UNION COUNTY BOARD OF EDUCATION
CONTRACT ROUTING SHEET

Contractor Name: Carolina Air Solutions, Inc.
UCPS Contract Number: 4-97352005
Address: 9224 Stockport Place
City, State, Zip: Charlotte, NC
Contact Name: Billy Garrison
Telephone Number: 704.525.2100

Purpose of Contract (location and brief description): Prospect Elementary School-HVAC Renovation

Submitting Department: Facilities Department
Date Submitted: 11.21.2023

Budget Account Number: _____
Funding Source: CIP
Contract Amount: $ 1,360,000.00
Contract Period: Completion February 20, 2025

UCPS Employee to Contact: Penny Helms/Danny McManus
Phone Number: 704-296-3160

NOTE: Individuals listed below should initial, date, and forward this form after completing their responsibilities relating to this Contract.

	INTIAL	DATE
1. Approved by Fund Owner/Acquire Vendor Signature and proper **Insurance Certificate with UCBOE NAMED as CERTIFICATE HOLDER.**		
A. Insurance Certificate Reviewed/Approved by Risk Management	DS SH	12/1/2023 | 7:54 AM EST
2. Approved by Appropriate Representative(s) of UCPS:		
☑ UCPS Project Coordinator	DS	11/21/2023 | 11:49 AM
☑ UCPS Department Head/School Principal	DS DM	11/22/2023 | 7:55 AM ES
☑ Asst. Supt. for Administration & Operations	DS CM	11/30/2023 | 4:23 PM ES
☐ Asst. Supt. for Human Resources		
☐ Asst. Supt. for Instructional Programs Asst.		
☐ Asst. Supt. of Student Support		
☐ Chief School Performance Officer		
☐ Chief Technology Officer		
FORWARD TO UCPS GENERAL COUNSEL OFFICE	DS SS DS KB DS MM	12/2/2023 | 7:06 AM
3. Approved by Legal Counsel		
FORWARD TO SUPERINTENDENT/BOARD OF EDUCATION		
4. Approved by Superintendent/Board of Education		
FORWARD TO FINANCE	DS SM	12/5/2023 | 1:09 PM
6. Pre-audited by Representative of Finance Officer		

Contract #:4-97352005

CONTRACT FOR SERVICES
PROSPECT ELEMENTARY SCHOOL-HVAC RENOVATION

This Contract for Services ("Contract") is made and entered into the 8th day of November 2023 between The Union County Board of Education, with a mailing address of 400 North Church Street, Monroe, North Carolina 28112 ("UCBOE") and Carolina Air Solutions,Inc. located at 9224 Stockport Place, Charlotte, North Carolina 28273 ("Vendor" or "Contractor" or "Service Provider").

For and in consideration of the mutual promises set forth in this Contract, the parties do mutually agree as follows:

1. Obligations of Vendor. The Vendor agrees to provide the services, goods, materials, equipment, and/or software (the "Services" and/or "Goods," as appropriate) to fully, timely and properly complete the Prospect Elementary School's HVAC Renovation Project as more particularly described in the Scope of Work document attached hereto and incorporated herein by reference as Exhibit 1.

   The UCBOE and Vendor recognize that time is of the essence to this Agreement and that the UCBOE will suffer financial loss if the work is not completed within the times specified herein. Both parties also recognize the delays, difficulties and expense involved in proving, in a legal or arbitration proceeding, the actual loss suffered by the UCBOE if the Work is not completed on time. Accordingly, in lieu of requiring such proof, the UCBOE and Vendor agree that as liquidated damages for delay (but not as penalty) the Vendor shall pay to the UCBOE for each day in excess of the term allowed for completion of the Work, the sum of $200 as liquidated damages.

   The term of this Contract shall be per Exhibit 1.

   This Contract does not grant the Vendor the right or the exclusive right to provide specified Services and/or Goods to UCBOE. Similar Services and/or Goods may be obtained from sources other than the Vendor (or not at all) at the discretion of UCBOE.

   The Vendor shall begin work immediately upon issuance of a written notice to proceed and be complete within the time identified within Exhibit 1. The Vendor agrees to perform the Services and supply the Goods or in a timely, complete, and professional manner and in accordance with the terms and conditions of this Contract. Furthermore, the Vendor represents and warrants that (i) it is duly qualified and, if required by law, licensed to provide the Services and/or Goods; (ii) it will provide the Services and/or Goods in a manner consistent with the level of care and skill ordinarily exercised by contractors providing similar Services and/or Goods under similar conditions; (iii) it possesses sufficient experience, personnel, and resources to provide the Services and/or Goods; (iv) it shall provide the Services and/or Goods in compliance with applicable laws, statutes, ordinances, codes, orders, rules and regulations; and (v) its reports, if any, shall be complete, accurate, and unambiguous.

2. Obligations of UCBOE. UCBOE hereby agrees to pay to the Vendor for the faithful performance of this Contract, and the Vendor hereby agrees to provide all of the Services and/or Goods, for the sum not to exceed $1,360,000 ("Contract Price") subject to adjustments as provided for in the Contract Documents.

Base Bid:	$1,350,000
Allowance Funds:	$ 10,000
Total	$1,360,000 (One Million, Three Hundred Sixty Thousand Dollars and Zero Cents)

3. Project Coordinator. Billy Garrison is designated as the Project Coordinator for UCBOE. The Project Coordinator shall be UCBOE's representative in connection with the Vendor's performance under this Contract. UCBOE has complete discretion in replacing the Project Coordinator with another person of its choosing.

4. Vendor Supervisor. Karl Todd is designated as the Vendor Supervisor for the Vendor. The Vendor Supervisor is fully authorized to act on behalf of the Vendor in connection with this Contract.

5. Terms and Methods of Payment. UCBOE will make payment after invoices are approved on a net 30-day basis. UCBOE will not pay for services or materials in advance without the prior approval of the Finance Officer. 5% Retainage will be held as allowed by NCGS.

6. Standard Terms and Conditions: Vendor agrees to the Standard Terms and Conditions set forth as Attachment A attached hereto and incorporated herein by reference.

7. Counterpart Execution. This Contract may be executed and recorded in two or more counterparts, each of which shall be deemed an original and all of which, when taken together, shall constitute one and the same instrument. Each party shall be entitled to rely upon executed copies of this Contract transmitted by facsimile or electronic "PDF" to the same and full extent as the originals.

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[SIGNATURES ON NEXT PAGE]

IN WITNESS WHEREOF, UCBOE and the Vendor have executed this Contract on the day and year first written above.

Carolina Air Solutions

Vendor Name

DocuSigned by:
Billy Garrison
9439CE74120A490...

12/6/2023 | 5:00 AM PST

Signature of Authorized Representative Date

20-2107707

Vendor's Federal Identification #
[if Contract is with Organization or Social Security Number if individual]

THE UNION COUNTY BOARD OF EDUCATION

DocuSigned by:
Kathy Heintel
2E0328CAE4374DD...

12/6/2023 | 8:28 AM EST

Authorized Representative Date

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

DocuSigned by:
Sara Hymel

12/1/2023 | 7:54 AM EST

Risk Management Date

DocuSigned by:
Shanna McLamb
4BF7630263B9452...

12/5/2023 | 1:09 PM PST

Finance Officer Date

As to form:

DocuSigned by:
Michele Morris

12/2/2023 | 7:06 AM PST

UCBOE Attorney Date

Attachment A

Standard Terms and Conditions

I. Standard Terms and Conditions for All Contracts

1. Defined Terms, "Contract" means the agreement between UCBOE and Vendor which consists of the applicable Contract Documents. "Contract Documents" means: (i) any applicable purchase order between Vendor and UCBOE specifically including all terms and conditions set forth or referenced herein and on the face of a Purchase Order, (ii) any attachments hereto, (iii) any applicable solicitation documentation related to hereto (including without limitation any request for proposals or invitation for bids and Vendor's response thereto), and (iv) any other terms and conditions of a written agreement signed by Vendor and UCBOE that deals with the same subject matter. "Goods" means any supplies, materials, products or other tangible personal property provided by Vendor to UCBOE. "Purchase Order" mean any applicable purchase order issued by UCBOE. "Services" means services, specifically including without limitation construction services, design services, professional or consulting services and software as a service, "UCBOE" means the Union County Board of Education. "Vendor" means the party contracting with UCBOE and includes individual and entities that may be referred to in Contract Documents as "vendor", "seller", "service provider", or "contractor".
2. Written Agreement Signed by Both Parties; Acceptance of Purchase Order Terms and Conditions when there is not a Separate Written Agreement Signed by Both Parties. When a Contract is signed by both UCBOE and Vendor then the Purchase Order issued by UCBOE is for administrative convenience and is not part of the Contract Documents. When there is not a separate Contract signed by both UCBOE and Vendor, then Vendor's acknowledgment of the terms of any Purchase Order, without timely objection, or Vendor's shipment or performance of any part of a Purchase Order, constitutes an agreement to all terms and conditions set forth or referenced herein and on the face of the Purchase Order, together with the terms and conditions of any other applicable Contract Documents. The terms and provisions set forth in the Contract Documents shall constitute the entire agreement between Vendor and UCBOE with respect to the purchase by UCBOE of the Services and/or Goods work performed as described in the Contract Documents. In the event of any conflict between any terms and conditions of the Contract Documents, the terms and conditions most favorable to UCBOE shall control. A Purchase Order constitutes an offer by UCBOE and expressly limits acceptance to the terms and conditions stated therein. No additional or supplemental provision or provisions in variance herewith that may appear in Vendor's quotation, acknowledgment, invoice, or in any other communication from Vendor to UCBOE shall be deemed accepted by or binding on UCBOE. UCBOE hereby expressly rejects all such provisions which supplement, modify or otherwise vary from the terms of the Contract Documents, and such provisions are superseded by the terms and conditions stated in the Contract Documents, unless and until UCBOE's authorized representatives expressly assent, in writing, to such provisions. Stenographic and clerical errors and omissions by UCBOE are subject to correction.
3. Cancellation of Purchase Order. UCPS may cancel any Purchase Order or portion thereof without liability, if: (a) Vendor fails upon request to give reasonable assurance of timely performance or UCPS otherwise determines that it has reasonable grounds for insecurity regarding Vendor's performance; (b) conforming Goods or Services (including the quantities specified for delivery) are not delivered within the time specified or, if no time is specified, within a commercially reasonable time; (c) Vendor otherwise breaches the Contract and such breach is not corrected within thirty (30) days following written notice of breach; or (d) cancellation is otherwise required or allowed by law.
4. Quantities. Shipments must equal exact amounts ordered unless otherwise agreed in writing by UCBOE. The award of a term contract neither implies nor guarantees any minimum or maximum purchases. Materials received in excess of quantity specified on the purchase order , at UCBOE option's, may be returned at the Vendor's expense.
5. Prices. If Vendor's price or the regular market price of any of the Goods covered hereunder is lower than the price stated in the Contract Documents on the date of shipment of such Goods, Vendor agrees to give UCBOE the benefit of such lower price on any such Goods. In no event shall Vendor's price be higher than the price last quoted or last charged to UCBOE unless otherwise agreed in writing. No charges for transportation, boxing, crating, etc. are allowable unless such charges are included in the Contract Documents.
6. Invoices. It is understood and agreed that orders will be shipped at the established Contract prices in effect on dates orders are placed. Invoicing at variance with this provision may subject the Contract to cancellation.

Applicable North Carolina sales tax shall be invoiced as a separate item. Invoices shall be sent to UCBOE's accounts payable department with a copy to UCBOE Project Coordinator.

7. Freight on Board. All shipments of Goods are FOB destination unless otherwise stated in the Contract Documents. Any freight charges prepaid by Vendor are to be itemized on the invoice unless stated otherwise in writing by form of quote, bid, contract. In instances where Goods are shipped against this order by parties other than those specified on the Purchase Order, the third=party shipper must be instructed to list the UCBOE purchase order number on all packages, bills of lading, etc. to insure prompt identification of order.
8. Taxes. Taxes are included in the Contract Price. Applicable taxes shall be invoiced as a separate item for UCBOE's records.
9. Payment Terms. Payment terms are Net 30 days after receipt of correct invoice or acceptance of Goods, whichever is later.
10. Condition and Packaging. Unless otherwise provided by special terms and conditions or specifications, it is understood and agreed that any item offered or shipped has not been sold or used for any purpose and shall be in first class condition. All containers/packaging shall be suitable for handling, storage or shipment.
11. Safety Data Sheets. Safety Data Sheets must be provided with shipment of all chemicals."
12. Delays in Shipment. Time and date of delivery are of the essence, except when delay is due to causes beyond Vendor's reasonable control and without Vendor's fault or negligence.
13. Risk of Loss. Vendor shall have the risk of loss of and damage to the Goods subject to the Contract Documents until such Goods are delivered to the destination and accepted by UCBOE or its nominee.
14. Rejection. All Goods shall be received subject to UCBOE's inspection. Goods that are defective in workmanship or material or otherwise not in conformity with the requirements of the Contract Documents may be rejected and returned at Vendor's expense or may be accepted at a reduced price. UCBOE may require Vendor to promptly replace or correct any rejected Goods Services and, if Vendor fails to do so, UCBOE may contract with a third party to replace such Goods Services and charge Vendor the additional cost.
15. Warranties. Vendor warrants that all Goods delivered hereunder will be free from defects in materials and workmanship and will conform strictly to the specifications, drawings, or samples specified or furnished. This warranty shall survive any inspection, delivery, acceptance or payment by UCBOE of the Goods and shall run to UCBOE and any user of the Goods. This express warranty is in addition to Vendor's implied warranties of merchantability and fitness for a particular purpose which shall not be disclaimed. In addition to any other rights available at law or equity, UCBOE shall be entitled to all rights and remedies provided by the Uniform Commercial Code, Chapter 25 of the North Carolina General Statutes, for breach of express warranties and implied warranties of merchantability or fitness for a particular purpose, including but not limited to consequential and incidental damages.
16. Compliance with All Laws. Vendor warrants that all performance hereunder shall be in accordance with all applicable federal, state and local laws, regulations and orders. The right of Vendor to proceed may be terminated immediately by written notice if UCBOE determines that Vendor, its agent or another representative, has violated any provision of law.
17. Use of Federal Funds. If the source of funds for this Contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable):Equal Employment Opportunity (41 C.F.R. Part 60); Davis-Bacon Act (40 U.S.C. 3141-3148); Copeland "Anti-Kickback" Act (40 U.S.C. 3145); Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708); Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387); Debarment and Suspension (Executive Orders 12549 and 12689); Byrd Anti-Lobbying Amendment (31 U.S.C. 1352); Procurement of Recovered Materials (2 C.F.R. § 200.322); and Record Retention Requirements (2 CFR § 200.324).
18. Registered Sex Offenders; Jessica Lunsford Act. Under North Carolina law, certain sex offenders are prohibited from coming onto school campuses. Vendor agrees to conduct an annual check of the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program and the National Sex Offender Registry for all of its employees whose job involves direct interaction with students as part of the job. UCBOE prohibits any personnel listed on such registries from being on any property owned or operated by UCBOE and from having any direct interaction with students. As a term of the Agreement, said checks must be performed by the Vendor and reported to UCBOE's Superintendent or designee, if Vendor's employees will be working directly with students. Under provisions set forth in the Jessica Lunsford Act under North Carolina law, the signature below certifies that neither Vendor nor any employee or agent of Vendor is

listed as a sex offender on the N.C. Sex Offender and Public Protection Registration Program, the N.C. Sexually Violent Predator Registration Program, and/or the National Sex Offender Registry.

19. Nondiscrimination. During the performance of the Contract, Vendor shall not discriminate against or deny the Contract's benefits to any person on the basis of sexual orientation, national origin, race, ethnic background, color, religion, gender, age or disability.
20. FERPA Electronically Stored Data Compliance: Vendor is expressly prohibited from selling or trading any education records or personally identifiable information acquired under the Agreement. Furthermore, Vendor agrees not to attempt to re-identify students from aggregated data. Further, Vendor will not use any personally identifiable information or education records to advertise or market to students of UCBOE or their parents. Any personally identifiable information and education records held by Vendor pursuant to the Agreement will be made available to UCBOE upon request. Vendor will store and process all data using appropriate administrative, physical, and technical safeguards to secure personally identifiable information and education records from unauthorized access, disclosure, and use. Vendor will conduct periodic risk assessments and remediate any identified security vulnerabilities in a timely manner. Vendor will also have a written incident response plan, to include prompt notification to UCBOE in the event of a security or privacy incident, as well as procedures for responding to a breach of data. Vendor agrees to share its incident response plan upon request. Vendor shall, for all personally identifiable data and education records in its possession and in the possession of any subcontractors, or agents to which it has transferred data as permitted herein, destroy or de-identify such data when such data is no longer needed to perform the Agreement. Vendor hereby agrees to abide by all Board of Education policies and procedures governing the confidentiality of student records and the responsible use of technology and internet safety. If Vendor experiences a security breach concerning any information covered by the Agreement, and such breach is covered by N.C.G.S. §75.61(14), then Vendor will (a) fully comply with Vendor's obligations under the N.C. Identity Theft Protection Act, (b) immediately notify UCBOE with the information listed in N.C.G.S. §75-65(d)(1-4), and (c) fully cooperate with UCBOE in carrying out its obligations under said Identity Theft Protection Act. Vendor will indemnify UCBOE for any breach of confidentiality or failure of its responsibilities to protect confidential information, and for cost of notification of affected persons as a result of its accidental or negligent release of personally identifiable information or education records provided to Vendor pursuant to the Agreement.
21. North Carolina Public Records Law: Vendor acknowledges that UCBOE is subject to the requirements of North Carolina's Public Records Law ("NCPRL"), N.C.G.S. § 132-1, et. seq. The Agreement and any related documents, papers, letters, maps, books, photographs, films, sound recordings, magnetic or other tapes, electronic data-processing records, artifacts, or other documentary material, regardless of physical form or characteristics, made or received by UCBOE in connection with the transaction of the Agreement may be considered a "public record," subject to disclosure under the NCPRL. UCBOE is under no obligation to notify Vendor prior to its compliance of its duties under NCPRL.
22. Conflict of Interest. Vendor represents and warrants that no member of UCBOE or any of its employees or officers who may obtain a direct benefit, personal gain or advantage for themselves or a relative or associate as a result of the Contract, subcontract or other agreement related to the Contract is in a position to influence or has attempted to influence the making of the Contract, has been involved in making the Contract, or will be involved in administering the Contract. Vendor also represents and warrants that, if the Contract is funded by any amount of federal funds, no violation of 2 C.F.R. § 200.318(c) or any other applicable federal conflict of interest law has occurred or will occur. Vendor shall cause this paragraph to be included in all Contracts, subcontracts and other agreements related to the Contract.
23. Gratuities. Vendor represents and warrants that no member of UCBOE or any of its employees has been or will be offered or given a gratuity to an official or employee of UCBOE in violation of applicable law or policy.
24. Kickbacks to Vendor. Vendor shall not permit any kickbacks or gratuities to be provided, directly or indirectly, to itself, its employees, subcontractors or subcontractor employees for the purpose of improperly obtaining or rewarding favorable treatment in connection with a UCBOE Contract or in connection with a subcontract relating to a UCBOE Contract. When Vendor has grounds to believe that a violation of this clause may have occurred, Vendor shall promptly report to UCBOE in writing the possible violation.
25. Iran Divestment Act. Vendor certifies that, as of the date listed below, it is not on the Final Divestment List, as created by the State Treasurer pursuant to N.C.G.S. § 143-6A-4, in violation of the Iran Divestment Act. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. § 143C-6A-5(b), Vendor shall not

utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List. The Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurer.com/Iran and should be updated every 180 days.

26. Divestment from Companies that Boycott Israel. The Vendor certifies that it has not been designated by the North Carolina State Treasurer as a company engaged in the boycott of Israel pursuant to N.C.G.S. 147-86.81. It is the responsibility of each vendor or contractor to monitor compliance with this restriction. Contracts valued at less than $1,000.00 are exempt from this restriction.
27. E-Verification. Vendor shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes
28. Indemnification. To the fullest extent permitted by law, Vendor shall indemnify and hold harmless UCBOE, its officers, agents, employees and assigns from and against all claims, losses, costs, damages, expenses, attorneys' fees and liability that any of them may sustain (a) arising out of Vendor's failure to comply with any applicable law, ordinance, regulation, or industry standard or (b) arising directly or indirectly out of Vendor's performance or lack of performance of the terms and conditions of the Contract. In the event that any Services and/or Goods sold and delivered or sold and performed under the Contract Documents shall be defective in any respect whatsoever, Vendor shall indemnify and save harmless UCBOE, its officers, agents, employees and assigns from all loss or the payment of all sums of money by reason of all accidents, injuries or damages to persons or property that shall happen or occur in connection with the use or sale of such Services and/or Goods and are contributed to by said condition. In the event Vendor, its employees, agents, subcontractors and or lower-tier subcontractors enter premises occupied by or under the control of UCBOE in the performance of the Contract Documents, Vendor agrees that it will indemnify and hold harmless UCBOE, its officers, agents, employees and assigns, from any loss, costs, damage, expense or liability by reason of property damage or personal injury of whatsoever nature or kind arising out of, as a result of, or in connection with such entry.
29. Insurance. Unless such insurance requirements are waived or modified by UCBOE or risk management ("DIRM"), Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Automobile - Vendor shall maintain bodily injury and property damage liability insurance covering all owned, non-owned and hired automobiles. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each person/each occurrence. Commercial General Liability - Vendor shall maintain commercial general liability insurance that shall protect Vendor from claims of bodily injury or property damage which arise from performance under the Contract. This insurance shall include coverage for contractual liability. The policy limits of such insurance shall not be less than $1,000,000 combined single limit each occurrence/annual aggregate. Worker's Compensation and Employers' Liability Insurance - If applicable to Vendor, Vendor shall meet the statutory requirements of the State of North Carolina for worker's compensation coverage and employers' liability insurance. Vendor shall also provide any other insurance or bonding specifically recommended in writing by the DIRM or required by applicable law. Certificates of such insurance shall be furnished by Vendor to UCBOE and shall contain the provision that UCBOE be given 30 days' written notice of any intent to amend or terminate by either Vendor or the insuring company. Failure to furnish insurance certificates or to maintain such insurance shall be a default under the Contract and shall be grounds for immediate termination of the Contract.
30. Termination for Convenience. In addition to all of the other rights which UCBOE may have to cancel this Contract or an applicable Purchase Order, UCBOE shall have the further right, without assigning any reason therefore, to terminate the Contract (or applicable Purchase Order), in whole or in part, at any time at its complete discretion by providing 10 days' notice in writing from UCBOE to Vendor. If the Contract is terminated by UCBOE in accordance with this paragraph, Vendor will be paid in an amount which bears the same ratio to the total compensation as does the Services and/or Goods actually delivered or performed to the total originally contemplated in the Contract. UCBOE will not be liable to Vendor for any costs for completed Goods, Goods in process or materials acquired or contracted for if such costs were incurred prior to the date of this Contract or an applicable Purchase Order.
31. Termination for Default. UCBOE may terminate the Contract, in whole or in part, immediately and without prior notice upon breach of the Contract by Vendor. In addition to any other remedies available to UCBOE law or equity, UCBOE may procure upon such terms as UCBOE shall deem appropriate, Services and/or Goods

substantially similar to those so terminated, in which case Vendor shall be liable to UCBOE for any excess costs for such similar goods, supplies, or services and any expenses incurred in connection therewith.

32. Contract Funding. It is understood and agreed between Vendor and UCBOE that UCBOE's obligation under the Contract is contingent upon the availability of appropriated funds from which payment for Contract purposes can be made. No legal liability on the part of UCBOE for any payment may arise until funds are made available to UCBOE's Finance Officer and until Vendor receives notice of such availability. Should such funds not be appropriated or allocated, the Contract shall immediately be terminated. UCBOE shall not be liable to Vendor for damages of any kind (general, special, consequential or exemplary) as a result of such termination.
33. Accounting Procedures. Vendor shall comply with any accounting and fiscal management procedures prescribed by UCBOE to apply to the Contract and shall assure such fiscal control and accounting procedures as may be necessary for proper disbursement of and accounting for all project funds.
34. Improper Payments. Vendor shall assume all risks attendant to any improper expenditure of funds under the Contract. Vendor shall refund to UCBOE any payment made pursuant to the Contract if it is subsequently determined by audit that such payment was improper under any applicable law, regulation or procedure. Vendor shall make such refunds within thirty (30) days after UCBOE notifies Vendor in writing that a payment has been determined to be improper.
35. Contract Transfer. Vendor shall not assign, subcontract or otherwise transfer any interest in the Contract without the prior written approval of UCBOE.
36. Contract Personnel. Vendor agrees that it has, or will secure at its own expense, all personnel required to provide the Services and/or Goods set forth in the Contract.
37. Key Personnel. Vendor shall not substitute for key personnel (defined as those individuals identified by name or title in the Contract Documents or in written communication from Vendor) assigned to the performance of the Contract without prior written approval from UCBOE Project Coordinator (the individual at UCBOE responsible for administering the Contract).
38. Contract Modifications. The Contract may be amended only by written amendment duly executed by both UCBOE and Vendor.
39. Relationship of Parties. Vendor is an independent contractor and not an employee of UCBOE. The conduct and control of the work will lie solely with Vendor. The Contract shall not be construed as establishing a joint venture, partnership or any principal-agent relationship for any purpose between Vendor and UCBOE. Employees of Vendor shall remain subject to the exclusive control and supervision of Vendor, which is solely responsible for their compensation.
40. Advertisement. The Contract will not be used in connection with any advertising by Vendor without prior written approval by UCBOE.
41. Monitoring and Evaluation. Vendor shall cooperate with UCBOE, or with any other person or agency as directed by UCBOE, in monitoring, inspecting, auditing or investigating activities related to the Contract. Vendor shall permit UCBOE to evaluate all activities conducted under the Contract. UCBOE has the right at its sole discretion to require that Vendor remove any employee of Vendor from UCBOE Property and from providing Services and/or Goods under the Contract following provision of notice to Vendor of the reasons for UCBOE's dissatisfaction with the Services and/or Goods of Vendor's employee.
42. Financial Responsibility. Vendor is financially solvent and able to perform under the Contract. If requested by UCBOE, Vendor agrees to provide a copy of its latest audited annual financial statements or other financial statements as deemed acceptable by UCBOE's Finance Officer. In the event of any proceedings, voluntary or involuntary, in bankruptcy or insolvency by or against Vendor, the inability of Vendor to meet its debts as they become due or in the event of the appointment, with or without Vendor's consent, of an assignee for the benefit of creditors or of a receiver, then UCBOE shall be entitled, at its sole option, to cancel any unfilled part of the Contract without any liability whatsoever.
43. Governmental Restrictions. In the event any governmental restrictions are imposed which necessitate alteration of the material, quality, workmanship or performance of the items offered prior to their delivery, it shall be the responsibility of the Vendor to notify, in writing, the issuing purchasing office at once, indicating the specific regulation which required such alterations. UCBOE reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or to cancel the Contract.
44. Inspection at Vendor's Site. UCBOE reserves the right to inspect, at a reasonable time, the equipment/item, plant or other facilities of a prospective contractor prior to Contract award, and during the Contract term as

necessary for UCBOE determination that such equipment/item, plant or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the Contract.

45. Confidential Information. All information about UCBOE provided to the Vendor or its officers, employees, agents, representatives and advisors (the "Vendor Representatives"), and all copies or other full or partial reproductions thereof and notes, memoranda or other writings related thereto created by Vendor or any Vendor Representative, regardless of whether provided before or after the date of the Contract and regardless of the manner or medium in which it is furnished, is referred to as "Confidential Information". Confidential Information does not include any information that (a) is or becomes generally available to the public other than as a result of an impermissible disclosure by Vendor, (b) was known by or available on a nonconfidential basis to Vendor before it was disclosed by UCBOE or (c) becomes available to Vendor on a nonconfidential basis from a third party whom Vendor does not know to be bound by a confidentiality agreement with, or have an obligation of secrecy to, UCBOE. Except as and to the extent required by law or order or demand of any governmental or regulatory authority, Vendor and Vendor Representatives will (x) keep all Confidential Information confidential and (y) will only disclose or reveal any Confidential Information to Vendor Representatives who must have the information to fulfill Vendor's obligations under the Contract and who agree to observe the terms of this Section. Vendor and Vendor Representatives will not use the Confidential Information for any purpose other than fulfilling Vendor's obligations under the Contract. By way of example and not limitation, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information. If Vendor is requested or required, pursuant to applicable law or regulation or by legal process, to disclose any Confidential Information, Vendor will provide UCBOE with prompt and timely notice of the requests or requirements so that UCBOE can seek an appropriate protective order or other remedy and will not be prejudiced by delay. If UCBOE does not obtain a protective order or other remedy, Vendor will only disclose that portion of the Confidential Information which Vendor's legal counsel determines Vendor is required to disclose. Upon termination of the Contract or otherwise upon UCBOE's request, Vendor will promptly deliver to UCBOE all Confidential Information in the possession of Vendor or the Vendor Representatives.
    Student Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to students or students' official records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. The Contract shall not be construed by either party to constitute a waiver of or to in any manner diminish the provisions for confidentiality of students' records. Additionally, pursuant to N.C.G.S. 115C-401.1, it is unlawful for a person who enters into a contract with a local board of education to sell personally identifiable information that is obtained from a student as a result of that person's performance under the Contract. Employee Personnel Information: If, during the course of Vendor's performance of the Contract, Vendor should obtain any information pertaining to employees of UCBOE's personnel records, Vendor agrees to keep any such information confidential and to not disclose or permit it to be disclosed, directly or indirectly, to any person or entity. This section will survive the termination of this Contract.
46. Intellectual Property. Vendor agrees, at its own expense, to indemnify, defend and save UCBOE harmless from all liability, loss or expense, including costs of settlement and attorney's fees, resulting from any claim that UCBOE's use, possession or sale of the Services and/or Goods infringes any copyright, patent or trademark or is a misappropriation of any trade secret.
47. No Pre-Judgment or Post-Judgment Interest. In the event of any action by Vendor for breach of contract in connection with the Contract, any amount awarded shall not bear interest either before or after any judgment, and Vendor specifically waives any claim for interest.
48. Background Checks. At the request of UCBOE's Project Coordinator, Vendor (if an individual) or any individual employees of Vendor shall submit to UCBOE criminal background check and drug testing procedures.
49. Mediation. If a dispute arises out of or relates to the Contract, or the breach of the Contract, and if the dispute cannot be settled through negotiation, the parties agree to try in good faith to settle the dispute by mediation administered by the American Arbitration Association under its Commercial Mediation Rules before resorting to litigation.

