



Union County Public Schools

Request For Proposal #5-97648033

Date Issued: Marc 5, 2025

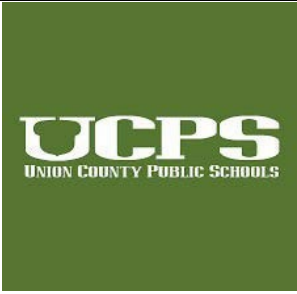
Sun Valley Middle School and High School HVAC Renovations

Direct all inquiries concerning RFP # to:

Jennifer West

Purchasing/Construction Contracts Specialist

Email: facilitiesbids@ucps.k12.nc.us

	Union County Public Schools (UCPS) Facilities Department 201 Venus Street Monroe NC, 28112 Request for Proposal #: 5-97648033
Request for Proposal Description: Sun Valley Middle School High School HVAC Renovations	Date of Issue: March 5, 2025
Bid Opening Date: April 3, 2025	BID Opening Time: 1:00 PM
Refer ALL Inquiries regarding this RFP to: Jennifer West (Construction Contracts Spec) Email to: facilitiesbids@ucps.k12.nc.us	

EXECUTION

In compliance with this Request for Proposal (RFP), and subject to all the conditions herein, the undersigned Vendor offers and agrees to furnish and deliver any or all items upon which prices are bid, at the prices set opposite each item within the time specified herein.

By executing this bid, the undersigned Vendor understands that false certification is a Class I felony and certifies that:

- this bid is submitted competitively and without collusion (G.S. 143-54),
- none of its officers, directors, or owners of an unincorporated business entity has been convicted of any violations of Chapter 78A of the General Statutes, the Securities Act of 1933, or the Securities Exchange Act of 1934 (G.S. 143-59.2), and
- it is not an ineligible Vendor as set forth in G.S. 143-59.1.

Furthermore, by executing this bid, the undersigned certifies to the best of Vendor's knowledge and belief, that:

- it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal or State department or agency.

As required by G.S. 143-48.5, the undersigned Vendor certifies that it, and each of its sub-Contractors for any Contract awarded as a result of this RFP, complies with the requirements of Article 2 of Chapter 64 of the NC General Statutes, including the requirement for each employer with more than 25 employees in North Carolina to verify the work authorization of its employees through the federal E-Verify system.

As required by Executive Order 24 (2017), the undersigned vendor certifies they will comply with all Federal and State requirements concerning fair employment and that it does not and will not discriminate, harass, or retaliate against any employee in connection with performance of any Contract arising from this solicitation. G.S. 133-32 and Executive Order 24 (2009) prohibit the offer to, or acceptance

by, any State Employee associated with the preparing plans, specifications, estimates for public contracts; or awarding or administering public contracts; or inspecting or supervising delivery of the public contract of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of this response to the RFP, the undersigned certifies, for Vendor's entire organization and its employees or agents, that Vendor is not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

By executing this bid, Vendor certifies that it has read and agreed to the **INSTRUCTION TO VENDORS and the NORTH CAROLINA GENERAL TERMS AND CONDITIONS incorporated herein**. These documents can be accessed from the ATTACHMENTS page within this document.

Failure to execute/sign bid prior to submittal may render bid invalid and it MAY BE REJECTED. Late bids shall not be accepted.

ACCEPTANCE OF BIDS

If your bid is accepted, all provisions of the RFP, along with the written results of any negotiations, shall become part of the written agreement between the parties ("Contract"). If applicable, the North Carolina General Terms and Conditions are incorporated herein and shall apply. Depending upon the Goods or Services being offered, other terms and conditions may apply, as mutually agreed.

COMPLETE/FORMAL NAME OF VENDOR:		
STREET ADDRESS:	P.O. BOX:	ZIP:
CITY & STATE & ZIP:	TELEPHONE NUMBER:	TOLL FREE TEL. NO:
PRINCIPAL PLACE OF BUSINESS ADDRESS IF DIFFERENT FROM ABOVE (SEE INSTRUCTIONS TO VENDORS ITEM #21):		
PRINT NAME & TITLE OF PERSON SIGNING ON BEHALF OF VENDOR:		FAX NUMBER:
VENDOR'S AUTHORIZED SIGNATURE*:	DATE:	EMAIL:

VALIDITY PERIOD

Offer shall be valid for at least 30 days from date of bid opening, unless otherwise stated. After this time, any withdrawal of this offer shall be made in writing, effective upon receipt by the agency issuing this RFP.

1.0 PURPOSE AND BACKGROUND

The intent of this solicitation is for Union County Public Schools to award a contract for the Sun Valley Middle School High School HVAC Renovations.

Work shall consist of furnishing all labor, taxes, materials, equipment, services, permits, incidental and implied for the Sun Valley Middle School High School HVAC Renovations.

Bid shall be submitted in accordance with the terms and conditions of the RFP and any addenda issued hereto.

2.0 GENERAL INFORMATION

2.1 Request for Proposal Document

This RFP is comprised of the base RFP document, any attachments, and any addenda released before Contract award, which are incorporated herein by reference.

2.2 Taxes

UCPS is **NOT** tax-exempt. Unless otherwise indicated, tax must be computed and added to your proposal. Any itemized shipping charges are also subject to tax. When invoiced, tax should be invoiced as a separate line item.

2.3 Notice to Vendors Regarding RFP Terms and Conditions

It shall be the Vendor's responsibility to read the Instructions to Vendors, and the North Carolina General Terms and Conditions, all relevant exhibits and attachments, and any other components made a part of this RFP and comply with all requirements and specification herein. Vendors are also responsible for obtaining and complying with all Addenda and other changes that may be issued in connection with this RFP.

If Vendors have questions or issues regarding any component of this RFP, those must be submitted as questions in accordance with the instructions in the Bid Questions Section. If UCPS determines that any changes will be made as a result of the questions asked, then such decisions will be communicated in the form of an RFP addendum. UCPS may also elect to leave open the possibility for later negotiation of specific provisions of the Contract that have been addressed during the question-and-answer period, prior to contract award.

Other than through the process of negotiation under 01 NCAC 05B.0503, UCPS rejects and will not be required to evaluate or consider any additional or modified terms and conditions submitted with Vendor's bid or otherwise. This applies to any language appearing in or attached to the document as part of the Vendor's bid that purports to vary any terms and conditions or Vendor's instructions herein or to render the bid non-binding or subject to further negotiation. Vendor's bid shall constitute a firm offer that shall be held open for the period required herein ("Validity Period" above). UCPS may exercise its discretion to consider Vendor proposed modifications. By execution and delivery of this RFP Response, the Vendor agrees that any additional or modified terms and conditions, whether submitted purposely or inadvertently, shall have no force or effect, and will be disregarded unless expressly agreed upon during negotiations and incorporated by way of a Best and Final Offer (BAFO). Noncompliance with, or any attempt to alter or delete, this paragraph shall constitute sufficient grounds to reject Vendor's bid as nonresponsive.

2.4 RFP Schedule

The table below shows the intended schedule for this RFP. UCPS will make every effort to adhere to this schedule.

Event	Responsibility	Date and Time
Issue RFP	UCPS	March 5, 2025
Hold Pre-Bid Meeting/Site Visit	UCPS	March 21, 2025 at 9:00 AM
Submit Written Questions	Vendor	March 28, 2025 by 2:00 PM
Provide Response to Questions	UCPS	March 31, 2025 by 2:00 PM
Bid Proposal Due Date	Vendor	April 3, 2025 at 1:00 PM
Contract Award	UCPS	Pending UCPS BOA Approval

2.4 Site Visit or Pre-Bid Conference

A site visit or pre-bid conference has been scheduled as follows and it **mandatory**:

Date	Time	Location	Where to Meet
March 21, 2025	9:00 AM	1409 Wesley Chapel Rd, Indian Trail, NC 28079	Front of school

2.5 Bid Questions

Upon review of the RFP documents, Vendors may have questions to clarify or interpret the RFP in order to submit the best bid possible. To accommodate the Bid Questions process, Vendors shall submit any such questions by the "Submit Written Questions" date and time provided in the above RFP Schedule Section above, unless modified by an Addendum.

Written questions must be emailed to the contact listed below by the date and time specified above in Section 2.3 RFP Schedule. Vendors should format the subject of the email as follows: **"RFP# 5-97648033 Replacement Questions"**. Question submittals should include a reference to the applicable RFP section and be submitted in the following format: **RFP Section, Page Number – Vendor Question**.

Contact Name	Contact Title	Contact Email Address
Jennifer West	Construction Contracts Specialist	facilitiesbids@ucps.k12.nc.us

No information, instruction or advice provided orally or informally by any UCPS personnel, whether made in response to a question or otherwise in connection with this RFP, shall be considered authoritative or binding. Vendors shall rely on written material contained in the RFP and an addendum to this RFP.

2.6 Bid Submittal

IMPORTANT NOTE: This is an absolute requirement. Late bids, regardless of cause, will not be opened or considered, and will be automatically disqualified from further consideration. Vendor shall bear the sole risk of late submission due to unintended or unanticipated delay. It is the Vendor's sole responsibility to ensure its bid has been received as described in this RFP by the specified time and date of opening. The time and date of receipt will be marked on each bid when received. Any bid or portion thereof received after the bid deadline will be rejected.

CAUTION: Vendors are cautioned that bids sent by U.S. Mail, including Express Mail, may not be delivered to the UCPS Facilities/Purchasing Office in time to meet the required bid closing date and time. All Vendors are urged to take the possibility of delay into account when submitted bids by the U.S. Postal Service, courier, or other delivery service.

If confidential and proprietary information is included in the proposal, also submit one (1) signed, REDACTED copy of the proposal. Such information may include trade secrets defined by N.C. General Statutes 66-152 and other information exempted from the Public Records Act pursuant to N.C. General Statutes 132-1.2 Vendor may designate information, Products, Services, or appropriate portions of its response as confidential, consistent with and to the extent permitted under the statutes and rules set forth above. By so redacting any page, or portion of a page, the Vendor warrants that it has formed a good faith opinion, having received such necessary or proper review by counsel and other knowledgeable advisors, that the portions determined to be confidential and proprietary and redacted as such, meet the requirements of the Rules and Statutes set forth above. However, under no circumstances shall price information be designated as confidential.

If the vendor does not provide a redacted version of the proposal with its proposal submission, the Department may release an unredacted version if a record request is received.

Bids for this project will be received by the UCPS Facilities/Purchasing Department until the date and time

listed below. At that time, the bids will be opened and evaluated. A bid tab will also be prepared.

Bid Closing Date	Bid Closing Time (Eastern Standard Time)
April 3, 2025	1:00 PM

Bids must be emailed to: facilitiesbids@ucps.k12.nc.us

Delivered bids will be accepted at the UCPS Facilities Department at Visitor Entrance only. Bids may be delivered Monday – Friday from 7:30 a.m. through 4:00 p.m. Bid proposals will not be accepted after the bid closing time on the bid closing date.

2.7 Bid Contents

Vendors shall complete the bid proposal form, and all indicated attachments and include all authorized signatures where requested. Failure to provide all required items, or Vendor's submission of incomplete items, may result in UCPS rejecting the Vendor's bid, in UCPS' sole discretion.

Mailed, delivered, and emailed bid submission must contain:

Item Description	Required (Yes or No)
RFP Page 2 – Acceptance of Bids	Yes
Cover Letter that includes (i) statement that confirms the Vendor has read the RFP in its entirety, including all links, and all Addenda released in conjunction with the RFP (ii) a statement that the Vendor agrees to perform in accordance with the scope of work, requirements, and specifications contained herein, and (iii) Vendor's agreement to comply with all instructions, terms, and conditions, and attachments	Yes
Title Page that includes the company name, address, phone number, and authorized representative along with the Bid Number	Yes
Completed and Signed Attachment: Bid Proposal Form	Yes
Completed and Signed Attachment: Certification of Financial Condition	Yes
Completed and Signed Attachment: Three (3) Customer Reference Form	Yes

Item Description	Required (Yes or No)
Completed and Signed Attachment: HUB Supplemental Vendor Information	Yes
Bid Bond Form (<i>Required for all bids of \$300,000.00 or more</i>)	Yes
Most Recent Audited Financial Statement	Yes

Additional items attached to this bid:

Item	Required (Yes or No)
UCPS General Terms and Conditions	Yes
Vendor Instructions	Yes
NC Sales and Use Tax Form	Provided After Bid Award
NC DOR – Affidavit E-589CI (Capital Improvement Project)	Provided After Bid Award

Mailed or delivered bid submissions must contain the following copy requirements:

Item	Required (Yes or No)
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Original Signed Hard Copy	Yes
One (1) Additional Hard Copy	No
Email or Flash Drive Copy	No

3.0 Method of Award and Bid Evaluation Process

3.1 Method of Award

North Carolina G.S. 143-52 provides a general list of criteria Union County Public Schools shall use to award contracts, as supplemented by the additional criteria herein. The Goods and Services being procured shall dictate the application and order of criteria; however, all award decisions shall be in Union County Public Schools' best interest.

All responsive bids will be reviewed, and an award or awards will be based on the responsive bid(s) offering the lowest price that meets the specifications provided herein, to include any required verifications set out here in such as but not limited to past performance, references, and financial documents.

While the intent of this RFP is to award a Contract(s) to a single vendor UCPS reserves the right to make separate awards to different Vendors for one or more-line items, to not award one or more-line items, or to cancel this RFP in its entirety without awarding a Contract, if it is considered to be most advantageous to UCPS to do so.

UCPS reserves the right to waive any minor informality or technicality in bids received.

UCPS reserves the right to reject any or all bids for any or no reasons.

3.2 Confidentiality and Prohibited Communications During Evaluation

While this RFP is under evaluation, the responding Vendor, including any subcontractors and suppliers, is prohibited from engaging in conversations intended to influence the outcome of the evaluation.

Each Vendor submitting a bid to this RFP, including its employees, agents, subcontractors, suppliers, subsidiaries and affiliates, is prohibited from having any communications with any person inside or outside the using agency; issuing agency, other government agency office or body (including the purchaser named above, any department secretary, agency head, members of the Board of Education) or private entity, if the communication refers to the content for Vendor's qualifications or ability to perform a resulting contract, and/or the transmittal of any other communication of information that could be reasonably considered to have the effect of directly or indirectly influencing the evaluation of proposals, the award of a contract, or both.

Any Vendor not in compliance with the provision shall be disqualified from evaluation and award. A Vendor's proposal may be disqualified if its subcontractor and/or supplier engage in any of the foregoing communications during the time that the procurement is active (i.e., the issuance date of the procurement until the date of contract award or cancellation of the procurement). Only those discussions, communications or transmittals of information authorized or initiated by the issuing agency for this RFP

or inquiries directed to the purchaser named in this RFP regarding requirements of the RFP (prior to proposal submission) or the status of the award (after submission) are exempt from this provision.

3.3 Proposal Evaluation Process

UCPS will conduct an evaluation of responsive Proposals, as follows:

- a) UCPS shall review the responses to this RFP to confirm that they meet the specifications and requirements. UCPS reserves the right to waive any minor informality or technicality.
- b) Proposals are requested for the items as specified. UCPS reserves the right to reject any proposal on the basis of fit, form and/or function, as well as cost.
- c) For all responses that pass the initial review process, UCPS will review and assess the Vendors' pricing. UCPS may request additional formal responses or submissions from any or all Vendors for the purpose of clarification or to amplify the materials presented in any part of the quote.

Vendors are cautioned, however, UCPS is not required to request clarification, and often does not. Therefore, all proposals should be complete and reflect the most favorable terms available from the Vendor. Prices quoted cannot be altered or modified as part of a clarification.

- d) Proposals will be evaluated, based on the award criteria identified by UCPS.

Award of a Contract to one Vendor does not mean that the other proposals lacked merit, but that, all factors considered, the selected proposal was deemed most advantageous and represented the best value to UCPS.

Vendors are cautioned that this is a request for proposal, not a request or an offer to contract, and UCPS reserves the unqualified right to reject any and all offers at any time if such rejection is deemed to be in the best interest of UCPS.

3.4 Interpretation of Terms and Phrases

This RFP serves two (2) functions: (1) to advise potential Vendors of the parameters of the solution being sought by UCPS; and (2) to provide (together with other specified documents) the terms of the Contract resulting from this procurement. The use of phrases such as "shall", "must", and "requirements" are intended to create enforceable contract conditions. In determining whether bids should be evaluated or rejected, UCPS will take into consideration the degree to which Vendors have proposed or failed to propose solutions that will satisfy UCPS needs as described in the RFP. Except as specifically stated in the RFP, no one requirement shall automatically disqualify a Vendor from consideration. However, failure to comply with any single requirement may result in UCPS exercising its discretion to reject a bid in its entirety.

4.0 Requirements

This Section lists the requirements related to this RFP. By submitting a bid, the Vendor agrees to meet all stated requirements in this Section as well as any other specifications, requirements, and terms and conditions stated in this RFP. If a Vendor is unclear about a requirement or specification or believes a change to a requirement would allow for UCPS to receive a better bid, the Vendor is urged to submit these items in the form of a question during the question-and-answer period in accordance with Section 2.5 Bid Questions.

4.1 Pricing

Bid price shall constitute the total cost to UCPS for the complete performance in accordance with the requirements and specifications herein, including all applicable charges for handling, transportation, administrative and other similar fees. Complete Attachment: Proposal Bid Form and include in Vendor's response.

4.2 Invoices

Vendor shall invoice UCPS. The standard format for invoicing shall be Single Invoices meaning that the Vendor shall provide Union County Public Schools with an invoice for each order or service date. Invoices shall include detailed information to allow UCPS to verify pricing at point of receipt matches the correct price from the original date of order. The following fields shall be included on all invoices, as relevant:

Vendor's Billing Address, Customer Account Number, RFP #, Order Date, Buyer's Order Number, Item or Service Descriptions, Price, Quantity, and Unit of Measure.

4.3 Financial Stability

As a condition of contract award, the Vendor must certify that is has the financial capacity to perform and to continue to perform its obligations under the Contract; that the Vendor has no constructive or actual knowledge of an actual or potential legal proceeding being brought against Vendor that could materially adversely affect performance of this Contract; and that entering into this Contract is not prohibited by any contract, or order by any court of competent jurisdiction.

Each Vendor shall certify it is financially stable by completing Attachment: Certification of Financial Condition. UCPS is requiring this certification to minimize potential issues from contracting with a

Vendor that is financially unstable. From the date of the Certification to the expiration of the Contract, the Vendor shall notify UCPS within thirty (30) days of any occurrence or condition that materially alters the truth of any statement made in this Certification. The Contract Manager may require annual recertification of the Vendor's financial stability.

In lieu of Attachment: Certification of Financial Condition, UCPS may require a bidder to submit their most recent financial statement (balance sheet and income statements).

4.4 HUB Participation

Pursuant to North Carolina General Statue G.S. 143-48, it is UCPS policy to encourage and promote the use of small, minority, physically handicapped, and women contractors in purchasing Goods and Services. As such, this RFP will serve to identify those Vendors that are minority owned or have a strategic plan to support UCPS Historically Underutilized Business program by meeting or exceeding the goal of 10% utilization of diverse firms as 1st or 2nd tier subcontractors. Vendor shall complete Attachment: HUB Supplemental Vendor Information.

4.5 References

Vendor shall provide at least three (3) references, using Attachment: Customer Reference Form, for which it has provided Services of similar size and scope to those proposed herein. UCPS shall contact these users to determine whether the Services provided are substantially similar in scope to those proposed herein and whether Vendor's performance has been satisfactory. The information obtain shall be considered in the evaluation of the Bid.

4.6 Background Checks

Vendor and its personnel are required to provide or undergo background checks at Vendor's expense prior to beginning work with UCPS. As part of Vendor background, the following details must be provided to UCPS.

- a) Any criminal felony conviction, or conviction of any crime involving moral turpitude, including but not limited to fraud, misappropriation or deception, By Vendor, its officers or directors, or any of its employees or other personnel to provide Services on this project, of which Vendor has knowledge, or provide a statement that Vendor is aware of none.
- b) Any criminal investigation for any offense involving moral turpitude, including, but not limited to fraud, misappropriation, falsification or deception pending against Vendor of which it has knowledge, or provide a statement Vendor is aware of none;
- c) Any regulatory sanctions levied against Vendor or any of its officers, directors or its professional employees expected to provide Services on this project by any state or federal regulatory agencies within the past three years or a statement that there are none. As used herein, the term "regulatory sanctions" includes the revocation or suspension of any license or certification, the levying of any monetary penalties or fines, and the issuance of any written warnings;
- d) Any regulatory investigations pending against Vendor or any of its officers, directors or its professional employees expected to provide Services on this project by any state or federal regulatory agencies of which Vendor has knowledge or a statement that there are none.
- e) Any civil litigation, arbitration, proceeding, or judgments pending against Vendor during the three (3) years preceding submission of its bid herein or a statement that there are none.

Vendor's response to these requests shall be considered a continuing representation, the Vendor's failure to notify the State within thirty (30) days of any criminal litigation, investigation or proceeding involving Vendor or its then current officers, directors or persons providing Services under this Contract during its term shall constitute a material breach of contract. The provisions of this paragraph shall also apply to any subcontractor utilized by Vendor to perform Services under this Contract.

4.6.1 Background Checks General Information

It is the policy of UCPS to provide a safe environment for UCPS employees and students. Due to the Contract requirements, UCPS requires criminal background checks of awarded Vendors, including but not limited to: owners, employees, agents, representatives, subcontractors, and all personnel of their respective companies. All costs and expenses associated with criminal background checks are the responsibility of the Vendor.

The following requirements must be met:

- a) Criminal background checks shall be current and completed within ninety (90) days of the Contract effective date.
- b) The criminal background check shall include a social security verification/check, felonies, misdemeanors, and traffic records covering a minimum of the last seven (7) years for all states and countries where the individual has resided. The criminal background check information shall be first thoroughly reviewed by the Vendor and then sent to the Contract Administrator for review and approval. Out of state searches shall be required for persons living in the state of North Carolina for fewer than seven (7) years. Fingerprint background checks may be required in some instances depending on the facility requirements.

- c) A criminal background check on the awarded Vendor and its employees shall be provided by the Vendor prior to the Contract effective date. Copies of the original criminal background check shall be sent to the Contract Administrator for evaluation.
- d) When a new employee or individual is identified to perform Services on this Contract, the Vendor shall provide the Contract Administrator with a criminal background check shall not be allowed to work in the relevant building until proper documentation is submitted and approved.
- e) UCPS may require the Vendor to exclude the Vendor's employees, agents, representatives, or subcontractors based on the background check results. Discovery that one or more employees have convictions does not disqualify the Vendor from award.
- f) Additionally, UCPS may use The North Carolina Department of Public Safety Offender Public Information or similar Services to conduct additional background checks on the Vendor's proposed employees.

4.6.2 Background Check Limitations

Any individual representing the Vendor, who:

- a) In his/her lifetime, has been adjudicated as a habitual felon as defined by GS 14-7.1 or a violent habitual felon as defined by GS 14-7.7, shall not be allowed to work in buildings occupied by UCPS employees or students.
- b) During the last seven (7) years has been convicted of any criminal felony or misdemeanor sexual offense or a crime of violence shall not be allowed to work in buildings occupied by UCPS employees or students.
- c) At any time has an outstanding warrant or a criminal charge for a crime described in (b) above shall not be allowed to work on UCPS property.
- d) The Vendor must ensure that all employees have a responsibility to self-report to the Vendor within twenty-four (24) hours any arrest for any disqualifying offense. The Vendor must notify the Contract Administrator within twenty-four (24) hours all the details concerning any reported arrest.
- e) Upon the request of the Contract Administrator, the Vendor will re-screen any of its employees, agents, representatives, and subcontractors during the term of the Contract.
- f) Vendor's responses to these background check requests shall be considered a continuing representation, and Vendor's failure to notify UCPS within thirty (30) days of any criminal charge, investigation, or proceeding involving Vendor or its then-current officers, directors or persons providing Services under this Contract during its term shall constitute a material breach of contract. The provisions of this paragraph shall also apply to any subcontractor utilized by Vendor to perform Services under this Contract.
- g) If there are problems or delays with performance associated with the completion and compliance with this background check requirements, any Vendor's performance bond could be used to complete these Services.

4.6.3 Background Document Requirements

Required documentation to be submitted prior to date Contract is effective and for performing any Services on UCPS property shall include:

- a) A cover letter by the Vendor on company letterhead with a list of the full names matching a required government issued photo ID, addresses, and birth dates of each person representing the contracting company.

- b) Vendor shall also provide a photocopy of the required State or Federal government issued picture ID or Driver License.
- c) A letter on company letterhead is not acceptable proof in itself but can be used to further clarify information on the criminal background check submitted. All documentation shall be submitted at the same time. Submit documents which are clear and legible.
- d) Background checks consisting of:
 - 1) Original unaltered criminal background check from the organization providing the background check.
 - 2) The background check provider's company name, company mailing address, and contact phone numbers.
 - 3) The full name of the individual, which matches the government issued photo ID.
 - 4) The current address of individual being checked.
 - 5) The date the criminal background check search was conducted.

4.7 Personnel

Vendor warrants those qualified personnel shall provide Services under this Contract in a professional manner. "Professional Manner" means that the personnel performing the Services will possess the skill and competence consistent with the prevailing business standards in the industry. Vendor will serve as the prime contractor under this Contract and shall be responsible for the performance and payment of all subcontractor(s) that may be approved by UCPS. Names of any third-party Vendors or subcontractors of Vendor may appear for purposes of convenience in Contract documents; and shall not limit Vendor's obligations hereunder. Vendor will retain executive representation for functional and technical expertise as needed in order to incorporate any work by third party subcontractor(s). Should the Vendor's bid result in an award, the Vendor shall be required to agree that it will not substitute key personnel assigned to the performance of the Contract without prior written approval by the Contract Lead. Vendor shall further agree that it will notify the Contract Lead of any desired substitution, including the name(s) and references of Vendor's recommended substitute personnel. UCPS will approve or disapprove the requested substitution in a timely manner. UCPS may, in its sole discretion, terminate the Services of any person providing Services under this Contract. Upon such termination, UCPS may request acceptable substitute personnel or terminate the contract Services provided by such personnel.

4.8 Vendor's Responsibility

If Vendor's bid results in an award, Vendor agrees that it will not enter any agreement with a third party that may abridge any rights of UCPS under the Contract. If any Services, deliverables, functions, or responsibilities not specifically described in this solicitation are required for Vendor's proper performance, provision and delivery of the Service and deliverables under a resulting Contract, or are an inherent part of or necessary sub-task included within such Service, they will be deemed to be implied by and included within the scope of the Contract to the same extent and in the same manner as is specifically described in the Contract. Unless otherwise expressly provided herein, Vendor will furnish all of its own necessary management, supervision, labor, facilities, furniture, computer and telecommunications equipment, software, supplies and materials necessary for the Vendor to provide and deliver the Service and/or other Deliverables.

4.9 Agency Insurance Requirements Modification

During the term of the contract, the contractor at its sole cost and expense shall provide commercial insurance of such type and with such terms and limits as may be reasonably associated with the contract. As a minimum, the contractor shall provide and maintain the following coverage and limits:

- 1) Workers' Compensation shall be maintained with at least the minimum statutory limits, including Employer's Liability with limits of at least \$1,000,000.

- 2) Employer's Liability shall be maintained with at least limits of \$100,000,000 each accident; \$100,000 disease, each employee; and \$1,000,000 disease, policy limit.
- 3) Commercial General Liability shall be maintained with at least the following minimum limits with the policy and the Certificate of Insurance indicating that the coverage is written on a "project" basis:
 - a) \$1,000,000 Bodily Injury and Property Damage for each occurrence
 - b) \$100,000 Fire Damage
 - c) \$1,000,000 Medical Expenses Any One Person
 - d) \$1,000,000 Personal and Advertising Injury
 - e) \$1,000,000 Products/Completed Operations Aggregate
 - f) \$2,000,000 General Aggregate

List the Owner (including its officers, agents, and employees) as an additional insured on the policy as evidenced by a policy endorsement. Coverage shall include, but not be limited to, the following supplementary coverages: Contractual Liability to cover liability assumed under this Agreement, Product and Completed Operations Liability Insurance, Broad Form Property Damage Liability Insurance, and Independent Contractors.

Such policy shall include all of the coverages, which may be included in coverages A, B, and C contained in the Commercial General Liability Policy, without deletion. Such policy must be issued on an "occurrence" basis, as distinguished from a "claims made" basis.

Completed Operations shall extend six (6) years after final payment.

If Contractor has design responsibility, endorsement CG22 80 and DIC for contractors' professional liability is required unless waived by the Owner.

- 4) Automobile Liability – Including Hired-Auto and Non-Owned Auto shall be maintained with at least a Minimum Combined Single Limit of \$1,000,000 per occurrence.
- 5) For Contractors with remediation or abatement responsibilities, Contractors shall carry Contractor's Pollution Liability Coverage. Coverage must be sudden and non-sudden, and include: Bodily injury, sickness, disease, mental anguish, or shock sustained by any person, including death; Property damage, including physical injury to or destruction of tangible property that has not been physically injured or destroyed; and Defense, including costs, charges, and expenses incurred in the investigation, adjustment, or defense of claims for such compensatory damages. List the Owner (including its officers, agents, and employees) as an additional insured on the policy as evidenced by a policy endorsement.
The Owner must be named as Additional Insured, and Non-Owned Disposal Site Endorsement must provide, scheduling the appropriate landfill.

Minimum CPL limits of coverage shall be: a)

\$1,000,000 Per Loss

b) \$2,000,000 All Losses

Umbrella Liability shall be maintained with the following minimum limits: a)

\$5,000,000 Per Occurrence

b) \$5,000,000 Aggregate

- 6) **Builder's Risk Insurance:** If requested by the Owner, the Contractor shall be responsible for purchasing and maintaining insurance satisfactory to the Owner to protect the Project from perils of physical loss. The Owner shall receive copies of the builder's risk insurance policies that satisfy this Article. The Contractor shall be responsible for any deductibles associated with this coverage.

The builder's risk insurance shall provide for the cost of replacement of the Work at the time of any loss. The insurance shall include as additional insureds the Owner, the Contractor, the Contractors and their subcontractors and shall insure against the loss from the perils of fire and all risk coverage for physical loss or damage due theft, vandalism, collapse, malicious mischief, terrorism, transit, flood, mold, earthquake, testing, or damages resulting from defective design, negligent workmanship or defective material. The Contractor shall obtain approval from the Owner before increasing any coverage due to increases in construction costs. See the Supplementary General Conditions 9.3.2 regarding Contractor's responsibilities for materials stored off-site.

Providing and maintaining adequate insurance coverage is a material obligation of the contractor and is of the essence of this contract. All such insurance shall meet all laws of the State of North Carolina. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized by the Commissioner of Insurance to do business in North Carolina. The contractor shall at all times comply with the terms of such insurance policies, and all requirements of the insurer under any such insurance policies, except as they may conflict with existing North Carolina laws of this contract. The limits of coverage under each insurance policy maintained by the contractor shall not be interpreted as limiting the contractor's liability and obligations under the contract.

The Contractor shall furnish a Certificate of Insurance as proof of the above coverages. Certificate will contain provision that the insurance coverages cannot be canceled, reduced in amount or coverage eliminated without thirty (30) days written notice to the Union County Board of Education. Owner's Protective insurance must list Union County Board of Education as the Certificate Holder and as "additional insured" as it's interest may appear. Owner's approval of Certificate of Insurance does not decrease or relieve the contractor's responsibility for maintaining insurance coverage as required in this Request for Proposal.

5.0 Specifications and Scope of Work

5.1 Project

Sun Valley Middle School High School HVAC Renovations

5.2 Scope

See attached Exhibit 1

5.3 Materials

No materials are to be stored onsite. Vendor must adhere to the guidelines within these specifications. Failure to do so will result in default of payment by the Union County Board of Education.

5.4 Safety Regulations

The Vendor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor.

5.5 License and Permits

The Vendor shall hold the appropriate license of work to be performed and shall secure all permits required for the job completion, obtain, and deliver to Union County Public Schools, all certification of inspection issued by the Authorities Having Jurisdiction.

5.6 Scheduling

The Contractor must submit a precise time schedule as to when specific work will occur in specific areas within the building. This will be used to coordinate the work with the occupants of the building. The Maintenance Project Manager or building Administrator may alter the schedule at any time to maintain the work process within the facility. Work must be scheduled during hours that are acceptable to the school Administrator and Maintenance Project Manager. The Union County Board of Education shall not incur any additional cost due to scheduling.

All work must be scheduled to avoid safety concerns and disruption of classroom instruction time and/or operation times. If required, all permits and inspections will be the responsibility of the contractor, and copies of permits and final inspection will be submitted to UCPS prior to final payment.

5.7 Liquidated Damages

Time is of the essence. The contractor shall complete work on site within the allotted time.

Liquidated damages shall be assessed for each calendar day beyond the substantial completed date in the amount of \$500.00 per day. Liquidated damages shall be assessed for final completion beyond the final completion date in the amount of \$1,000.00 per day.

5.8 Workers on the Job

All employees of the Vendor shall, while on Union County Board of Education property, act in a professional and courteous manner. All workers shall be expected to dress appropriately for a school site while on Board property. Also, all employees of the Vendor must sign-in in the main office upon entering the facility and sign-out in the main office upon leaving the property. Any employee of the Vendor may be told to leave the property by either the school administration or responsible department director if they do not follow the above procedure. The employee shall be replaced with another Vendor employee at no additional cost to the Union County Board of Education.

Smoking, vaping, or the use of tobacco products is prohibited on UPCS' property.

5.9 Sex Offender and Public Protection Program

In accordance with G.S. 14-208.18 all persons who (1) are required to register under the Sex Offender and

Public Protection Program and (2) have been convicted of certain sexually violent offenses or any offense where the victim was under the age of sixteen (16) years at the time of the offense are expressly forbidden to knowingly be present on any property owned or operated by the school system, including school buildings, athletic fields, playgrounds, parking lots, school buses, activity buses or other property of any kind for any reason, including attendance at sporting events or other school related functions, whether before, during or after school hours. It is the responsibility of the Vendor that their employees and sub-contractors are in accordance with G.S. 14-208.18.

5.10 E-Verify

Vendor shall comply with E-Verify, the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law and as in accordance with NCGS 64-25 et seq. In addition, to the best of Vendor's knowledge, any subcontractor employed by Vendor as a part of this contract shall be in compliance with the requirements of E-Verify and NCGS 64-25 et seq.

5.11 Equipment and Tools

The Vendor shall not use equipment or tools owned by the UCPS. Also, employees of UCPS shall not be utilized by the Vendor except for opening locked doors or giving directions.

5.12 Clean Up

The work area shall be cleaned after each service visit so that the Union County Board of Education shall not incur any additional cost to clean the treated area. Also, the Vendor shall make minimal use of UCPS' trash receptacles. All large trash items and Vendor used materials shall be properly disposed of off the property. Onsite dumpsters shall not be used.

5.13 Changes During Service Contract Period

Changes during the service contract period shall only be made by written direction signed by UCPS. No additional cost to the contract shall be allowed unless accepted in writing by UCPS before work has begun.

5.14 Contract Terms

Price must be applicable for the term agreed upon by both parties.

5.15 Price Adjustments – Term Contracts Only

Any price changes, downwards or upward, which might be permitted during the contract period must be general, either by reason of market change or on the part of the Vendor to the other customers.

- 1) **Notifications:** Notifications must be given to UCPS, in writing, concerning any proposed price adjustments. Such notifications shall be accompanied by copy of manufacturer's office notice or other acceptable evident that the change is general in nature.
- 2) **Decreases:** UCPS shall receive full proportionate benefit immediately at any time during the contract.
- 3) **Increases:** Consumer Price Index (CPI) – Contract prices for equipment and/or service will remain firm through the initial contract dates. Contractors must request price adjustments, in writing (30) days prior to the renewal date. If a Vendor fails to request CPI price adjustment thirty (30) days prior to the adjustment date, the adjustment will be effective thirty (30) days after UCPS receives the written request. Price adjustments will be made in accordance with the percentage change in the U.S. Department of Labor Consumer Price Index (CPI-U) for all urban consumers, all items, southern

region. The price adjustment rate will be determined by comparing the percentage difference between the CPI in effect for the base yearly average (January through December beginning the year the contract is effective); and each January through December thereafter. The percentage difference

between those two CPI issues will be the price adjustment rate. No retroactive contract price adjustments will be allowed. All bidders will be capped with a 3% maximum price increase.

