I N V I T A T I O N T O B I D

PENDER COUNTY COURTHOUSE
ADDITIONAL HVAC

100 SOUTH WRIGHT STREET
BURGAW, NC 28425

ITB # 221024-234

ISSUED:
OCTOBER 24, 2022

PRE-BID MEETING:
NOVEMBER 10, 2022 @ 3:00 PM EST

QUESTIONS DUE:
NOVEMBER 14, 2022 BY 11:00 AM EST

SEALED PROPOSALS DUE:
NOVEMBER 22, 2022 BY 2:00 PM EST

ESTIMATED NOTICE TO PROCEED:
DECEMBER 6, 2022

DEADLINE FOR PROJECT COMPLETION:
JUNE 23, 2023

BACKGROUND

Pender County recently performed a large-scale HVAC retrofit to the Pender County Courthouse. Limited funds forced a decision to keep some original equipment in place. However, grant funding is now allowing the county to complete the remaining items. These items include the cooling tower as well as the HVAC unit and exhaust for the public restrooms on the North end of the building (Wilmington Street side).

PROJECT SCOPE

Please refer to the Technical Specifications (Exhibit 1) and Plans (Exhibit 2) provided by Cheatham and Associates Engineers.

In terms of an abbreviated overview, the scope of this work includes:

1. Replacement of the cooling tower
   a. Existing fan VFD will remain (not to be replaced)
   b. Existing underground piping (6" CPVC – both return and supply) will remain (not to be replaced).
2. Replacement of roof mounted water source heat pump WSHP-17 including integral ERV to provide HVAC and exhaust for the first floor Men's and Women's public restrooms.
   a. NOTE: In order to maintain the warranty on the new roof that was recently installed, roof work (resulting from the scope of work performed) MUST be completed by Hound Roofing. All communications and coordination to take place through Tom Scott (Operations Manager) at 910-612-8456. See Hound Roofing price sheet exhibit.
3. Any subsequent electrical and plumbing work that may be required to achieve the scope of work as outlined in the attached technical specifications and plans provided by Cheatham and Associates.

NOTICE TO BIDDERS

Pender County invites North Carolina Licensed Contractors to submit a Single-Prime Lump-Sum bid for the PENDER COUNTY COURTHOUSE ADDITIONAL HVAC PROJECT: located at 100 South Wright Street, Burgaw, North Carolina 28425. Sealed bids will be received at the **Pender County Administration Building, Finance Office, 805 South Walker Street, Burgaw, NC 28425 until 2:00 pm EST on Tuesday, November 22, 2022. The bid opening will begin at 2:15 pm EST in the BOARD OF COMMISSIONERS MEETING ROOM.** This project will be bid and awarded in accordance with North Carolina G.S. 143-129. The Pender County point of contact for this proposal is:

Trisha Newton, Purchasing
Pender County Government
PO Box 1578
805 South Walker Street
Burgaw, NC 28425
Phone: (910) 259-1281
Email: purchasing@pendercountync.gov

NOTE: This project <u>does require</u> Performance and Payment Bonds.

Contractors are hereby notified that they must have proper license under the State laws governing their respective trades and that North Carolina General Statute 87 will be observed in receiving and awarding contracts.

<u>Prospective bidders may attend a Pre-Bid meeting which will be held at the Pender County Courthouse (Fremont Street side of the building), 100 South Wright Street, Burgaw on November 10, 2022 at 3:00 pm EST. A tour of the facility, equipment, and existing conditions will take place to describe/elaborate the enclosed scope of work. **THIS MEETING IS OPTIONAL.</u>**

<u>Prospective bidders may call or email Trisha Newton, Pender County Finance Office at the information listed above in order to receive a copy of the electronic bid package.</u>**

<u>IT IS THE RESPONSIBILITY OF PROSPECTIVE BIDDERS TO CHECK PENDER COUNTY'S WEBSITE (https://www.pendercountync.gov/public-notices/open-rfps-and-bids/) FOR ADDENDA INFORMATION PRIOR TO SUBMITTING BIDS.</u>**

<u>**THIS IS A GRANT FUNDED PROJECT IN WHICH THE FUNDS WILL HAVE TO BE UTILIZED BY JUNE 30, 2023. PROVISIONS DUE TO SUPPLY CHAIN ISSUES MUST BE COORIDINATED CLOSELY WITH THE OWNER REPRESENTATIVE.</u>

Once submitted, no bid may be withdrawn after the opening of bids for a period of 20 days. The Owner reserves the right to reject any or all bids and waive informalities. Proposals shall be made only on the form provided herein with all blank spaces for bids properly filled in and all signatures properly executed.

Note on the outside of the sealed envelope:

Bid Proposal For:

Pender County Courthouse – Additional HVAC
November 22, 2022
Attention: Trisha Newton, Purchasing
(Name of Contractor)
(License Number)

<u>SELECTION PROCESS</u>

The following is a general description of the process by which the contractor will be selected:

One complete copy of this proposal form must be received by Pender County in a sealed envelope by the date and time specified in the Notice to Bidders. The proposal must be signed and dated by an official who is authorized or has power of attorney to bind the Applicant. Unsigned or uncompleted proposals will not be considered.

Responses to this Invitation for Bids must be received by Pender County no later than the date and time specified. If hand delivered or by courier, ensure the proposal is delivered to the Pender County Government, Finance Office, 805 South Walker Street, Burgaw, NC 28425. If sending by the US Postal

Service, address to PO Box 1578, Burgaw, NC 28425. Delivery to any other location of the county government will not be considered delivered. Late bids will not be accepted.

THIS IS NOT A CONTRACT OR AN OFFER TO CONTRACT. Contractors are cautioned that this is a request for quotation, not a request to contract, or an offer to contract, or an acceptance of any proposal or offer. Pender County reserves the unqualified right to reject any and/or all submittals when such rejection is deemed to be in its best interest.

Additionally, only submitted written questions may be addressed in Addenda; verbal questions and responses are not official and do not change the requirements of this Invitation for Bids. All questions must be emailed to the Pender County Finance Office by Monday, November 14, 11:00 am EST purchasing@pendercountync.gov All questions and responded answers will be provided by Pender County on Tuesday, November 15, 5:00 pm EST.

GENERAL CONDITIONS

GENERAL INSTRUCTIONS

It is understood and agreed that by submitting a bid the Contractor has examined the proposal documents, specifications, visited the site of the Work, and has satisfied themselves relative to the Work to be performed.

MATERIALS, EQUIPMENT AND EMPLOYEES

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

b. All materials shall be new and of quality specified. Workmanship shall always be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.

c. No changes shall be made in the Work except upon written approval and change order of the Owner.

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

e. The contractor shall designate a foreman/superintendent who shall direct the work. An email address and cell number shall be provided upon receipt of notice to proceed.

CODES, PERMITS AND INSPECTIONS

a. The Contractor shall obtain the required permits, give all notice and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the Contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Owner in writing. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the Owner, he shall bear all cost arising therefrom.

b. All work under this contract shall conform to the 2018 North Carolina State Building Code and other state and national codes as are applicable.

SAFETY REQUIREMENTS

a. The Contractor shall be responsible for the entire site and the construction of the same and provide all the necessary protections as required by laws or ordinances governing such conditions and as required by the Owner. They shall be responsible for any damage to the Owner's property or that of others on the job, by themselves, their personnel or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any claims against the Owner arising from such damages.

b. The Contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926 published in Volume 39, Number 122, Part 11, June 24, 1974 Federal Register), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

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

d. The Contractor shall be responsible for moving all furniture, fixtures, and/or physical improvements required to complete the scope of work outlined.

e. The Contractor shall provide a port-o-john that is to be used by all individuals associated with the work outlined in this proposal. Under no circumstances shall indoor restroom facilities be used.

EQUAL OPPORTUNITY

a. The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to Equal Employment Opportunity for all persons

without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the Secretary of Labor, are incorporated herein.

b. The Contractors agree not to discriminate against any employees or applicant for employment because of physical or mental handicap regarding any position for which the employees or applicant is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices.

INSURANCE

The Contractor shall not commence work until they have obtained all insurance required, and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on the subcontract until all similar insurance required of the subcontractor has been obtained.

The Contractor shall provide and maintain during the life of this contract Workmen's Compensation Insurance for all employees employed at the site of the project under their contract in compliance with North Carolina requirements.

The Contractor shall provide and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect them and any subcontractor performing work covered by this contract, from claims for damage for personal injury, including accidental death, as well as from claims for property damages which may arise from operations under the contract, whether such operation be by the Contractor themselves or by any subcontractor, or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:
Public Liability Insurance in an amount not less than $1,000,000 for injuries, including accidental death, to any one person and subject to the same limit for each person, in amount not less than $500,000 on account of one accident; and Property Damage Insurance in an amount not less than $500,000.

The Contractor shall furnish such additional insurance as may be required by General Statutes of North Carolina, including motor vehicle insurance in amounts not less than statutory limits.

Each Certificate of Insurance shall bear the provision that the policy cannot be canceled, reduced in amount or coverage eliminated in less than fifteen (15) days after mailing written notice to the insured and/or the Owner of such alteration or cancellation, sent by registered mail.

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

INVOICES FOR PAYMENT

Partial Payment Requests may be submitted to the Owner's Project Manager (Allen Vann) on or about the 25th of each month of the project. All partial payment requests shall be accompanied by a County approved Schedule of Values reflecting the work completed in the preceding month. In

addition, a copy of all materials invoices, and a Sales Tax Listing, and Sales Tax Affidavit shall be submitted with each request. Final payment will be made within fifteen (15) consecutive days after acceptance of the work and the submission both of notarized contractor's affidavit and copies of any remaining invoices which are to include the contract, account and job order numbers.

The contractor's affidavit shall state: "This is to certify that all costs of materials, equipment, labor, and all else entering into the accomplishment of this contract, including payrolls, have been paid in full."

Executed contract documents, insurance certifications and, upon completion and acceptance of the work, invoices and other information requested are to be sent to:

Allen Vann, Assistant County Manager
Pender County Government
PO Box 5
805 South Walker Street
Burgaw, NC 28425

It is imperative that contract documents, invoices, etc., be sent only to the above address in order to assure proper and timely delivery and handling.

CLEANING UP

a. The Contractor shall always keep the sites and surrounding area reasonably free from rubbish and shall remove debris from the site from time to time or when directed to do so by the Owner. Before final inspection and acceptance of the project, the Contractor shall thoroughly clean the site, and completely prepare the project and site for use by the Owner.

GUARANTEE

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

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

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

CONTRACTOR-SUBCONTRACTOR RELATIONSHIPS

The Contractor agrees that the terms of these contract documents shall apply equally to a Subcontractor as to the Contractor, and that the subcontractor is bound by those terms as an employee of the Contractor.

SUPPLEMENTARY GENERAL CONDITIONS

TIME OF COMPLETION

The Contractor shall commence work to be performed under the Contract on a date to be specified in written order from the Owner and shall fully complete all work hereunder within **168** consecutive calendar days from the Notice to Proceed for the contract.

Tentative Schedule:	
Notice to Proceed	December 6, 2022
Pre-Construction Meeting	TBD – once clear on delivery time of equipment
Substantial Completion	June 13, 2023
Final Completion	June 23, 2023

If the Contractor is delayed at any time in the progress of his work by any act or negligence of the Owner, his employees or his separate contractor, by changes ordered in the work; by abnormal weather conditions; by any causes beyond the Contractor's control or by other causes deemed justifiable by Owner, then the contract time may be reasonably extended in a written order from the Owner upon written request from the contractor within ten days following the cause for delay.

PERFORMANCE AND PAYMENT BONDS

This project does require Performance and Payment bonds.

PENDER COUNTY TERMS AND CONDITIONS

In entering this Contract with Pender County North Carolina (the "County), your company (the "Vendor"), acknowledges and agrees to abide by the Terms and Conditions set forth below, which shall supersede any conflicting terms and conditions.

1. COUNTY RIGHT TO CANCEL OR RESCIND – The County reserves the right to cancel or otherwise rescind a Purchase Order based on the County's best interest.

2. PURCHASE ORDER REQUIRED – The County will not be responsible for any equipment, supplies, and/or services delivered without a Purchase Order and assumes no obligation for products or services shipped or delivered in excess of the quantity ordered. Any unauthorized products or services are subject to the County's rejection and shall be returned at the Vendor's expense.

3. VENDOR FAILURE TO DELIVER – In the event of Vendor's failure to deliver as and when specified, or to perform as and when specified, the County reserves the right to cancel this order, or any part thereof, without prejudice to its other rights, and Vendor agrees that the County may return part of any shipment so made and may charge Vendor with any loss expense sustained as a result of such failure to deliver or perform.

4. CHANGES – If Vendor refuses to accept this purchase order exactly as written, Vendor will return it at once with explanation. Any changes to this Purchase Order will be considered a 'Change Order' and requires the written acceptance of both parties to become effective. This will include product or service substitutions, cost changes, and delivery schedule changes.

5. INVOICES – Vendor will deliver invoices to the County at the address or electronically at website shown on the face of this Purchase Order. Vendor will send separate invoices for each purchase order number and invoices must be itemized in accordance with the items listed on the Purchase Order.

6. PRICE – The itemized price listed for products and services on the Vendor invoice must match that specified on the Purchase Order. No boxing, packing, cartage, or shipping charges will be allowed by the County unless specifically authorized on the face of this Purchase Order. Any cash discount period to County will date from County's receipt of the invoice or from the date of the receipt of goods, whichever is later.

7. TAXES – Vendor shall pay all sales or use taxes that are or become due in connection with any products or services provided hereunder and shall indemnify and save harmless the County from any damages, costs, fees, expenses, or penalties on account of such taxes. Vendor is required to list all applicable taxes as separate lines on the face of the invoice.

8. DELIVERY/TITLE – Unless otherwise agreed, delivery shall be f.o.b. point of destination and title shall pass to County upon acceptance at the final delivery point. Risk of damages or loss following shipment and prior to acceptance by County shall be the responsibility of Vendor.

9. RIGHT OF INSPECTION AND REJECTION – Equipment, supplies, and services supplied by Vendor shall be received subject to the County's inspection and approval either during manufacturing or delivery (with prior arrangement), or within a reasonable time after delivery, notwithstanding prior payment. If specifications or warranties are not met, material and equipment may be returned at Vendor's expense. No material or equipment returned to Vendor as defective shall be replaced except upon the County's formal authorization.

10. ASSIGNMENT – Neither this Purchase Order nor any interest therein nor shall any claim arising hereunder be transferred or assigned by Vendor without the prior written consent of the County. Vendor may transfer or assign the benefits of this agreement, in whole or in part, including without limitation the County's warranty, without the approval of County.

11. WARRANTY/PERFORMANCE – Vendor warrants that the products and services furnished pursuant to this Purchase Order shall: (a) comply with all federal, state and local laws applicable thereto; (b) satisfy all requirements set forth on the face of this purchase order and any applicable documentation incorporated herein; (c) meet industry standards and be suitable for the purpose intended; (d) be of merchantable quality; and (e) be free from defects in title, labor, material or fabrication.

12. INDEMIFICATION - INFRINGEMENT – Vendor will defend, indemnify, and save the County harmless from any and all loss, damages, costs, fees, and expenses incurred on account of any and all claims, suits, or judgments alleging that any product or service provided under this purchase order violates any patent, copyright, trade secret, trade name, or any other intellectual property right of any nature.

13. INDEMNIFICATION – DAMAGES – If any product provided hereunder is defective in any respect whatsoever, Vendor will defend, indemnify, and save County harmless from all loss, damages, costs, fees,

and expenses incurred by reason of such defect, including without limitation all liability arising from any accidents, injuries, or damages to persons or property that may result in whole or in part from such product.

14. INDEMNIFICATION – CONSEQUENCES OF ACTIONS - If Vendor performs services or constructs, erects, inspects, or delivers hereunder, Vendor will indemnify and save harmless the County from all loss, damages, costs, fees, or expenses incurred in connection with any accidents, injuries, or damages to persons or property that may result in whole or in part from the performance thereof.

15. USE OF COUNTY NAME OR LOGO – Vendor agrees not to release any advertising or other materials using the County's trademark, quoting the opinion of any County employee or implying in any way that the County indorses Vendor or its products or services.

16. FEDERAL OR STATE STATUTE – Vendor represents and warrants that no federal or state statute or regulation or municipal ordinance has been or will be violated in the manufacture, sale, or delivery of any product or service sold and delivered hereunder and if such violation has or does occur, Vendor will indemnify and save the County harmless from all loss, penalties, fees, costs, and expenses resulting in whole or in part from such violation.

17. E-VERIFY REQUIREMENTS – As a condition for payment under this purchase order, Vendor shall: (i) comply with N.C. Gen. Stat. Sections 64-25 et seq. (the "EVerify Requirements"); and (ii) cause each subcontractor hereunder to comply with such requirements. Vendor will indemnify and save harmless the County from all losses, damages, fees, costs, expenses, fines, and other liabilities resulting from any failure by Vendor or any subcontractor to comply with the E-Verify Requirements.

18. INSURANCE – Vendor shall secure, before delivery of any goods or services hereunder, Commercial General Liability insurance in an amount not less than $1,000,000 bodily injury each occurrence/aggregate and $1,000,000 property damage each occurrence/aggregate, or $1,000,000 bodily injury and property damage combined single limits each occurrence/ aggregate, with the County as additional insured. Vendor shall produce an insurance certificate evidencing such coverage upon request by the County.

19. STRICT COMPLIANCE – The County may at any time insist upon strict compliance with these terms and conditions notwithstanding any previous custom, practice, or course of dealing.

20. MATERIAL SAFETY DATA SHEETS – Current Material Safety Data Sheets, when applicable to the order, shall be provided by Vendor in accordance with all regulations.

21. VENUE FOR LEGAL ACTIONS – This purchase order is governed by North Carolina law without regard to its conflicts of law principles. Any legal actions arising from this purchase order shall be brought in Pender County, North Carolina.