50. No Third-Party Benefits. The Contract shall not be considered by Vendor to create any benefits on behalf of any third party. Vendor shall include in all contracts, subcontracts or other agreements relating to the Contract an acknowledgment by the contracting parties that the Contract creates no third-party benefits.
51. Force Majeure. Neither party shall be responsible to the other for any losses resulting from the failure to perform any terms or provisions of the Agreement if the party's failure to perform is attributable to war, riot or other disorder, strike or other work stoppage; fire; flood; storm; illness; pandemic, communicable disease, or any other act not within the control of the party whose performance is interfered with, and which, by reasonable diligence, such party is unable to prevent. However, UCBOE will be entitled to a refund for fees paid on account of services not rendered by Vendor including any and all deposits.
52. Ownership of Documents; Work Product. All documents created pursuant to the Contract shall, unless expressly provided otherwise in writing, be owned by UCBOE. Upon the termination or expiration of the Contract, any and all finished or unfinished documents and other materials produced by Vendor pursuant to the Contract shall, at the request of UCBOE, be turned over to UCBOE. Any technical knowledge or information of Vendor which Vendor shall have disclosed or may hereafter disclose to UCBOE shall not, unless otherwise specifically agreed upon in writing by UCBOE, be deemed to be confidential or proprietary information and shall be acquired by UCBOE free from any restrictions as part of the consideration of the Contract.
53. Strict Compliance. UCBOE may at any time insist upon strict compliance with these terms and conditions notwithstanding any previous course of dealing or course of performance between the parties to the contrary.
54. General Provisions. UCBOE's remedies as set forth herein are not exclusive. Any delay or omission in exercising any right hereunder, or any waiver of any single breach or default hereunder, shall not be deemed to be a waiver of such right or of any other right, breach, or default. If action be instituted by Vendor hereunder, UCBOE shall be entitled to recover costs and reasonable attorney's fees. Vendor may not assign, pledge, or in any manner encumber Vendor's rights under this Contract or applicable Purchase Order or delegate the performance of any of its obligations hereunder, without UCBOE's prior, express written consent.
55. Contract Situs. All matters, whether sounding in contract or tort relating to the validity, construction, interpretation and enforcement of the Contract, will be determined in Union County, North Carolina. North Carolina law will govern the interpretation and construction of the Contract.
56. Severability. Any provision of this Contract that is determined by any court of competent jurisdiction to be invalid or unenforceable will not affect the validity or enforceability of any other provision. Any provision of the Contract held invalid or unenforceable only in part or degree will remain in full force and effect to the extent not held invalid or unenforceable.

II. Additional Standard Terms and Conditions for Construction Contracts

1. Supervision and Provision for Labor and Supplies. The Vendor will supervise and direct the construction work (the "Work") and shall furnish, provide, and pay for all labor, materials, equipment, machinery, utilities, and services reasonably necessary for the execution and completion of the Work.
2. Coordination of Work and Notification of Progress. The Vendor agrees to coordinate its Work with the work of any other separate contractors or with the work of UCBOE's own forces to avoid delaying or interfering with their work. Vendor shall enforce good order and discipline among his employees and subcontractors on the Project. The Vendor further agrees to inform UCBOE on a regular basis or at UCBOE's request of the progress of the Work.
3. Provision for all Permits, Licenses, and Inspections. Unless otherwise provided, the Vendor shall secure and pay for all permits, licenses, and inspections necessary for the proper execution and completion of the Work.
4. Cleanliness. Vendor shall keep the Project reasonably free from waste materials or rubbish resulting from the Vendor's operations.
5. Additional Warranties. The Vendor warrants that the Vendor has visited the location of the Project and is familiar with all field conditions bearing upon the Vendor's performance of the Work; that the materials and equipment furnished under the Contract are of good quality and new (unless otherwise permitted); that the Work is non-negligent and meets or exceeds the standards ordinarily observed in the industry; and that the Work conforms to the requirements of the Contract and to all applicable codes, ordinances, laws, or regulations. The Vendor further warrants and promises that the Work shall be free from defects

and nonconformities in materials and workmanship for a period of one year from the later of the Date of Completion, which is the date UCBOE accepts the Work or such date as the Vendor actually completes all the Work (the "Date of Completion"). During such period, the Vendor will remedy at Vendor's expense nonconformities or defects in the Work within a reasonable time after receiving notice thereof from UCBOE.

6. Indemnity for Subcontractor Payment. In addition to the indemnification obligations contained in the attached terms and conditions to this Contract, the Vendor further agrees to defend and indemnify UCBOE from and against all claims, damages, losses, and expenses, including reasonable attorneys' fees, arising out of the Vendor's failure to pay subcontractors or materials suppliers.
7. Change Orders. The Vendor agrees that UCBOE may order changes in the general scope of the Work, including additions, deletions, and similar revisions. The parties agree to adjust the Contract Price and Date of Completion to reflect the effects of such changes, which adjustments shall be authorized only upon execution of a written change order (a "Change Order"). In case of emergency or extenuating circumstances or if a construction contingency is provided as stated below, approval of changes may be obtained verbally by telephone or field orders approved by UCBOE Project Coordinator and promptly thereafter substantiated in writing as outlined under normal procedures. The amount of any increase or decrease in the Contract Price shall be by mutual acceptance of a total amount supported by sufficient data and information to substantiate the change. Any decrease in Contract Price for a decrease in the Work will be the reasonable costs of the Work deleted, including a reasonable amount for the decrease in the Vendor's overhead.
8. Performance/Payment Bond. If required by law and/or the bidding documentation, the Vendor agrees to provide a Performance Bond and Labor and Material Payment Bond for its faithful performance in a form reasonably satisfying to UCBOE.
9. Payments Withheld. The UCBOE may withhold payment for the following reasons to the extent permitted under N.C. Gen. Stat. § 143-134.1(e): (1) defective Work not remedied; (2) third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to UCBOE is provided by the Vendor; (3) failure of the Vendor to make payments properly to subcontractors or for labor, materials or equipment; (4) reasonable evidence that the Work will not be completed with the time specified, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; (5) failure to carry out the Work in accordance with the Contract Documents; (6) failure to provide sales tax documentation in accordance with subparagraph 9.3.5; (7) failure or refusal of the Vendor to submit the required information on minority business enterprises; and (8) failure of the Vendor to comply with (a) the provisions of the Sedimentation and Pollution Control Act (N.C. Gen. Stat. § 113A-50 *et seq*.), and/or (b) any Notice of Violation issued by the North Carolina Department of Natural Resources.
10. Retainage. For public construction contracts costing an amount equal to or greater than $100,000, the UCBOE will retain five percent of the amount of each progress payment on the project for as long as is authorized by N.C. Gen. Stat. § 143-134.1. At all times during the Project, the UCBOE may retain the maximum funds allowed by N.C. Gen. Stat. § 143-134.1. The UCBOE specifically reserves the right to withhold additional funds as authorized by this Contract and N.C. Gen. Stat. § 143-134.1. The Vendor may pay each subcontractor no later than seven days after receipt of payment from the UCBOE and in accordance with N.C. Gen. Stat. § 143-134.1 the amount to which the subcontractor is entitled, reflecting percentages actually retained from payments to the Vendor on account of the subcontractor's portion of the Work. The Vendor shall, by appropriate agreement with each subcontractor, require each subcontractor to make payments to sub-subcontractors in a similar manner and in accordance with N.C. Gen. Stat. § 143-134.1.
11. The Vendor shall use and submit applications for payment using a form reasonably satisfactory to UCBOE ("Application for Payment"). The Contractor shall submit with each Application for Payment a completed "Statement of Sales Tax Paid" and "Minority Business Enterprise" documentation in a form acceptable to UCBOE.

III. Additional Standard Term and Condition for Designer Contracts (which include Architectural, Engineering, Surveying, and Technical Services)

Additional Insurance. In addition to the insurance required pursuant to Section 22 of the Standard Terms and Conditions for All Contracts, the Vendor certifies that it currently has and agrees to purchase and maintain during its performance under the Contract the following insurance from one or more insurance companies acceptable to UCBOE and authorized to do business in the State of North Carolina: Professional liability insurance in commercially reasonable amounts as reasonably determined by UCBOE.

IV. Additional Standard Terms and Conditions for Information Technology Contracts

1. Definitions.
   "Hardware" means the hardware the Vendor utilizes in the Hosted Environment for delivery and maintenance of the Hosted Software Services.
   "Hosted Environment" means the Hardware, system software, hosting support software, network connectivity, and facility used by Vendor to support the Hosted Software Services.
   "Hosted Software Services" means the application, including the Hosted Software and any applicable Third-Party Software, as run on the Hosted Environment.
   "Hosted Software" means the software owned and controlled by Vendor or Vendor's third-party contractor that supports the Hosted Software Services.
   "Support Services" means application and technical support required to maintain the performance, uptime and connectivity of the Hosted Software Services for UCBOE access and use, including without limitation, telephone support, error correction, maintenance, and installation of Updates and Upgrades to the Hosted Software.
   "Updates" means (i) modifications to or releases of the Hosted Software that (a) add new features, functionality, and/or improved performance, (b) operate on new or other databases, operating systems, or server platforms or (c) extend the Hosted Software functionality to take advantage of advances in coding language, hardware, network or wireless infrastructures; and (ii) deviation corrections, bug or error fixes, patches, workarounds, and maintenance releases.
   "Upgrades" means any new version or new release of the Hosted Software typically provided on an annual or bi-annual basis by the Vendor that includes new features, functions, support or service that were not in place with the immediately prior version.
2. Grant of License. Vendor grants to UCBOE for the term of this Contract a non-exclusive, non-transferable license to access and use over the internet the Hosted Software (the "License").
3. Updates and Upgrades. Vendor will make certain limited and applicable Hosted Software Updates and Upgrades available to UCBOE at no additional cost. All such Updates and Upgrades shall automatically become subject to the benefits and terms of this Contract and shall automatically be considered part of the License granted under this Contract.
4. Security. Vendor's Hosted Environment shall maintain security measures in place to help protect against the loss, misuse, and alteration of the Hosted Software Services, and specifically the Confidential Information provided to Vendor by UCBOE.
5. Warranties. Vendor warrants the following: (a) Vendor has the full authority to grant the License; (b) the Hosted Software is free from material defects or viruses; (c) the Hosted Software contains no disabling devices; and (d) the Hosted Software conforms to all material specifications set forth in the documentation and any other written material provided to UCBOE for any purpose. Without limiting any other remedies available to UCBOE under this Contract, at law or in equity, in the event that any Hosted Software does not conform to the warranties set forth for the Hosted Software herein, Vendor shall, at UCBOE's option, promptly correct or replace such Hosted Software and, in either case, Vendor shall perform any Support Services or other work required to restore the Hosted Software to the state that existed prior to any such breach, all at Vendor's expense. UCBOE reserves the right to reject the Hosted Software and to hold Vendor responsible for any loss, direct or indirect, caused by any such breach of warranty. In the event Vendor is or becomes aware of a problem with any item of Hosted Software, Vendor shall notify UCBOE upon such determination. Acceptance or use of the Hosted Software shall not constitute a waiver of any claim under any warranty.
6. Effect of Termination and Orderly Transition. Upon termination or expiration of this Contract for any reason, Vendor will cooperate in good faith with UCBOE to provide for an orderly transfer of the Goods and Services

and Confidential Information to UCBOE or UCBOE's successor vendor ("Orderly Transition") and according to the terms of this section.

a. Scope of Work for Orderly Transition. Within thirty (30) days of notification by UCBOE that it will transfer Goods and Services to itself or a successor vendor, the parties will create and execute a scope of work document detailing tasks, the responsible parties for individual tasks, and timeframes for completion of tasks necessary to complete an Orderly Transition. The final, executed Orderly Transition scope of work shall be incorporated into this Contract and become subject to its terms. Vendor's failure to (a) cooperate in developing the Orderly Transition scope of work, (b) execute an Orderly Transition scope of work, or (c) abide by the executed Orderly Transition scope of work shall be deemed a material breach of this Contract.

b. Time Frame. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor shall continue to provide Goods and Services while UCBOE migrates its Confidential Information from Vendor's Hosted Software Services in the Orderly Transition process. Vendor agrees that, as part of the Orderly Transition process and within the specified time frame, it will transfer to UCBOE all of the Confidential Information provided to Vendor by UCBOE pursuant to this Contract. Vendor will provide the Confidential Information in commercially reasonable electronic format as agreed in the Orderly Transition scope of work at no additional cost.

c. Time and Material Costs Only. UCBOE will be obligated to pay for time and materials at a reasonable hourly rate of no more than $75/hour for the Orderly Transition. No other fees will be assessed for the Orderly Transition. Fees shall be agreed upon in advance as part of developing the scope of work referenced in subsection (a) above.

d. Destruction of Confidential Information after Orderly Transition. Unless otherwise mutually agreed in an executed Orderly Transition scope of work, Vendor agrees that after returning all Confidential Information to UCBOE pursuant to subsection (b) above it will destroy all remaining copies of Confidential Information and back-up Confidential Information in its possession, contained in or on any medium (such as a storage area network or "SAN") or as may be stored offsite, within thirty (30) days of completion of Orderly Transition. Vendor shall provide UCBOE with a detailed summary of the destruction process and standards to be utilized by Vendor with respect to the Confidential Information, and UCBOE shall approve such process and standards prior to Vendor commencing such destruction.

7. Intellectual Property Warranty. In addition to the warranties set forth elsewhere in this Contract with respect to the Goods and Services, Vendor expressly represents, warrants and covenants that neither the furnishing of Hosted Services to UCBOE hereunder, nor does the Hosted Software, violate, in whole or in part, any provision of any law, common law or regulation concerning copyrights, trade secrets, trademarks, tradenames, service marks, patents or other provisions regulating or concerning intellectual property rights.
8. Additional Indemnification. To the fullest extent permitted by law, Vendor shall indemnify, defend and hold harmless UCBOE, its and directors, officers, managers, employees and agents, from all suits, claims, costs, damages and other liabilities, including reasonable attorneys' fees as incurred by counsel of UCBOE's choice, relating to or arising from (a) Vendor's failure to maintain the security and integrity of Confidential Information, the Hosted Software Services and the Hosted Environment; (b) any claim for infringement of any copyright, trade secret, trademark, tradename, service mark, patent, or other law or regulation concerning intellectual and/or proprietary property rights; and (c) any claims by third party interests in the Hosted Software.
9. Data Use. Notwithstanding the foregoing, Vendor acknowledges and agrees that all Confidential Information is proprietary to and owned exclusively by UCBOE, whether provided in tangible or electronic form and whether entered into any software or Hosted Software Services owned or licensed by Vendor (including without limitation the Hosted Software and Hosted Software Services) or otherwise provided in connection with any products provided and services performed by Vendor (including without limitation the Goods and Services) and whether to, by or through a Vendor-affiliated ASP or other Hosted Software Services. Furthermore, Vendor shall not sell, market, or commercialize Confidential Information, create derivative products or applications based on Confidential Information or otherwise use Confidential Information in any manner unrelated to the performance of Vendor's obligations under the Contract. Vendor shall not share Confidential Information with any parent or subsidiary company of Vendor or any other Vendor-affiliated entity without the express prior written consent of UCBOE detailing the scope of allowable disclosure. Vendor agrees that if it breaches this

section, UCBOE may, at its option, pursue any or all of the following remedies: (a) immediately terminate this Contract without liability to Vendor; (b) seek an injunction without posting a bond; and (c) pursue whatever other remedies may be available to it at law, in equity or pursuant to this Contract.

EXHIBIT 1

SCOPE OF WORK

PART 1-GENERAL

Union County Public Schools is soliciting bids for Prospect Elementary School's HVAC Renovation.

Contractor is to provide all labor, equipment, materials, permits, fees, inspections, etc. to provide a turnkey project as indicated on the drawings and specifications provided by McKnight Smith Ward Griffin Engineers. (Exhibit 2). Permits and Inspections shall be provided to assigned UCPS Project Coordinator.

Note: Drawings are provided in order to give a general description of the Work. Contractor is to visit the site and field verify all existing conditions that may affect the design and layout of this project prior to preparation of submittals.

Contractor shall comply with all current local, state, and national codes and regulations. This includes, but not limited to, complying with all ADA requirements. In the event of a conflict between the Scope of Work and code regulations, the Contractor shall notify the Engineer for direction.

Contractors shall be properly licensed within the state of North Carolina to complete work identified within the bid documents, have successfully completed projects of this type and size for a minimum of 5 years, and be able to provide references within 24 hours of request.

PART 2-SAFETY

Contractor is solely responsible for safeguarding the project areas through the duration of the project including, but not limited to, barricades, snow fencing.

The Contractor may setup on site at a location authorized by the assigned UCPS Project Coordinator. Any equipment or supplies left on school property shall be securely locked. UCPS will not be responsible for damages or theft of Contractor's or 3rd party (i.e. rental equipment) property.

Contractor shall require all employees to abide by the OSHA safety guidelines. A written safety policy shall be provided to the assigned UCPS Project Coordinator within 24 hours of request.

All representatives of Contractor shall dress appropriate for school environment and perform work in a professional manner. Compliance is at the sole discretion of Union County Public Schools. Any individual not in compliance will be asked to leave Union County Public School property.

There are not to be any drugs, firearms, tobacco, or weapons on school property.

Contractor's Project Manager shall provide daily, to front office of worksite, a list of employees working onsite that day.

PART 3-WARRANTY

Refer to Contract for Warranty Information.

Contractor is responsible for damages to UCPS property as a direct result of this project. Contractor shall repair, replace to the fullest extent as needed to restore the property to the original state at no cost to Union County Public Schools.

PART 4-PROJECT SCHEDULE

November 21, 2023	Notice to Proceed anticipated for release (contact Procurement Lead if not received).
June 13, 2024	Contractor may commence Work on site.
August 2, 2024	Substantial Completion
August 8, 2024	Final Completion

Interior Work may be performed during operating hours provided no interruption to the students or staff. Exterior Work can take place anytime. Existing HVAC system must remain in operation until the change over takes place. All work is to be closely scheduled with assigned UCPS Project Coordinator to ensure no disruption to school activities.

If work cannot be completed during the Project Schedule listed above, Contractor shall list the number of consecutive calendar days required for completion and provide a revised project schedule within the bid submittal. At minimum, the revised project schedule is to show the dates of Commence Work on site, Substantial Completion and Final Completion.

Contractor shall appoint a Project Manager to be the sole point of contact through the duration of the project. The Project Manager shall be fluent in the English Language (speaking and writing). The Project Manager shall be easily accessible via telephone and email. At minimum, a status update shall be provided to the assigned UCPS Project Coordinator on Tuesday of every week.

PART 5-ALLOWANCE FUNDS

Definition: A designated amount of funds included in the contract amount for unforeseen conditions.

When an unforeseen condition arises, Contractor is to submit a written request for the amount of funds needed. The request shall be accompanied with backup documentation for the request (i.e. materials and labor quotes).

If approved, UCPS is to provide a signature of approval to the Contractor.

All unused funds will be credited to UCPS at the end of the project.

Amount of Allowance Funds allocated to this project is $10,000.00

COST PROPOSAL/EXECUTION OF PROPOSAL

Prospect Elementary School
HVAC Renovation
BID NO. 4-97352005

By submitting this proposal, the potential contractor certifies the proposal is signed by an authorized representative of the firm.

The cost and availability of all equipment, materials, and supplies associated with performing the services described herein have been determined and included in the proposed cost.

All labor costs, direct and indirect, **sales tax, etc.** have been determined and included in the proposed cost.

The offeror is aware of prevailing conditions associated with performing these services.

The potential contractor has read and understands the conditions set forth in this bid and agrees to them with no exceptions.

Therefore, in compliance with this Request for Proposals, and subject to all conditions herein, the undersigned offers and agrees, if this proposal is accepted within **60** days from the date of the opening, to furnish the subject services for a cost not to exceed:

BID AMOUNT: $1360000.00 **(Includes $10,000 Allowance Funds)** 458 **CCD**

ALTERNATE 1: **ADD $** 675000.00 458 *CCD

ALTERNATE 2: **ADD $** 128000.00 458 *CCD

ALTERNATE 3: **ADD $** 135000.00 458 CCD

Unit vent & FAN Coils projected 30 weeks
RTU projected 30 weeks

*CCD: Consecutive Calendar Days required to achieve Final Completion from Issuance of Purchase Order

CCD includes thru next Winter break incase run out of time in summer

DDC System: VANGuard DDC Installer: Carolina Air Solutions/Control Stop

ADDENDA ACKNOWLEDGEMENT

ADDENDUM 1: _____ ADDENDUM 2: _____ ADDENDUM 3: _____

EXECUTION

OFFEROR: Carolina Air Solutions FEDERAL ID NO. 20-2107707

LICENSE DESCRIPTION: H1, HF2, H3 LICENSE NO. 17879

ADDRESS: 9224 Stockport Pl CITY, STATE, ZIP Charlotte, NC 28273

TELEPHONE NUMBER: 704-525-1900 MOBILE: 704-506-9068 EMAIL: billy@carolinaairsolutions.com

BY: Billy Garrison DATE: 10-10-23 TITLE: Operations MANAGER
(Signature)

Billy Garrison
(Typed or printed name)

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

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

County of Mecklenburg

(Name of Bidder)

Affidavit of Carolina Air Solutions

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

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

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

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

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

Date: 10-9-23 Name of Authorized Officer: Billy Garrison

Signature: Billy Garrison

Title: Operations MANAGER

SEAL

State of NORTH CAROLINA, County of MECKLENBURG

Subscribed and sworn to before me this 9th day of OCTOBER 2023

Notary Public [signature]

My commission expires 5.30.2028

MBForms 2002-Revised July 2010

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

Identification of HUB Certified/ Minority Business Participation

I, Carolina Air Solutions.
(Name of Bidder)

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

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

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

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

The total value of minority business contracting will be ($) 0.

MBForms 2002-Revised July 2010

RLI SURETY
P.O. BOX 3967 PEORIA, IL 61612-3967
P: (800)645-2402 E: contract.surety@rlicorp.com
RLISURETY.COM

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That We, Carolina Air Solutions, Inc
of Charlotte, NC
as Principal, and **Contractors Bonding and Insurance Company**, of Peoria, Illinois, as Surety, an Illinois corporation duly licensed to do business in the State of North Carolina, are held and firmly bound unto Union County Schools, as Obligee, in the penal sum of Five percent of contract amount (5%), for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, That whereas the Principal has submitted, or is about to submit, a proposal or a bid to the Obligee on a contract for Prospect ES HVAC Renovations.

NOW, THEREFORE, if the aforesaid principal shall be awarded the contract, the said principal will within the period specified therefore, or if no period be specified, within ten (10) days after the notice of such award enter into a contract and give bond for the faithful performance of the contract, then this obligation shall be null and void, otherwise the principal and the surety will pay unto the obligee the difference in money between the amount of the bid of said principal and the amount for which the obligee may legally contract with another party to perform the work if the latter amount be in excess of the former, in no event shall the liability hereunder exceed the penal sum hereof.

PROVIDED AND SUBJECT TO THE CONDITION PRECEDENT, that any suits at law or proceedings in equity brought or to be brought against the Surety to recover any claim hereunder must be instituted and service had upon the Surety within ninety (90) days after the acceptance of said bid of the Principal by the Obligee.

SIGNED, SEALED AND DATED this 6th day of October, 2023.

Carolina Air Solutions, Inc
Principal

By: Billy Jones

CONTRACTORS BONDING AND INSURANCE COMPANY — CORPORATE SEAL — ILLINOIS

Contractors Bonding and Insurance Company

By: Kathryn Calkins
Attorney in Fact

ADDRESS ALL CORRESPONDENCE TO:

Contractors Bonding and Insurance Company
P.O. Box 3967
Peoria, IL 61612-3967
800-645-2402

POWER OF ATTORNEY

RLI Insurance Company
Contractors Bonding and Insurance Company
9025 N. Lindbergh Dr. Peoria, IL 61615
Phone: 800-645-2402

Know All Men by These Presents:

That this Power of Attorney is not valid or in effect unless attached to the bond which it authorizes executed, but may be detached by the approving officer if desired.

That **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, each an Illinois corporation, (separately and together, the "Company") do hereby make, constitute and appoint:

Don Hanson, Stacie Brown, Brad Causey, Trena Moelker, Kathryn Calkins, Rick Craig, Bill Bobbitt, jointly or severally

in the City of Charlotte, State of North Carolina its true and lawful Agent(s) and Attorney(s) in Fact, with full power and authority hereby conferred, to sign, execute, acknowledge and deliver for and on its behalf as Surety, in general, any and all bonds and undertakings in an amount not to exceed Twenty Five Million Dollars ($25,000,000.00) for any single obligation.

The acknowledgment and execution of such bond by the said Attorney in Fact shall be as binding upon the Company as if such bond had been executed and acknowledged by the regularly elected officers of the Company.

RLI Insurance Company and/or **Contractors Bonding and Insurance Company**, as applicable, have each further certified that the following is a true and exact copy of a Resolution adopted by the Board of Directors of each such corporation, and is now in force, to-wit:

> "All bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation shall be executed in the corporate name of the Company by the President, Secretary, any Assistant Secretary, Treasurer, or any Vice President, or by such other officers as the Board of Directors may authorize. The President, any Vice President, Secretary, any Assistant Secretary, or the Treasurer may appoint Attorneys in Fact or Agents who shall have authority to issue bonds, policies or undertakings in the name of the Company. The corporate seal is not necessary for the validity of any bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation. The signature of any such officer and the corporate seal may be printed by facsimile."

IN WITNESS WHEREOF, the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, as applicable, have caused these presents to be executed by its respective Vice President with its corporate seal affixed this 14th day of December, 2022.

CONTRACTORS BONDING AND INSURANCE COMPANY CORPORATE SEAL ILLINOIS

RLI INSURANCE COMPANY CORPORATE SEAL ILLINOIS

RLI Insurance Company
Contractors Bonding and Insurance Company

By: B. W. D.
Barton W. Davis — Vice President

State of Illinois }
County of Peoria } SS

On this 14th day of December, 2022, before me, a Notary Public, personally appeared Barton W. Davis, who being by me duly sworn, acknowledged that he signed the above Power of Attorney as the aforesaid officer of the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company** and acknowledged said instrument to be the voluntary act and deed of said corporation.

By: Catherine D. Glover
Catherine D. Glover — Notary Public

CATHERINE D. GLOVER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires
March 24, 2024

CERTIFICATE

I, the undersigned officer of **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company**, do hereby certify that the attached Power of Attorney is in full force and effect and is irrevocable; and furthermore, that the Resolution of the Company as set forth in the Power of Attorney, is now in force. In testimony whereof, I have hereunto set my hand and the seal of the **RLI Insurance Company** and/or **Contractors Bonding and Insurance Company** this 6th day of October, 2023

RLI Insurance Company
Contractors Bonding and Insurance Company

By: Jeffrey D Fick
Jeffrey D Fick — Corporate Secretary

INDEX

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall coordinate the work and equipment of this Division with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation. Work such as excavation, backfill, concrete, flashing, wiring, etc., which is required by the work of this section shall be performed in accordance with the requirements of the applicable section of the specifications.

B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

1.2 DEFINITION

A. The word "Contractor" as used in this section of the specification refers to the HVAC Contractor unless specifically noted otherwise. The word "provide" means furnish, fabricated, complete, install, erect, including labor and incidental materials necessary to complete in place and ready for operation or use the item referred to or described herein and/or shown or referred to on the Contract Drawings.

1.3 CONTRACTOR'S QUALIFICATIONS

A. It is assumed that the Contractor has had sufficient general knowledge and experience to anticipate the needs of a construction of this nature. The Contractor shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by code, law or regulations shall be provided whether or not specified or specifically shown where it is a part of a major item of equipment, or of the control system specified or shown on the plans.

PART 2 PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished.

B. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welders, helpers and labor required to unload, transfer, erect, connect-up, adjust, start, operate and test each system.

C. Unless otherwise specifically indicated on the plans or specifications, all equipment and material shall be installed with the approval of the Engineer in accordance with the recommendations of the manufacturer. This shall include the performance of such tests as the manufacturer recommends.

D. All work must be done by first-class and experienced mechanics properly supervised and it is understood that the Engineer has the right to stop any work that is not being properly done and has the right to demand that any workman deemed incompetent by the Engineer be removed from the job and a competent workman substituted therefor.

2.2 EQUIPMENT APPLICATION AND PERFORMANCE

A. The Contractor and/or Equipment Supplier shall be responsible to see that equipment supplied is correct for the intended application and will perform within the limits of capacity, noise, life expectancy, pressure drop and space limitations intended for that equipment as shown on the plans or described in the specifications. The shop drawings shall show the capacity and operating characteristics of the equipment.

2.3 EQUIPMENT DEVIATIONS

A. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefor, shall be prepared by the Subcontractor at his own expense and submitted for approval by the Engineer.

B. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork,

piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

2.4 MOTORS

A. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C40 and conform thereto for installation resistance and dielectric strength. Each motor shall be provided with conduit terminal box, adequate starting and protective equipment as specified or required. The capacity shall be sufficient to operate associate driven devices under all conditions of operation and load and without overload, and at least shall be the horsepower indicated or specified. Each motor shall be selected for quiet operation. Motors 1 HP or more shall Motors shall be premium efficient with a minimum efficiency as specified by NEMA MG1-2006, Table 12-12. Motors shall be TEFC or TEAO construction as appropriate. ODP motors are not allowed. Motors shall be 1800 RPM whenever possible. Single phase motors shall be electrically commutated type.

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B. Motors connected to variable speed drives shall be inverter duty rated and shall be provided with a maintenance free, circumferential, conductive micro fiber shaft grounding ring (AEGIS® SGR or equal) shall be installed on the AC motor to discharge shaft currents to ground.

2.5 DRIVES

A. Machinery drives shall be provided for all power driven equipment specified in this section.

B. Drives shall be V-belt and shall be selected to overcome the starting inertia of the equipment without slippage, but in no case shall be less than 150% of the full motor load. Drives 1/2 HP and smaller may be provided with single belts. Drives 3/4 HP and larger shall be provided with the number of belts necessary to transmit the required power with 95% minimum efficiency.

C. Where adjustable type sheaves are indicated they shall be selected such that the schedule speed of the driven equipment is at the midpoint in the adjustment range of the sheave.

D. Where fixed type sheaves are indicated the Contractor shall include in his price changing sheave sizes once during the balancing period to achieve proper air quantities.

E. Sheaves shall be machined cast iron of the same manufacturer as the belt provided. Shop drawings shall be submitted of each drive which shall include actual transmission capacity of each drive.

2.6 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this contract, and shall submit drawings to the Engineer for approval before purchase, fabrication or construction of same.

B. For pumps, compressors, and other rotating machinery and for all equipment where foundations are indicated, furnish and install concrete pads minimum 4 inches thick or as shown. All pads shall be extended six (6) inches beyond machine base in all directions with top edge hampered. Insert six (6) inch long, l/2" round steel dowel rods at 12" on center into floors to anchor pads. Shop drawings for all foundations and pads shall be submitted to the Engineer for approval before same are constructed.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.

D. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Engineer, not strong enough shall be replaced as directed.

2.7 VIBRATION ISOLATION

A. All work shall operate under all conditions of loads without any sound or vibration which is objectionable in the opinion of the Engineer. If requested, the Contractor shall record sound power level readings in all areas adjacent to mechanical rooms, over, under or beside, after all equipment is fully operational and all wall and ceiling systems are completed. Sound level readings shall not exceed NC levels as recommended in Table 1, Chapter 48 of 2011 ASHRAE Applications Handbook.

B. The readings are to be tabulated in the Maintenance and Operating Instruction Booklets.

C. Sound or vibration conditions in excess of listed quantities shall be corrected in an approved manner by the Contractor at his expense.

