SECTION 235216	CONDENSING BOILER	$ 21,177.00
SECTION 238126.13	HYDRONIC AIR COILS	$ 8,777.00
DIVISION 26	**ELECTRICAL**	
SECTIONS 260519 to 264313	POWER AND LOW VOLTAGE WIRING	$ 9,829.00
ALLOWANCE	PROJECT CONTINGENCY	$ 10,000.00
TOTAL	**BASE BID**	$ 279,897.00
ALTERNATE #1	**BMS INTEGRATION**	$ NO ADD - INCLUDED W/ BASE

END OF SECTION 00311

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

Attach to Bid | Attach to Bid | Attach to Bid | Attach to Bid | Attach to Bid

Identification of Minority Business Participation

I, AirCon Carolina, Inc.
(Name of Bidder)

do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category
GP Supply Company - 336.274.7615 501 E. Washington Street, Greensboro, NC 27401	Material Supplier	HUB
Atlantic Contracting Company, Inc. - 336.931.3109 P.O. Box 49559, Greensboro, NC 27419	Subcontractor	DBE, HUB, WBE

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

The total value of minority business contracting will be ($) **$11,639.00**

R09-02

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

Attach to Bid | Attach to Bid | Attach to Bid | Attach to Bid | Attach to Bid

State of North Carolina - AFFIDAVIT A - Listing of the Good Faith Effort

County of Guilford

Affidavit of AirCon Carolina, Inc.
(Name of Bidder)

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30A .0101, et seq.)

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

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d). Failure to abide by this statutory provision will constitute a breach of the contract.

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

Date: **05/22/2018** Name of Authorized Officer: **Hadi H. Dabar**

Signature:

Title: **President**

State of North Carolina, County of Guilford

Subscribed and sworn to before me this 22 day of MAY 20 18

Notary Public

My commission expires 7/4/22

JAYNE BOLLINGER NOTARY SEAL COMMISSION EXPIRES PUBLIC FORSYTH COUNTY, NC

R09-02

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

STATE OF NORTH CAROLINA

COUNTY OF GUILFORD

AFFIDAVIT

****

I, **Hadi H. Dabar** (the individual attesting below), being duly authorized by and on behalf of **AirCon Carolina, Inc.** (the entity bidding on project hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. Mark "Yes" or "No":

   a. YES ____; or,

   b. NO X

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This 22 day of May, 2018, ~~2015~~.

Signature of Affiant
Print or Type Name: **Hadi H. Dabar**

State of North Carolina County of Guilford

Signed and sworn to (or affirmed) before me, this the 22 day of MAY, 2018 ~~2015~~.

My Commission Expires: 7/4/22

Jayne Bollinger
Notary Public

(Affix Official/Notarial Seal)

JAYNE BOLLINGER NOTARY PUBLIC FORSYTH COUNTY, NC MY COMMISSION EXPIRES

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

DOCUMENT 00480 – NON-COLLUSION AFFIDAVIT

STATE OF (North Carolina)

( )SS.

COUNTY OF ( )

I, **Hadi H. Dabar**, **of the Municipality of Greensboro**, In the County of **Guilford** and the State of **North Carolina**, of full age, being duly sworn according to law on my oath depose and say that:

I am **President**, of the firm of **AirCon Carolina, Inc.**, making the Proposal for the above- named authority.

My submission of a response to this event certifies that I agree to the non-collusion agreement contained below:

1. The submitter of this document is acting as an agent for their company who is the respondent that has submitted the attached bid response.
2. The undersigned person is fully informed concerning the preparation and contents of the attached response and of all pertinent circumstances related to it, and is authorized to sign this affidavit. This affidavit is given under penalty of perjury as provided by law.
3. Such bid response is genuine and is not collusive or sham in anyway whatsoever.
4. Neither the person responding nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including the signer of this affidavit, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other respondent, firm or person to submit collusive or sham response in connection with the contract for which the attached response has been submitted or to refrain from responding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other responder, firm or person to fix the price, or cost to secure through collusion, conspiracy, connivance or unlawful agreement any advantage against the Board of County Commissioners, Guilford County or any person interested in the proposed contract.
5. The price or prices quoted in the attached response are fair and proper and are not derived by any collusion, conspiracy, connivance or lawful agreement and on the part of the respondent or any of its agents, representatives, owners, employees, or parties in interest.