- 4) Invoices: It is understood and agreed that services will be provided at the established contract price in effect for a specified contract term. Vendor will provide a single monthly invoice detailing recurring charges for all serviced facilities.

5.16 Payment

Payment will be processed monthly from the single invoice provided by the Vendor. Invoice discrepancies must be resolved before payment will be processed.

5.17 Performance of Work

All work shall be performed at the highest level of quality. UCPS shall be responsible for determining the quality of work and may notify the Vendor of the same. **ANY WORK COMPLETED THAT IS NOT SUITABLE TO THE OWNER SHALL BE REPEATED BY THE VENDOR AT NO COST TO UNION COUNTY PUBLIC SCHOOLS.** Any damage to existing area or utilities will be the responsibility of the Vendor. No Exceptions.

5.18 Specifications

See Exhibit 1

Contractor must adhere to the guidelines within these specifications. Failure to do so will result in default of payment of Union County Board of Education and/or cancellation of this contract.

The Union County Board of Education reserves the right to reject any or all bids or any or no reason.

End of RFP # 5-79648033

Exhibit 1

Scope of Work

Table of Contents

Division	Section Title
230500	COMMON WORK RESULTS FOR HVAC
	230700 HVAC INSULATION
230900	BUILDING AUTOMATION SYSTEM
	233113 METAL DUCTS
237413	PACKAGED TERMINAL HEAT PUMP

END OF TABLE OF CONTENTS

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1: GENERAL

1.1 RELATED PROVISIONS

- a. The requirements of the general conditions and of Division 01 apply to that portion of the work specified in this section.
- b. These specifications and the accompanying drawings shall include the furnishing of all labor, tools, materials, fixtures, transportation, appurtenances and service necessary and incidental to the installation of a complete and operative system as indicated and intended on the Drawings and as herein specified.
- c. 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, etc., which is required by the work of this Division of the Specifications, shall be provided by this Division unless otherwise indicated.
- d. 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 DESCRIPTION OF THE WORK:

- a. Work included under this Division includes installation of a new cooling and heating system and associated electrical system and controls system. The systems shall be installed complete, with boilers, piping, chiller, pumps and auxiliaries as hereinafter called for. Miscellaneous items including conduits, concrete slab, etc., are to be provided as indicated.
- b. It shall be the responsibility of the Contractor to provide a complete and operating system according to the true intent and meaning of the plans and specifications and all pipe, controls and equipment, etc.

1.3 DEFINITION

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

1.4 HVAC CONTRACTOR'S QUALIFICATIONS

- a. It is assumed that the contractor has had sufficient general knowledge and experience to anticipate the needs for a construction of this nature. The contractor

shall furnish all items required to complete the construction in accordance with reasonable interpretation of the intent of the Drawings and Specifications. Any minor items required by Code, law or regulations shall be provided whether or not specified or specifically shown.

- b. 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 incompetent workman be removed from the job and a competent workman be substituted therefor.
- c. All work must be done in strict accordance with standards of AME, ASHRAE and the building laws of all character in force in the locality where the apparatus is being installed. All work must also be in accordance with rules and regulations of the National Board of Fire Underwriters.

1.5 DUTIES OF CONTRACTOR

- a. Contractor is responsible for familiarizing himself with the details of the construction of the building. Work under these specifications installed improperly or which requires changing due to improper reading or interpretation of building plans shall be corrected and changed as directed by Engineer without additional cost to the Owner.
- b. Contractor shall leave the premises in a clean and orderly manner upon completion of work, and shall remove from premises all debris that has accumulated during the progress of the work. The HVAC Contractor shall have the permanent HVAC systems in sufficient readiness for furnishing temporary climatic control at the time the building is enclosed. The HVAC systems control shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishers of the building. A building shall be considered enclosed when it has windows installed and when doorways and other openings have protection which will provide reasonable climatic control. The appropriate climatic condition shall be jointly determined by the Contractor and the Architect. Use of the equipment in this manner shall in no way affect the warranty requirements of the Contractor.

1.6 CODES, RULES, PERMITS AND FEES

- a. The contractor shall give all necessary notices, obtain all permits and pay all government sales taxes, fees and other costs including utility connections or extension, in connection with his work; file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates for inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.
- b. The contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, ordinances, rules and regulations as required to complete the project in accordance with the intent of the drawings.

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

1.7 SURVEYS AND MEASUREMENTS

- a. The contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check correctness of same as related to the work.
- 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 Architect and shall not proceed with his work until he has received instructions from the Architect.

1.8 PLANS

- a. Except where dimensions are shown, mechanical plans are diagrammatic; see Architectural drawings for building dimensions and locations of windows, doors, ceiling diffusers, lights, etc. The plans are not intended to show each and every fitting, valve, pipe or pipe hanger, or a complete detail of all the work to be done, but are for the purpose of illustrating the type of system, pipe and duct sizes, etc. and special conditions considered necessary for the experienced mechanic to take off his material and lay out his work. Contractor shall be responsible for taking such measurements as may be necessary at the job, and adapting his work to the local conditions.

1.9 DRAWINGS AND SPECIFICATIONS

- a. Plans are diagrammatic, and it sometimes occurs that conditions exist in buildings which require certain changes in drawings and specifications. In event that such changes are necessary, the same are to be made by Contractor without expense to the Owner, provided however, that such changes, do not require furnishing more material or performing more labor than the true intent of the drawings and specifications demand.
- b. It is understood that while the drawings are to be followed as closely as circumstances will permit, the Contractor is held responsible for the installation of the system according to the true intent and meaning of the drawings. Anything not entirely clear on the drawings or in the specifications will be fully explained if application is made to the Engineer. Should however, conditions arise where in the judgment of the Contractor certain changes would be advisable. Contractor will communicate with Engineer and secure approval of the changes before going ahead with the work.
- c. The electrical and mechanical systems for this job have been designed on the basis of the mechanical equipment listed or data given herein or on the drawings. It shall be the responsibility of the Contractor to determine that the electrical service outlets, wiring, conduit and all overcurrent protective and safety devices furnished are

adequate to meet Code Requirements for the equipment which he proposes to use. Changes required in the electrical system to accommodate the proposed mechanical equipment shall be worked out and the details submitted for approval. The cost of making the necessary changes to the electrical system shall be the responsibility of the Contractor.

1.10 SHOP DRAWINGS

- a. Refer to Division 01.
- b. All items submitted to Architect for review shall bear stamp or notation indicating contractor's prior review and approval.
- c. Any Electrical or other changes required by substituted equipment to be made at no change in contract price.
- d. Submit manufacturer's certified performance data for all equipment.
- e. Coordinate installation drawings with other parts of the work, whether specified in this Division or other Divisions.
- f. Approval of shop drawings by the Engineer shall not relieve the Contractor from his obligation to provide equipment, control, and operation to the true intent of plans and specifications.
- g. The Contractor shall submit to the Engineer, within ten (10) days after approval of bids by the owner, a list indicating the manufacturer of all equipment and materials which he proposes to use. After that date, no substitution will be approved and all items shall be as specified.

1.11 SCAFFOLDING, RIGGING, HOISTING:

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

1.12 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS:

- a. 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.

1.13 SLEEVES AND OPENINGS:

- a. Contractor must have an experienced mechanic on the job before concrete slab floors or concrete masonry walls are poured or built into place, whose duty it shall be to locate exact positions of any and all holes necessary for future installation of his pipe work, ducts or equipment. Where pipes pass through concrete or masonry walls or floors, steel pipe sleeves shall be furnished. These shall be the same length as wall thickness and shall extend 1/2" above finished floors. Pipe sleeves in equipment room floors shall extend 3" above refinished floor. Pipe sleeves in equipment room

floors shall extend 3" above finished floor. Sleeves shall be placed in position by this Contractor.

- b. This Contractor shall arrange for proper openings in the building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, portions cut must be restored to their former condition by this Contractor.
- c. This Contractor will provide duct openings or chases in masonry or concrete; however, it is this Contractor's responsibility to advise exact dimensions, shape and locations of openings required in sufficient time for the Contractor to make necessary provisions. This Contractor shall be responsible for correct size and location of each opening for his equipment through these openings.
- d. Wall openings that require a fire or smoke damper shall be made as nearly possible to the damper or duct size so that an angle frame can close the opening entirely.
- e. Where pipes or ducts penetrate floors or partitions which are fire or smoke barriers, the integrity of the barrier shall not be compromised by such penetration.

1.14 CUTTING AND PATCHING:

- a. The Contractor shall do all cutting, fitting and patching as required to install piping and equipment except openings through the roof shall be provided by the General Contractor. Patching shall be done by mechanics skilled in the various trades and work shall match the existing work.
- b. All exposed openings in walls and floors for piping shall be core drilled. Cutting of holes by hand will not be allowed.
- c. Provide all required protection including but not limited to, welding blankets, dust covers, shoring bracing and supports to maintaining structural integrity, safety and cleanliness of the work.

1.15 EXCAVATION AND BACKFILLING:

- a. All excavation and backfilling, puddling and tamping required to properly install work under this contract shall be done by this Contractor.
- c. Backfill shall be clear of rocks and trash. Backfilling shall be water tamped so as to provide firm footing for finish work, and shall be maintained at proper level for duration of the Contract. No backfilling shall be done until work to be covered has been inspected. Excessive excavation material shall be deposited on site and leveled as directed by the engineer.

1.16 POURED IN PLACE CONCRETE WORK:

- a. Furnish and install all concrete work required for the construction of anchors, guide bases and elsewhere as indicated on the Drawings. Refer to appropriate Section in Division 3 for specification requirements.

1.18 STORAGE OF MATERIALS:

- a. Equipment, ductwork, piping, and other equipment stored on site shall be protected from mud, dust, debris, weather, vermin, and construction traffic.
- b. Equipment, ductwork, piping, and other equipment shall be capped or otherwise covered to prevent water, dust, and debris intrusion. Cellophane membrane may be used for duct and equipment with care taken to maintain the seal integrity. Covering shall be replaced if seal is disturbed. Covering shall be removed only when necessary.
- c. Where pipe or ductwork becomes damaged by rust, dirt, dust, mud, or construction debris, it must be thoroughly cleaned and prepared to a like-new condition before installation.
- d. Porous materials such as duct liner and insulation that become saturated with water shall be discarded and replaced.
- e. Any equipment and/or materials affected (including aesthetically) as a result of improper storage shall be cleaned or replaced at contractor expense.

PART 2: PRODUCTS

2.1 MATERIALS

- a. Provide equipment complete with all components and accessories necessary to its satisfactory operation.
- b. Listing of a manufacturer's name in this Division does not infer conformity to all requirements of the Contract Documents, nor waive requirements thereof.

PART 3: EXECUTION

3.1 BELT DRIVES

- a. V-belt drives shall be rated at not less than 200% of nominal motor horsepower.
- b. Motor sheaves shall be fixed pitch type.
- c. Scheduled fan static pressures are estimated. Provide one extra drive per device as required to allow adjustment to deliver scheduled air quantities against actual system resistance.
- d. Provide guards for all belt drives not enclosed within equipment housings. Provide openings in guard at driving and driven sheaves for use of revolution counter.

3.2 MAINTENANCE AND OPERATING INSTRUCTIONS

- a. Upon completion of all work, the Contractor shall furnish a complete set of operating instructions for all equipment. Such instructions shall be diagrammatic in form on heavy white paper, suitably framed, protected with glass and hung where

directed by the owner. A preliminary draft of the instruction sheets shall be submitted to the engineer for approval before making same.

- b. Manufacturer's instruction books, card, etc., (to each individual piece of equipment furnished under this contract) shall be furnished to the owner. These shall contain instructions for the operation and maintenance of all equipment. Where such is not furnished by the manufacturer, the contractor shall give written instructions to the owner for the maintenance of the equipment involved.

3.3 DUCTS, PLENUM, ETC.

- a. As indicated on drawings, provide a system of ducts for supplying returning and exhausting air from various spaces. All details of the ductwork are not indicated and the necessary bends, offsets and transformations must be furnished whether shown or not.
- b. All sheet metal ducts, casing, plenums, etc., of sizes indicated, shall be constructed from prime galvanized sheet steel, and shall be in accordance with or equal to standards set forth in latest issue of SMACNA low velocity duct manual for gauges of materials, (2" pressure), workmanship, method of fabrication and erection.
- c. All uninsulated panels of ducts over twelve inches (12") wide shall be cross-broken, except on plenums, which shall be braced with angle iron as required to prevent breathing.
- d. All ductwork must present a smooth interior and joints must be airtight. Where there is evidence of undue leakage at the joints in low pressure ducts, they shall be sealed with cement similar to Foster 30-02.
- e. Depending upon space requirements, round or square elbows may be used as required or at the Contractors option in low velocity ducts. All elbows shall be constructed for minimum pressure drop. All elbows with an inside radius less than 3/4 the width of the duct must be fitted with multiple double thickness turning vanes.
- f. No transformations or offsets shall be made with a slope greater than (7 to 1), space conditions permitting.
- g. Where indicated on drawings, ductwork is to be lined with flexible fiberglass acoustics material weighing not less than 1 1/2 lb. per cubic foot and having a flame spread classification of not more than twenty-five (25) as listed under Underwriters Laboratories. Liner shall be applied according to SMACNA duct liner standard. Thickness shall be as indicated on the drawings. Duct sizes on plan are inside clear sizes, increase the actual sheet metal size accordingly in sizing the duct.
- h. The lining shall be secured to the ductwork with a suitable adhesive and with mechanical fasteners center. Liner shall be cut such that adjacent sections of insulation butt together and are sealed with Foster 30-02 joints.
- i. All duct connections to and from all centrifugal fans or cabinets containing fans, shall be made with fabric equal to "Ventfab" as made by Ventfabrics, Inc., not less

than four inches (4") long secured by peripheral iron straps holding fabric in galvanized iron, except as otherwise noted.

- j. Vertical ducts shall be supported by means of an angle iron frame riveted to the ductwork on at least two (2) sides. Horizontal runs of ductwork shall be supported on not more than 8'-0" centers as required.
- k. Manual volume and splitter dampers shall be furnished and installed where shown and where necessary for proper regulation of the air distribution. A quadrant and set screw equal to "Ventlock" #641 shall be installed for all dampers which are concealed above plaster or gypsum board ceilings, or behind the masonry construction, furnish and install concealed regulators ("Ventlock" #666) with chrome cover plate.
- l. All ductwork shall operate without chatter and vibration, and shall be free from pulsations.
- m. See section 233113 for metal ductwork requirements.

3.4 ACCESS DOORS OR PANELS

- a. Provide duct access doors of approved construction at any apparatus requiring service and inspection. Doors shall suit finish in which installed.
- b. Access doors in rated walls or assemblies shall be rated as required to maintain rating of assembly. Rated access doors shall bear U.L. Label.

3.5 CLEANING DUCT SYSTEM

- a. Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc., before installing any outlets. After installation of outlets and connections to fans are made, blow out entire systems with all control devices wide open.

3.6 ITEMS OF ELECTRICAL EQUIPMENT

- a. All electrical work shall be done by properly licensed electrical mechanics in accordance with Division 26 of the specifications under supervision of a licensed Electrical Contractor as approved by the Architect.
- b. The Electrical Contractor shall provide all power wiring to motor starter and/or disconnect switch and from starter/disconnect switch to motor. The Mechanical Contractor shall provide all control wiring, low voltage or line voltage, as required for the operation of all mechanical equipment. All control devices such as motor starters, thermostats, switches, etc. shall be provided by the Mechanical Contractor.
- c. All motor starters shall be provided with a "hand-off-auto" switch on the starter cover.
- d. All items of mechanical equipment electrically operated shall be in complete accordance with electrical division of the specifications. Mechanical equipment,

other than individually mounted motors, shall be factory prewired so that it will only be necessary to bring connections to a single set of terminals.

- e. Mechanical equipment electrical components shall all be bonded together and connected to electrical system ground.
- f. All mechanical equipment shall be U.L. listed and labeled as a complete package, not through individual components or parts. Provide required 3rd party field UL listing services as required to comply.

3.7 WARRANTY AND SERVICE

- a. Upon completion of all work, the contractor shall check the system out so that all motor bearings are greased as required and have all systems balanced. He shall be responsible for original service, of starting the system up, and providing one set of replacement filters after final acceptance.
- b. Refer to equipment specifications for specific warranty information.

3.8 INSPECTION AND ACCEPTANCE TEST

- a. The project will be checked periodically as construction progresses. The contractor shall be responsible for notifying the Engineer at least 48 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until approved by the Engineer.
- b. Upon completion of erection of all equipment and work specified herein and shown approved shop drawings, and at the time designated by the engineer, the contractor shall start all apparatus, making necessary tests as directed and as specified herein, and make adjustments of all parts of all equipment before acceptance of equipment by the owner. The contractor must demonstrate to the owner, by performance, that all equipment operates as specified and meets the guarantee called for.
- c. Tests shall include satisfactory evidence that all systems operate as called for on the drawings, and that all pieces of equipment operate at specified ratings under specified operating conditions.
- d. The contractor shall furnish all fuel and power required for these purposes, and provide the proper and necessary help required to operate the system while tests are being made.
- e. All drainage piping shall be tested by filling with water to a point 10' above the underground drains or to point of discharge to grade and let stand thus filled for 3 hours.
- f. Tests on all pipe work shall be subject to the inspection of the Engineer. He shall be given 24-hours notice when a section pipe is to be tested and the test shall not be removed until permission is given by the Engineer.

3.9 AS BUILT DRAWINGS

- b. This contractor shall keep on the job at all times, a clean set of contract drawings in blueprint form. As the job progresses, any and all deviations from the arrangements, piping runs, equipment locations, etc., shown on the bid prints shall be marked on this set with red ink. These prints shall not be used for any other purpose than to be marked up as "As-Built" Drawings.

3.10 OWNER TRAINING

- A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain the equipment listed below:
 1. DDC Control Systems
 2. RTUS
- B. Extent of Training:
 1. Base extent of training on scope and complexity of equipment installed and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
 2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
 3. Minimum Training Requirements:
 - a. Provide not less than the number days of training indicated below.
 - 1) DDC Control Systems - 8 hours
 - 2) VAV Boxes - 4 hours
 - 3) Electric Heaters – 4 hours
 - b. All training shall occur before end of warranty period.
- C. Training Schedule:
 1. Schedule training with Owner **20** business days before expected Substantial Completion.
 2. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays, with two morning sessions and two afternoon sessions.
 3. Provide staggered training schedule as requested by Owner.
- D. Training Attendee List and Sign-in Sheet:
 1. Request from Owner in advance of training a proposed attendee list with name, phone number and e-mail address.
 2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
 3. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.

4. At end of each training day, send Owner an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.
- E. Attendee Training Manuals:
1. Provide each attendee with a color hard copy of all training materials and visual presentations.
 2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
 3. In addition to hard-copy materials included in training manual, provide each binder with a sleeve or pocket that includes a DVD or flash drive with PDF copy of all hard-copy materials.
- F. Organization of Training Sessions:
1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following three levels of operators:
 - a. Daily operators.
 - b. Advanced operators.
 - c. System managers and administrators.
- G. Training Outline:
1. Submit training outline for Owner review at least **10** business day before scheduling training.
 2. Outline shall include a detailed agenda for each training day that is broken down into each of four training sessions that day, training objectives for each training session and synopses for each lesson planned.
- H. On-Site Training:
1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
 2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
 3. Provide as much of training located on-site as deemed feasible and practical by Owner.
 4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
 5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.
- I. Training Content:
1. Basic operation of each system.
 2. Understanding each unique product type installed including performance and service requirements for each.

3. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.

END OF SECTION 230500

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Shutoff single-duct air terminal units.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Instructions for resetting minimum and maximum air volumes.
 - 2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.5 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nailor Industries
 - 2. Titus
 - 3. Krueger
 - 4. Price
- B. Listing of manufacturers name does not guarantee approval. All equipment must meet or exceed quality and capacities of specified equipment. Final approval will be based on equipment submittals. Any manufacturer not listed but wishing to bid this project shall submit a written request 14 days prior to bid date, prior approval is required for all manufacturers not listed.

1.6 COORDINATION

- A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 SINGLE-DUCT AIR TERMINAL UNITS (w/ELECTRIC HEAT)

- A. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.
- B. Casing: 22-gauge steel.

1. Casing Lining: 1/2-inch- thick, coated, fibrous-glass duct liner complying with ASTM C 1071; secured with adhesive. Cover liner with nonporous foil.
 2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
 3. Air Outlet: S-slip and drive connections.
 4. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.
 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
- C. Regulator Assembly: Extruded-aluminum or galvanized-steel components; key damper blades onto shaft with nylon-fitted pivot points located inside unit casing.
1. Automatic Flow-Control Assembly: Combined spring rates shall be matched for each volume-regulator size with machined dashpot for stable operation.
 2. Factory-calibrated and field-adjustable assembly with shaft extension for connection to externally mounted control actuator.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
1. Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal airflow at 3-inch wg inlet static pressure.
- E. Electric Heating Coil: Slip-in-type, open-coil design with integral control box factory wired and installed. Include the following features:
1. Primary and secondary overtemperature protection.
 2. Nickel chrome 80/20 heating elements.
 3. Airflow switch.
 4. Noninterlocking disconnect switch.
 5. Fuses (for coils more than 48 A).
 6. SCR Controllers (1 – 10 VDC)
- F. DDC Controls: Single-package unitary controller and actuator specified in Division 23 Section "Instrumentation and Control for HVAC."
1. DDC controls shall be furnished by the controls vendor and shipped to the terminal unit manufacturer for factory mounting.
- G. DDC Controls: Bidirectional damper operators and microprocessor-based controller and room sensor shall be compatible with temperature controls specified in Division 23 Section "Instrumentation and Control for HVAC" and shall have the following features:
1. Damper Actuator: 24 V, powered closed, spring return open.
 2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
 - a. Proportional, plus integral control of room temperature.
 - b. Time-proportional reheat-coil control.
 - c. Occupied and unoccupied operating mode.
 - d. Remote reset of airflow or temperature set points.

- e. Adjusting and monitoring with portable terminal.
 - f. Communication with temperature-control system specified in Division 23 Section "Instrumentation and Control for HVAC."
- 3. Room Sensor: Wall mounting, wall plate.
 - 4. DDC controller shall be supplied by the BAS contractor to be factory mounted by the terminal box manufacturer.
- H. Control Sequence: See Sequence of Operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 CONNECTIONS

- A. Connect ducts to air terminal units according to Division 23 Section "Metal Ducts."
- B. Ground units with electric heating coils according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
 - b. Verify that controls and control enclosure are accessible.
 - c. Verify that control connections are complete.
 - d. Verify that nameplate and identification tag are visible.
 - e. Verify that controls respond to inputs as specified.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 233600

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Insulation Materials:
 - a. Cellular glass.
 - b. Flexible elastomeric.
 - c. Mineral fiber.
 - d. Phenolic.
- 2. Adhesives.
- 3. Mastics.
- 4. Lagging adhesives.
- 5. Sealants.
- 6. Factory-applied jackets.
- 7. Field-applied fabric-reinforcing mesh.
- 8. Field-applied cloths.
- 9. Field-applied jackets.
- 10. Tapes.
- 11. Securements.
- 12. Corner angles.

B. Related Sections:

- 1. Division 21 Section "Fire-Suppression Systems Insulation."
- 2. Division 22 Section "Plumbing Insulation."
- 3. Division 23 Section "Metal Ducts" for duct liners.

1.3 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. Aeroflex
- 2. Armacell
- 3. Certain Teed Corp.
- 4. Johns Manville
- 5. Knauf Insulation
- 6. Owens Corning

7. Pittsburgh Corning Corp.
8. Dyplast Products

- B. Listing of manufacturers name does not guarantee approval. All equipment must meet or exceed quality and capacities of specified equipment. Final approval will be based on equipment submittals. Any manufacturer not listed but wishing to bid this project shall submit a written request 14 days prior to bid date, prior approval is required for all manufacturers not listed.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Qualification Data: For qualified Installer.
- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Block Insulation: ASTM C 552, Type I.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Board Insulation: ASTM C 552, Type IV.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.

5. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- J. Mineral-Fiber, Preformed Pipe Insulation:
1. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 2. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- K. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
- L. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- M. Phenolic:
1. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
 2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
 3. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
 4. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.
 - a. Preformed Pipe Insulation: ASJ.

- b. Board for Duct and Plenum Applications: ASJ.
- c. Board for Equipment Applications: ASJ.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass, Phenolic, Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 200 deg F.
3. Solids Content: 63 percent by volume and 73 percent by weight.
4. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

2.5 SEALANTS

A. Joint Sealants: Cellular-Glass, Phenolic, Products.

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.
- B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

- C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for duct, equipment, and pipe.

2.8 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.9 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Adhesive: As recommended by jacket material manufacturer.
 - 2. Color: Color-code jackets based on system.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 - 4. Factory-fabricated tank heads and tank side panels.
- D. Metal Jacket:
 - 1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - a. Finish and thickness are indicated in field-applied jacket schedules.
 - b. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.

- 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.
- F. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
- G. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
- H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.10 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
 - 1. Width: 2 inches.
 - 2. Thickness: 6 mils.
 - 3. Adhesion: 64 ounces force/inch in width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: 18 lbf/inch in width.

- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Width: 2 inches.
 - 2. Thickness: 3.7 mils.
 - 3. Adhesion: 100 ounces force/inch in width.
 - 4. Elongation: 5 percent.
 - 5. Tensile Strength: 34 lbf/inch in width.
- E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
 - 1. Width: 3 inches.
 - 2. Film Thickness: 4 mils.
 - 3. Adhesive Thickness: 1.5 mils.
 - 4. Elongation at Break: 145 percent.
 - 5. Tensile Strength: 55 lbf/inch in width.
- F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
 - 1. Width: 3 inches.
 - 2. Film Thickness: 6 mils.
 - 3. Adhesive Thickness: 1.5 mils.
 - 4. Elongation at Break: 145 percent.
 - 5. Tensile Strength: 55 lbf/inch in width.

2.11 SECUREMENTS

- A. Bands:
 - 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
 - 2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
 - 1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

- b. Spindle: Aluminum, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - b. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Aluminum, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
- 6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, stainless steel.

2.12 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - a. Do not weld anchor pins to ASME-labeled pressure vessels.
 - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
 - d. Do not overcompress insulation during installation.
 - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - f. Impale insulation over anchor pins and attach speed washers.
 - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.

9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
 10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
- B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
 2. Seal longitudinal seams and end joints.
- C. Insulation Installation on Pumps:
1. Provide 1" foam-core insulation on all chilled water pumps. Install pump insulation per foam-core insulation manufacturer's pump insulation installation instructions. Include pump insulation installation instructions with insulation submittals.
 2. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.6 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable

- insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.7 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.8 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.
- E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 75 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 75 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.10 PHENOLIC INSULATION INSTALLATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.11 FIELD-APPLIED JACKET INSTALLATION

- #### A.
- Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- E. Where PVDC jackets are indicated, install as follows:
1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
 3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.12 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: Coat exposed outdoor flexible elastomeric insulation with two coats of manufacturer's recommended protective white coating; or cover with aluminum jacketing all exposed outdoor flexible elastomeric insulation, in lieu of paint.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.13 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
 - 2. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 - 3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.14 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return, and outdoor air.
2. Indoor, exposed outdoor air.
3. Outdoor, concealed supply and return.
4. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Exhaust ductwork
4. Factory-insulated flexible ducts.
5. Factory-insulated plenums and casings.
6. Flexible connectors.
7. Vibration-control devices.
8. Factory-insulated access panels and doors.

3.15 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply and Return-air Ducts, Concealed (installed above ceilings):

1. Mineral-Fiber Blanket: 2 inches thick and installed R-6.0.

B. Exposed Supply and Return Ductwork exposed in Air Conditioned Utility Spaces (Conditioned Mechanical Rooms or Mechanical Rooms used as Return Air Plenums) and Exposed in Non-Air Conditioned Spaces (Boiler Rooms, et. Al):

1. Mineral-Fiber Board Insulation: 2 inches thick and installed R-6.0.

C. Outside-Air Ducts:

1. Mineral-Fiber Blanket: 2 inches thick and installed R-6.0.

3.16 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Supply-air, return-air and outside-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 3 inches and 3-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 3 inches thick and 3-lb/cu. ft. nominal density.

3.17 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

- B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.
- C. Chillers: Insulate cold surfaces on chillers, including, but not limited to, evaporator bundles, condenser bundles, heat-recovery bundles, suction piping, compressor inlets, tube sheets, water boxes, and nozzles as recommended by the manufacturer.
- D. Chilled-water pump insulation shall be one of the following:
 - 1. Cellular Glass: 2 inches thick.
 - 2. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
 - 3. Flexible Elastomeric: 1 inch thick
- E. Dual-service heating and cooling pump insulation shall be one of the following:
 - 1. Cellular Glass: 2 inches thick.
 - 2. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- F. Chilled-water expansion/compression tank insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.
 - 3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- G. Dual-service heating and cooling expansion/compression tank insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.
 - 3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- H. Heating-hot-water expansion/compression tank insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.
 - 3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- I. Chilled-water air-separator insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.
 - 3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- J. Heating-hot-water air-separator insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.
 - 3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- K. Thermal storage tank insulation shall be one of the following:
 - 1. Cellular Glass: 1-1/2 inches thick.

2. Flexible Elastomeric: 1 inch thick.
3. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

3.18 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.19 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate, Cold Water Make-up and Equipment Drain Water:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 3/4 inch thick.
- B. Chilled Water Supply and Return:
 1. Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Phenolic: 1-1/2 inch thick.
- C. Condenser-Water Supply and Return:
 1. Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe, Type I or Pipe Insulation Wicking System: 1-1/2 inches thick.
 - c. Phenolic: 1 inch thick.
- D. Heating-Hot-Water Supply and Return:
 1. NPS 1-1/2" and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inches thick.
 - c. Phenolic: 1-1/2 inch thick.
 2. NPS 2" and Larger: Insulation shall be the following:

- a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.
 - c. Phenolic: 2 inch thick.
- E. Refrigerant Suction and Hot-Gas Piping:
 - 1. Insulation shall be installed per the manufacturer's recommendations.
- F. Dual-Service Heating and Cooling, 40 to 200 Deg F:
 - 1. Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Phenolic: 1-1/2 inch thick.

3.20 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Chilled Water:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 3 inches thick.
 - b. Flexible Elastomeric: 2 inches thick.
 - c. Phenolic: 1-1/2 inch thick.
- B. Condenser-Water Supply and Return:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Flexible Elastomeric: 2 inches thick.
 - c. Phenolic: 1 inch thick.
- C. Heating-Hot-Water Supply and Return:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 3 inches thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
 - c. Phenolic: 2 inch thick.
- D. Refrigerant Suction and Hot-Gas Piping:
 - 1. All Pipe Sizes: Insulation shall be as recommended by the manufacturer.
- E. Dual-Service Heating and Cooling:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 3 inches thick.

- b. Flexible Elastomeric: 2 inches thick.
- c. Phenolic: 2 inch thick.

3.21 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

- A. Loose-fill insulation, for belowground piping, is specified in Division 33 piping distribution Sections.
- B. Chilled Water, All Sizes: Cellular glass, 2 inches thick.
- C. Condenser-Water Supply and Return, All Sizes: Cellular glass, 2 inches thick.
- D. Heating-Hot-Water Supply and Return, All Sizes: Cellular glass, 2 inches thick.
- E. Dual-Service Heating and Cooling, All Sizes: Cellular glass, 2 inches thick.

3.22 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts, Plenums, and Piping, Concealed (installed above ceilings) and Exposed in Air Conditioned Occupied Spaces:
 - 1. None.
- D. Ducts, Plenums, and Piping, Exposed in Air Conditioned Utility Spaces (Conditioned Mechanical Rooms and Mechanical Rooms used as Return Air Plenums):
 - 1. 8 ounce canvas with lagging adhesive.
- E. Ducts, Plenums, and Piping, Exposed in Non-Air Conditioned Spaces (Boiler Rooms, et. al.):
 - 1. PVC: 20 mils thick (N/A if installed in a return air plenum).
 - 2. Aluminum, Smooth: 0.016 inch thick.
- F. Equipment, Concealed (installed above ceilings):
 - 1. None.
- G. Equipment, Exposed (all applications):
 - 1. PVC: 20 mils thick (N/A if installed in a return air plenum)
 - 2. Aluminum, Smooth: 0.016 inch thick.

3.23 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Concealed:
 - 1. PVC: 20 mils thick.
 - 2. Aluminum, Smooth: 0.016 inch thick.
- D. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
 - 1. Aluminum, Smooth: 0.016 inch thick.
- E. Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:
 - 1. Aluminum, Smooth with: 0.032 inch thick.
- F. Equipment, Concealed:
 - 1. None.
- G. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
 - 1. Painted Aluminum, Smooth: 0.016 inch thick.
- H. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:
 - 1. Aluminum, Smooth with: 0.032 inch thick.
- I. Piping, Concealed:
 - 1. None.
- J. Piping, Exposed:
 - 1. PVC, Color-Coded by System: 20 mils thick.
 - 2. Aluminum, Smooth: 0.016 inch thick.

3.24 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230700

SECTION 230900 - BUILDING AUTOMATION SYSTEM

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. The required system will be Niagara Based and be added to existing Tridium N4 Server. 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 N4 server and match existing layout and function of other schools unless approved in writing by UCPS.

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 is to be provided via 3 hard copies and also place on N4 server to be access via system graphics.

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.

EACH DEVICE WILL BE PULLED BACK TO A NETWORK SWITCH PROVIDED BY THE CONTRACTOR AND EACH DEVICE WILL BE ASSIGNED A SEPARATE IP ADDRESS.

BACNET OVER IP (NOT USING MS/TP TRUNK).

APPROVED PRODUCTS:

1. System to be IP based, all controllers now 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.

2. APPROVED PRODUCTS:

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

Company Name	Address Location	Primary Contact Phone	Primary Contact Email
Facility Systems Services Inc	P.O. BOX 1540, Matthews, NC 28106	Danny Fox 704-214-7810	dfox@fss-i.com
Platinum Building Automation	6527 Hudspeth Road, Harrisburg, NC 28075	Jason Williams 704-765-8503	jwilliams@platinumbuildingautomation.com
Environmental Controls	PO Box 481779 Charlotte, NC 28269	Brett Downs 704-995-4245	brettd@ecmsolution.com
Carolina Air Solutions	2900 Westinghouse Boulevard Charlotte NC,28273	Billy Garrison 704-506-9068	billy@carolinaairsolutions.com

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. This Section includes control equipment for HVAC systems and all components for addition to the facility, including control components for terminal heating and cooling units not supplied with factory wired controls.

1.4 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, to control the addition and existing mechanical systems. Add interlock wiring components to existing system as indicated on the drawings.

1.5 SEQUENCE OF OPERATION **REFER TO DRAWINGS M003 **

1.6 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Each control device labeled with setting or adjustable range of control.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required

Clearances, method of field assembly, components, and location and size of each field connection.

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.

2. Wiring Diagrams: Power, signal, and point to point control wiring. Differentiate between manufacturer-installed and field-installed wiring.

3. Details of control panel faces, including controls, instruments, and labeling.

4. Written description of sequence of operation.

5. Schedule of valves including leakage and flow characteristics.

PART 2 - PRODUCTS

2.1 Products

The Basis of design is the Facility Explorer system from JCI, Approved manufactures may bid based on meeting all requirements of the specification and receiving approval from UCPS 10 days prior to bid. A paragraph by paragraph comparison of the base bid specified system versus alternative systems with three references of similar projects (including project name, contact, phone number, location, consultant, value of contract and a brief description of the control system and how it operates) shall be submitted 15 days prior to bid for review process. The manufacture must have a working system in the school system for consideration.