D. Unless otherwise noted mechanical equipment over one horsepower shall be isolated from the structure with resilient vibration and noise isolators supplied by one manufacturer to the Mechanical Contractor. Where isolator type and required deflection are not shown, equipment shall be isolated in accordance with the 2011 ASHRAE Applications Handbook, Chapter 48, Table 47. Submittals shall include complete design for the equipment bases, a tabulation of the design data for the isolators, including lateral stiffness, O.D., free operating and solid height of the spring isolators, free and operating height of the neoprene or fiberglass isolators. Selection of isolators for proper loading to obtain desired efficiency shall be the responsibility of the manufacturer of isolating units to suit the equipment being supplied on the job and shall be fully guaranteed by this supplier. All vibration isolation equipment complete with thorough selection data shall be submitted. Units shall be Vibration Eliminator Company, Mason, Peabody, or approved equal.

E. Flexible duct connections shall be provided at inlet and outlet of all fans or cabinets containing fans and shall be constructed such as to allow a minimum movement of 2 inches in any direction and will not restrict normal movement of any equipment.

2.8 CONNECTIONS FOR DISSIMILAR METALS

A. Brass fittings shall be used at any points within the piping systems where dissimilar metals meet. Careful attention shall be given to support brackets and hangers to select proper materials to avoid dissimilar metal contact at these points.

2.9 DRAINS AND VENTS

A. In addition to the drains and vents indicated on the plans and piping details, the Contractor shall install additional drains and vents as required to remove all water and air from the piping systems.

2.10 MOTOR STARTERS AND DISCONNECTS

A. Individual motor controllers, motors using variable frequency drives, complete with auxiliary contacts, control transformers, push buttons, selector switches and remote push button stations not specifically specified to be furnished with the equipment shall be provided under this section. Motor controllers shall comply with NEMA Standards and be complete with proper size heaters and auxiliary contacts and shall be in NEMA enclosures as required. Unless otherwise noted, push button stations shall be oil-tight heavy duty type. Controllers shall be manual, magnetic, or combination type with disconnect switch or circuit breaker as indicated on the drawings or where required by the NEC. Controllers shall include motor overcurrent protection in each phase conductor. Each motor controller shall be provided with phenolic nameplate, black with 1/4" high letters and white border, indicating equipment served, attached using counter sunk screws.

B. The Electrical Contractor shall furnish and install all disconnecting switches unless otherwise indicated or specified. Where disconnecting switches are indicated to be furnished under this Section, they shall be General Electric, Type TH in NEMA 1 enclosures, with voltage and amperage rating appropriate to the application. Unless otherwise noted, fuses shall be Buss "Fusetrons", or approved equal. Unfused motor disconnecting switches shall be Type TH in NEMA 1 or 4 applicable enclosures. Similar and equivalent equipment as manufactured by I.T.E., Square D, or Westinghouse is equally acceptable. Switches used as service switches shall bear such U.L. Label and nameplate on switch shall so indicate.

2.11 PAINTING

A. Paint material shall be selected from the products listed below and, insofar as practical, products of only one manufacturer shall be used. Contractor shall submit to the Engineer the listed manufacturer he proposes to use in the work. Should the Contractor desire to use products of a manufacturer not listed below, or products made by a listed manufacturer but not scheduled herein, Contractor shall submit complete technical information on the proposed products to the Engineer for approval. Only products approved by the Engineer shall be used.
   1. Rust Inhibitive Primer:
      a. Devoe: Ready-Mixed Red No. 20.
      b. Duron: Deluxe Red Primer.
      c. Glidden: Rustmaster Tank and Structure Primer.
      d. Pittsburgh: Inhibitive Red Primer.
   2. Galvanized Metal Primer:
      a. Devoe: Devoe Zinc Dust Primer.

b. Duron: Duron Deluxe Galvanized Metal Primer
c. Glidden: Rustmaster Galvanized Iron Metal Primer.
d. Pittsburgh: Speedhigh Galvanized Steel Primer.

PART 3 EXECUTION

3.1 DUTIES OF CONTRACTOR

A. Contractor shall furnish and install all materials called for in these Specifications and accompanying drawings, and must furnish the apparatus complete in every respect. Anything called for in the specifications and not shown on the drawings or shown on the drawings and not called for in the specifications must be furnished by the Contractor.

B. The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Engineer shall be notified before proceeding with installation.

C. The plans are diagrammatic and are not intended to show each and every fitting, valve, pipe, pipe hanger, or a complete detail of all the work to be done; but are for the purpose of illustrating the type of system, showing pipe sizes, etc., and special conditions considered necessary for the experienced mechanic to take off his materials and lay out his work. This Contractor shall be responsible for taking such measurements as may be necessary at the job and adapting his work to local conditions.

D. The right to make any responsible change in location of apparatus, equipment, routing of piping up to the time of roughing in, is reserved by the Engineer without involving any additional expense to the Owner.

3.2 CODES, RULES, PERMITS AND FEES

A. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, and with the requirements of all governmental departments having jurisdiction.

B. All materials and equipment for the electrical portion of the mechanical system shall bear the approval label, and shall be listed by the Underwriters' Laboratories, Inc.

C. All work shall be done in accordance with the North Carolina State Building Code, and requirements of governmental agencies having jurisdiction.

D. It shall be the responsibility of this Contractor to complete installation of the specified fired and unfired pressure vessels, and their safety devices, in accord with requirements of the latest edition of the North Carolina Boiler Inspection Law, Rules and Regulations. Contractor shall have the equipment which is installed under this contract inspected and approved by the State of North Carolina, Department of Labor, Bureau of Boiler Inspections. Contractor shall be responsible for notifying State Boiler Inspector in writing at least two weeks prior to date of completion of all equipment requiring inspection.

E. Furnish and install a suitable metal frame, having a removable glass cover, for posting certificates of inspection furnished by the North Carolina Department of Labor, Boiler Bureau. Certificates are to be installed in frames by this Contractor before requesting final inspection of complete job by the Owner and Engineer. Final payment will not be made until such certificate has been duly posted. All fees or expenditures necessary for this requirement shall be paid by this Contractor.

3.3 COOPERATION WITH OTHER TRADES

A. This Contractor shall give full cooperation to other trades and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Where the work of the Contractor will be installed in close proximity to, or may interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 3/8" = 1'-0", clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordination with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

3.4 RECORD DRAWINGS

A. The Contractor shall furnish drawings showing dimensioned location and depths of all exterior piping and structures, and shall indicate any and all changes in location of piping, ductwork, equipment or valves from that shown on the Contract Drawings. The drawings shall consist of clean, legible sepia prints of the Contract Drawings, available from the Engineer on which the Contractor shall mark all notes, dimensions, sizes and information required. The sepias shall be kept for this purpose only. Before final inspection the Contractor shall submit to the Engineer eight (8) sets of black line prints of the sepias.

3.5 SURVEYS AND MEASUREMENTS

A. This Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

B. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications. He shall notify the Engineer and shall not proceed with his work until he has received instructions from the Engineer.

3.6 SAFETY REQUIREMENTS

A. All systems shall be installed so as to be safe operating and all moving parts shall be covered where subject to human contact. All rough edges of equipment and materials shall be made smooth.

B. All safety controls shall be checked under the supervision of the Engineer's representative and eight (8) copies of test date showing setting and performance of safety controls shall be submitted to the Engineer. All pressure vessels shall be ASME stamped and shall have stamped relief valves. Boilers shall be provided with ASME stamped T & P relief valve.

C. An emergency shutoff switch shall be provided at the door to each equipment room containing gas burners. Activation of the switch shall cause each burner within that equipment room to cease operation.

3.7 SHOP DRAWINGS

A. The Contractor shall submit for approval eight (8) sets of detailed shop drawings of all equipment and all material required to complete the project, and no materials or equipment may be delivered to the job site or installed until the Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein.

B. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly marked. Data of a general nature will not be accepted. Data shall include eight (8) copies of computation sheets indicating how unit capacity was determined where ratings are at other than standard conditions. No payment for any equipment or labor will be allowed until all major pieces of equipment specified have been submitted to the Engineer for approval.

C. The Contractor, as part of the shop drawing submitted, shall submit shop drawing of all ductwork in the mechanical rooms, the risers including takeoffs to the floors with their associated dampers, and ells with unequal legs showing turning vanes.

D. Static pressure drops across fittings, dampers, heaters, attenuators, etc. shall not exceed minimum ASHRAE Standards when not specified.

3.8 ACCESSIBILITY

A. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to valves, traps, cleanouts, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility and any change shall be submitted for approval.

3.9 CONCEALED PIPE

A. In general, all pipe in finished spaces shall be run concealed in floors, walls, partitions and above ceilings.

B. Concealment of pipe and covering of same shall not be done until authorized by the Engineer, after proper tests have been made. This applies to all interior work and exterior work.

3.10 CUTTING AND PATCHING

A. This Contractor shall provide all cutting and patching necessary to install the work specified in this section.

3.11 SLEEVES AND PLATES

A. This Contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed, or where incorrectly located. This Contractor shall do all drilling required for the installation of his hangers.

B. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction. Sleeves shall not be provided for piping running imbedded in concrete or in insulating concrete slabs on grade.

C. Where sleeves are placed in exterior walls below grade, the space between the pipe or conduit and the sleeves shall be packed with oakum and lead and made completely watertight.

D. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations; make actual lengths to suit the following:

E. Terminate sleeves flush with walls, partitions and ceiling.

F. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor or as shown on the plans.

G. In all areas where pipes are exposed, extend sleeves 1/4 inch above finished floor, except in rooms having floor drains, where sleeves shall be extended 3/4 inches above floor.

H. Sleeves shall be constructed of schedule 40 black steel pipe unless otherwise indicated on the drawings. Sleeves through concrete beams shall be constructed as indicated on the drawings.

I. Fasten sleeves securely in floor, walls, so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

J. Where piping penetrates fire rated floors or walls, penetrations shall be sealed with a U.L. approved fire stopping system. System shall be as manufactured and detailed by 3M Company or approved equal.

K. Escutcheon plates shall be provided for all exposed pipes and all exposed conduit passing through walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

3.12 SCAFFOLDING, RIGGING, HOISTING

A. This Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

3.13 EXCAVATING AND BACKFILLING

A. Each trade shall perform all excavation and backfill required for the installation of its work.

B. Particular care shall be taken not to disturb or damage work of other Contractors.

C. The Contractor shall do all trench and pit excavation and backfilling required for work under this section of the specifications, inside and outside the building, including repairing of finished surfaces and all required shoring, bracing, pumping and all protection for safety of persons and property. State and OSHA Safety Codes shall be strictly observed. In addition, it shall be the responsibility of the Contractor to check the indicated elevations of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Engineer shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the

responsibility of the Contractor to make the excavations at the minimum required depths in order to avoid undercutting the footings.

D. No backfilling shall be done until work involved has been tested and approved by the Engineer.

E. Contractor shall schedule excavation work so as not to unduly interfere with work of other trades on the job. Contractor shall be responsible for establishing all lines and grades required for proper location of his work.

F. When rock is encountered in excavation, it shall be paid for as outlined under the specifications.

G. In backfilling pipe trenches, approved fill shall first be compacted firmly and evenly on both sides of pipe in 6" layers to a depth of 12" over the top of the pipe. Remainder of trench shall be backfilled to established grade in 6" layers. Compact between each layer with a high-frequency vibrator tamper such as Dart Soil Compactor (as manufactured by Dart Manufacturing Company, Denver, Colorado). Fill shall be compacted to density specified under Earth Work Section of specifications for specified area through which trench passes. Compact fill to 95% maximum density at optimum moisture content all other areas. Earth bearing pressure as indicated shall be verified by a testing laboratory, which following the criteria specified for foundation wall trench, etc. in the Earth Work Section of the specifications. The reports shall be forwarded to the Engineer for approval unless otherwise specified; the cost will be borne by this contractor, before any work is performed. If the earth bearing pressure is less than that required, the Contractor shall not begin additional work until notified by the Engineer to do so. A copy of the report shall be forwarded to the Engineer in triplicate.

H. Excess earth shall be distributed on premises as directed by the Engineer.

I. Where ditches occur outside the building, the surface shall be finished to match existing surfaces. Any existing work or work of other trades which is damaged or disturbed shall be repaired or replaced, and left in good order.

3.14 ELECTRICAL CONNECTIONS

A. The Electrical Contractor shall furnish and install all wiring except: (1) temperature control wiring; (2) equipment control wiring and (3) interlock wiring. The Electrical Contractor shall receive from the Mechanical Contractor and mount all individually mounted motor starters and provide all power wiring to the motor terminals unless otherwise indicated. The Electrical Contractor will provide branch circuit protection and disconnects unless otherwise indicated or specified. The Mechanical Contractor shall provide all other control and protective devices, and perform all control and interlock wiring required for the operation of the equipment. Power wiring, from nearest panel, for control components (dampers, panels, etc.) shall be provided by the Mechanical Contractor.

B. After all circuits are energized and complete, the Electrical Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of this Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.

C. It shall be the responsibility of this Contractor to check with the Electrical Contractor on service outlets provided for this Contractor, to determine that the switches and wiring provided are of adequate size to meet Code requirements for this Contractor's equipment. Any discrepancy shall be brought to the attention of the Engineer before work is installed. Otherwise, any cost for changes shall be at the expense of this Contractor, and in any case electrical cost increase due to equipment substitution of different electrical characteristics shall be this Contractor's expense.

3.15 PIPE WORK

A. All pipe work shown on the drawings and/or specifications or implied herein and required for a complete and operating system shall be done by experienced mechanics in a neat and workmanlike manner and subject to the approval of the Engineer.

B. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required and it shall be the responsibility of the Contractor to furnish and install all materials and equipment required for the operating systems.

C. The piping shall be installed as shown on the plans with strict conformity to the sizes listed and due provisions for expansion and contraction.

D. Unless otherwise noted on the plans, all piping shall be installed inside the insulated envelope of the building.

3.16 LUBRICATION

A. All bearing, except those specifically requiring oil lubrication, shall be pressure lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen. In areas where lubrication points are not readily accessible Contractor shall provide extended lubrication tubes to positions where lubrication can be easily accomplished. Pressure grease lubrication fittings shall be "Zerk-Hydraulic" type as made by the Stewart-Warner Corporation, or approved equal, for each type of grease required.

B. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication. Eight (8) copies of charts and schedules shall be submitted to the Engineer prior to final inspection and approved copies of each schedule and chart shall be framed by the Contractor in metal frames with glass front and installed in the Equipment Room.

3.17 PROTECTION

A. The Contractor shall protect all work and material from damage, and shall be liable for all damage during construction.

B. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which is not immediately installed. He shall close open ends of work including pipe, duct, or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.

C. Provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint or other foreign materials from collecting on the equipment and/or fouling working parts.

3.18 CLEANING

A. Clean from all exposed insulation and metal surfaces grease, debris or other foreign material.

B. Chrome plated fittings, fixtures, piping and trim shall be polished upon completion.

3.19 LABELS AND INSTRUCTIONS

A. Label all switches and controls furnished under this Section with engraved bakelite permanent labels to indicate the function of each and the apparatus serviced.

B. Post in the Equipment Room framed under glass the following:
   1. Lubrication instructions listing all equipment which requires lubrication, the type of lubricant to be used and the frequency of lubrication.
   2. Photostatic copy of wiring diagram of temperature controls.
   3. Step-by-step operating instruction for each piece of equipment with control sequence description.

C. All units shall be marked with unit numbers in three inch high letters with unit designated numbers.

D. A tabulation shall be made of each panel number and circuit number serving each air conditioning unit, fan or other device with electrical service. This list shall be prepared and be ready to turn over to inspectors prior to calling for final inspection.

E. Labeling shall be as follows:
   1. Air-Cooled Chiller - ACCH
   2. Air Handling Unit - AHU
   3. Boiler - B
   4. Pumps - primary chilled water (CHWP), secondary chilled water (BCWP), primary hot water (HWP), secondary hot water (BHWP).
   5. Hot water supply and return piping - HWS/HWR with flow direction arrows in mechanical areas and above ceilings
   6. Chilled water supply and return piping - CHS/CHR with flow direction arrows in mechanical areas and above ceilings

F. Labeling shall be in 4 inch letters and every ten feet on exposed piping. Above ceilings labeling shall be every 25 feet in a location easily seen, usually on the bottom of the pipe. Labeling shall occur on both sides of a wall, ceiling or floor.

G. Provide engraved plastic laminated (5 in x 4 in) labels on all equipment. Labels shall include equipment number, area(s) served (use actual room numbers), substantial completion date (S.C.D.), extended warranty period, number and size of filters and capacity.

3.20 VALVE, MOTOR AND DAMPER TAGS AND SCHEDULE

A. Each valve, motor and damper shall be provided with an engraved black finish, phenolic tag indicating service and number. Tag lettering shall be at least 1/4" high etched white letters and beveled white trim. Tags to be attached using brass chains.

B. The Contractor shall submit eight (8) copies of charts indicating number, location, service, "normal" position, manufacturer, size and model number to the Engineer for approval.

C. Prior to final inspection an approved copy of each chart shall be framed by the Contractor in a metal frame with glass front and installed in the Equipment Room.

3.21 EQUIPMENT SERVICEABILITY

A. All equipment shall be serviceable. All equipment shall be installed so that it can be removed. All equipment in or connected to piping systems shall have valves to isolate this equipment from the piping system. This includes, but not necessarily limited to control valves, sensors, switches, pumps, traps and strainers. Unions (screwed or flanged) shall be provided so that all equipment is removable.

B. Equipment installed in walls, ceilings or floors shall be accessible for service or removal without cutting walls, etc.

C. Equipment requiring periodic service shall be installed to allow clearance for service and have removable panels, access doors, etc. through which the service is to be performed.

D. Serviceability to equipment shall include a minimum of 36” in front of all equipment per NEC 110.26.

3.22 ACCEPTANCE OF EQUIPMENT

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

B. Contractor shall make all necessary tests, trial operation balancing and balance tests, etc., as may be required as directed by the engineer to prove that all work under these plans and specification is in complete serviceable condition and will function as intended. Fully trained service technicians employed or recommended by the manufacturers representative(s) providing the main mechanical room equipment such as boiler(s), chiller(s), pump(s), etc. shall perform start up **(Chillers only by manufacturer technicians)**. After start up, technicians shall complete start up form and include in the closeout manuals). This start up shall note any deficiencies and corrections to the initial start up. Manufacturers’ representative shall warrant all equipment to be free from defect.

C. Upon completion of all work the system shall be tested to determine if any excess noise or vibration is apparent during operation of the system. If any such objections are detected in the system or noisy equipment found, the Contractor shall be responsible for correcting same. Ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of rubbish and dust before installing outlet faces. Equipment shall be wiped clean with all traces of oil, dust, dirt and paint spots removed. Temporary filters shall be provided for all fans that are operated during construction and after all construction dirt has been removed from the building, new filters shall be installed. Bearings shall be lubricated as recommended by the equipment manufacturer. All control valves and equipments shall be adjusted to setting indicated. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.23 GUARANTEE

A. The Contractor shall guarantee the complete mechanical system against defect due to faulty materials, faulty workmanship or failure due to negligence of the Contractor. This guarantee will exclude normal wear and tear, maintenance lubrication, replacement of expendable components, or abuse. The guarantee period shall begin on the date of the final acceptance and shall continue for a period of 12 months during which time the Contractor shall make good such defective workmanship and materials and any damage resulting therefrom, within a reasonable time of notice given by the Owner.

B. The period of Guarantee for equipment driven by electrical motors, etc., shall be 12 months from the date of final acceptance. Refrigeration compressors shall have a five (5) year warranty.

3.24 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Submit 3 sets of complete operating and maintenance instructions. Manuals shall be submitted at 50% construction completion point.

B. Bind each set in plain black vinyl-covered, hard back, 3-ring binder. Individual paper shall be Boorum and Pease Reinforced Ring Book Sheet, No. S-212-101 or equivalent.

C. Organize material in the following format:
   1. Section I:
      a. Name of Project
      b. Address
      c. Owner's Name
      d. General Contractor's Name and Address
      e. Contractor's Name and Address
      f. Control Subcontractor's Name and Address
      g. Warranty Dates
   2. Section II:
      a. Major Equipment List (name, manufacturer, serial no., H.P. and voltage) (include all equipment with motors)
      b. Control Sequence Description
      c. Routine Maintenance Instructions in Step-by-Step form
      d. Lubrication Charts and Schedules
      e. Valve Schedules
      f. Test and Balance Reports
      g. Sound Power Level Readings (Where Required)
   3. Section III:
      a. Operating and Maintenance Instructions by Manufacturer
      b. Approved Shop Drawings (Major Requirement)
      c. Wiring Diagrams
      d. Control Drawings

3.25 PAINTING

A. All surfaces to receive paint shall be dry and clean.

B. Before priming, all surfaces shall be thoroughly cleaned of all dirt, oil, grease, rust, scale and other foreign matter. Cleaning shall be done with sandpaper, steel scraper, or wire brush where appropriate and necessary. Metallic surfaces which have been soldered shall be cleaned with benzol and all other metal surfaces washed with benzine.

D. Mixing shall be in galvanized iron pans. Paint shall be mixed in full compliance with manufacturer's directions. Thinning shall be done only in full compliance with manufacturer's directions.

E. Workmanship shall be highest quality, free from brush marks, laps, streaks, sags, unfinished patches, or other blemishes. Edges where paint joins other material or colors shall be sharp and clean without overlapping. Paint shall be brushed or sprayed on in strict compliance with manufacturer's directions and shall work evenly and be allowed to dry at least 48 hours before subsequent coating. Paint shall not be applied in damp or rainy weather or until surface has thoroughly dried. Contractor shall furnish and lay drop-cloths in all areas where painting is done as necessary to protect work of other trades. Varnish and enamel shall not be applied when temperature in the area is less than 60 degrees Fahrenheit nor paint when under 50 degrees Fahrenheit. Prior to final acceptance, Contractor shall touch up or restore any damaged finish. All insulation materials shall be provided with a paint suitable jacket.

F. The following materials and equipment require painting as noted:
   1. All concealed piping, sheet metal, hangers and accessories except galvanized sheet metal or piping:
      a. One coat rust-inhibitive primer except where exterior insulation is provided.
   2. All exposed, exterior and interior, piping, sheet metal, hangers and accessories, air handling units, chillers, pumps, etc. except galvanized sheet metal or piping:
      a. One coat rust-inhibitive primer except where exterior insulation is provided.
   3. All concealed galvanized sheet metal, piping and accessories.
      a. One coat galvanized metal primer on threaded portions of piping and any damaged galvanized surfaces.
   4. All exposed, exterior and interior galvanized sheet metal, piping and accessories.
      a. One coat galvanized metal primer except where exterior insulation is provided.

5. All exposed, exterior and interior, insulation equipment.
    a. Two coats exterior glass enamel over paint suitable insulation jacket.

G. All piping in Equipment Rooms shall be painted (color shown below) and identified by stenciling with letters minimum 1/2" high in a contrasting color. Piping outside Equipment Rooms shall be stenciled. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.
    1. Standard piping color codes:
        a. Heating Hot Water - Orange
        b. Chilled Water - Blue
        c. Drains - Natural with Walls
        d. Electrical - Natural with Walls

H. All gas piping in shall be painted Light Yellow and identified by stenciling with letters minimum 1/2" high in a contrasting color. Stenciling shall occur at each change of direction and every 20 feet. Arrows should be placed adjacent to letters signifying direction of flow.

END OF SECTION 23 05 00

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all the work in this Section.

B. Work shall be performed by an independent balancing company certified by AABC or NEBB. Technicians shall be competent in the trade of testing and balancing environmental systems and shall be done in an organized manner utilizing appropriate test and balance forms.

C. The test and balance contractor shall be a sub-contractor to the HVAC contractor.

D. The test and balance report shall be submitted prior to the final inspection. The TAB sub-contractor shall attend the final to spot check air and water flows.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00:
   1. Manufacturer's cut sheets for all equipment to be used.
   2. Sample balancing charts and forms.
   3. Completed final balancing data.

PART 2 PRODUCTS

2.1 INSTRUMENTATION

A. Instruments for use in the test and balancing procedures shall be of first quality and be accurately calibrated at the time of use. The following list is provided to indicate the instruments expected, however, other instruments as necessary to properly perform the work will be provided and subject to approval of the Architect.
   1. Inclined manometer calibrated in no less that .006-inch divisions.
   2. Combination inclined and vertical manometer (0 to 10 inch is generally the most useful).
   3. Pitot Tubes. (Usually and 18 and 48 inch tube covers most balance requirements.
   4. Tachometer. This instrument should be of the high quality self-timing type.
   5. Clamp-on ampere meter with voltage scales.
   6. Deflecting vane anemometer.
   7. Rotating vane anemometer.
   8. Thermal type (hot wire) anemometer.
   9. Hook gage.
   10. Dial and glass stem thermometers.
   11. Sling psychrometer.

B. The accuracy of calibration of the field instruments used is of the utmost importance. All field instruments used in the balance should have been calibrated at least within the previous three months. Naturally, any suspect instruments should be checked more frequently.

PART 3 EXECUTION

3.1 SYSTEM START-UP

A. Starting date for mechanical system shall be scheduled well in advance of expected completion date and shall be established a minimum of two weeks prior to acceptance date. The system shall be in full operation with all equipment functional prior to acceptance date.

B. Performance readings shall be taken and recorded on all air and water distribution devices and the system shall be balanced out prior to acceptance. Balancing of the system shall be accomplished with duct dampers and only minor adjustments made with grille dampers. Record and submit results in table form along side of scheduled quantities.

C. All controls shall be calibrated by qualified personnel prior to acceptance date. Thermostats shall be in close calibration with one another and shall operate their respective units without interference from adjacent units.

D. All units shall be checked out thoroughly and the following information recorded on each machine which shall include, but not be limited to information listed below. Check sheets shall be included in Operating and Maintenance instructional Manual.
   1. Compressor

a. Check General Condition
b. Check Sight Glass
c. Check Moisture Indicator
d. Check Oil Level
e. Read Oil Pressure
f. Read Head Pressure
g. Read Suction Pressure
h. Read Ambient Air
i. Read Motor Volts Each Phase
j. Read Motor Amps Each Phase
k. Lubricate Motor Bearing
l. Oil Safety Device Op.
m. Capacity Control Op.
n. Crankcase Heater Op.
o. Check Pressure Switch Op.
p. Check Superheat: Suction Temperature, Suction Pressure

2. Coils (Each)
   a. Unit Number and Location
   b. Manufacturer and Model No.
   c. Return Air, Supply Air and Outside Air Temperature
   d. Discharge Temperature, Cooling or Heating
   e. Air Flow CFM, Entering and Leaving Static Pressure
   f. Hot Water, Pressure Drop, and EWT, LWT
   g. Water Flow
4. Fans and Miscellaneous
   a. Unit No. and Use
   b. Manufacturer and Model
   c. Motor Nameplate Data
   d. Motor Amps and Volts
   e. Entering and Leaving Static Pressure
   f. Fan RPM
   g. Damper Operation

E. Contractor shall have in his possession a copy of a letter from the responsible Control Representative stating that the controls have been installed according to the plans; that the control sequence has been checked and that all controls have been calibrated.

F. Systems shall be balanced to +/- 10% of the specified values.

3.2 SPECIAL REQUIREMENTS:

A. Provide TAB result to ATC contractor for use in control logic.

END OF SECTION 23 05 93

PART 1 GENERAL

1.1 DESCRIPTION

A. This section of specifications and related drawings describe requirements pertaining to insulation.

B. Provide all insulation in conjunction with equipment and piping furnished under this division.

C. The provisions of Section 23 05 00 apply to all the work in this section.

1.2 QUALITY ASSURANCE

A. Products of the manufacturers listed under MATERIALS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers, and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

B. Materials shall be applied subject to their temperature limits. Any methods of application of insulating materials or finishes not specified in detail herein shall be in accordance with the particular manufacturer's published recommendations.

C. Insulation shall be applied by experienced workers regularly employed for this type of work.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00:
   1. Catalog cuts.
   2. Materials ratings.
   3. Insulation instructions.

1.4 RATING

A. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless noted otherwise, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials that are factory applied shall be tested individually. No fugitive or corrosive treatments shall be employed to impart flame resistance.

B. Flame spread and smoke developed ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.

C. Products of their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

D. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. The use or water-soluble treatment is prohibited.

E. Certify in writing, prior to installation, that products to be used will meet RATING criteria.

PART 2 PRODUCTS

2.1 PIPE INSULATION

A. Hot water piping insulation materials shall be heavy density fiberglass with an all-service jacket (all-service jacket to be used only in mechanical equipment rooms) composed of an outer layer of vinyl, fiberglass scrim cloth, aluminum foil, and kraft paper, in that order, from outside to inside of pipe covering. Chilled water piping insulation materials shall be closed cell polystyrene insulation.
   1. Chilled water supply and return piping, including drain lines from chilled water coils or apparatus handling chilled water.
   2. Hot water heating supply and return piping.
   3. Insulation shall have a minimum density of 1¼ lb/ft3, perASTM C-303 and D-1622.
   4. Insulation shall have a “k” value of 0.255 (BTU-IN/hr-sq ft-F)at 75º F per ASTM C-177 or C-518.
   5. Compressive strength must maintain a minimum of 15 psi at 10% deflection per ASTM D-1621.
   6. Water vapor permeability should not exceed 4.0 perm-inch per ASTM E-96.
   7. Fittings (valves, flanges, 90º and 45º elbows) shall be manufactured 1-¼ lb/ft3 pre-molded closed cell insulation.
   8. Fitting insulation thickness is to be equal to the adjacent pipe insulation thickness.

B. Thicknesses:
   1. Condensate drain lines: 1".

2.2 DUCT INSULATION

A. Materials. Insulation shall be Owens-Corning as specified hereinafter or products of Certain-Teed/St. Gobain or Manville. Adhesives shall be as manufactured by 3-M Foster or Insulation Manufacturer. Insulation shall have composite (insulation, jacket and adhesive) fire and smoke hazard rating as tested by ASTM E-84, not exceeding Flame Spread -25 and Smoke Developed -50.

PART 3 EXECUTION

3.1 PIPE INSULATION

A. Application. Insulation and surfaces to be insulated shall be clean and dry when insulation is installed and during the application of any finish. Installation shall comply with Midwest Insulation Contractors Association "National Commercial and Industrial Insulation Standards", (MICA).

B. Fiberglass Insulation. All fiberglass pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Under no circumstances will staples be allowed. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all chilled water and cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints every 21' and at all fittings. All insulation outside shall be protected with aluminum weather-proof jacketing with lap-seal, and factory attached moisture barrier. The aluminum shall be .016 gauge (3303-H14 alloy) of embossed pattern. It shall be applied with a 2" circumferential and 1-1/2" longitudinal lap and be secured with aluminum bands 3/8" wide 8" o.c.. All elbows shall be covered with the same .016 aluminum with factory applied moisture barrier. All fittings, valve bodies, unions, and flanges shall be finished as follows:
   1. Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2#14 copper wires.
   2. Apply a skim coat of insulating cement to the insulated fitting, if needed, to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglass Fitting Mastic, Type C, UL labeled.
   3. Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1 to 2". Also, overlap mastic and cloth by 2" on adjoining sections of pipe insulation.
   4. Apply a second coat of mastic over cloth, working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon. All flanges and fittings on hot and cold lines in utility tunnels shall be insulated according to above. Omit insulation on flanges and unions over 60 degrees F. If painting is required, no sizing is necessary. To maintain the non-combustibility of the system only Glidden acrylic latex paint (#5370) is to be used.
   5. All piping in equipment rooms shall be covered with an 8 oz. canvas jacket.

