Brunswick County
Operation Services Department
Stephanie Lewis, Director

Construction & Grounds
Building Maintenance
Housekeeping

PO Box 249
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Solid Waste & Recycling
Mosquito Control
Service Center

Brunswick County Operation Services is requesting proposals for HVAC installation for Building B - Annex at the Brunswick County Government Center.

I. General Information

Building B - Annex is a part of Building B which is located at 60 Government Center Drive NE and is a building totaling approximately 16,130 square feet.

II. Scope of Work

The intent of this scope of work is to replace the existing 14 variable air volume (VAV) boxes with 14 VAV boxes with electrical heat.

The scope of work for this building is as follows:

1) Replace existing 14 VAV boxes with 14 VAV boxes with electrical heat according to the technical specifications included as Exhibit A and the design plans included as Exhibit B.
2) If tile and grid in the area where the boxes are being replaced need to be removed and replaced, the removal and replacement will be performed by the Contractor.
3) The contractor is responsible for obtaining all permits. All permits are paid by county.
4) Contractor must have system balancing performed by a 3rd party independent certified balancing contractor. Documentation must be provided.
5) All material, labor and work will carry a one (1) year warranty from the date accepted by the county as substantial completion. Manufacturer's warranty for proposed equipment should be outlined in proposal.
6) Construction schedule indicating durations of work must accompany all bid proposals. Include electrical work in this schedule.
7) All trash and debris is the responsibility of the contractor. Job site must be neat and clean at the end of every shift.
8) Electrical sub-contractor must be listed on proposal.

9) Contractor must show proposed equipment certification for employees completing the installation.
10) Contractor must provide documentation of building pressure and humidity once system installation is complete.
11) Contractor must show proof of at least three (3) completed similar VAV projects and references for this work.
12) Work must begin within 15 days of notice to proceed.

Demolition: Disconnect electrical and control power wiring to 14 variable air volume boxes.
Disconnect duct work.
Safely remove the existing 14 non-heated VAV boxes.
Proper disposal of these VAV boxes are the responsibility of contractor.

New System Installation:

Equipment: 14 new VAV boxes with electrical heat.
Reconnect the electrical and control wiring.
Provide and install necessary duct fitting to reconnect duct work.

Controls: Each VAV will include its own WIRED thermostat within that space.

Electrical: Provide and install new flexible conduit and power wiring to serve the new VAV boxes.
Provide and install new control wiring as required by the new fan powered boxes and connect to the existing control system.
All work must be performed by a licensed contractor.
All panels, devices must be properly labeled to match equipment served.
Existing electrical drawings are available for review prior to bid.
Approved isolation/disconnects are required at each air handler.

III. Minority Business Participation Requirements

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

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

After the proposals are received - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low Bidder, the Bidder shall then file within seventy-two (72) hours of the notification of being the apparent lowest Bidder, the following:

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

OR

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

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

The following documents are attached and made a condition of this quote:

1. Identification of Minority Business Participation
2. MBE Affidavit A (Listing of Good Faith Efforts) and Affidavit B (Intent to Perform Contract with Own Workforce).

IV. Insurance Requirements

The contractor must carry the minimum insurance requirements as described in Attachment "A". The contractor will provide the county with a copy of insurance documents.

V. Price and Type of Bid

Proposals are requested according to the above scope of work and should include all labor, tools, materials and equipment.

VI. Right to Reject

The county reserves the unqualified right to reject any or all proposals when such rejection is deemed to be in the best interest of the county.

VII. Cost to Prepare Proposals

Any cost incurred by a contractor in preparing or submitting a proposal is the sole responsibility of the contractor and will not be eligible for reimbursements by the county.

VIII. Right to Submitted Proposals and Supporting Documents

All written correspondence, proposals and supporting documents received by the county regarding the Request for Proposals will become property of the county.

IX. Proposal Deadline

All proposals must be received no later than **September 30, 2019** at **4:00 pm**. Each should be clearly marked "RFP – Building B - Annex HVAC Replacement". These proposals shall be emailed, hand delivered or mailed. These materials should be delivered to Heather Murray, Brunswick County Operation Services Department, PO Box 249, 179 March 9, 1764 Drive NE, Bolivia, NC 28422 or emailed to heather.murray@brunswickcountync.gov.

X. Inquiries

All inquiries concerning this Request for Proposals may be directed to Heather Murray, Brunswick County Operation Services at (910) 253-2503 or heather.murray@brunswickcountync.gov or James Carter, Brunswick County Operation Services at (910) 253-2529 or james.carter@brunswickcountync.gov.

TECHNICAL SPECIFICATIONS
FOR

VAV BOX REPLACEMENT
BUILDING B ANNEX

BRUNSWICK COUNTY OPERATION SERVICES
179 MARCH 9, 1764 DRIVE, NE
BOLIVIA, NC 28422

APRIL 2019

PROJECT DESIGNER

CHEATHAM AND ASSOCIATES, P.A.
3412 ENTERPRISE DRIVE
WILMINGTON, NC 28405
910.452.4210 | FAX 910.452.4211
WWW.CHEATHAMPA.COM
NC LICENSE NO. C-1073
PROJECT NO. 19015

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VAV BOX REPLACEMENT
BUILDING B - ANNEX
BRUNSWICK COUNTY OPERATION SERVICES
BOLIVIA, NORTH CAROLINA
CONSTRUCTION DOCUMENTS

TECHNICAL SPECIFICATIONS

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

230500 Heating and Air Conditioning
230900 Instrumentation & Control for HVAC

DIVISION 26 – ELECTRICAL

260000 Electrical, Basics
260500 Basic Materials & Methods
260519 Conductors & Cables
260526 Grounding & Bonding
260533 Raceways & Boxes
260553 Electrical Identification

Kenneth Lynch, PE, LEED AP
Mechanical

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Electrical

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www.cheathampa.com
CAPA Project No. 19015

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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 install all work in accordance with the requirements of the latest edition of the North Carolina State Building Code.

C. 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 some 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.

D. 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 Engineer until installed. All items subject to moisture damage shall be stored in dry spaces.

E. 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. The Heating and Air Conditioning Contractor shall not scale mechanical plans, but rather refer to architectural plans for dimensions.

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.

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. The drawings define the scope of work, but it is not intended that all items of demolition work be specifically indicated.

B. Protection of Materials and Work: 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 asbestos is encountered during demolition.

230504 SHOP DRAWINGS AND SUBMITTAL DATA

A. The Heating and Air Conditioning Contractor shall submit multiple copies of submittal data in written form for the use in approving materials and equipment. Data certified for the specified project and indicated manufacturer, type, or size, capacity, etc., shall be submitted for the following equipment items:

1. VAV Room Terminal Boxes
2. Diffusers, Grilles, and Registers
3. Controls with Complete Diagram
4. Insulation
5. Testing and Balancing

230505 VAV ROOM TERMINAL BOXES

A. The VAV room terminal boxes shall be UL listed pressure independent variable air volume type complete with electric DDC volume regulators, heavy gauge casing, control dampers, unit mounted disconnect switch, and electric heating coils. The boxes shall be Trane, Metal Aire, Enviro-Tec, Price, JCI/York, Krueger, or approved equal.

B. Insulation of terminal units shall be 1" thick, 1.5 lbs. density, R-4.1 fiberglass with foil face and no exposed or raw edges. The surface of the insulation shall be treated to prevent erosion and shall conform to UL Test 181 for erosion and mold growth. The insulation shall be UL approved and meet NFPA 90A requirements.