BID PROPOSAL

1) SIGNED AND SEALED BID PROPOSAL

PROPOSAL

For

Pender County Courthouse – Additional HVAC

The undersigned, as bidder, proposes and agrees if this proposal is accepted to contract with Pender County for the furnishing of all materials, equipment, and labor necessary to complete the construction of the work described in these documents in full and complete accordance with plans, specifications, and contract documents, and to the full and entire satisfaction of Pender County for the sum of:

BASE BID: _____ Dollars $_____

Respectively submitted this ____ day of_____2019.

_____

(Name of firm or corporation making bid)

Federal ID#:_____

Attest: By: _____

_____ Title: _____

_____

_____ Address: _____

Title

_____

_____

(Corporate Seal)

EXHIBITS

1. Technical Specifications – Cheatham and Associates, P.A.

DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING

230500 Heating and Air Conditioning

DIVISION 26 – ELECTRICAL

260000 Electrical, Basics
260500 Basic Electrical Materials and Methods
260519 Conductors and Cables
260526 Grounding and Bonding
260533 Raceways and Boxes

2. Drawings – Cheatham and Associates, P.A.

a. **M-001 Mechanical Legend, Notes, and Schedules**
b. **M-101 Mechanical Crawlspace Plan**
c. **M-102 Mechanical First Floor Plan**
d. **M-103 Mechanical Second Floor Plan**
e. **M-501 Mechanical Schematics & Details**
f. **E-101 Electrical Notes, Plan**

3. Hound Roofing – Price Sheet

Pender County Courthouse Additional HVAC
ITB # 221024-234
Exhibit 1

TECHNICAL SPECIFICATIONS

FOR

PENDER COUNTY COURTHOUSE ADDITIONAL HVAC

PENDER COUNTY GOVERNMENT

100 S. Wright Street
Burgaw, North Carolina 28425

SEPTEMBER 26, 2022

Cheatham and Associates, P.A.
Plumbing • Mechanical • Electrical • Fire Protection Consulting Engineers
3412 Enterprise Drive
Wilmington, North Carolina 28405
(910) 452-4210 Fax (910) 452-4211
www.cheathampa.com
License No. C-1073
CAPA Project No. 22038

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TECHNICAL SPECIFICATIONS

DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

230500 Heating and Air Conditioning

DIVISION 26 - ELECTRICAL

260000 Electrical, Basics
260500 Basic Electrical Materials and Methods
260519 Conductors and Cables
260526 Grounding and Bonding
260533 Raceways and Boxes

Kenneth Lynch, PE, LEED AP
Mechanical Engineer

Mark A. Ciarrocca, PE
Electrical Engineer

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SECTION 230500 – HEATING AND AIR CONDITIONING

230501 GENERAL

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

B. The Heating and Air Conditioning Contractor shall cooperate with the contractors of other trades and shall install his work as fast as the progress of the balance of the work will permit.

C. The Heating and Air Conditioning Contractor shall install all work and fired and unfired pressure vessels and their safety devices in accordance with the requirements of the latest edition of the North Carolina State Boiler Inspection Law Rules and Regulations and the North Carolina State Building Code. Codes to be a part of these specifications: North Carolina State Building Code, National Fire Protection Association Codes Section 70, 90A, 91 and other applicable sections.

D. Inspection by local authorities will be required.

E. The drawings accompanying these specifications indicate diagrammatically the general location of the ducts, piping, and equipment and do not show all offsets, supports, fittings, bolts, connections, etc., required for a complete system. While the drawings are to be followed as closely as possible, if it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner, and as directed by the Engineer. Any detail which is omitted, and which is necessary for the proper operation of any system included under the contract, shall be supplied and installed by the Heating and Air Conditioning Contractor without extra cost to the Owner. All pipes and ducts shall be run as high as possible to maintain ceiling and head clearance. All equipment shall be installed in such a manner as to allow proper maintenance access.

F. Equipment and Materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Owner or Engineer until installed. All items subject to moisture damage shall be stored in dry spaces.

G. Conditions shall be checked at the building before placing orders for apparatus and such apparatus shall be of such dimensions as to fit the spaces allotted.

H. All debris resulting from heating and air conditioning work shall be removed from the premises daily or as directed by the Owner or Engineer. Trash and rubbish shall not be allowed to accumulate either within or outside the building. Materials and debris, which in the opinion of the Engineer cannot practicably be removed from the site the same day, may be temporarily stacked or stored in a designated location on the site as directed by the Engineer.

I. Guards shall be provided for all moving equipment, motor couplings, pump shafts, belt drives and similar exposed reciprocating or rotating components.

J. All HVAC and refrigeration equipment shall be labeled in accordance with Section 301 of the North Carolina Mechanical Code and as required by the Authority having jurisdiction. Labeling shall be a permanent factory-applied nameplate affixed to the equipment on which shall appear in legible lettering, the manufacturer's name or trademark, the model, serial number, and the seal or mark of the testing agency.

230502 SCOPE

A. The Heating and Air Conditioning Contractor shall provide labor and materials required for a complete system ready for operation as shown on the drawings and hereinafter specified. This includes all equipment,

ductwork, necessary plumbing, and all other services necessary whether they are specifically mentioned herein or not. The entire installation shall be installed in a first-class, neat, professional manner to the satisfaction of the Engineer and shall conform to all applicable codes and laws.

230503 DEMOLITION

A. General Requirements: The work includes the demolition or removal of all construction indicated, specified, or necessary to accomplish the work under this contract. All items not to be reused shall become the property of the Heating and Air Conditioning Contractor. The drawings define the scope of work, but it is not intended that all items of demolition work be specifically indicated. After carefully reviewing the drawings and specifications to determine intent, and prior to bidding, the Heating and Air Conditioning Contractor shall visit the site and determine the extent of demolition work required to properly complete the work under his contract.

B. Protection of Materials and Work: Before beginning any cutting or demolition work, the Heating and Air Conditioning Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of work required. The Heating and Air Conditioning Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced at no additional cost to the Owner.

C. The Contractor shall notify the Owner immediately in the event that any suspected asbestos containing materials or lead based paint are encountered during demolition.

D. Refrigerant in Demolition Equipment: Recover all refrigerant in approved refrigerant containers and in compliance with section 608 of the EPA Clean Air Act. Removal must be conducted under supervision of an EPA certified technician.

230504 SHOP DRAWINGS AND SUBMITTAL DATA

A. The Heating and Air Conditioning Contractor shall submit within 10 days after award of the contract a list of materials and the manufacturer to be used on this project. He shall submit within thirty days after award of the contract at least five copies of submittal data in written form for the Engineer's use in approving materials and equipment. One copy will be returned. If the Heating and Air Conditioning Contractor desires the return of more than one copy, additional copies shall be provided to the Engineer at the time of the original submission. It is requested that all submittal data be sent to the Engineer at one time. Unless special consideration is given, none of the submittal data will be checked until it has all been received by the Engineer. Where called for, the Heating and Air Conditioning Contractor shall submit five sets of shop drawings showing the detailed arrangement or connections that are shown schematically on the drawings. Data certified for the specified project and indicated manufacturer, type, or size, capacity, etc., shall be submitted for the following equipment items:

1. Water Source Heat Pump with ERV
2. Cooling Tower
3. Valves
4. Controls with Complete Diagrams
5. Water Treatment and Feeder System
6. Heat Trace Cable
7. Insulation
8. Gauges and Thermometers
9. Testing and Balancing

230505 APPROVED EQUAL EQUIPMENT, ETC.

A. Manufacturers listed are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality, free from defect or other imperfections. It should be understood that where the word "provide" is used, it is intended that the Heating and Air Conditioning Contractor shall purchase and install all materials required. Approval of equipment will not relieve the Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Heating and Air Conditioning Contractor.

230506 WATER SOURCE HEAT PUMP WITH ERV

A. Units shall be downflow one-piece factory assembled, tested, precharged, and prewired for roof mounting. Factory assembly and testing shall include fully programmed unit controller. Units shall be rated according to ARI-ISO-13256-1 and listed by ETL or Underwriter Laboratories. Basis of design units are Trane.

B. Cabinet/chassis shall be zinc coated, heavy gauge, galvanized steel casing in weather resistant steel cabinet with fully painted exterior. Cabinet shall be fully insulated with UL 181 1/2" thick coated glass fiber liner. Cabinet construction shall include hinged service and filter access panels that provide water and air tight seal. Base pan in downflow units shall not have any penetrations within the perimeter of the curb other than raised lips for supply and return air openings and electrical.

C. Fans in unit shall be direct driven, centrifugal with single speed, permanently lubricated PSC motor resiliently mounted in cabinet. All units shall have high static fan option.

D. Units shall contain a sealed refrigeration circuit(s) including the following:

1. Refrigeration-to-water heat exchangers shall be copper water tube with enhanced heat-transfer surfaces inside an insulated steel shell. Shell and tube shall be leak tested to 450 psig on refrigerant side and 400 psig on water side. Heat exchanger shall be factory mounted in unit on resilient rubber vibration isolators. Heat exchanger shall be insulated.
2. Refrigerant-to-air coils shall be copper tubes with aluminum fins leak tested to 450 psig. Factory selected and installed thermostatic expansion valves shall be included.
3. Compressors shall be high efficiency hermetic type installed on vibration isolators and housed in acoustically treated enclosure fully charged with R-410A refrigerant. Compressors shall be rotary or scroll on units 5 tons and smaller and shall have two separate scroll compressors on units 6 tons and larger. Factory installed safeties shall include anti-recycle timer, high pressure cutout, low pressure cutout or loss of charge switch, internal thermal overload protection, water loop freezestat, and condensate overflow switch.
4. Circuits shall include refrigerant circuit filter dryer, suction and liquid line service fittings, pilot operated sliding type reversing valve to be fail-safe in heating position with replaceable magnetic coil, ASTM B 743 copper tubing with wrought copper fittings and brazed joints all insulated with 25/50 ASTM E 84 3/8-inch thick flexible elastomeric insulation, bi-directional thermal expansion valve metering device, and pilot operated sliding type hot gas reheat valve with replaceable magnetic coil.

E. Heat pump shall have energy recovery ventilator (ERV) attached to it to make the heat pump operate as 100% outside air for supply air and 100% or return air to be exhausted

1. Unit casing 20 gauge galvanized steel with ½" thick neoprene insulation constructed as necessary to hang off of and be supported only by the water source heat pump. Units shall have a weatherproof sheet metal roof. Exterior finish of the unit will be coated with an alkyd enamel painting system for

added protection.

2. Outdoor air intake opening shall be protected by galvanized steel sheet metal weather hood and include an automatic shutoff damper with electric operator. Exhaust air discharge shall be covered with a gravity backdraft damper and weather hood.
3. Access to components shall be through large, hinged, tightly sealed and easily removable access doors constructed of the same materials as the unit casing and use standard hardware of similar material. The wheel cassette shall be easily removable from the unit. The roof of the ERV unit shall also be removable for access.
4. Fans shall be double width double inlet design with forward curve type wheels, blades designed for maximum efficiency and quiet operation, and statically and dynamically balanced impellers. Fans shall be direct drive motors located at the fan inlet or by motors using belts and sheaves. Motors shall be standard NEMA frame with open drip-proof enclosures. V-belt drives shall be designed for a minimum 1.2 service factor.
5. Total energy recovery wheel shall be rotor media made of aluminum coated to prohibit corrosion. All surfaces shall be coated with non-migrating adsorbent to maximize latent recovery. Equal sensible and latent recovery efficiencies shall be clearly documented through certification program in accordance with ASHRAE 84-78P and ARI 1060 standards. The media shall be cleanable with low temperature steam, hot water, or light detergent, without degrading latent recovery. Dry particles up to 600 microns shall freely pass through the media. Wheel media shall be independently tested and shown to conform with the requirements of NFPA-90A, documenting a flame spread of less than 25 and a smoke generation rating of less than 50.
6. Media shall be assembled into a rotor cassette with sheet metal framework to limit deflection of the rotor due to air pressure. The cassette shall be made of galvanized steel to prevent corrosion. Rotor cassette shall be easily removable from the ERV to facilitate rigging and ease of service. The wheel cassette design shall use pillow block bearings for long life. A non-adjustable purge sector shall be included in the cassette.
7. Recovery wheel control unit shall be equipped with a stop/jog control option for both economizer operation and frost prevention, and also includes a freeze protection thermostat to shut down the entire recovery system at a predetermined, extreme cold weather condition.
8. Unit shall be equipped with a rotation sensor and controller such that should the energy recovery wheel not rotate during a signaled run period, the controller shall send a 24 volt AC signal suitable for operating a relay to be used as an alarm contact.
9. Freeze Protection Thermostat shall be an outdoor air temperature thermostat such that the energy recovery ventilator shall be stopped during very low temperature periods. Thermostat shall stop both fans and the energy recovery wheel until the outdoor a temperature rises above the setpoint, then ERV shall restart automatically.

F. Filters in heat pump and ERV outdoor air and return air paths shall be disposable 2” thick MERV 8. Contractor shall supply complete sets of filters to protect the equipment during construction, changes of filters at testing and balancing, another change of filters at completion, and leave one additional complete set of filters at the project for the next change. Provide factory supplied fixed filter blockoffs to prevent air bypass around filters.

G. Native DDC BACnet unitary controller with interface to existing Trane BAS system and room sensor(s) shall be by unit manufacturer, factory programmed and tested per specified sequence of operation, and factory installed in unit. The controller shall be capable of standalone application or as applied to a full building automation installation.

1. The factory DDC control package in the unit shall include a 75VA transformer, high and low pressure switch, condensate overflow and fan status.
2. The controller shall provide random start delay, heating/cooling status, occupied/unoccupied mode, and fan status options.
3. Controls shall also include diagnostic LED’s, low and high voltage protection, and overcurrent and phase protection for compressor and fan motor.
4. Room temperature sensor is existing to be reused and connected to new accordingly.

5. Heat pump manufacturer shall include a copy of the full controller software package, users tool package, and programming of each controller to Owner.

H. Where necessary for mounting on existing roof curb and lining up with existing ductwork, adaptor curbs shall be custom made from 12 gauge or heavier as required galvanized steel with welded construction and 1-1/2" thick rigid insulation. Secure all curbs to existing curbs and units to curbs per manufacturer's recommendations.

I. See Guarantee 230525 for description of unit and compressor warranty requirement.

J. Unit manufacturer shall provide the services of factory authorized representative to perform all phases of startup for the new heat pump. Authorized representative shall be located within a two-hour drive of Burgaw, North Carolina.

230507 COOLING TOWER

A. Heating and Air Conditioning Contractor shall furnish and install cooling tower as shown and scheduled on the drawings and hereinafter specified. Unit shall produce the specified water temperatures at the specified temperatures per the scheduled data. Basis of design cooling tower is Baltimore Aircoil Series V.

B. Cooling Tower shall be open circuit, vertical discharge, forced draft, counterflow, factory assembled, film fill, industrial duty, of size to fit existing concrete pad and enclosure space. Tower shall include:

1. Heavy-Gage G235 (Z700) galvanized steel Tower with all edges given a protective coating of zinc-rich compound.
2. Lift out Strainers
3. Air Inlet Screens
4. Drain/Cleanout Connection
5. Vibration Switch

C. Tower thermal performance at specified conditions shall be certified by the Cooling Technology Institute.

D. See Guarantee 230525 for description of cooling tower's warranty requirements. Towers not covered by a warranty of this scope will not be accepted.

E. These specifications, as written, are intended to indicate those materials that will be capable of withstanding the above water quality in continuing service, as well as the loads described hereinbefore. They are to be regarded as minimum requirements. Where component materials peculiar to individual tower designs are not specified, the manufacturers shall take the above water quality and load carrying capabilities into account in the selection of their materials of manufacture.

F. Fans shall be forward curve centrifugal type mounted on steel shaft, with belt drive, bearings with ABMA STD 9 or ABMA STD 11-L-10 life at 40,000 hours with extended grease fittings.

G. Motors and Drives:

1. Motor: Single speed (1800 rpm), totally enclosed fan cooled (TEFC), cooling tower duty, inverter-duty type designed per NEMA Standard MG1, Section IV, Part 31. Motor will be located on a heavy-duty motor base, adjustable by a single threaded bolt-and-nut arrangement.
2. Fan Drive System: Belt Drive designed for minimum 150 percent motor nameplate power. Removable steel screens or panels protect the fan drive and all moving parts.

H. Existing Variable Speed Drive system is to be reused as shown on the drawings.

I. Casing Panels and Framework:

1. Galvanized steel protected by a thermosetting hybrid polymer. The polymer to consist of G-235 (Z700 metric) hot-dip galvanized steel prepared in a four-step (clean, pre-treat, rinse, and dry) process with an electrostatically applied, thermosetting, hybrid polymer fuse-bonded to the substrate during a thermally activated curing stage and monitored by a 23-step quality assurance program. Other coatings must be submitted to the engineer for pre-approval. Approved equals must have undergone testing, resulting in the following results as a minimum:

    a. When X-scribed to the steel substrate, unit to withstand 6000 hours of 5 percent salt spray per ASTM B117 without blistering, chipping, or loss of adhesion.
    b. When X-scribed to the steel substrate, unit to withstand 6000 hours of exposure to acidic (pH=4.0) and alkaline (pH=11.0) water solutions at 95 degrees F (35 degrees C) without signs of chemical attack.
    c. Unit to withstand impact of 160 in-lbs per ASTM D2794 without fracture or delamination of the polymer layer.
    d. Unit to withstand 6000 hours of ultraviolet radiation equivalent to 120,000 hours of noontime sun exposure without loss of functional properties.
    e. Unit to withstand 200 thermal shock cycles between minus 25 degrees F and 180 degrees F (minus 32 degrees C and 82 degrees C) without loss of adhesion or other deterioration.
    f. Unit to withstand 6000 hours of exposure to 60 psi (42,184 kg/m^2) water jet without signs of wear or erosion.
    g. Type 304 stainless steel may be supplied as an equal to eliminate the need for passivation, minimize maintenance requirements, and prolong equipment life.

J. Circular access doors shall be provided for easy access to the make-up water assembly and suction strainer for routine maintenance.

K. Distribution Section: Polyvinyl chloride piping header and branches with non-clog ABS plastic spray nozzles. The branches and spray nozzles will be held in place by snap-in rubber grommets, allowing quick removal of individual nozzles or complete branches for cleaning or flushing.