C. Delivery, Preparation, Storage and Handling:
   1. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
   2. Store insulation in original wrapping and protect from weather and construction traffic.
   3. All insulation and surfaces to be insulated shall be kept dry and free from all moisture prior to and during the application of insulation and vapor barrier. It is critical to keep the entire insulation system free from moisture. All wet insulation and wet vapor barrier jacketing; tapes, joint sealers and mastics will be removed from the job site at the insulation contractor's expense.

D. Examination
   1. Before applying insulation, M.C. shall verify that piping has been prime coated, inspected, tested and approved.
   2. Before applying insulation, verify that surfaces are clean (foreign material removed) and dry.
   3. Before applying insulation, verify that brass thermowells with 2.5" lagging extensions have been installed.
   4. Before applying insulation, verify that 4" long brass nipples for gage cocks have been installed.

E. Joint Sealant
   1. A ¼" bead of non-hardening vapor retardant butyl rubber joint sealant shall be used to seal all longitudinal and circumferential joints on both indoor and outdoor applications.
   2. Layers of insulation should not be bonded together. Excessive sealer in the joints should be avoided during application. Do no feather edge. It is important that all insulation sections be trimmed and tightly butted to

eliminate voids, gaps or open joints. Joint sealer shall not be used to fill these imperfections. Insulation ends shall be rubbed against each other to achieve a tight fit prior to application of joint sealer.

3. Joint sealer shall be vapor barrier type, moisture and water resistant, 97% solids by weight, non-hardening, flexible with a service temperature range from -50ºF to 180ºF.
4. All joint sealers shall be compatible with closed cell insulation and be absolutely free of solvents or any chemicals that will attack EPS.
5. Joint sealant material shall be recommended by closed cell manufacturer.

G. Installation and Warranty
1. Refer to Manufacturer's Installation Specification for complete installation procedure.
2. Prior to delivery of pipe and vessel insulation to the project, theinsulation contractor will submit a certification from the manufacturer that all insulation material to be provided will meet all the above performance and property requirements. All polystyrene shall be manufactured from virgin materials. No recycled or regrind material shall be permitted. Any material which is found in violation of these requirements shall be removed from the project by the contractor and replaced at his own expense with materials which do meet these specification requirements. Any product substitutions must be approved by PermaTherm, Inc. in writing prior to commencement of installation or all product warranties will be voided.

3.2 DUCT INSULATION

A. All vapor barriers and joints shall be sealed to prevent condensation. Clean and dry all ductwork before installing insulation. All weld joints shall be wire brushed and give one (1) coat of red lead before insulating. Staples will not be permitted in insulation.

B. Wrapped Duct
1. All supply and outside air ducts unless noted shall be insulated by wrapping with 2" thick, ¾ lb density fiberglass with vapor barrier jacket with joints overlapped a minimum of two inches. Insulation shall be adhered to duct with non-combustible insulation bonding adhesive applied in 4" strips, 8" on center. All joints shall be secured with flare door staples on 3" centers through all laps over duct tape.

C. Ducts Installed Outdoors
1. Ductwork exposed to weather shall be insulated by sealing all joints with hard cast sealer, applying 2" thick polystyrene insulation (min R vaule 8), and covering with two (2) individual layers of glassfab and white mastic. Paint to match background color.

END OF SECTION 23 07 00

PART 1 GENERAL

1.1 WORK INCLUDED

A. Direct Digital Controls (DDC)

B. Programming and Graphics

C. Controllers (Global, Standalone, Application Specific)

D. Communications

E. Sensors

F. Valves and actuators

G. Electrical appurtenances and wiring systems

H. Sequence of Operation

1.2 RELATED WORK

A. Section 23 05 00 -Mechanical General Requirements

B. Electrical Contract Documents

1.3 SHOP DRAWINGS

A. System Architecture

B. Wiring diagrams

C. Valves and actuators

D. System schematics for all mechanical systems

E. Material lists with part numbers and quantities, as appropriate

F. Technical/Product data sheets for each piece of equipment

G. Sequence of Operation for each system

H. As-built drawings of installed system

1.4 SUBMITTALS

A. Submit Shop Drawings of the complete Building Automation System (DDC System) for review and approval.

B. Drawings shall be submitted on standard sheet size format (8-1/2” x 11”, 11” x 17”, or 24” x 36”).

C. Drawings shall be bound within a standard 3-ring binder, cover, or other suitable permanent binder. For projects in which the controls submittals will be less than one-half inch thick, the submittal documents may be securely stapled in the upper left hand corner provided the cover sheet and back sheet are printed on card stock (heavy bond paper).

D. Submit five (5) copies of submittal drawings for review by the Owner.

E. At completion, furnish as-built drawings in bound form and on CD.

F. Submit documentation for all DDC programming in graphical form (AutoCAD or Visio format, or equal) as a part of the as-built documentation.

G. Submit manufacturer's operating instruction manual for the DDC control system for use in owner training.

H. Submit Certificate of Training upon completion of all scheduled training of the owner's operating personnel.

1.5 CODES AND REFERENCE STANDARDS

A. The latest edition of the following standards and codes in effect and amended as of the date of the supplier's proposal, and any subsections thereof as applicable, shall govern the design and selection of equipment and material supplied.
   1. NFPA 70 - National Electrical Code (NEC)
   2. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers (Handbooks)
   3. ANSI/ASHRAE Standard 135 (1995) – BACnet: A Data Communication Protocol for Building Automation and Control Networks
   4. UL 916 - Standard for Energy Management Equipment
   5. FCC – Part 15, Subpart J
   6. City, County, State and Federal regulations and codes in effect as of the date of the Contract

1.6 PERMITS

A. Except as otherwise indicated, the system supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for all necessary approvals by the governing authorities.

1.7 QUALITY ASSURANCE

A. Responsibility: The supplier of the HVAC digital logic control system shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished by him.

B. Component Testing: Maximum reliability shall be achieved through extensive use of high quality, pre-tested components. The manufacturer prior to shipment shall individually test each and every controller, sensor, and all other DDC components.

C. Tools, Testing and Calibration Equipment: The control system supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the control system.

D. Authorized Representative: The systems control contractor shall have been in business a minimum of three years and be the authorized representative for the manufacturer of the BACnet components.

1.8 WARRANTY

A. The DDC control system installed under this Specification shall be free from defects in material and workmanship under normal use and service for a period of twelve (12) months after final acceptance by the Owner. If within the twelve (12) month warranty period, any equipment, software, or labor is found to be defective in workmanship or materials, it shall be replaced free of charge by the Controls system installer. Warranty service shall be available to the job site during normal working hours.

1.9 PREVENTATIVE MAINTENANCE

A. The DDC control system installed as part of this project shall include a preventative maintenance schedule including two four hour inspections per building twice within the first year of operation. The college desires one service company to have responsibility for maintaining the entire campus-wide automation system. Therefore, the successful bidder shall be responsible for conducting similar inspections at all campus buildings with DDC controls.

1.10 CONTROL AND INTERLOCK WIRING

A. All electrical work required under this section of specifications shall comply with the latest National Electrical Code. Control system power supply shall be served by a separate breaker and fused in control center for secondary protection.

B. The mechanical contractor shall furnish and turn over to the electrical contractor, motor starters for mounting and power connections through starter to motor. Disconnect switches, when required, shall be furnished by electrical contractor.

C. All control wiring shall be run in rigid conduit below grade or, on outdoor installation. Galvanized EMT may be run in dry wall construction, above ceilings, or in equipment rooms where permitted by electrical specifications.

D. Control wiring shall be color-coded #16 TFF of TFFN wire with 600 volt insulation. Run all wiring between terminal points without changing color. Color code of control wiring shall be as indicated on control wiring diagram. Multi-conductor thermostat cable will not be acceptable.

PART 2 PRODUCTS

2.1 SCOPE OF WORK

A. The required system will be Tridium based and shall be a new system to replace existing pneumatic control systems. All equipment will consist of approved products specified below. Contractor to provide needed quantities of product specified below based on jobsite visit and plans provided. All Graphics, Alarms, Trending and Scheduling shall be added to existing AX Jace (LON-BASED) on site and match existing layout and function of other schools unless approved in writing by UCPS. Contractor shall be responsible for a seamless complete integration of new BACnet over IP Controller into existing LON based BAS and shall provide all devices, modems, switches, etc as required to complete this scope of work.

1. Contractor to provide job documentation, including System Layout, Comm bus layout, sequence of operation, point to point controller diagrams and all product data sheets. The documentation shall be provided via 3 hard copies and also placed on existing AX Jace on site to be accessible via system graphics.

2. All Products to be warrantied for a period of 3 years from the date of purchase, all labor to be warrantied 1 year from Job Completion and Sign-off.

3. System to be BACNET/IP based, all controllers need to be connected via UCPS Ethernet network. Contractor to provide switches listed below. UCPS will install and setup switches in existing IT closets located on each classroom wing. All Ethernet cable for HVAC equipment will be Cat-6 and orange in color. The Contractor will pull CAT-6 cable via existing cable tray from field controllers to new switches.

B. APPROVED PRODUCTS
1. VG-20 Controllers for Fan Coils
2. VG-32 Controllers for Chillers, Boilers, Air Handling Units, and Roof Top Units.
3. VC-20 Expansion Controllers for Chillers, Boilers, Air Handling Units
4. A/CP-S Room Sensors
5. EX3300-48 48 Port switch (1 Per Wing)
6. FX-7021 Jace (Located in Mechanical Room and will be provided by UCPS)
7. A/10K-CP-6 Duct Temp Sensors for Fan Coils
8. RIXGA CT Switches for Fan Coil Fan Status (Fan Coils, Air Handling Units, Chillers, Boilers)
9. PA Series JCI UL Listed Control Panels (if needed) Chiller, Boiler Plant
10. A/10K-CP Immersion Sensors Chillers, Boilers

C. APPROVED INSTALLERS
1. Facility Systems Services Inc
2. Platinum Building Automation
3. Environmental Controls
4. Carolina Air Solutions
5. Schneider Controls

2.2 SYSTEM REQUIREMENTS

A. The Building Automation System (BAS) shall consist of Network Server/Controllers (NSCs), a family of Standalone Digital Control Units (SDCUs), Administration and Programming Workstations (APWs), and Web-based Operator Workstations (WOWs). The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable.

B. An Enterprise Level BAS shall consist of an Enterprise Server, which enables multiple NSCs (including all graphics, alarms, schedules, trends, programming, and configuration) to be accessible from a single Workstation simultaneously for operations and engineering tasks.

C. The Enterprise Level BAS shall be able to host up to 250 servers, or NSCs, beneath it.

D. For Enterprise reporting capability and robust reporting capability outside of the trend chart and listing ability of the Workstation, a Reports Server shall be installed on a Microsoft Windows based computer. The Reports Server can be installed on the same computer as the Enterprise Server.

E. The system shall be designed with a top-level 10/100bT Ethernet network, using the BACnet/IP.

F. BACnet MS/TP, BACnet IP, LonTalk FTT-10A, and WebServices shall be native to the NSCs. There shall not be a need to provide multiple NSCs to support all the network protocols, nor should there be a need to supply additional software to allow all three protocols to be natively supported. A sub-network of SDCUs using the BACnet MS/TP, LonTalk FTT-10A, and/or Modbus RTU protocol shall connect the local, stand-alone controllers with Ethernet-level Network Server Controllers/IP Routers.

G. The TCP/IP layer connects all of the buildings on a single Wide Area Network (WAN) isolated behind the campus firewall. Fixed IP addresses for connections to the campus WAN shall be used for each device that connects to the WAN.

H. Fieldbus Level with Standalone Digital Control Units (SDCUs)

I. The fieldbus layer shall be support all of the following types of SDCUs:

J. BACnet SDCU requirements: The system shall consist of one or more BACnet MS/TP field buses managed by the Network Server Controller. Minimum speed shall be 76.8kbps. The field bus layer consists of an RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) for operation of HVAC and lighting equipment. These devices shall conform to BACnet standard 135-2007. The NSCs shall be capable of at least two BACnet MS/TP field buses for a total capability of 254 SDCUs per NSC.

K. NETWORK 8000 SDCU requirements: The system shall consist of one or more ASD or LCM field buses managed by the Network Server Controller. The field bus layer shall consist of up to 128 ASD SDCUs or 31 LCM SDCUs for operation of HVAC, power metering, and lighting equipment.

M. I/NET SDCU requirements: The system shall consist of one or more controller LANs and subLANs managed by the Network Server Controller. The network shall consist of up to 100,000 I/NET points capable through numerous links and devices for operation of HVAC, power metering, and lighting equipment.

N. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN). Workstations can manage a single LAN (or building), and/or the entire system with all portions of that LAN maintaining its own, current database.

O. All NSCs, Workstation(s) and Servers shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NSC's, Workstation(s), and Server(s) shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Systems Department as all devices utilize standard TCP/IP components.

P. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same TCP/IP level and fieldbus level controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.

Q. Web-based operation shall be supported directly by the NSCs and require no additional software, other than a Java supported network browser.

R. The system shall be capable of using graphical and/or line application programming language for the Network Server Controllers.

2.3 SENSORS, TRANSMITTERS AND THERMOSTATS

A. Temperature Sensors: Thermistor type with an accuracy of plus or minus 0.40 degree F over the entire control range. Sensors for pipe installations shall be immersion type, brass well, and thermistor with integral lead wire. Sensors for duct application shall be insertion probe type, stainless steel probe, integral handibox, and thermistor with integral lead wire. Space temperature sensors shall be compatible with the unit controller and shall be provided in a decorative metal or plastic enclosure. Space temperature sensors shall be provided with setpoint adjustment (lever or slide type), and override pushbutton, and connection port for field service tool. Outdoor temperature sensors shall be mounted inside a protective weather and sun shield.

B. Space Temperature Sensor: Wall mounted room controller with integral digital display and user function keys to control room temperature setpoints, select fan speeds (where appropriate), view room and outside air temperatures, view room setpoints or discharge temperature, or initiate after-hours operation of the associated terminal unit or system. The controller shall also be capable of functioning as a field service tool to allow maintenance personnel to observe and adjust all control parameters resident in the terminal unit controller. These control parameters shall also be adjustable from the global controller. Sensor shall be standard two-wire connection and have a thermistor, housed in a decorative plastic enclosure.

C. Humidity Sensors: Thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degree F. Duct mounted type sensors shall have a stainless steel insertion element, sealed to prohibit corrosion. Sensors shall be selected for wall, duct or outdoor type installation as appropriate.

D. Current Switches (Type 1): For proving fan or pump operational status, provide split-core type current status switches with adjustable setpoint and solid state internal circuitry. Current switch shall have induced power, trip point set adjustment to plus or minus 1% over a range of 1 to 135 amps, trip and power LED, and field adjustable to indicate both On-Off conditions and loss of load (broken belt, etc.). Units shall have a five-year manufacturer's warranty. Current switches shall be Hawkeye Series H-908 by Veris Industries, or approved equal.

E. Low Temperature Sensors: For sensing low temperatures in air handling units, provide SPST type switch, 35 to 45 degree F range, manual reset, vapor charged twenty foot long sensing element, and 120 volt electrical power connection.

2.4 MISCELLANEOUS MATERIALS

A. Panels: All enclosures for DDC controllers and devices shall be fabricated in accordance with UL Standards from code gauge steel. Enclosures shall be provided with a continuous hinge on the door and a flush latching mechanism. Enclosures shall be shop painted with standard grade enamel coating. Back panels shall be furnished when required to facilitate installation of boards or accessories. All enclosures installed outdoors shall be constructed to NEMA 3R standards. All controllers shall be installed within an approved enclosure unless the controller will be installed within the control cabinet section of the equipment that it is intended to control. Enclosures shall facilitate the mounting of gauges, switches, pilot lights, and the like, on the face panel when required. Control devices that are mounted on the face of the panel shall be identified with engraved nameplates.

B. Power Transformers: Step-down power transformers shall be provided for all DDC controllers and associated accessory devices as required. Transformers shall be sized and selected to accommodate all connected accessory items. Transformers shall be UL Listed Class 2 type with 120 VAC primary, 24 VAC secondary.

C. Relays: Miscellaneous control relays shall be provided as required to energize or control equipment and devices within the control system. Relays shall be located as close as practical to the controlled device (motor, motor starter, etc.). Where approved by NEC, relays may be installed within starters and equipment control panels where space is available. Relays installed outside of the controlled device shall be provided with a NEMA enclosure suitable for the location where installed.

D. Wiring: All wiring shall be installed raceways. Control wiring shall not be installed in power circuit conduits.
   1. Provide all interlock and control wiring. Provide wiring as required by functions as specified and as recommended by equipment and device manufacturers to achieve the specified control functions.
   2. Low voltage conductors shall be stranded bare or tinned-copper with premium grade polymer alloy insulation. For shielded cable, furnish multi-conductor of overall polyester supported aluminum foil with stranded tinned copper drain wire to facilitate grounding. Coaxial shield shall be copper braided type.

Provide shielded cable where recommended by the equipment or device manufacturer, grounded in strict accordance with the manufacture's recommendations.

3. Low voltage wiring shall be UL Listed type for the intended application. Non-plenum type cable shall be UL Type CM and /or CMR. Plenum type cable shall be UL type CMP and /or CL3P for approved plenum installations.

2.5 DIRECT DIGITAL CONTROL SYSTEM

A. The Direct Digital Control (DDC) System shall consist of native BACnet type global controller(s) and standalone or application specific unitary controller(s) configured as a distributed communications network composed of one or more levels of BACnet compliant local area networks (LAN). No gateways shall be used except when required to interface with specific equipment furnished by another manufacturer (e.g.: chiller controllers, packaged equipment controllers, etc.). The intent of the distributed control strategy is to install the controllers in close proximity to the equipment being controlled, and to distribute the processing to each standalone DDC panel. In the event of a communications failure of the BACnet LAN, the controllers shall be capable of operating in standalone mode. All devices (global controllers, standalone controllers, programmable controllers, etc.) shall be UL Listed, FCC approved, and BACnet compliant.

B. Furnish a totally native BACnet -based system based on distributed logic control in accordance with this specification section. The existing operator's terminal, all global controllers, logic controllers, and all input/output devices shall communicate using the protocols and local area network (LAN) standards as defined by ANSI/ASHRAE Standard 135-1995, BACnet. All DDC controllers, including unitary controllers, shall be native BACnet devices. In general, no gateways shall be used except when required to interface with specific equipment furnished by another manufacturer. Scope of work will include, but not be limited to, the following:
   1. Provide all necessary BACnet compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for every controller in the system, including unitary controllers. All direct digital logic hardware is to comply with BACnet.
   2. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
   3. Implement the detailed design for all system-standard analog and binary objects, distributed control and system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
   4. Design, provide, and install all equipment enclosures, panels, data communication network cables needed, and all associated hardware.
   5. Provide and install all interconnecting cables between supplied enclosures, logic controllers, and input/output devices.
   6. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this contract.
   7. Provide complete manufacturer's product data for all items that are supplied. Include vendor name of every item supplied.
   8. Provide qualified supervisory personnel and technicians at the job site to assist in all phases of system installation, startup, and commissioning.
   9. Provide for operator training as described in this Section.
   10. Provide "as-built" documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.
   11. Provide new dampers, valves, actuators, sensors, controllers, and the like. No used components shall be provided as any part or piece of the installed system.

2.6 SYSTEM DESCRIPTION

A. General Requirements
   1. A distributed logic control system complete with Direct Digital Control (DDC) and Direct Analog Control (DAC) software shall be provided. System shall be totally based on ANSI/ASHRAE Standard 135 – 1995, BACnet. This system is to control all mechanical equipment, including all unitary equipment such as packaged air conditioning units, and all air handling units, boilers, chillers, and any other listed equipment on this project using native BACnet -compliant components.
   2. The entire processing system shall be in complete compliance with the BACnet standard. The system shall use BACnet protocols and LAN types throughout and exclusively. Non-BACnet compliant or proprietary equipment or systems (including gateways, except as specified previously) shall not be acceptable and are specifically prohibited.

3. All logic controllers for terminal units, air handlers, central mechanical equipment, and Microsoft Windows-based operator's terminal(s) shall communicate and share data, utilizing only BACnet communication protocols.
4. All logic controllers shall be fully programmable. Programmable controllers for every terminal unit, air handler, all central plant equipment, and any other piece of controlled equipment shall be provided. Programming tools shall be provided as part of the operator workstation for every controller supplied for the project.
5. The Controls Contractor shall assume complete responsibility for the entire controls system as a single source. He shall certify that he has factory-trained personnel on staff under his direct employ on a daily basis. These employees shall be qualified to engineer, program, debug, and service all portions of the BACnet based logic control system. This shall include operator's terminal, global controllers, routers, programmable controllers, terminal unit controllers, sensors and all other components of the system.

B. Trendlog Information
1. DDC system shall be capable of periodically monitoring the values or status of selected feedback or control data from the system global controller(s) or field controllers, and archiving this information on the operator's terminal. Archived files shall be appended with new sample data, allowing samples to be accumulated over a user defined period. Systems that overwrite previously archived data samples shall not be allowed, unless limited file size is specified. Samples in a trendlog shall be available for viewing at the operator's terminal. Displays of trendlog data shall be in spreadsheet format. Operator shall be capable of scrolling through all trendlog data. System shall automatically open archive files as needed to display archived data when the operator scrolls through the data vertically. All trendlog information displays shall be shown in standard engineering units.
2. Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x, y) graphs that display up to six object types at the same time in different colors. Graphs shall show object type values relative to time.
3. Operator shall be able to change trendlog setup information. This shall include the data points and status information being trendlogged as well as the interval at which the information is to be logged. All trendlog functions shall be password protected. The operator shall be capable of viewing or setting up a trendlog for any prompted or read-only item.
4. The system shall provide a means for the operator to directly export data to a comma-delimited file format for use in third-party software spreadsheets or other database programs. The system operation shall not be affected in any way by this data exchange.

C. Energy Log Information
1. DDC system shall periodically gather energy log data stored in field terminal controllers and archive this information on the operator terminal's hard disk. Archive data shall be appended with the new data and allow data to be accumulated over several years. Systems that overwrite archived data shall not be allowed unless limited file size is specified. System shall automatically open archive files as needed to display archived data when the operator scrolls through the data. All energy log information shall be displayed in standard engineering units.
2. System software shall be capable of graphing the Energy Log data. Software shall be capable of creating graphs in two-axis (x, y) format that shows recorded data relative to time. All data shall be stored in comma-delimited file format for direct use by third party software spreadsheets or other database programs. System operation shall not be affected by on-line access to the energy information.
3. Operator shall be able to modify the energy log setup information. This shall include which meters are to be logged, meter pulse value, and what types of energy units are being logged. All energy meters monitored by the system shall be capable of being logged. All energy logging operations shall be password protected.
4. Provide capability for the operator to export to a comma-delimited file format all energy-logged data for use by third party software spreadsheets or other database programs. System operation shall not be affected by on-line access to the energy information.

D. Configuration/Setup
1. Provide means for the operator to display and change the system configuration. This shall include, but not be limited to: system time, day of the week, date of daylight savings time set forward/back, printer termination, port addresses, modem port and speed, and the like. Items shall be modified utilizing easily understood terminology by means of simple mouse/cursor key movements.

E. Programming Tools
1. Operator's Terminal shall include programming tools for all controllers supplied. If a new software package is proposed it is the contractor's responsibility to load all programming tools/ engineering software

on all of the owner's existing operator terminals and laptops, as well as provide all connectors for connection to field devices with portable terminals. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from different types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to pick graphical function block from the menu and place on screen. Programming tools shall place lines connecting appropriate function blocks together automatically. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.
3. Programming tools shall include a teat mode. Test mode shall show user the real-time data on top of graphical display of selected function blocks. Data shall be updated real-time with no interaction by the user. Function blocks shall be animated to show status of data inputs and outputs. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

2.7 GLOBAL BUILDING CONTROLLERS (GBCs)

A. The controls contractor shall supply one or more global controller as part of this contract. Number of global controllers required is dependent on the type and quantity of DDC devices.

B. The Global Building Controller shall provide the interface between the LAN and the field control devices, and provide global supervisory control functions over the control devices connected to the GBC. It shall be capable of executing application control programs to provide:
   1. Calendar functions
   2. Scheduling
   3. Trending
   4. Alarm monitoring and routing
   5. Time synchronization
   6. Integration of LonWorks controller data and BACnet controller data
   7. The GBC must provide the following hardware features as a minimum:
      a. One Ethernet Port - 10 Mbps
      b. One RS-232 port
      c. One BACnet MS/TP Port
      d. Battery Backup
      e. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
      f. The GBC must be capable of operation over a temperature range of 0 to 55°C
      g. The GBC must be capable of withstanding storage temperatures of between 0 and 70°C.
      h. The GBC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.
      i. The GBC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the GBC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
      j. Event Alarm Notification and actions
      k. The GBC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
      l. The GBC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
      m. Alarm generation shall be selectable for annunciation type and acknowledgement requirements.
   8. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
   9. Provide timed (schedule) routing of alarms by class, object, group, or node.
   10. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
   11. Control equipment and network failures shall be treated as alarms and annunciated.
   12. Alarms shall be annunciated in any of the following manners as defined by the user:
   13. Screen message text
   14. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
      a. Day of week
      b. Time of day
      c. Recipient
   15. Pagers via paging services that initiate a page on receipt of email message
   16. Graphic with flashing alarm object(s)

17. Printed message, routed directly to a dedicated alarm printer
18. Audio messages
19. The following shall be recorded by the NAC for each alarm (at a minimum):
    a. Time and date
    b. Location (building, floor, zone, office number, etc.)
    c. Equipment (air handler #, accessway, etc.)
    d. Acknowledge time, date, and user who issued acknowledgement.
    e. Number of occurrences since last acknowledgement.
20. Alarm actions may be initiated by user defined programmable objects created for that purpose.
21. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
22. A log of all alarms shall be maintained by the GBC and/or a server (if configured in the system) and shall be available for review by the user.
23. Provide a “query” feature to allow review of specific alarms by user defined parameters.
24. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
25. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

C. DATA COLLECTION AND STORAGE
1. The GBC shall have the ability to collect data for any property of any object and store this data for future use.
2. The data collection shall be performed by log objects, resident in the GBC that shall have, at a minimum, the following configurable properties:
3. Designating the log as interval or deviation.
4. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
5. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
6. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
7. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
8. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.
9. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
10. All log data shall be available to the user in the following data formats:
11. HTML
12. XML
13. Plain Text
14. Comma or tab separated values
15. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
16. The GBC shall have the ability to archive it’s log data either locally (to itself), or remotely to a server or other GBC on the network. Provide the ability to configure the following archiving properties, at a minimum:
17. Archive on time of day
18. Archive on user-defined number of data stores in the log (buffer size)
19. Archive when log has reached it’s user-defined capacity of data stores
20. Provide ability to clear logs once archived

D. AUDIT LOG
1. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it’s user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
2. Time and date
3. User ID
4. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

E. DATABASE BACKUP AND STORAGE

1. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
2. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
3. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XMLformat is supported.

PART 3 EXECUTION

3.1 TRAINING

A. The Controls Contractor shall provide complete on-site training for the Owner's designated operating personnel. Training shall include all functional aspects of the control system and all modes of system operation. System modes include occupied/unoccupied, heating/cooling, economizer, startup/shutdown, energy management, and alarm event operations. Training of Owner's operating personnel shall include a minimum of eight (8) hours of system instruction, conducted during one or two site visits for a combined total of eight hours of instruction. Additional instruction time may be requested by the Owner for an additional fee if needed for training additional personnel or if more instruction is requested. Training is not intended to include in-depth instruction in system programming.

B. Training shall be conducted during normal working hours, Monday through Friday, at the project site. When applicable, the training may be conducted at the Owner's central energy management office in addition to training on site.

C. Contractor shall furnish one (1) copy of the system Operator's Manual to the Owner. This manual should be delivered to the Owner at the time of training. This manual is in addition to the system As-built documents which are intended to show wiring configurations and sensor locations.

PART 4 SEQUENCE

4.1 SEQUENCE OF OPERATION

A. Fan Coil Units
   1. A programmable controller capable of stand-alone operation will control the unit. The unit will be started via pre-determined optimum start through the Building Automation System (BAS). The unit will be de-energized in accordance with time schedules through the BAS.
   2. Occupied Mode: In occupied mode, the supply fan will be indexed on and will run continuously. In unoccupied mode, the fan shall cycle on as required to maintain space set points.
   3. Temperature Control: The unit shall index mode based on dual temperature system settting, In cooling mode, on a rise in space temperature above the setpoint, the controller will modulate the chilled water valve open to the coil. On a drop in space temperature, the chilled water valve will modulate closed. In heating mode, on a drop in space temperature below the heating set point, the controller will modulate the valve open to the coil. On a rise in space temperature, the reverse will occur. Unique temperature set points shall be provided for occupied and unoccupied mode.
   4. Fan coil point list.
      a. Fan start/stop/status.
      b. Discharge air temperature.
      c. Control valve outputs.
      d. Space temperature

B. Unit Ventilators
   1. A programmable controller capable of stand-alone operation will control the unit. The unit will be started via pre-determined optimum start through the Building Automation System (BAS). The unit will be de-energized in accordance with time schedules through the BAS.
   2. Occupied Mode: In occupied mode, the supply fan will be indexed on and will run continuously. In unoccupied mode, the fan shall cycle on as required to maintain space set points.
   3. Temperature Control: The unit shall index mode based on dual temperature system settting, In cooling mode, on a rise in space temperature above the setpoint, the controller will modulate the chilled water valve open to the coil and the face and bypass damper shall modulate to maintain temperature set point. On a drop in space temperature, the chilled water valve will modulate closed. In heating mode, on a drop in space temperature below the heating set point, the controller will modulate the valve open to the coil. On a rise in space temperature, the reverse will occur. In heating mode the face and bypass dampers shall

be fully open to th coil. Unique temperature set points shall be provided for occupied and unoccupied mode.

4. Fan coil point list.
   a. Fan start/stop/status.
   b. Discharge air temperature.
   c. Face and bypass damper output
   d. Control valve outputs.
   e. Space temperature

C. Packaged Unitary Equipment
1. A programmable controller capable of stand-alone operation will control the unit. The unit will be started via pre-determined optimum start through the Building Automation System (BAS). The unit will be de-energized in accordance with time schedules through the BAS.
2. Occupied Mode: In occupied mode, the supply fan will be indexed on and will run continuously. In unoccupied mode, the fan shall cycle on as required to maintain space set points. In occupied mode the outside air damper shall modulate to minimum position. In unoccupied mode the damper shall remain closed.
3. Temperature Control: The unit components shall modulate as required to maintain space heating or cooling setpoint.
4. Provide current sensors for fans and compressor(s).
5. Points list.
   a. Start/stop/status of fan.
   b. Start/stop/status of compressor(s).
   c. Discharge air temperature.
   d. Space temperature.

D. Other
1. All points (unit start/stop, temperature settings, etc.) shall be viewable and adjustable through the building graphics.
2. Main page shall have a holiday setting that will enable the owner to put the entire building in “unoccupied” mode.
3. In unoccupied mode, units shall operate to maintain setback space setpoints.

END OF SECTION 23 09 00

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all work in this Section.

B. Furnish and install all chilled water, hot water, dual temperature water, make up water, refrigerant and condensate drain piping as shall be required in order to provide a complete and satisfactory system.