C. DDC controller and actuator for damper and wireless communicating space temperature sensor shall be by the room terminal box manufacturer for standalone operation. See Section 230900 Instrumentation and Control for HVAC for additional information and requirements.

D. The control dampers shall be specifically designed to provide linear control characteristics throughout its operating range. An external indication of the damper blade position shall be provided. Total leakage of casing and dampers shall not exceed 5% at 3" inlet static pressure. Damper assembly shall be complete with integral flow sensor regardless of control type. Flow sensor shall be a multi-point, averaging, ring or cross type to be furnished and mounted by terminal unit manufacturer. Bar or single point sensing type is not acceptable. Flow sensing device shall be capable of maintaining airflow to within +/- 5% of rated unit airflow setpoint and communicating terminal box inlet cfm to its controller and BAS system.

E. Electric heating coils shall be UL listed and factory mounted on the discharge of the unit's casing with capacities and stages as shown in the schedule. Heaters shall have SCR controls, safety cutouts, and airflow switch. Coil shall be externally insulated as specified for ductwork

F. Except where specified elsewhere, terminals shall have a maximum NC level of 30 in the space when using modeling assumptions for room and duct effect based on ARI 885-90. The NC level shall be based on a static pressure of one inch at the entrance of the box.

G. Terminal boxes shall be shipped with self-adhesive 3 mil polyethylene film over all openings. Film shall remain to protect the interior of the boxes until ductwork is connected to box openings.

230506 DIFFUSERS, GRILLES, AND REGISTERS

A. Diffusers, Grilles, and Registers shall be as manufactured by Carnes, Metal Aire, Titus, Krueger, Price or approved equal unless otherwise noted.

B. All diffusers, grilles, and registers shall have a maximum NC level of 25 in the space for the specified airflow, and shall have factory applied white baked enamel finish. Where indicated on drawings to be field painted, white factory finish shall be as necessary to receive field finish painting.

C. Ceiling Return Air Grille: Grille shall be 2'x2' lay-in return air grille with a 12" diameter flex connection, 36" long for sound attenuation. Grille shall be aluminum 1/2" x 1/2" egg crate, steel frame. Registers shall be full flow across the entire face of register and tapered up to neck size.

230507 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 coordinate with Electrical Contractor to 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 Division, Division 26, of these specifications.

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 Division, Division 26, 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 Division, Division 26, of these specifications.

230508 DUCTWORK

A. Ductwork shall be of galvanized steel with standard gauges and construction in accordance with the recommendations of SMACNA HVAC Duct Construction Standards, Metal and Flexible, Third Addition, 2005 for appropriate pressure class. Supply ductwork between rooftop units and room terminal boxes shall be 3" w.g. pressure class construction classification with gauges, construction, etc. as necessary. Airfoil turning vanes with 1-1/8" spacing and rail support system shall be installed in all 90º elbows. Ductwork shall be cross broken on all sides and shall be supported at both ends of each joint and at 10'-0" intervals maximum with galvanized angles supported by galvanized threaded rods of sizes and spacing in accordance with SMACNA. Ductwork to be exposed shall be constructed in a first class, neat, professional manner and exposed ductwork with excessive hammer marks shall be replaced. Round supply takeoffs from trunk ducts shall be made with factory 45º entry branch rectangular to round type fittings with dampers in takeoff fittings. Damper handles shall be on 2" stand-off brackets. Handles shall be spray painted red. Splitter dampers shall be provided where indicated with adjustment quadrant locking device and shall be constructed of two thicknesses of 24-gauge-galvanized steel. All dimensions on the drawings are free inside dimensions. All components of the air distribution system shall be mechanically fastened with at least three equally spaced sheet metal screws with screws not more than on 12" centers. All duct joints shall be sealed in accordance with SMACNA Seal Class A before insulation is applied. All sealants shall meet the provisions of UL181.

B. Flexible ductwork shall be factory fabricated complying with NFPA Standard No. 90A, UL 181, and shall be UL Class 1 R-6 insulated type with foil vapor barrier. The flexible duct shall be air tight for factory test when bent to full recommended radius and under not less than 10" water gauge internal pressure and shall be limited to 8'-0" maximum length. Flexible ducts shall be supported by galvanized steel straps in accordance with SMACNA at intervals not exceeding 4'-0" and at each change of direction. Flexible ducts shall have a minimum of one support.

230509 INSULATION

A. All new 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.

B. All new air conditioning supply and return air ducts concealed above a ceiling and the back of all diffusers and grilles shall be externally insulated with 2" thick 1 lb. density foil scrim kraft jacketed insulation. Adhere insulation to duct with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width over 24" shall be further secured on all sides with mechanical fasteners on 18" maximum centers. 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.

230510 OPENINGS

A. All penetrations in rated floors, firewalls and any other rated separations shall be protected using a through-penetration firestopping method with an “F” rating equivalent to the rating of the membrane being penetrated for particular piping materials used and membrane construction type. Floor penetrations shall additionally have a “T” rating equivalent to the rating of the floor being penetrated. Through-penetration firestop systems shall be installed and tested in accordance with ASTM E814 or UL 1479.

230511 NAMEPLATES

A. All new room terminal boxes shall be furnished with engraved plastic laminated labels permanently attached to the equipment. Lettering shall be ½" tall. Label shall include equipment number, final acceptance date, number and size of filters, and capacities. Final acceptance date shall be on a separate label so as to allow equipment nameplates to be installed prior to final acceptance.

B. Provide engraved plastic laminated or plastic tape label on ceiling grid below room terminal boxes located above ceilings. Label text shall match the piece of equipment’s identifier/symbol noted on the drawings.

230512 TESTING AND BALANCING

A. Testing and balancing of the new portions of the heating, ventilating, and air conditioning systems shall be performed by an independent 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.

B. Heating and Air Conditioning Contractor shall make any changes in the pulleys, belts, filters, dampers, valves, etc. necessary for correct balance at no additional cost to the Owner.

C. Upon completion of the heating, ventilating, and air conditioning systems, the Heating and Air Conditioning Contractor shall compile the test data and submit three copies of the completed and certified test data for evaluation and approval.

D. Testing Procedure (Air):

1. Test and adjust each room terminal box and diffusers for supply air system to within 10% of design requirements. Test at maximums and minimums for both cooling and heating. Record all data.
2. All adjustments to air diffusing devices where possible shall be made in trunk or run out dampers, not at diffuser volume control.

230513 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.

230514 MAINTENANCE DATA

A. For all new 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 multiple 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.

230515 RECORD DRAWINGS

A. Heating and Air Conditioning Contractor shall maintain "during the course of the work" a set of specifications and drawings marked up to show the work as installed.

230516 GUARANTEE

A. The Heating and Air Conditioning Contractor shall guarantee the entire heating and air conditioning system subject to the General Conditions of these specifications.

END OF SECTION 230500

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SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Furnish and install an electric control system to fulfill the intent of the drawings and specifications. The systems shall include all necessary labor, electrical wiring, controllers, programmable thermostats, devices, and materials for a complete installed control system. The control system shall be erected, assembled, and installed by factory-trained mechanics regularly employed by the control manufacturer or manufacturer's authorized distributor as a subcontractor to the Heating and Air Conditioning Contractor. All equipment, unless specified to the contrary, shall be fully proportional and shall be the product of the control manufacturer.