2.2 Software

A. All field controllers must be fully programmable with windows based software with the following requirements:

1. Software must be windows 7 and 10 compatible

2. Software must not require hardware or software keys or licensing to operate

3. Software must not depend on any other software to operate

3. Connection to field controllers must be available via BACnet IP and Bluetooth

2.3 Sensors

All existing sensor and devices must be removed and walls and ducts must be repaired and sealed properly

A. Temperature and humidity sensors as follows:

1. Space-Temperature Sensors: 10k type II Nickel Blank Stainless plate or Network sensor with no Set-point knob or Display.

2. Duct-Mounted or Immersion-Type Temperature Sensors: 10k type IINickel with Double encapsulated sensor and Easy open/close latch system (no screws)
3. Averaging-Element Sensors 10k type IINickel with copper averaging element and Easy open/close latch system (no screws)
4. Outdoors: Provide 10k type II Nickel sensor with 3% RH 0-10vdc transmitter with sun shield
5. Space and Duct Humidity Transmitters: 10k type II Nickel sensor with 3% RH 0-10vdc transmitter
6. Differential-Pressure Transmitters: Provide 0-10vdc transmitters with display

B. Equipment operation sensors as follows:

1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg (0 to 1243 Pa).
2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psig (55 to 414 kPa).
3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled water applications, provide vapor proof type.

D. Room Thermostat Cover Construction: Manufacturer's standard locking covers to match existing.

E. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet (6 m).

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.
- B. Verify that duct-, pipe-, and equipment-mounted devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

- A. Install equipment level and plumb.
- B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- C. Connect and configure equipment and software to achieve sequence of operation specified.
- D. Verify location of space temperature sensors, and other exposed control sensors with plans and room details before installation. Locate all 60 inches (1524 mm) above the floor.
 - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- E. Install guards on thermostats in the following locations:
 - 1. Entrances
 - 2. Public areas
- F. Install automatic dampers according to Division 15 Section "Duct Accessories."
- G. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- H. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."
- I. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."
- J. Install duct volume-control dampers according to Division 15 Sections specifying air ducts

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways and Boxes."
- B. Install building wire and cable according to Division 16 Section "Conductors and Cables."
- C. Install signal and communication cable according to Division 16 Section "Control/Signal Transmission Media."
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway.
 - 3. Install concealed cable in raceway.

4. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.

5. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position but not to override manual or hard wired interlock controls.

3.4 FIELD QUALITY CONTROL

Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Start, test, and adjust control systems.

2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.

3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

4. After test and calibration, any defective mechanical equipment must be reported in writing to UCPS project manager for repair before job signoff will be completed.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping,

Troubleshooting, servicing, and maintaining equipment and schedules.

2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs.

3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.6 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

3.7 JOB COMPLETION AND SIGNOFF

A. Job will be considered complete when all items of specifications are met and owner has satisfactorily completed in house commissioning

END OF SECTION 230900

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Double-wall round ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
 2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
 3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.

- d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- E. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
- 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. Hamlin Sheet Metal
 - g. Turn Key Duct Systems
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Lindab Inc.
 2. McGill AirFlow LLC.
 3. SEMCO Incorporated.
 4. Sheet Metal Connectors, Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - b. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.
- E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 3. Coat insulation with antimicrobial coating.
 4. Cover insulation with polyester film complying with UL 181, Class 1.

- F. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
 - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. CertainTeed Corporation; Insulation Group.

- b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Aeroflex USA Inc.
 - b. Armacell LLC.
 - c. K-Flex USA.
 - 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 - 3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Insulation Pins and Washers:
- 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
- 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 - 3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 4 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Water-Based Joint and Seam Sealant:
 1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.

4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.
- C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.

- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.7 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. All medium pressure supply mains from built-up Air Handling Units to the terminal box connections.
 - b. All concealed low pressure supply mains from built up Air Handling Units.
 - c. Low pressure supply ducts (single zone units and supply ductwork downstream of terminal boxes): Test representative duct sections, totaling no less than 10 percent of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.10 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.11 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.12 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel unless noted otherwise.
- B. Supply Ducts:
 1. Ducts Connected to Indoor Units, Packaged Heat Pumps, and Downstream of Terminal Boxes:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
- C. Return Ducts:
 1. Ducts Connected to Indoor Units and Packaged Heat Pumps:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 3-inch wg.

- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
- d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Carbon-steel sheet.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 3-inch wg.
 - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - f. SMACNA Leakage Class: Per current SMACNA standards based on specified pressure class.
3. Ducts Connected to Dishwasher Hoods:
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
 - e. Pressure Class: Positive or negative 2-inch wg.
 - f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - g. SMACNA Leakage Class: Per current SMACNA standards based on specified pressure class.
4. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Indoor Units or Packaged Heat Pumps:

- a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: Per current SMACNA standards based on specified pressure class.
 - d. SMACNA Leakage Class for Round and Flat Oval: Per current SMACNA standards based on specified pressure class.
- F. Intermediate Reinforcement:
1. Galvanized-Steel Ducts: Galvanized steel.
 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
 3. Aluminum Ducts: Aluminum.
- G. Double-Wall Duct Interstitial Insulation:
1. Supply Air Ducts: 1 inch thick.
 2. Return Air Ducts: 1 inch thick.
- H. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

- c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
- 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
- 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- I. Branch Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.

- c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

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SYMBOL SCHEDULE

2018 NORTH CAROLINA
ENERGY CONSERVATION CODE
COMMERCIAL ENERGY EFFICIENCY – ELECTRICAL SUMMARY

C401 METHOD OF COMPLIANCE

☐ 2018 NCECC CHAPTER 4

☐ NC SPECIFIC COMCHECK PROVIDED

☒ N/A BASED ON PROJECT SCOPE

☐ ASHRAE 90.1–2013

C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

☐ C406.2 EFFICIENT MECH EQUIPMENT

☐ C406.5 ON–SITE RENEWABLE ENERGY

☐ C406.3 REDUCED LTG DENSITY

☐ C406.6 DEDICATED OA SYSTEM

☐ C406.4 ENHANCED DIGITAL LTG CNTLS

☐ C406.7 HI–EFF SERVICE WTR HTG

☒ NOT APPLICABLE BASED ON PROJECT SCOPE

☐ C406.7.1 WTR HTG LOAD FRACTION SCOPE

C408 – SYSTEM COMMISSIONING:

☐ BUILDING IS LESS THAN 10,000 SQUARE FEET AND IS EXEMPT FROM THE SYSTEM COMMISSIONING REQUIREMENTS OF SECTION C408.

☐ BUILDING IS GREATER THAN 10,000 SQUARE FEET AND REQUIRES SYSTEM COMMISSIONING PER SECTION C408.

☐ NOT APPLICABLE

C405.2 – LIGHTING CONTROLS (MANDATORY REQUIREMENTS):

☐ LIGHTING SYSTEMS ARE PROVIDED WITH CONTROLS AS REQUIRED PER SECTION C405.2, EXCEPT WHERE EXEMPT.

☐ NOT APPLICABLE

C405.3 – EXIT SIGNS (MANDATORY REQUIREMENTS):

☐ INTERNALLY ILLUMINATED EXIT SIGNS DO NOT EXCEED 5 WATTS PER SIDE.

☐ NOT APPLICABLE

C405.4 – INTERIOR LIGHTING POWER REQUIREMENTS (PRESCRIPTIVE) (NON–EXEMPT):

☒ NOT APPLICABLE PER 2018 NCECC C503.1, EXCEPTION 2.G.

C405.4.1 – TOTAL CONNECTED INTERIOR LIGHTING POWER:
_____ WATTS SPECIFIED
_____ % REDUCTION OF SPECIFIED VS. ALLOWED (APPLICABLE IF C406.1.2 IS SELECTED)

C405.4.2 – TOTAL ALLOWABLE INTERIOR LIGHTING POWER:
METHOD OF COMPLIANCE:

☐ BUILDING AREA METHOD

☐ SPACE–BY–SPACE METHOD

_____ WATTS ALLOWED

C405.5.1 – EXTERIOR BUILDING LIGHTING POWER (NON–EXEMPT):

☒ NOT APPLICABLE

TOTAL CONNECTED EXTERIOR LIGHTING POWER:
_____ WATTS SPECIFIED

TOTAL ALLOWABLE EXTERIOR LIGHTING POWER:
_____ WATTS ALLOWED

C405.6 – ELECTRICAL ENERGY CONSUMPTION (DWELLING UNITS):

☐ SEPARATE ELECTRICAL METERING HAS BEEN PROVIDED FOR EACH DWELLING UNIT IN GROUP R–2 BUILDINGS.

☐ NOT APPLICABLE

C405.7 – ELECTRICAL TRANSFORMERS (MANDATORY REQUIREMENTS):

☐ ELECTRICAL TRANSFORMERS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.7, EXCEPT WHERE EXEMPT.

☒ NOT APPLICABLE

C405.8 – ELECTRICAL MOTORS (MANDATORY REQUIREMENTS):

☐ ELECTRICAL MOTORS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.8, EXCEPT WHERE EXEMPT.

☐ NOT APPLICABLE

C405.9 – VERTICAL AND HORIZONTAL TRANSPORTATION SYSTEMS AND EQUIPMENT:

☐ VERTICAL AND HORIZONTAL TRANSPORTATION SYSTEMS AND EQUIPMENT HAVE BEEN SPECIFIED TO COMPLY WITH REQUIREMENTS PER C405.9, EXCEPT WHERE EXEMPT.

☒ NOT APPLICABLE

GENERAL PROJECT NOTES

- A. ELECTRICAL CODE COMPLIANCE SHALL BE IN ACCORDANCE WITH NEC 2020.
B. ALL ELECTRICAL MATERIALS, DEVICES, APPLIANCES, AND EQUIPMENT SHALL BE LABEL LISTED BY AN NC APPROVED THIRD PARTY TESTING AGENCY.
C. FIRE ALARM SHOP DRAWINGS SHALL BE INSTALLED PER NFPA 72 2013 REQUIREMENTS.

DEVICES AND PATHWAYS

 BRANCH CIRCUIT HOMERUN TO PANEL.

 GROUND FAULT RECEPTACLE WITH WEATHERPROOF COVER. NEMA 5–20R DUPLEX.

PANELS, DISCONNECTS

☒ FUSED HEAVY DUTY DISCONNECT SWITCH. NUMERALS INDICATE SWITCH RATING/FUSE SIZE. NEMA 1 ENCLOSURE, UNLESS OTHERWISE NOTED.

 PANELBOARD. SEE SCHEDULE FOR MOUNTING. TOP OF PANEL AT 6'–6" AFF.

PLAN NUMBER	PLAN NAME
E001	ELECTRICAL NOTES, LEGENDS & SPECIFICATIONS
E002	ELECTRICAL POWER RISERS
E003	MIDDLE SCHOOL PANEL SCHEDULES
E004	HIGH SCHOOL PANEL SCHEDULES
E201	MIDDLE SCHOOL ELECTRICAL WORK
E202	HIGH SCHOOL ELECTRICAL WORK – DEMOLITION PLAN SOUTH
E203	HIGH SCHOOL ELECTRICAL WORK – DEMOLITION PLAN NORTH
E203	HIGH SCHOOL ELECTRICAL WORK – NEW WORK

1. GENERAL:

A. THE WORK COVERED BY THESE SPECIFICATIONS CONSISTS OF FURNISHING ALL LABOR, EQUIPMENT, MATERIALS, SUPPLIES AS NECESSARY FOR MULTILINE WIRE BRANCH CIRCUITS SHALL NOT BE ALLOWED. COMPLETE AND SATISFACTORY OPERATING ELECTRICAL SYSTEMS AS SHOWN ON THE PLANS.

B. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2020 NATIONAL ELECTRICAL CODE, NFPA, STATE BUILDING CODE, AND ANY OTHER LOCAL REQUIREMENTS THAT MAY APPLY.

C. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL ELECTRICAL PERMITS AND INSPECTION FEES.

D. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND SHALL BE LISTED BY THE UNDERWRITER'S LABORATORIES, INC. OR BY A STATE APPROVED THIRD PARTY TESTING AGENCY FOR THE USE INTENDED WHERE A STANDARD FOR SUCH MATERIALS AND USE EXISTS. ALL ITEMS OF THE SAME TYPE AND RATING SHALL BE IDENTICAL AND OF THE SAME MANUFACTURER.

E. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND CATALOG DATA IN ELECTRONIC FORMAT (PDF) FOR ALL ELECTRICAL ITEMS IN THE SCOPE OF WORK, INCLUDING, BUT NOT LIMITED TO, RACEWAYS, BOXES, FITTINGS, CONDUCTORS, WIRING DEVICES, SAFETY SWITCHES, DISCONNECTS, PANELBOARDS, FIRE ALARM, ETC. FOR APPROVAL AS APPLICABLE FOR THE PROJECT. ONE COMPLETE SET OF APPROVED SUBMITTALS SHALL BE MAINTAINED AT THE JOB SITE.

F. ALL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT TO COMPLY WITH THE BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, CONDUIT, WIRING, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, METHODS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COSTS ASSOCIATED WITH SUBSTITUTED EQUIPMENT WILL BE APPROVED AFTER BIDS HAVE BEEN ACCEPTED AND ALL COSTS WILL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. CREDITS SHALL BE GIVEN TO THE OWNER WHERE SUCH EQUIPMENT AND METHODS RESULT IN LESS EXPENSE TO THE CONTRACTOR.

G. ONE COMPLETE SET OF THE LATEST CONSTRUCTION PLANS OF ALL TRADES SHALL BE MAINTAINED AT THE JOB SITE. IN ADDITION, ALL ADDENDUMS, BULLETINS, AND/OR SKETCHES SHALL BE INCORPORATED INTO THE ON–SITE CONSTRUCTION PLANS AS THE JOB PROGRESSES.

H. COMPLETELY ADEQUATE HOUSING SHALL BE PROVIDED FOR ALL MATERIALS STORED ON JOB SITE. ONLY CONDUIT MAY BE STORED OUTSIDE, BUT NOT IN CONTACT WITH THE GROUND.

I. WIRING SHALL BE TESTED FOR CONTINUITY AND GROUNDS BEFORE BEING ENERGIZED. FAULTY WIRING SHALL BE REPLACED AT NO ADDITIONAL EXPENSE TO THE OWNER.

J. PROVIDE ALL CUTTING AND PATCHING FOR INSTALLATION OF WORK AND REPAIR ANY DAMAGE DONE.

K. THE ELECTRICAL CONTRACTOR SHALL CONNECT ALL EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS (UNLESS OTHERWISE NOTED), EXCEPT FOR CONTROL WIRING FOR EQUIPMENT NOT PROVIDED BY THE ELECTRICAL CONTRACTOR. CONTROL WIRING FOR SUCH EQUIPMENT SHALL BE PROVIDED BY THE RESPECTIVE DISCIPLINE.

L. ALL ELECTRICAL JUNCTION BOXES, SWITCHGEAR, RECEPTACLES, ETC. SHALL BE LABELED ACCORDING TO PANEL, RACK AND CIRCUIT NUMBER.

M. UPON COMPLETION OF WORK, CONTRACTOR SHALL PRESENT ENGINEER WITH CERTIFICATE OF APPROVAL FROM LOCAL INSPECTOR AND/OR AUTHORITY HAVING JURISDICTION BEFORE WORK WILL BE APPROVED FOR FINAL PAYMENT.

N. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS FOR A PERIOD OF ONE YEAR EFFECTIVE THE DATE THE PROJECT IS ACCEPTED BY THE OWNER. ANY IMPERFECT MATERIALS OR WORKMANSHIP SHALL BE REPLACED WITHOUT ADDED COST TO THE PROJECT.

O. IT SHALL NOT BE THE INTENT OF ISSUED PLANS AND/OR SPECIFICATIONS TO SHOW EVERY MINOR DETAIL OF CONSTRUCTION. THE ELECTRICAL CONTRACTOR IS EXPECTED TO FURNISH AND INSTALL ALL NECESSARY ITEMS FOR A COMPLETE AND OPERATING SYSTEM.

P. THE WORD "PROVIDE" MEANS THAT THIS CONTRACTOR SHALL FURNISH, FABRICATE, ERECT, CONNECT, AND COMPLETELY INSTALL SYSTEMS IN PROPER OPERATING CONDITION. ALL LABOR, PRODUCT OPTIONS, ACCESSORIES AND INCIDENTAL MATERIALS REQUIRED SHALL BE INCLUDED AS PART OF THIS WORK TO COMPLETE THE INSTALLATION.

Q. THE WORD "CONNECT" MEANS THAT THIS CONTRACTOR SHALL PROVIDE (SEE DEFINITION ABOVE) ALL DISCONNECTING MEANS, OVERCURRENT PROTECTION AND WIRING REQUIRED TO PLACE THE EQUIPMENT AND SYSTEMS IN PROPER OPERATING CONDITION AND TO COMPLY WITH CODE REQUIREMENTS.

R. CONTRACTOR SHALL COORDINATE THE ROUGH–IN OF ALL OUTLET LOCATIONS WITH ARCHITECTURAL FLOOR PLANS, ELEVATIONS, AND MILLWORK SHOP DRAWINGS PRIOR TO ROUGH–IN.

S. ELECTRICAL CONTRACTOR SHALL NOT SCALE PLANS. CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS AND ELEVATIONS FOR EXACT LOCATIONS OF ALL EQUIPMENT, UNLESS OTHERWISE NOTED.

T. IF DURING THE COURSE OF WORK, THE CONTRACTOR DISCOVERS A PROBLEM WITH THE PERFORMANCE OF THE INSTALLATION RELATIVE TO THE PLANS AND SPECIFICATIONS, THE NEC, OR OTHER CODES OR REQUIREMENTS, THE CONTRACTOR SHALL IMMEDIATELY BRING THE PROBLEM TO THE ATTENTION OF THE ARCHITECT AND/OR ENGINEER FOR RESOLUTION PRIOR TO THE EXECUTION OF THE WORK.

U. WHERE THERE ARE CONFLICTS BETWEEN THE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL BRING THE ISSUE TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION PRIOR TO THE EXECUTION OF THE WORK OR ORDERING ANY MATERIALS. NO ADDITIONAL COSTS SHALL BE WARRANTED WITHOUT A CHANGE TO THE PROJECT SCOPE.

2. RACEWAY:

A. CONDUIT SHALL BE MANUFACTURED BY ALLIED, WHEATLAND, REPUBLIC CONDUIT, WESTERN TUBE, OR APPROVED EQUIVALENT.

B. FOR INTERIOR WORK, CONDUIT SHALL BE ZINC COATED EMT EXCEPT WHERE NOT PERMITTED BY CODE. USE IMC OUTDOORS.

C. EMT FITTINGS SHALL BE COMPRESSION GLAND TYPE, OF MALLEABLE STEEL. CONNECTORS SHALL HAVE INSULATED THROATS. CAST, SET SCREWS OR INDENTER TYPE FITTINGS ARE NOT ACCEPTABLE. ALL FITTINGS FOR EMT SHALL BE MADE OF STEEL.

D. ALL RACEWAY SHALL BE RUN CONCEALED, UNLESS OTHERWISE NOTED. FISH ALL NEW OUTLETS IN EXISTING WALLS, WHERE POSSIBLE. ALL RUNS SHALL BE NEAT AND SQUARE.

E. RACEWAY PENETRATIONS THROUGH FLOOR SLABS AND FIRE–RATED WALLS SHALL BE FILLED WITH IMPERVIOUS, NON–SHRINK GROUT SUFFICIENTLY TIGHT TO PREVENT THE TRANSFER OF SMOKE, WATER, AND DUST. ROOF PENETRATIONS SHALL BE WITHIN THE EQUIPMENT ROOF CURB.

F. SUPPORT ALL CONDUIT WITH STRAPS AND CLAMPS.

G. ALL CONDUIT SHALL BE RUN PARALLEL OR PERPENDICULAR TO BUILDING LINES, WHETHER EXPOSED OR NOT AND SUPPORTED FROM STRUCTURE AND PROPERLY SECURED.

H. WHERE CONDUITS PASS THROUGH A BUILDING EXPANSION JOINT, PROVIDE GALVANIZED EXPANSION FITTINGS WITH BONDING JUMPERS.

I. MINIMUM CONDUIT SIZE SHALL BE 3/4" FOR INTERIOR WORK, 1" FOR EXTERIOR WORK.

J. PROVIDE MINIMUM 210# TEST NYLON PULL CORD AND NYLON BUSHINGS IN ALL EMPTY RACEWAYS.

K. LIQUID–TIGHT METAL CONDUIT SHALL ONLY BE USED FOR FINAL CONNECTIONS TO EQUIPMENT AND ALL OTHER ROTATING AND VIBRATING EQUIPMENT, MAXIMUM LENGTH OF 3'–0".

L. PROVIDE PULL BOXES, SUCH THAT NO SINGLE CONDUIT RUN HAS BENDS IN EXCESS OF 360°. PULL BOXES SHALL BE SUITABLE AND APPROVED FOR THE INTENDED USE. WHERE CONDUITS PASS UNDER PAVED AREAS, THEY SHALL BE RGS.

M. ALL CONDUIT BENDS/ELBOWS EMERGING FROM UNDERGROUND SHALL BE IMC AND SHALL EXTEND A MINIMUM OF 18" BELOW GRADE.

N. THE USE OF AC OR NM CABLE IS NOT PERMITTED.

3. OUTLET BOXES:

A. JUNCTION AND PULL BOXES SHALL BE CODE GAUGE GALVANIZED STEEL. ACCEPTED MANUFACTURERS SHALL BE STEEL CITY (THOMAS & BETTS), RACO, CROUSE–HINDS, APPLETON (EMERSON), OR APPROVED EQUIVALENT.

B. OUTLET BOXES SHALL NOT BE MOUNTED BACK TO BACK IN COMMON WALLS. ATTACH EMT IN TH CONNECTORS HAVING INSULATED THROAT.

C. ATTACH BOXES TO STUD WORK USING CADDY BAR STRAPS THAT CONNECT TO TWO ADJACENT METAL STUDS TO PREVENT TWISTING OF BOX IN WALL.

D. ALL OUTLET BOXES (INCLUDING TELEPHONE, CABLE TV, AND COMPUTER) SHALL HAVE COVER PLATES. BLANK IF NOT USED.

E. ALL EXTERIOR BOXES SHALL BE WATER–TIGHT.

4. CONDUCTORS:

A. CONDUCTORS SHALL BE MANUFACTURED BY SOUTHWIRE (SIMPULL), ENCORE (SUPERSUCK), UNITED COPPER (SLK), CERRO (SLP), OR APPROVED EQUAL, "PRE–LUBRICATED" BY THE MANUFACTURER.

B. ALL CONDUCTORS SHALL BE COPPER, RATED 75° C WET/DRY EXCEPT WHERE OTHERWISE NOTED OR REQUIRED BY U.L. OR OTHER CODES.

C. ALL CONDUCTORS SHALL BE SINGLE INSULATED CONDUCTOR, THHN/THWN–2, SIZES #10 AWG AND SMALLER SHALL BE SOLID, SIZES #8 AWG AND LARGER SHALL BE STRANDED.

D. BRANCH CIRCUITS SHALL NOT BE SMALLER THAN #12 AWG. CONTROL WIRING MAY BE #14 AWG.

E. CONDUCTORS SHALL BE COLOR CODED BLACK/RED/BLUE FOR 120/208 VOLT SYSTEMS AND BROWN/ORANGE/YELLOW FOR 277/480 VOLT SYSTEMS FOR A, B, AND C PHASES, RESPECTIVELY. NEUTRAL SHALL BE WHITE FOR 120/208 VOLT SYSTEMS AND NATURAL GRAY FOR 277/480 VOLT SYSTEMS. GROUND CONDUCTOR SHALL BE GREEN ON ALL SYSTEMS. ALL CONDUCTOR SIZES SHALL HAVE COLOR–CODED INSULATION. THE USE OF COLORED TAPE ON LARGER WIRE SIZES SHALL NOT BE ALLOWED.

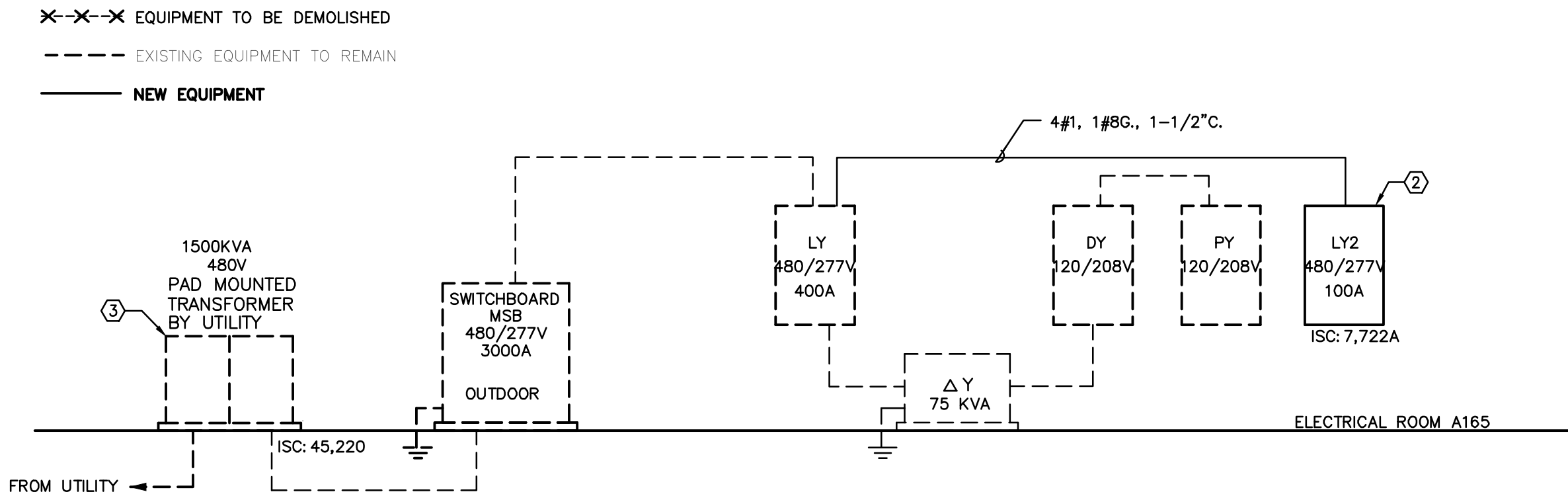
F. INSULATION SHALL BE DUAL RATED TYPE THHN/THWN–2 FOR FEEDERS AND BRANCH CIRCUITS. FIXTURE TAPS SHALL BE #12 THHN/THWN–2 IN FLEX WITH
- | VOLTAGE | CONDUCTOR LENGTH • | BRANCH CIRCUIT |
|---|--------------------|----------------|
| 120 | – 50' | #10 |
| 120 | 51' – 90' | #10 |
| 120 | 91' – 140' | #8 |
| 120 | 141' – 225' | #6 |
| 277 | 0' – 125' | #12 |
| 277 | 126' – 200' | #10 |
| 277 | 201' – 330' | #8 |
| 277 | 331' – 525' | #6 |
| • – THE LENGTH IS MEASURED FROM THE CIRCUIT BREAKER TO THE FIRST DEVICE WHICH THE BRANCH CIRCUIT SERVES. WHERE THE DISTANCE EXCEEDS ABOVE, CONSULT WITH THE ENGINEER. | | |
- SUPPORTS:
- A. ALL EQUIPMENT SHALL BE ADEQUATELY SUPPORTED FROM STRUCTURE.
B. INSERTS IN MASONRY SHALL BE LEAD OR FIBER IN DRILLED HOLES, OR CAST IN PLACE.
C. NAILS OR POWER ACTUATED FASTENERS SHALL NOT BE USED.
D. EMT/IMC/RGS SUPPORTS SHALL BE A MAXIMUM OF 8'–0" APART AND A MAXIMUM OF 3'–0" FROM BOXES.
- ELECTRICAL COORDINATION WITH OTHER TRADES:
- A. THE ELECTRICAL CONTRACTOR SHALL CONNECT AND/OR PROVIDE FINAL CONNECTIONS TO ALL EQUIPMENT SUPPLIED BY OTHERS APPLICABLE TO THE PROJECT, INCLUDING BUT NOT LIMITED TO, MECHANICAL, PLUMBING, FIRE PROTECTION AND SUPPRESSION, OWNER FURNISHED, KITCHEN, LABORATORY, ETC. UNLESS OTHERWISE NOTED.
B. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL CONNECTIONS PRIOR TO THE START OF CONSTRUCTION.
C. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL MANUAL MOTOR STARTER SWITCHES, DISCONNECT SWITCHES, RECEPTACLES, ETC. TO MECHANICAL AND PLUMBING EQUIPMENT. ALL STARTERS, OTHER THAN MANUAL STARTER SWITCHES, SHALL BE PROVIDED BY OTHERS, BUT INSTALLED BY THE ELECTRICAL CONTRACTOR.
D. ALL DISCONNECT SWITCHES AND FUSE SIZES SHALL BE COORDINATED WITH SHOP DRAWINGS PRIOR TO ORDERING OR INSTALLING. ANY EQUIPMENT INSTALLED INCORRECTLY BECAUSE OF LACK OF COORDINATION WILL BE REMOVED AND REINSTALLED CORRECTLY AT THE EXPENSE OF THE ELECTRICAL CONTRACTOR.
E. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL CONDUIT RUNS AND LIGHT FIXTURE LOCATIONS ABOVE THE CEILING WITH OTHER TRADES PRIOR TO INSTALLATION.
F. ALL DUCT SMOKE DETECTORS SHALL BE PROVIDED AND CONNECTED BY THE ELECTRICAL CONTRACTOR, BUT INSTALLED BY THE MECHANICAL CONTRACTOR.
G. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY OUTLETS FOR HEAT TAPE CONNECTIONS FOR MECHANICAL SYSTEMS. PROVIDE CLASS 3 (30mA) GFCI PROTECTION ON THE BREAKER SUPPLYING THE HEAT TAPE.
H. THE ELECTRICAL CONTRACTOR SHALL PROVIDE 120V POWER AT EACH HVAC UNIT HAVING A CONTRACT POWER SUPPLY. CIRCUIT(S) SHALL BE DEDICATED 20A SERVING A MAXIMUM OF 10 HVAC UNITS PER CIRCUIT. COORDINATE ALL LOCATIONS WITH THE MECHANICAL CONTRACTOR.
- DEMOLITION NOTES:
- A. PARTIAL AND TOTAL DEMOLITION OF PORTIONS SHALL BE PERFORMED ALONG WITH ALL NECESSARY MODIFICATIONS TO THAT PORTION OF THE EXISTING BUILDING WHICH SHALL REMAIN SO THAT IT CONTINUES TO FUNCTION UNAFFECTED BY THE DEMOLITION AND ASSOCIATED NEW CONSTRUCTION.
B. WHERE INCLUDED AS PART OF THE CONTRACT DOCUMENTS, THE DRAWINGS INDICATE THE GENERAL AREAS OF WORK INVOLVED. HOWEVER, THE ELECTRICAL CONTRACTOR SHALL PERFORM WORK OUTSIDE THOSE AREAS SHOWN AS IS NECESSARY TO COMPLY WITH THE INTENT OF THIS SECTION.
C. THE ELECTRICAL CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE EXISTING BUILDING AND WITH THE WORK OF ALL OTHER TRADES AND INCLUDE ALL WORK NECESSARY TO COMPLY WITH THE INTENT OF THE DEMOLITION.
D. IT SHALL BE UNDERSTOOD THAT FIELD CONDITIONS MAY BE ENCOUNTERED DURING THE EXECUTION OF THIS CONTRACT WHICH WILL REQUIRE EXTENSION OR RELOCATION OF EXISTING SYSTEMS OR EQUIPMENT WHICH ARE NOT SPECIFICALLY SHOWN ON THE DRAWINGS, BUT WHICH ARE REQUIRED TO MEET THE STATED INTENT THAT THE BUILDING CONTINUE TO FUNCTION UNAFFECTED BY THE DEMOLITION AND ASSOCIATED NEW CONSTRUCTION. THE ELECTRICAL CONTRACTOR SHALL INCLUDE SUCH WORK AS WOULD NORMALLY BE EXPECTED IN AN EXISTING BUILDING OF THIS AGE AND TYPE.
E. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL TOOLS, EQUIPMENT, LABOR, ETC. IN ORDER TO ACCOMPLISH THE DEMOLITION PORTION OF THE PROJECT.
F. THE DEMOLITION OF CERTAIN AREAS OF THE EXISTING BUILDING SHALL BE PERFORMED BY THE GENERAL CONTRACTOR. IT SHALL BE THE ELECTRICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE GENERAL CONTRACTOR TO DIFFERENTIATE THE SCOPE OF WORK BETWEEN SEPARATE TRADES.
G. THE ELECTRICAL CONTRACTOR SHALL INCLUDE COORDINATION WITH THE GENERAL CONTRACTOR AND SUCH DEMOLITION OF THE EXISTING ELECTRICAL SYSTEMS AS IS NECESSARY SO THAT THE DEMOLITION WORK OF THE GENERAL CONTRACTOR SHALL NOT DAMAGE THOSE PORTIONS OF THE ELECTRICAL SYSTEMS WHICH ARE TO REMAIN IN SERVICE, ARE TO BE REUSED, OR ARE TO BECOME THE PROPERTY OF THE OWNER.
H. TURN OVER TO OWNER, UPON REQUEST OR AS NOTED, ITEMS SHOWN AS BEING REMOVED AND NOT REINSTALLED. ITEMS NOT DIRECTED OR REQUESTED TO BE TURNED OVER TO THE OWNER SHALL BE DISPOSED OF BY THE ELECTRICAL CONTRACTOR.
I. EQUIPMENT OR MATERIALS WHICH ARE TO BE REUSED OR TURNED OVER TO THE OWNER SHALL BE CAREFULLY REMOVED, CLEANED, AND STORED IN A CLEAN AND DRY AREA. SHOULD THE ELECTRICAL CONTRACTOR ENCOUNTER SUCH EQUIPMENT WHICH IS NOT IN SATISFACTORY CONDITION FOR REUSE AND NOT IN WORKING ORDER, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY.
J. DISCONNECT ELECTRICAL SERVICES TO ALL EQUIPMENT REQUIRING REMOVAL. CONDUIT SHALL BE REMOVED BACK TO THE POINT WHERE IT WILL BE CONCEALED AT THE COMPLETION OF THIS CONTRACT. WIRE AND CABLE SHALL BE REMOVED BACK TO THE FIRST OUTLET BOX, CABINET, OR TERMINATION POINT WHICH IS TO REMAIN. CIRCUITS WHICH ARE NOT REUSED SHALL BE REMOVED BACK TO THE SOURCE IN THEIR ENTIRETY.
K. REMOVE AND REINSTALL CEILINGS IN THE EXISTING BUILDING AS REQUIRED FOR THE WORK. COORDINATE WITH THE GENERAL CONTRACTOR. IN SUCH AREAS, REMOVE AND REINSTALL ALL ELECTRICAL DEVICES WHICH ARE TO REMAIN IN OR ON THE CEILING.
L. WHERE NEW CEILINGS CONFLICT WITH EXISTING ELECTRICAL WORK WHICH IS TO REMAIN, RELOCATE THE ELECTRICAL WORK INVOLVED TO CLEAR THE NEW CONSTRUCTION.
M. WHERE NEW WALL OR FLOOR FINISHES CONFLICT WITH EXISTING ELECTRICAL WORK WHICH IS TO REMAIN, RELOCATE THE ELECTRICAL WORK INVOLVED OR PROVIDE BOX EXTENSIONS OR SIMILAR DEVICES AND REINSTALL ON THE NEW FINISH.
N. WHERE EXISTING BRANCH CIRCUITS AND SYSTEMS ARE INTERRUPTED BY NEW WORK OR SYSTEMS (ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, ETC.), EXTEND AND RECONNECT THOSE CIRCUITS AND SYSTEMS. WHERE THOSE CIRCUITS OR SYSTEMS MUST REMAIN IN SERVICE DURING THE EXECUTION OF THIS CONTRACT, PROVIDE TEMPORARY CONNECTIONS UNTIL FINAL CONNECTIONS ARE COMPLETE.