AirCon Carolina, Inc.
(Name of Contractor)

Signature	**Hadi H. Dabar** (Type or Print Name)	**President** Title	**05/22/2018** Date

Subscribed and sworn to before me on this 22 **day of** MAY, **20** 18.

Signature — Jayne Bollinger (Type or Print Name)

Notary Public of the State of North Carolina

My Commission expires 7/4, **20** 22.

JAYNE BOLLINGER NOTARY PUBLIC FORSYTH COUNTY, NC MY COMMISSION EXPIRES

END OF DOCUMENT 00480

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

SECTION 00481 – STATEMENT OF OWNERSHIP

I certify that the list below contains the names and home addresses of all stockholders holding 10% or more of the issued outstanding stock of the undersigned corporation. If one or more such stockholder or partner is itself a corporation or partnership, the stockholder holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, are also listed.

AirCon Carolina, Inc.
Corporate Name

Attest: _____ Date: **05/22/2018**

_____ _____
Secretary Officer

_____ HADI H. DABAR
(Also, Print/Type Name) (Also, Print/Type Name)

Affix Corporation Seal

Stockholders:

Name: Hadi H. Dabar

Home Address: 5151 N. Church Street
Greensboro, NC 27455

Name: _____

Home Address: _____

_____

Name: _____

Home Address: _____

_____

END OF DOCUMENT 00481

Greene Street Center
201 S. Greene Street, Greensboro, North Carolina
HVAC Renovations

SECTION 00486 – CONSENT OF SURETY

The Selective Insurance Company of America

40 Wantage Avenue, Branchville, NJ 07890-1000

(Name and address of ~~Bidder~~) Surety

a corporation existing under the Laws of the State of

New Jersey

and authorized to do business under the Laws of the State of North Carolina, hereby certifies that application has been made to us by

AirCon Carolina, Inc., 704 Carnegie Place, Greensboro, NC 27409

(Name and address of Bidder)

and satisfactory arrangements have been completed by which we have and do now agree to furnish a Performance Bond equal to 100% of the Contract to ensure the faithful performance on the part of the Bidder of the terms and conditions of the contract, and a labor and materials bond to ensure the payment of all persons furnishing labor and materials in accordance with the contract.

Title of Work: **Greene Street Center**

Location of Project: 201 S. Greene Street, Greensboro, North Carolina

This proposition is made with the understanding that any change made in the specifications or agreements without the consent of the bondsmen shall in no way vitiate the bond.

WITNESS:

SURETY COMPANY

Selective Insurance Company of America

Title: Attorney-In-Fact

Attorney-In Fact

By:

Date: May 2[illegible], 2018

(Affix corporate seal)

END OF DOCUMENT 00486

12741

SELECTIVE®

Selective Insurance Company of America
40 Wantage Avenue
Branchville, New Jersey 07890
973-948-3000

POWER OF ATTORNEY

SELECTIVE INSURANCE COMPANY OF AMERICA, a New Jersey corporation having its principal office at 40 Wantage Avenue, in Branchville, State of New Jersey ("SICA"), pursuant to Article VII, Section 1 of its By-Laws, which state in pertinent part:

> The Chairman of the Board, President, Chief Executive Officer, any Executive Vice President, any Senior Vice President or any Corporate Secretary may, from time to time, appoint attorneys in fact, and agents to act for and on behalf of the Corporation and they may give such appointee such authority, as his/her certificate of authority may prescribe, to sign with the Corporation's name and seal with the Corporation's seal, bonds, recognizances, contracts of indemnity and other writings obligatory in the nature of a bond, recognizance or conditional undertaking, and any of said Officers may, at any time, remove any such appointee and revoke the power and authority given him/her.

does hereby appoint **ELIZABETH MOORE, TIMOTHY B. TEMPLETON, LARRY B. ROLAND, T. GRAY MCCASKILL, PATSY B. LEWIS, GLYDA E. MEREDITH, ANNE B. THEODORE, CHAVONNE C. HILL, ROBERT J. RAMSEUR, JAMES P. LOWREY, BENJAMIN T. SINGLETON, WINDY LEBBAD**

, its true and lawful attorney(s)-in-fact, full authority to execute on SICA's behalf fidelity and surety bonds or undertakings and other documents of a similar character issued by SICA in the course of its business, and to bind SICA thereby as fully as if such instruments had been duly executed by SICA's regularly elected officers at its principal office, in amounts or penalties not exceeding the sum of: **NO ONE BOND TO EXCEED ONE MILLION DOLLARS ($1,000,000.00)**

Signed this 5TH day of APRIL, 2010.