L. Tower shall include a single water connection located as shown on the plans. An internal system of PVC piping shall deliver water equally to the distribution basins without the need for balancing valves. This internal piping system shall require no scheduled maintenance and shall be located such that it does not interfere with normal maintenance access. The internal piping must extend to the tower exterior surface of the tower.

M. Fill: Polyvinyl chloride plastic with flame spread index of 5 or less, when tested in accordance with ASTM E84. The fill will be manufactured, and performance tested by the cooling tower manufacturer to assure single source responsibility and control of the final product.

N. Drift Eliminators: Three-pass design to minimize drift loss, made of PVC material.

O. Cold water collection basin shall be heavy-gage G-235 (Z700) galvanized steel with all edges given a protective coating of zinc-rich compound. Basin shall include large area lift out strainers with perforated openings sized smaller than the water distribution system nozzles and an anti-votexing device to prevent air entrainment. The strainer and anti-vortexing device shall be constructed of the same material as the basin to prevent dissimilar metal corrosion. Basin shall include drain and clean-out connections.

P. Basin Water Level Control: PVC, balanced piston type mechanical make-up valve with plastic float.

Q. Electric Immersion Heaters: In pan suitable to maintain temperature of water in pan at 40 degrees F (4.4 degrees C) when outside temperature is 0 degrees F (-17.7 degrees C) [OR -20 degrees F (-28.9 degrees C)] and wind velocity is 15 mph (25 kph); immersion thermostat and float control operate heaters on low temperature when the pan is filled. Heaters shall be constructed of copper.

R. Install tower in accordance with manufacturer's installation instructions.

S. Startup shall be performed by factory trained and authorized servicing technicians confirming equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under warranty. Start-up and testing report shall be included in project's O&M Manual.

230508 VALVES

A. Valves shall be furnished as specified and as shown on the plans. All valves shall have manufacturer's metal identification disc under the handle nut. Provide valve extension handles for all valves in chilled water piping systems. Seats for iron body valves shall be renewable. Valves shall be by a single manufacturer unless noted otherwise. Provide a 3/4" diameter dot on lay-in ceiling grid below all valve locations. Dot color shall be same as that color specified hereinafter for that piping's finish painting. Provide 19 gauge polished brass valve tag on all valves. Heating and Air Conditioning Contractor shall furnish valve schedule mounted under glass in a frame in the main mechanical room.

B. Ball valves shall have bronze body, synthetic rubber seat rated at 250°F, ball and seat and indicating dial with memory stop. Valves on insulated piping or equipment shall have stem extensions for insulation coverage.

C. Butterfly valve shall have ductile iron lug body, aluminum bronze disc, synthetic rubber seats rated at 250°F, ductile iron or aluminum lock handle with memory stop. Valves 4" and larger shall be equipped with gear operator with handwheel. All gear operators shall have traveling indicator and adjustable stops. Valves on insulated piping or equipment shall have stem extensions for insulation coverage.

SIZES UP TO AND INCLUDING 2" BRONZE BODY SCREW IN

	BALL	CHECK
Hammond	8201	IB 946
Nibco	T-580	T-433-Y
Milwaukee	BA-200	510T

SIZES 2-1/2" AND OVER FLANGE CONNECTED IRON BODY

	CHECK	BUTTERFLY
Hammond	9354	6200
Nibco	F-910	LD-3100
Milwaukee	1800	ML-122B

D. Automatic Flow Control Valves:

1. Manufacturers: Flow Design, Inc., Autoflow, Griswold, Bell & Gossett, PRO Hydronic Specialties, Nexus, or approved equal.
2. Design:
   a. The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified amount.
   b. The 1/2" - 2", the flow cartridge shall be removable from the Y-body housing without the use of special tools to provide access for regulator changeout, inspection, and cleaning without breaking the main piping. (Access shall be similar to that provided for removal of a Y-strainer screen).
   c. True operating ranges of 2-32 PSID or 5-60 PSID are required. The design flow should be achieved at the minimum PSI differential. A 50% safety factory applied to the lower operating range is not acceptable.
   d. Each valve shall have two P/T ports.
   e. All automatic flow control devices shall be supplied by a single source and certified flow tests, witnessed by a Professional Engineer, shall be available.
   f. Five-year product warranty and free first year cartridge exchange.

3. Construction:

   a. The internal wear surfaces of the valve cartridge shall be electroless nickel or stainless steel.
   b. The internal flow cartridge body shall have machined threads so the spring free height may be compensated for without the use of fixed shims. A crimpled sheet metal design is not acceptable.
   c. The internal flow cartridge shall be permanently marked with the GPM and spring range.
   d. For 1/2" through 2" pipe sizes: An assembly shall consist of a brass Y-type body, integral brass body ball valve and "O" ring type union.
   e. For 2-1/2" and larger flanged connections: Ductile iron body suitable for mounting wafer style between standard 150# or 300# flanges. The long flange bolts and nuts shall be provided with each control valve.
   f. All valves shall be factory leak tested @ 100 PSI air under water.
   g. Valve bodies shall have flow direction indicated.
   h. Valves shall have attached and permanent labels indicating unit served, flow rate, pressure control range, manufacturer, and model number.

4. Minimum Ratings:

   a. 1/2" through 2" pipe size: 400 PSIG at 250°F.
   b. 2-1/2" through 14" pipe size: 600 PSIG at 250°F.
   c. 16" through 30" pipe size: 250 PSIG at 250°F.

5. Flow Verification:

   a. As part of testing and balancing, the differential pressure across the Automatic Flow Control Valve shall be measured for flow verification and to determine the amount of system over heading or under pumping.
   b. The flow shall be verified by measuring the differential pressure across the coil served or the wide-open temperature control valve and calculation the flow using the coil or valve Cv.

6. Test Kit: A differential test kit shall be supplied to the Owner by the Heating and Air Conditioning Contractor to verify flow and measure overheading. The kit shall consist of a 4-1/2" diaphragm gauge equipped with ten-foot hoses and P/T adapters all housed in a vinyl case with instructions. Calibration shall be 0-35 PSID for 2-32 PSI spring range or 0-65 PSID for 5-60 PSI range. Kit shall be digital meter type.
7. Installation:

   a. Install automatic flow control valves on the return lines of coils, etc. as indicated on the plans. Balancing valve on supply side is not acceptable.
   b. The standard ports and handles shall clear 1" thick insulation. Handle and port extensions are required and shall be provided for over 1" thick insulation. Coordinate with insulation thickness schedule indicated on the drawings.
   c. Install, on the supply side of coils, a Y-strainer with a brass blowdown valve with 3/4" hose end connection with cap and chain.
   d. Flow control valves shall be 2-32 PSID range.

230509 CONTROLS

A. See drawings for notes regarding controls for new WSHP/ERV and Cooling Tower.

B. General:

1. Furnish and install new controls as necessary for boilers and pumps operation and fully connected to and integrated with the building's existing Schneider Electric Andover DDC system to fulfill the intent of the drawings and specifications, including DDC graphics. The systems shall include all necessary labor, electrical wiring, devices, and materials for a complete installed control system.

2. All electric wiring in connection with the temperature controls and all interlock wiring shall be furnished under this section of the specifications. The wiring shall be installed by licensed electricians employed by, or subcontracted by, the Mechanical Contractor, in strict accordance with all Local, State and National Codes. All control and interlock wiring shall be in accordance with the Electrical section of these specifications.
3. The existing building control system shall interface to and energize the new primary hot water systems including both boilers. Each new boiler shall energize its primary pump. The existing secondary hot water system pump shall continue to be controlled by the DDC.
4. The control system shall be complete with all necessary relays, switches, accessories, etc., and all interconnections so arranged that there will be the proper automatic sequence in operation between the various control devices required to maintain the desired temperature or conditions.
5. The exact location of instruments, panelboards, accessories, etc., not definitely located shall be approved by the Owner or his representative. All automatic controls and accessories shall be located in accessible locations. All non-panel, as well as panel mounted instruments, shall be clearly labeled as to use, position and system served by means of engraved phenolic nameplates.

C. Control Panels:

1. Furnish and install as shown on the plans a wired control.
2. All wiring shall be neatly bundled, labeled, and wiring shall be terminated inside the cabinet at labeled wiring terminals.
3. Engraved Bakelite nametags shall be provided for each panel mounted device whether inside the cabinet or mounted on the panel's face.
4. All relays, controllers, switches, and accessories shall be mounted in the control panels. Switches shall be mounted in the panel's face.
5. All line voltage wiring and terminals shall be covered with insulated guards for the protection of service personnel even with the control panel open.

D. Sequence of Operation shall be as existing.

E. Instructions and Diagrams:

1. The Mechanical Contractor shall provide to the Owner a complete instruction manual covering the function and operation of all control components. The manuals shall also contain a schematic drawing of boilers and pumps control system properly marked and keyed with the equipment list to identify each item of control equipment.
2. The Mechanical Contractor shall also provide a complete schematic control diagram framed under glass and mounted on the wall in the equipment room.
3. The Mechanical Contractor shall provide a minimum of eight (8) hours on-site training on the control system for the boilers. This training shall be conducted by a competent representative of the Mechanical Contractor. Training shall include a complete review of the control system, control component or devices and their locations, control functions with demonstration, and safety shutdown functions.

230510 WATER TREATMENT AND FEED SYSTEMS

A. **Heating and Air Conditioning Contractor shall provide flushing and cleaning of new piping and new equipment. Existing piping and equipment shall not be flushed with cleaning chemicals. Coordinate cleaning chemicals with the Pender County's Chemical Treatment Contractor. System treatment and treatment chemicals shall be by the Pender County's Chemical Treatment Contractor (Sky Enterprises – Ken Catlet 919-285-9309).**

B. Initial Flushing and Clean-Out:

1. Prior to extended operation, all piping systems shall be flushed with clean water to remove foreign matter. Flow rates in sections being flushed shall be 6 feet per second minimum. All strainers at

equipment shall be periodically checked and cleaned until flushing operations reveal the absence of foreign materials.

2. Provide sidestream filtration utilizing filters in the chemical feed tank for system clean-up as necessary. Water Treatment Contractor shall provide 20 micron filters.

C. Closed Hydronic Piping Systems Chemical Treatment – Heat Pump Loop Water and Hot Water Systems:

1. By Pender County's Chemical Treatment Contractor.

D. Open Hydronic Piping Systems Chemical Treatment – Condenser Water Systems:

1. By Pender County's Chemical Treatment Contractor.
2. Chemical treatment system for open system is existing.

E. Test Reports:

1. Submit water treatment test reports in typewritten form documenting acceptable flushing.

230511 HEAT TRACE CABLE

A. See drawing for detail and specification of heat trace cable. Coordinate heat trace type and installation with pipe material being protected. Heat trace cable shall be installed on all new exterior above grade water piping to grade and on all new piping, valves, etc.at the cooling tower.

230512 ELECTRICAL

A. Electrical circuit sizes are based on capacities of the drawings and it shall be the responsibility of Heating and Air Conditioning Contractor to change any and all electrical work in order to fit mechanical equipment. Heating and Air Conditioning Contractor shall assure that all units are properly connected and shall check wiring prior to starting units. Any damage to units resulting from improper wiring or connections shall be the responsibility of Heating and Air Conditioning Contractor. Flexible electrical conduits shall be 18 inches in length maximum. All electrical work shall be installed in accordance with codes having jurisdiction and the Electrical section of these specifications. Termination of electrical power wiring to mechanical equipment shall be as detailed on the drawings.

B. Starters shall have integral 120V Control power transformer. Starters shall have holding coil for 120V control with Hand-Off-Auto switch. The starters shall be inoperative if the thermal unit is removed. All magnetic starters shall be NEMA sized with applicable melting alloy overload relays and applicable enclosure. Starters shall be GE or approved equals by Allen-Bradley, Square D, Siemens or Cutler-Hammer.

C. All three phase motors shall be provided with phase loss protection.

D. Fused disconnect switches shall be per the Electrical section of these specifications.

E. Motor Starters and Fused Disconnect Switches shall be neatly arranged, and securely fastened to walls with expansion bolts, lead shields, etc. Each starter or switch shall have its usage or letter designation indicated on its cover per the Electrical section of these specifications.

230513 PIPING

A. The Heating and Air Conditioning Contractor shall furnish all piping and supports necessary to provide a complete system as shown or intended by the plans and specifications. All piping shall be inspected, tested, and approved before being insulated or concealed. Pipe shall be clean, run generally parallel to the building and have all open ends closed with caps at all times. Eccentric reducers shall be used in horizontal runs and

concentric reducers in vertical runs. All piping and fittings shall have manufacturer's identification and ASTM designation incorporated thereon.

B. Heat pump loop water and hot water system piping shall be Schedule 80 CPVC plastic pipe in accordance with ASTM F 441. All fittings shall be Schedule 80 socket-type in accordance with ASTM F439. Joints shall be made with appropriate primer and ASTM F 493 solvent cement. Contractor shall note reduced hanger spacing requirement when using CPVC. **Do not make threaded connection of CPVC to metal/brass valves, hose kits, etc. Threaded connection must be metal to metal. Use appropriate glue-on adaptor that has metal male or female threads for threaded connection – Sioux Chief ASTM F438 CPVC Adaptors or equal.**

C. Condenser water piping where aboveground shall be Schedule 80 CPVC plastic pipe in accordance with ASTM F 441. All fittings shall be Schedule 80 socket-type in accordance with ASTM F439. Joints shall be made with appropriate primer and ASTM F 493 solvent cement. Contractor shall note reduced hanger spacing requirement when using CPVC. **Do not make threaded connection of CPVC to metal/brass valves, hose kits, etc. Threaded connection must be metal to metal. Use appropriate glue-on adaptor that has metal male or female threads for threaded connection – Sioux Chief ASTM F438 CPVC Adaptors or equal.**

D. Make-up water piping at the cooling tower shall be Type L copper with all joints soldered with 95-5 solder. Piping shall have dielectric connection to ferrous pipe.

E. Cooling tower drain piping shall be Schedule 40 solid wall PVC-DWV conforming to ASTM D-2665 with fittings conforming to piping specifications. Joints for PVC-DWV piping shall be made using pipe manufacturer's approved solvent cement.

230514 PIPE HANGERS

A. All piping shall be neatly and securely supported by hangers spaced in the following manner:

1. CPVC Piping 1" and smaller - 3'-0" O.C.
2. CPVC Piping 1-1/4" and larger - 4'-0" O.C.
3. Copper Piping 1-1/4" and smaller - 6'-0" O.C.
4. Copper Piping 1-1/2" and larger - 10'-0" O.C.
5. PVC Piping - 4'-0" O.C.
6. Provide 2 hangers at each change in direction.

B. Hangers shall be the Clevis type as manufactured by Modern Fig. 590, B-Line Fig. B 3100, or Grinnell Fig. 260 complete with hanger rods of size to conform to the type of hanger and pipe supported. Hangers shall be attached to the building by beam clamps or bolted to bar joist. At hangers provide 16" long 16 gauge galvanized sheet metal protection saddle three times the nominal pipe diameter. Under no condition shall hangers be connected directly to insulated pipe. Saddles shall be Modern Type A, B-Line Fig. B 3151, or Grinnell Fig. 167.

C. Hangers for vertical piping shall be riser clamp design as manufactured by Modern Fig. 500, B-Line Fig. B3373 or Grinnell Fig. 261. Riser clamps shall be installed on top of each floor penetration.

230515 INSULATION

A. All piping and ductwork shall be inspected and tested before insulation is applied. All insulation shall meet UL 723 and ASTM-E84 flame spread and smoke developed requirements of 25/50 and shall comply with NFPA 90A and the latest edition of the NC Building Code. Insulation shall be Certainteed, Owen Corning, Knauf, Johns-Manville, Trymer, Hi-Therm, or Dyplast.

B. All new or renovated interior air conditioning supply, return, and outside air ducts and back of new diffusers and grilles shall be externally insulated with 2" thick 1 lb. density foil scrim kraft jacketed fiberglass wrap insulation with installed R value of R-6 minimum. Adhere insulation to duct with fire retardant adhesive in sufficient quantities to prevent sagging. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. Tape all joints, breaks, punctures, and any penetrations with SMACNA foil faced kraft duct tape.

D. New heat pump loop water piping and interior condenser water piping will not be insulated where inside the building.

E. Where on exterior, new condenser water piping, fittings, valves, etc., shall be insulated with rigid 2.3 lb/cubic feet phenolic insulation with a thermal conductivity of 0.15 btu-in/hr-ft^2-°F or lower at 75°F equal to Trymer Green, Hi-Therm, or Dyplast DyTherm. Insulation and vapor retarder shall not exceed a ASTM E-84 flame/smoke rating of 25/50. Provide Saran 540 vapor retarder film factory applied and Saran vapor retarder tape field applied. All butt and longitudinal joints shall be sealed. Fittings and valves shall be insulated with pre-formed phenolic fittings or mitered sections of pipe covering and covered with Saran 520 tape. Fiberglass fittings will not be permitted. Provide a 24" section of insulation for each pipe hanger to be installed by Heating and Air Conditioning Contractor at time pipe hanger and pipe are installed. Install insulation in such a manner as required to provide a complete vapor barrier. Piping insulation thickness shall be as shown in the schedule on the drawings. All piping and fittings shall be clean and dry prior to installation of the insulation.

1. All insulation shall be tightly butted and free of voids and gaps. Vapor Retarder must be continuous. All fasteners and bands shall be neatly aligned and overall work must be of high quality appearance and workmanship.
2. In below ambient systems, staples, rivets, screws and other fasteners capable of penetrating the vapor retarder shall not be used.
3. Lap joint of vapor retarder to be sealed using SSL tape. Vapor retarder butt joints shall be covered with Saran 520 Vapor Retarder Tape.
4. Elbows and fittings shall be wrapped with Saran 520 Vapor Retarder Tape in a spiral fashion. Use a minimum amount of overlap between successive courses of spiral wrapped Saran Tape.
5. Insulation sections in hangar saddles shall be phenolic for pipes less than 16 NPS. At 10 feet hangar spacing and on pipes 16 NPS and larger, the bottom insulation sections in hanger saddles shall be 3.75 lb. per cubic foot rigid phenolic foam insulation for resistance to compression. Saddles shall wrap the insulation in an arc between 120° and 180°F depending upon the load.
6. When Saran vapor retarder film is used without PVC jacketing, a 1″-wide or greater filament tape or Saran 520 tape with a 25% (1-1/4 wraps) circumferential overlap shall be wrapped around the outside of the Saran 540 vapor retarder on 12" centers.