9. FIRE STOPPING:

A. ALL PENETRATIONS OF RATED ASSEMBLIES SHALL BE SEALED WITH RATED MATERIALS MEETING ASTM E–814.
B. PROVIDE FIRESTOPPING DEVICE(S) OR SYSTEM(S) WHICH HAVE BEEN TESTED AND LISTED AS COMPLYING WITH ASTM E–814. INSTALL THE DEVICE(S) OR
- SYSTEM(S) IN ACCORDANCE WITH THE CONDITIONS OF THEIR LISTING. PROVIDE THE APPROPRIATE DEVICE(S) OR SYSTEM(S) WITH AN "I" RATING EQUAL TO THE RATING OF THE ASSEMBLY BEING PENETRATED.
C. DEVICE(S) AND/OR SYSTEM(S) SHALL BE BY HILTI, 3M OR EQUIVALENT.
- MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • TECHNOLOGY DESIGN
-
- sun valley high school and middle school hvac renovations
- middle school
1409 wesley chapel rd
monroe, nc 28110
- | REV # | DATE | DESCRIPTION |
|-------|------|-------------|
| | | |
| | | |
| | | |
| | | |

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: wd
DESIGNED BY: wd
CHECKED BY: mam
- SHEET TITLE:
ELECTRICAL
NOTES,
SYMBOLS AND
LEGEND
- DWG #:
E001
SHEET NO: 1 of 8
- OPTIMA ENGINEERING
MECHANICAL • ELECTRICAL • PLUMBING • FIRE PROTECTION • LIGHTING DESIGN

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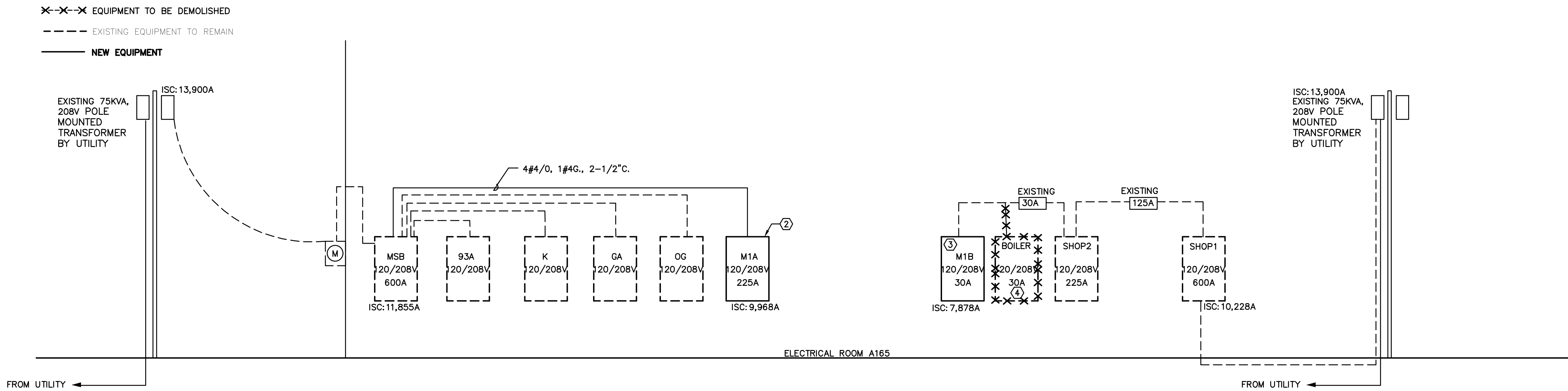
1 MIDDLE SCHOOL POWER RISER DIAGRAM

NO SCALE

- NOTES:
- DASHED EQUIPMENT EXISTING AND TO REMAIN IN PLACE.
 - PROVIDE NEW 100A PANEL.
 - CONTRACTOR SHALL CONTACT UTILITY ELECTRIC COMPANY AND NOTIFY OF THE ADDITIONAL LOAD ON THE TRANSFORMER.

PANEL DESIGNATION	MSB
VOLTAGE	480/277V
AMPERAGE	3000A
DESIGNED LOAD CAP (KVA)	2,393.00
CURRENT CONNECTED LOAD (KVA)	+1932.0
REMOVED LOAD (KVA)	-0.00
NEW LOAD (KVA)	+79.68
NEW TOTAL LOAD (KVA)	2011.68

- 12 MONTH PEAK DEMAND PROVIDED BY DUKE ENERGY ON 12/20/24. THE EXISTING LOAD FOR PANEL MSB IS ALSO CALCULATED PER NEC 220.87.



2 HIGH SCHOOL POWER RISER DIAGRAM

NO SCALE

- NOTES:
- DASHED EQUIPMENT EXISTING AND TO REMAIN IN PLACE.
 - PROVIDE NEW 225A PANEL. FEED FROM NEW BREAKER LOCATED IN PANEL 'MSB'.
 - PROVIDE NEW 30A PANEL. FEED FROM EXISTING 30A BREAKER LOCATED IN PANEL 'SHOP2'.
 - DEMO EXISTING BOILER PANEL. REUSE FEED TO SUPPLY NEW PANEL.

PANEL DESIGNATION	'MSB'
VOLTAGE	120/208V
AMPERAGE	600A
DESIGNED LOAD CAP (KVA)	172.80
CURRENT CONNECTED LOAD (KVA)	+21.8
REMOVED LOAD (KVA)	-2.25
NEW LOAD (KVA)	+34.35
NEW TOTAL LOAD (KVA)	53.90

- 12 MONTH PEAK DEMAND PROVIDED BY DUKE ENERGY ON 01/31/25. THE EXISTING LOAD FOR PANEL RED IS ALSO CALCULATED PER NEC 220.87.

PANEL DESIGNATION	'SHOP1'
VOLTAGE	120/208V
AMPERAGE	600A
DESIGNED LOAD CAP (KVA)	172.80
CURRENT CONNECTED LOAD (KVA)	+145.00
REMOVED LOAD (KVA)	-4.69
NEW LOAD (KVA)	+00.00
NEW TOTAL LOAD (KVA)	140.31

- 12 MONTH PEAK DEMAND PROVIDED BY DUKE ENERGY ON 01/31/25. THE EXISTING LOAD FOR PANEL RED IS ALSO CALCULATED PER NEC 220.87.

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • TECHNOLOGY DESIGN



1927 S. TRYON ST., SUITE 300, CHARLOTTE NC 28203
150 FAYETTEVILLE ST., SUITE 520, RALEIGH, NC 27601
PHONE: 704.366.1111
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NORTH CAROLINA LICENSE NUMBER C-059114

SEAL:

sun valley
high school and
middle school
hvac renovations

middle school
5211 old charlotte hwy 1409 wesley chapel rd
monroe, nc 28110

REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: wd
DESIGNED BY: wd
CHECKED BY: mam

SHEET TITLE:
ELECTRICAL
POWER RISERS

DWG #:
E002
SHEET NO: 2 of 8

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EXISTING PANEL: LY (N)																SOD MFR		
LOAD TYPE	VOLTAGE: 277 / 480 3 PHASE 4 WIRE														NF TYPE			
	MOUNTING: SURFACE 400 AMP MAIN CIRCUIT BREAKER														22,000 AIC			
	LOAD KVA	LOAD SERVED	WIRE	TRIP	FRAME (Note 1)	CKT NO	A	B	C	CKT NO	FRAME (Note 1)	TRIP	WIRE	LOAD SERVED	LOAD KVA	LOAD TYPE		
C	17.50	RTU-1		EX	100	1				2						12.27	F	
C	17.50					3				4				125	EX	PANEL DTY VIA TRANS	12.90	F
C	17.50					5				6						13.17	F	
L	1.80	LTG CLASS		EX	20	7				8			20	EX	LTG EXTERIOR	1.20	L	
L	1.80	LTG CLASS		EX	20	9				10			20	EX	LTG EXT	1.20	L	
L	1.80	LTG CLASS		EX	20	11				12			20	EX	LTG COOR	2.25	L	
L	1.80	LTG CLASS		EX	20	13				14			20	EX	LTG TEACHER WK RM	2.40	L	
L	1.80	LTG CLASS		EX	20	15				16			20	EX	EXISTING	2.00	MS	
L	1.80	LTG CLASS		EX	20	17				18			20	EX	EXISTING	2.00	MS	
MS	1.00	EXISTING		EX	20	19				20			20		SPARE	0.00	S	
MS	1.00	EXISTING		EX	20	21				22			20		SPARE	0.00	S	
MS	1.00	EXISTING		EX	20	23				24			20		SPARE	0.00	S	
S	0.00	SPARE			20	25				26			20		SPARE	0.00	S	
S	0.00	SPARE			20	27				28			20		SPARE	0.00	S	
S	0.00	SPARE			20	29				30			20		SPACE ONLY	0.00	S	
H	3.00			12		31				32					SPACE ONLY	0.00	S	
H	3.00	VAV BOX 1-1		15		33				34					SPACE ONLY	0.00	S	
H	3.00	(NOTE 1)				35				36					SPACE ONLY	0.00	S	
H	3.00			12		37				38					SPACE ONLY	0.00	S	
H	3.00	VAV BOX 1-2		15		39				40			100	1	PANEL LY2	18.98	F	
H	3.00	(NOTE 1)				41				42			100	1	(NOTE 1)	18.98	F	
SUB-TOTALS																106.3		
84.3																		
L	LOAD (KVA)	Conn	D.F	Dmd	TOTAL LOAD PER PHASE:												NOTES:	
L	LIGHTS	17.9	1.25	22.3	CONNECTED												1. PROVIDE NEW BREAKER IN SPARE LOCATION	
H	HEATING	74.9	1.00	74.9	A = 63.0 KVA 227.2 A													
C	COOLING	55.2	1.00	55.2	B = 63.2 KVA 228.0 A													
V	VENTILATION	4.0	1.00	4.0	C = 64.5 KVA 232.7 A													
M	Motors	0.0	1.00	0.0	DEMAND													
K	KITCHEN	0.0	0.65	0.0	A = 63.0 KVA 227.2 A													
R	REC. (1st 10kVA)	10.0	1.00	10.0	B = 63.1 KVA 227.6 A													
R	REC. (>10kVA)	8.8	0.50	4.4	C = 64.6 KVA 233.3 A													
WH	WATER HEATER	3.0	1.00	3.0	DEMAND @ 125%													
MS	MSC	16.8	1.00	16.8	A = 78.7 KVA 284.0 A													
S	SPARE	0.0	1.00	0.0	B = 78.8 KVA 284.5 A													
	TOTAL (KVA)	190.8		180.7	C = 80.8 KVA 291.6 A													

NEW PANEL: LY2																SOD MFR	
VOLTAGE: 277 / 480 3 PHASE 4 WIRE																NF TYPE	
MOUNTING: SURFACE 100 AMP MAIN CIRCUIT BREAKER																22,000 AIC	
LOAD TYPE	LOAD KVA	LOAD SERVED	WIRE	TRIP	FRAME (Note 1)	CKT NO	A	B	C	CKT NO	FRAME (Note 1)	TRIP	WIRE	LOAD SERVED	LOAD KVA	LOAD TYPE	
H 3.00	3.00	VAV BOX 1-3	12	15		1				2			12		VAV BOX 1-6	3.66	H
H 3.00	3.00		12			3				4			12			3.66	H
H 3.00	3.00		12			5				6			12			3.66	H
H 3.00	3.00	VAV BOX 1-4	12	15		7				8			12		VAV BOX 1-7	3.66	H
H 3.00	3.00		12			9				10			20			3.66	H
H 3.00	3.00		12			11				12			12			3.66	H
H 2.00	2.00	VAV BOX 1-5	12	15		13				14			12		VAV BOX 1-8	3.66	H
H 2.00	2.00		12			15				16			12			3.66	H
S 0.00	0.00	SPARE				17				18			20		SPARE	0.00	S
S 0.00	0.00	SPARE				19				20			20		SPARE	0.00	S
S 0.00	0.00	SPARE				21				22			20		SPARE	0.00	S
S 0.00	0.00	SPARE				23				24			20		SPARE	0.00	S
S 0.00	0.00	SPARE				25				26			20		SPARE	0.00	S
S 0.00	0.00	SPARE				27				28			20		SPARE	0.00	S
S 0.00	0.00	SPARE				29				30			20		SPARE	0.00	S
S 0.00	0.00	SPACE ONLY				31				32					SPACE ONLY	0.00	S
S 0.00	0.00	SPACE ONLY				33				34					SPACE ONLY	0.00	S
S 0.00	0.00	SPACE ONLY				35				36					SPACE ONLY	0.00	S
S 0.00	0.00	SPACE ONLY				37				38					SPACE ONLY	0.00	S
S 0.00	0.00	SPACE ONLY				39				40					SPACE ONLY	0.00	S
S 0.00	0.00	SPACE ONLY				41				42					SPACE ONLY	0.00	S
SUB-TOTALS																32.9	
24.0																	
L	LOAD (KVA)	Conn	D.F	Dmd	TOTAL LOAD PER PHASE:				NOTES:								
H	LIGHTS	0.0	1.25	0.0	CONNECTED				1. BREAKER FRAME SHALL BE AS REQ'D PER PANEL AIC RATING								
H	HEATING	56.9	1.00	56.9	A = 19.0 KVA 68.5 A				2. SHALL BE FULLY RATED - SERIES RATINGS NOT ALLOWED								
C	COOLING	0.0	1.00	0.0	B = 19.0 KVA 68.5 A				3. ALL BUSSING, INCL GND AND NEUTRAL, SHALL BE COPPER								
V	VENTILATION	0.0	1.00	0.0	C = 19.0 KVA 68.5 A				4. ALL INCOMING PANEL & BRKR LUGS SHALL MATCH FEEDERS								
M	MOTORS	0.0	1.00	0.0	DEMAND				5. PROVIDE HINGED DOOR-IN DOOR WITH OUTER DOOR LOCK								
K	KITCHEN	0.0	0.65	0.0	A = 19.0 KVA 68.5 A				6. PROVIDE METAL DIRECTORY FRAME								
R	REC. (1st 10kVA)	0.0	1.00	0.0	B = 19.0 KVA 68.5 A												
R	REC. (>10kVA)	0.0	0.50	0.0	C = 19.0 KVA 68.5 A												
WH	WATER HEATER	0.0	1.00	0.0	DEMAND @ 125%												
MS	MSC	0.0	1.00	0.0	A = 23.7 KVA 85.6 A												
S	SPARE	0.0	1.00	0.0	B = 23.7 KVA 85.6 A												
	TOTAL (KVA)	56.9		56.9	C = 23.7 KVA 85.6 A												

EXISTING PANEL: DY (N)														SOD MFR			
LOAD TYPE	VOLTAGE: 120 / 208 3 PHASE 4 WIRE														NF TYPE		
	MOUNTING: SURFACE 300 AMP MAIN CIRCUIT BREAKER														10,000 AIC		
	LOAD KVA	LOAD SERVED	WIRE	TRIP	FRAME (Note 1)	CKT NO	A B C			CKT NO	FRAME (Note 1)	TRIP	WIRE	LOAD SERVED	LOAD KVA	LOAD TYPE	
R 0.00	REC OFF 203		EX	20		1	●	●	●	2			20	EX	TEACHER WKRM 213	0.54	R
R 0.50	REC 209		EX	20		3	●	●	●	4			20	EX	TEACHER WKRM 213	0.72	R
R 0.50	CLASSRM 209		EX	20		5	●	●	●	6			20	EX	SCIENCE 217	0.50	R
R 0.50	CLASS 210		EX	20		7	●	●	●	8			20	EX	SCIENCE 217	0.50	R
R 0.50	CLASS 210		EX	20		9	●	●	●	10			20	EX	SCIENCE 218	0.50	R
R 0.50	CLASS 214		EX	20		11	●	●	●	12			20	EX	SCIENCE 218	0.00	R
R 0.50	CLASS 214		EX	20		13	●	●	●	14			20	EX	HVAC CONTROL	0.00	MS
R 0.50	CLASS 215		EX	20		15	●	●	●	16			20	EX	FIRE ALARM	0.50	MS
R 0.50	CLASS 215		EX	20		17	●	●	●	18			20	EX	SPARE	0.00	S
MS 0.00	DATA 216		EX	20		19	●	●	●	20			20	SPARE	SPARE	0.00	S
MS 0.00	DATA 216		EX	20		21	●	●	●	22			20	SPARE	SPARE	0.00	S
C 1.35	ODU AND A/C ALT MS1		12	20		23	●	●	●	24			20	SPARE	SPARE	0.00	S
C 1.35	(NOTE 1)		12			25	●	●	●	26			20	SPARE	SPARE	0.00	S
MS 0.50	CONDENSATE PUMP(NOTE 1)		12	15		27	●	●	●	28			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			29	●	●	●	30			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			31	●	●	●	32			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			33	●	●	●	34			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			35	●	●	●	36			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			37	●	●	●	38			20	SPARE	SPARE	0.00	S
S 0.00	SPARE		20			39	●	●	●	40			EX	SUBFEED PY		9.18	F
S 0.00	SPARE		20			41	●	●	●							9.82	F
SUB-TOTALS																31.1	
7.2																	
TOTAL LOAD PER PHASE																	
L	H	C	V	M	R	KITCHEN	REC. (≥10KVA)	REC. (≥10KVA)	WATER HEATER	MISC.	SPARE	TOTAL (KVA)	Conn.	D.F	0ma	NOTES	
													CONNECTED			1. PROVIDE NEW BREAKER	
										</							

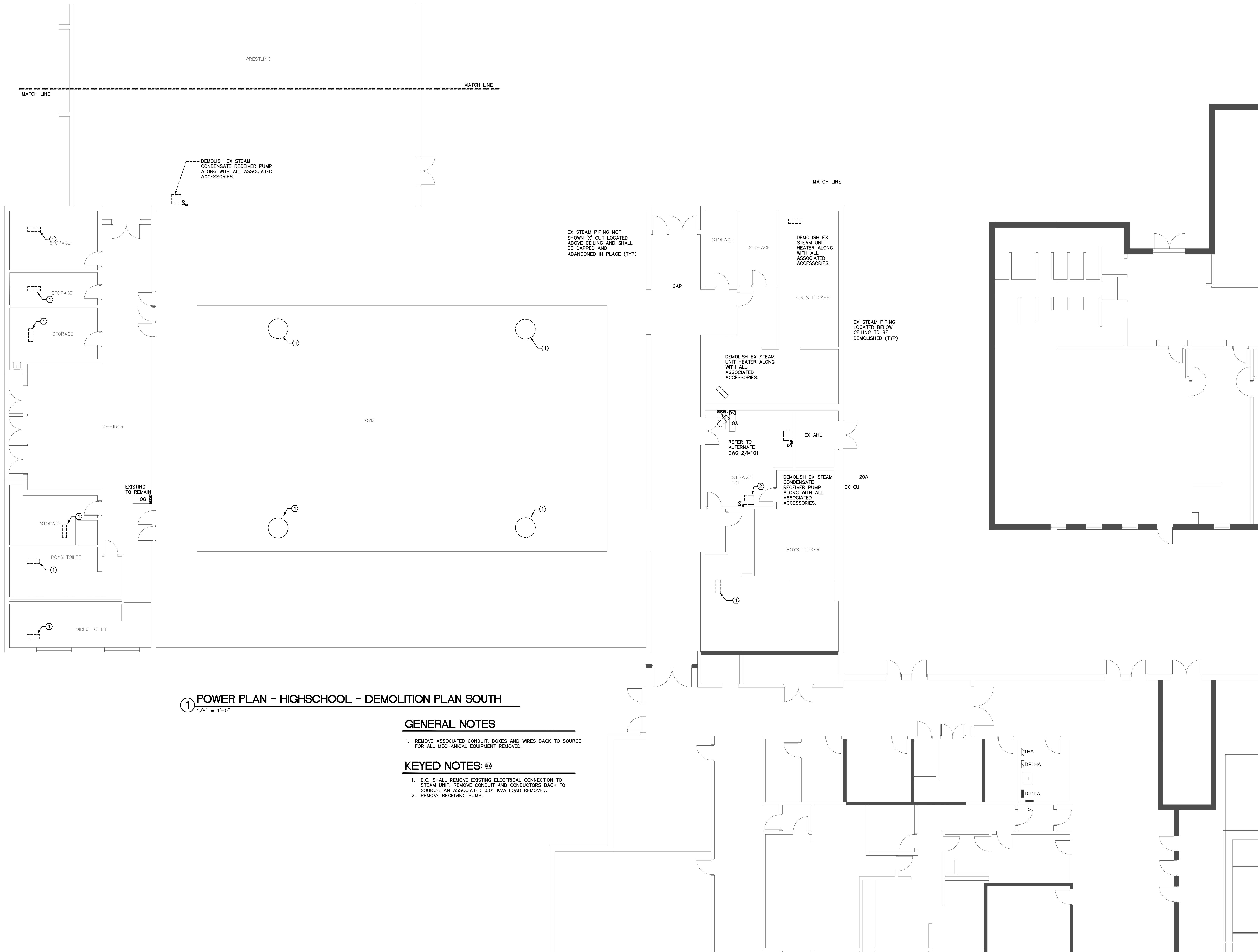
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EXISTING PANEL: MSB (N)														SQD MFR		
VOLTAGE: 120 / 208 3 PHASE 4 WIRE I-LINE TYPE														AIC		
MOUNTING: SURFACE 600 AMP MAIN CIRCUIT BREAKER																
LOAD TYPE	LOAD KVA	LOAD SERVED	WIRE	TRIP	FRAME (Note 1)	CKT NO	A	B	C	CKT NO	FRAME (Note 1)	TRIP	WIRE	LOAD SERVED	LOAD KVA	LOAD TYPE
F	0.00	PANEL 93A	EX	200		1				2					0.00	F
F	0.00					2				3					0.00	F
F	0.00					3				4					0.00	F
S	0.00					5				6					0.00	S
S	0.00	HEATER ROAD	EX	100		7				8					0.00	S
S	0.00					9				10					0.00	S
S	0.00					11				12					0.00	S
F	0.00	PANEL K	EX	225		13				14					0.00	F
F	0.00					15				16					0.00	F
S	0.00					17				18					0.00	S
S	0.00	HEATER COURT YARD	EX	100		19				20					21.59	F
S	0.00					21				22					21.59	F
S	0.00					23				24					21.59	F
S																S
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SHEET NO: 5 of 8

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1 POWER PLAN - HIGHSCHOOL - DEMOLITION PLAN SOUTH
1/8" = 1'-0"

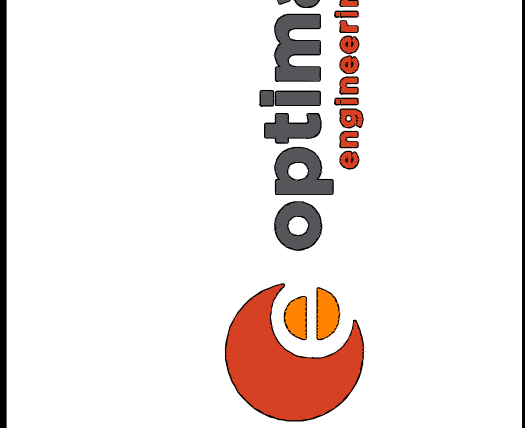
GENERAL NOTES

1. REMOVE ASSOCIATED CONDUIT, BOXES AND WIRES BACK TO SOURCE FOR ALL MECHANICAL EQUIPMENT REMOVED.

KEYED NOTES: Ⓢ

1. E.C. SHALL REMOVE EXISTING ELECTRICAL CONNECTION TO STEAM UNIT. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. AN ASSOCIATED 0.01 KVA LOAD REMOVED.
2. REMOVE RECEIVING PUMP.

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • TECHNOLOGY DESIGN



SEAL:

**sun valley
high school and
middle school
hvac renovations**

high school
5211 old charlotte hwy
monroe, nc 28110

middle school
1409 wesley chapel rd
indian trail, nc 28079

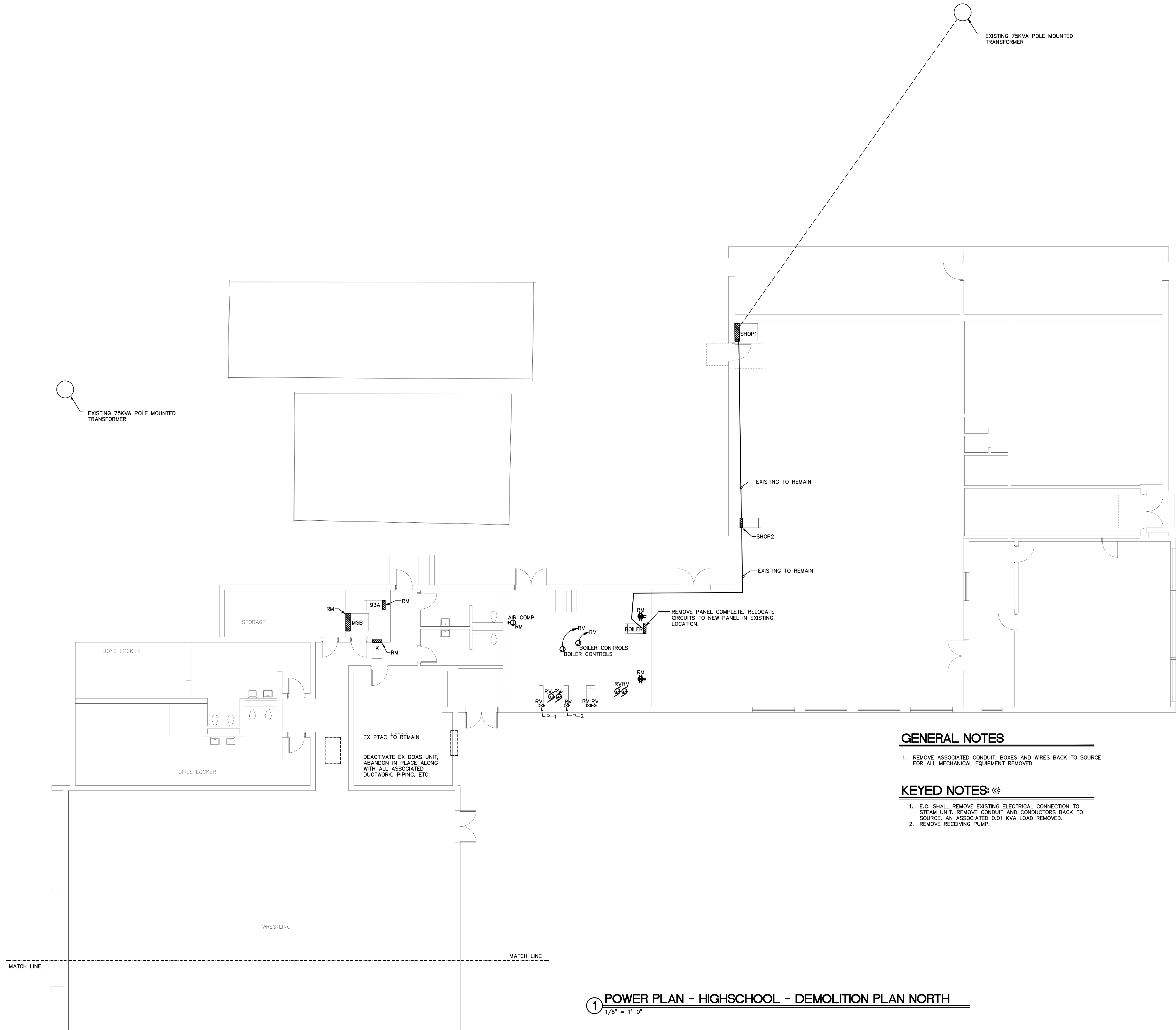
REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: WD
DESIGNED BY: WD
CHECKED BY: MAM

SHEET TITLE:
HIGH SCHOOL
ELECTRICAL
WORK -
DEMOLITION
PLAN SOUTH

DWG #:
E202
SHEET NO: 6 of 8

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GENERAL NOTES

1. REMOVE ASSOCIATED CONDUIT, BOXES AND WIRES BACK TO SOURCE FOR ALL MECHANICAL EQUIPMENT REMOVED.

KEYED NOTES:

1. E.C. SHALL REMOVE EXISTING ELECTRICAL CONNECTION TO STEAM UNIT. REMOVE CONDUIT AND CONDUCTORS BACK TO SOURCE. AN ASSOCIATED 0.01 KVA LOAD REMOVED.
2. REMOVE RECEIVING PUMP.

1 POWER PLAN - HIGHSCHOOL - DEMOLITION PLAN NORTH
1/8" = 1'-0"

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • TECHNOLOGY DESIGN

optima
engineering

1927 S. TRYON ST., SUITE 300, CHARLOTTE NC 28203
150 FAYETTEVILLE ST., SUITE 520, RALEIGH, NC 27601
PHONE: 704.366.8888
WWW.OPTIMAENGINEERING.COM
NORTH CAROLINA LICENSE NUMBER EC0914

SEAL:

**sun valley
high school and
middle school
hvac renovations**

high school
5211 old charlotte hwy
monroe, nc 28110

middle school
1409 wesley chapel rd
indian trail, nc 28079

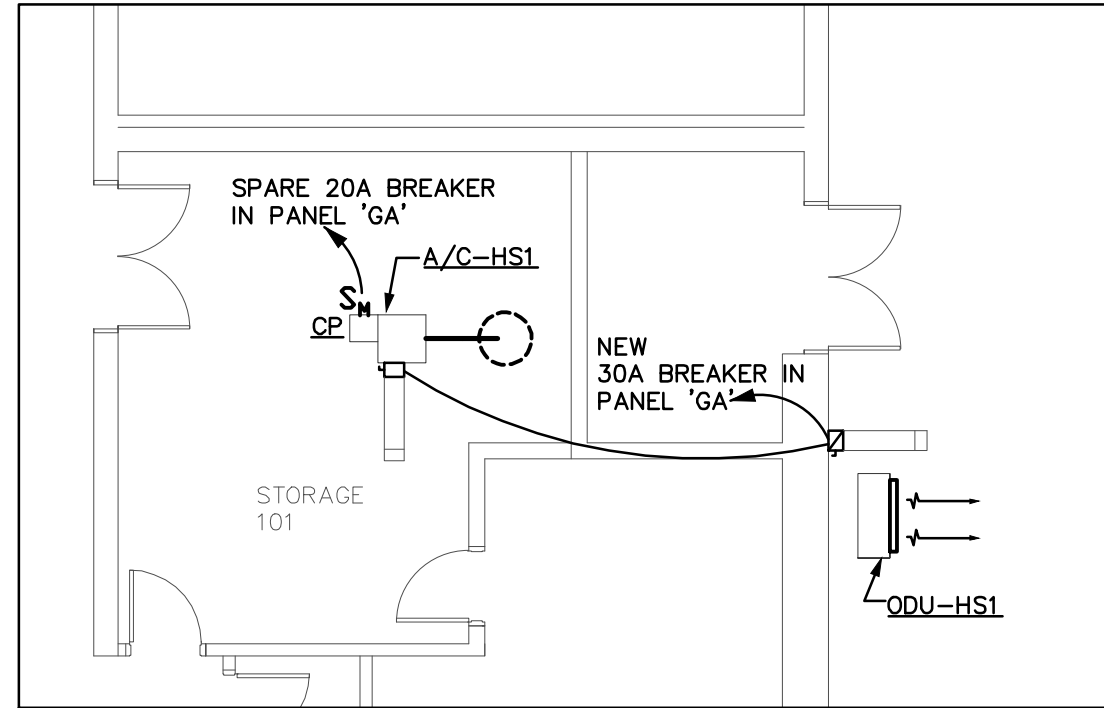
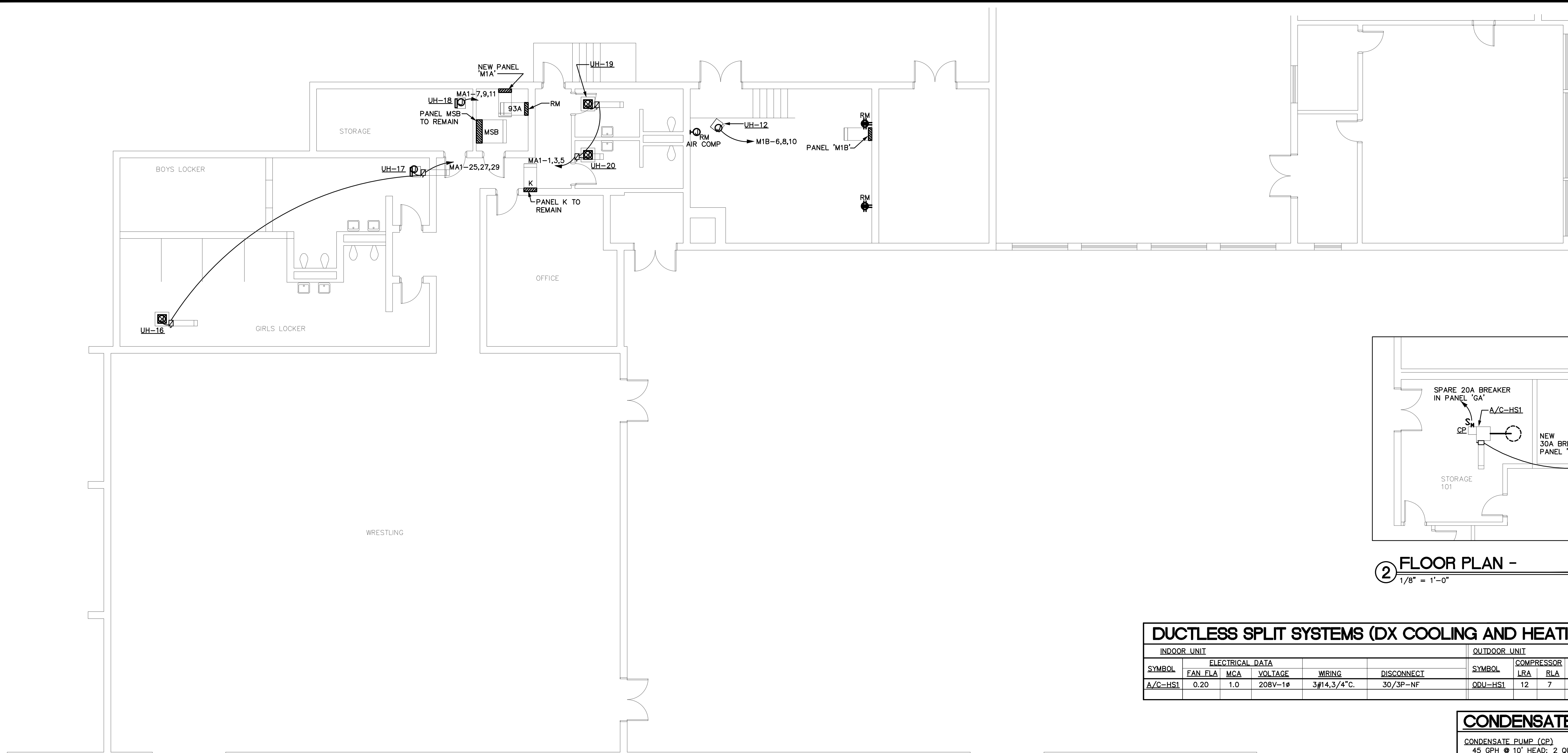
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DATE:	02-25-2025
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CHECKED BY:	MAM

SHEET TITLE:
**HIGH SCHOOL
ELECTRICAL
WORK -
DEMOLITION
PLAN NORTH**

DWG #:
E203
SHEET NO: 7 of 8

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2 FLOOR PLAN -
1/8" = 1'-0"

DUCTLESS SPLIT SYSTEMS (DX COOLING AND HEATING) - ALTERNATE #HS1										
INDOOR UNIT						OUTDOOR UNIT				
SYMBOL	FAN FLA	MCA	VOLTAGE	WIRING	DISCONNECT	SYMBOL	COMPRESSOR	FAN	ELECTRICAL DATA	
A/C-HS1	0.20	1.0	208V-1Ø	3#14,3/4"C.	30/3P-NF	ODU-HS1	LRA	RLA	FLA	MCA FUSE VOLTAGE
							12	7	0.50	11 28 208V-1Ø 3#12,1#12G,3/4"C.