B. There is not an existing DDC system in the building. New VAV Room Terminal Boxes shall be furnished with programmable BACnet controller and wireless communicating space temperature sensors for standalone control independent of control of existing rooftop A/C unit and other VAV boxes in the building.

C. The control diagrams indicated on the drawings or specified herein show the intended sequences of operation of the various control systems and shall be followed as closely as practicable. All required devices and control schemes may not be shown on the drawings. It is the Contractor's responsibility to provide all devices and control schemes whether shown or not.

D. Additional General Requirements for Controls:

1. All wiring, conduit, and panels for all temperature controls.
2. Power required for controls shall be provided by the Controls Contractor from points coordinated with the Electrical Contractor.
3. Perform all wiring in accordance with all local and national codes and Division 26 of these specifications.
4. Surge transient protection shall be incorporated in the design of the system to protect electrical components in all system components as described below under "General Product Description."
5. System modifications necessary to fine-tune sequences during commissioning of systems at no additional cost to the Owner.
6. Mount control devices inside of a UL-listed steel enclosure panel, with hinged locking cover and key locking latch.

E. Wiring and Controls:

1. Control Contractor shall be responsible for the installation and wiring of temperature controls, control interlock wiring, electrical controls and devices in the temperature control system.

1.3 QUALITY ASSURANCE AND STANDARDS

A. Materials and equipment shall be the cataloged products of manufacturers regularly engaged in production and installation of integrated control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

B. All products used in this project installation shall be new and currently being manufactured. This installation shall not be used as a test site for any new products. Spare parts shall be available for at least five years after completion of this contract.

C. Install system using competent workmen who are fully trained in the installation of integrated control systems.

D. Single source responsibility of Contractor shall be the complete installation and proper operation of the control system and shall include debugging and proper calibration of each component in the entire system.

E. Contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

F. The Contractor and manufacturer representative shall support the installed system for a minimum of 1 year. The support shall provide full material warranty of controllers and 8 hours of on-site training.

G. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, governing Radio Frequency Electromagnetic Interference and be so labeled.

H. Design and build all system components to be fault-tolerant.

1. Satisfactory operation without damage at 110% and 85% of rated voltage and at plus 3-Hertz variation in line frequency.
2. Static, transient and short-circuit protection on all inputs and outputs.
3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.
4. Network-connected devices to be A.C. coupled or equivalent or that any single device failure will not disrupt or halt network communication.
5. All real time clocks and data file RAM to be battery-backed for a minimum 72 hours and include local and system low battery indication.
6. All programs shall retain their memory for a minimum of 7 days upon loss of power.

I. Comply with NFPA 90A, Standard for Installation of Air Conditioning and Ventilating Systems.

J. Provide wiring in accordance with NEC requirements and Division 26 of these Specifications.

1.4 SUBMITTALS

A. Product Data: Submit copies of manufacturer's technical product data for each control device furnished. Indicate dimensions, capacities, performance, electrical characteristics, material finishes; also include installation and start-up instructions.

B. Shop Drawings: Submit copies of shop drawings for each control system, containing at least the following information:

1. Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, control devices and all interconnections between devices.
2. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
3. Written description of sequence of operation.

C. Number of copies of Product Data and Shop Drawings shall be per Division 1 of these Specifications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Provide equipment and control devices in factory shipping carton. Maintain in cartons while shipping, storing and handling as required to prevent equipment damage and to keep dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

PART 2 - PRODUCTS

2.1 ARCHITECTURE/COMMUNICATION

A. System shall include laptop PC completely programmed including software package utility kit, cables, and wireless adaptor for communication to the controllers.

B. Zone Controllers shall meet the following communication requirements:

1. Communicate to System Controller via BACnet MS/TP
2. To allow maximum communications speed and co-existence with other controllers, the controller shall support at a minimum the following BACnet MS/TP master baud rate: 9600, 19200, 38400, 76800, and 115200.
3. To ensure integration to the installed system and additions the controller must be BTL Testing Lab listed for the following:

a. Advance Applications Controller (B-AAC) or
b. Application Specific Controller (B-ASC) and Supports sending alarm/event notifications to a subscriber

C. Wireless equipment controllers and auxiliary control devices shall conform to:

1. IEEE 802.15.4 radios to minimize risk of interference and maximize battery life, reliability, and range.
2. Operating range shall be a minimum of 200 feet; open range shall be 2,500 ft. (762 m) with less than 2% packet error rate.
3. To maintain robust communication, two-way communications shall be used between the wireless zone sensor and receiver to allow channel switching based on varying channel traffic and signal strength.
4. Certifications shall include FCC CFR47 - RADIO FREQUENCY DEVICES - Section 15.247 & Subpart E.

2.2 PRODUCTS

A. Building controls, controllers, and communications between devices shall be provided as necessary to achieve specified sequences of operation.

B. Equipment Controllers:

1. Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which through hardware or firmware design control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

a. Application Specific Controller are only allowed when both the following:

1) The equipment is compressor based or boiler based and
2) The controller is provided by the equipment manufacturer and warrantied as part of the equipment.

2. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, and Water Source Heat Pumps.

   a. Software

      1) To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.
      2) Stand-Alone Operation: Each piece of equipment specified in section A shall be controlled by a single controller and provide stand-alone control in the event of communication failure. In case of communications failure stand-alone operation shall use default values or last values for remote sensors read over the network such as outdoor air temperature.
      3) For controlling ancillary devices and for flexibility to change to sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

   b. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

      1) Storage: -55 to 203 ºF (-48 to 95ºC) and 5 to 95% Rh, non-condensing.
      2) Operating: -40 to 158 ºF (-40 to 70 ºC) and 5 to 95% Rh, non-condensing.
      3) Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum
      4) Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40 F to 158 F [-40 C to 70 C].

   c. Input/Output:

      1) For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).
      2) For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.
      3) For flexibility in selection and replacement of binary sensors, the controller shall support dry and wetted (24VAC) binary inputs.
      4) For flexibility in selection and replacement devices, the controllers shall have binary output which are able to drive at least 12VA each.
      5) For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).
      6) For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.
      7) For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points must communicate with the controller via an internal communications bus. Expansion points must be capable of being mounted up to 200 meters from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.

   d. Serviceability – The controller shall provide the following in order to improve serviceability of the controller:

      1) Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
      2) All binary output shall have LED’s indicating the output state.

3) All wiring connections shall removable without the use of a tool.
4) Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller's zone sensor.
5) For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.
6) Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.
7) BACnet Mack Address shall be set using decimal (0-9) based rotary switches.
8) Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.
9) BACnet trending objects resident on controller:

a) Minimum of 20,000 trending points total on controller
b) Shall be capable of trending all BACnet points used by controller
c) Shall be capable of 1 second sample rates on all points

e. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.
f. Transformer for the controller must be rated at minimum of 115% of ASC power consumption, and shall be fused or current limiting type. 24 VAC, +/- 15% nominal, 50-60 Hz, 24 VA plus binary output loads, for a maximum of 12 VA for each binary output.
g. Agency Approval: The controller shall have met the Agency Compliance:

1) UL916 PAZX, Open Energy Management Equipment
2) UL94-5V, Flammability
3) **FCC Part 15, Subpart B, Class B Limit**

C. Wireless zone sensors for use in Heating, Ventilating, and Air Conditioning (HVAC) systems:

1. Wireless zone sensors shall be the Operator Interface.
2. To check for proper operation, wireless zone temperature sensors shall include a signal strength and battery condition indicators on the zone sensor display or using LED's on non-display models.
3. To allow local troubleshooting without specialized tools, error codes shall be displayed on the digital display through a blinking pattern on the non-display models. Error codes shall include: not associated, address to 000, improper software configuration, input voltage too high, or general sensor failure. Codes shall be indicated on inside of sensor back cover.
4. To support use by the physically impaired, the wireless zone sensor shall be a minimum font size of 12 points, and the LCD model shall be readable in low light conditions.
5. The wireless zone sensor shall include a readily visual indication of battery condition. The battery indication lights shall flash periodically for a minimum of 5 days to indicate the need for battery replacement prior to failure.
6. Temperature and Humidity Range:

a. The ambient operating temperature range for the wireless zone sensor shall be 32 to 122°F (0 to 50°C).
b. The ambient operating temperature range for the wireless receiver shall be -40 to 158°F (-40 to 70°C).
c. The ambient storage temperature range for the wireless zone sensor and receiver shall be -40 to 185°F (-40 to 85°C).C.
d. The ambient operating and storage humidity range for the wireless zone sensor and receiver shall be 5 to 95%, non-condensing.