C. The Mechanical Contractor shall furnish and install all necessary valves and specialties to make the installation complete and as specified below. All specialty items unless otherwise noted shall be for operation on at least 125 pound psig working pressure as rated in accordance with the standards of ASA.

1.2 SUBMITTAL

A. Submit the following in accordance with Section 23 05 00:
   1. Manufacturer's cuts.
   2. Installation instructions.
   3. Operating and Maintenance Instructions.

1.3 SAFETY AND RELIEF VALVES

A. The Mechanical Subcontractor shall furnish and install safety and relief valves on all fired and unfired pressure vessels in accordance with current requirements of North Carolina Department of Labor, Boiler Bureau. All valves shall bear the stamp and approval of the American Society of Mechanical Engineers Boiler Construction Code, and shall be proper size for the respective equipment it serves.

PART 2 PRODUCTS

2.1 DRAIN PIPING

A. All drain lines shall be Type “L” hard drawn copper [or PVC drain pipe conforming to ASTM D 1785]. Drains shall be run in a neat manner to the floor drain and turned down at the floor drain, unless otherwise indicated. Minimum of 1-1/4" unless otherwise shown.

2.2 VALVES

A. All new valves shall be as specified below by figure number and shall be one manufacturer throughout.

B. Spring check valves shall be installed on water lines 2-1/2 inches and above. Valves shall be non-slam type of such design that closing is controlled by spring action so designed to return disc or leaves to seat at zero velocity or before reversal of flow. Disc or leaves shall be free-flowing with no greasing or counterweights required. Body shall be semi-steel, 125 psi rated. Disc or leaves and seat shall be bronze with stainless steel spring.

Manufacturer	Wafer 125#	Flanged 125#
NIBCO	W910-B	F910-B
MUELLER	91-AP	105M-AP
MISSION		

C. Butterfly valves shall be lug type and suitable for water service. Valves shall have EPDM seats suitable for temperature up to 275 degrees Fahrenheit and pressure up to 150 psig. Body shall be cast iron, disc shall be aluminum bronze, and shafts shall be stainless steel. Valves 2" to 6" shall be interim positive lock, lever operators. Valves 8" and larger shall have encased gear operators with hand whl. Bodies shall be lug type. All working parts shall be field replaceable. All valves shall be equipped with extended neck for insulation up to 2" thick. Manufacturer must certify valves (2" through 16") to be capable of providing bubble tight seal at 200 psi when used for end of line service without the need of a flange on the down stream side. Valves 18" and larger must be capable of 150 psi end of line service.

Manufacturer	Lug 150#
NIBCO	LD2000
CRANE	14-TL
STOCKHAM	LD-711-BS3-E

D. Hose end gate valves shall be screwed connection, bronze as specified above. Hose connection shall be as specified above. Hose connection shall be suitable for l/2" hose.

Manufacturer	Hose End 125#
NIBCO	T113-HC
CRANE	451
STOCKHAM	-

E. Ball valves shall be bronze, two piece construction rated for 125 SWP/400 WOG. Valves shall have full port with Teflon seats. Stem shall be of silicon bronze. Sizes 1/4"-2".

MANUFACTURER	THREADED 125#	SOLDER 125#
NIBCO	T580	S580
APOLLO	70-100	70-200
STOCKHAM	S214-BR-T-T	S214-BR-T-S

2.4 VALVE TAGS AND CHARTS

A. Furnish for each valve and gas cock in the HVAC system a brass tag fitted to each valve so that it may not be removed. Each tag shall be numbered consecutively with the Numbers V-1, V-2, V-3, etc..

B. Furnish two (2) copies of a master valve chart denoting valve number, location and purpose. One (1) chart shall be in a suitable black wood frame with glass cover and mounted where directed.

2.5 SPECIALTIES

A. Gaskets: This Contractor shall furnish and install at each flange connection, Johns-Manville Service Gasket N. 60, or approved equal.

B. Flow Balance Valves: Flow balance valves, where shown, shall be Bell and Gossett Circuit Setter, or approved equal, size indicated in each case. Provide (1) differential meter to be turned over to Owner with operation and maintenance manuals.

C. Automatic Control Valves: All automatic control valves shall be of the modulating or proportioning type. See temperature controls.

D. Compression Tanks. Furnish and install the ASME and National Board Labeled Code constructed steel compression tanks indicated on plans with necessary tappings for connections to heating system. Tanks shall be supported from over head with hanger rods connected to suitable overhead structure and as called for on the plans. Equip each tank with Bell and Gossett or approved equal air control valve and separate tank drain. Drain shall be globe valve. "Boiler Drain Valves" prohibited. Tank shall be given three (3) coats of high temperature aluminum rust preventative paint on the exterior. The tanks shall be a part of the "Air Control System" in the heating system and must be furnished, guaranteed and installed in strict accordance with the manufactured's instructions.

E. Pressure gauges shall be designed for the service. Gauge size shall be 4-1/2" diameter with black lettering on a white field. Provide snubber and shutoff cock. Gauge scale shall be twice the normal pressure of the line in which it is installed. Gauge shall be Bourdon tube type with bushed movement and cast aluminum case. Accuracy shall be 90% of the entire range. Gauges no higher than 6' above finish floor. Scale range shall be 0-100 psi.

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall install valves and specialties according to the best practice and manufacturer's recommendations.

3.2 PIPE AND PIPE FITTINGS

A. Provide all piping and connections to all items of equipment as shown and/or required to fully complete the system indicated, including drains and other connections. The drawings show the arrangement desired and the Contractor shall follow the drawings as accurately as possible. If conflict should arise, the Contractor shall verify all

measurements on the job and cut pipe unless specifically noted for expansion loops. All piping shall be reamed or filed and cleaned to remove burrs and other obstructions.

B. The Contractor shall be responsible for installing all piping work in a neat workmanlike manner. This shall be interpreted to mean that all piping shall be neatly aligned, installed and supported in equally spaced parallel runs using trapeze hangers where applicable, install square, true and plumb with walls, equipment or other related surfaces using standard fittings. Any pipe work installed in a disorderly or unworkmanlike manner as adjudged by the Architect shall be corrected by the Contractor at the Contractor's expense.

3.3 BLOWING-OUT SYSTEM

A. All piping and equipment shall be thoroughly blown-out under pressure and clean of all foreign matter wasting condensate through temporary connections so long as necessary to thoroughly clean before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter getting into piping system and equipment.

3.5 HANGERS

A. All piping shall be supported on not less than 10' centers and within 30" of each change of direction except that piping 1-1/4" size and smaller shall be supported on 8'-0" centers.

B. All piping shall be hung by means of split type wrought iron hanger rings similar to Grinnell Figure 104 except as otherwise noted. Copper piping not insulated shall be hung from copper plated hangers similar to Figure CT-97. All insulated piping shall be hung by means of clevis type hangers sized to fit outside of insulation, Grinnell Figure 260.

C. Pipe hangers shall be supported by means of iron hanger rods from the building construction or from structural steel members, and in an approved manner. Where required, piping shall be hung from angle iron slips or suitable brackets attached to sides of masonry construction.

D. All insulated piping shall be provided with insulating protection sheet metal saddles. These shall be 20 gauge galvanized iron. Saddles shall be of a length equal to two times the outside diameter of the insulation and shall extend to above the center line of the pipe.

E. Spring type isolators and wood blocking under insulation jacket shall be provided at large piping subject to vibrations as indicated in the plans and details. Contractor shall provide spring isolator submittal indicating construction, spacing, loading and efficiency.

F. Where piping passes through masonry construction, steel pipe sleeves shall be provided, sized to allow at least 1/2" clearance around pipe or insulation where pipe is insulated. Sleeves shall be flush with finished walls and extend 1/2" above finish floors. A watertight seal shall be provided between floor and sleeve and space between pipe and sleeve shall be caulked with lead wool.

3.6 TEST

A. Pressure test all chilled water, hot water dual temperature water piping at a pressure of 150 psig for 24 hours. Engineer shall be notified 24 hours before test is to be performed.

END OF SECTION 23 20 00

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all the work in this Section.

B. Furnish and install packaged air conditioning units with gas heat as required to provide a complete and satisfactorily job.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00.
   1. Manufacturer's Cuts.
   2. Certified Capacity Ratings.
   3. Installation Instructions.
   4. Operating and Maintenance Instructions.

PART 2 PRODUCTS

2.1 PACKAGED AIR CONDITIONING UNITS

A. Unit shall be a one-piece air cooled electric cooling, gas heating unit and shall be mounted as noted on plans and schedules.

B. Unit compressor(s) shall be serviceable semi-hermetic or welded fully hermetic with crankcase heater(s) and suitable vibration isolators. Compressor shall be of the same manufacturer as unit and shall have a 5 year warranty.

C. Coils: Indoor and outdoor coils shall be of nonferrous construction with aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.

D. Unit shall have 1" permanent washable filters.

E. Fans and Motors: Indoor blowers shall be forward curved, centrifugal, belt driven type. Motor pulley shall be adjustable pitch. Indoor blower shall have permanently lubricated bearings. Outdoor fans shall be of the propeller type, with direct driven permanently lubricated motor. Outdoor fans shall discharge upward.

F. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a baked enamel finish. Cabinet interior shall be insulated with 1" thick neoprene coated fiberglass. Cabinet panels shall be easily removable for service to all operating components. A condensate drain for the indoor coil shall be provided.

G. Controls: The cooling system shall be protected with high pressure static low pressurestats, loss of charge protection, indoor coil freezestats, and current and temperature sensitive overload devices. Each of the devices shall be wired to prevent compressor restart until reset at the thermostat (or unit circuit breaker).

H. Heat exchanger shall be tubular in design and constructed of corrosion resistance aluminized steel. Heat exchanger shall carry a 5 year warranty and an extended 10 year warranty at additional cost. Burners shall be constructed of aluminum painted cold rolled steel and be of the in shot type.

I. Heating controls shall consist of a redundant gas valve, intermittent, pilot ignition, remote pilot flame sensor, indoor fan relay, limit switches and centrifugal switch.

J. Unit electrical connections. Cabinet shall contain suitable openings for routing of all utility connections. The base unit shall contain a terminal strip in the control compartment to allow for terminal connection of room thermostat and field installed accessories.

K. Roof curb shall be of the same manufacturer as unit and shall include an insulated panel under compressor section to prevent condensation forming on the bottom. Dimensions shall be provided to allow for easy duct location and connection to roof curb prior to unit placement. Curb design shall comply with National Roofing Contractors Association requirements.

L. Provide circuit to prevent compressor short cycling as a result of a rapid change in thermostat setting. Also, automatically prevents compressor restart for at least 5 minutes after shutdown.

PART 3 EXECUTION

3.1 INSTALLATION

A. Unit shall be installed in accordance with the manufacturer's recommendations.

B. Unit shall be installed in fully accessible locations.

END OF SECTION 23 74 01

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all the work in this Section.

B. Furnish and install packaged air conditioning units with gas heat as required to provide a complete and satisfactorily job. Scope includes removal of existing unit and replacement with new. Make all necessary modifications to duct, electrical, gas piping connections, concrete pad, etc. as required for new installation.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00.
   1. Manufacturer's Cuts.
   2. Certified Capacity Ratings.
   3. Installation Instructions.
   4. Operating and Maintenance Instructions.

PART 2 PRODUCTS

2.1 PACKAGED AIR CONDITIONING UNITS

A. Unit shall be a one-piece air-cooled direct-expansion cooling-only unit and shall be mounted on roof.

B. Unit compressor(s) shall be serviceable semi-hermetic or welded fully hermetic with crankcase heater(s) and suitable vibration isolators. Compressor shall be of the same manufacturer as unit and shall have a 5 year warranty.

C. Coils: Indoor and outdoor coils shall be of nonferrous construction with aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed.

D. Unit shall have 1" permanent washable filters.

E. Fans and Motors: Indoor blowers shall be forward curved, centrifugal, belt driven type. Motor pulley shall be adjustable pitch. Indoor blower shall have permanently lubricated bearings. Outdoor fans shall be of the propeller type, with direct driven permanently lubricated motor. Outdoor fans shall discharge upward.

F. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a baked enamel finish. Cabinet interior shall be insulated with 1" thick neoprene coated fiberglass. Cabinet panels shall be easily removable for service to all operating components. A condensate drain for the indoor coil shall be provided.

G. Controls: The cooling system shall be protected with high pressure static low pressurestats, loss of charge protection, indoor coil freezestats, and current and temperature sensitive overload devices. Each of the devices shall be wired to prevent compressor restart until reset at the thermostat (or unit circuit breaker).

H. Unit electrical connections. Cabinet shall contain suitable openings for routing of all utility connections. The base unit shall contain a terminal strip in the control compartment to allow for terminal connection of room thermostat and field installed accessories.

K. Provide circuit to prevent compressor short cycling as a result of a rapid change in thermostat setting. Also, automatically prevents compressor restart for at least 5 minutes after shutdown.

PART 3 EXECUTION

3.1 INSTALLATION

A. Unit shall be installed in accordance with the manufacturer’s recommendations.

B. Unit shall be installed in fully accessible locations.

END OF SECTION 23 74 02

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all the work in this Section.

B. Furnish and install fan coil units as required to provide a complete and satisfactory job. Furnish includes all necessary electrical, patching, painting, ceiling repair, piping, ductwork and insulation asssoicated with removal of existing unit and installation of new. Provide new piping specialties per coil piping detail shown on the drawings.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00.
   1. Manufacturer's Cuts.
   2. Certified Capacity Ratings.
   3. Installation Instructions.
   4. Operating and Maintenance Instructions.

PART 2 PRODUCTS

2.1 FAN COIL UNITS

A. Units shall be certified to deliver published heating/cooling capacities as tested in accordance with the latest ARI Standard 441. All units shall be listed by Underwriters' Laboratories. All units and accessories shall be wired in accordance with the National Electrical Code.

B. Fans shall be centrifugal, forward curved, double with type and shall be both statically and dynamically balanced. Fan wheels and housing shall be of galvanized steel.

C. Base unit shall be complete with water coil, centrifugal fan(s) and motor, insulated condensate pan, 3-speed fan switch and 18 gauge galvanized steel casing panels.

D. Cabinet shall be constructed of cold-rolled steel, bonderized and coated with baked enamel finish. Access panels shall have positive-locking quarter turn fasteners for easy removal. Fasteners shall be slotted head type tamperproof.

E. Interior surfaces of casing panels shall be insulated with 1/2" glass fiber meeting NFPA-90A requirements. Condensate pan shall be lined with 1/2" fire retardant closed cell foam insulation.

F. Fan motors shall be 3-speed, tap-wound type with integral motor protection. Motor shall be of the permanent split capacitor type.

G. Motor bearings shall be of the sleeve type with oil tubes and oversized oil reservoir to ensure positive lubrication.

H. Coils shall be 1/2" OD copper tubes and mechanically bonded aluminum fins. Coils shall be leak tested at 350 psig minimum air pressure, and shall be suitable for up to 250 psig working pressure. Each coil shall have a manual air vent. Coil seat connections shall be 5/8" OD copper.

I. Filters shall be 1" thick throwaway type (standard) or 1" thick cleanable type in aluminum frame (optional).

J. Primary drain pan shall be of 18 gauge galvanized steel. Pan shall be pitched for positive drainage and shall project under full length of coil, including return bends and headers.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install unit per manufacturer's recommendations.

B. Reuse existing hangers for horizontal units. Modify as required for new unit.

END OF SECTION 23 82 19

PART 1 GENERAL

1.1 SCOPE

A. The provisions of Section 23 05 00 apply to all the work in this Section.

B. Furnish and install fan coil units as required to provide a complete and satisfactory job. Furnish includes all necessary electrical, patching, painting, ceiling repair, piping, ductwork and insulation asssoicated with removal of existing unit and installation of new. Provide new piping specialties per coil piping detail shown on the drawings.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 23 05 00:
   1. Manufacturer's cuts.
   2. Certified capacity ratings.
   3. Installation instructions.
   4. Operating and Maintenance Instructions.

PART 2 PRODUCTS

2.1 UNIT VENTILATORS

A. Unit ventilators shall be 30" high and 15-1/4" deep. They shall be constructed of 16 gauge furniture quality steel, with exposed edges rounded. Precise panel fit-up is required.

B. Front panels shall be retained by a minimum of three Allen wrench operated camlocks. The camlock heads shall be surrounded by a plastic inset to prevent paint damage.

C. All steel unit ventilator surfaces shall be clean phosphatized, and flow coated with baked prime paint before application of final finish coat. Units shall be supplied in one of seven decorator colors as selected by the Architect. The baked enamel coating shall be even and smooth with no visible run marks.

D. Unit ventilator discharge grilles shall be constructed of heavy steel bars welded in place as an integral part of the unit structure. Easily cleaned sight blockoffs shall be installed below the grille in the end pockets.

E. Unit inlet grilles shall be easily removable for easy access by loosening two camlocks.

F. Unit ventilator end pockets shall be at least 13" wide and provided with removable outside ends to allow fullest access for easy field installation of valves and piping. The unit shall have large pipe access openings in the bottom of both end pockets and large knockouts for piping or electrical connection in the back of both ends. Pipe chase across the back of the unit for field installation of crossover piping or running of electrical wiring as required.

G. Leveling legs shall be provided at both ends of the unit to facilitate alignment and leveling.

H. Unit ventilators shall be equipped with dual blade type mixing dampers to ensure proper modulation and mixing of return and outdoor air. A continuous divider shall be placed between the damper blades to separate the fresh air and return air compartments and positively prevent blow-through.

I. Bypass dampers shall be aluminum and insulated for sound attenuation and to prevent formation of condensate. Dampers shall be tight sealing and designed to minimize heat pick up in bypass.

J. The unit ventilator fan board assembly shall be a single, rigid assembly and include the fans, fan housing, bearings, fan shaft and motor. The fan motor shall be mounted on the fan board.

K. The wrap-around portion of the fan housings shall be constructed of 6 lbs. density molded fiberglass. at least 3/4" thick, and vinyl coated on the exterior surface.

L. Motors shall be permanent split capacitor type with two speeds. A multiple tap auto transformer shall be wired to the motor to insure rated capacity with all coil combinations. Motor speed shall not be affected by damper positions or filter loading. The motor shall be easily removable without removing the fan board.

M. All hydraulic coils shall be plate-fin type and manufactured by the unit ventilator manufacturer. Fins shall be heavy gauge aluminum and have crack free, continuous fin collars. Tubes shall be 5/8" x .020" wall copper.

N. Unit shall be designed so a different type coil can be easily exchanged in the same basic unit. Substitution of chilled water or direct expansion coils for a heating coil shall not required revision on the basic unit or addition or insulation.

O. Unit drain pan shall be deep formed galvanized steel, lined internally with closed cell inert plastic insulating material.

P. Each unit shall be equipped with a single 1" thick (throwaway) (permanent) or (replaceable media), filter accessible without removal of the unit front panel.

Q. The sound power level (re: 10-12 watts) generated when producing the specified CFM shall not exceed the following in any octave band:

Mid Frequency	Maximum Sound Power Level DB
125	68
250	66
500	60
1000	55
2000	48
4000	43
8000	38

R. Furnish unit with a OFF-Hi-Low fan speed selector switch.

S. Furnish unit with unit mounted disconnect switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install unit per manufacturer's recommendations.

B. Reuse existing hangers for horizontal units. Modify as required for new unit.

END OF SECTION 23 82 23

UNION COUNTY SCHOOLS

PROSPECT ELEMENTARY

SYMBOL SCHEDULE

GENERAL SYMBOLS

SYMBOL	DESCRIPTION
	CONDUIT RUN CONCEALED ABOVE CEILINGS OR IN WALLS.
	CONDUIT RUN CONCEALED IN OR BELOW FLOORS OR UNDERGROUND.
	CONDUIT RUN EXPOSED.
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	SQUARE ON CONDUIT SYMBOL INDICATES THAT CIRCUIT CONTINUES BUT NOT SWITCHLEG.
	HOMERUN TO PANEL AND CIRCUIT(S) DESIGNATED. ARROW(S) INDICATE QUANTITY OF CIRCUITS.
J	JUNCTION BOX PER N.E.C.
1	SPECIAL NOTE, NUMERALS IDENTIFY, SEE SCHEDULE.
1	SPECIAL CONNECTION TO A SPECIFIC ITEM OF EQUIPMENT. SEE CONNECTION SCHEDULE.

DISTRIBUTION

SYMBOL	DESCRIPTION
	ELECTRICAL PANELBOARD, FLUSH MOUNTED.
	ELECTRICAL PANELBOARD, SURFACE MOUNTED.
	CONTROL CABINET, FLUSH OR SURFACE MOUNTED.
	MOTOR STARTER
	ENCLOSED CIRCUIT BREAKER
	DISCONNECT SWITCH, NON-FUSIBLE.
	DISCONNECT SWITCH, FUSIBLE.
	DISCONNECT SWITCH PROVIDED WITH EQUIPMENT.
	GROUND CONNECTION.
S	MOTOR RATED TOGGLE SWITCH.

ELECTRICAL SPECIFICATIONS

1. PROVIDE ALL WORK AND MATERIALS REQUIRED FOR A COMPLETE AND WORKMANLIKE INSTALLATION AS SHOWN BY THE THE DRAWINGS AND SPECIFIED HEREIN.

2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, STATE, AND LOCAL CODES. ELECTRICAL MATERIALS SHALL BE NEW AND SHALL COMPLY WITH ALL APPLICABLE NEMA, U.L., ANSI, OSHA, AND ICEA STANDARDS.

3. PERFORM ALL CUTTING AND PATCHING NECESSARY FOR THE PROPER INSTALLATION OF THIS WORK AND REPAIR ANY DAMAGE DONE AS A RESULT OF THIS WORK.

4. AN ELECTRICAL INSPECTION CERTIFICATE SHALL BE ISSUED BY THE AUTHORITIES HAVING JURISDICTION BEFORE WORK WILL BE APPROVED FOR FINAL PAYMENT.

5. ALL ELECTRICAL CONDUIT AND CONDUCTORS WHICH ARE ABANDONED SHALL EITHER BE REMOVED COMPLETELY OR MECHANICALLY AND ELECTRICALLY SECURED. BACK BOXES OF OUTLETS AND SWITCHES SHOWN TO BE REMOVED FROM THE WALLS REMAINING SHALL BE REMOVED AND THE WALL PROPERLY PATCHED. ALL EXISTING ELECTRICAL OUTLETS NOT SHOWN TO BE REMOVED SHALL BE RECONNECTED. ALL MATERIALS AND EQUIPMENT NOTED TO BE REUSED IN THE NEW WORK SHALL BE CLEANED AND, IF NECESSARY, REPAIRED AND SHALL BE STORED AND PROTECTED ON THE SITE. ALL REUSED FIXTURES SHALL BE RELAMPED. PROVIDE OUTLET BOX EXTENSIONS WHERE NEW WALL FINISHES REQUIRED ADDITIONAL OUTLET BOX DEPTH. RELOCATE ANY EXISTING CONDUITS, CONDUCTORS, FIXTURES, AND OUTLETS WHERE REQUIRED BY THIS WORK.

6. ALL CONDUCTORS SHALL BE COPPER, TYPE THHN/THWN, AND SOLID OF #10, #12, AND #14 AWG AND STRANDED FOR #8 AWG AND LARGER. BRANCH CIRCUIT CONDUCTORS SHALL NOT BE SMALLER THAN #12 AWG. CONDUCTORS SHALL BE COLOR CODED BLACK/RED/BLUE FOR 120/208 VOLT AND 240 VOLT SYSTEMS. (PHASE A/ PHASE B/ PHASE C) CONDUCTORS SHALL BE CONTINUOUS FROM OUTLET TO OUTLET. NO SPLICES SHALL BE MADE EXCEPT WITHIN OUTLET OR JUNCTION BOXES. SPLICES SHALL BE MADE BY TWISTING SECURELY AND FASTENING WITH U.L. LISTED, PRESSURE-TYPE TWIST ON INSULATED-WIRE CONNECTORS OF THE SAME TEMPERATURE RATING AS THE CONDUCTORS. SPLICES TO LIGHT FIXTURE LEADS SHALL BE MADE WITH PLASTIC WIRE NUTS.

7. ALL WIRING SHALL BE IN CONDUIT. WHERE CONCEALED WIRING SHALL BE METAL CLAD (MC) CABLE UNLESS OTHERWISE NOTED. WHERE EXPOSED, WIRING SHALL BE IN ELECTRICAL METALLIC TUBING (EMT), i-INCH TRADE SIZE MINIMUM. WHERE EMT IS USED, FITTINGS SHALL BE THREADLESS-COMPRESSION TYPE GALVANIZED STEEL. WHERE FLEXIBLE METAL CONDUIT IS USED, CONNECTORS SHALL BE T & B NYLON-INSULATED "TITE-BITE".

8. OUTLET BOXES SHALL BE GALVANIZED SHEET STEEL. FIXTURE OUTLET BOXES ON CEILINGS SHALL NOT BE LESS THAN 4 INCHES OCTAGONAL OUTLET BOXES ON NEW GYPSUM DRYWALL WALLS SHALL BE 4 INCHES SQUARE WITH SQUARE-CUT COVER EXTENSIONS.

9. SWITCHES AND RECEPTACLES SHALL BE SPECIFICATION GRADE BY ARROW-HART, GENERAL ELECTRIC, BRYANT, OR HUBBELL. PLATES SHALL BE 302 STAINLESS STEEL.

10. OUTLET AND JUNCTION BOXES SHALL BE CAST TYPE WITH THREADED HUBS. BOXES AND ENCLOSURES LARGER THAN 5 INCHES SQUARE SHALL BE NEMA 12.

11. ALL CONDUIT SHALL BE RUN AS HIGH AS POSSIBLE, PARALLEL WITH STRUCTURAL MEMBERS, SUPPORTED ON APPROVED TYPES OF GALVANIZED TRAPEZES, HANGERS, OR STRAPS.

12. LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE USED FOR EQUIPMENT CONNECTIONS, BUT NOT AS A WIRING METHOD OTHERWISE.

13. DISCONNECT SWITCHES SHALL BE HEAVY-DUTY TYPE WITH REJECTION-TYPE FUSE CLIPS AND SUITABLE FOR 75°C CONDUCTOR TERMINATION.

14. A CONTINUOUS GREEN GROUND WIRE SHALL BE RUN WITH EACH CIRCUIT.

15. SHOP DRAWINGS SHALL BE SUBMITTED FOR DRY-TYPE TRANSFORMERS AND PANELBOARDS.

16. PROVIDE ENGRAVED PHENOLIC NAMEPLATES FOR PANELBOARDS.

17. REFER TO BOUND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

18. UPDATE PANEL DIRECTORY TO REFLECT ALL CHANGES REQUIRED BY THIS WORK.

UNIT VENTILATOR SCHEDULE

Unit Tag	*Watts*	*Volts*	*Phs*
UV-1	191	115	1
UV-2	191	115	1
UV-3	191	115	1
UV-4	191	115	1
UV-5	180	115	1
UV-6	191	115	1
UV-7	191	115	1
UV-8	191	115	1
UV-9	180	115	1
UV-10	180	115	1
UV-11	180	115	1
UV-12	180	115	1
UV-13	235	115	1
UV-14	235	115	1
UV-15	235	115	1
UV-16	235	115	1
UV-17	235	115	1
UV-18	235	115	1
UV-19	235	115	1
UV-20	235	115	1
UV-21	235	115	1
UV-22	235	115	1
UV-23	235	115	1
UV-24	135	115	1
UV-25	135	115	1
UV-26	135	115	1
UV-27	135	115	1
UV-28	180	115	1
UV-29	180	115	1
UV-30	180	115	1
UV-31	180	115	1

FAN COIL UNIT SCHEDULE

Unit Tag	*Motor*					
	Qty	*MCA*	*HP*	*Watts*	*Volts*	*Phs*
FC-1	1	2.75	.13	40	115	1
FC-2	1	2.75	.13	58	115	1
FC-3	1	2.75	.13	22	115	1
FC-4	1	2.75	.13	22	115	1
FC-5	1	2.75	.13	88	115	1
FC-6	1	2.75	.13	40	115	1
FC-7	1	2.75	.13	40	115	1
FC-8	1	2.75	.13	40	115	1
FC-9	1	2.75	.13	40	115	1
FC-10	1	3.88	.22	145	115	1
FC-11	1	3.88	.22	219	115	1
FC-12	1	2.75	.13	79	115	1

EQUIPMENT CONNECTION SCHEDULE

SYM.	EQUIPMENT	LOAD	VOLT/PHASE	DISCONNECT					CONDUCTORS	RACEWAY		NOTES
				TYPE	RATING	POLES	TRIP/FUSE	ENCLO.		TYPE	SIZE	
1	RTU-1 (ALTERNATE #1)	16.4RLA+9.2RLA+ 8.8FLA	208/3	FDS	60	3	50	3R	3#8,1#10G	LFMC	3/4"	
2	RTU-2 & RTU-3 (ALTERNATE #2)	16.4RLA+9.2RLA+ 8.8FLA	208/3	FDS	60	3	50	3R	3#8,1#10G	LFMC	3/4"	
3	PAC-1 (ALTERNATE #3)	16.4RLA+9.2RLA+ 8.8FLA	208/3	FDS	60	3	50	3R	3#8,1#10G	LFMC	3/4"	

LEGEND

DISCONNECT TYPES
- ETCB = ELECTRONIC-TRIP CIRCUIT BREAKER
- FDS = FUSIBLE DISCONNECT SWITCH
- MCP = MOTOR CIRCUIT PROTECTOR
- NFDS = NON-FUSIBLE DISCONNECT SWITCH
- ST/DS = COMBINATION STARTER/DISCONNECT SWITCH
- TMCB = THERMAL-MAGNETIC CIRCUIT BREAKER
- TOG = HP RATED TOGGLE SWITCH

DISCONNECT ENCLOSURE TYPES
- 1 = NEMA 1 ENCLOSURE
- 3R = NEMA 3R ENCLOSURE
- 4 = NEMA 4 ENCLOSURE
- 4X = NEMA 4X ENCLOSURE
- FPN = FUSE PER NAMEPLATE

RACEWAY TYPES
- EMT = ELECTRIC METALLIC TUBING
- FMC = FLEXIBLE METAL CONDUIT
- IMC = INTERMEDIATE METAL CONDUIT
- LFMC = LIQUID-TIGHT FLEXIBLE METAL CONDUIT
- PVC = NON-METALLIC PVC CONDUIT
- RMC = RIGID METAL CONDUIT

STARTER TYPES
- CFVNR = COMBINATION FULL VOLTAGE, NONREVERSING

CONTROL DEVICES
- HOA = HAND-OFF-AUTO
- RPL = RED PILOT LIGHT
- AUX = AUXILIARY CONTACTS (2 N.O., 1 N.C.)
- CT50 = 50 VA CONTROL TRANSFORMER

NOTES

ALL ELECTRICAL CHARACTERISTICS SCHEDULED ABOVE ARE BASED ON INFORMATION AVAILABLE AT THE TIME OF DESIGN. ELECTRICAL CONTRACTOR SHALL VERIFY ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT WITH EQUIPMENT SUPPLIER(S) PRIOR TO ROUGHING, AND SHALL VERIFY EXACT LOCATION AND EXACT TYPE OF CONNECTION. ALL EQUIPMENT SHALL BE PROPERLY AND SECURELY GROUNDED. ANY SIGNIFICANT CHANGES IN LOCATION, ELECTRICAL REQUIREMENTS, OR TYPE OF CONNECTION REQUIRED FOR ANY EQUIPMENT SCHEDULED ABOVE SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IN WRITING PRIOR TO PROCEEDING.