SELECTIVE INSURANCE COMPANY OF AMERICA

By: _____
Antonio C. Albanese
Its Senior Vice President

SELECTIVE INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1926 NEW JERSEY

CERTIFIED COPY

STATE OF NEW JERSEY :
:ss. Branchville
COUNTY OF SUSSEX :

On this **5TH** day of **APRIL, 2010,** before me, the undersigned officer, personally appeared Antonio C. Albanese who acknowledged himself to be the Senior Vice President of SICA, and that he, as such Senior Vice President being authorized so to do, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as Senior Vice President and that the same was his free act and deed and the free act and deed of SICA.

SUSAN NEYENS
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES 12/12/2012

_____
Notary Public

SUSAN NEYENS NOTARY PUBLIC NEW JERSEY

The power of attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of SICA at a meeting duly called and held on the 6th of February 1987, to wit:

"RESOLVED, the Board of Directors of Selective Insurance Company of America authorizes and approves the use of a facsimile corporate seal, facsimile signatures of corporate officers and notarial acknowledgements thereof on powers of attorney for the execution of bonds, recognizances, contracts of indemnity and other writing obligatory in the nature of a bond, recognizance or conditional undertaking."

CERTIFICATION

I do hereby certify as SICA's Corporate Secretary that the foregoing extract of SICA's By-Laws and Resolution are still in force and effect and this Power of Attorney issued pursuant to and in accordance with the By-Laws is valid.

Signed this 22 day of May, 2018

_____
Michael H. Lanza, SICA Corporate Secretary

SELECTIVE INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1926 NEW JERSEY

The power is void unless the Selective watermark appears.

B91 (04-07)

AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO: GUILFORD COUNTY FACILITIES AND PARKS

ADDRESS:

SUBMITTED BY: AIRCON CAROLINA, INC.

NAME:

ADDRESS: 704 CARNEGIE PLACE, GREENSBORO, NC

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

PRINCIPAL OFFICE:

- ☒ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT: *(If applicable)* EVENT #608
GREENE STREET CENTER HVAC RENOVATIONS

TYPE OF WORK: *(File a separate form for each Classification of Work.)*

- ☐ General Construction
- ☒ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other: *(Specify)*

§ 1.0 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

15 YEARS

§ 1.2 How many years has your organization been in business under its present business name?

15 YEARS

§ 1.2.1 Under what other or former names has your organization operated?

N/A

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

10/15/2003

§ 1.3.2 State of incorporation:

NORTH CAROLINA

§ 1.3.3 President's name:

HADI H. DABAR

§ 1.3.4 Vice-president's name(s):

DEREK BULL, DEAN GERNER

§ 1.3.5 Secretary's name:

KRISTIN DABAR

§ 1.3.6 Treasurer's name:

RHONDA YOUNTS

§ 1.4 If your organization is a partnership, answer the following: N/A

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership, if applicable:

§ 1.4.3 Name(s) of general partner(s):

§ 1.5 If your organization is individually owned, answer the following: N/A

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals: N/A

§ 2.0 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

MECHANICAL - NC - 15268

GENERAL CONTRACTOR - NC -68948

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

NORTH CAROLINA

§ 3.0 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

HVAC, ELECTRICAL, CONTROLS

§ 3.2 Claims and Suits

(If the answer to any of the questions below is yes, attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

NO

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

NO

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

NO

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?
(If the answer is yes, attach details.)