7. Components:

a. Wireless zone sensors shall be available in three models: temperature only, temperature with setpoint control and override pushbuttons, and field configurable model with digital display. The field configurable model shall all allow field configuration without a field service tool. Configuration options include: setpoint, override pushbuttons, fan speed, and system mode switches. System mode, fan speed and setpoint shall include a lock option. The digital display shall also be field configurable to display in Fahrenheit or Celsius units of measure.
b. The wireless zone sensor and receiver addresses shall be held in non-volatile memory to ensure operation through system voltage disturbances and to minimize the risk of incorrect association.
c. The wireless zone sensor and receiver shall be addressed using rotary switches with numerical indication to simplify and reduce installation time and minimize risk of incorrect addressing. Two position DIP switches are not acceptable.
d. Installation and replacement of failed sensors shall be accomplished automatically after power up.
e. The wireless zone sensor shall include security screws to protect against theft.
f. All component certifications shall include:

1) TFP-13651127 - Canada Compliance
2) UL 916 - Energy Management Equipment
3) UL 94 - The Standard for Flammability of Plastic Materials for Parts in Devices and Appliances: 5 VA flammability rating
4) UL 873 - Temperature regulating and indicating equipment

8. Accuracy:

a. To ensure proper system performance, the wireless zone sensors and receiver shall automatically determine when the space temperature is rapidly changing. When the space temperature is readily changing, the space temperature shall be transmitted at least once each 30 seconds. The maximum time between transmissions shall be 15 minutes. Zone temperature sensing accuracy shall be +/- 0.5F (+/- 0.28C).

9. Power Requirements:

a. The wireless zone sensor battery life shall provide at least 5 years life under normal operating conditions and must be readily available size AA, 1.5V.
b. The wireless receiver shall operate on 24VAC power.

9. Wireless Zone Sensor Installation and Configuration Tools:

a. To enable installation and servicing when specialized tools are required, site survey and installation tools as well as software shall be provided to the contractor use for system installation and commissioning for the duration of the warranty period.
b. To enable installation and servicing when specialized tools are required, site survey and installation tools as well as software shall be provided to the owner for permanent possession for ongoing system maintenance and trouble shooting.

D. Duct-Mounted Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ± 0.2ºC. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F. The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 - foot long sensor element. These devices shall have accuracy of 0.5 degrees, F., over the entire range.

E. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Manufacturer: Veris, or approved equivalent.

F. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

G. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120VAC/24VAC operation.

H. Line voltage protection: All control system panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install systems and materials in accordance with manufacturer's instructions in a neat workmanlike manner.

B. Coordinate with other trades on the project as the work progresses so that each will be aware of the extent of all work. Carefully plan all work and check for interferences before installation. No extras will be allowed for changes caused by failure to check for interferences.

C. Provide structural supports as required for panels and control devices.

D. Supervise installation of all control dampers.

E. Install metering devices away from bends and elbows with minimum upstream and downstream straight distances per manufacturer's recommendations and as shown on Drawings.

3.2 CONTROL WIRING

A. Install color-coded control wiring without splices between terminal points in accordance with National Electrical Code.

B. Install circuits over 25 volts with color-coded No. 12 or 14.

C. Install circuits under 25 volts with color-coded cable as recommended and approved by the manufacturer.

D. All wiring and cable used shall be plenum rated.

E. Wiring above hard ceilings, in walls, or where exposed including in mechanical rooms shall be in 3/4” minimum EMT conduit with steel-plated hexagonal compression connectors. Wiring above lay-in ceilings may be installed as properly supported cable. Flexible metallic conduit shall be 1/2” minimum in size and not exceed 3’-0” in length.

F. All wiring in floor slabs or on exterior shall run in rigid conduit.

3.3 TESTING

A. When installation of the control system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line.

B. Provide a cross check of each control point within the control system by making a comparison between the control command and the field-controlled device.

C. Replace any work found defective. After replacement, repeat test.

3.4 START-UP AND DEMONSTRATION

A. After completion and testing of the installation, regulate, adjust and service as necessary all control devices in the systems, placing each item in complete and proper operation.

B. Demonstrate all systems to Owner, Architect and Engineer, and that all are operable from local controls in the specified failure mode upon electronic control system failure or loss of power.

C. Complete all commissioning requirements as necessary to this scope of work.

3.5 INSTRUCTION

A. Provide the services of manufacturer's technical personnel for 8 hours of instruction to Owner's personnel in the operation, maintenance and programming of the control system. Orient the training specifically to the system installed rather than a general training course.

B. Provide training manuals, equipment and material required for classroom training.

C. Training to include the following items:

1. Operation of equipment
2. Programming
3. Diagnostics
4. Failure recovery procedures
5. Alarm formats (where applicable)
6. Maintenance and calibration
7. Trouble shooting, diagnostics, and repair instructions

PART 4 - POINTS LISTS AND SEQUENCES OF OPERATION

4.1 SUMMARY

A. The drawings indicate the individual types of systems and the points required in each system.

B. System sequences of operation and points shall be as indicated on the drawings and as specified herein.

END OF SECTION 230900

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 the Instructions to Bidders and General Conditions of the Contract shall be a part of the Electrical Specifications. The electrical contractor shall examine the general and special conditions before submitting a proposal.

B. The electrical work shall be performed by a licensed electrical contractor.

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
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 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 a complete job will be provided without requests for minor extras.

1.5 RECORD DRAWINGS

A. A set of drawings covering the electrical contract will be provided to the electrical contractor to mark 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 photographs of switchboards and panelboards. Photographs shall clearly show equipment designations, manufacturer nameplates, breaker positions, breaker ratings, and directory descriptions.

1.6 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, the Engineer 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. These materials shall be third party listed or labeled in accordance with the General Statutes of the State (example: UL, ETL, CSA, etc.).

1.7 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. Unless directed otherwise in the Architectural Specifications, Civil Specifications, or General Provisions and/or Conditions of the Contract, the CONTRACTOR shall submit PDF files of shop drawings, certified prints, literature, and cuts to the Engineer for all major items of equipment and 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 cut sheets with multiple components, part numbers, etc. shall be clearly marked to identify what is proposed for this project.

C. The CONTRACTOR shall analyze all shop drawings and submittal data and certify that they meet requirements of Contract Drawings and Specifications, prior to delivery to the Engineer. CONTRACTOR Certification shall be in the form of suitable approval stamp placed on each shop drawing submitted for approval.