F. Make-up water piping on exterior shall be insulated with tubular closed cell elastomeric insulation with all joints butted and cemented tight. Insulation on make-up water piping and interior condensate piping shall be 1-1/2” thick.

G. All insulation on exterior hydronic piping above grade shall be provided with a protective aluminum jacket with a factory-applied asphalt and kraft paper moisture barrier. Aluminum jackets shall be cross-crimped (longitudinally corrugated) for strength. Aluminum jackets shall be not less than 0.016" thick and shall be secured with aluminum or stainless steel screw; not more than 8" apart. Each jacket shall be applied by turning a 1" hem inward on one longitudinal edge and then lapping the hemmed edge over the unhemmed edge. The jacket may be machine cut to produce a straight smooth edge and the hem omitted. The longitudinal and circumferential seams shall be lapped not less than 2". Jackets on horizontal lines shall be so installed that the longitudinal seams are on the bottom half of the pipe with the seam of each jacket slightly offset from the seam of the adjacent jackets; top edge shall overlap bottom edge. The jackets on vertical lines and lines pitched from the horizontal shall be installed from low point to high point so that the lower circumferential edge of each jacket overlaps the jacket below it. Special fitting jackets conforming to the above with the exception of longitudinal lapping dimensions and location of seams shall be used for fittings,

valves, and flanges. Jackets for fittings, valves, and flanges shall be properly overlapped and secured. Equivalent aluminum jacketing system, when approved, will be acceptable.

230516 SPECIALTIES

A. Thermometers (9" long) and gauges (4-1/2" dial) shall have metal case with white backgrounds, black numerals and graduations, and non-mercury, non-alcohol indicating fluid. Ranges shall be selected to indicate operating conditions at mid-scale. Accuracy shall be within 1% of scale range. Pressure gauges shall be compound. Mounting provisions shall provide for insertion of well with separable socket into piping at an angle to permit reading from the floor and shall be of adequate length to project through insulation. Thermometers and gauges shall be Bitmet, Mueller, Taylor, or approved equal. Gauges shall have shut-off cocks.

B. Air vents shall be provided at all points on the piping systems where required to eliminate air from the system. The air vents shall be manual or high capacity automatic type as indicated and manufactured by Bell and Gossett, Hoffman or Armstrong.

C. Unions or flanges shall be provided throughout the piping system to facilitate the removal and servicing of all valves, equipment, items, etc.

D. Hose kits for supply and return water piping connections to water source heat pumps shall be stainless steel outer braid and polymer inner core with swivel connectors on one end. Hoses shall be flame retardant per UL 723 and ASTM-E84 and shall be rated to 300 psi. See Water Source Heat Pump Detail on the drawings for all valves, accessories, etc. to be included in hose kits.

E. Pressure and temperature taps shall be provided at all coils. Taps shall be a 1/4" MPT fitting to receive either a temperature or pressure probe 1/8" OD. Fitting shall be solid brass with two valve cores of Nordel (Max 275°F) at 500 PSI, fitted with a color-coded cap strap with gasket, and shall be rated at 1000 PSIG at 140°F. Provide two (2) temperature and pressure probe readout kits to Owner for maintenance use.

230517 VIBRATION ISOLATION

A. Flexible duct connections, both at inlet and discharge of air handling units, shall be made of 30 oz. workinglass fiber coated with neoprene, sewn together at edges and joints. These flexible connections shall withstand the operating air-pressure, shall not permit air leakage, and shall not transmit vibration.

230518 PIPE MARKERS

A. Markers shall have wording, wording colors, and wording background in accordance with ANSI A13.1. Markers shall have letters approximately 1” high on appropriate background, flow arrows, and shall be located on the duct or pipe at intervals not exceeding 10’-0”. Markers shall be plastic with markers on piping completely encircling the pipe with overlap and permanent tension in the marker to grip the pipe firmly without the need of adhesives. Provide markers on all new piping. Wording of markers shall be as follows:

1. Heat Pump Loop Supply – Heat Pump Loop Return
2. Condenser Water Supply – Condenser Water Return
3. Make-Up Water
4. Piping with heat trace cable shall have appropriate warning labels on insulation cover or protective aluminum jacket.

230519 NAMEPLATES

A. New water source heat pump and cooling tower shall be furnished with engraved plastic laminated labels permanently attached to the equipment. Lettering shall be ½" tall. Label shall include equipment number, area served, final acceptance date, number and size of filters, and capacities. Substantial completion date shall be on a separate label so as to allow equipment nameplates to be installed prior to final acceptance.

230520 PIPING PRESSURE TESTING

A. The Heating and Air Conditioning Contractor shall make the following tests before the systems are insulated or covered by construction. The systems shall have no decrease in pressure during the test periods. All system components shall be protected from test pressures that exceed manufacturer's design limits.

B. Notify Engineer and Owner 48 hours in advance of all tests.

C. Heat pump loop water and condenser water piping shall be tested by applying a hydrostatic pressure of 1.5 times system's working pressure or 150-PSIG, whichever is greater but not exceeding the maximum pressure rating for any component in the system under test, for a period of four (4) hours. Water source heat pumps, cooling towers existing piping shall be isolated from the test pressure during testing.

D. No caulking of joints shall be permitted. Any joint found to leak under this test shall be broken, remade, and a new test applied.

230521 TESTING AND BALANCING

A. Testing and balancing of the new systems shall be performed by an AABC certified Test and Balance Company as a subcontractor to the Heating and Air Conditioning Contractor. All instruments used shall be accurately calibrated and in good working order. The tests shall be in strict accordance to the Standards of AABC. Test and Balance Contractor shall submit TAB plan to the Engineer for their review and approval prior to starting any TAB work.

B. Air balance and testing shall not begin until the systems have been installed in full working order and shown to be operating satisfactory on both heating and cooling. The Contractor shall place all heating, ventilating, and air conditioning systems into full operation and shall continue operation of the system until balancing is completed. All operational cost shall be borne by the Heating and Air Conditioning Contractor. The Owner, and Engineer shall be given two weeks advance notice of when tests are to be made.

C. Upon completion of the heating, ventilating, and air conditioning systems, the Test and Balance Contractor shall compile the test data and submit the completed test data to the Engineer for evaluation and approval. At final inspection and prior to final commissioning verification, Heating and Air Conditioning Contractor shall have a copy of test and balance report and all necessary personnel and equipment to facilitate spot-checking of test and balance data by the Engineer or their representative. Final payment to the Contractor shall be withheld until the complete test and balance data has been approved.

D. Testing Procedure (Air):

1. Test and adjust unit fan's RPM and CFM to design requirements. Record all data.
2. Test and record motor full load amperes on all motors.
3. Adjust all main supply and outside air ducts to proper design CFM when air handling systems are in normal operating mode. Record exhaust and outside air data.
4. Test and adjust each diffuser, grille, and register for supply, exhaust, or return systems to within 10% of design requirements. Record all data.
5. All adjustments to air diffusing devices where possible shall be made in trunk or run out dampers, not at diffuser volume control.

6. The Heating and Air Conditioning Contractor shall make any changes in the pulleys, belts, filters, dampers, or valves necessary or as recommended by the Engineer for correct balance at no additional cost to the Owner.

E. Testing Procedure (Water):

1. All air systems shall be balanced prior to water balance.
2. Open all valves to full open position.
3. Clean all strainers.
4. Set mixing valves to full flow.
5. Check expansion/compression tanks to determine that they are not air bound.
6. Check all air vents at high points of water systems to insure their installation and operation.
7. Set water pumps to proper gallons per minute delivery. Record all data.
8. Check and record motor full load amperes.
9. Check and record coils' inlet water temperature and record all temperature drops or rises across coils during full cooling or full heating.
10. Test and adjust each water balancing item to within 5% of design requirements. Record all data.

230522 INSTRUCTIONS/TRAINING

A. The Heating and Air Conditioning Contractor shall give an instruction and training period in the operation of the apparatus to the persons who will be in charge of the system.

230523 MAINTENANCE DATA

A. For all new or renovated items requiring maintenance, the Heating and Air Conditioning Contractor shall furnish two weeks prior to Final Acceptance and deliver to the Owner's representative on the job copies of complete data as prepared by the manufacturer covering the details of operation and maintenance and complete parts list for all equipment specified. Each copy of the maintenance data shall be assembled into a 3-ring hardback binder with indexing and label on cover and spine. Data shall include:

1. Index with page numbers.
2. List of all subcontractors and suppliers with names, addresses, and phone numbers.
3. Contractor's certificate of Final Acceptance.
4. Copy of all warranties.
5. Equipment model numbers, etc. indicated and referenced with the same mark as shown on equipment on the drawings.
6. Filter schedules of sizes and quantities for all equipment requiring filters referenced by mark on the drawings.
7. Equipment summary showing all capacities and ratings.
8. Certified test and balance report.
9. Start-up and test reports for equipment.
10. Complete start-up, operation, and shut-down procedures for each system.
11. Lubrication schedules and types of lubricates.
12. All submittal data and shop drawings, unless included in a separate manual.

230524 RECORD DRAWINGS

A. The Heating and Air Conditioning Contractor shall maintain "during the course of the work" a set of specifications and drawings marked up to show the new and renovated work as installed, **including a minimum of two dimensions to indicate locations and elevations of buried work**. Upon completion of the work, return this set of drawings to the Engineer.

230525 GUARANTEE

A. The Heating and Air Conditioning Contractor shall guarantee the new and renovated heating and air conditioning systems subject to the General Conditions of these specifications, except:

1. Refrigeration compressors for water source heat pumps shall have a four-year extended warranty for the compressors only. Labor, freight, refrigerant, and other required parts shall be provided or paid for by the Owner.

2. Cooling tower shall be one-year for complete tower, five-years for fans, fan shafts, bearings, sheaves, gearboxes, drive shafts, couplings, and mechanical equipment supports.

END OF SECTION 230500

SECTION 260000 – ELECTRICAL, BASICS

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

A. Applicable requirements of any Instructions to Bidders, General Conditions of the Contract, and/or Supplemental Conditions shall be a part of the Electrical Specifications. The electrical contractor shall examine all contract documents before submitting a proposal.

B. The electrical work shall be performed by an electrical contractor, suitably licensed for the scope of work of this specific project.

C. The electrical contractor shall assume total responsibility for any portion of the work provided by his subcontractors.

1.3 CODES AND STANDARDS

A. Building Codes:

1. National Fire Protection Association No. 70, National Electrical Code (NEC)
2. North Carolina State Building Code, Latest Edition and Revisions (NCSBC)
3. National Electrical Safety Code (NESC)
4. National Bureau of Standards (NBS)
5. Local Codes where applicable

B. Industry Standards:

1. Underwriter's Laboratories, Inc. Standards and approved listings (UL)
2. Electrical Testing Laboratories Standards (ETL)
3. National Electrical Manufacturers Association Standards (NEMA)
4. Insulated Power Cable Engineers Association Standards (IPCEA)
5. American National Standards Institute (ANSI)
6. American Society for Testing Materials Standards (ASTM)
7. Canadian Standards Association (CSA)

1.4 QUALITY ASSURANCE

A. Electrical materials, equipment, devices, fixtures, etc. shall be listed and labeled by a third-party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label electrical & mechanical equipment. Listing and labeling shall comply with NC Department of Insurance requirements as detailed in NC General Statutes 66-23 through 66-25. This paragraph applies to all electrical specification sections under specification divisions 26, 27, and 28.

1.5 SCOPE OF WORK

A. It is the intent and meaning of the drawings and specifications to call for finished work that has been tested and is ready for operation. The electrical contractor shall take this into consideration and include in his proposal allowance for contingencies that will allow him to provide minor pieces of materials and

labor not specifically indicated but required for the job to operate properly. This paragraph is intended to insure that a complete job will be provided without requests for minor extras.

B. It shall be understood that where the words “furnish,” “provide,” and/or “install” are used, it is intended that this CONTRACTOR shall purchase and install completely all material necessary and required for this particular item, system, equipment, etc.

1.6 RECORD DRAWINGS

A. A set of drawings covering the electrical contract will be provided to the electrical contractor to mark in color all changes, modifications, or revisions effected during construction. These field mark-up drawings are to be turned over to the electrical designer.

B. The electrical contractor shall provide final installed photographs of switchboards and panelboards. Photographs shall clearly show equipment designations, manufacturer nameplates, breaker positions, breaker ratings, and directory descriptions.

1.7 APPROVAL OF MATERIALS

A. Construction phase: The CONTRACTOR shall submit his proposal on the specified materials and equipment, or their equivalent, provided the words "or equal" or "or approved equal" follow the named manufacturers. If the above phrases do not appear, the specified manufacturers shall be furnished without substitution. Equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, with the Design Team being the judge of equality.

B. Where no specific material or equipment type is mentioned, any first-class product of a reputable manufacturer may be used provided it conforms to the requirements of the specifications.

1.8 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. The CONTRACTOR shall submit PDF files of literature and product data sheets to the Design Team of materials for review and approval. It is preferred that all electrical submittals for the project shall be submitted at one and the same time.

B. Product data sheets with multiple components, part numbers, etc. shall be clearly marked or highlighted to identify what specific product/model/part number/component is proposed for this project. All instances of the proposed part number components in the product data shall be marked or highlighted throughout product data sheets submitted.

C. The CONTRACTOR shall analyze all submittal data and certify that it meets requirements of Contract Drawings and Specifications, prior to delivery to the Design Team. CONTRACTOR Certification shall be in the form of suitable approval stamp placed on each shop drawing/submittal submitted.

1. If the submittal data deviates from the Contract Documents, the CONTRACTOR shall advise the Design Team of deviations in writing, accompanying the shop drawings and submittal data, including the reason for deviations.

D. If the Design Team deems submittal data is either incomplete or incorrect, a resubmittal will be required. Where a resubmittal is not necessary but confirmation of receipt of review comments is requested, confirmation shall be submitted in writing.

E. At least one set of all final submittal data, certified prints, etc., shall be maintained at the job site and available to representatives of the Design Team.

F. Approval by the Design Team of submittal data is for general conformance with the contract documents and design concept.

1. Such approval does not relieve the CONTRACTOR of responsibility for compliance with the project drawings and specifications.
2. Such approval for any materials, apparatus, devices, and layouts shall not relieve the CONTRACTOR from the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently complete the requirements and intent of the contract documents.
3. Such approval shall not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings.

G. Record Documents for OWNER

1. Conductor and cable megger test results.
2. Field mark-up as-built drawings.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Electrical drawings and specifications are complementary each to the other, and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment wiring, etc and show the general arrangement of raceways, fixtures, and equipment. Drawings shall be followed as closely as actual building construction and the work of other trades will permit; however, all work shall suit the finished surroundings and/or trim.

B. Any omission from either the drawings or the specifications are unintentional, and it shall be the responsibility of the CONTRACTOR to call to the attention of the Design Team any pertinent omissions before submitting a proposal. Complete and working systems are required, whether every small item of material is shown and specified or not.

C. The electrical work shall conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not practical to indicate offsets, fittings and accessories that may be required. The CONTRACTOR shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the OWNER and as directed by the Design Team.

D. Load circuits shall be installed as indicated on the drawings. Circuit number revisions will not be accepted unless approved in writing by the Engineer.

1.10 COORDINATION OF WORK

A. It is understood and agreed that by submitting a proposal, the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The CONTRACTOR shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in other divisions of the specifications and in other contract documents. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

B. The CONTRACTOR shall compare the electrical drawings and specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Design Team. If needed, request from the Design Team written instructions for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the CONTRACTOR shall make proper provisions to avoid interferences in a manner approved by the Design Team. All changes required in the work of the CONTRACTOR caused by his neglect to do so shall be made by him at his expense.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The CONTRACTOR shall determine the exact route and location of each electrical raceway prior to make up and assembly.

D. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example; steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

E. Offsets and changes in direction of electrical raceways shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The CONTRACTOR shall furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions. Conflicts between electrical raceways, fixtures, etc., and ductwork which cannot be resolved otherwise, will be resolved by the Design Team.

F. The CONTRACTOR shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The CONTRACTOR shall arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

G. Work at Existing Facilities:

1. Where work may be required to be performed at existing and/or occupied facilities, such work shall be scheduled and arranged to be done at the convenience of the OWNER so as not to interfere with, disrupt, or disturb normal operations at the facilities. The CONTRACTOR shall obtain written approval from the OWNER before proceeding with work at existing facilities and shall work at existing facilities on schedule as agreed upon with the OWNER. This is not to be necessarily construed to mean that the CONTRACTOR is expected to perform work at existing facilities on holidays, weekends, etc., but that the Contractor must schedule work with the OWNER for the OWNER's beneficial and normal usage of the facilities, and that the CONTRACTOR will be required to maintain the schedule as approved by the OWNER.
2. The CONTRACTOR shall, at all times, provide safety barriers, protective devices, screening, dust barriers, etc., as required to maintain the safety and comfort of the building's personnel and/or occupants in or near his work area.
3. The CONTRACTOR shall be responsible for cleanup in connection with his work at existing facilities. At the end of each working day, all debris, boxes, waste, etc. shall be removed from the facilities and properly disposed of. Equipment, materials, etc. may be left inside the facilities, but such must be properly stored, stacked, and located as approved by the OWNER.
4. The CONTRACTOR shall do all cutting, patching, finishing, repairing, painting, etc., necessary for electrical work to be installed at existing facilities. All finishes shall be left to equal finish and condition prior to cutting. No cutting of structural members will be allowed. All cutting of walls, floors, roofs, etc. shall be repaired and/or replaced to a finish equal to that found prior to cutting.
5. The CONTRACTOR shall route conduits and locate equipment as approved by the OWNER and Design Team. Routing and locations shall be firmly established and approved before proceeding with any phase of the work.
6. The CONTRACTOR shall be responsible for any and all damage to the existing facilities, grounds, walkways, paving, etc. caused by the work, the CONTRACTOR and/or his personnel, and/or his equipment in the accomplishment of this work. Such damages shall be repaired and/or

replaced by the CONTRACTOR at his expense, to equal finish prior to damage. The Design Team shall be the judge as to equal finishes, etc.