CONDUCTORS AND RACEWAY SPECIFIED IN THE ABOVE SCHEDULE ARE FOR FINAL CONNECTION TO UNIT AND SHALL BE EXTENDED FROM THE DISCONNECT SHOWN ON THE FLOOR PLANS TO THE EQUIPMENT TERMINATION BOX.

CONDUIT AND BOXES REQUIRED FOR EQUIPMENT CONNECTIONS SHALL BE INSTALLED IN SUCH A WAY AS TO NOT COVER UP EQUIPMENT NAMEPLATES, SERVICE AREAS, AIR FLOW AREAS, ETC.

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 36875 MATTHEW D. K... 08-31-2023

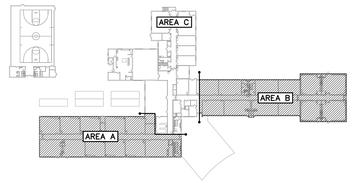
JOB NUMBER	21-185
DRAWN BY	MDK
CHECKED BY	MPA
DATE	08/31/2023

REVISION DATES | REVISION DESCRIPTION

JOB TITLE: PROSPECT ELEMENTARY HVAC REPLACEMENT

SHEET TITLE: SYMBOLS, SCHEDULES AND SPECIFICATIONS

SHEET E1.0

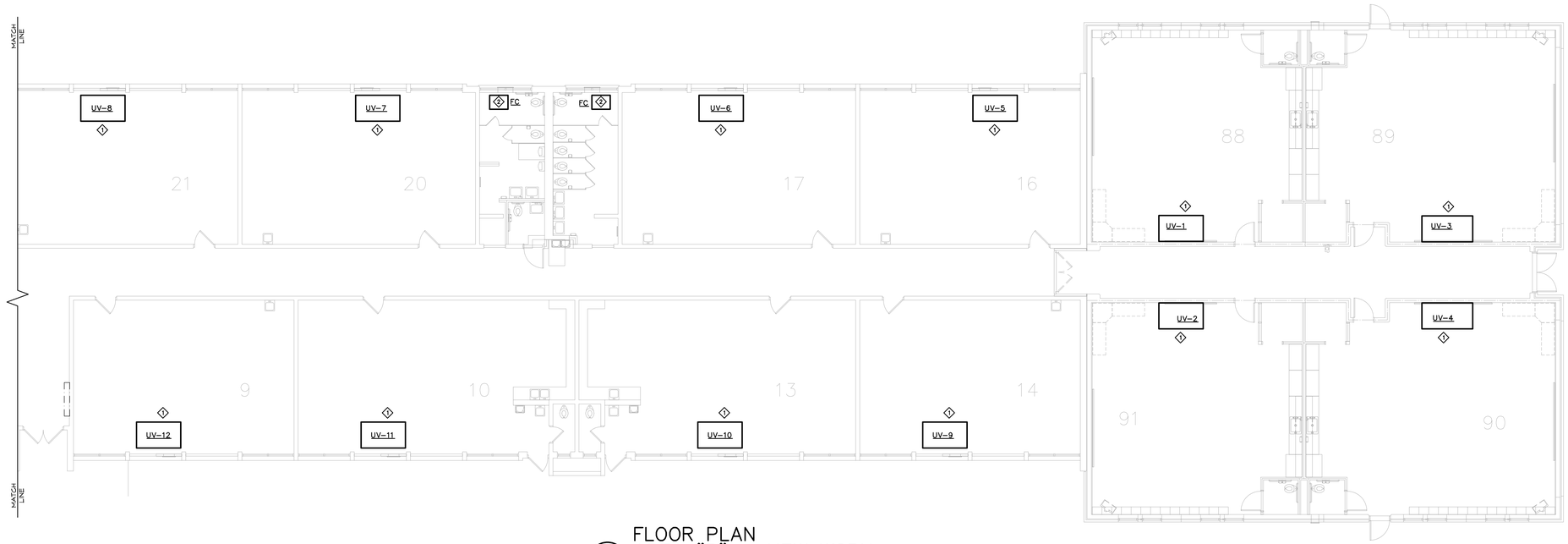


KEY PLAN

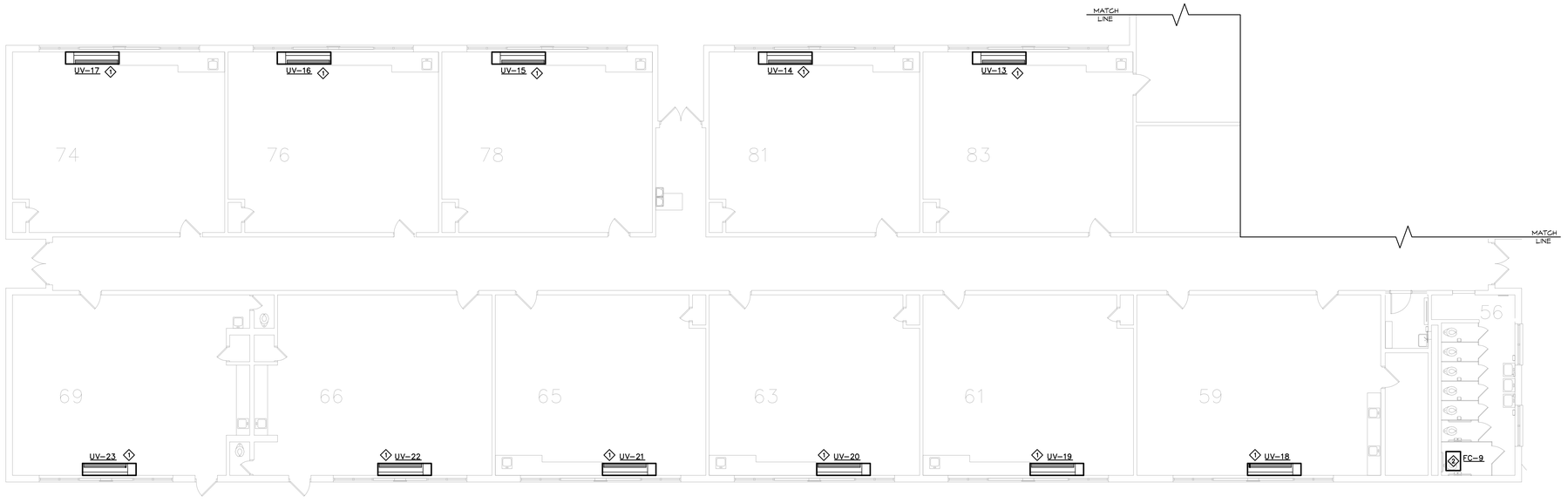
UNION COUNTY SCHOOLS

PROSPECT ELEMENTARY

McKNIGHT·SMITH
WARD · GRIFFIN
ENGINEERS, INCORPORATED
4223 South Boulevard
Charlotte, NC 28209
704/527-2112
F-0595
21-185



2 FLOOR PLAN
AREA "B" – NEW WORK
SCALE: 1/8" = 1'-0"



1 FLOOR PLAN
AREA "A" – NEW WORK
SCALE: 1/8" = 1'-0"

NOTES:

1. DISCONNECT EXISTING 120V UNIT VENTILATOR AND CONNECT NEW UNIT IN SAME LOCATION WITH 2#12,1#12G,1/2"C.
2. DISCONNECT EXISTING 120V FAN COIL UNIT AND CONNECT NEW UNIT IN SAME LOCATION WITH 2#12,1#12G,1/2"C.

NOTE: THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS. SUBMISSION OF BIDS IS CONSIDERED VERIFICATION THAT THE CONTRACTOR HAS VISITED THE SITE. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF THE EXISTING CONDITIONS.

JOB NUMBER	21-185
DRAWN BY	MDK
CHECKED BY	MPA
DATE	08/31/2023

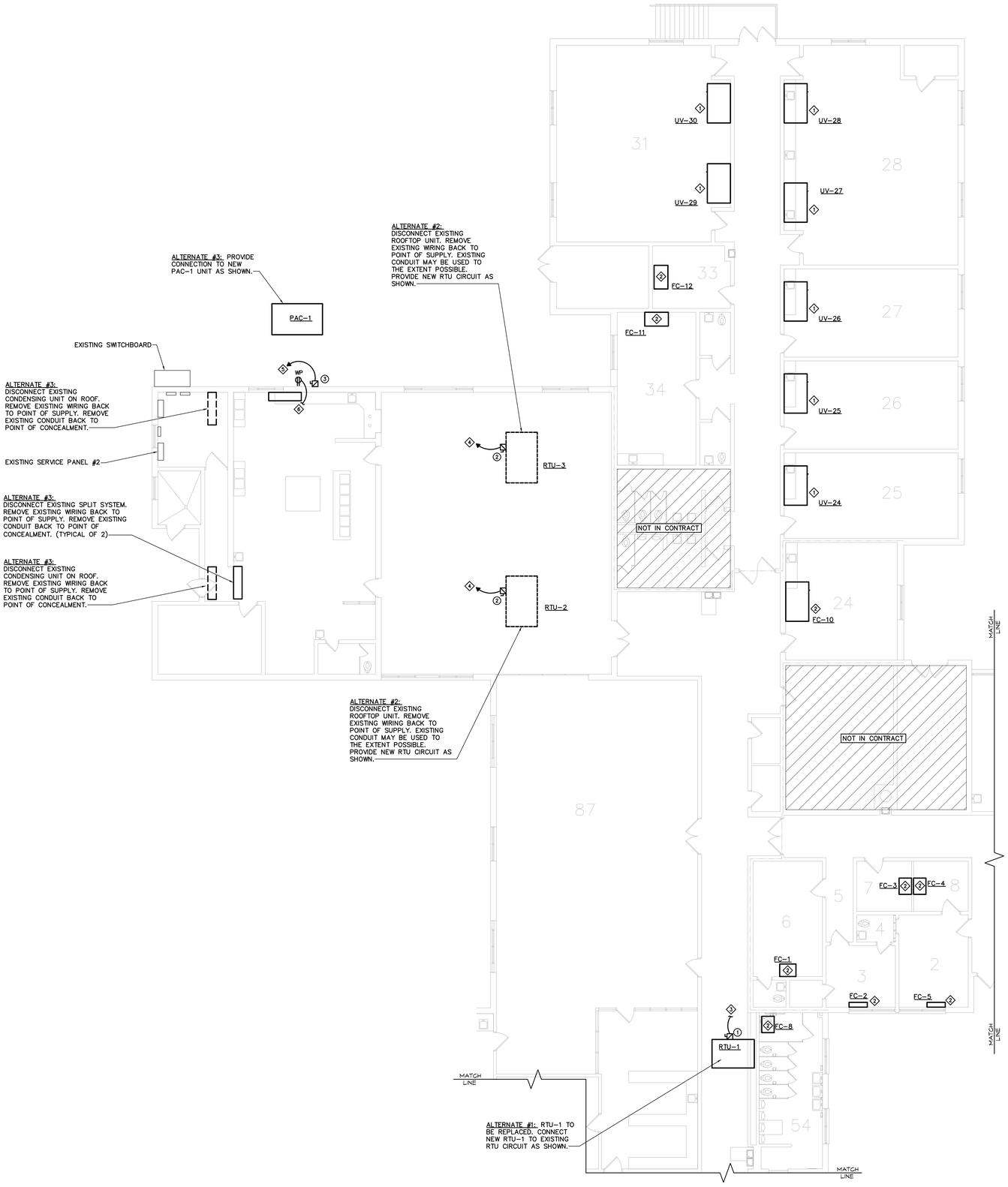
REVISION DATES

REVISION DESCRIPTION

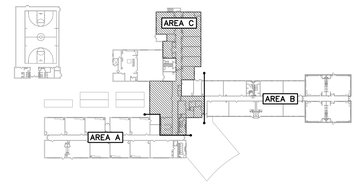
JOB TITLE
PROSPECT ELEMENTARY
HVAC REPLACEMENT

SHEET TITLE
ELECTRICAL FLOOR PLANS
NEW WORK - AREA A & B

SHEET
E2.1
2 OF 3



1 BLDS C & D – DEMOLITION MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0"



KEY PLAN

NOTES:

1. DISCONNECT EXISTING 120V UNIT VENTILATOR AND CONNECT NEW UNIT IN SAME LOCATION WITH 2#12,1#12G,1/2"C.
2. DISCONNECT EXISTING 120V FAN COIL UNIT AND CONNECT NEW UNIT IN SAME LOCATION WITH 2#12,1#12G,1/2"C.
3. UNDER ALTERNATE #1, REPLACE EXISTING RTU-1 DISCONNECT SWITCH WITH NEW FUSIBLE DISCONNECT SWITCH AS INDICATED AND CONNECT TO EXISTING RTU CIRCUIT IN THE AREA. UNDER BASE BID, EXISTING RTU TO REMAIN.
4. UNDER ALTERNATE #2, PROVIDE NEW 50/3 CIRCUIT BREAKER IN EXISTING SERVICE PANEL #2 (208Y/120V, 3PH, 4W, 800A MCB, GE CCB) AND CONNECT TO RTU WITH 3#8,1#10G, 3/4"C. UNDER BASE BID, EXISTING RTU TO REMAIN. (TYPICAL OF 2)
5. UNDER ALTERNATE #3, PROVIDE NEW 50/3 CIRCUIT BREAKER IN EXISTING SERVICE PANEL #2 (208Y/120V, 3PH, 4W, 800A MCB, GE CCB) AND CONNECT TO PAC-1 WITH 3#8,1#10G, 3/4"C. UNDER BASE BID, DO NOT PROVIDE NEW CIRCUIT.
6. CONNECT TO NEAREST 120V, 20A GENERAL PURPOSE RECEPTACLE CIRCUIT WITH 2#12,1#12G,1/2"C.

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UNION COUNTY SCHOOLS

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4223 South Boulevard
Charlotte, NC 28209
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21-185

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 36875 MATTHEW P. ATKINSON REGISTERED 08-31-2023

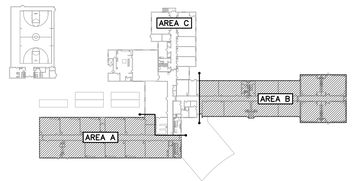
REVISION DATES	REVISION DESCRIPTION

JOB NUMBER	21-185
DRAWN BY	MDK
CHECKED BY	MPA
DATE	08/31/2023

JOB TITLE
PROSPECT ELEMENTARY
HVAC REPLACEMENT

SHEET TITLE
ELECTRICAL FLOOR PLANS
NEW WORK – AREA C

SHEET
E2.2
3 OF 3



KEY PLAN

UNION COUNTY SCHOOLS

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423 South Boulevard
Charlotte, NC 28209
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21-185

EXISTING HORIZONTAL FAN COIL UNIT TO BE REMOVED AND REPLACED WITH NEW. ASSOCIATED WATER AND CONDENSATE DRAIN PIPING TO REMAIN FOR CONNECTION TO REPLACEMENT UNIT. TYPICAL OF 2.

EXISTING PIPING THRU SOFFIT TO REMAIN.

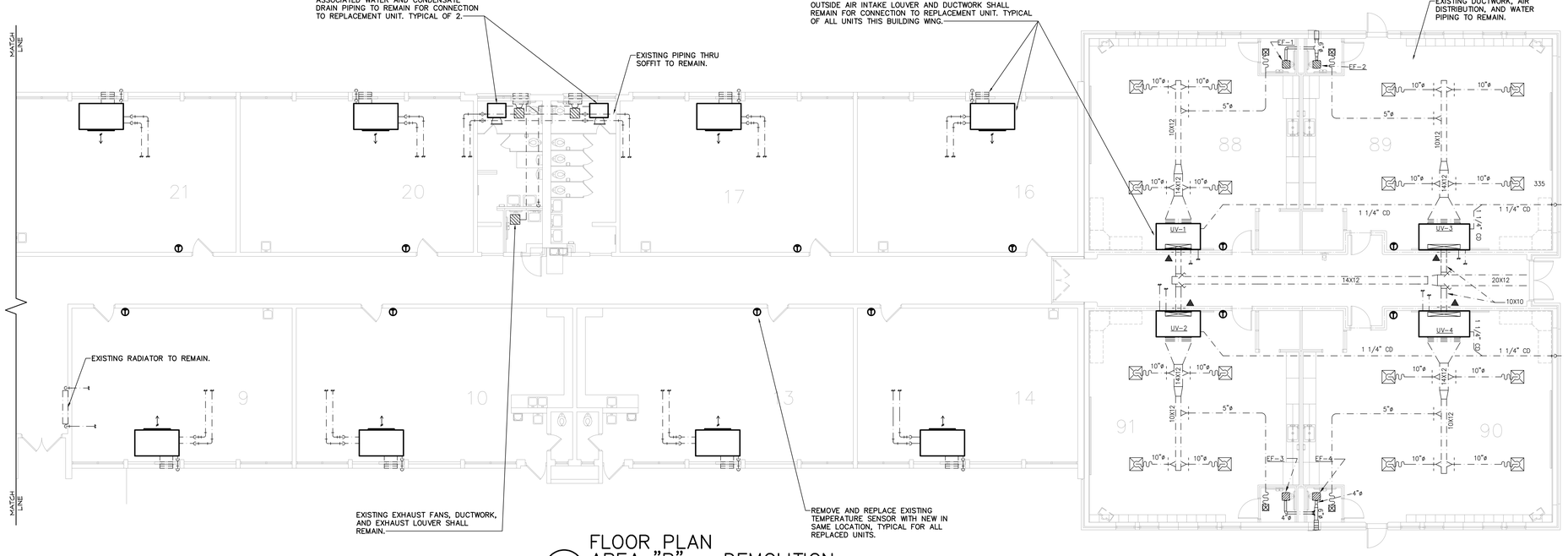
EXISTING VERTICAL UNIT VENTILATOR SHALL BE REMOVED AND REPLACED WITH NEW. ASSOCIATED WATER AND CONDENSATE DRAIN PIPING SHALL REMAIN. EXISTING OUTSIDE AIR INTAKE LOUVER AND DUCTWORK SHALL REMAIN FOR CONNECTION TO REPLACEMENT UNIT. TYPICAL OF ALL UNITS THIS BUILDING WING.

EXISTING DUCTWORK, AIR DISTRIBUTION, AND WATER PIPING TO REMAIN.

EXISTING RADIATOR TO REMAIN.

EXISTING EXHAUST FANS, DUCTWORK, AND EXHAUST LOUVER SHALL REMAIN.

REMOVE AND REPLACE EXISTING TEMPERATURE SENSOR WITH NEW IN SAME LOCATION, TYPICAL FOR ALL REPLACED UNITS.



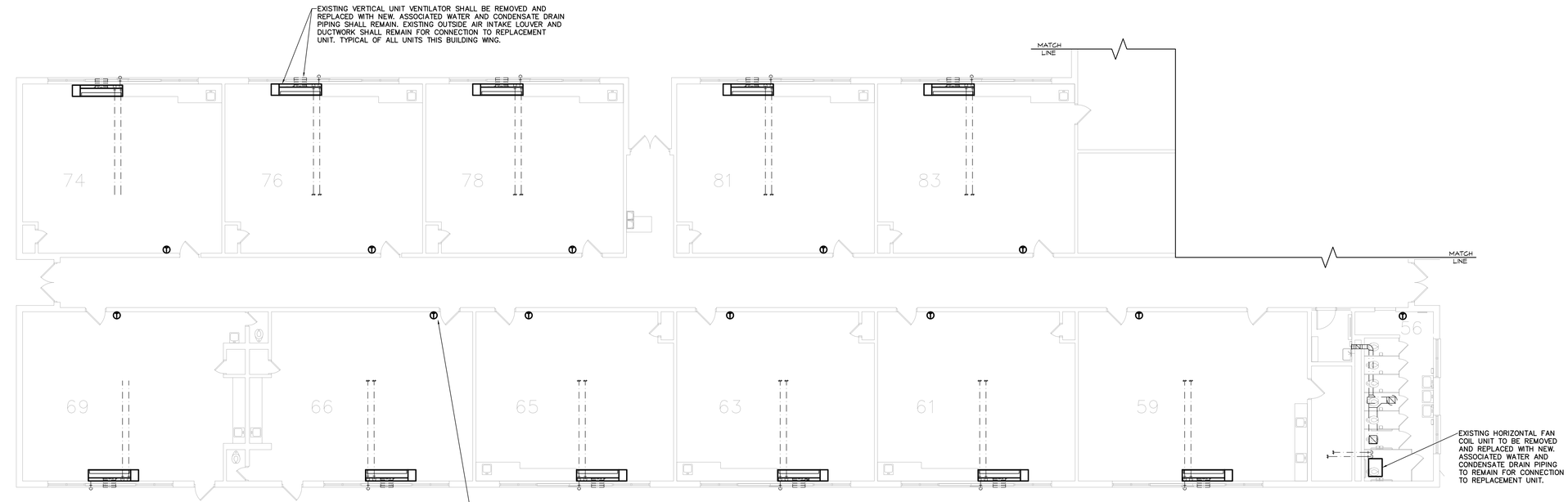
2 FLOOR PLAN AREA "B" – DEMOLITION

SCALE: 1/8" = 1'-0"

EXISTING VERTICAL UNIT VENTILATOR SHALL BE REMOVED AND REPLACED WITH NEW. ASSOCIATED WATER AND CONDENSATE DRAIN PIPING SHALL REMAIN. EXISTING OUTSIDE AIR INTAKE LOUVER AND DUCTWORK SHALL REMAIN FOR CONNECTION TO REPLACEMENT UNIT. TYPICAL OF ALL UNITS THIS BUILDING WING.

REMOVE AND REPLACE EXISTING TEMPERATURE SENSOR WITH NEW IN SAME LOCATION, TYPICAL FOR ALL REPLACED UNITS.

EXISTING HORIZONTAL FAN COIL UNIT TO BE REMOVED AND REPLACED WITH NEW. ASSOCIATED WATER AND CONDENSATE DRAIN PIPING TO REMAIN FOR CONNECTION TO REPLACEMENT UNIT.



1 FLOOR PLAN AREA "A" – DEMOLITION

SCALE: 1/8" = 1'-0"

DEMOLITION NOTES

A. THIS CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING NECESSARY TO INSTALL HIS EQUIPMENT. THIS CONTRACTOR SHALL RESTORE AREAS UNCOVERED BY REMOVAL OF EXISTING EQUIPMENT WHICH WILL REMAIN EXPOSED. PATCHING SHALL MATCH ADJACENT SURFACES. FINAL PAINTING SHALL BE PROVIDED IN THIS CONTRACT AND COORDINATED WITH OWNER.

B. NO STRUCTURAL MEMBERS SHALL BE CUT WITHOUT THE APPROVAL OF THE OWNER AND LICENSED DESIGN PROFESSIONAL.

C. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER OPENINGS INTO BUILDING TO ADMIT EQUIPMENT. IF IT BECOMES NECESSARY TO CUT ANY PORTION OF THE BUILDING TO ADMIT EQUIPMENT, PORTIONS CUT MUST BE RESTORED TO THEIR FORMER CONDITION BY THIS CONTRACTOR.

D. EXISTING EQUIPMENT REMOVED SHALL BE STORED ON SITE BY THIS CONTRACTOR. EXISTING EQUIPMENT TO BE RETURNED TO OWNER (IDENTIFIED BY OWNER) SHALL BE KEPT IN ORIGINAL CONDITION, PROTECTED FROM WEATHER BY THIS CONTRACTOR AND REMOVED FROM SITE STORAGE BY OWNER. EXISTING EQUIPMENT NOT RETURNED TO OWNER SHALL BE REMOVED FROM SITE STORAGE & DISPOSED OF BY THE CONTRACTOR.

E. EQUIPMENT REMOVED CONTAINING REFRIGERANTS (COILS, REFRIGERANT LINES, CONDENSING UNITS, CHILLERS, ETC.): EVACUATE AND DISPOSE OF REFRIGERANT PER ALL APPLICABLE CODES. RETURN REFRIGERANT TO OWNER.

F. EQUIPMENT REMOVED WITH PIPING CONNECTIONS: REMOVE EQUIPMENT, EXPOSED PIPING, AND PIPING SPECIALTIES. CAP PIPES BELOW FLOOR, IN WALL, OR ABOVE CEILING AS REQUIRED. REPAIR WALLS, FLOORS, AND CEILINGS TO ORIGINAL CONDITION. FINAL PAINTING BY THIS CONTRACTOR UNLESS NOTED OTHERWISE.

G. REMOVE LAY-IN CEILING AS REQUIRED FOR WORK ABOVE CEILING. REINSTALL CEILING WHEN WORK IS COMPLETE. REPLACE DAMAGED CEILING TILES. CEILING REMOVAL AND REPLACEMENT SHALL BE PERFORMED BY A SUBCONTRACTOR REGULARLY EMPLOYED FOR INSTALLATION OF CEILING SYSTEMS, SUBJECT TO APPROVAL BY OWNER AND LICENSED DESIGN PROFESSIONAL.

H. REMOVE PLASTER CEILING AS REQUIRED FOR PIPE, OR UNIT HANGER ATTACHMENT TO JOIST. REINSTALL CEILING WHEN WORK IS COMPLETE. REPLACE DAMAGED PORTIONS OF CEILING. CEILING REMOVAL & REPLACEMENT SHALL BE PERFORMED BY A SUBCONTRACTOR REGULARLY EMPLOYED FOR INSTALLATION OF CEILING SYSTEMS, SUBJECT TO APPROVAL BY OWNER AND LICENSED DESIGN PROFESSIONAL.

I. PIPING SHOWN TO DEMONSTRATE UNIT HANDING. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING UNIT HANDING TO ENSURE NEW UNITS ARE COMPATIBLE WITH EXISTING HYDRONICS PIPING.

J. DURING DEMOLITION, MECHANICAL CONTRACTOR IS RESPONSIBLE FOR TAKING NOTE OF EACH UNITS CONTROL VALVE CONFIGURATION. WHEN INSTALLING NEW UNITS, PROVIDE MATCHING CONTROL VALVE SCHEME.

NOTE: THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS. SUBMISSION OF BIDS IS CONSIDERED VERIFICATION THAT THE CONTRACTOR HAS VISITED THE SITE. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF THE EXISTING CONDITIONS.

DEMOLITION LEGEND

- EXISTING TO REMAIN
- EXISTING TO BE REMOVED
- CAP DUCT

JOB NUMBER	21-185
DRAWN BY	JMP
CHECKED BY	BSC
DATE	08/31/2023

REVISION DATES

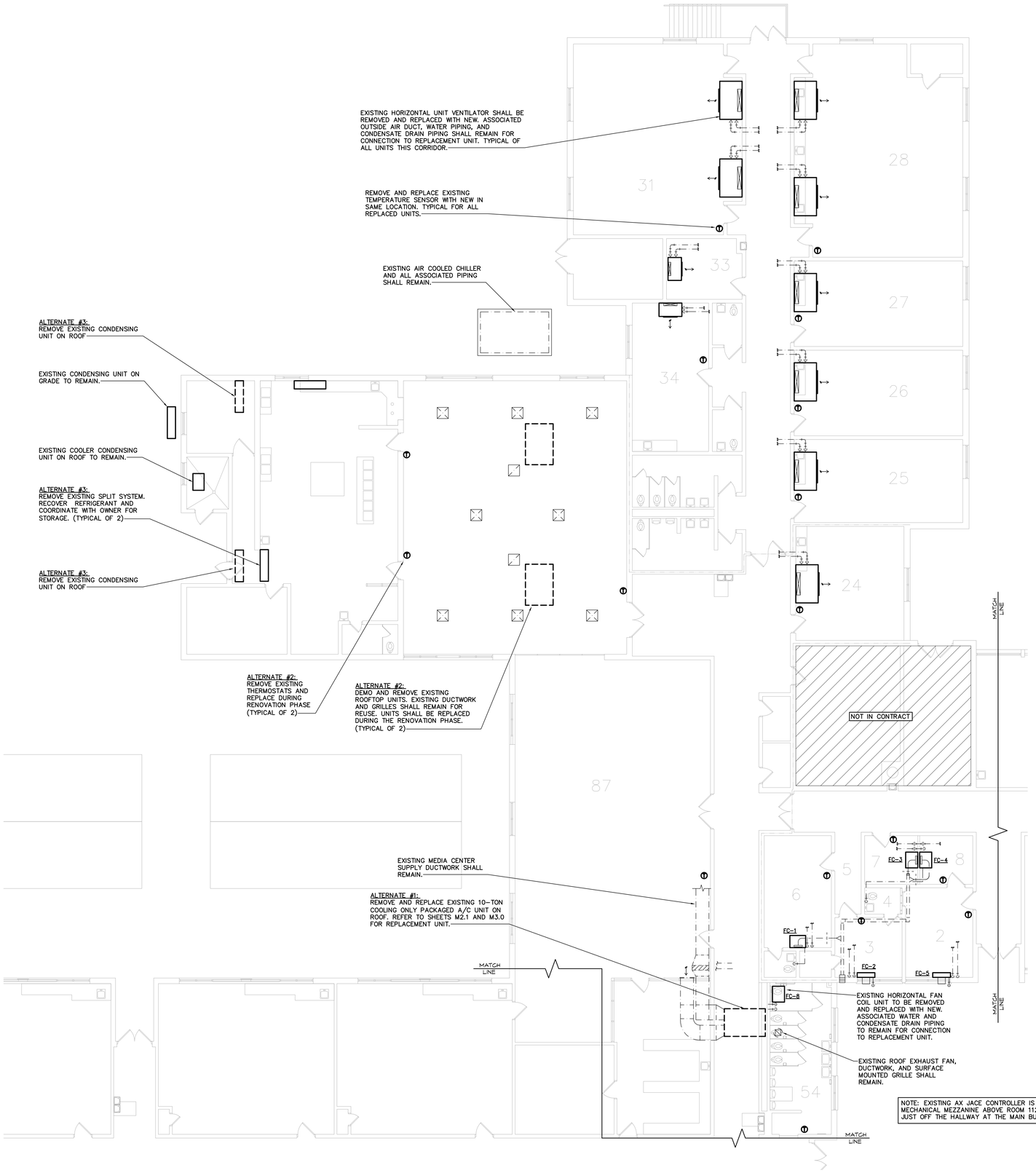
REVISION DESCRIPTION

JOB TITLE: PROSPECT ELEMENTARY HVAC REPLACEMENT

SHEET TITLE: MECHANICAL FLOOR PLANS DEMOLITION – AREA A & B

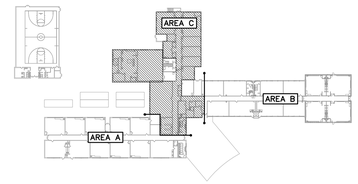
SHEET M1.0

1 OF 7



NOTE: EXISTING AX JACE CONTROLLER IS LOCATED IN THE MECHANICAL MEZZANINE ABOVE ROOM 112 WHICH IS LOCATED JUST OFF THE HALLWAY AT THE MAIN BUILDING ENTRANCE.

1 FLOOR PLAN AREA "C" – DEMOLITION
SCALE: 1/8" = 1'-0"



KEY PLAN

DEMOLITION NOTES

A. THIS CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING NECESSARY TO INSTALL HIS EQUIPMENT. THIS CONTRACTOR SHALL RESTORE AREAS UNCOVERED BY REMOVAL OF EXISTING EQUIPMENT WHICH WILL REMAIN EXPOSED. PATCHING SHALL MATCH ADJACENT SURFACES. FINAL PAINTING SHALL BE PROVIDED IN THIS CONTRACT AND COORDINATED WITH OWNER.