D. If the Engineer deems submittal data is either incomplete or incorrect, a resubmittal submittal will be required.

E. At least one set of all “approved” shop drawings, certified prints, etc., shall be maintained at the job site and available to representative of the Engineer.

F. Approval by the Engineer of shop drawings 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 perform the requirements and intent of the contract documents. Such approval shall not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the Contract Documents, the CONTRACTOR shall advise the Engineer of the deviations in writing, accompanying the shop drawings, including the reason for the deviations.

G. Physical sizes of equipment used in the design layout are those of reputable equipment manufacturers. The CONTRACTOR is responsible for providing equipment that will fit the space available. If the CONTRACTOR elects to use equipment that results in conflicts with space clearance or codes, it shall be the responsibility of the CONTRACTOR to correct at his expense. The CONTRACTOR shall assume responsibility for providing code clearances. Where equipment is designated for existing space, the

CONTRACTOR shall make necessary field measurements to ascertain space requirements, including those for connections; and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the intent and meaning of the drawings and specifications.

H. Catalog Data for OWNER:

1. The CONTRACTOR shall provide compilations of catalog data, bound in suitable loose-leaf binders, for each manufactured item of equipment used in the electrical work. These shall be presented to the Engineer for transmittal to the OWNER before the final inspection is made. Data shall include printed installation, operation, and maintenance instructions for each item, indexed by product with heavy sheet dividers and tabs. All warranties shall be included with each item. Each manufacturer's name, address, and telephone number shall be clearly indicated. Generally, shop drawings and submittal data alone are not adequate for catalog data.

I. Record Documents for OWNER:

1. Conductor and cable megger test results.

1.8 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. 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.

C. 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 Engineer 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.

D. 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 Engineer.

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

1.9 COORDINATION OF WORK

A. It is understood and agreed that by submitting a bid, 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 the other divisions of these specifications. 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 Engineer and obtain from him 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 Engineer. 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 Engineer.

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 equal finish prior to cutting. The CONTRACTOR shall route conduits and locate equipment as approved by the OWNER and Engineer. Routing and locations shall be firmly established and approved before proceeding with any phase of the work.

5. 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 no additional cost to the OWNER, to equal finish prior to damage. The ENGINEER shall be the judge as to equal finishes, etc.
6. 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. Electrical motors shall meet the minimum efficiency requirements of applicable tables in the North Carolina Energy Conservation Code.
3. 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 ENGINEER until installed.
        2) Rusty and/or corroded materials and equipment will be replaced at the direction of the Engineer.
    c. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
    d. Protect stored products from damage.
4. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
5. At the completion of the work; fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the OWNER in a condition satisfactory to the Engineer. Damage or defects, developing before acceptance of the work shall be corrected at the CONTRACTOR's expense.
6. 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 Engineer, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the Engineer'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 the direction of the Engineer at no additional cost to the Owner.

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 Engineer.

J. Cutting and Patching:

1. The electrical contractor shall do all rough cutting and patching as required for the proper installation of work under this contract. Cutting shall be kept to a minimum, and finishes shall be restored to the satisfaction of the Engineer.

K. Locations and Measurements:

1. Outlets, equipment, and appliances are shown and located on the drawings as accurately as possible. All measurements shall be verified on the project and coordinated with the drawings of other disciplines. In all cases, the work shall suit the surrounding trim and/or decoration and construction. The locations of outlets for special appliances shall be installed so that when extended, they are flush with the finished wall, floor, or ceiling and permit the proper installation of fixtures, devices, equipment, appliances, etc. Heights of all outlets shown on the drawings are approximate only. Slight relocations of outlets, devices, and equipment shall be made by the electrical contractor as required or as directed by the Engineer at no additional cost to the OWNER.

L. Workmanship:

1. Work shall be executed as required by the specifications and the accompanying drawings and 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 men to open fixtures, boxes, panels, or any other equipment to enable the Engineer representatives to see into any parts of the installation he may request.
3. The CONTRACTOR shall furnish meters for observation of readings as directed by the Engineer representative. Meters to be furnished include: clamp-on type ammeter, voltmeter, 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.
4. Firestopping
5. Electrical demolition.

B. Shop Drawings: UL details for firestopping cable and raceway penetrations of fire-rated floor and wall assemblies.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

C. 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.

D. Expansion Anchors:

1. Inside: Carbon-steel wedge or sleeve type.

E. Toggle Bolts:

1. Inside: All 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.

2.3 FIRESTOPPING

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate location of 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.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

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 indicated.

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. 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 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.6 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site after coordination with the Owner's representative. Equipment and/or materials that the Owner desires to retain shall be moved to a location designated by the Owner's representative.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work.

3.9 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.

3.10 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

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.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 POWER CONDUCTORS AND CABLES

A. Manufacturers:

1. Cerro Wire LLC.
2. Colonial Wire and Cable.
3. Encore Wire Corporation.
4. General Cable Corporation.
5. Okonite.
6. Prysmian Group.
7. Republic Wire, Inc.
8. Southwire.
9. Or approved equal.

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

C. 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.

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

E. 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. Power-Limited Fire-Alarm Circuits: Comply with UL 1424
4. Healthcare facilities: MC cable shall be listed for healthcare applications.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems.
2. AMP Incorporated/Tyco International.
3. FCI.
4. Greaves Polaris.
5. Hubbell/Anderson.
6. ILSCO.
7. NSI.
8. O-Z/Gedney; EGS Electrical Group LLC.
9. Penn Union.
10. 3M Company; Electrical Products Division.
11. Or approved equal.

B. 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 wirenut type twist connectors.
2. For conductors #6 & larger, use pre-insulated solderless connectors with one spare port(s) for future cable connection.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Branch Circuits:

1. Concealed in Ceilings: Type THHN/THWN-2, single conductors in raceway or metal-clad cable, Type MC.
2. Exposed: Type THHN/THWN-2, single conductors in raceway, with the exception of exposed locations in electrical rooms where MC cable may be dropped out of cable trays to panelboards.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. 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 outlet 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. 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 megger. Megger testers shall not be electronic type. Megger 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 megger readings for each panel circuit.

C. Witness Tests:

1. The CONTRACTOR shall furnish a megger and show A/E representative and/or Owner that the conductors and panels comply with the above requirements.

END OF SECTION 260519

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. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. 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.

B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

C. Tighten screws and bolts for grounding and bonding 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.

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.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. Alflex Inc.
2. Allied Tube and Conduit.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.

4. Atkore International / Calbrite.
5. Conduit Pipe Products Company.
6. Electri-Flex Co.
7. Gibson Stainless.
8. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
9. Manhattan/CDT/Cole-Flex.
10. Maverick Tube.
11. O-Z Gedney; Unit of General Signal.
12. Patriot Industries.
13. Republic Conduit.
14. Shaw Stainless and Alloy.
15. Wheatland Tube Co.
16. Or approved equal.

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

2.3 METAL WIREWAYS

A. Listed to UL 870.

B. Manufacturers:

1. Austin.
2. B-Line.
3. Hammond/
4. Hoffman.
5. Milbank.
6. Square D.
7. Thomas & Betts.
8. Unity Manufacturing.
9. Or approved equal.