7. Certain power requirements must be met without interruption during certain times on the existing electrical system. It is anticipated that partial power outages will be necessary to accomplish the work covered by these drawings and specifications. The CONTRACTOR shall determine in advance the dates, times and duration of these outages and shall obtain permission from the OWNER to shut down the electric power. Unauthorized power outages will not be tolerated.

H. Equipment and Materials (General):

1. Materials shall be new and shall bear the manufacturer's name, trade name, and listing label in every case where a standard has been established for the particular material. The equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment and shall be the manufacturer's latest approved design.
2. Delivery and Storage:
    a. Store products to allow for inspection and measurement of quantity or counting of units.
    b. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
        1) Electrical equipment shall be delivered to the site and stored in original containers. Store inside dry, heated spaces, but readily accessible for inspection by the Design Team until installed.
        2) Rusty and/or corroded materials and equipment will be replaced at the direction of the Design Team.
    c. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
    d. Protect stored products from damage.
3. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
4. At the completion of work; fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the OWNER in a condition satisfactory to the Design Team. Damage or defects, developing before acceptance of the work shall be corrected at the CONTRACTOR's expense.
5. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The CONTRACTOR shall promptly notify the Design Team, in writing, of any conflicts between requirements of the Contract Documents and the manufacturer's directions and shall obtain the Design Team's written instructions before proceeding with the work. Should the CONTRACTOR perform any work that does not comply with the manufacturer's instructions, recommendations, or requirements; it shall be corrected at his expense as directed by the Design Team.

I. Sleeves, Inserts, Openings, Etc.:

1. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located, and installed by the electrical contractor. Where working under a subcontract for a General Contractor, the electrical contractor shall give sufficient information (marked and located) to the General Contractor in time for proper placement in the construction schedule. Should the electrical contractor delay or fail to provide sufficient information in time, the electrical contractor shall cut and patch construction as necessary and required to install electrical work, with finishes completed to the satisfaction of the Owner and the Design Team.

J. Cutting and Patching:

1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. The electrical contractor shall be responsible for cutting and patching as required for the proper installation of electrical work for this project. Cutting shall be kept to a minimum. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Finishes shall be restored to the satisfaction of the Owner and the Design Team.

K. Locations and Measurements:

1. Outlets, equipment, fixtures, etc. are shown and located on the drawings as intended based on the Design Team's understood project scope. All measurements for installation shall be verified on the project and coordinated with the drawings of other disciplines. In all cases, work shall suit the surrounding trim and/or decoration and construction. The locations of outlets for appliances shall be installed so that when connected they permit the proper installation of appliances. Slight relocations of outlets, devices, and equipment shall be made by the electrical contractor as required or as directed by the Design Team at no additional cost to the OWNER.

L. Workmanship:

1. Work shall be executed as required by the drawings and specifications, shall be done in a workmanlike manner by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

M. Final Inspections and Equipment Demonstrations:

1. The CONTRACTOR shall acquire permits for construction & coordinate all required inspections with the office of the local electrical inspector and/or local authority having jurisdiction, if required. The CONTRACTOR shall provide the Owner two (2) copies of Electrical Inspectors' written reports.
2. The CONTRACTOR shall furnish ladders, required tools, and personnel to open equipment, fixtures, boxes, panels, etc. to enable the Design Team representatives to observe any parts of the installation they may request.
3. The CONTRACTOR shall furnish meters for observation of readings as directed by the Design Team representative. Meters to be furnished include: clamp-on type ammeter, voltmeter, insulation resistance tester (i.e., often called a megger), and clamp-on type ground resistance tester.

N. Operating Instructions:

1. At the completion of the entire installation, the CONTRACTOR shall arrange to operate each component of systems and then systems as a whole. When all the requirements of the plans and specifications have been met, the CONTRACTOR shall then arrange to instruct the OWNER's operating and maintenance personnel in the correct and proper procedures for the operation and maintenance of the systems

END OF SECTION 260000

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Cutting and patching for electrical construction.
3. Touchup painting.

1.3 SUBMITTALS

A. Product Data:

1. Support channels and hardware.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Metal Items for Use Indoors: Plain Steel.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

D. Slotted Support Systems Fittings and Accessories: Products of the same manufacturer as channels.

E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Expansion Anchors:

1. Inside: Carbon-steel wedge or sleeve type.
2. Outside: Hot-dip galvanized steel wedge or sleeve type.

G. Toggle Bolts:

1. Inside: All steel springhead type.
2. Outside: Hot-dip galvanized steel springhead type..

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION

A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

B. Coordinate location of and install access panels and doors for electrical items that are concealed by finished surfaces.

3.2 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Selection of Supports: Comply with manufacturer's written instructions.

B. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded hanger rods, unless otherwise detailed.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

I. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

J. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

K. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Spring-tension clamps on steel.
6. Light Steel: Sheet-metal screws.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work.

3.6 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Final Acceptance.

END OF SECTION 260500

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SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

PART 2 - PRODUCTS

2.1 POWER CONDUCTORS AND CABLES

A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

B. Conductor Material:

1. Copper complying with NEMA WC70 / ICEA S-95-658 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
2. Power and lighting circuitry: Minimum conductor size shall be #12, and maximum conductor size shall be #500 kcmil.

C. Conductor Insulation Types: Type THHN/THWN-2 complying with NEMA WC70 / ICEA S-95-658.

D. Metal-Clad Cable, Type MC:

1. Description: A factory assembly of current-carrying insulated copper conductors in an overall metallic sheath.
2. Comply with NEMA WC 70 / ICEA S-95-658 for metal-clad cable, Type MC with ground wire.
3. Connectors: Insulated throat type.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. For conductors #8 & smaller, use wire-nut type twist connectors.
2. For conductors #6 & larger, use pre-insulated solderless connectors with one spare port for future conductor connection.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Branch Circuits:

1. Concealed in Ceilings: Type THHN/THWN-2, single conductors in raceway or metal-clad cable, Type MC.
2. Concealed in Walls and Partitions: Type THHN/THWN-2, single conductors in raceway or metal-clad cable, Type MC.
3. Exposed: Type THHN/THWN-2, single conductors in raceway
4. Branch Circuits in Crawl Space: Type THHN/THWN-2, single conductors in raceway.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables, conductors, or raceway.

C. Identify and color-code conductors and cables according to Section "Electrical Identification."

D. Shared neutral conductors shall not be used unless specifically indicated so on homerun circuitry designations on the drawings.

3.3 CONNECTIONS

A. Connect equipment, outlet, device, and component connections to wiring systems and to ground. 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.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Inspect for physical damage. test conductors and cable for continuity and shorts.
3. Insulation Resistance (Megger) testing for building wire and cable:

a. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-Volt insulation resistance tester. Insulation resistance testers shall not be electronic type. Insulation resistance testers shall be hand crank or power-driven crank type. Minimum readings between conductors and between conductor and the grounded

metal raceway shall be: 25 mega-ohms for #6 wire and smaller; 50 mega-ohms for #4 wire or larger.

b. The CONTRACTOR shall correct malfunctioning conductors and cables, including replacement if necessary, and retest to demonstrate compliance.

c. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. Provide tabulated insulation resistance readings for each panel circuit.

C. Witness Tests:

1. The CONTRACTOR shall furnish an insulation resistance tester and show Design Team representative and/or Owner that the conductors comply with the specified requirements.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 QUALITY ASSURANCE

A. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For raceways, fittings, wireways, hinged-cover enclosures, and cabinets.

1.5 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

A. IMC: Produced to ANSI C80.6; listed to UL 1242.

B. EMT and Fittings: Produced to ANSI C80.3; listed to UL 797.

1. Fittings: Plated-steel, hexagonal, compression type.

C. FMC: Listed to UL 1.

D. LFMC: Listed to UL 360.

E. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.2 NONMETALLIC CONDUIT AND TUBING

A. RNC: Produced to NEMA TC 2; listed to UL 651.

1. Schedule 40 and Schedule 80 PVC.

B. RNC Fittings: Produced to NEMA TC 3; listed to UL 514B; match to conduit or tubing type and material.

2.3 METAL WIREWAYS

A. Listed to UL 870.

B. Material and Construction: Sheet metal sized and shaped as indicated.

1. Indoors: NEMA 1.
2. Outdoors: NEMA 3R.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers:

1. Indoors: Hinged type.
2. Outdoors: Flanged-and-gasketed type.

F. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Metal Hinged-Cover Enclosures:

1. Interior Locations: NEMA 250, Type 1 with continuous hinged cover, concealed hinge, and flush latch. Finished inside and out with manufacturer's standard enamel.
2. Exterior Locations: NEMA 250, Type 3R galvanized steel with continuous hinged cover and 3-point latch.
3. Removable interior panel.
4. Metal barriers to separate wiring of different systems and voltages.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid metal or IMC.
2. Concealed: Rigid metal or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed, Higher than 10' AFF: EMT.
2. Exposed, Lower than 10' AFF:
    a. In Electrical Rooms: EMT.
    b. Elsewhere: Rigid metal or IMC.
3. Concealed: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid metal conduit fittings, unless otherwise indicated.

E. EMT shall not be installed where raceway or fittings would be in direct contact with the earth, underground, in/below concrete, exposed to the elements, exposed to severe physical damage, or exposed to severe corrosive influence.

3.2 INSTALLATION

A. Keep raceways a minimum of 6 inches away from runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal raceways within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Conduits installed on the inside face of exterior building walls shall be spaced off the wall surface a minimum of ¼" using strut-type channel or "clamp-backs".

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

K. Raceway connectors shall be insulated throat type. If uninsulated throat connectors are installed, use insulating bushings to protect conductors.

L. Expansion Fittings:

1. Where raceways of any type pass a building or structure expansion joint, a standard expansion fitting shall be provided and installed. Review architectural and structural drawings for locations of expansion joints.
2. Where raceways installed are subject to temperature swings, install expansion fittings spaced in accordance with manufacturer instructions and NFPA 70 requirements.
3. Expansion fittings shall be compatible with the type of raceway being used.

M. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
3. Where using boxes with concentric, eccentric, or over-sized knockouts; provide bonding bushings and jumpers. Size bonding jumpers in accordance with NEC Table 250-122, connecting to the box with ground lugs.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Label each end of pull wires with location of opposite end.

O. Flexible Connections:

1. Use maximum of 24 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors.
2. Use LFMC in damp or wet locations.

P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings and finishes are without damage or deterioration at time of Final Acceptance.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

1. Exposed threads on galvanized conduits and fittings, installed outdoors, shall be coated with galvanizing paint or equivalent protective coating.

END OF SECTION 260533

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Pender County Courthouse Additional HVAC
ITB # 221024-234
Exhibit 2

WATER SOURCE HEAT PUMP SCHEDULE

SYMBOL	AIR QUANTITY		EXT. S.P. "H2O (3)	CAPACITY		EER FULL LOAD (4)	COP (5)	GPM	MAX. P.D. FT.	RUNOUT SIZES	ELECTRICAL			BASIS OF DESIGN	UNIT	REMARKS
	TOTAL CFM	OUTSIDE CFM		COOLING MBTUH (1)	HEATING MBTUH (2)						MCA	MOCP	VOLTAGE			
WSHP-1	1500	200	0.55	46.0	60.0	15.0	5.0	11.0	8.0	1-1/4"	21.5	30	208V-3ø	TRANE EXV048	VERTICAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-2	1500	200	0.55	46.0	60.0	15.0	5.0	11.0	8.0	1-1/4"	21.5	30	208V-3ø	TRANE EXV048	VERTICAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-3	1500	200	0.55	46.0	60.0	15.0	5.0	11.0	8.0	1-1/4"	21.5	30	208V-3ø	TRANE EXV048	VERTICAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-4	1500	200	0.55	46.0	60.0	15.0	5.0	11.0	8.0	1-1/4"	21.5	30	208V-3ø	TRANE EXV048	VERTICAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-5	1100	150	0.55	34.0	45.0	15.0	5.0	8.0	5.5	1-1/4"	15.3	20	208V-3ø	TRANE EXH036	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-6	950	125	0.50	29.5	37.0	15.0	5.0	7.0	9.2	1"	20.9	30	208V-1ø	TRANE EXH030	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-7	1100	150	0.50	34.0	45.0	15.0	5.0	8.0	5.5	1-1/4"	15.3	20	208V-3ø	TRANE EXH036	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-8	1100	200	0.45	34.0	45.0	15.0	5.0	8.0	5.5	1-1/4"	15.3	20	208V-3ø	TRANE EXH036	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-9	950	125	0.45	29.5	37.0	15.0	5.0	7.0	9.2	1"	20.9	30	208V-1ø	TRANE EXH030	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-10	1100	150	0.50	34.0	45.0	15.0	5.0	8.0	5.5	1-1/4"	15.3	20	208V-3ø	TRANE EXH036	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-11	1700	150-325	0.50	58.0	76.0	13.0	4.3	14.0	7.5	1-1/4"	28.0	40.0	208V-3ø	TRANE EXH060	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-12	1700	150-325	0.50	58.0	76.0	13.0	4.3	14.0	7.5	1-1/4"	28.0	40.0	208V-3ø	TRANE EXH060	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-13	1700	150-325	0.50	58.0	76.0	13.0	4.3	14.0	7.5	1-1/4"	28.0	40.0	208V-3ø	TRANE EXH060	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-14	1700	150-325	0.50	58.0	76.0	13.0	4.3	14.0	7.5	1-1/4"	28.0	40.0	208V-3ø	TRANE EXH060	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-15	950	125	0.45	29.5	37.0	15.0	5.0	7.0	9.2	1"	20.9	30	208V-1ø	TRANE EXH030	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-16	950	150	0.45	29.5	37.0	15.0	5.0	7.0	9.2	1"	20.9	30	208V-1ø	TRANE EXH030	HORIZONTAL	WITH FACTORY HGRH COIL – NO WORK
WSHP-17	**1000**	**1000**	**0.50**	**28.1**	**33.9**	**14.95**	**4.62**	**6.0**	**3.6**	**1-1/4"**	**25.0**	**35.0**	**208V-3ø**	TRANE GWSC036	ROOF MOUNTED	WITH ERV ATTACHED TO WSHP, SEE SCHEDULE BELOW, AND ADAPTOR ROOF CURB IF NECESSARY

(1) TOTAL COOLING CAPACITY BASED ON 90°F EWT/100°F LWT, 78°F EADB/ 65°F EAWB.

(2) TOTAL HEATING CAPACITY BASED ON 70°F EWT, 68°F EADB.

(3) EXT. S.P. INCLUDES SUPPLY & RETURN AIR DUCTWORK & GRILLES. FILTERS IN UNIT ARE NOT INCLUDED IN THIS FIGURE.

(4) MIN EER SHALL BE 12.0 PER AHRI/ASHRAE 13256-1.

(5) MIN COP SHALL BE 4.2 PER AHRI/ASHRAE 13256-1.

ENERGY RECOVERY VENTILATOR

SYMBOL	AIR QUALITY		EXT SP "H20		FAN HP		OUTSIDE AIR			RETURN AIR			SUPPLY AIR			MCA	MOCP	VOLTAGE AND PHASE	BASIS OF DESIGN	REMARKS
	OUTSIDE AIR CFM	EXHAUST AIR CFM	OA/SA	EX.A	OA/SA	EX.A	COOLING DB°F	COOLING WB°F	HEATING DB°F	COOLING DB°F	COOLING WB°F	HEATING DB°F	COOLING DB°F	COOLING WB°F	HEATING DB°F					
ERV-1	1000	1000	-0.10	0.30	3/4	3/4	92.0	78.0	23.0	75.0	62.0	72.0	80.6	67.9	55.8	17.7	25.0	208V-3ø	SEMCO SP-700	

COOLING TOWER

SYMBOL	WATER GPM	MAX. SPRAY PRESS AT INLET HEADER & HEIGHT	WATER TEMP		OUTSIDE WET BULB °F	ELECTRICAL				EXISTING TOWER	REMARKS
			IN °F	OUT °F		MOTOR HP	VOLTAGE & PHASE	SUMP HTR. KW	VOLTAGE & PHASE		
CT-1	260 (2)	5.51 PSIG	95.0	85.0	80.0	15 (1)	208V-3ø	14.4	208V-3ø	BAC MODEL VTO-107-L	

(1) EXISTING REUSED VARIABLE SPEED DRIVE LOCATED INSIDE BUILDING.

(2) TAB TO NEW PERFORMANCE CONDITIONS TO MATCH EXISTING.

PLATE AND FRAME HEAT EXCHANGER – FOR REFERENCE ONLY

SYMBOL	SYSTEM WATER				TOWER WATER				BASIS OF DESIGN	AREA	REMARKS
	GPM	MAX. PD.	EWT °F	LWT °F	GPM	MAX. PD.	EWT °F	LWT °F			
HEX-1	170	25.0 FT	100.0	90.0	200	25.0 FT	85.0	95.0	N/A	N/A	EXISTING B&G AP20 BY5444 (95 PLATES) (2018) – NO WORK

PUMP SCHEDULE

SYMBOL	GPM	HEAD IN FEET	RPM	MINIMUM % EFFICIENCY	ELECTRICAL		TYPE	MIN. SIZE		REMARKS
					HP	VOLTAGE		SUCTION	DISCHARGE	
P-1	200 (2)	60	1760	77	7.5	208V-3ø	SPLIT COUPLE VERTICAL INLINE	3"	3"	EXISTING COOLING TOWER PUMP (1)
P-2	170	80	1760	–	7.5	208V-3ø	BASE MOUNTED CENTRIFUGAL	2-1/2"	2"	EXISTING SYSTEM PUMP – B&G e1510 – NO WORK
P-3	170	80	1760	–	7.5	208V-3ø	BASE MONTED CENTRIFUGAL	2-1/2"	2"	EXISTING SYSTEM PUMP – B&G e1510 – NO WORK
P-4	45	25	1760	–	3/4	208V-1ø	VERTICAL INLINE	2"	2"	EXISTING BOILER PUMP – B&G 90-34 – NO WORK

(1) WITH TEFC MOTOR AND MAX NPSHR OF 5'-0".