CONDENSATE PUMP SCHEDULE ALTERNATIVE #HS1	
CONDENSATE PUMP (CP)	LITTLE GIANT (LOW PROFILE) VCC-20ULS
	45 GPH @ 10' HEAD; 2 QUART TANK; MOTOR - 1/30 H.P., 120V-1Ø;
	FURNISH WITH: BUILT-IN CHECK VALVE.



1 POWER PLAN - HIGHSCHOOL - NEW WORK
1/8" = 1'-0"

ELEC HEATER SCHEDULE			
(T-BAR CEILING MOUNTED)	CIRCUIT	DISCONNECT	WIRE
UH-1 2.0 KW; 208V-3Ø	MA1-14,16,18	30/3P-F15	3#6,1#10G,1"C.
UH-2 2.0 KW; 208V-3Ø	MA1-14,16,18	30/3P-F15	3#6,1#10G,1"C.
UH-3 3.0 KW; 208V-3Ø	MA1-13,15,17	30/3P-F15	3#8,1#10G,1"C.
UH-4 3.0 KW; 208V-3Ø	MA1-13,15,17	30/3P-F15	3#8,1#10G,1"C.
UH-5 3.0 KW; 208V-3Ø	MA1-13,15,17	30/3P-F15	3#8,1#10G,1"C.
UH-6 3.0 KW; 208V-3Ø	MA1-13,15,17	30/3P-F15	3#8,1#10G,1"C.
UH-7 3.0 KW; 208V-3Ø	MA1-7,9,11	INTERNAL DISC	3#12,1#12G,3/4"C.
UH-8 2.0 KW; 208V-3Ø	MA1-1,3,5	30/3P-F15	3#12,1#12G,3/4"C.
UH-9 2.0 KW; 208V-3Ø	MA1-1,3,5	30/3P-F15	3#12,1#12G,3/4"C.
UH-10 3.0 KW; 208V-3Ø	MA1-14,16,18	30/3P-F15	3#6,1#8G,1"C.
UH-11 3.0 KW; 208V-3Ø	MA1-8,10,12	30/3P-F15	3#6,1#8G,1"C.
UH-12 3.0 KW; 208V-3Ø	MA1-8,10,12	30/3P-F15	3#6,1#8G,1"C.
UH-13 3.0 KW; 208V-3Ø	MA1-19,21,23	30/3P-F15	3#10,1#10G,3/4"C.
UH-14 5.0 KW; 208V-3Ø	MA1-14,16,18	30/3P-F20	3#6,1#8G,1"C.
UH-15 3.0 KW; 208V-3Ø	MA1-8,10,12	30/3P-F15	3#6,1#8G,1"C.
UH-16 5.0 KW; 208V-3Ø	MA1-19,21,23	30/3P-F20	3#10,1#10G,3/4"C.
UH-17 7.5 KW; 208V-3Ø	MA1-2,4,6	INTERNAL DISC	3#10,1#10G,3/4"C.
UH-18 5.0 KW; 208V-3Ø	MA1-6,8,10	INTERNAL DISC	3#12,1#12G,3/4"C.
UH-19 5.0 KW; 208V-3Ø	MA1-25,27,29	30/3P-F20	3#8,1#10G,3/4"C.
UH-20 5.0 KW; 208V-3Ø	MA1-25,27,29	30/3P-F20	3#8,1#10G,3/4"C.

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FIRE PROTECTION • TECHNOLOGY DESIGN



SEAL:

**sun valley
high school and
middle school
hvac renovations**

high school
5211 old charlotte hwy
monroe, nc 28110

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1409 wesley chapel rd
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REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: WD
DESIGNED BY: WD
CHECKED BY: MAM

SHEET TITLE:
**HIGH SCHOOL
ELECTRICAL
WORK - NEW
WORK**

DWG #:
E204
SHEET NO: 8 of 8

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MECHANICAL LEGEND

SYMBOL	DESCRIPTION	ABBR.
---	EX LOW PRESSURE RETURN	LPR
---	EX LOW PRESSURE STEAM	LPS
---	EX NATURAL GAS PIPING	G
PD	PUMPED CONDENSATE	PD
	BUTTERFLY VALVE	
	3-PIECE BALL VALVE	
	CHECK VALVE	
	STRAINER WITH BLOWDOWN VALVE WITH HOSE CONN.	
	BALANCING VALVE	
	B&G CIRCUIT SETTER	
	UNION	
	THERMOMETER	
	PRESSURE GAGE & COCK	
	GAGE COCK	
	FLOW SWITCH	
	ECCENTRIC REDUCER	
	CONCENTRIC REDUCER	
	CONTROL VALVE	
	THERMOSTAT / TEMP SENSOR (4"-0" AFF TO TOP)	
	HUMIDISTAT (4"-0" AFF TO TOP)	
	EX RTU-1 DUCT MOUNTED STATIC PRESS. SENSOR	
	SUPPLY AIR DIFFUSER (4-WAY)	
	RETURN AIR GRILLE	
	EXHAUST AIR GRILLE	
	DOUBLE LINE DUCTWORK	
	SINGLE LINE DUCTWORK	
	EXISTING DOUBLE LINE DUCTWORK	
	EXISTING SINGLE LINE DUCTWORK	
	EXISTING MECHANICAL TO BE REMOVED	
	POINT OF EXISTING TO NEW CONNECTION	
	POINT OF EXISTING TO DEMOLITION	
	20"x14" RECTANGULAR DUCT 8" DIAMETER ROUND DUCT EXISTING ABOVE FINISHED FLOOR DOWN UP	
	VAV BOX (VAV) W/ELECTRIC HEAT	
	ELECTRIC UNIT HEATER (CEILING MOUNTED)	

MECHANICAL DRAWING INDEX

DRAWING NUMBER	DRAWING NAME
M001	MECHANICAL GENERAL NOTES, LEGEND AND SYMBOLS
M002	MECHANICAL SCHEDULES - MIDDLE SCHOOL
M003	MECHANICAL SCHEDULES - HIGH SCHOOL
M004	MECHANICAL SEQUENCE OF OPERATIONS AND POINTS LIST
M101	MECHANICAL FLOOR PLANS - DEMOLITION - HIGH SCHOOL
M102	MECHANICAL FLOOR PLANS - DEMOLITION - HIGH SCHOOL
M201	MECHANICAL FLOOR PLANS - NEW WORK - HIGH SCHOOL
M202	MECHANICAL FLOOR PLANS - NEW WORK - HIGH SCHOOL
M203	MECHANICAL FLOOR PLANS - DEMOLITION AND NEW WORK MIDDLE SCHOOL
M301	MECHANICAL BOILER ROOM - DEMOLITION AND NEW WORK HIGH SCHOOL
M401	MECHANICAL DETAILS

VENTILATION CALCULATIONS (NCMC 2018, SECT 403): MIDDLE SCHOOL

VENTILATION REQUIREMENTS DO NOT APPLY FOR THIS APPLICATION. PROJECT CONSISTS OF REPLACEMENT OF EXISTING VAV BOXES. MECHANICAL LOAD REQUIREMENTS, EQUIPMENT AND ROOM IDENTIFICATIONS DO NOT CHANGE WITHIN THIS SCOPE OF WORK.

VENTILATION CALCULATIONS (NCMC 2018, SECT 403): HIGH SCHOOL

VENTILATION REQUIREMENTS DO NOT APPLY FOR THIS APPLICATION (UNIT HEATER SEGMENT). PROJECT CONSISTS OF REPLACEMENT OF EXISTING STEAM UNIT HEATERS WITH ELECTRIC HEAT UNIT HEATERS. MECHANICAL LOAD REQUIREMENTS, EQUIPMENT AND ROOM IDENTIFICATIONS DO NOT CHANGE WITHIN THIS SCOPE OF WORK.

WORK SCHEDULING NOTE

ALL WORK INVOLVING EXISTING EQUIPMENT SHUTDOWN, EXISTING SYSTEM CONNECTION, AND/OR MODIFICATION TO EXISTING EQUIPMENT SHALL BE COORDINATED WITH THE OWNER 1 WEEK PRIOR TO COMMENCING WORK.

NO SHUTDOWN OF ANY EXISTING SYSTEM WILL BE ALLOW WITH OUT AUTHORIZATION FROM THE OWNER.

COORDINATE WITH OWNER AND PROVIDE DETAILED WORK SEQUENCE PLAN PRIOR TO START OF DEMOLITION

FIRE ALARM COORDINATION

THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COORDINATION WITH THE FIRE ALARM VENDOR AND SHALL BE RESPONSIBLE FOR ALL ASSOCIATED COSTS AND SCHEDULING FOR DIS-ARMING, RE-ARMING, WATCH, ETC. COORDINATE ALL REQUIREMENTS WITH UNION COUNTY SCHOOLS

COMMISSIONING NOTE (MIDDLE SCHOOL)

THIS PROJECT INCLUDES A THIRD PARTY COMMISSIONING AGENT CONTRACTED BY THE OWNER. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH OWNER'S COMMISSIONING AGENT AND PROVIDE ALL NECESSARY TIME, MATERIALS, AND PROCEDURES REQUIRED FOR A FULLY COMMISSIONED PROJECT. SEE COMMISSIONING REQUIREMENTS IN THE PROJECT MANUAL FOR FURTHER INFORMATION.

TESTING, ADJUSTING, AND BALANCING

1. THE MECHANICAL CONTRACTOR SHALL BALANCE ALL MECHANICAL SYSTEMS TO THE PERFORMANCE SPECIFICATIONS INDICATED ON PLANS AND PROVIDE THE ENGINEER WITH THREE COPIES OF A COMPLETE TEST AND BALANCE REPORT. THE REPORT IS TO BE ISSUED A MINIMUM OF TWO WEEKS PRIOR TO PROJECT COMPLETION. THE TEST AND BALANCE REPORT WILL BE SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER. ANY ADDITIONAL TESTING, ADJUSTING AND BALANCING REQUIRED (AT ENGINEER'S REQUEST) AFTER REVIEW OF THE INITIAL REPORT SHALL BE PROVIDED AT NO ADDITIONAL COST. TEST AND BALANCE REPORT TO BE COMPLETED BY AN INDEPENDENT, CERTIFIED TEST AND BALANCE CONTRACTOR.

2. CONDUCT TESTING AND BALANCING IN ACCORDANCE WITH TECHNICAL PORTIONS OF THE AABC "NATIONAL STANDARDS FOR TESTING AND BALANCING HVAC SYSTEMS", LATEST EDITION.

3. INSTRUMENTS USED FOR BALANCING MUST HAVE BEEN CALIBRATED WITHIN A PERIOD OF SIX (6) MONTHS PRIOR TO BALANCING. SUBMIT SERIAL NUMBERS, AND DATES OF CALIBRATION OF ALL INSTRUMENTS TO BE USED PRIOR TO THE START OF WORK.

4. SET HVAC SYSTEM AIRFLOW RATES WITHIN THE FOLLOWING TOLERANCES:

4.1. SUPPLY FANS AND EQUIPMENT WITH FANS: MINUS 5 TO PLUS 5 PERCENT.

4.2. VAV BOX & AIR DEVICE OUTLETS AND INLETS: 0 TO MINUS 5 PERCENT.

EXISTING ACOUSTICAL T-BAR CEILING

IN AREAS WHERE ACOUSTICAL T-BAR CEILING IS TO REMAIN BUT MECHANICAL WORK EXISTS, CONTRACTOR MAY NEED TO REPLACE DAMAGED OR REMOVED CEILING TILES DUE TO MECHANICAL WORK THROUGH EXISTING CEILING. AS PART OF THIS PROJECT CONTRACTOR TO PROVIDE 60 ACOUSTICAL T-BAR CEILING TILES TO REPLACE DAMAGED OR DEMOLISHED TILES DURING CONSTRUCTION. IF A SURPLUS OF TILES EXISTS AT PROJECT COMPLETION, REMIT REMAINING CEILING TILES TO OWNER.

095113 Acoustical Panel Ceilings	
Manufacturer:	ARMSTRONG (Basis-of-Design)
Style:	Cortega 770 - 2'x2'x5/8"
Color:	White
Pattern:	2'x2'x5/8" Square Lay-in
Subject to compliance with the project requirements, provide the named product above or a comparable product by one of the following manufacturers:	
• CertainTeed Fine Fissured HFF-157	
• USG, RadarlimaPlus 2210	

VENTILATION CALCULATIONS (NCMC 2018, SECT 403): STORAGE ROOM 101

OCCUPANCY CLASSIFICATION	PEOPLE O/A RATE (CFM/PERSON)	AREA O/A RATE IN BREATHING ZONE (CFM/SQ. FT.)	DEFAULT OCCUPANCY DENSITY (PEOPLE/1000 SQ. FT.)	AREA (SQ. FT.)	CALCULATED OCCUPANCY (PEOPLE)	CALCULATED PEOPLE O/A (CFM)	CALCULATED AREA O/A (CFM)
STORAGE ROOMS	0	0.120000	0	325	0	0	39
BLDG TOTAL OUTSIDE AIR REQ'D (E=0.8, CFM)						49	
BUILDING TOTAL OUTSIDE AIR PROVIDED (CFM)						50	

2018 NORTH CAROLINA ENERGY CONSERVATION CODE

COMMERCIAL ENERGY EFFICIENCY - MECHANICAL SUMMARY

C401 METHOD OF COMPLIANCE

- ☒ 2018 NCEC CHAPTER 4
- ☐ COMCHECK PROVIDED (2018 NCECC)
- ☐ ASHRAE 90.1-2013 PRESCRIPTIVE
- ☐ COMCHECK PROVIDED (90.1-2013)
- ☐ ASHRAE 90.1-2013 PERFORMANCE
- ☐ ENERGY MODELING DATA PROVIDED
- ☐ N/A (EXISTING LIGHTING, HVAC, AND DOM. WATER HEATING SYSTEMS TO REMAIN)

C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

☒ C406.2 EFFICIENT MECH EQUIPMENT

☐ C406.5 ON-SITE RENEWABLE ENERGY

☐ C406.3 REDUCED LTG DENSITY

☐ C406.6 DEDICATED OA SYSTEM

☐ C406.4 ENHANCED LTG CONTROLS

☐ C406.7 SERVICE WATER HEATING

C301 CLIMATE ZONE

3A - UNION COUNTY, NORTH CAROLINA

DESIGN CONDITIONS

EXTERIOR (ASHRAE 90.1-2013 TABLE D-1)

winter dry bulb 18° F.
summer dry bulb 91° F.
summer wet bulb 74° F.

INTERIOR (2018 NCECC SECTION C302.1)

winter dry bulb 72° F.
summer dry bulb 75° F.

C403.2 HEATING & COOLING LOADS AND EQUIPMENT & SYSTEM SIZING

BUILDING HEATING LOAD	N/A BTUH (peak)
BUILDING COOLING LOAD	N/A BTUH (peak)
INSTALLED HEATING CAPACITY	UNIT REPLACEMENT
INSTALLED COOLING CAPACITY	UNIT REPLACEMENT

C403.2.3 & C406.2 - REQUIRED & INCREASED HVAC EQUIPMENT PERFORMANCE

SYSTEM DESCRIPTION - REPLACEMENT OF EX VAV BOXES, ADDITION OF ELECTRICAL HEAT AND ADDITION OF 2 DX SPLIT SYSTEM

- ☒ MINIMUM HVAC EQUIP EFFICIENCY COMPLIANCE - TABLE C403.2.3
- ☐ INCREASED HVAC EQUIP EFFICIENCY COMPLIANCE - 10% OVER TABLE C403.2.3

EQUIP. TYPE	SIZE CATEGORY (BTUH)	SUBCATEGORY	C403.2.3 MINIMUM EFFICIENCY (q)	10% INCREASED EFF. (q)	DESIGN EFFIC.
TABLE C403.2.3(1) - UNITARY AIR CONDITIONERS AND CONDENSING UNITS					
AIR COND.	< 65,000	SPLIT SYSTEM &	13.0 SEER	14.3 SEER	SEE SCHEDULE
AIR COOLED	(<= 5 TONS)	SINGLE PACKAGE			

a. DEDUCT 0.2 FROM THE REQUIRED EERS AND IEERS FOR UNITS WITH A HEATING SECTION OTHER THAN ELECTRIC RESISTANCE HEAT OR NO HEAT.

C403.2.4 THRU C403.2.11

HVAC SYSTEMS ARE FULLY COMPLIANT WITH THE REQUIREMENTS FOR HVAC SYSTEM CONTROL, VENTILATION, ENERGY RECOVERY, DUCT AND PLENUM INSULATION AND SEALING, PIPING INSULATION, AND SYSTEM COMPLETION.

C403.2.12 - AIR SYSTEM DESIGN AND CONTROL

- ☒ ALL FANS INSTALLED ON THE PROJECT ARE 5 HP OR LESS AND ARE EXEMPT FROM THESE REQUIREMENTS.
- ☐ FANS ABOVE 5 HP MEET THE CFM LIMITATIONS SHOWN BELOW:

C403.3 - ECONOMIZERS (PRESCRIPTIVE)

- ☒ PROJECT INCLUDES AN EXISTING AIR ECONOMIZER COMPLIANT WITH C403.3
- ☐ PROJECT MEETS AN ECONOMIZER EXCEPTION LISTED IN C403.3

C403.4 - HYDRONIC AND MULTIPLE-ZONE HVAC SYSTEMS CONTROL AND EQUIPMENT (PRESCRIPTIVE)

- ☒ PROJECT CONSISTS OF ONLY SINGLE ZONE DX SYSTEMS, EXEMPT FROM THE PRESCRIPTIVE REQUIREMENTS OF C403.4.
- ☐ PROJECT CONSISTS OF HVAC SYSTEMS FULLY COMPLIANT WITH THE PRESCRIPTIVE REQUIREMENTS OF C403.4.

C405.8 - ELECTRICAL MOTORS (MANDATORY REQUIREMENTS).

- ☒ ELECTRICAL MOTORS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.8, EXCEPT WHERE EXEMPT.
- ☐ NOT APPLICABLE.

C408 - SYSTEM COMMISSIONING

- ☐ BUILDING IS LESS THAN 10,000 SQUARE FEET AND IS EXEMPT FROM THE SYSTEM COMMISSIONING REQUIREMENTS OF SECTION C408.
- ☒ BUILDING IS GREATER THAN 10,000 SQUARE FEET AND REQUIRES SYSTEM COMMISSIONING PER SECTION C408.

EQUIVALENT MANUFACTURERS LISTING

LISTING OF MANUFACTURER'S NAME DOES NOT GUARANTEE APPROVAL. ALL EQUIPMENT MUST MEET OR EXCEED QUALITY AND CAPACITIES OF SPECIFIED EQUIPMENT. FINAL APPROVAL WILL BE BASED ON EQUIPMENT SUBMITTALS. ANY MANUFACTURER NOT LISTED BUT WISHING TO BID THIS PROJECT SHALL SUBMIT A WRITTEN REQUEST A MINIMUM OF 7 DAYS PRIOR TO BID DATE OR AS INDICATED IN THE SPECIFICATIONS. ALL EQUIPMENT LISTED IN THE PROJECT SCHEDULE IS TO BE CONSIDERED DESIGN BASIS EQUIPMENT. PRIOR APPROVAL IS REQUIRED FOR ALL MANUFACTURERS NOT LISTED.

(ALPHABETICAL ORDER)

AIR DISTRIBUTION: KRUEGER, NAILOR, PRICE, TITUS

DDC CONTROLS: EXISTING N4 SERVER (CAMPUS) EASYSO FW-VAV (BACNET IP)

DUCTED SPLIT SYSTEMS: CARRIER, LENNOX, TRANE, YORK, MITSU

ELECTRIC UNIT HEATERS: BERKO, MARKEL, MODINE, QMARK, RAYWALL

VAV TERMINAL UNITS: KRUEGER, NAILOR, PRICE, TITUS

NOTE:

ALL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

ALTERNATE #MS1

INSTALL (1) NEW 1.5 TON COOLING ONLY DUCTLESS SPLIT SYSTEM FOR THE DATA ROOM. REBALANCE EXISTING VAV BOX (VAV-1.9).

ALTERNATE #HS1

INSTALL (1) NEW 1.5 TON COOLING AND HEATING DUCTLESS SPLIT SYSTEM FOR THE EQUIPMENT STORAGE ROOM. DEMOLISH EXISTING 2-TON COOLING ONLY SPLIT SYSTEM.

ALTERNATE #HS2

ALL STEAM PIPING AND STEAM UNIT HEATER DEMOLITION WITHIN GYM

PROJECT SCHEDULE

CONTRACTORS SHALL ACHIEVE SUBSTANTIAL COMPLETION OF WORK SHOWN ON THESE DRAWINGS AND SPECIFICATIONS PRIOR TO AUGUST 8, 2025.

MECHANICAL GENERAL NOTES

SEE SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. THESE GENERAL NOTES ARE INTENDED TO SUPPLEMENT THE SPECIFICATIONS. IN THE EVENT THAT THE VERBIAGE IS IN CONFLICT OR CONTRADICTS THE REQUIREMENTS LISTED HERE, THE QUESTION SHALL BE ASKED PRIOR TO BIDDING OR THE MORE STRINGENT SHALL APPLY AT THE ENGINEER'S DISCRETION.

1. DO NOT SCALE DRAWINGS. SEE ARCHITECTURAL DRAWINGS AND REFLECTED CEILING PLANS FOR EXACT LOCATION OF DOORS, WINDOWS, CEILING DIFFUSERS, ETC.

2. ALL EQUIPMENT LISTED IN THE PROJECT SCHEDULES IS TO BE CONSIDERED DESIGN BASIS EQUIPMENT. ALL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED/NON-DESIGN BASIS EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. THIS INCLUDES ANY MODIFICATIONS TO ANY ASSOCIATED MECHANICAL, PLUMBING, OR ELECTRICAL SYSTEMS REQUIRED BY THIS SPECIFIC MANUFACTURER'S INSTALLATION INSTRUCTIONS.

3. ALL DUCTWORK SHALL BE GALVANIZED SHEET METAL CONSTRUCTED IN ACCORDANCE WITH THE LATEST SMARNA STANDARDS. ALL SUPPLY, RETURN AND OUTSIDE AIR DUCTWORK SHALL BE INSULATED AS PER SPECIFICATIONS. DUCT DIMENSIONS ON PLANS ARE FREE AREA SIZE.

4. ALL DUCTWORK SHALL BE SEALED PER THE REQUIREMENTS OF THE NORTH CAROLINA INTERNATIONAL MECHANICAL CODE. SEAL MEDIUM PRESSURE SUPPLY DUCTWORK AS PER SPECIFICATIONS.

5. ALL PIPING, DUCTS, VENTS, ETC., EXTENDING THROUGH WALLS AND ROOF SHALL BE FLASHED AND COUNTERFLASHED IN A WATERPROOF MANNER.

6. ALL PIPING AND DUCTWORK LOCATIONS SHALL BE COORDINATED WITH THE WORK UNDER OTHER DIVISIONS OF THE SPECIFICATIONS, TO AVOID INTERFERENCE.

7. THE MECHANICAL CONTRACTOR SHALL BALANCE ALL MECHANICAL SYSTEMS AS PER SPECIFICATIONS THIS SHEET.

8. UPON PROJECT COMPLETION, THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE OWNER INSTALLATION INFORMATION INCLUDING RECORD SUBMITTALS (WITH ANY SUBMITTAL REVIEW COMMENTS ADDRESSED) AND O&M MANUALS FOR EACH PIECE OF EQUIPMENT INCLUDING ALL SELECTED OPTIONS, THE NAME AND ADDRESS OF AT LEAST ONE SERVICE AGENCY, FULL CONTROL SYSTEM O&M AND CALIBRATION INFORMATION INCLUDING WIRING DIAGRAMS, SCHEMATICS, FULL SEQUENCE OF OPERATION, AND PROGRAMMED SETPOINTS.

9. PROVIDE A ONE YEAR WARRANTY FOR ALL WORK PERFORMED BEGINNING ON THE DAY THE SYSTEM IS COMPLETELY OPERATIONAL AND ACCEPTABLE BY THE OWNER.

10. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND ALL EQUIPMENT FOR MAINTENANCE AND FILTER REMOVAL.

11. CONDENSATE DRAIN PIPING SHALL BE TYPE 'L' OR 'K' HARD DRAWN COPPER AND SHALL BE INSULATED WITH 1 1/2" THICK FIBERGLASS INSULATION WITH A DENSITY OF 1.5 LB. PER CUBIC FOOT. INSULATION SHALL HAVE A FACTORY APPLIED PRESSURIZED VAPOR BARRIER JACKET WITH PRESSURE SENSITIVE ADHESIVE SELF-SEALING LAP. INSULATION AND JACKET SHALL BE RATED FOR INSULATION IN A RETURN AIR PLENUM.

12. ALL REFRIGERANT PIPE SHALL BE NITROGENIZED A/C COPPER TUBE. SIZE, INSULATE, AND INSTALL REFRIGERANT PIPING PER MANUFACTURER'S RECOMMENDATIONS. REFRIGERANT PIPING INSULATION EXPOSED OUTDOORS SHALL BE COVERED WITH AN OUTER ALUMINUM JACKET.

13. ANY DEVICE REQUIRING A THERMOSTAT FOR CONTROL SHALL BE FURNISHED WITH A THERMOSTAT WHETHER INDICATED ON THE DRAWINGS OR NOT.

14. INSTALL THE TOP OF ALL THERMOSTATS, SENSORS, AND SWITCHES AT 4'-0" (MAXIMUM) ABOVE FINISH FLOOR. COORDINATE EXACT THERMOSTAT LOCATION WITH OWNER PRIOR TO INSTALLATION.

15. CONTRACTOR SHALL VERIFY LOCATION OF ALL ROOF PENETRATIONS WITH ARCHITECT & OWNER PRIOR TO INSTALLATION. NEW ROOF PENETRATIONS MADE THROUGH EXISTING ROOF SYSTEMS SHALL BE VERIFIED WITH THE OWNER'S EXISTING ROOF WARRANTY PRIOR TO INSTALLATION.

16. ROOF CURBS SHALL ALLOW A MINIMUM OF 8" ABOVE ROOF INSULATION FOR FLASHING, OR AS INDICATED ON THE DRAWINGS, WHICHEVER IS GREATER. IN ADDITION, ALL ROOF CURBS SHALL BE SUPPORTED BY RAILS THAT SUPPORT EQUIPMENT, PIPING, CONDUIT, ETC. EXPOSED ON THE ROOF SHALL HAVE SUFFICIENT HEIGHT TO MAINTAIN A MINIMUM OF 18" CLEARANCE BELOW SUPPORTED EQUIPMENT FOR ROOF MAINTENANCE.

17. ALL TERMINAL UNITS, CONTROLS, ETC. REQUIRING ACCESS AND SERVICE SHALL BE INSTALLED WITHIN 18" OF THE CEILING FOR SERVICE ACCESSIBILITY. LOCATIONS SHALL BE INDICATED ON THE CEILING GRID PER THE SPECIFICATIONS.

18. DUCTWORK AND PIPING PASSING THROUGH/ABOVE ELECTRICAL ROOMS SHALL BE CLOSELY COORDINATED WITH THE ELECTRICAL CONTRACTOR. DUCTWORK OR PIPING SHALL NOT BE LOCATED ABOVE ELECTRICAL PANELS.

19. EQUIPMENT OPERATED DURING CONSTRUCTION SHALL USE FILTERED MEDIA TO PREVENT CONSTRUCTION DEBRIS FROM ENTERING COILS, DUCTWORK SYSTEMS, AIR TERMINALS, ETC. AT COMPLETION OF CONSTRUCTION, MECHANICAL CONTRACTOR SHALL CLEAN ALL SYSTEMS WITH ALL CONTROL DEVICES WIDE OPEN AND REMOVE ANY REMAINING DEBRIS PRIOR TO TEST AND BALANCING. MECHANICAL CONTRACTOR SHALL REPLACE ALL FILTRATION WITH NEW FILTERS AT COMPLETION OF CONSTRUCTION. ANY DUCTWORK, AIR TERMINALS, AND/OR OTHER EQUIPMENT UPSTREAM OF FILTRATION SHALL BE CLEANED THOROUGHLY OF CONSTRUCTION DEBRIS BEFORE HANDING OVER TO OWNER.

20. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING RESTRAINTS TO RESIST THE EARTHQUAKE EFFECTS ON THE MECHANICAL SYSTEMS. THE REQUIREMENTS FOR THOSE RESTRAINTS ARE FOUND IN THE LOCAL BUILDING CODE AND ASCE 7. THE ANCHORAGE OF THE MECHANICAL SYSTEMS SHALL COMPLY WITH THE REQUIREMENTS OF THE LOCAL BUILDING CODE AND ASCE 7.

21. ALL MECHANICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED AS A COMPLETE PACKAGE, NOT THROUGH INDIVIDUAL COMPONENTS OR PARTS. PROVIDE REQUIRED 3RD PARTY FIELD UL LISTING SERVICES AS REQUIRED TO COMPLY.

MECHANICAL DEMOLITION NOTES

1. THE MECHANICAL CONTRACTOR SHALL VISIT SITE PRIOR TO BEGINNING WORK TO DETERMINE THE LEVEL OF DEMOLITION REQUIRED AND INCLUDE ALL NECESSARY PRICING IN THEIR BID.

2. IT IS THE MECHANICAL CONTRACTORS RESPONSIBILITY TO FIELD VERIFY ALL EXISTING DUCTWORK AND PIPING. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND MECHANICAL PLANS SHOULD BE BROUGHT TO THE ATTENTION OF THE MECHANICAL ENGINEER.

3. THE MECHANICAL CONTRACTOR SHALL FIELD VERIFY ALL EXISTING FIRE DAMPERS ARE LOCATED WHERE INDICATED ON DRAWINGS. ALL NEW AND EXISTING DUCTWORK PENETRATING NEW RATED WALLS SHALL BE PROVIDED WITH A 1 1/2-HOUR (TYPE-B) FIRE DAMPER WHETHER INDICATED ON PLANS OR NOT.

4. M.C. SHALL VERIFY ALL EXISTING SUPPLY AND RETURN AIR DUCT TO REMAIN IS INSULATED WITH VAPOR BARRIER INTACT. IF EXISTING DUCT IS NOT INSULATED WITH EITHER DUCT LINER OR WRAP, M.C. SHALL PROVIDE 2" THICK DUCT WRAP WITH VAPOR BARRIER (MIN. R-VALUE OF 5.0).

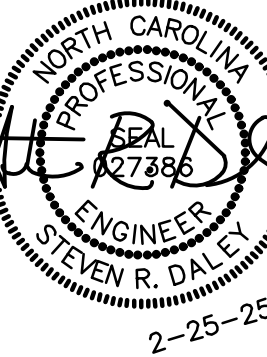
5. FOR ALL EXISTING HVAC EQUIPMENT AND DUCTWORK NOTED TO REMAIN AND SERVING AREA OF RENOVATION, MECHANICAL CONTRACTOR SHALL INSPECT EQUIPMENT (AND ANY ASSOCIATED CONTROLS, VALVES, DAMPERS, ETC.) TO VERIFY PROPER WORKING ORDER. MECHANICAL CONTRACTOR TO SERVICE AND CLEAN EXISTING HVAC UNITS TO ENSURE DESIGN AIRFLOW AND COOLING/HEATING CAPACITIES ARE OBTAINED. ANY EQUIPMENT FOUND TO BE INOPERABLE OR SHORT OF DESIGN CAPACITIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO PROJECT COMPLETION. PROVIDE CLEAN FILTERS IN ALL UNITS AT COMPLETION OF PROJECT. DAMAGED DUCTWORK SHALL BE REPAIRED.

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • TECHNOLOGY DESIGN

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SEAL:



SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

REV # DATE DESCRIPTION

DATE: 02-25-2025

PROJECT #: 24-0219

DRAWN BY: JMF

DESIGNED BY: JMF

CHECKED BY: SRD

SHEET TITLE:

MECHANICAL
GENERAL
NOTES,
SYMBOLS AND
LEGEND

DWG #:

M001

SHEET NO: 1 OF 11

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DUCTLESS SPLIT SYSTEMS (DX COOLING ONLY) - ALTERNATE #MS1

INDOOR UNIT										OUTDOOR UNIT														
SYMBOL	CFM	COOLING CAPACITY		HEATING CAPACITY		ELECTRICAL DATA		MANUFACTURER	SYMBOL	COOLING CAPACITY		EER	HEATING CAPACITY		AMBIENT	COMPRESSOR		FAN		ELECTRICAL DATA		OPERATING WEIGHT	MANUFACTURER	
		TC (BTUH)	SHC (BTUH)	(BTUH)	(BTUH)	FAN FLA	MCA			TC (BTUH)	SHC (BTUH)		(BTUH)	(BTUH)		LEA	FLA	FLA	MCA	FUSE	VOLTAGE			
A/C-MS1	425	18,000	12,240	N/A	— COOL ONLY	0.33	1.0	208V-1ø	PKA-A18HA	ODU-MS1	18,000	12,240	15.3	N/A	— COOL ONLY	95° F	14	12	0.35	13	20	208V-1ø	97 LBS	PUY-A18NHA

- NOTES:
- ALL UNITS SHALL BE U.L. LISTED AND HAVE A MINIMUM SEER OF 18.
 - COOLING CAPACITIES ARE BASED ON 95° AMBIENT, 80° ENTERING AIR DRY BULB, 67° ENTERING AIR WET BULB. AIRFLOWS INDICATED ARE AT 'HIGH' SPEED.
 - MOUNT ODU ON ROOF ON WIND RATED EQUIPMENT SUPPORT RAILS AS MFG. BY ROOF PRODUCTS AND SERVICE CORP. (OR EQUAL). UNITS MUST BE SECURED TO RAILS VIA STAINLESS STEEL TIE DOWN BRACKETS.
 - PROVIDE MANUFACTURER'S SUGGESTED CLEARANCES AROUND UNIT.
 - PROVIDE UNITS WITH MANUFACTURER'S WIND BAFFLES OR LOW AMBIENT CONTROLS FOR OPERATION DOWN TO 0° F. INVERTER COMPRESSOR, INTEGRAL NON-LOCKING DISCONNECT FOR INDOOR UNIT, HARD WIRED WALL-MOUNTED 7-DAY PROGRAMMABLE THERMOSTAT
 - PROVIDE OUTDOOR UNITS WITH 6 YEAR EXTENDED COMPRESSOR WARRANTY.
 - SEE MANUFACTURER'S RECOMMENDATIONS FOR REQUIRED ADDITIONAL REFRIGERANT CHARGE AND RECOMMENDED LINE-SET LENGTHS.
 - POWER SUPPLY TO CONDENSING UNIT IS A SINGLE POINT ELECTRICAL CONNECTION FOR THE SYSTEM (A/C UNIT AND CONDENSING UNIT). THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER TO THE CONDENSING UNIT AND FROM THE CONDENSING UNIT TO THE A/C UNIT. CODE REQUIRED DISCONNECT SWITCHES ARE PROVIDED BY MECHANICAL CONTRACTOR.
 - REFRIGERANT PIPING AND WIRING FOR WALL-MOUNTED INDOOR UNITS SHALL BE ROUTED IN WALL WHERE POSSIBLE. ANY EXPOSED PIPING SHALL BE PAINTED TO MATCH WALL-FINISH.
 - PROVIDE A/C UNITS WITH CONDENSATE PUMP, REFER TO CONDENSATE PUMP SCHEDULE.