NO

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

SEE ATTACHED

§ 3.4.1 State total worth of work in progress and under contract:

$2,410,896

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces. SEE ATTACHED

§ 3.5.1 State average annual amount of construction work performed during the past five years:

$4,000,000

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4.0 REFERENCES

§ 4.1 Trade references:

SEE ATTACHED

§ 4.2 Bank references:

SEE ATTACHED

§ 4.3 Surety

§ 4.3.1 Name of bonding company:

SELECTIVE INSUARNCE

§ 4.3.2 Name and address of agent:

MARSH & MCLENNAN AGENCY, LLC
3625 N. ELM STREET, GREENSBORO, NC

§ 5.0 FINANCING

§ 5.1 Financial Statement

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items: SEE ATTACHED

.1 Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);
.2 Net Fixed Assets;
.3 Other Assets;
.4 Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes); and
.5 Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

IN HOUSE ACCOUNTING SOFTWARE 05/21/2018

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

YES

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

N/A

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

N/A

§ 6.0 SIGNATURE

§ 6.1 Dated this 22 day of MAY 2018

Name of organization: AIRCON CAROLINA, INC.

By: H. H. Dabbs

Title: PRESIDENT

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this 22 day of MAY 2018

Notary Public: Jayne Bollinger

My commission expires: 7/4/22

JAYNE BOLLINGER NOTARY PUBLIC FORSYTH COUNTY, NC MY COMMISSION EXPIRES

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

PROJECT NAME	OWNER	ARCHITECT	AMOUNT	% COMPLETE	SCHEDULED COMPLETION
HVAC UPGRADES	PGW	N/A	$400K	15%	10/2018
CHW SYSTEM	PRETIUM	N/A	$286K	95%	05/2018
ARMC LINAC #1	CONE	LITTLE	$140K	20%	08/2018

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

PROJECT NAME	OWNER	ARCHITECT	AMOUNT	DATE COMPLETE	% OWN FORCE
SHERATON HOTEL	KOURY	N/A	$1,300K	2015	90%
DATA HALL 4	FIDELITY	IDG	$800K	2018	70%
HVAC RENOVATIONS	RCC	N/A	$295K	2018	90%

§ 3.6

EMPLOYEE	Experience	
Hadi Dabar, PE	Engineering	30 years
Derek Bull, PE	Engineering, Construction Management	26 years
Dean Gerner	Vice President of Construction	40 years

AirCon Carolina, Inc.
Income Statement
For the Five Months Ending May 31, 2018

	Current Month		Year to Date	
Revenues				
Sales- Installation	$ 315,116.07	95.90	$ 1,361,296.45	94.75
Sales- Materials	348.44	0.11	13,314.74	0.93
Sales - Design & Engineering	0.00	0.00	0.00	0.00
Sales- Equipment	5,162.08	1.57	5,162.08	0.36
Sales - Rental	0.00	0.00	0.00	0.00
Sales- Service	5,787.92	1.76	5,787.92	0.40
Sales - Automobile Mileage	0.00	0.00	0.00	0.00
Sales - BoomTrux	2,190.00	0.67	49,632.50	3.45
Interest Income	0.00	0.00	1,478.82	0.10
Other Income	0.00	0.00	0.00	0.00
Other Income - NC Tax Refunds	0.00	0.00	0.00	0.00
Other Income - US Tax Refunds	0.00	0.00	0.00	0.00
Gain on Sale of Stocks	0.00	0.00	0.00	0.00
Life Insurance Contributions	0.00	0.00	0.00	0.00
Dividend Income	0.00	0.00	0.00	0.00
Finance Charge Income	0.00	0.00	0.00	0.00
Shipping Charges Reimbursed	0.00	0.00	0.00	0.00
Sales Returns and Allowances	0.00	0.00	0.00	0.00
Sales Discounts	0.00	0.00	0.00	0.00
Total Revenues	328,604.51	100.00	1,436,672.51	100.00
Cost of Sales				
Cost of Sales- Materials	6,130.41	1.87	189,810.83	13.21
Cost of Sales- Equipment	356.38	0.11	243,175.69	16.93
Cost of Sales - Subcontract	13,404.61	4.08	168,829.90	11.75
Cost of Sales - Rigging	1,588.70	0.48	29,295.61	2.04
Cost of Sales - Labor & Wages	19,168.49	5.83	425,802.10	29.64
Cost of Sales - Rentals	300.00	0.09	4,060.00	0.28
Cost of Sales- Salaries	0.00	0.00	0.00	0.00
Cost of Sales- Freight	0.00	0.00	0.00	0.00
Cost of Sales - Plots & Prints	0.00	0.00	3,701.25	0.26
Cost of Sales - Permits	0.00	0.00	276.00	0.02
Cost of Sales- Other	0.00	0.00	22.94	0.00
Inventory Adjustments	0.00	0.00	0.00	0.00
Purchase Returns and Allowance	0.00	0.00	0.00	0.00
Purchase Discounts	(93.17)	(0.03)	(828.34)	(0.06)
Auto Fuel	0.00	0.00	12,423.21	0.86
Payroll Tax Expense	788.02	0.24	6,536.79	0.45
Travel/Mileage Expense	0.00	0.00	0.00	0.00
Total Cost of Sales	41,643.44	12.67	1,083,105.98	75.39
Gross Profit	286,961.07	87.33	353,566.53	24.61
Expenses				
Lease of GMC truck	0.00	0.00	0.00	0.00
Advertising Expense	76.86	0.02	4,285.06	0.30
Amortization Expense	0.00	0.00	0.00	0.00
Auto Expenses	9.92	0.00	6,326.93	0.44
Auto Maint. - 1996 Ford SW	0.00	0.00	0.00	0.00
Auto Maint. - 1995 Buick RM	0.00	0.00	0.00	0.00
Auto Maint. - 1994 Lincoln TC	0.00	0.00	0.00	0.00
Auto Repairs - 1996 Ford SW	0.00	0.00	0.00	0.00