(2) RE-TAB PUMP.

PIPE INSULATION THICKNESS SCHEDULE

PIPE SIZE	INSULATION THICKNESS		CONDENSER WATER (1)	CW	REMARKS
	HOT WATER	LOOP SUPPLY & RETURN			
3/4"	1"	1-1/2"	1-1/2"		
1"	1-1/2"	1-1/2"	1-1/2"		
1-1/4"	1-1/2"	1-1/2"	1-1/2"		
1-1/2"	1-1/2"	1-1/2"	1-1/2"		
2"	2"	1-1/2"	1-1/2"		
2-1/2"	2"	1-1/2"	1-1/2"		
3"	2"	1-1/2"	1-1/2"		
4"	2"	1-1/2"	1-1/2"		
5"	2"	1-1/2"	1-1/2"		
6"	2"	1-1/2"	1-1/2"		

(1) EXTERIOR CONDENSER WATER INSULATION.

LEGEND

- REMOVE EXISTING DUCTWORK
- REMOVE EXISTING PIPING, LINE SYMBOL INDICATES SERVICE
- EXISTING DUCTWORK TO REMAIN
- ES – EXISTING LOOP SUPPLY PIPING
- ER – EXISTING LOOP RETURN PIPING
- EREF – EXISTING REFRIGERANT PIPING
- EHWS – EXISTING HOT WATER SUPPLY PIPING
- EHWR – EXISTING HOT WATER RETURN PIPING
- ECWR – EXISTING CONDENSER WATER RETURN
- ECWS – EXISTING CONDENSER WATER SUPPLY
- CWS – CONDENSER WATER SUPPLY PIPING
- CWR – CONDENSER WATER RETURN PIPING
- EG – EG – EXISTING GAS PIPING
- BALL VALVE
- MULTIPURPOSE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- 2-WAY CONTROL VALVE
- SQUARE HEAD COCK
- AUTOMATIC FLOW CONTROL VALVE
- VALVE IN RISE OR DROP
- UNION
- PRESSURE TEMPERATURE RELIEF VALVE WITH FULL SIZE DISCHARGE PIPING TO WITHIN 6" OF FLOOR DRAIN
- STRAINER WITH BALL VALVE BLOWDOWN, NIPPLE AND CAP
- RECTANGULAR DUCTWORK
- SUPPLY AIR DUCTWORK TURNED DOWN
- SUPPLY AIR DUCTWORK TURNED UP
- RETURN AIR/EXHAUST AIR TURNED DOWN
- RETURN AIR/EXHAUST AIR TURNED UP
- CEILING RETURN AIR/ EXHAUST AIR REGISTER
- CEILING SUPPLY AIR DIFFUSER
- TH HP-2 – HEATING AND COOLING TEMP & RH SENSOR WITH # INDICATING UNIT
- TS C – COOLING THERMOSTAT
- DISCONNECT SWITCH
- (1) – KEYED NOTE SYMBOL
- TS – TEMPERATURE SENSOR
- CO2 – CARBON DIOXIDE SENSOR
- FAR – FIRE ALARM RELAY
- RH – RELATIVE HUMIDITY SENSOR
- F/D – EXISTING FLOOR MOUNTED FIRE DAMPER
- F/D – EXISTING WALL MOUNTED FIRE DAMPER
- SA – SUPPLY AIR
- RA – RETURN AIR
- EX.A. – EXHAUST AIR
- EXFD – EXISTING FLOOR DRAIN
- EXFCO – EXISTING FLOOR CLEANOUT
- OA – OUTSIDE AIR
- NO – NORMALLY OPEN
- NC – NORMALLY CLOSED
- MD – MANUAL DAMPER
- MOD – MOTOR OPERATED DAMPER
- AFF – ABOVE FINISHED FLOOR
- AFG – ABOVE FINISHED GRADE
- FIN. FL. – FINISHED FLOOR
- CONC. – CONCRETE
- CONT. – CONTINUATION
- CONTR. – CONTRACTOR
- TERMINATION POINT OF DEMOLITION
- POINT OF NEW CONNECTION TO EXISTING
- 1 HOUR WALL DESIGNATION

GENERAL NOTES:

1. HVAC CONTRACTOR SHALL FIELD VERIFY ALL RELEVANT DIMENSIONS, CLEARANCES, LOCATIONS AND ELEVATIONS WITH NEW AND EXISTING CONDITIONS PRIOR TO ORDERING, FABRICATION, AND INSTALLATION OF HIS WORK. DISCREPANCIES OR INTERFERENCE'S SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER AS SOON AS POSSIBLE. THE DRAWINGS DIAGRAMMATICALLY INDICATE THE GENERAL LOCATION OF DUCTS, PIPING AND EQUIPMENT AND DO NOT SHOW ALL OFFSETS, FITTINGS, SUPPORTS,BOLTS, CONNECTIONS, ETC. REQUIRED FOR A COMPLETE SYSTEM. WHILE THE DRAWINGS ARE TO BE FOLLOWED AS CLOSELY AS POSSIBLE, IF IT IS FOUND NECESSARY TO CHANGE THE LOCATION OF ANY WORK TO ACCOMMODATE THE CONDITIONS AT THE BUILDING, INCLUDING EXISTING UTILITIES TO REMAIN (PIPING, ELECTRICAL CONDUIT, ETC.), SUCH CHANGES SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER, AND AS DIRECTED BY THE ENGINEER. WHILE SOME OFFSETS MAY BE SHOWN ON DRAWING, THE DRAWINGS DO NOT SHOW ALL OFFSETS, SUPPORTS, ETC.
2. ALL SUPPLY AND RETURN CONNECTIONS TO AHU SHALL BE MADE WITH A FLEXIBLE DUCT CONNECTION.
3. ALL DUCT JOINTS SHALL BE SEALED AS SPECIFIED.
4. IN AREAS WITH GYPBOARD CEILINGS, HVAC CONTRACTOR SHALL INSTALL EQUIPMENT, DUCTWORK AND PIPE HANGERS PRIOR TO GYPBOARD INSTALLATION.
5. HVAC CONTRACTOR/ CONTROLS CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR FOR PROVISIONS OF POWER TO DDC CONTROL SYSTEM CONTROL PANELS, CONTROLLERS, ETC.. NOT SHOWN ON M OR E DRAWINGS. ELECTRICAL CONTRACTOR WILL PROVIDE POWER TO GENERAL POINTS, JUNCTION BOXES, ETC., AND POWER WIRING FROM THOSE POINTS TO EQUIPMENT SHALL BE BY THE HVAC CONTRACTOR/CONTROL CONTRACTOR.
6. ALL PIPING PENETRATIONS THROUGH RATED WALLS SHALL BE FIRE STOPPED USING PIPE PENETRATIONS DETAILS AS SPECIFIED. ALL DUCT PENETRATIONS THRU RATED AND NONRATED WALLS SHALL BE PER DETAILS SHOWN ON SHEET M-001.
7. MECHANICAL EQUIPMENT AND PIPING TO BE REUSED SHALL BE STORED AND PROTECTED DURING CONSTRUCTION. ANY DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED.
8. ALL THERMOSTATS, SENSORS AND SWITCHES FOR MECHANICAL SYSTEMS AND HVAC CONTROL PANEL SHALL BE MOUNTED 44" AFF.
9. COORDINATE MECHANICAL DUCTWORK AND PIPING TO AVOID ALL ELECTRICAL PANELS. COORDINATE LOCATIONS WITH ELECTRICAL CONTRACTOR.
10. INSTALL ALL MANUAL DAMPERS AND MOTORIZES DAMPERS TO BE EASILY ACCESSIBLE.
11. SEE SCHEDULES FOR INDIVIDUAL PIPE SIZES TO EQUIPMENT NOT SHOWN ON DRAWINGS.
12. WHERE INDICATED FOR DUCTWORK, GRILLES, REGISTERS AND DIFFUSERS ARE TO BE REUSED, CONTRACTOR SHALL PROTECT DURING CONSTRUCTION AND REPLACE ANY THAT ARE DAMAGED OR BENT. FULLY CLEAN BEFORE REINSTALLING/REUSING. SEE DUCT CLEANING NOTES THIS SHEET.
13. TEST AND BALANCE WORK SHALL BE AS SPECIFIED AND SHALL INCLUDE:
    A. CHECK AND BALANCE WATER FLOWS TO WSHP-17, PUMP P-1, HEAT EXCHANGER, AND COOLING TOWER.
    B. CHECK AND BALANCE AIR FLOWS FOR NEW WSHP-17.
    C. CHECK AND BALANCE EACH SUPPLY AND RETURN GRILLE, REGISTER OR DIFFUSER FOR WSHP-17.
    D. CHECK AND BALANCE ALL PORTIONS OF THE EQUIPMENT AND AIR DISTRIBUTION FOR NEW OR RENOVATED WORK.
18. HEATING AND AIR CONDITIONING CONTRACTOR SHALL PROVIDE FLUSHING AND CLEANING OF NEW PIPING AND NEW EQUIPMENT AND JUST FLUSHING OF EXISTING PIPING SYSTEMS AND EXISTING EQUIPMENT. EXISTING PIPING AND EQUIPMENT SHALL NOT BE FLUSHED WITH CHEMICAL CHEMICALS. COORDINATE CLEANING CHEMICALS WITH THE PENDER COUNTY'S CHEMICAL TREATMENT CONTRACTOR. SYSTEM TREATMENT AND TREATMENT CHEMICALS SHALL BE BY THE PENDER COUNTY'S CHEMICAL TREATMENT CONTRACTOR (SKY ENTERPRISES – KEN CATLET 919-285-9309).

SCHEDULE OF DRAWINGS

REVISION

DATE	DESCRIPTION

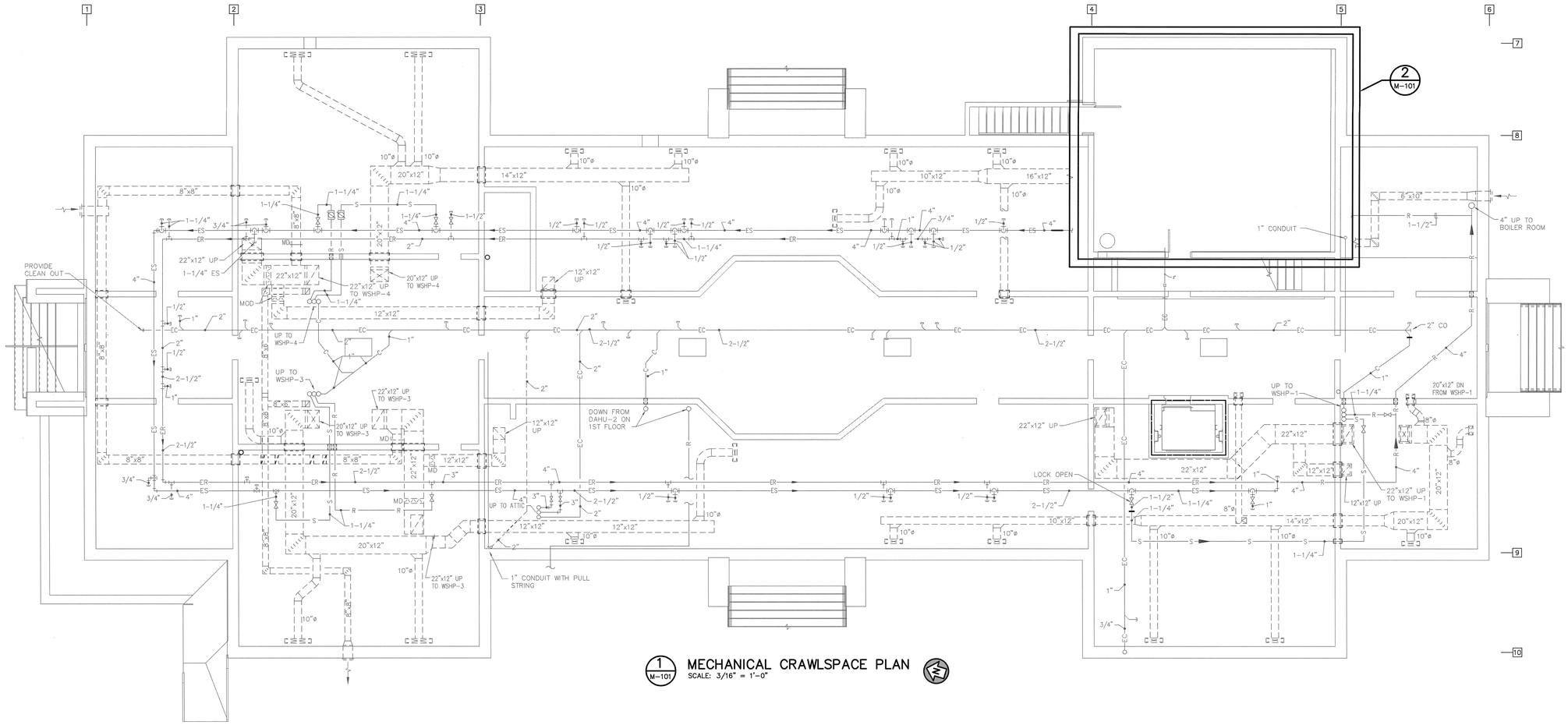
ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE
100 S WRIGHT ST, BURGAW, NC 28425

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PH: (910)452-4210 FAX: (910)452-4211
E-MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C-0707

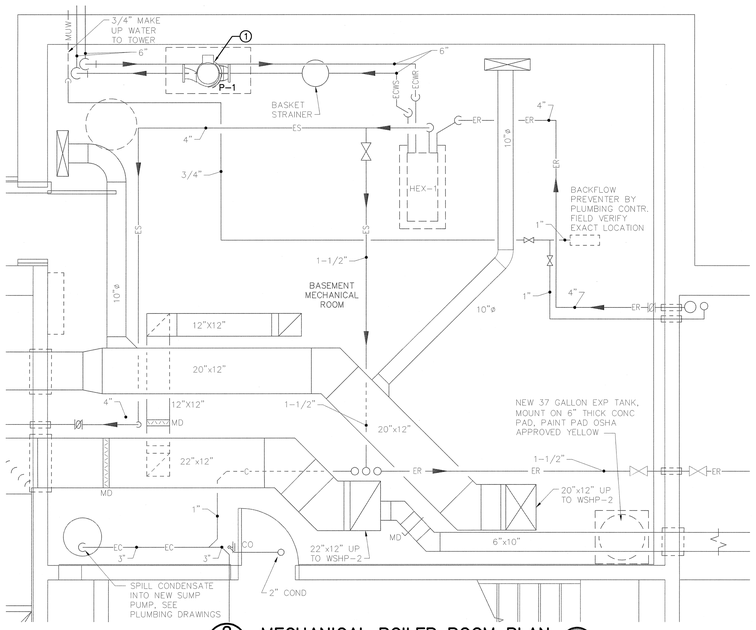
NORTH CAROLINA PROFESSIONAL SEAL 17655 ENGINEER KENNETH LYNCH

MECHANICAL LEGEND, NOTES, AND SCHEDULES

DESIGNED BY KL
DRAWN BY HLK
CHECKED BY KL
JOB NUMBER 22038
SHEET M-001
OF 5
DATE SEPTEMBER 26, 2022



1 M-101 MECHANICAL CRAWLSPACE PLAN
SCALE: 3/16" = 1'-0"



2 M-101 MECHANICAL BOILER ROOM PLAN
SCALE: 3/8" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. RE-TAB EXISTING COOLING TOWER PUMP P-1, SEE SCHEDULE SHEET M-001.