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

1. Indoors: NEMA 1.

D. 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.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

F. Wireway Covers:

1. Indoors: Hinged type.

G. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Arlington.
2. Austin.
3. B-Line.
4. Cooper Crouse-Hinds.
5. Emerson/General Signal; Appleton Electric Company.
6. Erickson.
7. FSR.
8. Hammond.
9. Hoffman.
10. Hubbell.
11. Milbank.
12. O-Z/Gedney.
13. Peerless.
14. RACO.
15. Robroy Industries.
16. Rose + Bopla.
17. Scott Fetzer Co.; Adalet-PLM Division.
18. Spring City Electrical.
19. Strong.
20. Thomas & Betts.
21. Vynckier.
22. Walker Systems.
23. Woodhead Industries.
24. Or approved equal.

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

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

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. 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.
5. Boxes and Enclosures: NEMA 250, Type 1.

B. Minimum Raceway Size: 3/4-inch trade size (DN 21).

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

D. 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. 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.

F. 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.

G. 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".

H. 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.

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

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

K. Expansion joints: Where raceways of any type pass a building or structure expansion joint, a standard expansion joint fitting, compatible with the type of raceway being used, shall be provided and installed. Review architectural and structural drawings for locations of expansion joints.

L. 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.

M. 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.

N. Flexible Connections:

1. Use maximum of 24 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors.

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

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets 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.

END OF SECTION 260533

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SECTION 260553 - ELECTRICAL IDENTIFICATION

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 electrical identification materials and devices intended to comply with NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data:

1. For each electrical identification product indicated.
2. For double coated, adhesive tape product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND SIGNS

A. Engraved Plastic Nameplates and Signs: Engraving stock, plastic laminate, minimum 1/16” thick for signs up to 20 sq. in. and 1/8” thick for larger sizes.

B. Fasteners for Nameplates and Signs: High performance, double coated tape with adhesive. Design Basis: 3M #06383, or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Circuit Identification Labels on Boxes: Panel and circuit number.

1. Interior Boxes:

a. Exposed: Pressure-sensitive, self-adhesive plastic label on cover.
b. Concealed:

1) Pressure-sensitive, self-adhesive plastic label on cover; or
2) Permanent marker on cover, legible by Architect, Engineer, and Owner.

E. Color-Coding of Phase, Neutral, and Ground Conductors: Use the following colors for service, feeder, and branch-circuit phase conductors:

1.

Configuration	Phase A	Phase B	Phase C	Neutral	Ground
120/240-V, 1 Ph, 3W	Black	Red	N/A	White	Green
120/240-V, 3 Ph, 4W	Black	Orange	Blue	White	Green
120/208-V, 3 Ph, 4W	Black	Red	Blue	White	Green
277/480-V, 3 Ph, 4W	Brown	Orange	Yellow	Gray	Green

2. For conductors #6 AWG and smaller, factory apply color the entire length of conductors.
3. For conductors #4 AWG and larger, field apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
4. At each panelboard, a color code legend shall be permanently posted corresponding to the conductors and voltage in that panelboard.

F. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

G. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment unless units are delivered with their own self-explanatory identification. Attached engraved labels with high performance double coated adhesive tape. Apply labels for each unit of the following categories of equipment:

1. HVAC equipment. Indicate:

a. Equipment designation / tag.
b. Voltage configuration.
c. Supply panel-circuit.

2. Nameplate colors shall be: White surface with black core.

END OF SECTION 260553

Exhibit B

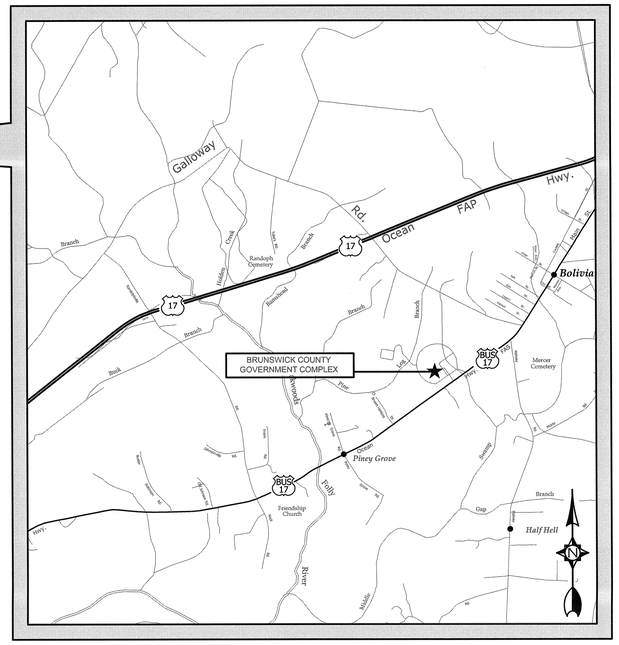
VAV BOX REPLACEMENT

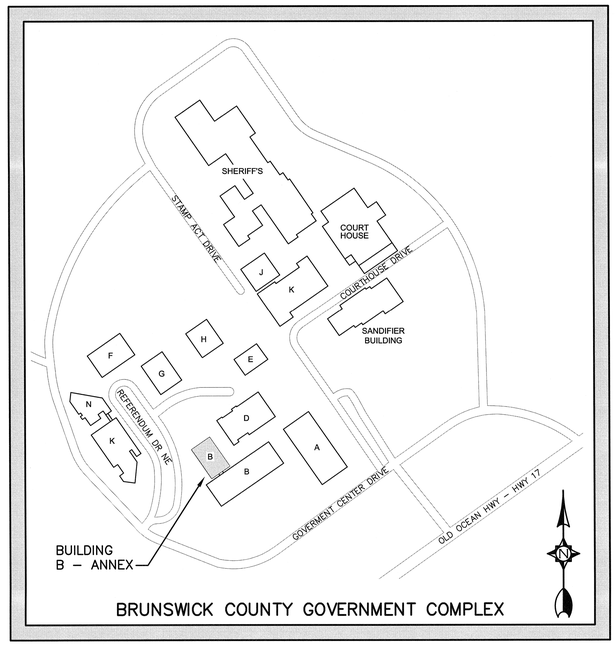
FOR

BUILDING B - ANNEX

BRUNSWICK COUNTY GOVERNMENT COMPLEX
BOLIVIA, NORTH CAROLINA

BRUNSWICK COUNTY
NORTH CAROLINA





Brunswick County Government Complex
25 Courthouse Drive NE
Bolivia, NC 28422

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CONSULTING ENGINEERS
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NC LICENSE# C-1073