AirCon Carolina, Inc.
Income Statement
For the Five Months Ending May 31, 2018

	Current Month		Year to Date	
Auto Repairs - Yukon	0.00	0.00	0.00	0.00
Auto Repairs - 1994 Lincoln TC	0.00	0.00	0.00	0.00
Bad Debt Expense	0.00	0.00	0.00	0.00
Bank Charges	0.00	0.00	0.00	0.00
Cash Over and Short	0.00	0.00	0.00	0.00
Charitable Contributions Exp	0.00	0.00	2,518.00	0.18
Commissions and Fees Exp	0.00	0.00	0.00	0.00
Depreciation Expense	0.00	0.00	0.00	0.00
Dues and Subscriptions Exp	0.00	0.00	0.00	0.00
Education & Training Expense	157.00	0.05	350.50	0.02
Employee Benefit Programs Exp	0.00	0.00	0.00	0.00
Freight Expense	0.00	0.00	0.00	0.00
Gifts Expense	0.00	0.00	0.00	0.00
Income Tax Expense	0.00	0.00	0.00	0.00
Insurance Exp: WC, Lib, & Auto	4,044.75	1.23	21,182.45	1.47
Insurance Expense: Key Man	0.00	0.00	271.83	0.02
Insurance: Owner's Grp Life	0.00	0.00	0.00	0.00
Insurance: Owner HHD Medical	0.00	0.00	0.00	0.00
Disability Insurance	290.60	0.09	86.30	0.01
Group Insurance	0.00	0.00	0.00	0.00
Insurance : Administ. fee.	0.00	0.00	0.00	0.00
Interest Expense	219.84	0.07	1,347.32	0.09
Management Fee	0.00	0.00	0.00	0.00
Laundry and Cleaning Exp	0.00	0.00	0.00	0.00
Legal and Professional Expense	385.60	0.12	4,244.53	0.30
Licenses Expense	0.00	0.00	1,446.24	0.10
Loss on NSF Checks	0.00	0.00	0.00	0.00
Maintenance Expense	0.00	0.00	5,246.29	0.37
Meals and Entertainment Exp	0.00	0.00	1,826.76	0.13
Medical expenses	0.00	0.00	0.00	0.00
Office Expense	0.00	0.00	529.30	0.04
Other Taxes	6,132.90	1.87	8,546.13	0.59
Owner's Co Car Usage Taxes	0.00	0.00	0.00	0.00
Owner's Med Ins Prem Taxes	0.00	0.00	0.00	0.00
Penalties and Fines Exp	0.00	0.00	0.00	0.00
Pension/Profit-Sharing Plan Ex	910.88	0.28	5,223.36	0.36
Postage Expense	0.00	0.00	0.00	0.00
Rent or Lease Expense	10,000.00	3.04	50,000.00	3.48
Repairs Expense	0.00	0.00	0.00	0.00
Salaries Expense	9,615.40	2.93	73,077.00	5.09
Owner (s) distribution	0.00	0.00	0.00	0.00
Printing & Reproduction Exp	0.00	0.00	0.00	0.00
Supplies Expense	0.00	0.00	0.00	0.00
Telephone Expense	0.00	0.00	0.00	0.00
Uniforms	0.00	0.00	0.00	0.00
Utilities Expense	0.00	0.00	0.00	0.00
Wages Expense	3,432.00	1.04	64,540.95	4.49
Equipment Calibration Expense	0.00	0.00	0.00	0.00
Other Expense	0.00	0.00	320.00	0.02
Purchase Disc- Expense Items	0.00	0.00	0.00	0.00
Gain/Loss on Sale of Assets	0.00	0.00	0.00	0.00
Total Expenses	35,275.75	10.74	251,368.95	17.50
Net Income	$ 251,685.32	76.59	$ 102,197.58	7.11