B. NO STRUCTURAL MEMBERS SHALL BE CUT WITHOUT THE APPROVAL OF THE OWNER AND LICENSED DESIGN PROFESSIONAL.

C. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER OPENINGS INTO BUILDING TO ADMIT EQUIPMENT. IF IT BECOMES NECESSARY TO CUT ANY PORTION OF THE BUILDING TO ADMIT EQUIPMENT, PORTIONS CUT MUST BE RESTORED TO THEIR FORMER CONDITION BY THIS CONTRACTOR.

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E. EQUIPMENT REMOVED CONTAINING REFRIGERANTS (COILS, REFRIGERANT LINES, CONDENSING UNITS, CHILLERS, ETC.): EVACUATE AND DISPOSE OF REFRIGERANT PER ALL APPLICABLE CODES. RETURN REFRIGERANT TO OWNER.

F. EQUIPMENT REMOVED WITH PIPING CONNECTIONS: REMOVE EQUIPMENT, EXPOSED PIPING, AND PIPING SPECIALTIES. CAP PIPES BELOW FLOOR, IN WALL, OR ABOVE CEILING AS REQUIRED. REPAIR WALLS, FLOORS, AND CEILINGS TO ORIGINAL CONDITION. FINAL PAINTING BY THIS CONTRACTOR UNLESS NOTED OTHERWISE.

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H. REMOVE PLASTER CEILING AS REQUIRED FOR PIPE, OR UNIT HANGER ATTACHMENT TO JOIST. REINSTALL CEILING WHEN WORK IS COMPLETE. REPLACE DAMAGED PORTIONS OF CEILING. CEILING REMOVAL & REPLACEMENT SHALL BE PERFORMED BY A SUBCONTRACTOR REGULARLY EMPLOYED FOR INSTALLATION OF CEILING SYSTEMS, SUBJECT TO APPROVAL BY OWNER AND LICENSED DESIGN PROFESSIONAL.

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DEMOLITION LEGEND

- – – – – – – EXISTING TO REMAIN
- ——————— EXISTING TO BE REMOVED
- E– – – – – – CAP DUCT

UNITED COMMITMENT PRODUCES RESULTS
UNION COUNTY SCHOOLS
1998 N+C UCPS

PROSPECT ELEMENTARY

McKNIGHT·SMITH
WARD · GRIFFIN
ENGINEERS, INCORPORATED
4223 South Boulevard
Charlotte, NC 28209
704/527-2112
F-0595
21-185

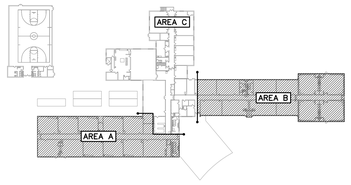
08-31-2023

	REVISION DATES	REVISION DESCRIPTION
JOB NUMBER	21-185	
DRAWN BY	JMP	
CHECKED BY	BSC	
DATE	08/31/2023	

JOB TITLE
PROSPECT ELEMENTARY
HVAC REPLACEMENT

SHEET TITLE
MECHANICAL FLOOR PLANS
DEMOLITION – AREA C

SHEET
M1.1
2 OF 7



KEY PLAN

UNION COUNTY SCHOOLS

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4223 South Boulevard
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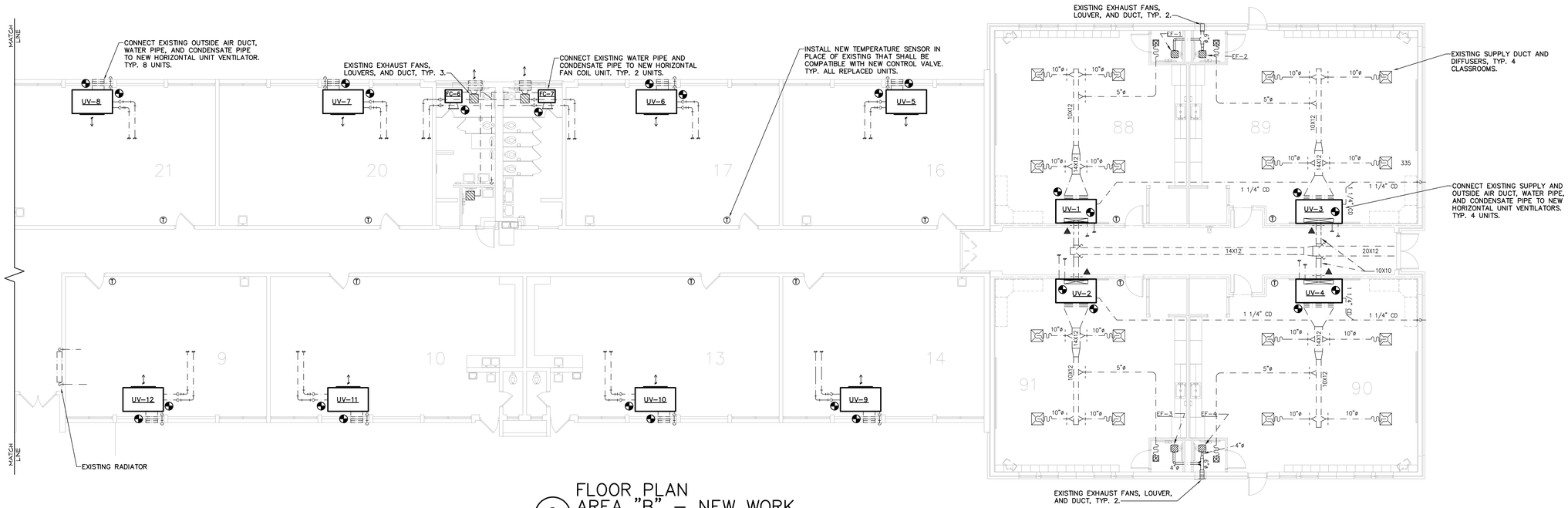
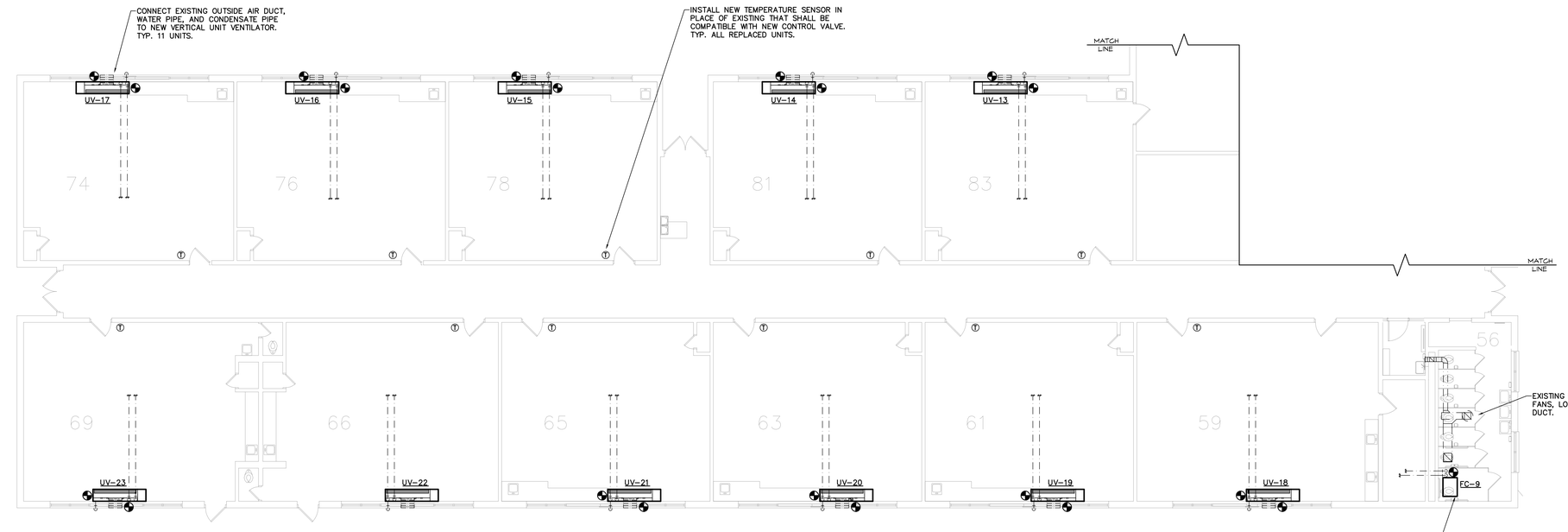


2 FLOOR PLAN AREA "B" – NEW WORK

SCALE: 1/8" = 1'-0"



1 FLOOR PLAN AREA "A" – NEW WORK

SCALE: 1/8" = 1'-0"

RENOVATION LEGEND

- NEW EQUIPMENT
- EXISTING
- CONNECT TO EXISTING

MECHANICAL GENERAL NOTES

01) INSTALL ANY EXISTING CONDENSATE PUMPS ON RESPECTIVE REPLACEMENT UNITS.

02) CONNECT REPLACEMENT FAN COIL UNITS TO EXISTING HYDRONICS AND DRAIN PIPING.

03) PIPING SHOWN TO DEMONSTRATE UNIT HANDING. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING UNIT HANDING TO ENSURE NEW UNITS ARE COMPATIBLE WITH EXISTING HYDRONICS PIPING.

04) DURING DEMOLITION, MECHANICAL CONTRACTOR IS RESPONSIBLE FOR TAKING NOTE OF EACH UNIT'S CONTROL VALVE CONFIGURATION. WHEN INSTALLING NEW UNITS, PROVIDE MATCHING CONTROL VALVE SCHEME.

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REVISION DESCRIPTION	REVISION DATES

JOB NUMBER	21-185
DRAWN BY	JMP
CHECKED BY	BSC
DATE	08/31/2023

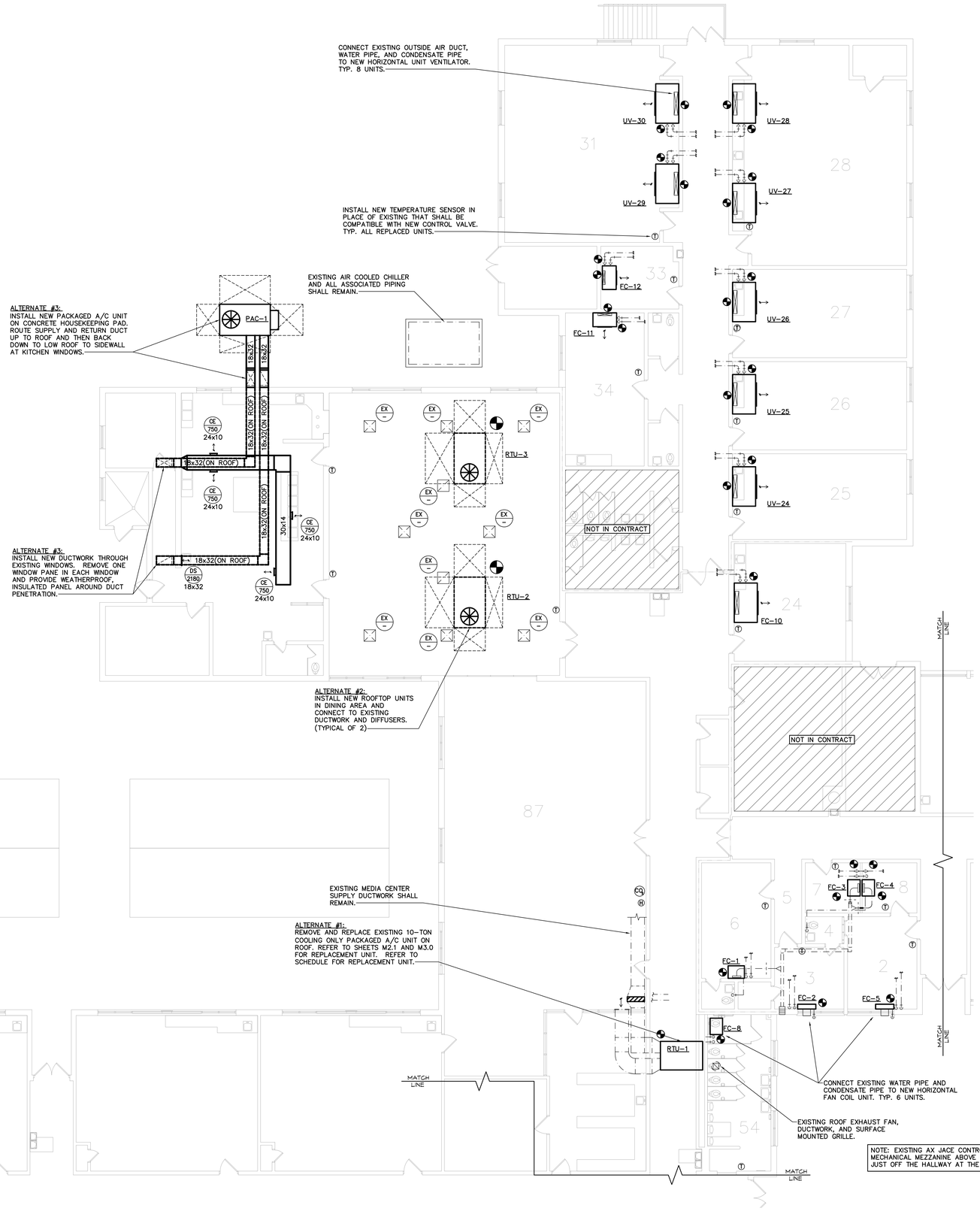
JOB TITLE

PROSPECT ELEMENTARY
HVAC REPLACEMENT

SHEET TITLE

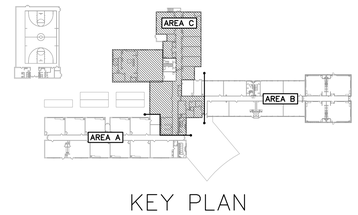
MECHANICAL FLOOR PLANS
NEW WORK – AREA A & B

SHEET
M2.0
3 OF 7



1 BLDS C & D – RENOVATION MECHANICAL FLOOR PLAN

SCALE: 1/8" = 1'-0"



KEY PLAN

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ENGINEERS, INCORPORATED
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704/527-2112
F-0595
21-185

08-31-2023

JOB NUMBER	21-185
DRAWN BY	JMP
CHECKED BY	BSC
DATE	08/31/2023

REVISION DATES | REVISION DESCRIPTION

JOB TITLE: PROSPECT ELEMENTARY HVAC REPLACEMENT

SHEET TITLE: MECHANICAL FLOOR PLANS NEW WORK – AREA C

RENOVATION LEGEND

- NEW EQUIPMENT
- EXISTING
- CONNECT TO EXISTING

MECHANICAL GENERAL NOTES

01) INSTALL ANY EXISTING CONDENSATE PUMPS ON RESPECTIVE REPLACEMENT UNITS.

02) CONNECT REPLACEMENT FAN COIL UNITS TO EXISTING HYDRONICS AND DRAIN PIPING.

03) PIPING SHOWN TO DEMONSTRATE UNIT HANDING. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING UNIT HANDING TO ENSURE NEW UNITS ARE COMPATIBLE WITH EXISTING HYDRONICS PIPING.

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SHEET M2.1
4 OF 7

UNION COUNTY SCHOOLS

PROSPECT ELEMENTARY

OUTSIDE AIR CALCULATION AREA A

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 59, 66, & 69	CLASSROOMS (AGES 5-8)	1000	0	25	**25**	7.5	**190**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	190
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	190

OUTSIDE AIR CALCULATION AREA A

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 61, 63, 65, 74, 76, 78, 81, & 83	CLASSROOMS (AGES 5-8)	850	0	25	**21**	7.5	**160**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	160
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	160

OUTSIDE AIR CALCULATION AREA B

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 9, 14, 16,17, 20, & 21	CLASSROOMS (AGES 5-8)	850	0	25	**21**	7.5	**160**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	160
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	160

OUTSIDE AIR CALCULATION AREA B

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 10, & 13	CLASSROOMS (AGES 5-8)	960	0	25	**24**	7.5	**180**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	180
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	180

OUTSIDE AIR CALCULATION AREA B

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 88, 89, 90, & 91	CLASSROOMS (AGES 9 PLUS)	1160	0	35	**41**	7.5	**310**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	310
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	310

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOM 24	CLASSROOMS (AGES 5-8)	396	0	25	**10**	7.5	**80**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	80
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	80

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 25, 26, & 27	CLASSROOMS (AGES 5-8)	463	0	25	**12**	7.5	**90**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	90
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	90

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOMS 28, & 31	CLASSROOMS (AGES 5-8)	1050	0	25	**26**	7.5	**200**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	200
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	200

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOM 33	OFFICE SPACES	145	0.06	10	**1**	5	**10**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	10
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	10

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOM 34	OFFICE SPACES	363	0.06	10	**4**	5	**40**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	40
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	40

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ.FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ.FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
ROOM 87	MEDIA CENTER	2200	0.12	25	**55**	10	**810**

TOTAL OUTSIDE AIR CALCULATON (V_{ou}) =	810
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	810

UNIT VENTILATOR SCHEDULE (2-PIPE SYSTEM)

Unit Tag	Area Served	CFM Unit	CFM Min. OA	ESP	Motor HP	Motor Watts	Motor Volts	Motor Phs	Cooling Performance EAT DB/WB	LAT DB/WB	MBH Total	MBH Sens.	GPM	EWT (F)	Fluid Δ (F)	Max. Water PD (ft.)	Heating Performance EAT (F)	LAT (F)	MBH	GPM	EWT (F)	Fluid Δ (F)	Max. Water PD (ft.)	Pipe Sizes (in) DTS/R	Pipe Sizes (in) CD	Trane Model	Remarks
UV-1	SEE PLANS	1250	250	.2"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-2	SEE PLANS	1250	250	.2"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-3	SEE PLANS	1250	250	.2"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-4	SEE PLANS	1250	250	.2"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-5	SEE PLANS	1000	250	0.05"	1.0	180	115	1	80/67	54.36/53.31	35.8	23.69	8.2	45	8.7	10.0	60	148.99	94.29	6.0	180	31.41	10.0	1-1/4"	3/4"	HUVC100	1-11
UV-6	SEE PLANS	1250	250	0.05"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-7	SEE PLANS	1250	250	0.05"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-8	SEE PLANS	1250	250	0.05"	1.0	191	115	1	80/67	58.35/57.09	36.72	27.64	6.0	45	12.2	10.0	60	145.13	113.56	6.0	180	37.84	10.0	1.0"	3/4"	HUVC125	1-11
UV-9	SEE PLANS	1000	250	0.05"	1.0	180	115	1	80/67	54.36/53.31	35.8	23.69	8.2	45	8.7	10.0	60	148.99	94.29	6.0	180	31.41	10.0	1-1/4"	3/4"	HUVC100	1-11
UV-10	SEE PLANS	1000	250	0.05"	1.0	180	115	1	80/67	54.36/53.31	35.8	23.69	8.2	45	8.7	10.0	60	148.99	94.29	6.0	180	31.41	10.0	1-1/4"	3/4"	HUVC100	1-11
UV-11	SEE PLANS	1000	250	0.05"	1.0	180	115	1	80/67	54.36/53.31	35.8	23.69	8.2	45	8.7	10.0	60	148.99	94.29	6.0	180	31.41	10.0	1-1/4"	3/4"	HUVC100	1-11
UV-12	SEE PLANS	1000	250	0.05"	1.0	180	115	1	80/67	54.36/53.31	35.8	23.69	8.2	45	8.7	10.0	60	148.99	94.29	6.0	180	31.41	10.0	1-1/4"	3/4"	HUVC100	1-11
UV-13	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-14	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-15	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-16	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-17	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-18	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-19	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-20	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-21	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-22	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-23	SEE PLANS	1000	250	0.05"	1/4	235	115	1	80/67	58.64/55.14	34.15	21.84	8.2	45	8.52	10.0	60	141.34	82.43	5.5	180	30.0	10.0	1-1/4"	3/4"	VUVE100	1-11
UV-24	SEE PLANS	815	200	0.05"	1.0	135	115	1	80/67	57.66/56.51	24.96	18.22	4.29	45	11.60	10.0	60	139.98	67.40	4.49	180	30.0	10.0	1.0"	3/4"	HUVC075	1-11
UV-25	SEE PLANS	815	200	0.05"	1.0	135	115	1	80/67	57.66/56.51	24.96	18.22	4.29	45	11.60	10.0	60	139.98	67.40	4.49	180	30.0	10.0	1.0"	3/4"	HUVC075	1-11
UV-26	SEE PLANS	815	200	0.05"	1.0	135	115	1	80/67	57.66/56.51	24.96	18.22	4.29	45	11.60	10.0	60	139.98	67.40	4.49	180	30.0	10.0	1.0"	3/4"	HUVC075	1-11
UV-27	SEE PLANS	815	200	0.05"	1.0	135	115	1	80/67	57.66/56.51	24.96	18.22	4.29	45	11.60	10.0	60	139.98	67.40	4.49	180	30.0	10.0	1.0"	3/4"	HUVC075	1-11
UV-28	SEE PLANS	1000	125	0.05"	1.0	180	115	1	80/67	56.35/55.24	31.3	21.84	5.38	45	11.6	10.0	60	141.14	85.97	5.73	180	30.0	10.0	1.0"	3/4"	HUVC100	1-11
UV-29	SEE PLANS	1000	125	0.05"	1.0	180	115	1	80/67	56.35/55.24	31.3	21.84	5.38	45	11.6	10.0	60	141.14	85.97	5.73	180	30.0	10.0	1.0"	3/4"	HUVC100	1-11
UV-30	SEE PLANS	1000	125	0.05"	1.0	180	115	1	80/67	56.35/55.24	31.3	21.84	5.38	45	11.6	10.0	60	141.14	85.97	5.73	180	30.0	10.0	1.0"	3/4"	HUVC100	1-11
UV-31	SEE PLANS	1000	125	0.05"	1.0	180	115	1	80/67	56.35/55.24	31.3	21.84	5.38	45	11.6	10.0	60	141.14	85.97	5.73	180	30.0	10.0	1.0"	3/4"	HUVC100	1-11

1. REFER TO APPROVED MFR'S. LIST FOR EQUALS.
2. CONTROL VALVE MAX. PD = 10'. CONTROL VALVE TO SEAT AGAINST THE MAXIMUM SYSTEM PRESSURE.
3. ENSURE NEW THERMOSTAT IS COMPATIBLE WITH NEW CONTROL VALVE.
4. MFGR'S FAN DATA INCLUDES UNIT CASING, WET COIL & CLEAN FILTER. ESP IN SCHEDULE INCLUDES ALL OTHER PRESSURE DROPS.
5. FIBROUS MEDIA FILTERS (TA) MOUNTED INSIDE UNIT.
6. PROVIDE CONTROL VALVE SETUP (2- OR 3-WAY) THAT MATCHES EXISTING FOR EACH UNIT.
7. PROVIDE WITH ECM MOTOR.
8. PROVIDE 3-SPEED CONTROL SWITCH. COORDINATE FAN SPEED CONTROL SWITCH STYLE WITH OWNER PRIOR TO ORDERING. INSTALL NEW SWITCH IN EXISTING LOCATION. REMOVE OLD SWITCH.
9. SURFACE MOUNTED CABINETS SHALL BE PROVIDED WITH ENAMEL FINISH. COLOR TO BE SELECTED BY OWNER.
10. PROVIDE WITH SIDE CONVERTIBLE DRAIN PAN CONNECTIONS.
11. PROVIDE WITH CUSTOMER SUPPLIED TERMINAL INTERFACE (CSTI) PRE-WIRED CONTROL.

DUAL TEMP FAN COIL UNIT SCHEDULE

Unit Tag	Supply Air CFM	ESP (in.)	Motor Qty	Motor MCA	Motor HP	Motor Watts	Motor Volts	Motor Phs	Cooling Performance EAT DB/WB	LAT DB/WB	MBH Total	MBH Sens.	GPM	EWT (F)	Fluid Δ T (F)	Max. Water PD (ft.)	Construction Arr.	Inlet	Outlet	Pipe Sizes (in) DTS/R	CD w/ Trap	Trane Model No.	Remarks
FC-1	210	0.02	1	2.75	.13	40	115	1	80/67	59.14/57.39	6.34	4.78	1.3	45	9.72	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-2	270	0.02	1	2.75	.13	58	115	1	80/67	59.46/57.82	7.82	6.05	1.55	45	10.06	10.0	VC	FTS	TBG	5/8"	3/4"	FCBB030	1-9
FC-3	130	0.02	1	2.75	.13	22	115	1	80/67	58.76/57.13	4.02	3.01	0.8	45	10.02	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-4	130	0.02	1	2.75	.13	22	115	1	80/67	58.76/57.13	4.02	3.01	0.8	45	10.02	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-5	330	0.02	1	2.75	.13	88	115	1	80/67	59.56/57.66	9.71	7.35	2.2	45	8.8	10.0	VC	FTS	TBG	3/4"	3/4"	FCBB030	1-9
FC-6	210	0.02	1	2.75	.13	40	115	1	80/67	59.14/57.39	6.34	4.78	1.3	45	9.72	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-7	210	0.02	1	2.75	.13	40	115	1	80/67	59.14/57.39	6.34	4.78	1.3	45	9.72	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-8	210	0.02	1	2.75	.13	40	115	1	80/67	59.14/57.39	6.34	4.78	1.3	45	9.72	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-9	210	0.02	1	2.75	.13	40	115	1	80/67	59.14/57.39	6.34	4.78	1.3	45	9.72	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB020	1-9
FC-10	600	0.02	1	3.88	.22	145	115	1	80/67	56.88/56.14	20.23	15.12	3.48	45	11.6	10.0	HC	BSL	FBG	1.0"	3/4	FCDB060	1-9
FC-11	800	0.02	1	3.88	.22	219	115	1	80/67	57.59/56.36	26.50	19.54	4.55	45	11.6	10.0	HC	BSL	FBG	1.0"	3/4"	FCDB080	1-9
FC-12	300	0.02	1	2.75	.13	79	115	1	80/67	57.17/56.28	10.0	7.46	1.72	45	11.6	10.0	HC	BSL	FBG	5/8"	3/4"	FCDB030	1-9

1. REFER TO APPROVED MANUFACTURER LIST FOR ACCEPTABLE EQUAL MANUFACTURERS. COORDINATE POWER REQUIREMENTS FOR ALL SUBSTITUTIONS.
ARR. ABRV.: VFC = VERTICAL FAN COIL, VC = VERTICAL CABINET
LVC = LOW VERTICAL CABINET, HC = HORIZONTAL CABINET
OUTLET ABRV.: FBG = FRONT BAR GRILLE. FQG = FRONT QUAD GRILLE
TBG = TOP BAR GRILLE
INLET ABRV.: BSL = BOTTOM STAMPED LOUVER
FTS = FRONT TOE SPACE
2. CONTROL VALVE MAX. PD = 10'. CONTROL VALVE TO SEAT AGAINST THE MAXIMUM SYSTEM PRESSURE.
3. ENSURE NEW THERMOSTAT IS COMPATIBLE WITH NEW CONTROL VALVE.
4. MFGR'S FAN DATA INCLUDES UNIT CASING, WET COIL & NO FILTER. ESP IN SCHEDULE INCLUDES ALL OTHER PRESSURE DROPS.
5. PROVIDE CONTROL VALVE SETUP (2- OR 3-WAY) THAT MATCHES EXISTING FOR EACH UNIT.
6. PROVIDE WITH ECM MOTOR.
7. PROVIDE 3-SPEED CONTROL SWITCH. COORDINATE FAN SPEED CONTROL SWITCH STYLE WITH OWNER PRIOR TO ORDERING. INSTALL NEW SWITCH IN EXISTING LOCATION. REMOVE OLD SWITCH.
8. SURFACE MOUNTED CABINETS SHALL BE PROVIDED WITH ENAMEL FINISH. COLOR TO BE SELECTED BY OWNER.
9. PROVIDE WITH SIDE CONVERTIBLE DRAIN PAN CONNECTIONS.

APPROVED MANUFACTURER LISTING

THE FOLLOWING MANUFACTURER'S LISTING (ALPHABETICALLY ORDERED) IS PROVIDED FOR BIDDING PURPOSES AND DOES NOT IMPLY OR PROVIDE A GUARANTEE OF SUBMITTAL APPROVAL. ALL ITEMS SUBMITTED SHALL MEET OR EXCEED THE MINIMUM SPECIFIED DESIGN AND QUALITY CRITERIA IN THIS SET OF CONSTRUCTION DOCUMENTS. ANY BIDDER THAT INTENDS TO SUBMIT USING A MANUFACTURER NOT LISTED BELOW MAY REQUEST A PRIOR APPROVAL IN ACCORDANCE WITH THE ENTIRETY OF THE PROJECT BID DOCUMENTS, REFER TO THE ARCHITECT'S GENERAL CONDITIONS AND BIDDING REQUIREMENTS.

THE BIDDER IS RESPONSIBLE FOR INCLUDING ALL COSTS ASSOCIATED WITH SUBSTITUTED EQUIPMENT, INCLUDING BUT NOT LIMITED TO, CODE AND MANUFACTURER'S REQUIRED MAINTENANCE AND ACCESS CLEARANCE, COORDINATION WITH ALL OTHER BUILDING TRADES, AND INSTALLATION OF DUCTWORK, PIPING, ETC. BIDDER SHALL BEAR RESPONSIBILITY FOR ALL ASSOCIATED COSTS AND ADDITIONAL COSTS RESULTING FROM SUBSTITUTED ITEMS SHALL NOT BE CONSIDERED FOR APPROVAL AFTER BIDS ARE AWARDED.