SHEET INDEX

REVISION	
DATE	DESCRIPTION

VAV BOX REPLACEMENT
BRUNSWICK COUNTY GOVERNMENT COMPLEX
BUILDING B – ANNEX
BOLIVIA, NORTH CAROLINA

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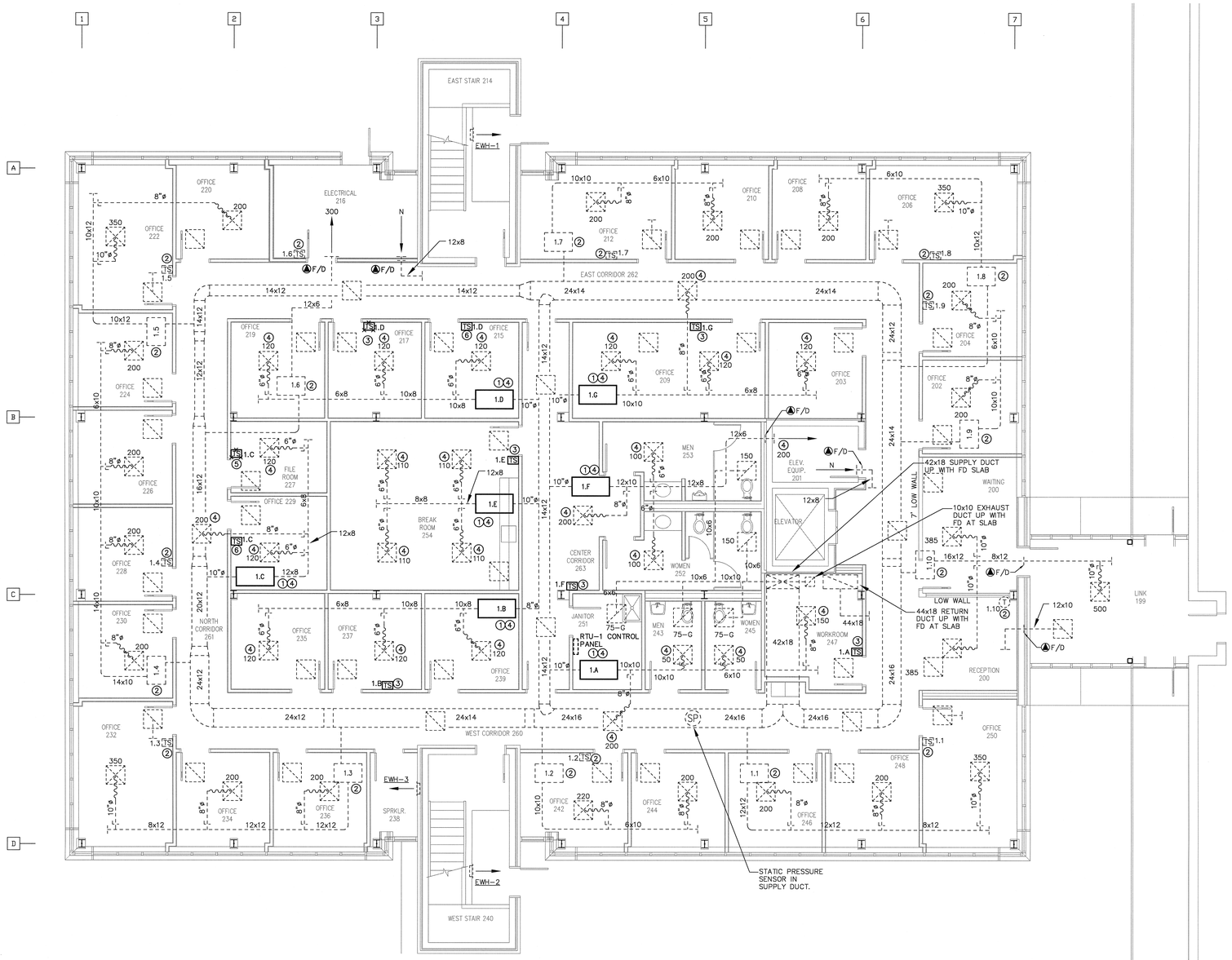
NC LICENSE #C-1073

SHEET
COVER

DATE
APRIL 5, 2019



LEGEND

- EXISTING TO REMAIN
- RECTANGULAR DUCTWORK
- CEILING RETURN AIR/ EXHAUST AIR REGISTER
- 180 — CEILING SUPPLY AIR DIFFUSER WITH # INDICATING CFM
- BALANCING DAMPER
- FLEXIBLE DUCT
- F/D — VERTICAL FIRE DAMPER WITH ACCESS DOOR IN DUCT
- S — EXISTING SMOKE DETECTOR
- TS 3.1 — EXISTING HEATING AND COOLING SPACE TEMPERATURE SENSOR WITH # INDICATING UNIT
- TS 3.A — NEW HEATING AND COOLING SPACE TEMPERATURE SENSOR WITH # INDICATING UNIT
- 1 — KEYED NOTE SYMBOL
- CONT. — CONTINUATION
- RTU — ROOF TOP UNIT
- 3.1 — EXISTING VAV BOX WITH # INDICATING UNIT
- 2.H — NEW VAV BOX WITH # INDICATING UNIT
- POINT OF NEW CONNECTION TO EXISTING

GENERAL NOTES: (THIS SHEET ONLY)

1. HVAC CONTRACTOR SHALL FIELD VERIFY ALL RELEVANT DIMENSIONS, CLEARANCES, LOCATIONS AND ELEVATIONS 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, 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, SUCH CHANGES SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER, AND AS DIRECTED BY THE ENGINEER. ALL CHANGES SHALL BE MARKED ON ASUILT DRAWINGS.
2. PIPING, DUCTWORK, ETC., SHALL NOT BE SUPPORTED FROM BAR JOIST BRIDGING OR ROOFDECK. DUCTWORK AND PIPING SHALL BE SUPPORTED DIRECTLY FROM FIRE RESISTANCE RATED STRUCTURAL ELEMENTS OF THE BUILDING. EQUIPMENT SUPPORTED BY BAR JOISTS AND/OR ROOF TRUSSES SHALL HAVE SUPPORTS ATTACHED AS CLOSE AS POSSIBLE TO PANEL POINTS. REINFORCE BAR JOISTS/ OVERHEAD STRUCTURE AS NECESSARY.
3. ALL DUCT JOINTS SHALL BE SEALED AS SPECIFIED.
4. SAFETY AND SECURING OF WORK AREAS AND BUILDING AND ACTIVATION OF BUILDING'S SECURITY SYSTEM SHALL BE BY THE CONTRACTOR AND OCCUR DAILY IN ACCORDANCE WITH THE GENERAL CONDITIONS OF THIS PROJECT.

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

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

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE EXISTING VAV BOX AND REPLACE WITH NEW BOX, SEE SCHEDULE. FIELD VERIFY AND MODIFY ALL DUCT CONNECTIONS TO NEW VAV BOX. VERIFY EXISTING BALANCING DAMPER TO EACH BOX, IF BOX DOES NOT HAVE ONE PROVIDE NEW BALANCING DAMPER. SEE ELECTRICAL DRAWINGS FOR ELECTRICAL INFORMATION.
2. EXISTING VAV BOX AND ASSOCIATED THERMOSTAT TO REMAIN.
3. REMOVE AND REPLACE THERMOSTAT FOR NEW VAV BOX. EXISTING CONDUIT TO REMAIN IN PLACE FOR REUSE IF NECESSARY.
4. TAB VAV BOX AND SUPPLY AIR DISTRIBUTION BASED ON INFORMATION IN THE VAV TERMINAL BOX SCHEDULE. RETAB ROOMS SERVED AS SHOWN.
5. THERMOSTAT TO BE REMOVED, PROVIDE STAINLESS STEEL BLANK COVER OVER THE THERMOSTAT BOX.
6. NEW LOCATION OF VAV BOX TEMPERATURE SENSOR.