GRAPHIC SCALE:

2' 0 2' 4' 6'
SCALE: 3/8"=1'-0"

4' 2' 0 4' 8' 12'
SCALE: 3/16"=1'-0"

REVISION	
DATE	DESCRIPTION

ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE
100 S WRIGHT ST, BURGAW, NC 28425

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
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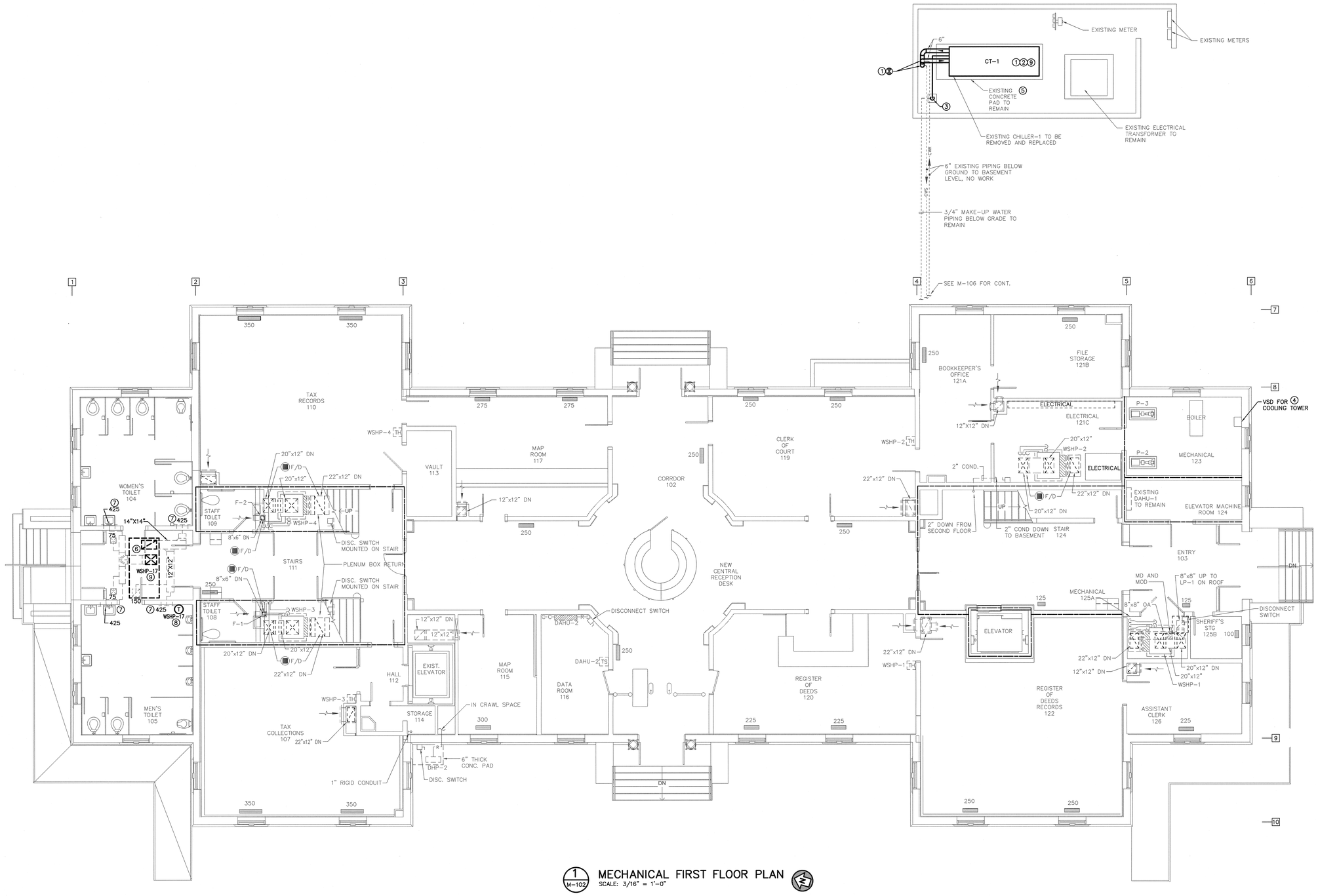
NC LICENSE #C-1073

NORTH CAROLINA PROFESSIONAL SEAL 17655 ENGINEER KENNETH H. LYNCH

MECHANICAL CRAWLSPACE PLAN

DESIGNED BY	KL
DRAWN BY	HLK
CHECKED BY	KL
JOB NUMBER	22038
SHEET	M-101
OF	5
DATE	SEPTEMBER 26, 2022



1 M-102 MECHANICAL FIRST FLOOR PLAN

SCALE: 3/16" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE EXISTING COOLING TOWER CT-1. REPLACE EXISTING PIPING TO GRADE AND CONNECT NEW CONDENSER WATER PIPING TO EXISTING TO NEW COOLING TOWER. SEE PIPING SCHEMATIC C/M-501. PIPING SHALL BE INSULATED AS SPECIFIED, PROVIDED WITH HEAT TRACE PER DETAIL A/M-501, AND COVERED WITH ALUMINUM JACKET PER DETAIL B/M-501.
2. REMOVE 3/4" MAKE UP WATER PIPING AS NECESSARY FOR TOWER DEMOLITION AND RECONNECT TO NEW TOWER. SEE PIPING SCHEMATIC C/M-501. PIPING SHALL BE INSULATED AS SPECIFIED, PROVIDED WITH HEAT TRACE PER DETAIL A/M-501, AND COVERED WITH ALUMINUM JACKET PER DETAIL B/M-501
3. SPILL CT-1 DRAIN AND OVERFLOW INTO EXISTING AREA DRAIN.
4. EXISTING VFD FOR COOLING TOWER TO REMAIN AND BE REUSED. FOR NEW TOWERS FAN.
5. EXISTING CONCRETE PAD TO REMAIN AND BE REUSED. PROTECT DURING DEMOLITION OF COOLING TOWER.
6. MOUNT WSHP ON ADAPTER CURB IF NECESSARY ON EXISTING ROOF CURB SO NEW DUCTWORK OPENINGS MATCH EXISTING DUCTWORK OPENINGS.
7. TAB SUPPLY AND EXHAUST AIR GRILLES/REGISTERS TO CFM INDICATED.
8. PROVIDE BLANK PLATE COVER OVER EXISTING THERMOSTAT LOCATION.
9. EXISTING CONTROLS ARE BRADY TRANE BACnet MS/TP DDC. NEW CT-1 AND WSHP-17 SHALL BE RECONNECTED TO EXISTING CONTROLS. EXISTING CONTROL WIRING, DEVICES, CONTROLLERS ARE TO BE REUSED AND EXTENDED AS NECESSARY TO NEW.
   A. EXISTING SEQUENCES OF OPERATION SHALL REMAIN AS EXISTING.
   B. EXISTING VIBRATION SWITCH SHALL BE INSULLATED ON NEW COOLING TOWER AND SHALL BE RECONNECTED TO THE DDC.
   C. FOR WSHP-17, EXISTING BACnet THERMOSTAT SHALL BE CONNECTED TO AND INTERFACED WITH NEW UNIT'S INTEGRAL FACTORY CONTROLLER FOR BOTH WSHP-17 AND ITS ERV.

GRAPHIC SCALE

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

REVISION	
DATE	DESCRIPTION

ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE

100 S WRIGHT ST, BURGAW, NC 28425

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
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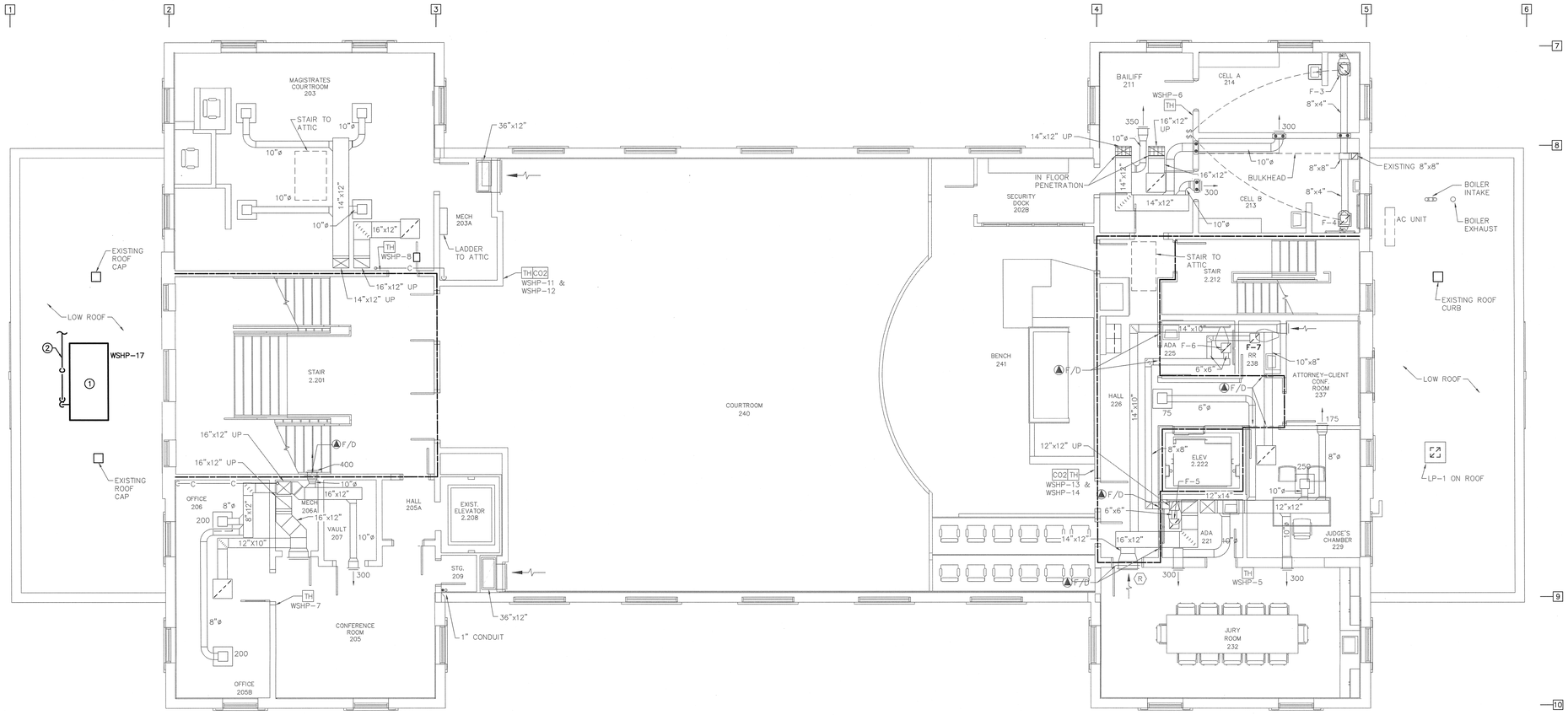
NORTH CAROLINA PROFESSIONAL SEAL 17655 ENGINEER KENNETH LYNCH

MECHANICAL FIRST FLOOR PLAN

DESIGNED BY	KL
DRAWN BY	HLK
CHECKED BY	KL
JOB NUMBER	22038
SHEET	M-102
OF	5
DATE	SEPTEMBER 26, 2022



1 M-103 MECHANICAL SECOND FLOOR PLAN

SCALE: 3/16" = 1'-0"

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE AND REPLACE WSHP-17 WITH NEW WSHP ON ROOF. MOUNT ON NEW ADAPTER CURB IF NECESSARY ON EXISTING ROOF CURB. RECONNECT TO EXISTING SUPPLY AND RETURN PIPING AS NECESSARY. WHERE NOT EXISTING, PROVIDE ISOLATION VALVES, UNIONS, P/T PORTS, AND AUTOMATIC FLOW CONTROL VALVE FOR UNITS SCHEDULED GPM. CONNECTION MAY BE MADE WITH HOSE KITS.
2. SPILL CONDENSATE ON EXISTING ROOF, MINIMUM 6 FEET AWAY FROM UNIT.

GRAPHIC SCALE

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

REVISION	
DATE	DESCRIPTION

ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE

100 S WRIGHT ST, BURGAW, NC 28425

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NC LICENSE #C-1073 PEC-1073

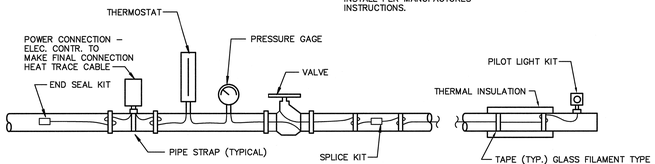
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 17655 09/26/2022 KENNETH LANE

MECHANICAL SECOND FLOOR PLAN

DESIGNED BY	KL
DRAWN BY	HLK
CHECKED BY	KL
JOB NUMBER	22038
SHEET	M-103
OF	5
DATE	SEPTEMBER 26, 2022

HEAT TRACE CABLE SIZING CHART	
PIPE SIZE	MIN. WATTS PER FOOT
3/4" – 4"	5
5" – 10"	8

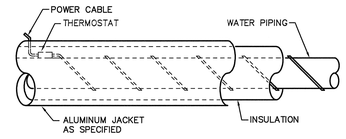
HEAT TRACE CABLE: 120V SELF-REGULATING TYPE WITH POWER CONNECTION KIT AND THERMOSTAT SET AT 40°F (# INDICATED WATTS/FOOT FROM CABLE SIZING CHART). HVAC CONTR. TO PROVIDE AND INSTALL HEAT TRACE CABLE AND ALL ACCESSORIES. INSTALL PER MANUFACTURES INSTRUCTIONS.



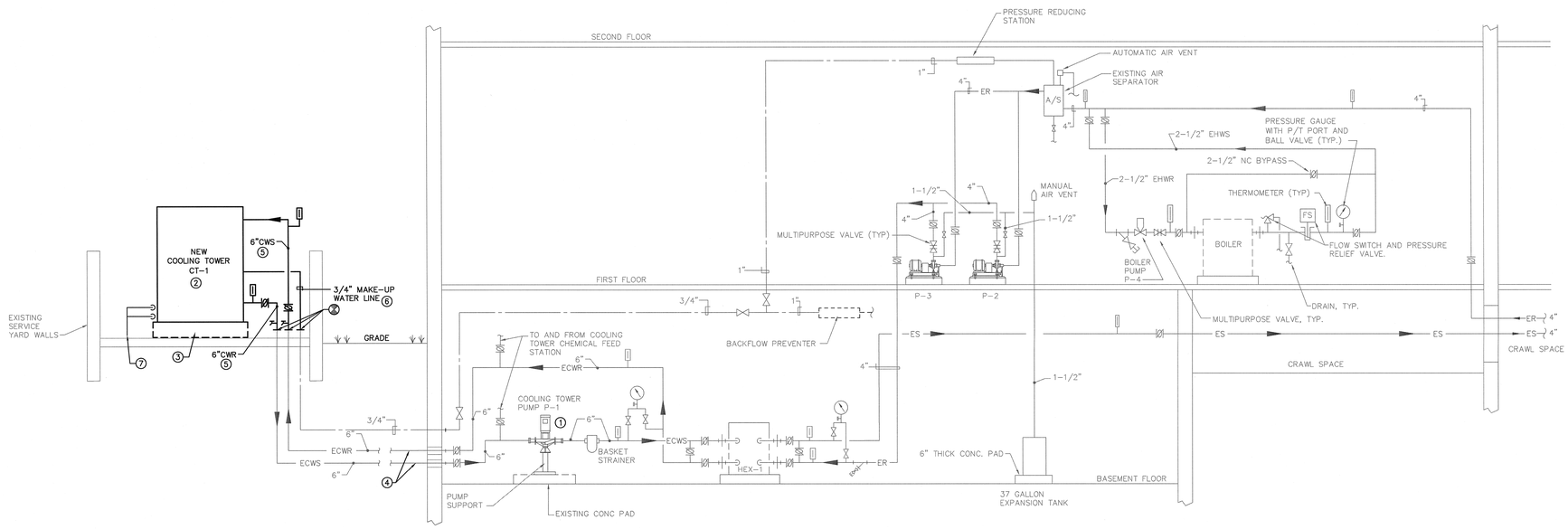
NOTES:

1. PROVIDE A TEE KIT WHEN CONNECTING THREE LENGTHS OF HEAT TRACE CABLE TOGETHER.
2. INSTALL HEAT TRACE CABLE ON ALL DEVICES PER UNIT MFGR. RECOMENDATIONS. THIS INCLUDES BUT IS NOT LIMITED TO PUMP, TEES, ELBOWS, AND SUPPORTS EXPOSED ON EXTERIOR.
3. INSTALL HEAT TRACE CABLE ON PIPING.

A / M-501 **HEAT TRACE DETAIL**
NO SCALE



B / M-501 **EXTERIOR WATER PIPING**
NO SCALE



C / M-501 **PIPING SCHEMATIC**
NO SCALE

KEYED NOTES: (THIS SHEET ONLY)

1. RE-TAB EXISTING P-1 FOR NEW COOLING TOWER.
2. REMOVE AND REPLACE EXISTING COOLING TOWER WITH NEW COOLING TOWER.
3. EXISTING COOLING TOWER CONCRETE PAD TO REMAIN AND BE REUSED.
4. EXISTING 6" ECWR AND ECWS TO ABOVE GRADE TO BE REUSED.
5. PROVIDE NEW 6" CWS AND 6" CWR TO NEW CT-1. INSULATE PER DETAIL B/M-501 AND HEAT TRACE PER A/M-501.
6. RECONNECT EXISTING 3/4" MAKE-UP WATER LINE TO NEW CT-1. INSULATE PER DETAIL B/M-501 AND HEAT TRACE PER A/M-501.
7. SPILL OVERFLOW AND DRAIN INTO EXISTING AREA DRAIN.

REVISION

DATE	DESCRIPTION

ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE
100 S WRIGHT ST, BURGAW, NC 28425

CHEATHAM AND ASSOCIATES, P.A.
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2 CYPRESS POINTE
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NC LICENSE #C-1075