CONDENSATE PUMP SCHEDULE

CONDENSATE PUMP (CP) LITTLE GIANT (LOW PROFILE) VCC-20ULS
45 GPH @ 10' HEAD; 2 QUART TANK; MOTOR — 1/30 H.P., 120V-1ø;
FURNISH WITH: BUILT-IN CHECK VALVE.

- NOTE:
- INSTALL CONDENSATE PUMP OVER 3" DEEP EMERGENCY DRAIN PAN WITH LIQUID DETECTOR WIRED TO SHUTDOWN ASSOCIATED INDOOR UNIT IF LIQUID IS DETECTED

GRILLE AND DIFFUSER SCHEDULE

SYMBOL	SERVICE	CFM RANGE	FACE SIZE	NECK SIZE	TYPE	ODB	NAILOR
A	SUPPLY	100	24x24	8"	PERF.	NO	4320F
B	SUPPLY	300	24x24	10"	PERF.	NO	4320F
EX	EXISTING DIFFUSER TO REMAIN						
RE	EXISTING DIFFUSER TO BE RELOCATED						
XXX-EX	EXISTING DIFFUSER TO REMAIN; BALANCE TO XXX CFM.						

- NOTES:
- ALL CEILING AND WALL MOUNTED DEVICES SHALL BE FURNISHED WITH AN ENAMEL OFF-WHITE FINISH.
 - ALL DEVICES SHALL BE FURNISHED WITH FRAMES SUITABLE FOR TYPE OF INSTALLATION REQUIRED.
- * MATCH EXISTING BUILDING STANDARD

VAV BOX SCHEDULE

SYMBOL	CFM	HEATING	RUNOUT	ELEC.	VOLTAGE/ø	NAILOR	REMARKS
VAV	MAXIMUM	MINIMUM	CFM	SIZE	HEAT (KW)	D3ORE	
1-1	1200	250	750	SEE DWG	9.5	460V/3ø	10 SEE BELOW
1-2	1200	250	750	SEE DWG	9.5	460V/3ø	10 SEE BELOW
1-3	1200	250	750	SEE DWG	9.5	460V/3ø	10 SEE BELOW
1-4	1200	250	750	SEE DWG	9.5	460V/3ø	10 SEE BELOW
1-5	600	125	500	SEE DWG	6	460V/3ø	08 SEE BELOW
1-6	1150	250	750	SEE DWG	9	460V/3ø	10 SEE BELOW
1-7	1500	250	850	SEE DWG	11	460V/3ø	10 SEE BELOW
1-8	1500	250	850	SEE DWG	11	460V/3ø	10 SEE BELOW

- NOTES:
- MINIMUM INLET PRESSURE TO TERMINAL UNITS SHALL BE 0.75" W.G.
 - MAXIMUM PRESSURE DROP THROUGH TERMINAL UNITS SHALL BE 0.25" S.P.
 - FURNISH BOXES WITH: DDC CONTROLS, ACOUSTICAL LINING, FILTER AND FRAME, DDC TEMP SENSOR THERMOSTAT, CONTROL VOLTAGE TRANSFORMER, ELECTRIC HEAT, U.L. LABEL, ELECTRONIC DUCT SENSOR FOR MORNING WARM-UP.
 - ELECTRIC HEATER SHALL BE FURNISHED WITH DISCONNECT SWITCH, MAGNETIC CONTACTORS, AIRFLOW SWITCH, MANUAL RESET THERMAL CUTOUT.
 - PROVIDE SCR CONTROLLERS ON ALL BOXES (1 — 10 VDC).
 - DDC CONTROLS SHALL BE FURNISHED TO THE BOX MANUFACTURER BY THE CONTROLS VENDOR. BOX MANUFACTURER SHALL FACTORY MOUNT AND WIRE CONTROLS. INSTALLATION OF CONTROLS SHALL INCLUDE CONTROLS TRANSFORMER, FAN RELAY, HEAT RELAY, AIR FLOW PROBE, CONTROL COVER, AND ALL WIRING AND LABOR FOR A COMPLETE AND OPERATIONAL SYSTEM.
 - AFFIX BLUE MAINTENANCE STICKER ON CEILING BELOW EACH VAV BOX.

EXISTING RTU-1

UNIT	SUPPLY AIR (CFM)	RETURN AIR (CFM)	OUTSIDE AIR (CFM)
EX RTU-1	9,000	7,500	1,500

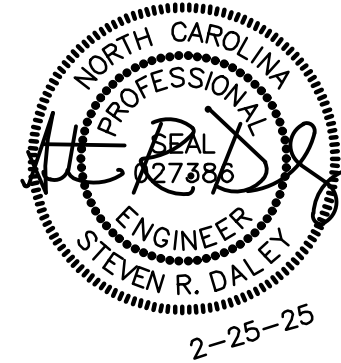
REBALANCE EXISTING RTU-1: OA, SA AND RA CFM VALUES AS INDICATED ABOVE. PROVIDE TAB DATA IN REPORT FOR ENGINEERS REVIEW. REFER TO TEST AND BALANCE SCHEDULE ON SHEET M001

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SEAL:



SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

MIDDLE SCHOOL
HIGH SCHOOL
5211 OLD CHARLOTTE HWY 1409 VESLEY CHAPEL RD
MONROE, NC 28110 INDIAN TRAIL, NC 28079

REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL
SCHEDULES
MIDDLE SCHOOL

DWG #:
M002
SHEET NO: 2 OF 11

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DUCTLESS SPLIT SYSTEMS (DX COOLING AND HEATING) - ALTERNATE #HS1

INDOOR UNIT										OUTDOOR UNIT									
SYMBOL	CFM	COOLING CAPACITY		HEATING CAPACITY		ELECTRICAL DATA			MANUFACTURER	SYMBOL	CFM	COOLING CAPACITY		EFF. EER	HEATING CAPACITY		AMBIENT	COMPRESSOR	FAN
		TC (BTUH)	SHC (BTUH)	(BTUH)		FAN FLA	MCA	VOLTAGE	MITSUBISHI			TC (BTUH)	SHC (BTUH)		(BTUH)				
A/C-HS1	560	18,000	13,000	23,000		0.20	1.0	208V-1Ø	TPLA0A018	QDU-HS1	18,000	13,000	14.2	23,000	95° F	12	7	0.50	11
																	28	208V-1Ø	112 LBS

- NOTES:
- ALL UNITS SHALL BE U.L. LISTED AND HAVE A MINIMUM SEER OF 14
 - COOLING CAPACITIES ARE BASED ON 95° AMBIENT, 80° ENTERING AIR DRY BULB, 67° ENTERING AIR WET BULB. AIRFLOWS INDICATED ARE AT 'HIGH' SPEED.
 - MOUNT UNIT ROOF ON EQUIPMENT SUPPORT RAILS AS MFG. BY ROOF PRODUCTS AND SERVICE CORP. (OR EQUAL).
 - PROVIDE MANUFACTURER'S SUGGESTED CLEARANCES AROUND UNIT.
 - PROVIDE UNITS WITH MANUFACTURER'S WIND BAFFLES OR LOW AMBIENT CONTROLS FOR OPERATION DOWN TO 0° F, INVERTER COMPRESSOR, 7-DAY PROGRAMMABLE THERMOSTAT (WALL-MOUNTED), INTEGRAL NON-LOCKING DISCONNECT FOR INDOOR UNIT.
 - PROVIDE OUTDOOR UNITS WITH 6 YEAR EXTENDED COMPRESSOR WARRANTY.
 - SEE MANUFACTURER'S RECOMMENDATIONS FOR REQUIRED ADDITIONAL REFRIGERANT CHARGE AND RECOMMENDED LINE-SET LENGTHS.
 - POWER SUPPLY TO CONDENSING UNIT IS A SINGLE POINT ELECTRICAL CONNECTION FOR THE SYSTEM (A/C UNIT AND CONDENSING UNIT). THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER TO THE CONDENSING UNIT AND FROM THE CONDENSING UNIT TO THE A/C UNIT. CODE REQUIRED DISCONNECT SWITCHES ARE PROVIDED BY MECHANICAL CONTRACTOR.
 - ANY EXPOSED REFRIGERANT PIPING SHALL BE PAINTED TO MATCH WALL-FINISH. REFRIGERANT PIPING AND WIRING FOR CEILING CASSETTE INDOOR UNITS SHALL BE ROUTED ABOVE CEILING.
 - PROVIDE A/C UNITS WITH CONDENSATE PUMP, REFER TO CONDENSATE PUMP SCHEDULE.

CONDENSATE PUMP SCHEDULE

- CONDENSATE PUMP (CP) LITTLE GIANT (LOW PROFILE) VCC-20ULS
45 GPH @ 10' HEAD; 2 QUART TANK; MOTOR - 1/30 H.P., 120V-1Ø;
FURNISH WITH: BUILT-IN CHECK VALVE.
- NOTE:
1. INSTALL CONDENSATE PUMP OVER 3" DEEP EMERGENCY DRAIN PAN WITH LIQUID DETECTOR WIRED TO SHUTDOWN ASSOCIATED INDOOR UNIT IF LIQUID IS DETECTED

ELEC HEATER SCHEDULE

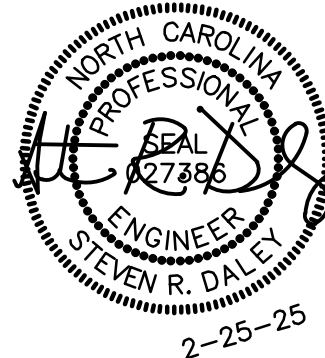
- UH-1,2,14,19,20 (T-BAR CEILING MOUNTED)
RAYWALL 83RCH2A1
2.0 KW; 208V-3Ø; 6,826 BTUH; 600 CFM
- UH-5,10,13,15 (T-BAR CEILING MOUNTED)
RAYWALL 83RCH3A1
3.0 KW; 208V-3Ø; 10,200 BTUH; 600 CFM
- UH-16 (T-BAR CEILING MOUNTED)
RAYWALL 83RCH5A1
5.0 KW; 208V-3Ø; 17,000 BTUH; 600 CFM
- UH-4,6,7,9,18 (HORIZONTAL CEILING SUSPENDED)
RAYWALL F3FUHE03C03T
3.3 KW; 208V-3Ø; 11,200 BTUH; 400 CFM
- UH-3,8,12,17 (HORIZONTAL CEILING SUSPENDED)
RAYWALL F2FUHE05C03T
5.0 KW; 208V-3Ø; 17,100 BTUH; 400 CFM
- UH-11 (HORIZONTAL CEILING SUSPENDED)
RAYWALL F3FUHE07C03T
7.5 KW; 208V-3Ø; 26,500 BTUH; 575 CFM
- FEATURES:
T-BAR CEILING TYPE:
LOW VOLTAGE WALL MOUNTED THERMOSTAT W/LOCKABLE WALL
GUARD COVER, AIR DIRECTIONAL LOUVER OUTLET; 1" SLOTS FOR
RETURN AIR AND CONCENTRIC RINGS FOR AIR DISCHARGE, BUILT
IN DISCONNECT SWITCH, RECESSED TYPE FLUSH WITH CEILING,
HEATING ELEMENT IS HELICALLY COILED NICKEL CHROMIUM ALLOY
RESISTANT WIRE
- CEILING SUSPENDED TYPE:
SEPARATE LINE VOLTAGE THERMOSTAT W/LOCKABLE GUARD
COVER, AIR DIRECTIONAL LOUVERS (HORIZONTAL THROW), BUILT
IN DISCONNECT SWITCH

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SEAL:



SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

MIDDLE SCHOOL
5211 OLD CHARLOTTE HWY 1409 VESLEY CHAPEL RD
MONROE, NC 28110 INDIAN TRAIL, NC 28079

REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL
SCHEDULES
HIGH SCHOOL

DWG #:
M003
SHEET NO: 3 OF 11

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INPUT/OUTPUT SUMMARY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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	TEMPERATURE	PRESSURE	REL. HUMIDITY	AIR FLOW	WATER FLOW	HERTZ	RTZ	VOLTS	AMPS	ENTHALPY	RUN TIME	EFFICIENCY	STATUS	FILTER	SMOKE	AIR FLOW	METER	OVER-RIDE	OFF-ON	OFF-AUTO-ON	OFF-HI-LO	OFF-LO-CLOSE		DMPR. POS.	POS. SETPOINT	VAL. STEP CONTROL	HI ANALOG	LO ANALOG	HI ANALOG	LO ANALOG	PROOF	TIME SCHEDULING	DEMAND LIMITING	DUTY CYCLE	OFF	ENTHALPY OPT.	SMOKE ONT.	ALARM INSTRUCT	MAIN. WK. ORD.	COLOR GRAPHIC																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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SEQUENCE OF OPERATION (MIDDLE SCHOOL)

A COMPLETE AND OPERATIONAL DDC CONTROL SYSTEM (BAS) SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS (SECTION 230900) AND AS INTENDED ON THESE PLANS. ALL CONTROL POINTS AND EQUIPMENT SEQUENCES OF OPERATION LISTED IN SPECIFICATION SECTION 230900 SHALL BE CONSIDERED IN ADDITION TO THOSE LISTED HERE. IN THE EVENT THAT THE VERBAGE IS IN CONFLICT OR CONTRADICTS THE REQUIREMENTS LISTED HERE, THE QUESTION SHALL BE ASKED PRIOR TO BIDDING OR THE MORE STRINGENT SHALL APPLY. MECHANICAL CONTRACTOR SHALL COORDINATE ALL BAS INTEGRATION REQUIREMENTS WITH EQUIPMENT VENDORS AND CONTROLS CONTRACTOR PRIOR TO PURCHASING EQUIPMENT AND PROVIDE ALL EQUIPMENT WITH COMMUNICATION/INTERFACE CARDS AS REQUIRED FOR SYSTEM INTEGRATION.

EXISTING BUILDING – PROJECT DESCRIPTION
THIS PROJECT CONSISTS OF WORK IN ONE CLASSROOM WING IN THE MIDDLE SCHOOL. THE EXISTING CAMPUS BAS IS N4 SERVER. ALL NEW BAS CONTROLS SHALL EXTEND OFF THIS EXISTING SYSTEM.

PROVIDE OWNER REQUIRED BACNET OVER IP CARD.
EACH DEVICE WILL BE PULLED BACK TO A NETWORK SWITCH PROVIDED BY THE CONTRACTOR AND EACH DEVICE WILL BE ASSIGNED A SEPARATE IP ADDRESS.

BACNET OVER IP (NOT USING MS/TP TRUNK).

HUMIDITY CONTROL (EX RTU-1)
WITH SYSTEM IN OCCUPIED OR UNOCCUPIED MODE, HUMIDITY CONTROL SYSTEM SHALL BE CAPABLE OF BEING ACTIVATED. UNDER NORMAL OPERATION, UNIT SHALL BE CONTROLLED AS PER EXISTING SEQUENCE. PROVIDE HUMIDISTAT AS INDICATED ON THE PLANS. IF SPACE HUMIDITY REACHES 60% R.H. (ADJ), ALARM SHALL BE SENT TO THE CENTRAL BAS AND HUMIDITY CONTROL SEQUENCE SHALL BE ACTIVATED. OUTSIDE AIR INTAKE SHALL CLOSE TO MINIMUM POSITION FOR EX RTU. UNIT COMPRESSORS SHALL ACTIVATE TO PROVIDE COOLING. VAV BOX ELECTRIC REHEAT COILS SHALL MODULATE TO MAINTAIN SPACE TEMPERATURE SETPOINT. WHEN SPACE RELATIVE HUMIDITY DROPS BELOW 55% R.H. (ADJ), BAS SHALL DEACTIVATE HUMIDITY CONTROL SEQUENCE. CONTROL OF UNIT SHALL REVERT BACK TO PREVIOUS SEQUENCE.

VAV BOX W/ ELECTRIC REHEAT
THE VAV BOX SHALL HAVE SEPARATE MINIMUM CFM SETTINGS FOR HEATING AND COOLING OPERATION. REFERENCE VAV BOX SCHEDULE ON THE PLANS FOR CFM VALUES.

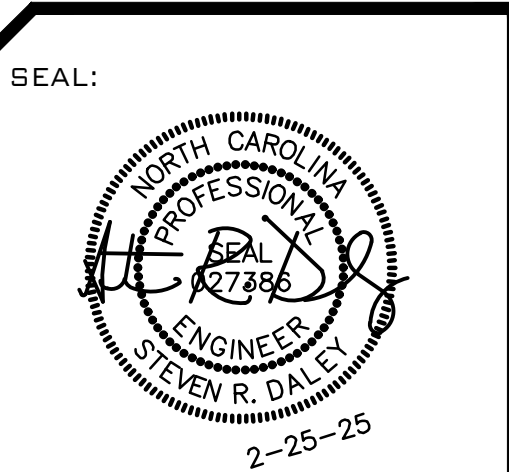
VAV BOX OCCUPIED MODE: A TEMPERATURE SENSOR SHALL BE UTILIZED TO MAINTAIN SPACE TEMPERATURE. ON RISE IN SPACE TEMPERATURE ABOVE SETPOINT, THE VOLUME DAMPER SHALL OPEN AS REQUIRED TO MAINTAIN SPACE TEMPERATURE. ON DROP IN SPACE TEMPERATURE BELOW SETPOINT, THE VOLUME DAMPER SHALL CLOSE AS REQUIRED TO MAINTAIN SETPOINT UNTIL THE MINIMUM DAMPER POSITION IS REACHED. UPON CONTINUED DROP IN SPACE TEMPERATURE BELOW SETPOINT, BOX SHALL RESET TO HEATING CFM, AND THE ELECTRIC COIL SHALL BE STAGED TO MAINTAIN SETPOINT.

VAV BOX UNOCCUPIED MODE: IN THE NIGHT SETBACK MODE, WHEN THE AHU IS ENERGIZED, THE VAV BOX SHALL OPERATE AT HEATING CFM AND STAGE THE REHEAT COIL TO MAINTAIN UNOCCUPIED SPACE HEATING SETPOINT UNTIL THE VAV AHU SYSTEM SPACE TEMPERATURE RISES ABOVE THE NIGHT SETBACK UNOCCUPIED HEATING SETPOINT.

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SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

HIGH SCHOOL
5211 OLD CHARLOTTE HWY 1409 WESLEY CHAPEL RD
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MIDDLE SCHOOL
INDIAN TRAIL, NC 28079

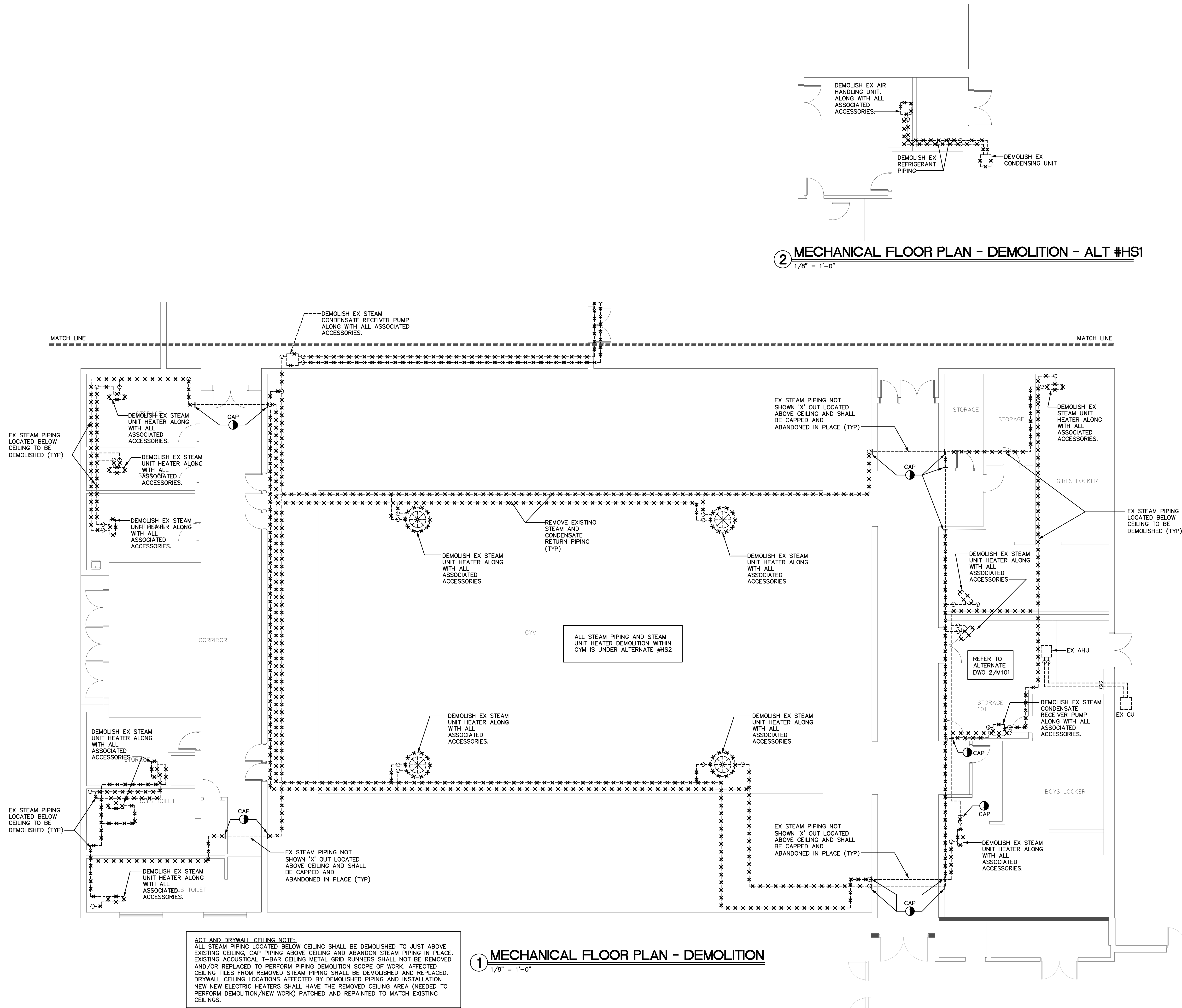
REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL
POINTS LIST
AND SEQUENCE
OF OPERATIONS

DWG #:
M004
SHEET NO: 4 OF 11

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② MECHANICAL FLOOR PLAN - DEMOLITION - ALT #H51
1/8" = 1'-0"

① MECHANICAL FLOOR PLAN - DEMOLITION
1/8" = 1'-0"

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2-25-25

**SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS**

HIGH SCHOOL
5211 OLD CHARLOTTE HWY 1409 VESLEY CHAPEL RD
MONROE, NC 28110

MIDDLE SCHOOL
INDIAN TRAIL, NC 28079

REV #	DATE	DESCRIPTION

DATE:	02-25-2025
PROJECT #:	24-0219
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:

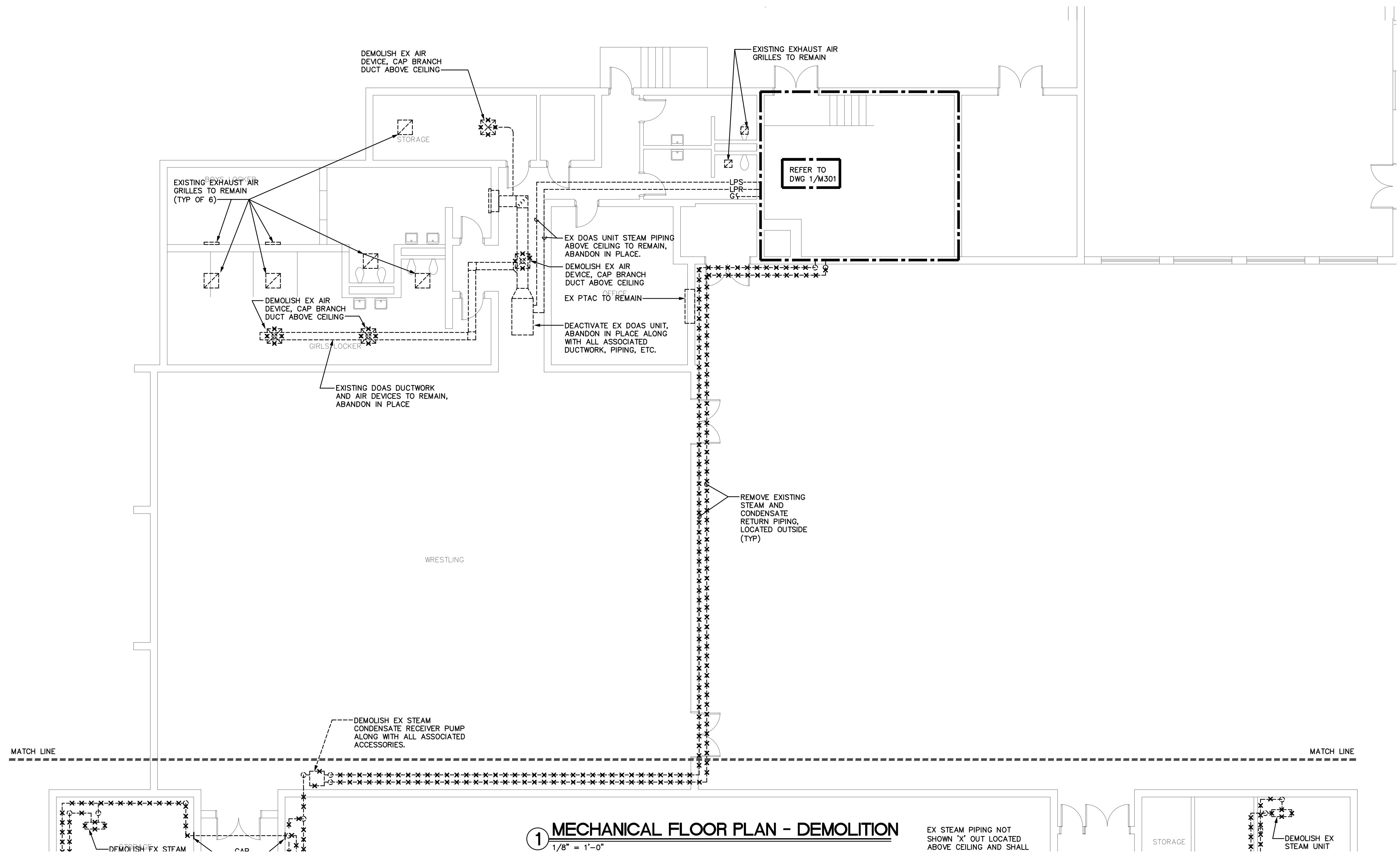
**MECHANICAL
FLOOR PLAN -
DEMOLITION
HIGH SCHOOL**

DWG #:

M101

SHEET NO: 5 OF 11

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NORTH CAROLINA
2-25-25

**SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS**

HIGH SCHOOL
5211 OLD CHARLOTTE HWY 1409 WESLEY CHAPEL RD
MONROE, NC 28110

MIDDLE SCHOOL
INDIAN TRAIL, NC 28079

REV #	DATE	DESCRIPTION

DATE:	02-25-2025
PROJECT #:	24-0219
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

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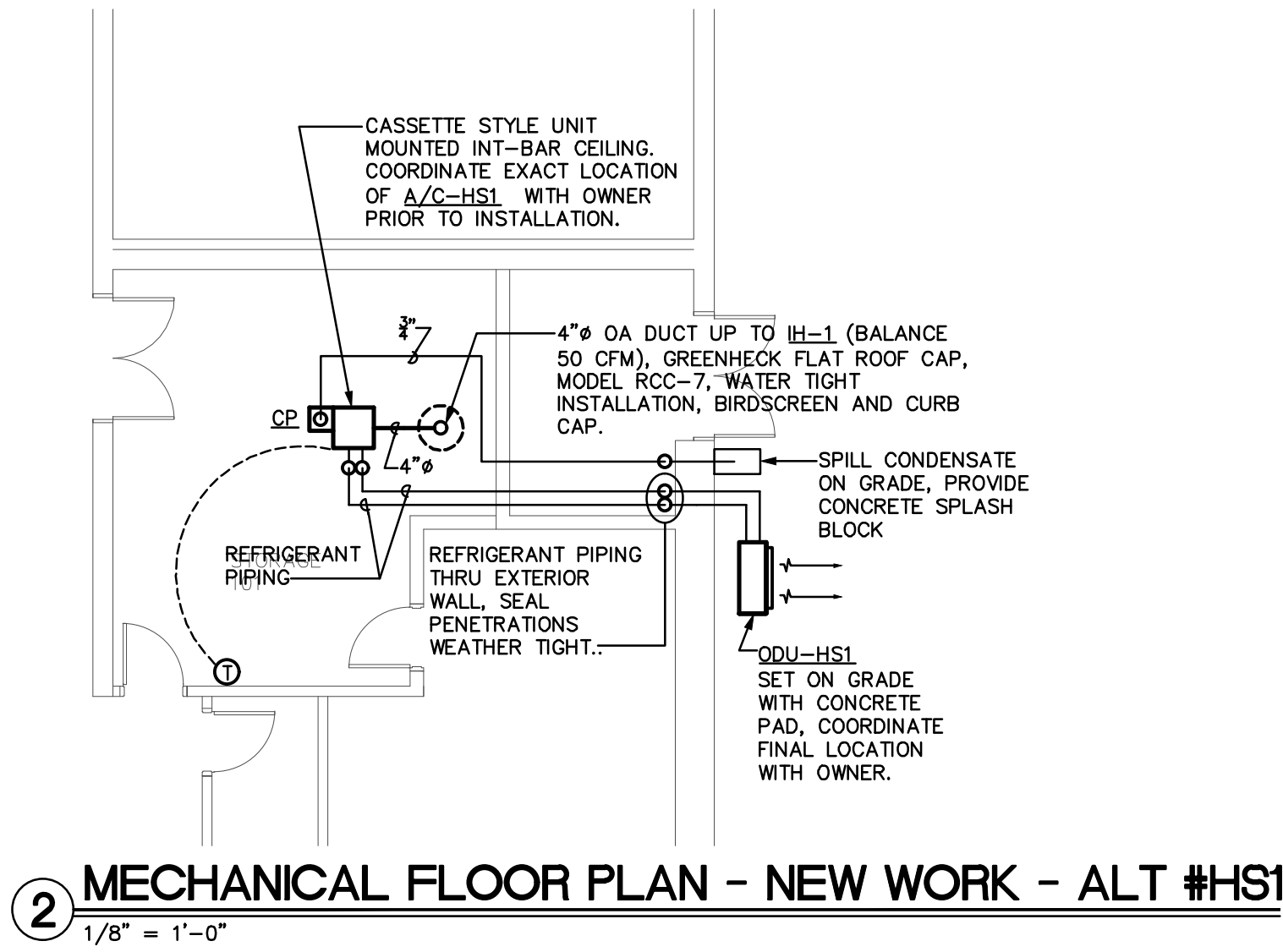
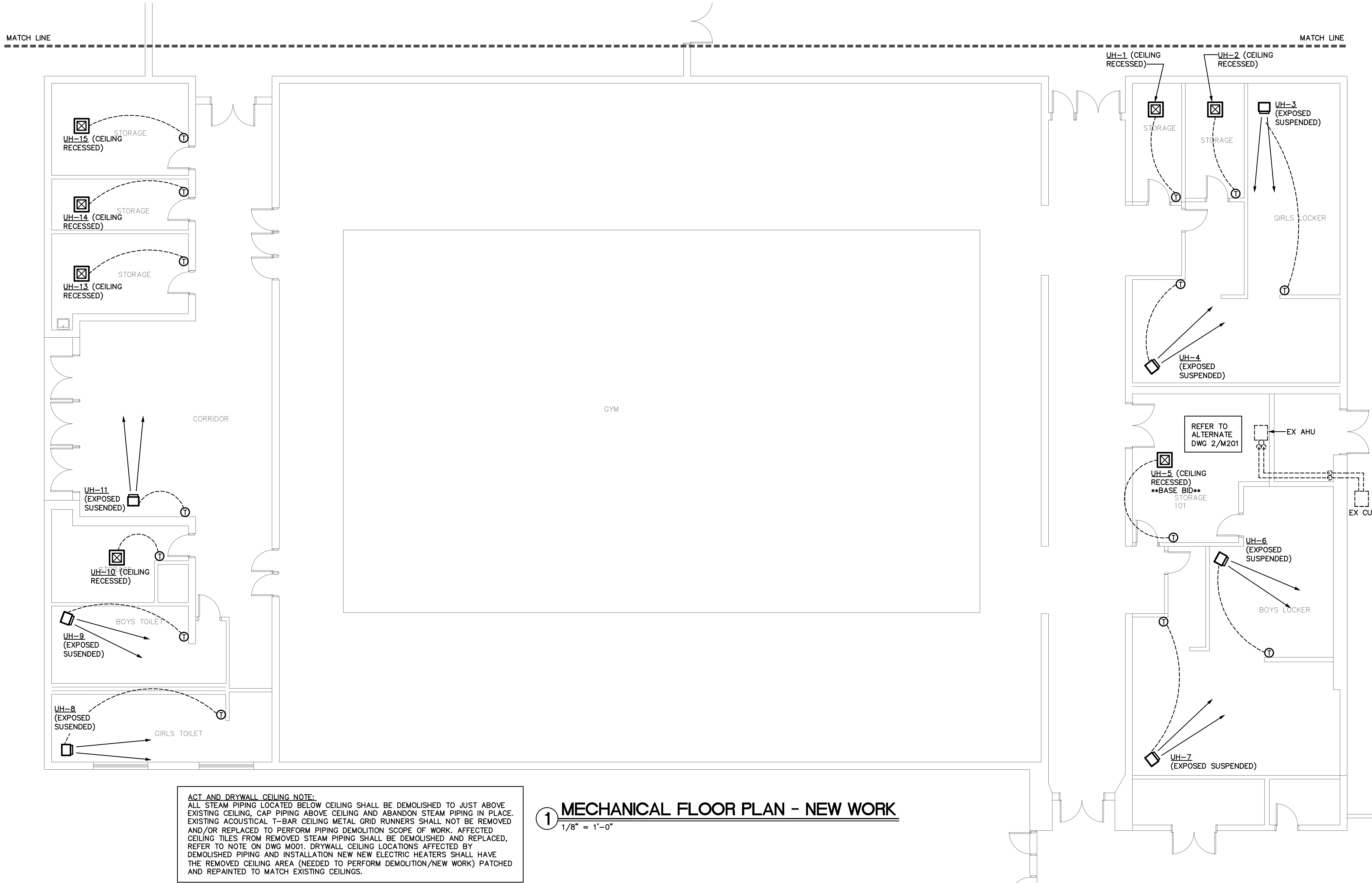
**MECHANICAL
FLOOR PLAN -
DEMOLITION
HIGH SCHOOL**

DWG #:

M102

SHEET NO: 6 OF 11

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REV #	DATE	DESCRIPTION

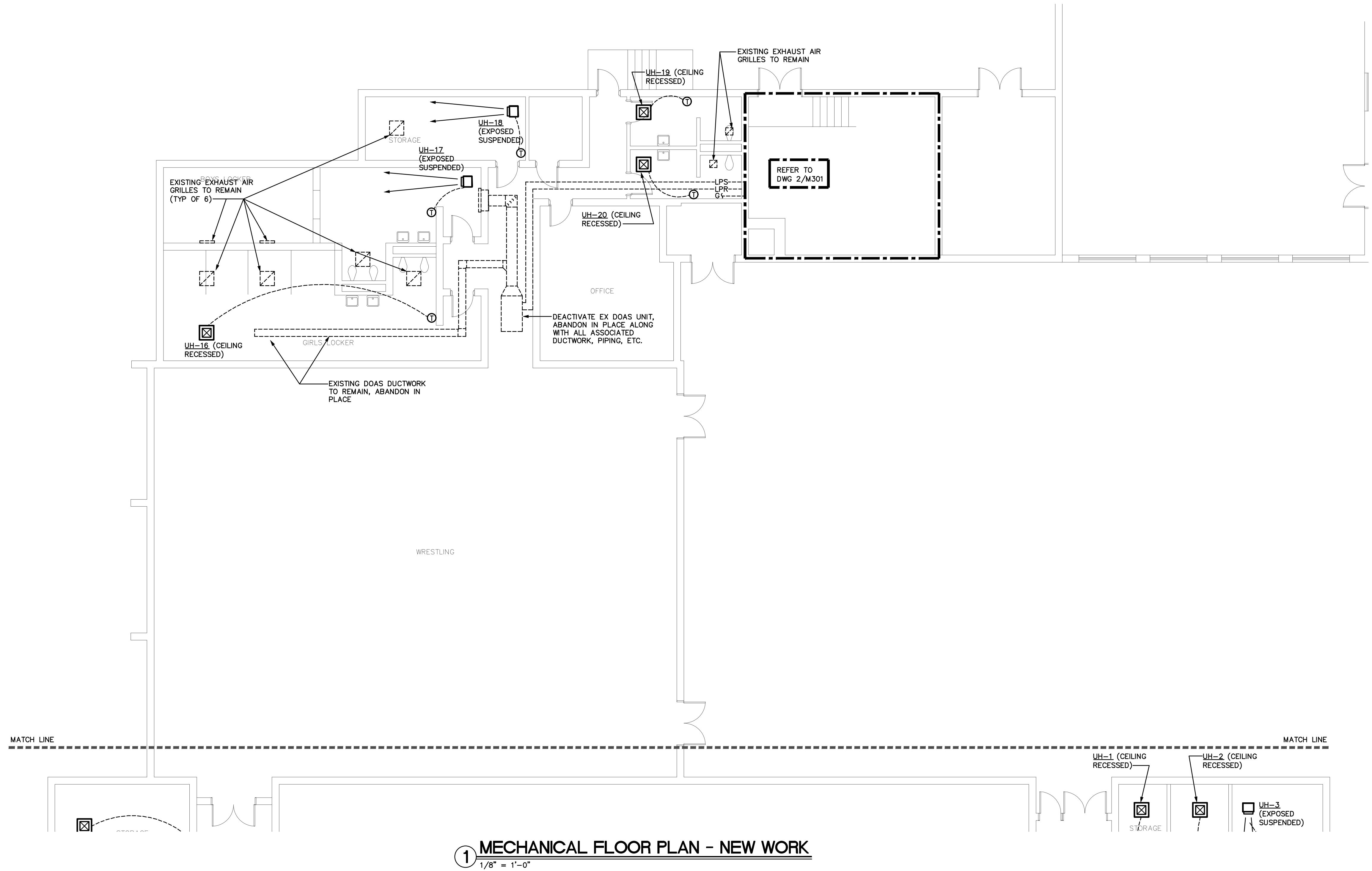
DATE:	02-25-2025
PROJECT #:	24-0219
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:
MECHANICAL
FLOOR PLAN -
NEW WORK
HIGH SCHOOL

DWG #:
M201

SHEET NO: 7 OF 11

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1 MECHANICAL FLOOR PLAN - NEW WORK

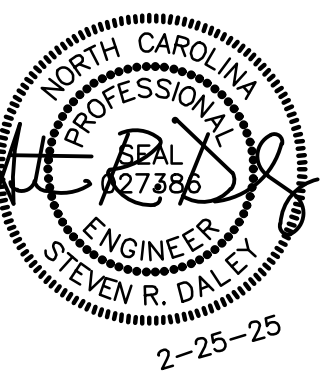
1/8" = 1'-0"

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SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

MIDDLE SCHOOL
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INDIAN TRAIL, NC 28079

REV #	DATE	DESCRIPTION

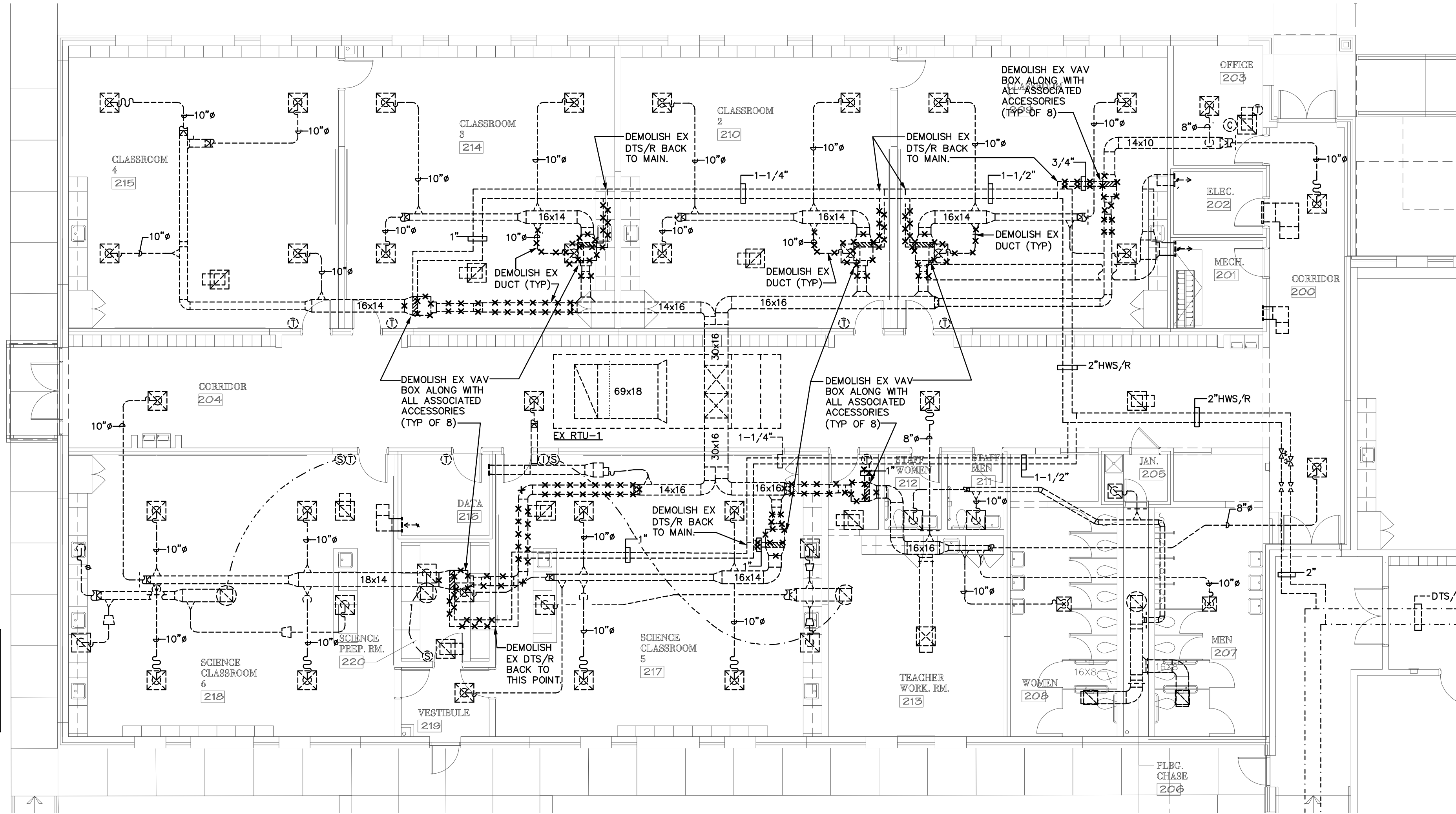
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PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL
FLOOR PLAN -
NEW WORK
HIGH SCHOOL

DWG #:
M202
SHEET NO: 8 OF 11

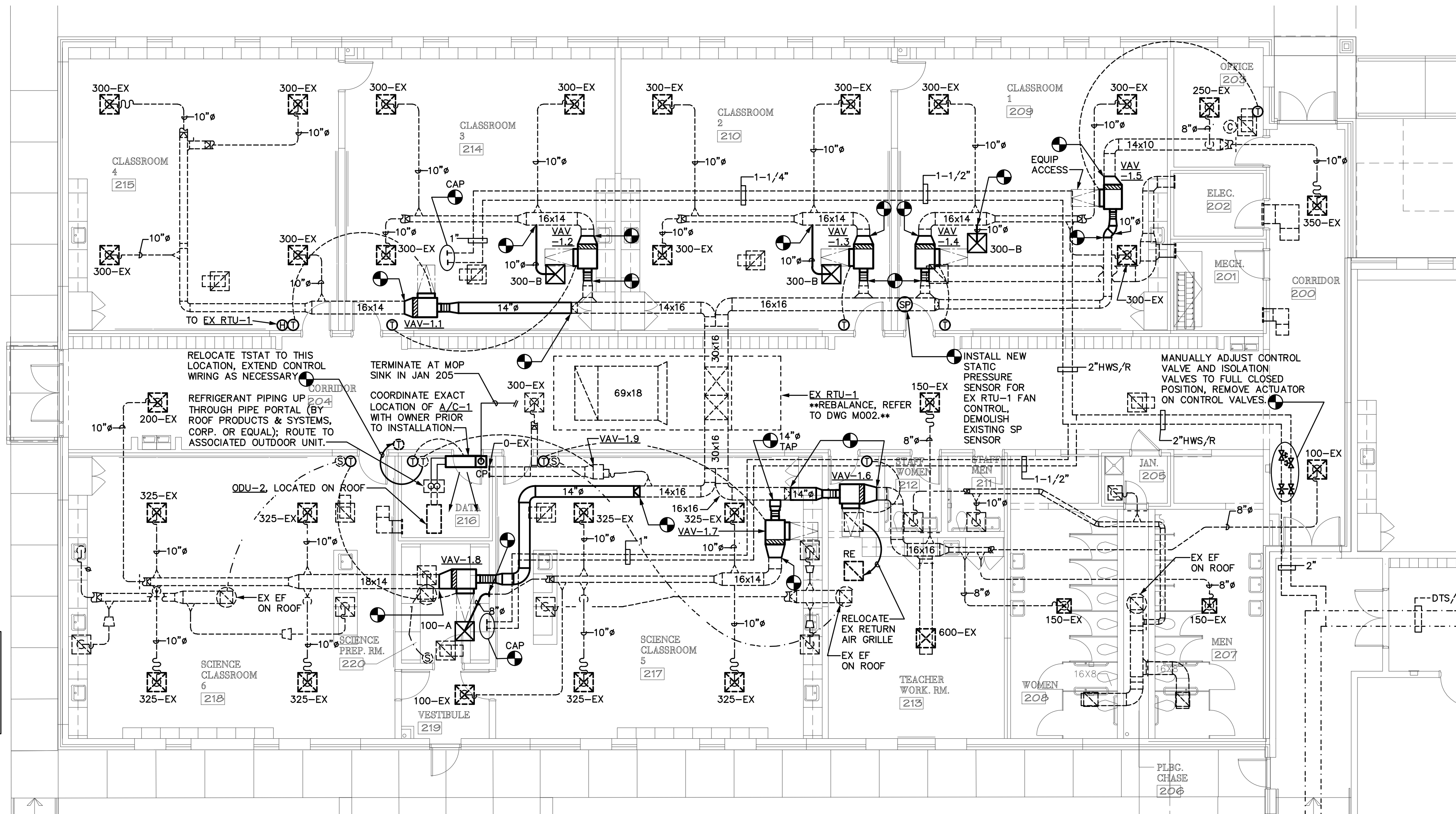
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ACT CEILING NOTE:
EXISTING ACoustICAL T-BAR CEILING MAY BE REQUIRED TO BE PARTIALLY DE-CONSTRUCTED FOR EXISTING DUAL TEMP VAV BOX DEMOLITION AND NEW ELECTRIC HEAT VAV BOX INSTALLATION. UPON COMPLETION OF VAV BOX INSTALLATION, CEILING RUNNERS AND TILES SHALL BE RE-INSTALLED. DAMAGED CEILING TILES DURING CONSTRUCTION SHALL BE REPLACED WITH NEW TILES. REFER TO NOTE ON DWG M001.



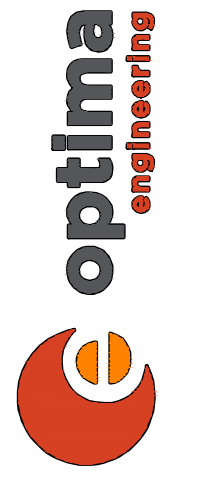
1 MECHANICAL DEMOLITION PLAN
1/8" = 1'-0"

ACT CEILING NOTE:
EXISTING ACoustICAL T-BAR CEILING MAY BE REQUIRED TO BE PARTIALLY DE-CONSTRUCTED FOR EXISTING DUAL TEMP VAV BOX DEMOLITION AND NEW ELECTRIC HEAT VAV BOX INSTALLATION. UPON COMPLETION OF VAV BOX INSTALLATION, CEILING RUNNERS AND TILES SHALL BE RE-INSTALLED. DAMAGED CEILING TILES DURING CONSTRUCTION SHALL BE REPLACED WITH NEW TILES. REFER TO NOTE ON DWG M001.



2 MECHANICAL FLOOR PLAN - NEW WORK
1/8" = 1'-0"

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SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

HIGH SCHOOL
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MIDDLE SCHOOL
INDIAN TRAIL, NC 28079

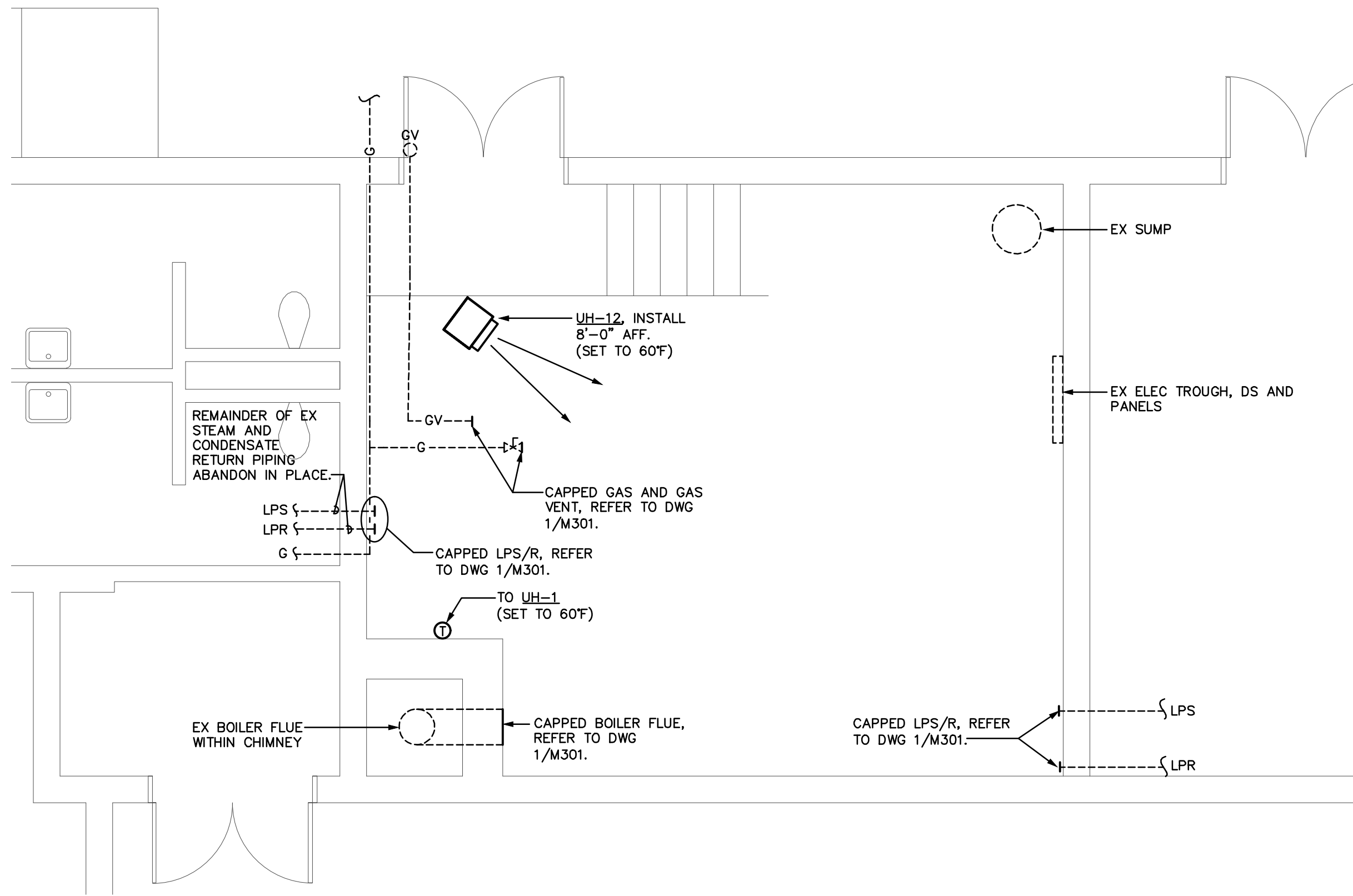
REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
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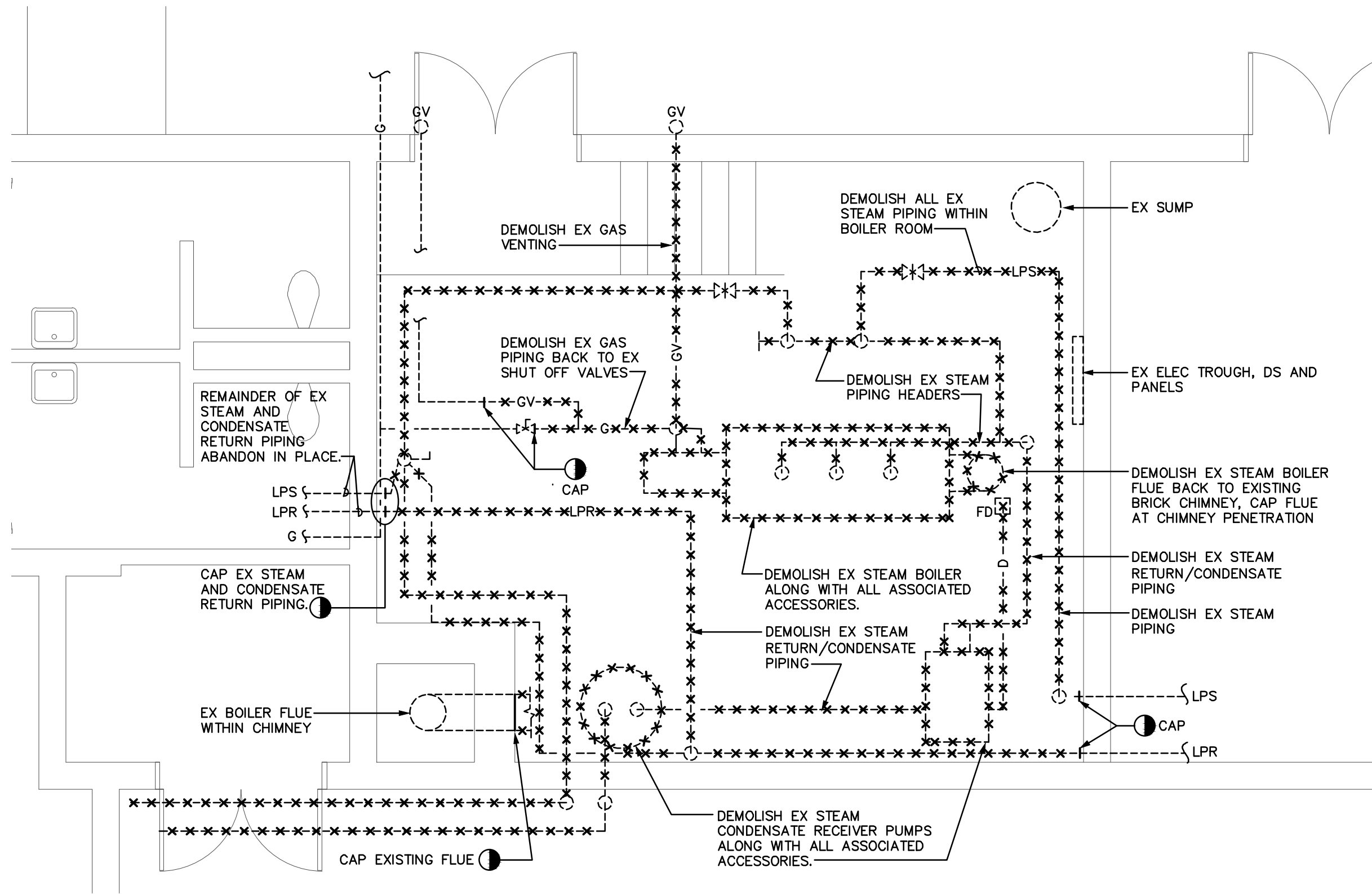
SHEET TITLE:
MECHANICAL
FLOOR PLANS
NEW WORK AND
DEMOLITION
MIDDLE SCHOOL

DWG #:
M203
SHEET NO: 9 OF 11

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2 MECHANICAL BOILER ROOM - NEW WORK
1/4" = 1'-0"



1 MECHANICAL BOILER ROOM - DEMOLITION
1/4" = 1'-0"

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HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