ITEM	MANUFACTURER'S
AIR DISTRIBUTION	CARNES, METAL*AIRE, NAILOR, PRICE, TITUS, TUTTLE & BAILEY
FAN COIL UNITS	CARRIER, DAIKIN-MCQUAY, TRANE
UNIT VENTILATORS	CARRIER, DAIKIN-MCQUAY, TRANE
PACKAGED ROOFTOP UNITS	CARRIER, DAIKIN-MCQUAY, TRANE

McKNIGHT·SMITH
WARD · GRIFFIN
ENGINEERS, INCORPORATED
4223 South Boulevard
Charlotte, NC 28209
704/527-2112
F-0595
21-185

REVISION DESCRIPTION

REVISION DATES

JOB NUMBER 21-185
DRAWN BY JMP
CHECKED BY BSC
DATE 08/31/2023

JOB TITLE
PROSPECT ELEMENTARY
HVAC REPLACEMENT

SHEET TITLE
MECHANICAL SCHEDULES

SHEET
M3.0
5 OF 7

UNION COUNTY SCHOOLS

PROSPECT ELEMENTARY

ALTERNATE #1 - PACKAGED A/C UNIT (COOLING ONLY)

Unit Tag	EER	CFM	O.A. Min.	ESP	Fan Motor HP	Fan Motor Volts	Cooling Performance EAT DB/WB	Cooling Performance MBH Net Total	Cooling Performance MBH Net Sens.	Hot Gas Reheat MBH	Electrical Data Fan No.	Fan FLA	Compressor No.	Compressor LRA	Compressor RLA	MCA	MOCP	Volts	Phase	Model	Approx. Weight (lbs.)	Remarks
RTU-1	11.2	3000	1,010	0.7	3.1	208	80/67	89.20	63.58	54.99	1	8.8	2	-	16.4/9.2	42	50	208	3	TSJ090A3S00	975	1-13

1. REFER TO APPROVED MANUFACTURERS LIST FOR EQUALS. PRIOR TO ORDERING EQUIPMENT, THE MECHANICAL CONTRACTOR SHALL VERIFY SERVICE CLEARANCES FOR SUBSTITUTIONS.
2. MANUFACTURER FAN DATA BASED ON WET COIL & CLEAN FILTERS.
3. 2" THICK MERV 8 FILTERS
4. R-410A REFRIGERANT. TWO CIRCUITS AND TWO COMPRESSORS.
5. SINGLE POINT ELECTRICAL CONNECTION, DISCONNECT BY ELECTRICAL CONTRACTOR.
6. PROVIDE UNIT WITH WATER LEVEL MONITORING DEVICE IN CONDENSATE DRAIN PAN TO SHUT UNIT DOWN IN ACCORDANCE WITH NC MECHANICAL CODE SECTION
7. PROVIDE A DUCT MOUNTED IONIZATION TYPE SMOKE DETECTOR IN RETURN DUCT FOR UNITS WITH GREATER THAN 2,000 CFM SUPPLY AIR. UPON DETECTION OF SMOKE, THERE SHALL BE FIRE ALARM NOTIFICATION AND THE UNIT SHALL SHUT DOWN. ELECTRICAL CONTRACTOR SHALL FURNISH DUCT MOUNTED SMOKE DETECTOR AND ANY OTHER APPURTENANCES NECESSARY FOR A COMPLETE INSTALLATION. MECHANICAL CONTRACTOR SHALL INSTALL THE DUCT DETECTOR IN THE
8. UNIT SHALL BE TRUE HORIZONTAL DISCHARGE (3-10 TONS AND 27.5-50 TONS). HORIZONTAL DISCHARGE CURB IS NOT ALLOWED.
9. PROVIDE WITH MANUFACTURER'S (HOT GAS REHEAT) DEHUMIDIFICATION OPTION WITH DUCT HUMIDITY SENSOR.
10. PROVIDE C02 BASED DEMAND CONTROLLED VENTILATION.
11. ENTHALPY BASED OUTSIDE AIR ECONOMIZER WITH BAROMETRIC RELIEF.
12. PROVIDE COMBINATION TEMPERATURE AND HUMIDITY SENSOR AND UNIT CONTROLLER AS MANUFACTURED BY VANGUARD OR APPROVED EQUAL. UNIT CONTROLLER SHALL BE CAPABLE OF CONTROLLING HEATING, COOLING, DEHUMIDIFICATION, AND ECONOMIZER. UNIT SHALL BE PROVIDED WITH BACNET OVER IP CONTROL SYSTEM AND NECESSARY DEVICES TO COMMUNICATE ON
13. INTEGRATE INTO EXISTING BUILDING AUTOMATION SYSTEM INCLUDING MAPPING AND GRAPHICS. PROVIDE BACNET OVER IP AND INTEGRATE INTO EXISTING SCHNEIDER ELECTRIC WORKPLACE TECH SOFTWARE AND LON-BASED AX JACE. EXISTING BAS SHALL INDEX UNIT TO OCCUPIED/UNOCCUPIED AS WELL AS ADJUST SPACE TEMPERATURE SETPOINTS.

OUTSIDE AIR CALCULATION AREA C

ROOM NAME	AREA TYPE	FLOOR AREA (SQ FT)	CFM/SQFT	DEFAULT OCCUPANT DENSITY #/1000 SQ FT	# OF PEOPLE PER SPACE	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON)	OUTSIDE AIR PER SPACE (CFM)
DINING ROOM	DINING ROOMS	1962	0.18	70	**137**	7.5	**1380**

TOTAL OUTSIDE AIR CALCULATON (V_{bz}) =	1380
ZONE DISTRIBUTION EFFECTIVENESS (E_z) =	1
ZONE OUTDOOR AIRFLOW RATE (V_{OZ}) =	1380

ALTERNATE #3 GRILLE & DIFFUSER SCHEDULE

SYM	TYPE	USE	CFM RANGE	NECK SIZE	OVER-ALL SIZE	FINISH	FRAME	PRICE MODEL NO	REMARKS
C-	SIDEWALL	SUPPLY	SEE PLANS	SEE PLANS	RMK 4	RMK 12	SEE PLANS	520D	1-4, 9, 11-13
D-	SIDEWALL	RETURN/ EXHAUST	SEE PLANS	SEE PLANS	RMK 4	RMK 12	SEE PLANS	530	1-4, 9, 12, 13

REMARKS
1. EQUALS: METALAIRE, TITUS, KRUEGER, TUTTLE & BAILEY, NAIL-OR, CARNES. SCHEDULE IS GENERAL, SOME MAY NOT BE USED. PAINT ALL INSIDE VISIBLE SURFACES FLAT BLACK.
2. SYMBOL EXPLANATION:
XXX/CFM = SYMBOL, FRAME (RMK 3), NECK (RMK 5,7)/CFM
3. FRAME TYPES:
S = FLUSH SURF. MTD.. PLASTER FRAME FOR CEILING MOUNTING.
T = T-BAR
E = DUCT MOUNTED: V-BEVELED DROP SURF. (TYPE "A" DIFFUSER)
D = DROPPED FRAME
NOTE: VERIFY FRAME/CEILING COMPATIBILITY.
4. OVERALL SIZE: LAY-IN = 2'x2', OTHER GRILLES = NECK + 2"+/-.
5. LOUVER FACE SUPPLY NECK SIZES

NO.	ROUND NK SIZE	CFM	NO.	SQUARE NK SIZE	CFM
A	6"	100	H	6x6	125
B	8"	175	I	9x9	280
C	10"	275	J	12x12	500
D	12"	400	K	15x15	780
E	14"	535	L	18x18	1125
F	16"	700	M	21x21	1530
G	18"	885	N	24x24	2000

NOTE: VERIFY CFM / NECK SIZE.
6. ADJUSTABLE: HORIZONTAL/VERTICAL - "PIANO HINGE" DEVICE.
7. "B" & "E" EXH/RETURN NECK SIZES ("E" = SQ. NK. ONLY)

NO.	ROUND NK SIZE	CFM	NO.	SQUARE NK SIZE	CFM
A	6"	100	G	8x8	220
B	8"	175	H	10x10	345
C	10"	275	I	12x12	500
D	12"	400	J	14x14	680
E	14"	535	K	16x16	885
F	16"	700	L	18x18	1125
NOTE: VERIFY			M	22x22	1680
CFM / NECK SIZE.			N	22x46	2600

8. NO NECK SIZE INDICATES NON-DUCTED, LAY-IN PANEL.
9. PROVIDE OPPOSED BLADE BALANCING DAMPER.
10. ALL ALUM. CONSTRUCTION (INCLUDING BACKPAN) IF SHOWN ON PLANS.
11. VOLUME EXTRACTOR WHERE SHOWN ON PLANS.
12. PAINT TO MATCH WALL.
13. VERTICAL FRONT BLADES.

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT METHOD OF COMPLIANCE

Prescriptive — Energy Cost Budget

Thermal Zone: Union County (3A)

Exterior Design Conditions

Winter Dry Bulb: 19
Summer Dry Bulb: 97

Interior Design Conditions

Winter Dry Bulb: 70
Summer Dry Bulb: 75
Relative Humidity: 50%

Building Heating Load: Existing
Building Cooling Load: Existing

Mechanical Space Conditioning System

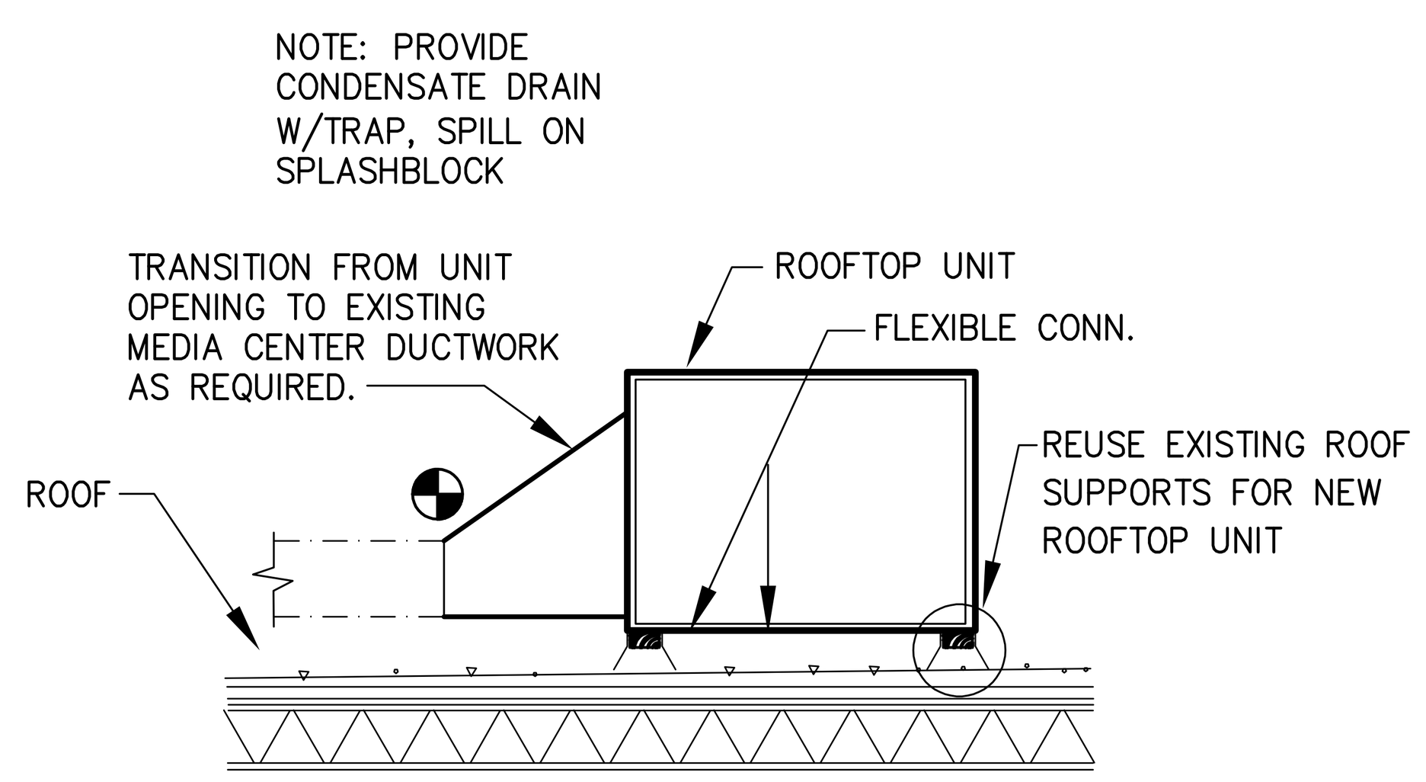
Unitary:
Description of Unit: Existing Boiler/Chiller system with FCU's
New Packged A/C w/Hot gas Reheat

Heating Efficiency: Refer to HVAC Equipment Schedules
Cooling Efficiency: Refer to HVAC Equipment Schedules
Heat Output of Unit: Refer to HVAC Equipment Schedules
Cooling Output of Unit: Refer to HVAC Equipment Schedules

List Equipment Efficiencies:

Equipment Schedules with Motors (Mechanical Systems)
Motor Horsepower: Comply w/ 2018 NC Energy Code
Number of Phases: Comply w/ 2018 NC Energy Code
Minimum Efficiency: Comply w/ 2018 NC Energy Code
Motor Type: Comply w/ 2018 NC Energy Code
Number of Poles: Comply w/ 2018 NC Energy Code

Designer Statement:
To the best of my knowledge and belief, the design of this building complies with the 2018 North Carolina Energy Code. The requirements of Section C406 is met through the Subsection C406.3 (Reduced Lighting Power Density).

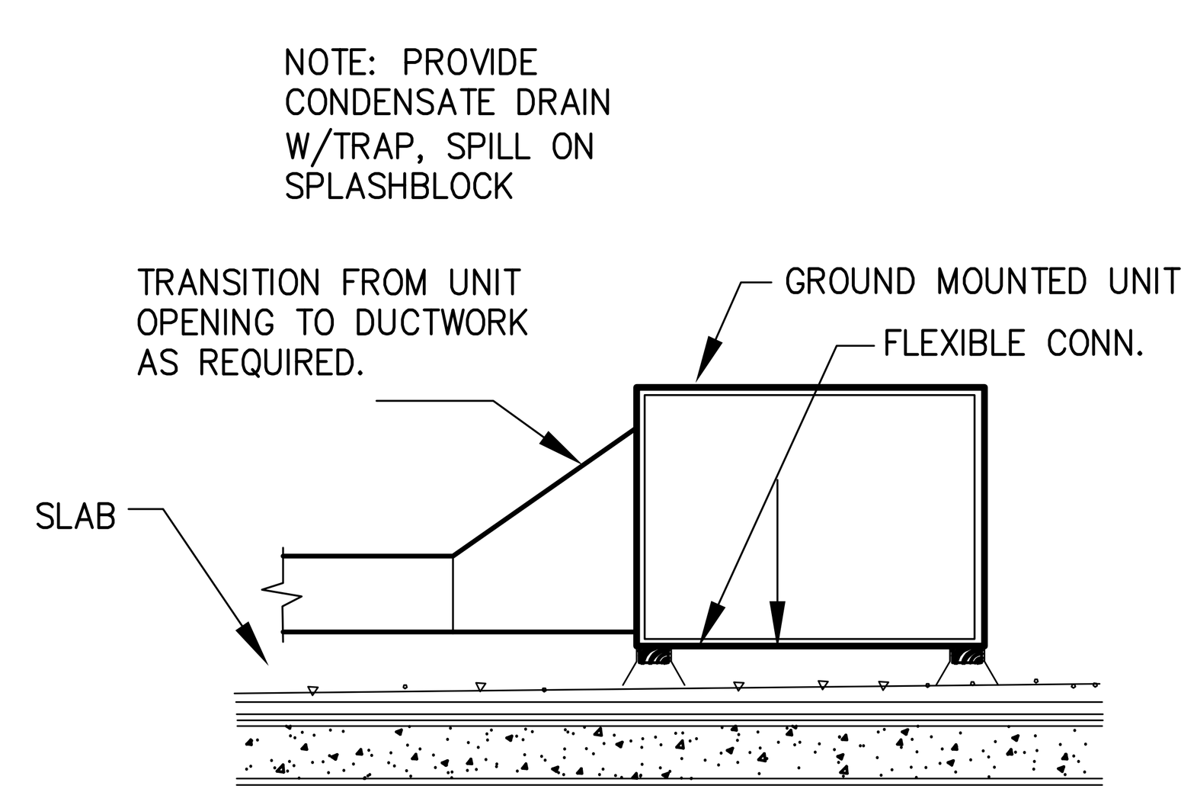


1 SECTION AT ROOFTOP UNIT
NTS — NOTE: SEE PLANS FOR SIZES

ALTERNATE #2 PACKAGED CAV SINGLE ZONE UNIT WITH GAS HEAT SCHEDULE

Unit Tag	Area Served	Nom. Tons	EER	IEER	AFUE %	S.A. Design	O.A. Design	ESP	Indoor Fan Motor HP	Indoor Fan Motor Volts/Ph.	Cooling EAT DB/WB	Cooling MBH Net Total	Cooling MBH Net Sens.	Heating EAT	Heating INPUT MBH	Heating OUTPUT MBH	Cond. Fan No.	Cond. Fan FLA	Exh. Fan No.	Exh. Fan FLA	Compressors No.	LRA	RLA	No.	LRA	RLA	MCA	MOCP	Volts	Phase	Model	Weight (lbs.)	Remarks
RTU-2	KITCHEN	7.5	11	14.6	80	3000	820	1.0	3.1	208/3	80/67	91.6	70.2	70	150	121.5	1	3.3	-	-	1	-	16.4	1	-	9.2	42	50	208	3	TRANE YSJ090A3S0M	1146	1-16
RTU-3	KITCHEN	7.5	11	14.6	80	3000	820	1.0	3.1	208/3	80/67	91.6	70.2	70	150	121.5	1	3.3	-	-	1	-	16.4	1	-	9.2	42	50	208	3	TRANE YSJ090A3S0M	1146	1-16

1. REFER TO APPROVED MANUFACTURER LIST FOR ACCEPTABLE EQUAL MANUFACTURERS. COORDINATE POWER REQUIREMENTS FOR ALL SUBSTITUTIONS.
2. SINGLE POINT ELECTRICAL CONNECTION.
3. MANUFACTURER FAN DATA BASED ON WET COIL AND CLEAN FILTERS. TSP = ESP + ECON HOOD PD.
4. DRY BULB ECONOMIZER WITH DCV.
5. CONSTANT AIR VOLUME.
6. PROVIDE UNIT WITH WATER LEVEL MONITORING DEVICE IN CONDENSATE DRAIN PAN TO SHUT UNIT DOWN IN ACCORDANCE WITH 2018 NCMC SECTION 307.2.3.1 WATER LEVEL MONITORING DEVICE.
7. PROVIDE CARBON MONOXIDE DETECTION FOR EACH GAS-FIRED RTU AS REQUIRED BY NORTH CAROLINA FIRE CODE, WIRED TO FIRE ALARM SYSTEM.
8. INTEGRATE INTO EXISTING BUILDING AUTOMATION SYSTEM INCLUDING MAPPING AND GRAPHICS. PROVIDE BACNET OVER IP AND INTEGRATE INTO EXISTING SCHNEIDER ELECTRIC WORKPLACE TECH SOFTWARE AND LON-BASED AX JACE. EXISTING BAS SHALL INDEX UNIT TO OCCUPIED/UNOCCUPIED AS WELL AS ADJUST SPACE TEMPERATURE SETPOINTS.
9. MANUFACTURER'S KIT AS REQUIRED FOR MOUNTING ON EXISTING FRAMED ROOF SUPPORT.
10. UNIT SHALL BE TRUE HORIZONTAL DISCHARGE (3-10 TONS AND 27.5-50 TONS). HORIZONTAL DISCHARGE CURB IS NOT ALLOWED.
11. R-410A REFRIGERANT
12. PROVIDE A DUCT MOUNTED IONIZATION TYPE SMOKE DETECTOR IN RETURN DUCT FOR UNITS WITH GREATER THAN 2,000 CFM SUPPLY AIR. UPON DETECTION OF SMOKE, THERE SHALL BE FIRE ALARM NOTIFICATION AND THE UNIT SHALL SHUT DOWN.
13. PROVIDE GAS REGULATOR AND KIT FOR LIQUID PROPANE GAS SERVICE AND DISTRIBUTION.
14. DISCONNECT BY ELECTRICAL CONTRACTOR.
15. PROVIDE WITH MANUFACTURER'S DEHUMIDIFICATION (HOT GAS REHEAT) OPTION.
16. PROVIDE DEMAND CONTROLLED VENTILATION, CARBON DIOXIDE BASED.



2 SECTION AT GROUND MOUNTED UNIT
NTS — NOTE: SEE PLANS FOR SIZES

ALTERNATE #3 PACKAGED CAV SINGLE ZONE UNIT WITH GAS HEAT SCHEDULE

Unit Tag	Area Served	Nom. Tons	EER	IEER	AFUE %	S.A. Design	O.A. Design	ESP	Indoor Fan Motor HP	Indoor Fan Motor Volts/Ph.	Cooling EAT DB/WB	Cooling MBH Net Total	Cooling MBH Net Sens.	Heating EAT	Heating INPUT MBH	Heating OUTPUT MBH	Cond. Fan No.	Cond. Fan FLA	Exh. Fan No.	Exh. Fan FLA	Compressors No.	LRA	RLA	No.	LRA	RLA	MCA	MOCP	Volts	Phase	Model	Weight (lbs.)	Remarks
PAC-1	KITCHEN	7.5	11	14.6	80	3000	820	1.0	3.1	208/3	80/67	91.6	70.2	70	150	121.5	1	3.3	-	-	1	-	16.4	1	-	9.2	42	50	208	3	TRANE YSJ090A3S0M	1146	1-16

1. REFER TO APPROVED MANUFACTURER LIST FOR ACCEPTABLE EQUAL MANUFACTURERS. COORDINATE POWER REQUIREMENTS FOR ALL SUBSTITUTIONS.
2. SINGLE POINT ELECTRICAL CONNECTION.
3. MANUFACTURER FAN DATA BASED ON WET COIL AND CLEAN FILTERS. TSP = ESP + ECON HOOD PD.
4. DRY BULB ECONOMIZER WITH DCV.
5. CONSTANT AIR VOLUME.
6. PROVIDE UNIT WITH WATER LEVEL MONITORING DEVICE IN CONDENSATE DRAIN PAN TO SHUT UNIT DOWN IN ACCORDANCE WITH 2018 NCMC SECTION 307.2.3.1 WATER LEVEL MONITORING DEVICE.
7. PROVIDE CARBON MONOXIDE DETECTION FOR EACH GAS-FIRED RTU AS REQUIRED BY NORTH CAROLINA FIRE CODE, WIRED TO FIRE ALARM SYSTEM.
8. INTEGRATE INTO EXISTING BUILDING AUTOMATION SYSTEM INCLUDING MAPPING AND GRAPHICS. PROVIDE BACNET OVER IP AND INTEGRATE INTO EXISTING SCHNEIDER ELECTRIC WORKPLACE TECH SOFTWARE AND LON-BASED AX JACE. EXISTING BAS SHALL INDEX UNIT TO OCCUPIED/UNOCCUPIED AS WELL AS ADJUST SPACE TEMPERATURE SETPOINTS.
9. MANUFACTURER'S KIT AS REQUIRED FOR MOUNTING ON EXISTING FRAMED ROOF SUPPORT.
10. UNIT SHALL BE TRUE HORIZONTAL DISCHARGE (3-10 TONS AND 27.5-50 TONS). HORIZONTAL DISCHARGE CURB IS NOT ALLOWED.
11. R-410A REFRIGERANT
12. PROVIDE A DUCT MOUNTED IONIZATION TYPE SMOKE DETECTOR IN RETURN DUCT FOR UNITS WITH GREATER THAN 2,000 CFM SUPPLY AIR. UPON DETECTION OF SMOKE, THERE SHALL BE FIRE ALARM NOTIFICATION AND THE UNIT SHALL SHUT DOWN.
13. PROVIDE GAS REGULATOR AND KIT FOR LIQUID PROPANE GAS SERVICE AND DISTRIBUTION.
14. DISCONNECT BY ELECTRICAL CONTRACTOR.
15. PROVIDE WITH MANUFACTURER'S DEHUMIDIFICATION (HOT GAS REHEAT) OPTION.
16. PROVIDE DEMAND CONTROLLED VENTILATION, CARBON DIOXIDE BASED.

McKNIGHT · SMITH WARD · GRIFFIN
ENGINEERS, INCORPORATED
4223 South Boulevard
Charlotte, NC 28209
704/527-2112
F-0595
21-185

NORTH CAROLINA PROFESSIONAL ENGINEER 17250 J. CRAIG CHAPIN 08-31-2023

JOB NUMBER	21-185
DRAWN BY	JMP
CHECKED BY	BSC
DATE	08/31/2023

REVISION DATES | REVISION DESCRIPTION

JOB TITLE: PROSPECT ELEMENTARY HVAC REPLACEMENT

SHEET TITLE: MECHANICAL SCHEDULES

UNION COUNTY SCHOOLS

PROSPECT ELEMENTARY

McKNIGHT·SMITH WARD · GRIFFIN
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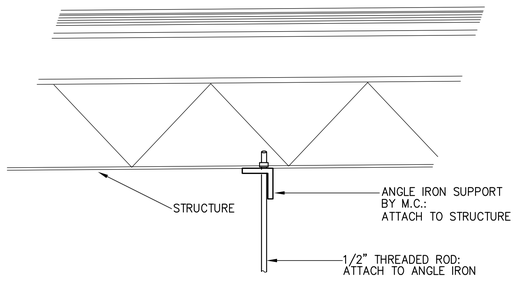
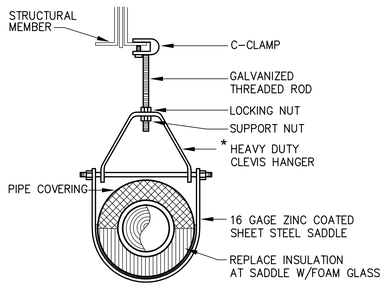
08-31-2023

MISCELLANEOUS		
SYMBOL		DESCRIPTION
SINGLE LINE	DOUBLE LINE	
(T)	(T)	THERMOSTAT
(H)	(H)	HUMIDISTAT
(CO2)	(CO2)	CARBON DIOXIDE SENSOR
		SMOKE DAMPER
		MOTOR OPERATED DAMPER
		DAMPER
		TIE INTO EXISTING AT THIS POINT

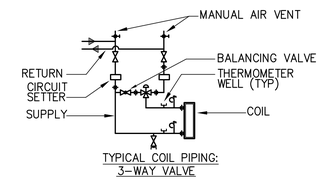
PIPING & VALVE LEGEND	
SYMBOL	DESCRIPTION
	GATE VALVE
	GLOBE VALVE
	BALL VALVE
TD	TRIPLE DUTY VALVE
MPV	MULTIPURPOSE VALVE
	PRESSURE REDUCING VALVE
	CHECK VALVE
	BUTTERFLY VALVE
	BALANCING BUTTERFLY VALVE W/100% SHUTOFF & MEMORY STOP
	HOSE END DRAIN VALVE
	REDUCED PRESSURE BACKFLOW PREVENTER
	TEMPERATURE & PRESSURE RELIEF VALVE
	THERMOMETER
	WATER FLOW INDICATOR
	GAUGE COCK AND SNUBBER
	PRESSURE GAUGE
	PIPE UNION
	STRAINER
-CHWS-	CHILLED WATER SUPPLY
-CHWR-	CHILLED WATER RETURN
A.F.F.	ABOVE FINISHED FLOOR
	TIE INTO EXISTING AT THIS POINT
C.I.	CAST IRON
U.N.O.	UNLESS NOTED OTHERWISE



6 SUPPORT DETAIL
NTS



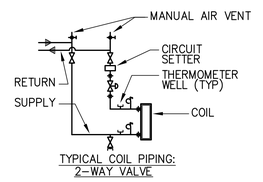
5 PIPE HANGER DETAIL
NTS
* CONTRACTOR OPTION: MICHIGAN HANGER #403



TYPICAL COIL PIPING: 3-WAY VALVE

NOTE: FOR UNITS WITH PIPING LESS THAN ONE INCH DIAMETER: IN LIEU OF GAUGE COCK AND SNUBBER THERMOMETER WELL, PROVIDE SISCO PLUG AND ONE SET OF GAUGES.

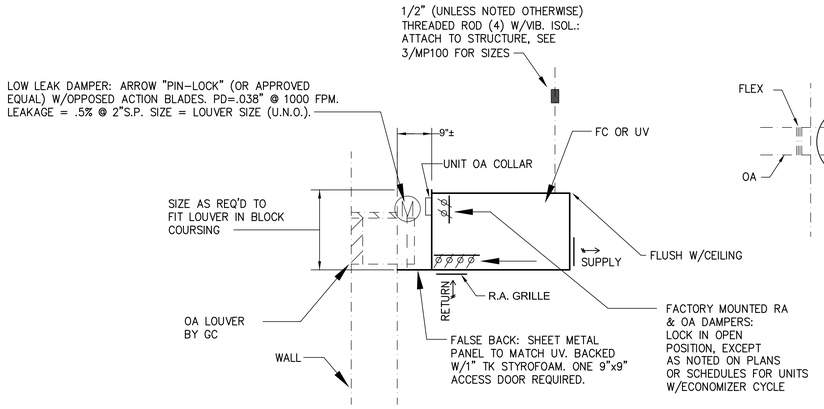
4 COIL PIPING DETAIL
NTS



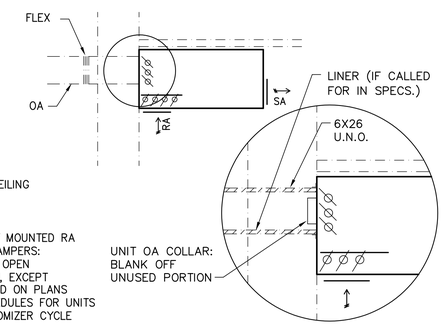
TYPICAL COIL PIPING: 2-WAY VALVE

NOTE: FOR UNITS WITH PIPING LESS THAN ONE INCH DIAMETER: IN LIEU OF GAUGE COCK AND SNUBBER THERMOMETER WELL, PROVIDE SISCO PLUG AND ONE SET OF GAUGES.

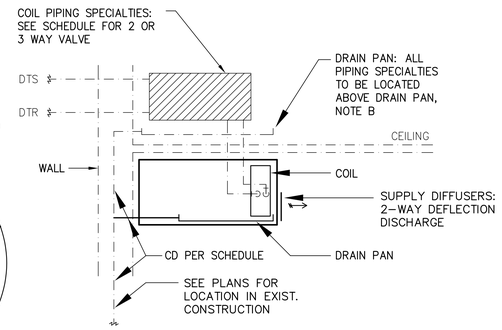
3 COIL PIPING DETAIL
NTS



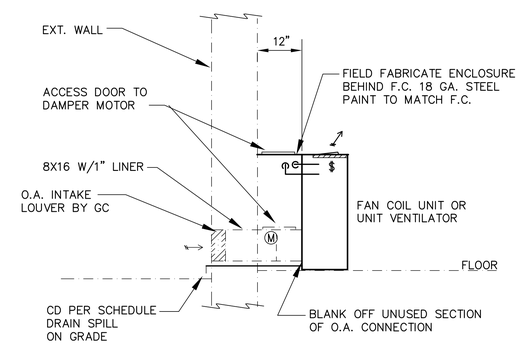
SECTION: OA LOUVER



SECTION: OA DUCT



SECTION: PIPING (SEE LEGEND)



2 SECTION AT VERTICAL CABINET TYPE UNIT VENTILATOR
NTS

LEGEND
EXISTING TO REMAIN IN USE OR BE ABANDONED
NEW EQUIPMENT

1 HORIZONTAL CABINET TYPE UNIT VENTILATOR & FAN COIL UNIT DETAIL: BACK INLET OA
NTS

NOTES:
A) THIS DETAIL APPLIES TO ALL CABINET TYPE HORIZONTAL BACK INLET OA UNITS UNLESS NOTED OTHERWISE.
B) PIPING SPECIALTIES MAY BE LOCATED EXTERNAL TO UNIT AS SHOWN, OR INSIDE UNIT USING FACTORY PIPING PACKAGE. EXTENDED DRAIN PAN FOR INTERNAL MOUNTING.
C) UNITS W/NO OA: RA INLET ONLY.

LEGEND
EXISTING TO REMAIN IN USE OR BE ABANDONED
NEW EQUIPMENT

REVISION DATES	REVISION DESCRIPTION

JOB NUMBER 21-185
DRAWN BY JMP
CHECKED BY BSC
DATE 08/31/2023

JOB TITLE
PROSPECT ELEMENTARY HVAC REPLACEMENT

SHEET TITLE
MECHANICAL DETAILS AND LEGENDS

SHEET
M4.0
7 OF 7