NORTH CAROLINA PROFESSIONAL SEAL 17655 ENGINEER KENNETH L NOE 8/25/2022

MECHANICAL SCHEMATICS AND DETAILS

DESIGNED BY	KL
DRAWN BY	HLK
CHECKED BY	KL
JOB NUMBER	22038
SHEET	M-501
OF	5
DATE	SEPTEMBER 26, 2022

ELECTRICAL NOTES

1. ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION.
2. PERMITS FOR ELECTRICAL WORK SHALL BE OBTAINED BY AND PAID BY THE ELECTRICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL PAY FOR ANY ADDITIONAL FEES FOR INSPECTIONS, TESTS, AND OTHER SERVICES AS REQUIRED FOR THE COMPLETION OF THE WORK.
3. THE ELECTRICAL CONTRACTOR AND ANY OF HIS SUBCONTRACTORS SHALL VISIT THE PROJECT SITE TO WITNESS EXISTING CONDITIONS AND BECOME FAMILIAR WITH THE SCOPE OF THE WORK REQUIRED PRIOR TO SUBMITTING PROPOSALS. WORK REQUIRED BY EXISTING JOB CONDITIONS NOT INDICATED ON DRAWINGS SHALL BE INCLUDED IN THE PROPOSALS.
4. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO RESULT IN THE PRODUCTION OF A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIAL, LABOR, EQUIPMENT, AND OTHER SERVICES AS NECESSARY TO COMPLETE THE WORK.
5. DISCREPANCIES IN THE DRAWINGS AND SPECIFICATIONS THAT WILL AFFECT THE WORK SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER, AND/OR OWNER PRIOR TO SUBMITTING PROPOSALS.
6. UNLESS NOTED OTHERWISE, ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND INCLUDE A 3RD PARTY LABEL (I.E.: UL, CSA, ETL, ETC.) LISTING APPROVAL FOR ITS INSTALLED APPLICATION.
7. REVIEW PLANS OF OTHER TRADES FOR COORDINATION OF WORK AND FOR RELATED AND ADJOINING WORK.
8. REVIEW COMPLETE PLAN SET FOR CONSTRUCTION TYPE, FINISHES, HEADROOM, ROOF FINISHES, CEILINGS, ETC. REVIEW COMPLETE PLAN SET FOR PROJECT PHASING AND STAGING. REVIEW COMPLETE PLAN SET FOR WORK COVERED BY ALTERNATE BID ITEMS.
9. PENETRATIONS OF FIRE-RATED WALLS, FLOORS, CEILINGS, AND PARTITIONS SHALL BE FIRE STOPPED IN ACCORDANCE WITH REQUIREMENTS OF THE STATE BUILDING CODE. COORDINATE WORK TO INSURE THAT FIRE STOPPING IS COMPLETED.
10. PENETRATIONS OF EXTERIOR BUILDING WALLS, FLOORS, OR ROOFS SHALL BE SEALED WATERTIGHT. INTERIORS OF RACEWAY PENETRATIONS THROUGH EXTERIOR WALLS SHALL BE SEALED WITH NON-HARDENING ELECTRICAL PUTTY.
11. CUTTING AND PATCHING TO INSTALL DEVICES AND EQUIPMENT SHALL BE PERFORMED WITH FINISHES RESTORED TO THEIR ORIGINAL CONDITION. SUCH WORK SHALL BE COMPLETED TO A DEGREE THAT IS ACCEPTABLE TO THE ENGINEER, AND/OR OWNER.
12. COORDINATE PRECISE LOCATION OF HVAC EQUIPMENT WITH THE MECHANICAL CONTRACTOR.
13. FOR HVAC EQUIPMENT, VERIFY CIRCUIT BREAKER RATINGS, FUSE RATINGS, AND WIRE SIZES. IF RATINGS DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE ARCHITECT, ENGINEER, AND OWNER FOR DIRECTION. PROVIDE OVERCURRENT PROTECTION IN ACCORDANCE WITH EQUIPMENT MANUFACTURER NAMEPLATE DATA. IF THE EQUIPMENT LISTING LABEL REQUIRES FUSED PROTECTION, ENSURE THAT FUSES IN A FUSED DISCONNECT SWITCH AT THE EQUIPMENT ARE SIZED AS INDICATED ON THE EQUIPMENT LABEL.
14. VERIFY PROPER SIZING OF OVERLOAD DEVICES IN STARTERS BASED ON EQUIPMENT NAMEPLATE DATA.
15. IF HORSEPOWER OR LOAD RATINGS OF EQUIPMENT DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE ARCHITECT, ENGINEER, AND OWNER FOR DIRECTION.
16. PROVIDE NATIONAL ELECTRICAL CODE REQUIRED CLEARANCES FOR ALL ELECTRICAL EQUIPMENT. COORDINATE RESOLUTION OF CONFLICTS WITH OTHER TRADES.
17. NO MOUNTING HARDWARE SHALL BE ATTACHED TO ROOF DECKS. ATTACHMENTS SHALL BE MADE TO THE ROOF SUPPORTING STRUCTURE.
18. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; PROTECT AND MAINTAIN IN OPERATION EXISTING LIFE SAFETY SYSTEMS, PUBLIC ADDRESS SYSTEMS, ELECTRICAL SYSTEMS, ETC. IF SHUTDOWNS ARE REQUIRED, NOTIFY THE ARCHITECT, ENGINEER, AND OWNER FOR COORDINATION WELL IN ADVANCE OF ANY SYSTEM SHUTDOWN. WHERE AN OUTAGE OF EXTENDED DURATION IS NOT ACCEPTABLE TO THE OWNER, PROVIDE TEMPORARY CONNECTIONS AS REQUIRED TO MAINTAIN SERVICE.
19. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; WORK MAY BE REQUIRED TO BE PERFORMED WHILE REMAINING OCCUPIED BY OWNER STAFF. WORK SHALL BE COORDINATED WITH THE OWNER TO MINIMIZE DISRUPTION TO THE OWNER.
20. WHERE WORKING IN EXISTING BUILDINGS, FACILITIES, OR STRUCTURES; EXISTING ABANDONED CIRCUITS USED TO CONNECT NEW LOADS IN THE SAME AREA SHALL BE CLEARLY IDENTIFIED ON AS-BUILT MARK-UP DRAWINGS WITH REGARD TO PANEL-CIRCUIT AND CIRCUITRY ROUTING CONFIGURATION.
21. SHARED NEUTRAL CONDUCTORS SHALL NOT BE USED UNLESS SPECIFICALLY INDICATED SO ON HOMERUN CIRCUITRY DESIGNATIONS.
22. PANEL BREAKER CONFIGURATIONS SHALL BE INSTALLED AS INDICATED ON THE PANEL SCHEDULES OR AS NOTED. BREAKER POSITION REVISIONS WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING BY THE ENGINEER.
23. LOAD CIRCUITS SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS. CIRCUITRY REVISIONS WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING BY THE ENGINEER.

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLER UNIT
AIC	AMPS INTERRUPTING CAPABILITY
BKR	BREAKER
C	CONDUIT
C/B	CIRCUIT BREAKER
CLG	CEILING
CKT	CIRCUIT
CU	COPPER
DIA	DIAMETER
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
ERV	ENERGY RECOVERY VENTILATION
G	EQUIPMENT GROUND
HP	HEAT PUMP
HP	HORSEPOWER
K	KILO (THOUSAND)
LTG	LIGHTING
LTS	LIGHTS
MDP	MAIN DISTRIBUTION PANEL
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
NTS	NOT TO SCALE
P	PHASE OR POLE
PH	PHASE
PNL	PANEL
REC	RECEPTACLE
SYS	SYSTEM
S/N	SOLID NEUTRAL
TYP	TYPICAL
UL	UNDERWRITERS LABORATORY
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VA	VOLT-AMPS
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS
W	WIRE
W/	WITH
WP	WEATHERPROOF
WSHP	WATER SOURCE HEAT PUMP
XFMR	TRANSFORMER

M (EXISTING PANEL)

ROOM: ELECTRICAL ROOM
MOUNTING: SURFACE
FED FROM: MDP
NOTE:

VOLTS: 208Y/120V 3P 4W
BUS AMPS: 225
NEUTRAL: 100%

AIC: 18,000
MAIN BKR: MLO
LUGS: STANDARD

CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	LOAD KVA B	LOAD KVA C	CKT #	CKT BKR	CIRCUIT DESCRIPTION	LOAD KVA A	LOAD KVA B	LOAD KVA C
1	30/3	SPD-M	0			2	20/1	SPARE	0		
3	|			0		4	20/1	SPARE		0	
5	|				0	6	20/1	SPARE			0
7	60/3	PUMP P-1	3.05			8	40/3	COOLING TOWER HEATER	4.8		
9	|			3.05		10	|			4.8	
11	|				3.05	12	|				4.8
13	60/3	COOLING TOWER CT-1	5.82			14	40/1	HEAT TAPE	0.2		
15	|			5.82		16	20/1	PANEL OHTLAP		0.2	
17	|				5.82	18	20/1	ELEVATOR LTS & ALARM			0.4
19	25/3	(*) ERU-17	2.12			20	20/1	REC CRAWL SPACE	0.2		
21	|			2.12		22	20/1	SPARE		0	
23	|				2.12	24	20/1	BOILER			0.4
25	20/1	PUMP P5	0.7			26	20/1	RM #122 DEDICATED CIRCUIT	0.6		
27	20/1	REC ELEVATOR		0.2		28	20/1	REC CRAWL SPACE		0.2	
29	20/1	TELEPHONE SYSTEM			0.4	30	20/1	REC CRAWL SPACE			0.2
31	20/1	REC BASEMENT	0.4			32	15/2	AIR UNIT SOUTH SIDE	0.5		
33	20/1	LTS BASEMENT		0.6		34	|			0.5	
35	20/1	CLERKS OFFICE			0.6	36	20/1	REC SERVER			0.4
37	20/1	ELEVATOR EXHAUST FAN	0.4			38	20/1	REC EQUIPMENT IN TRAFFIC COURT	0.6		
39	20/1	COOLING TOWER PANEL		0.4		40	20/1	SPARE		0	
41	20/1	COOLING TOWER PANEL			0.4	42	20/1	SPARE			0
43	20/1	REC-BATTERY CHARGER	1			44	20/1	SPARE	0		
45	20/1	REC-BLOCK HEATER		1.5		46	20/3	EUH-1		1.1	
47	20/1	REC-BATTERY CHARGER			1	48	|				1.1
49	20/1	REC-BLOCK HEATER	1.5			50	|		1.1		
51	20/2	WH-1		1.25		52	20/2	ESPCP		1.2	
53	|				1.25	54	|				1.2
								TOTAL CONNECTED KVA BY PHASE	23	22.9	23.1
								TOTAL CONNECTED AMPS BY PHASE	192	191	193

	CONN KVA	CALC KVA	
LIGHTING	1	1.25	(125%)
LARGEST MOTOR	17.5	4.36	(25%)
MOTORS	37.5	37.5	(100%)

	CONN KVA	CALC KVA	
RECEPTACLES	10.2	10.1	(50%>10)
CONTINUOUS	2.5	3.13	(125%)
NONCONTINUOUS	0.2	0.2	(100%)
HEATING	17.7	17.7	(100%)
TOTAL LOAD		74.2	
BALANCED 3-PHASE LOAD		206 A	

(*) PROVIDE NEW BREAKER INDICATED

MISC. ELECTRICAL SYMBOL LEGEND

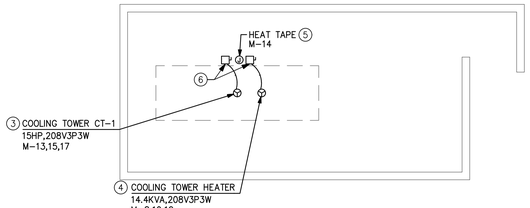
- EQUIPMENT CONNECTION
- SAFETY SWITCH DISCONNECT, HEAVY-DUTY, NON-FUSED, NEMA 1 INSIDE, NEMA 3R OUTSIDE (UNO), AMPERAGE AS INDICATED OR BASED ON SUPPLY CIRCUIT BREAKER RATING.
- SAFETY SWITCH DISCONNECT, HEAVY-DUTY, FUSED AT NAMEPLATE RATING OF EQUIPMENT SERVED, NEMA 1 INSIDE, NEMA 3R OUTSIDE (UNO), AMPERAGE AS INDICATED OR BASED ON SUPPLY CIRCUIT BREAKER RATING.
- PANELBOARD, SEE PANEL SCHEDULE

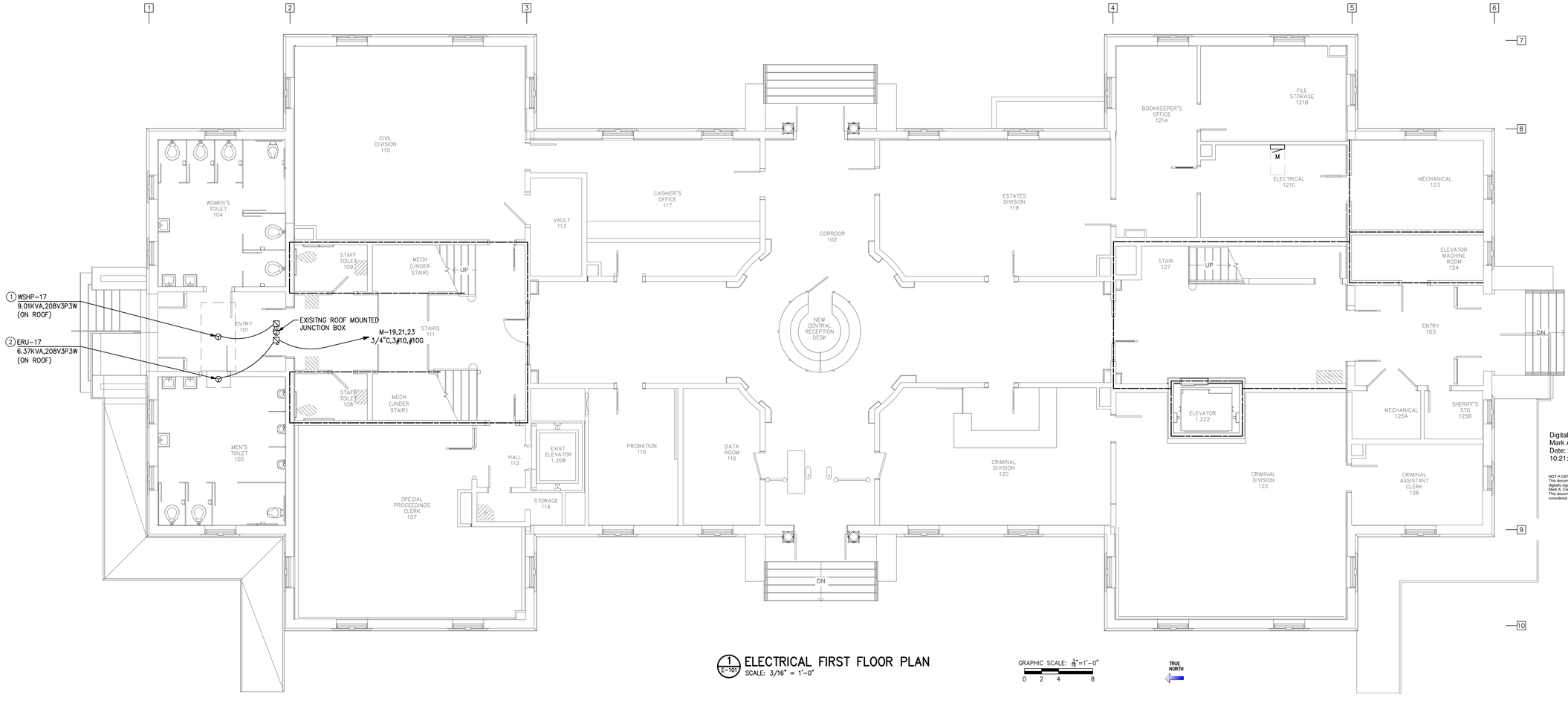
HOMERUN DESIGNATION, #12 CONDUCTORS UNLESS NOTED OTHERWISE.
EQUIPMENT GROUND CONDUCTOR
PHASE CONDUCTOR
NEUTRAL CONDUCTOR

A — LETTER INDICATES ELEVATION OR DETAIL; NUMBER INDICATES PLAN OR SECTION
E-502 — SHEET NUMBER WHERE PLAN, SECTION, ELEVATION OR DETAIL IS DRAWN

KEYED NOTES:

1. DISCONNECT EXISTING MECHANICAL UNIT FOR UNIT REPLACEMENT. FIELD LOCATE EXISTING SOURCE. REPLACE BREAKER AS NEEDED TO COMPLY WITH EQUIPMENT NAMEPLATE REQUIREMENTS. COORDINATE FUSE SIZES IN EXISTING FUSIBLE DISCONNECT WITH EQUIPMENT NAMEPLATE. CONNECT NEW UNIT TO EXISTING DISCONNECT WITH NEW 3/4"C, 3#10,#12G.
2. DISCONNECT EXISTING MECHANICAL UNIT. REMOVE EXISTING CIRCUITRY BACK TO EXISTING ROOF MOUNTED JUNCTION BOX. RE-USE EXISTING FUSIBLE DISCONNECT AND INSTALL NEW CIRCUITRY AS INDICATED TO EXISTING PANEL M.
3. DISCONNECT EXISTING COOLING TOWER TO ACCOMMODATE REPLACEMENT. REMOVE EXISTING LOAD CIRCUITRY BACK TO EXISTING NON-FUSIBLE DISCONNECT. CONNECT NEW UNIT TO EXISTING DISCONNECT WITH 1-1/4"C, 3#4,#10G. EXISTING UNIT SOURCE IS INDICATED AT EQUIPMENT CALLOUT.
4. DISCONNECT EXISTING COOLING TOWER HEATER TO ACCOMMODATE REPLACEMENT. REMOVE EXISTING LOAD CIRCUITRY BACK TO EXISTING NON-FUSIBLE DISCONNECT. CONNECT NEW UNIT TO EXISTING DISCONNECT WITH 3/4"C, 3#8,#12G. EXISTING UNIT SOURCE IS INDICATED AT EQUIPMENT CALLOUT.
5. DISCONNECT EXISTING COOLING TOWER HEAT TAPE TO ACCOMMODATE REPLACEMENT. REMOVE EXISTING LOAD CIRCUITRY BACK TO EXISTING JUNCTION BOX INDICATED. RE-CONNECT HEAT TAPE TO EXISTING JUNCTION BOX WITH 3/4"C, 1#12,#12N,#12G. EXISTING SOURCE IS INDICATED AT EQUIPMENT CALLOUT. PROVIDE NEW UNI-STRUT STRUCTURE TO SUPPORT EXISTING JUNCTION BOX TO EXISTING COOLING TOWER EQUIPMENT PAD.
6. PROVIDE NEW UNI-STRUT STRUCTURE TO SUPPORT EXISTING DISCONNECT TO EXISTING COOLING TOWER EQUIPMENT PAD.





1 E-101 ELECTRICAL FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"

GRAPHIC SCALE: 3/16"=1'-0"
0 2 4 8

TRUE NORTH

Digitally signed by Mark A. Ciarrocca
Date: 2022.09.23 10:21:03-04'00'

NOT A CERTIFIED DOCUMENT
This document was originally digitally signed by MARK A. CIARROCCA, NC PE #17593.
This document shall not be considered a certified document.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 17593 MARK A. CIARROCCA

REVISION	
DATE	DESCRIPTION

ADDITIONAL HVAC
PENDER COUNTY COURTHOUSE
100 S WRIGHT ST, BURGAW, NC 28425

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PHONE: (910)452-4211 FAX: (910)452-4211
E-MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C-1073

ELECTRICAL NOTES, PLAN

DESIGNED BY	M. CIARROCCA
DRAWN BY	C. BEVERLY
CHECKED BY	M. CIARROCCA
JOB NUMBER	22038
SHEET	E-101
DATE	SEPTEMBER 26, 2022

COMMERCIAL ROOFING SOLUTIONS
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ROOFING
TRUSTED ◆ PROFESSIONAL ◆ RESPONSIVE

Hound Roofing: Repair & Fit-Up Pricing

Items	Pricing
Pipe Boots	$150 ea
Hand Wrap Pipes	$250 ea
Pitch Pan	$300 ea
1’ X 1’ Curb	$375 ea
2’ X 2’ Curb	$450 ea
3’ X 3’ Curb	$525 ea
4’ X 4’ Curb	$650 ea
4’ X 6’ Curb	$725 ea
Larger Curbs	$850 ea

- Prices include all labor, materials, taxes & insurance.
- Minimum charge is $450 for each visit, includes two professionals for 3 hours.
- **Contact us for special pricing**.
- All prices are subject to change based on onsite conditions.
- Contact Hound Roofing for individual job quotes.

HOUND ROOFING
910.799.6723
https://houndroofing.com/
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