MIDDLE SCHOOL
5211 OLD CHARLOTTE HWY 1409 VESLEY CHAPEL RD
MONROE, NC 28110 INDIAN TRAIL, NC 28079

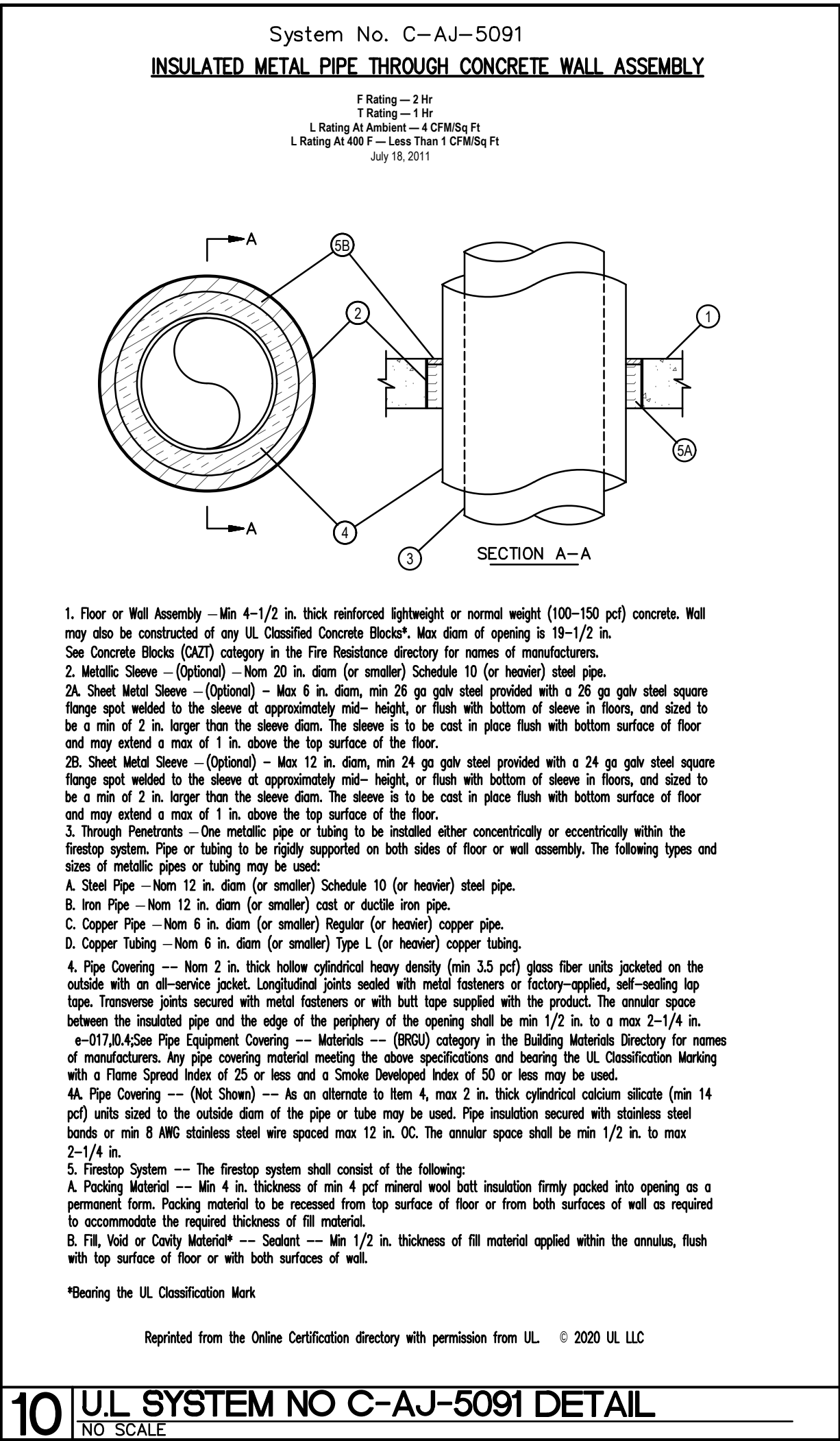
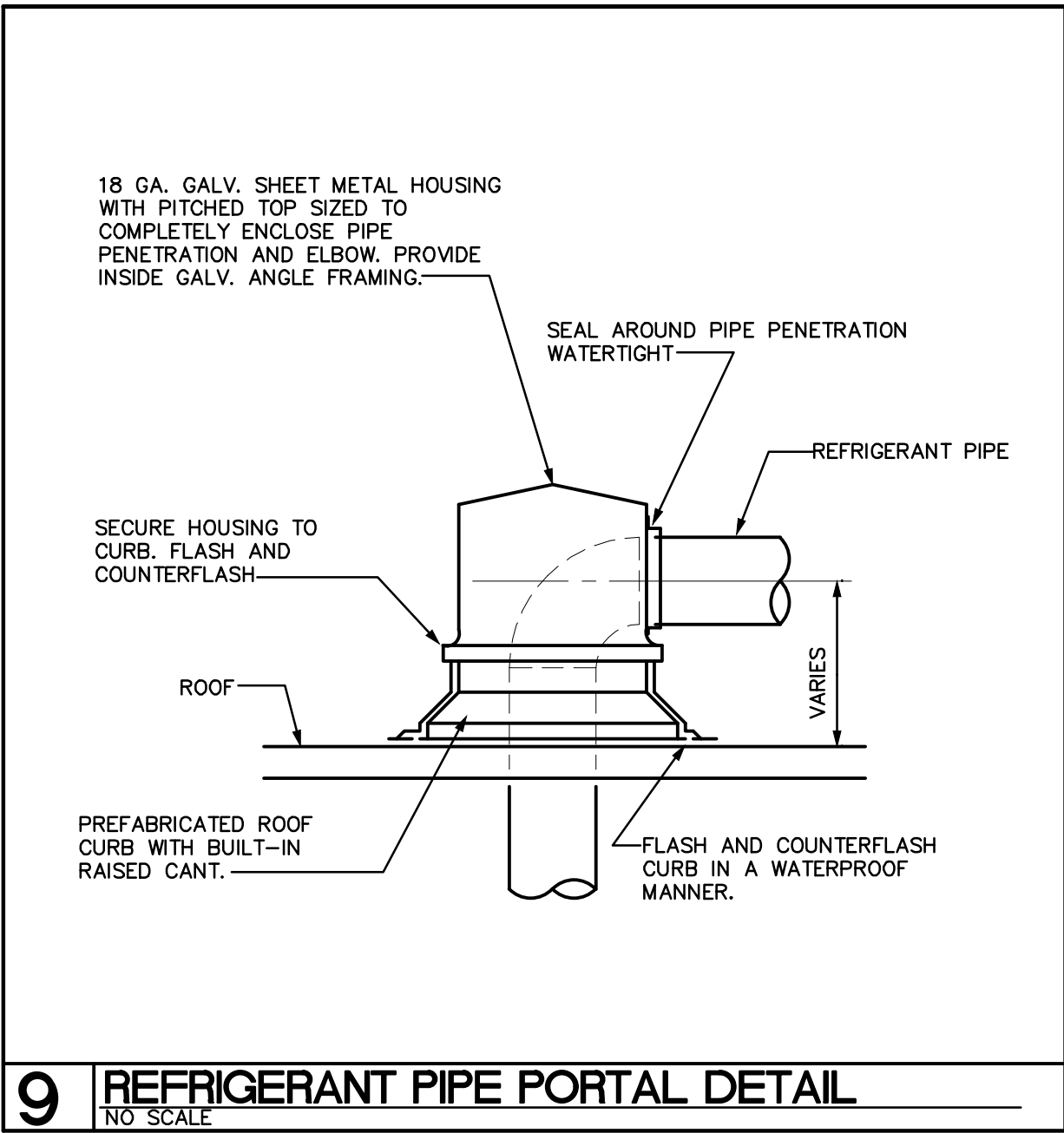
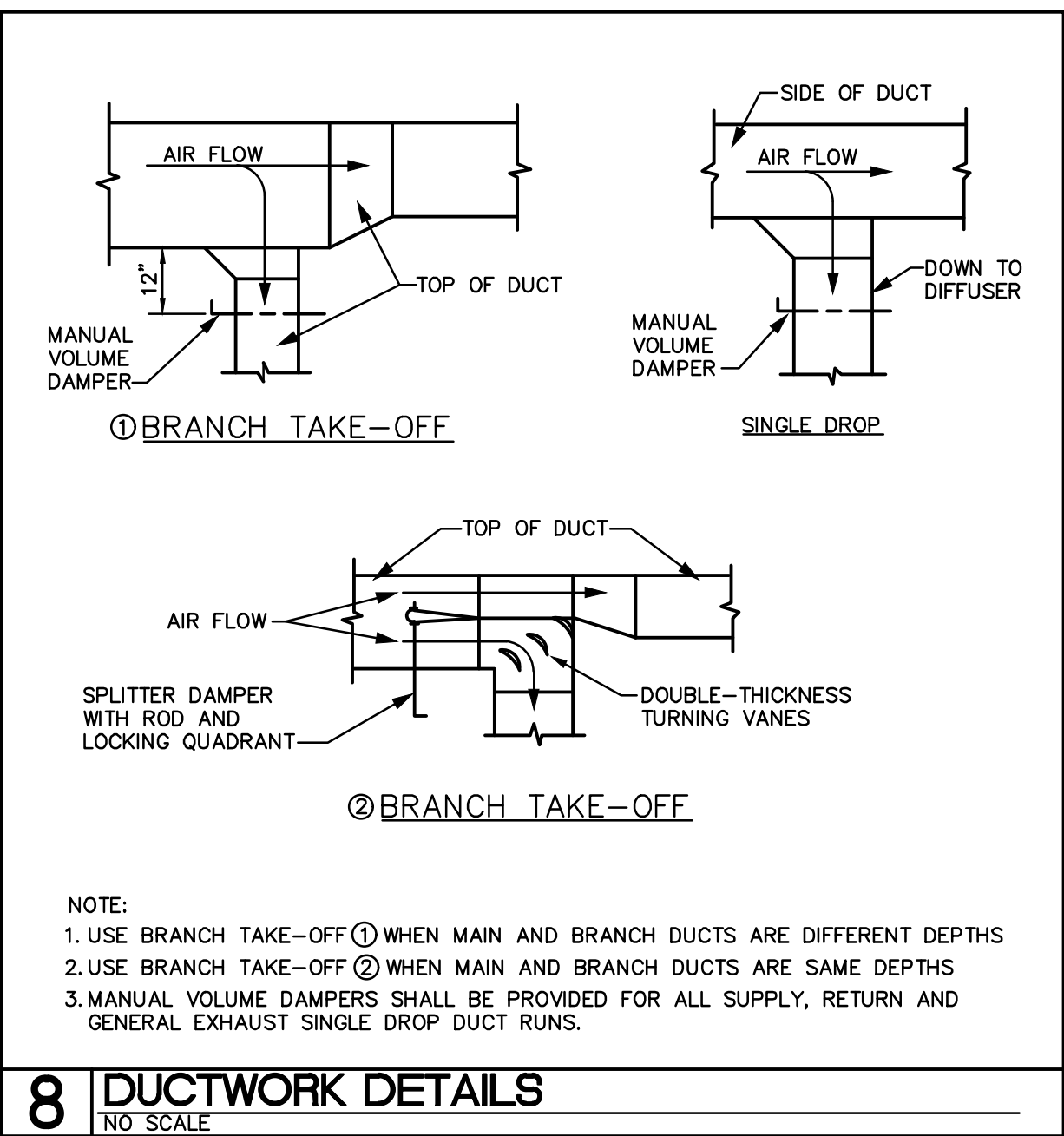
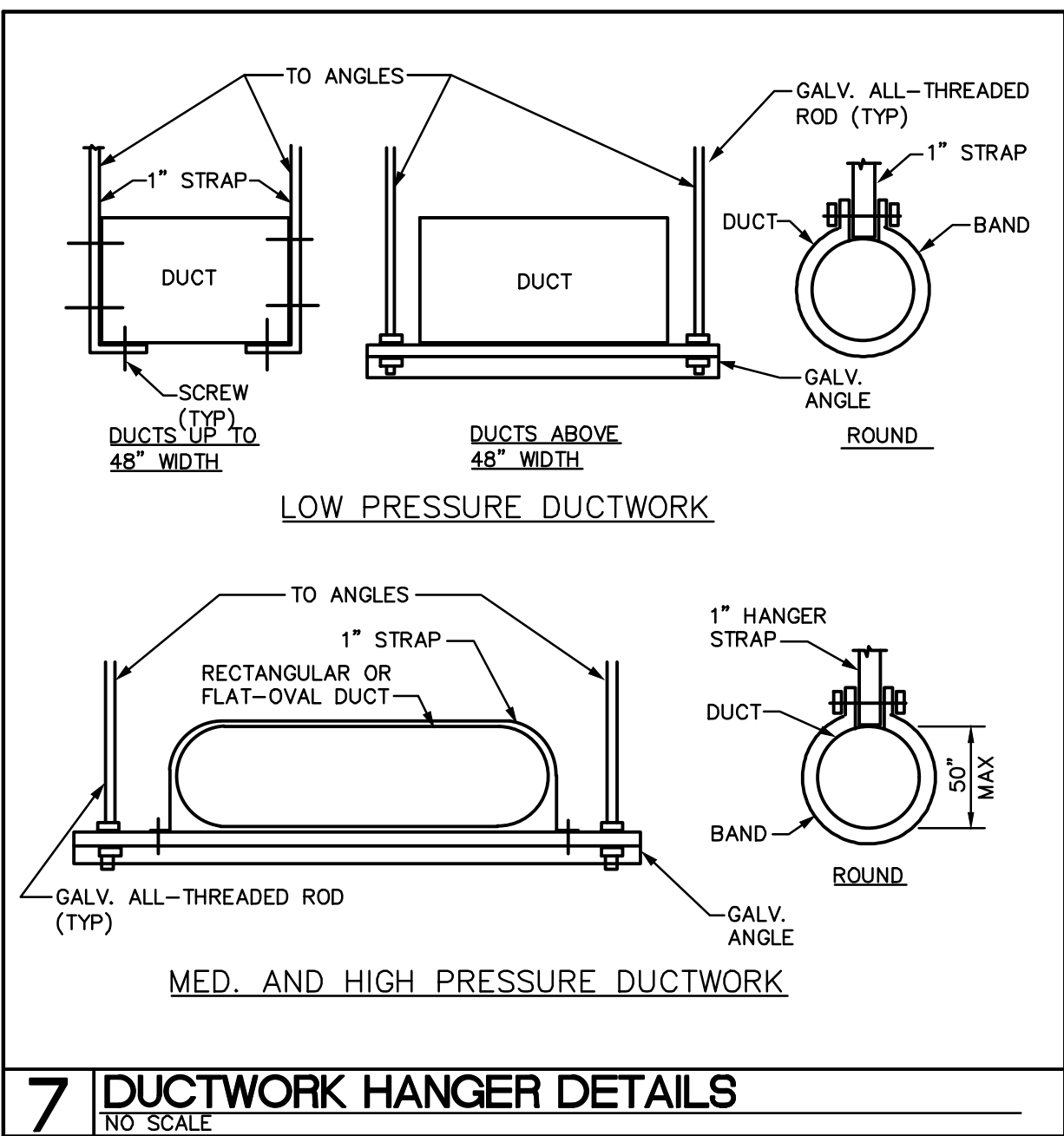
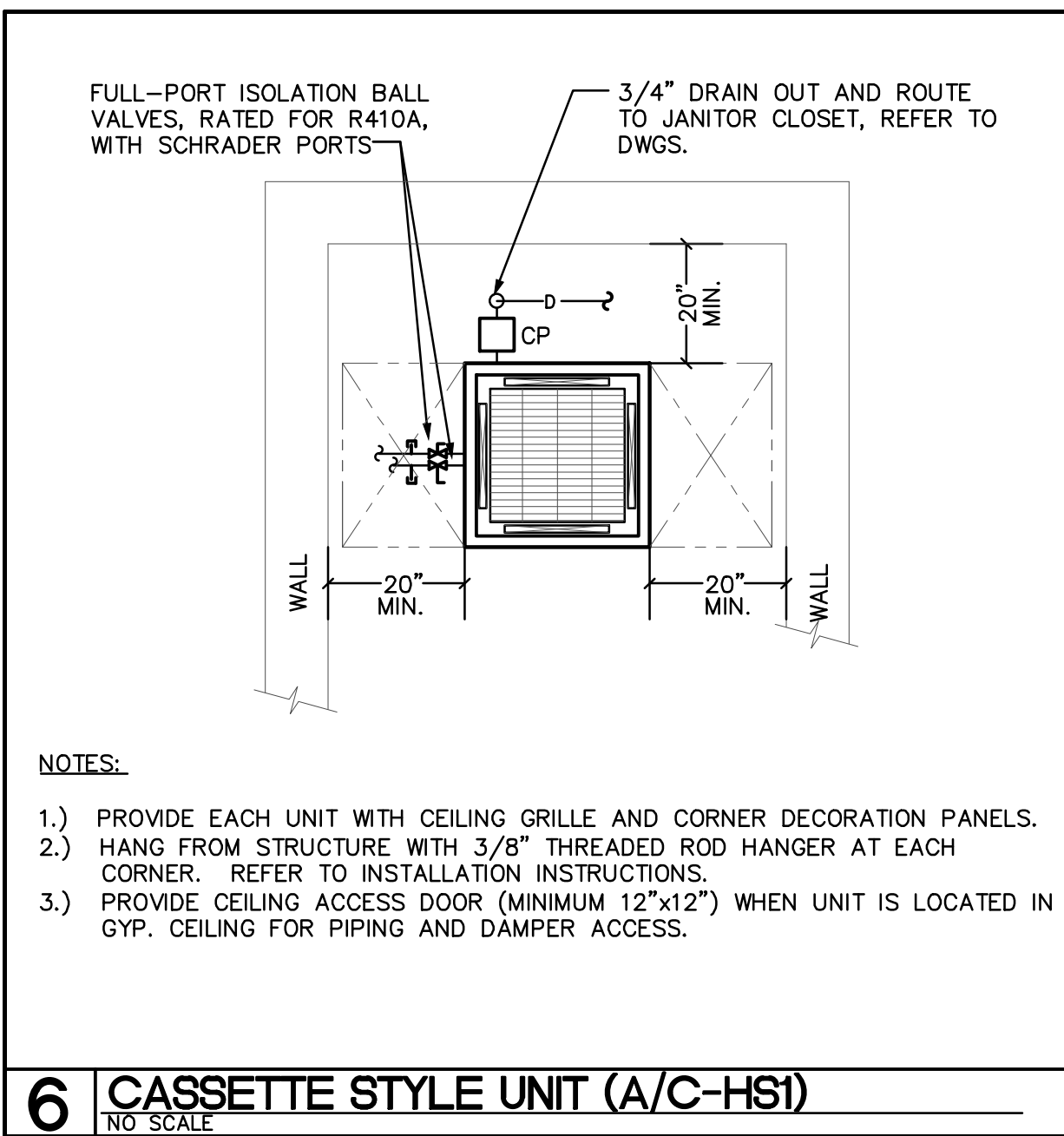
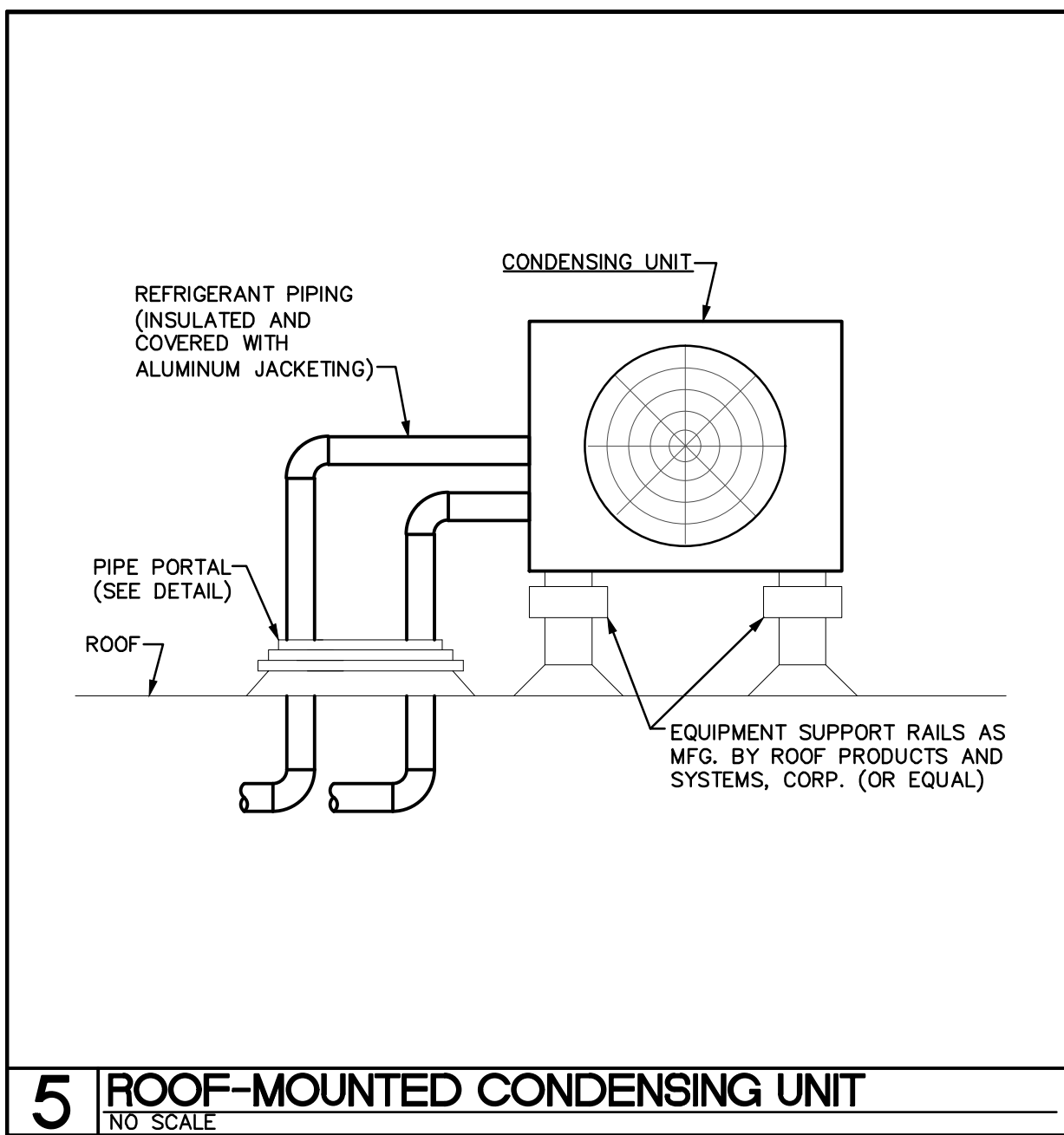
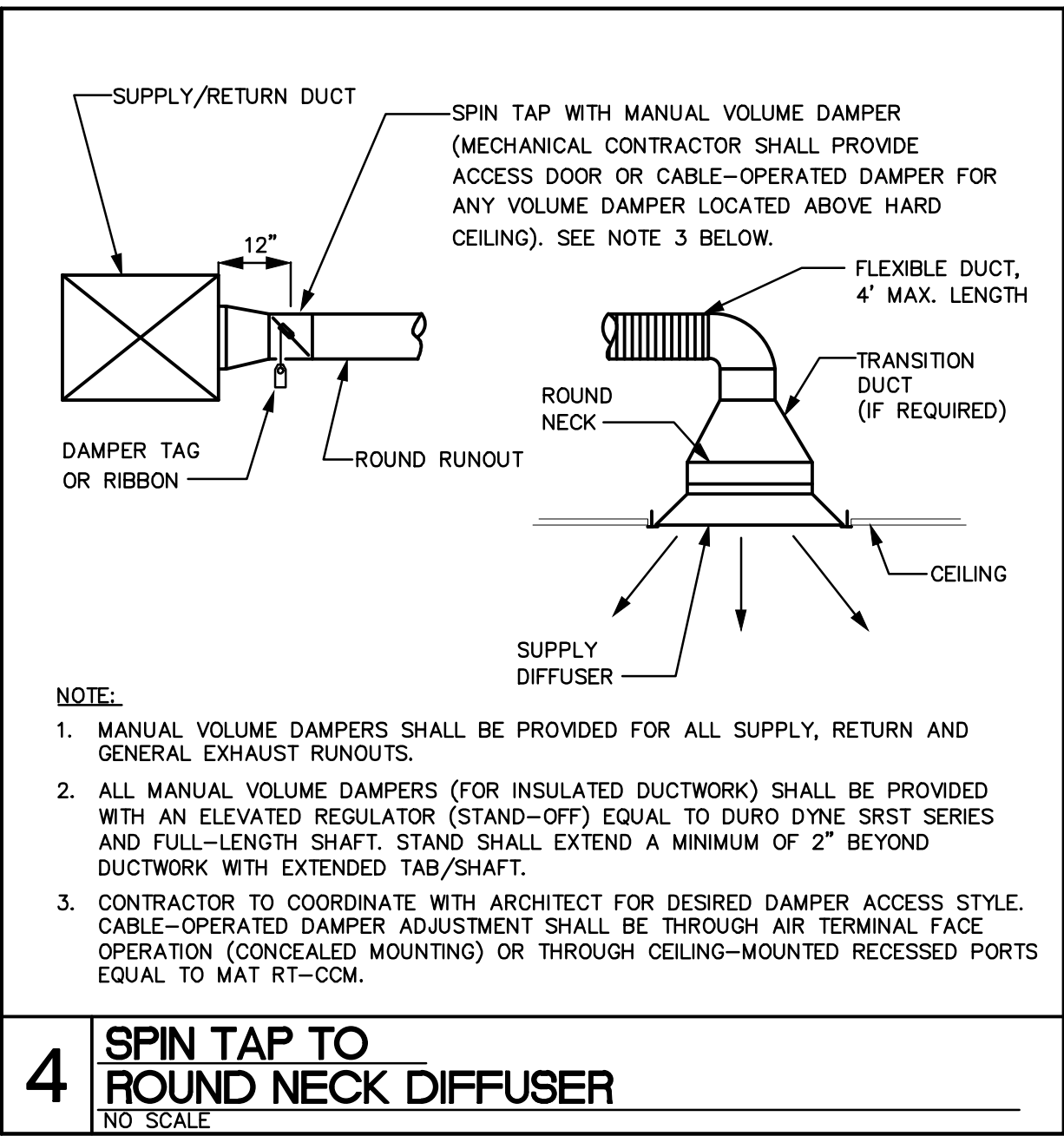
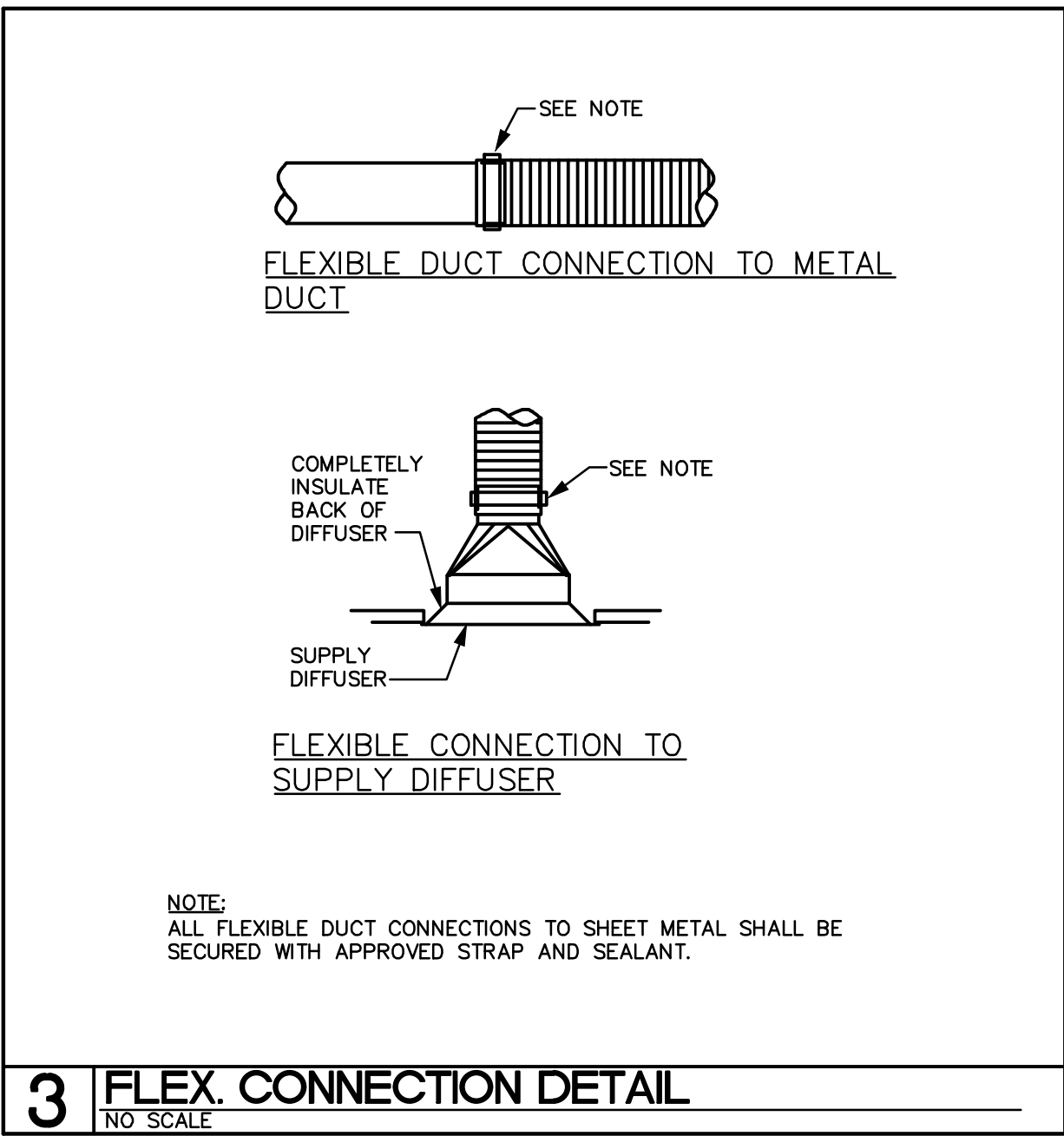
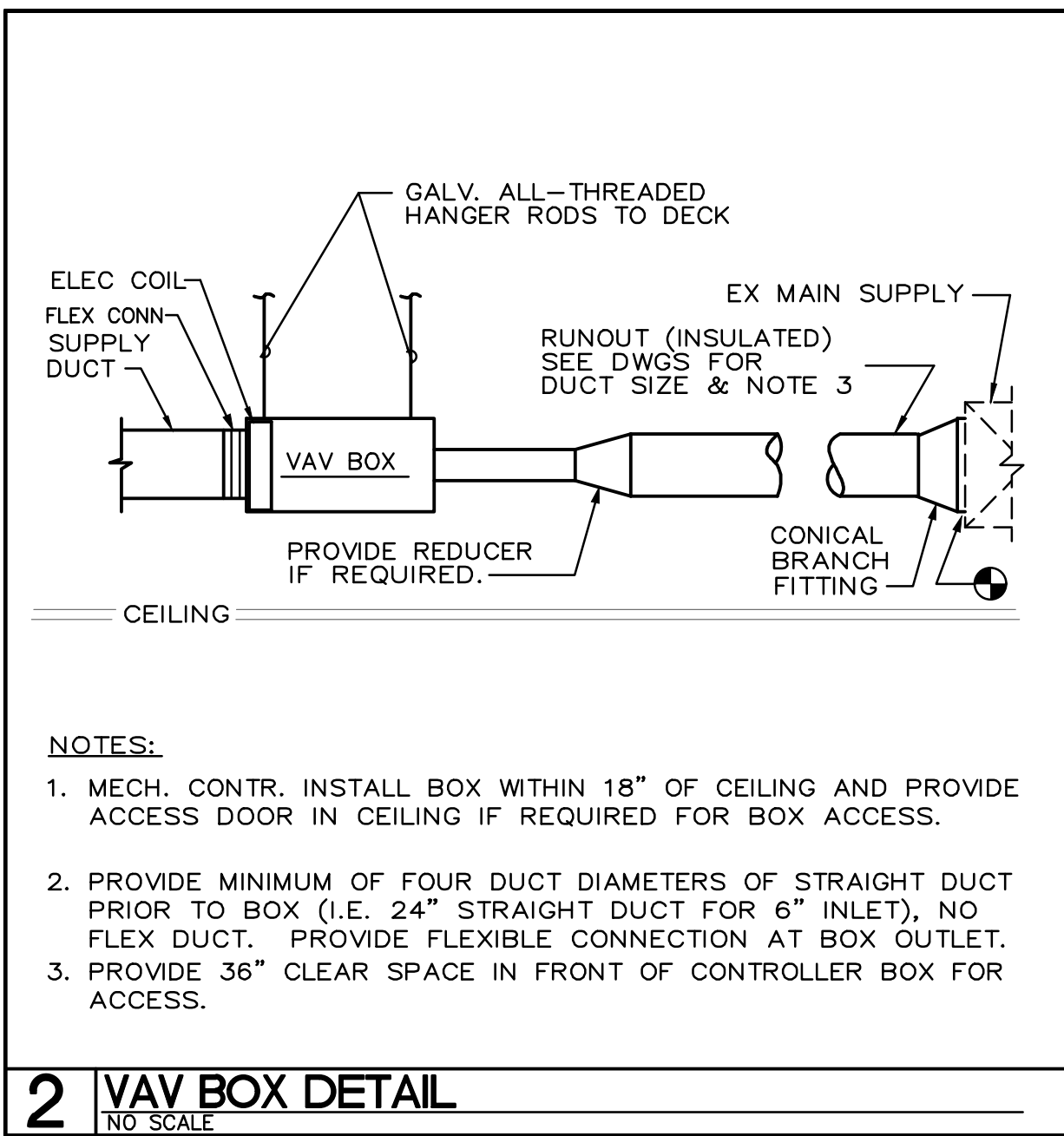
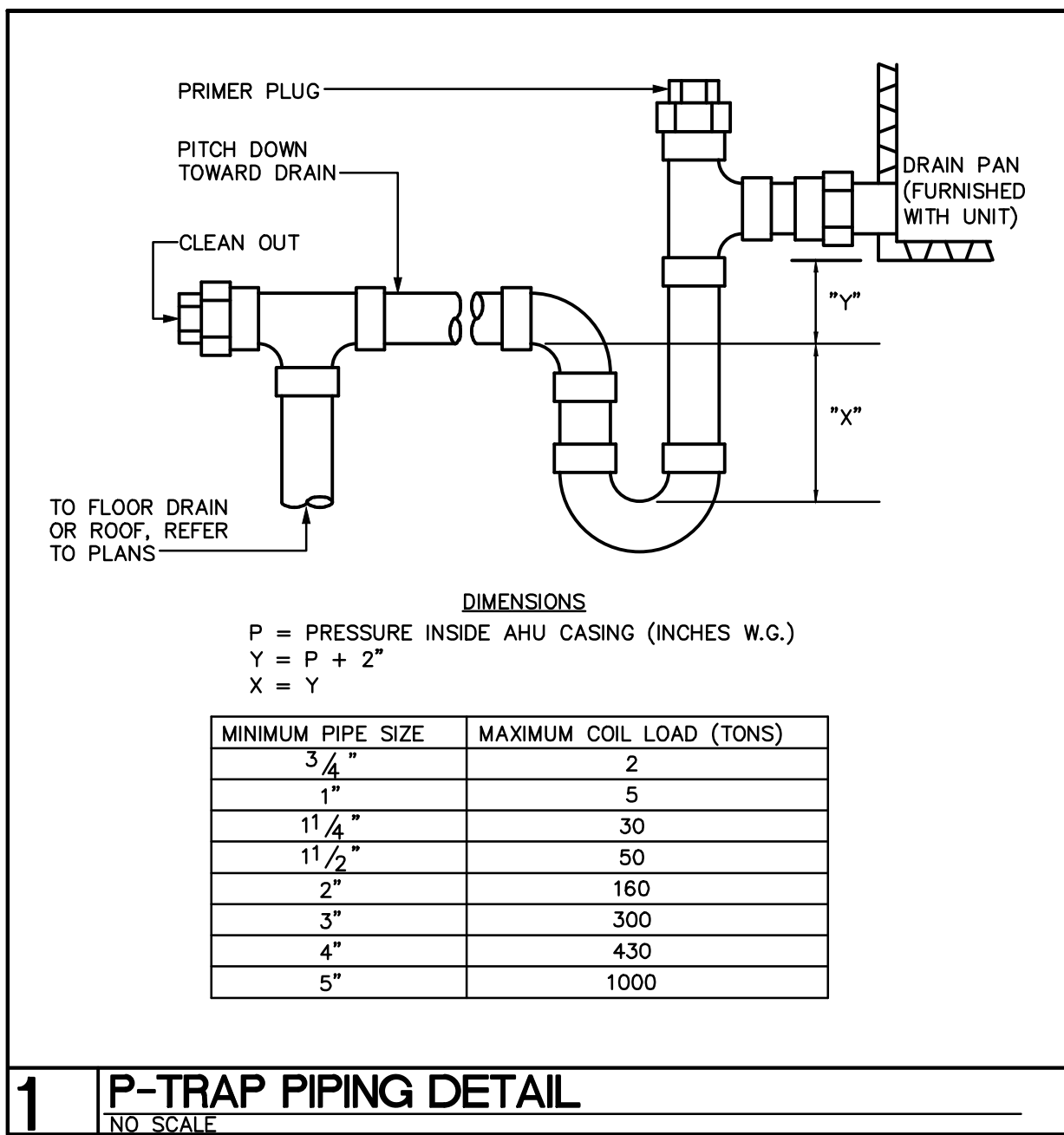
REV #	DATE	DESCRIPTION

DATE: 02-25-2025
PROJECT #: 24-0219
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL
BOILER ROOM -
DEMOLITION AND
NEW WORK
HIGH SCHOOL

DWG #:
M301
SHEET NO: 10 OF 11

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SUN VALLEY
HIGH SCHOOL AND
MIDDLE SCHOOL
HVAC RENOVATIONS

MIDDLE SCHOOL
5211 OLD CHARLOTTE HWY 1409 WESLEY CHAPEL RD
MONROE, NC 28110

REV #	DATE	DESCRIPTION

DATE:	02-25-2025
PROJECT #:	24-0219
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:
MECHANICAL DETAILS

DWG #:

M401

SHEET NO: 11 OF 11

I. Attachment A/Terms and Conditions

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 ThirdParty 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.

By submitting this proposal, the potential contractor certifies the following: 1) this proposal is signed by an authorized representative of the firm, 2) It can obtain and will submit to Union County Public Schools insurance certificates as required, within five (5) calendar days after the notice to award. 3) all taxes have been determined and are included in the proposed cost 4) the potential contractor has read and understands the conditions set forth in this RFP and agrees to them with no exceptions.

Contractor's Name

Federal ID Number

Address

City

State

Zip Code

Email

Telephone Number

Fax Number

Principal Place of Business if Different from Above

Printed Name

Title

Signature

Date

Attest: (Corporate Seal)

By

License #

Title

End of Proposal Form for RFP 5-97648033

RFQ#: 5-97648033

Vendor Name: _____

The undersigned hereby certifies that: [check all applicable boxes]

The Vendor is in sound financial condition and, if applicable, has received an unqualified audit opinion for the latest audit of its financial statements.

Date of last audit _____(if not audit within the past 18 months, explain the reason below.)

The Vendor has no outstanding liabilities, including tax and judgment liens, to the Internal Revenue Service or any other government entity.

The Vendor is current in all amounts due for payments of federal and state taxes and required employment-related contributions and withholdings.

The Vendor is not the subject of any current litigation or findings of noncompliance under federal or state law.

The Vendor has not been the subject of any past or current litigation, findings in any past litigation or findings of noncompliance under federal or state law that may impact in any way its ability to fulfill the requirements of this Contract.

He or She is authorized to make the foregoing statements on behalf of the Vendor.

Note: this shall constitute a continuing certification and Vendor shall notify the Contract Lead within 30 days of any material change to any of the representations made herein.

If any one or more the foregoing boxes is NOT checked, Vendor shall explain the reason(s) in the space below. Failure to include an explanation may result in Vendor being deemed non-responsive and its submission rejected in its entirety.

--

Signature

Date

Printed Name

Title

[This Certification must be signed by an individual authorized to speak for the Vendor]

RFP #: 5-79648033

Vendor Name: _____

Instructions: Vendor shall use this form to submit three (3) customer references with its offer. If available, one reference should be from a school or school system.

<i>Customer Reference # 1</i>	
Name of Customer Organization:	
Customer Contact Name:	
Customer Address:	
Customer Email:	
Customer Phone Number:	
Project Start Date:	
Project End Date:	
Project Description:	
Project Outcome:	

RFP #: 5-97648033

Vendor Name: _____

Instructions: Vendor shall use this form to submit three (3) customer references with its offer. If available, one reference should be from a school or school system.

<i>Customer Reference # 2</i>	
Name of Customer Organization:	
Customer Reference Name:	
Customer Reference Address:	
Customer Reference Email:	
Customer Phone Number:	
Project Start Date:	
Project End Date:	
Project Description:	
Project Outcome:	

Attachment: Union County Public Schools Customer Reference Template

RFP #: 5-97648033

Vendor Name: _____

Instructions: Vendor shall use this form to submit three (3) customer references with its offer. If available, one reference should be from a school or school system.

<i>Customer Reference # 3</i>	
Name of Customer Organization:	
Customer Contact Name:	
Customer Address:	
Customer Email:	
Customer Phone Number:	

Project Start Date:	
Project End Date:	
Project Description:	
Project Outcome:	

Company Name: _____

BID No.: 5-97648033

____ Bid Submittal Form
____ Affidavit A or B
____ Identification of Minority Business Form
____ 5% BID Bond

Project Title: Sun Valley Middle/High School HVAC Renovations

Location: 1409 Wesley Chapel Rd, Indian Trail, NC 28079

COST PROPOSAL/EXECUTION OF PROPOSAL

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, supplies, taxes, etc. associated with performing the services described herein have been determined and included in the proposed cost. All labor costs, direct and indirect (including sales tax), 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:

BASE BID:	\$ _____
ALTERNATE 1	\$ _____
ALTERNATE 2	\$ _____
ALTERNATE 3	\$ _____
ALLOWANCE FUNDS:	\$40,000.00
ALL INCLUSIVE TOTAL	\$ _____

Consecutive calendar days required to achieve Final Completion from issuance of Notice to Proceed: _____ calendar days.

ADDENDA ACKNOWLEDGEMENT

ADDENDUM 1: ADDENDUM 2: ADDENDUM 3: ADDENDUM 4:

EXECUTION

FEDERAL ID NO.

OFFEROR:

LICENSE DESCRIPTION:

_ LICENSE NO.

ADDRESS:

CITY, STATE, ZIP

TELEPHONE NUMBER:

MOBILE:

EMAIL:

BY:

DATE:

TITLE:

(Signature)

(Typed or printed name)

Identification of HUB Certified/ Minority Business Participation

I, _____,

(Name of Bidder)

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

Firm Name, Address and Phone #

Work Type

*Minority
Category

****HUB**
Certified
(Y/N)

[illegible]

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such, that if the PRINCIPLE shall be awarded the contract for which the bid and proposal above described is submitted and shall execute the contract, give bond for the faithful performance of the contract, and give bond for the payment of all persons supplying labor and materials in the prosecution of the work provided for in said contract, within ten (10) days after the award of the same to the PRINCIPLE above named, then this obligation shall be null and void; but if the PRINCIPLE above named fails to so execute such contract and give performance bond and payment bond as required by Section 129 of Chapter 143 of the General Statutes of North Carolina, as amended, the Article 3 of Chapter 44-A of the General Statutes of North Carolina, as amended, the Surety shall upon demand, forthwith pay the Obligee the amount of this bond set forth above.

IN WITNESS WHEREOF, the Principle above named and the Surety above named have executed this instrument under their several seals on the date set forth above.

WITNESS:

Principle (Name of individual, and trade
Name, partnership, corporation, or joint
venture)

(Proprietorship or Partnership)

BY _____(Seal)

TITLE _____
(Owner, Partner, Office held in
corporation, joint venture)

(Corporate Seal)

ATTEST

BY _____
(Corporation)

TITLE _____
(Corporation Secretary or Assistant Secretary Only)

Surety (Name of Surety Company)

WITNESS:

BY _____

TITLE Attorney in Fact

(Corporate Seal of Surety)

(Address of Attorney in Fact)

COUNTERSIGNED:

N.C. Licensed Resident Agent

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

County of _____

(Name of Bidder)

Affidavit of _____

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

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

- ⑨ **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.
- ⑨ **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.
- ⑨ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ⑨ **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.
- ⑨ **5 – (10 pts)** Attended Prebid meetings scheduled by the public owner.
- ⑨ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ⑨ **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.
- ⑨ **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 **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.

- ⑨ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

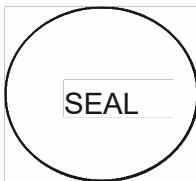
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure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

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

Date: _____ Name of Authorized Officer:

Signature:

Title:



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

State of _____, County of _____

Notary Public

My commission expires

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

County of _____

Affidavit of _____

(Name of Bidder)

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

contract.

(Name of Project)

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

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

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

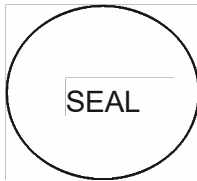
Date: _____

Name of Authorized Officer: _____

State of _____

Signature: _____

Title: _____



_____, County of _____

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

Notary Public _____

My commission expires _____

UNION COUNTY PUBLIC SCHOOLS TAX FORM INSTRUCTIONS

To the tax statement preparer for pay applications for Union County Public Schools:

Please find the attached form for providing sales taxes paid on materials for Union County Public Schools. It is important that you note the following:

Tax paid by contractors on rental equipment, tools or supplies that they use in the process of completing their contract is not refundable. Tax statements from contractors should indicate

the **amount of tax paid on materials that become part of the structure only**. Statements should indicate the vendor's name, date of invoice, invoice number, taxable amount, and sales tax amount. The statement must be "certified" by the contractor. Additionally, be sure the county tax is allocated to the correct county. As of January 1, 2002, the county is determined by the "ship to" address; therefore, if the material was shipped to your place of business instead of the job site the county name would reflect the county where your business is located.

Subcontractors performing work should also provide sales tax statements to the general contractor. It is the general contractor's responsibility to secure from the subcontractor the tax statement. (Reference Sales and Use Tax Bulletin Section 31)

If you submit a pay application upon which no sales tax was paid, **please send a blank form indicating "none this period"**. Payment may be delayed if proper sales tax accounting is not attached.

If you have any questions regarding the attached form please contact Anna Austin w/UCPS at 704290-1541 or Chase Simpson at 704-290-1549.

AS OF JULY 1, 2011, THE SALES TAX DISTRIBUTION FOR UNION COUNTY IS 4.75% STATE AND 2.00% COUNTY.

Mecklenburg County has an additional ½% local transit tax. They and Wake County are the only counties with 7 ¼% rate of tax. Other counties local to Union may have 2.25% for the County Rate. For other county rates refer to Form Gen562 on the NC Department of Revenue website www.dor.state.nc.us.

PLEASE USE THE CORRECT DISTRIBUTION (NOTED ABOVE) ON ALL CONTRACTOR STATEMENTS.

STATE COUNTY SALES/USE TAX STATEMENT CERTIFICATION

Contractor: _____

Sheet #: _____

For Sales Taxes Paid from _____ to _____

Project Name: _____

Payment Application #: _____

[illegible]

Total:									

We certify that the above listing includes all materials purchased by us and incorporated into the above referenced project for the period stated, became a permanent part of the project, and that the sales tax shown has been paid. The above represents a complete listing of these sales taxes paid for the pay application number.

Sworn and subscribed before me this _____ day of _____, _____.

Notary Public: _____

My Commission Expires: _____

By: _____

Title:

PERFORMANCE AND PAYMENT BOND FORMS

FORM OF PERFORMANCE BOND

Date of Contract:

Date of Execution:

Name of Principal
(Contractor)

Name of Surety :

Name of Contracting Body :

Amount of Bond :

Project

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized

modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness :

Contractor: (Trade or Corporate Name)

By :

(Proprietorship or Partnership)

Attest: (Corporation)

Title :

(Owner, Partner, or Corp.

Pres. or Vice Pres. only)

By: _____

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

(Corporate Seal)

(Surety Company)

Witness :

By: _____

(Attorney in Fact)

Countersigned :

(Surety Corporate Seal)

(N.C. Licensed Resident Agent)

_____ Title :

Name and Address-Surety Agency

Surety Company Name and N.C.

Regional or Branch Office Address

FORM OF PAYMENT BOND

Date of Contract:

Date of Execution:

Name of Principal
(Contractor)

Name of Surety :

Name of Contracting Body :

Amount of Bond :

Project

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above-named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all

duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise, to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

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Witness:

Contractor: (Trade or Corporate Name)

By:

(Proprietorship or Partnership)

Attest: (Corporation)

Title:

(Owner, Partner, or Corp.

Pres. or Vice Pres. only)

By: _____

Title: _____

(Corp. Sec. or Asst. Sec... only)

(Corporate Seal)

(Surety Company)

Witness:

By:

(Attorney in Fact)

Countersigned :

(Surety Corporate Seal)

Title :

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

PERFORMANCE AND PAYMENT BOND FORMS

FORM OF PERFORMANCE BOND

Date of Contract:

Date of Execution:

Name of Principal
(Contractor)

Name of Surety :

Name of Contracting Body :

Amount of Bond :

Project

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty

required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts .

Witness :

Contractor: (Trade or Corporate Name)

By :

(Proprietorship or Partnership)

Attest: (Corporation)

Title :

(Owner, Partner, or Corp.

Pres. or Vice Pres. only)

By: _____

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

(Corporate Seal)

(Surety Company)

Witness :

By: _____

(Attorney in Fact)

Countersigned :

Name and Address-Surety Agency

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above-named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise, to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

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Contractor: (Trade or Corporate Name)

By:

(Proprietorship or Partnership)

Attest: (Corporation)

Title:

(Owner, Partner, or Corp.

Pres. or Vice Pres. only)

By: _____

Title: _____

(Corp. Sec. or Asst. Sec... only)

(Corporate Seal)

(Surety Company)

Witness :

By : _____

(Attorney in Fact)

Countersigned :

(Surety Corporate Seal)

_____ Title :
(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address