For Management Purposes Only

AirCon Carolina, Inc.
Balance Sheet
May 31, 2018

ASSETS

Current Assets		
Checking-Bank of Oak Ridge	$ 793,303.69	
Accounts Receivable	315,632.95	
Inventory- Materials	74,160.06	
Inventory- Equipment- Vehicles	11,518.32	
Employee Advances	500.00	
Notes Receivable-Current	2,000.00	
Total Current Assets		1,197,115.02
Property and Equipment		
Furniture and Fixtures	5,686.88	
Equipment & computers	10,854.22	
2004 Chevrolet 2500 Pickup-DG	16,500.00	
2008 Ford Truck	4,500.00	
2007 Ford Truck	4,000.00	
2006 Chevrolet Truck	3,000.00	
2007 Chevrolet Truck	3,000.00	
2012 Chev. Silverado 1500-Dean	21,200.00	
2012 Chevy Equinox - Derek	11,570.49	
2013 Chevy Truck	15,200.00	
2012 Chev Colorado	6,700.00	
2011 Ford XL F50-82283	13,760.00	
2012 Ford XL F50-55939	14,532.00	
2013 Chevy 2500HD-222487	19,685.00	
Scissor Lift	3,896.38	
Scissor Lift - Genie 1930	4,003.13	
Manitex 2892C 28 Ton Crane	227,500.00	
New Kawasaki Mule UTV	8,850.00	
2015 Dump Trailer - Leonard	6,650.00	
Duct Jack Lift	2,129.66	
1981 Qual enclosed trailer	2,000.00	
Service Tools	60,529.74	
Accum. Depreciation	(330,455.00)	
Total Property and Equipment		135,292.50
Other Assets		
Total Other Assets		0.00
Total Assets		$ 1,332,407.52

LIABILITIES AND CAPITAL

Current Liabilities		
Accounts Payable	$ 80,407.39	
Capital One-4802132466695650	(19,595.60)	
NC Sales Tax Payable	25,633.01	
Other Taxes Payable	(169.78)	
Total Current Liabilities		86,275.02

Unaudited - For Management Purposes Only

AirCon Carolina, Inc.

CONFIDENTIAL CREDIT APPLICATION INFORMATION

FIRM NAME:	AirCon Carolina, Inc.
STREET:	704 Carnegie Place
CITY:	Greensboro, NC 27409
PHONE:	336-852-6552
FAX:	336-852-6747
DATE FORMED:	2003
FEDERAL ID #:	56-2416011

BILL TO: ADDRESS AND SHIP TO: ADDRESS WILL BE THE SAME UNLESS DIRECTED OTHERWISE

BANK REFERENCE

BANK	Bank of Oak Ridge	**CONTACT:**	Tammy Barbee
PHONE:	336-286-1904		
ADDRESS	400 Pisgah Church Road	**FAX:**	336-286-3347
CITY	Greensboro, NC 27455		

TRADE REFERENCES

NAME	Hoffman and Hoffman	**CONTACT:**	Dennis Lambeth
PHONE	336-252-1768	**FAX:**	336-292-6822
STREET	3816 Patterson Street		
CITY	Greensboro, NC 27407		

NAME	GP Supply		
PHONE	336-274-7615	**FAX:**	336-370-4715
STREET	501 E. Washington St.		
CITY	Greensboro, NC 27401		

NAME	Ensco Supply		
PHONE	336-292-9000	**FAX:**	336-292-7162
STREET	4344 Federal Drive		
CITY	Greensboro, NC 27410		