REVISION	
DATE	DESCRIPTION

VAV BOX REPLACEMENT
BRUNSWICK COUNTY GOVERNMENT COMPLEX
BUILDING B – ANNEX
BOLIVIA, NORTH CAROLINA

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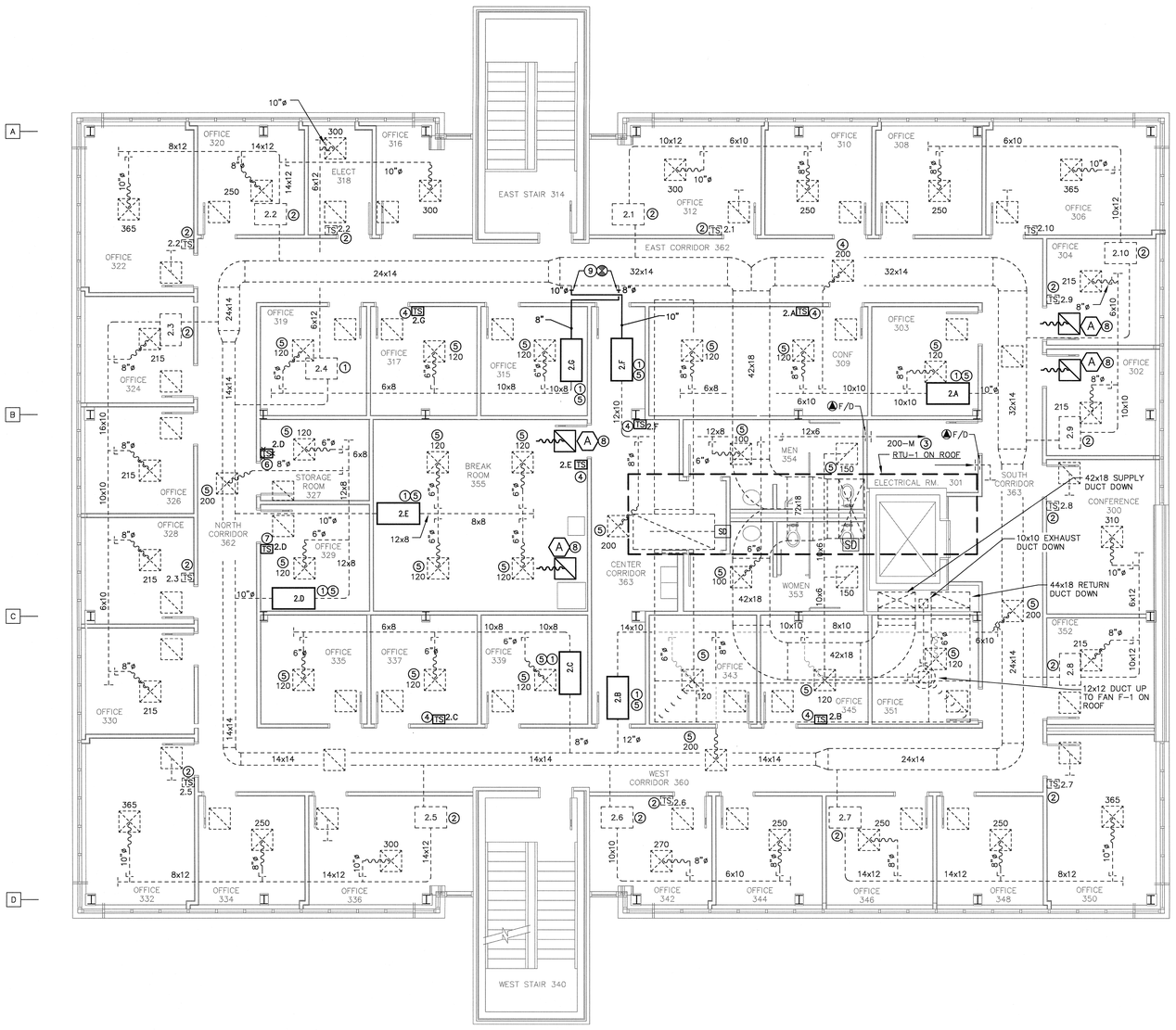
NC LICENSE #C-1073

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 17505 KENNETH LYNCH

DESIGNED BY	KL
DRAWN BY	TWT
CHECKED BY	KL
JOB NUMBER	19015

BUILDING B
1ST FLOOR
VAV BOX
REPLACEMENT

SHEET
M-101
OF OF 2
DATE APRIL 12, 2019



1 M-102 MECHANICAL SECOND FLOOR PLAN

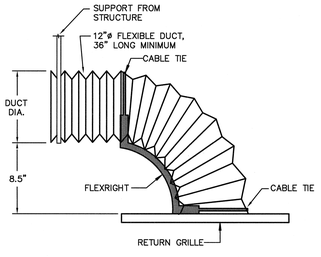
SCALE: 3/16" = 1'-0"

4' 2' 0 4' 8' 12'

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

KEYED NOTES: (THIS SHEET ONLY)

1. REMOVE EXISTING VAV BOX AND REPLACE WITH NEW BOX, SEE SCHEDULE. FIELD VERIFY AND MODIFY ALL DUCT CONNECTIONS TO NEW VAV BOX. VERIFY EXISTING BALANCING DAMPER TO EACH BOX. IF BOX DOES NOT HAVE ONE PROVIDE NEW BALANCING DAMPER. SEE ELECTRICAL DRAWINGS FOR ELECTRICAL INFORMATION.
2. EXISTING VAV BOX TO REMAIN.
3. EXISTING RTU TO REMAIN.
4. REMOVE AND REPLACE THERMOSTAT FOR NEW VAV BOX. EXISTING CONDUIT TO REMAIN IN PLACE FOR REUSE IF NECESSARY.
5. TAB VAV BOX AND SUPPLY AIR DISTRIBUTION BASED ON INFORMATION IN THE VAV TERMINAL BOX SCHEDULE. RETAB ROOMS SERVED AS SHOWN.
6. THERMOSTAT TO BE REMOVED, PROVIDE STAINLESS STEEL BLANK COVER PLATE OVER THE THERMOSTAT BOX.
7. NEW LOCATION OF VAV BOX TEMPERATURE SENSOR.
8. PROVIDE NEW 2'X2' LAY-IN RETURN AIR GRILLE WITH 24" OF 12" FLEXIBLE DUCT CONNECTED TO THE GRILLE FOR SOUND ATTENUATION, SEE DETAIL B/M-102. SEE SPECIFICATIONS FOR GRILLE INFORMATION.
9. CONNECT THE EXISTING 8" TAP TO NEW BOX 2-G, THE EXISTING 10" TAP TO NEW BOX 2-F.



B M-102 RETURN GRILLE DETAIL

SCALE: NONE

VAV ROOM TERMINAL BOX SCHEDULE

TERMINAL NUMBER	BOX CFM			BOX INLET SIZE (1)	BOX RUNOUT SIZE (2)	ELECTRIC HEATING				REMARKS
	COOLING MAXIMUM	COOLING MINIMUM	HEATING			HEATING CAPACITY BTU/HR	KW	VOLTAGE AND PHASE	STAGES	
1.A	450	125	225	8"ø	10"ø	8,530	2.5	277V-1ø	(3)	
1.B	360	85	180	6"ø	8"ø	6,825	2.0	277V-1ø	(3)	
1.C	440	125	220	8"ø	10"ø	8,530	2.5	277V-1ø	(3)	
1.D	360	85	180	6"ø	10"ø	6,825	2.0	277V-1ø	(3)	
1.E	440	125	220	8"ø	10"ø	8,530	2.5	277V-1ø	(3)	
1.F	600	200	300	10"ø	10"ø	11,945	3.5	277V-1ø	(3)	
1.G	560	125	280	8"ø	10"ø	11,945	3.5	277V-1ø	(3)	
2.A	560	125	280	8"ø	10"ø	11,945	3.5	277V-1ø	(3)	
2.B	760	200	400	10"ø	12"ø	13,355	4.5	277V-1ø	(3)	
2.C	360	85	180	6"ø	8"ø	6,825	2.0	277V-1ø	(3)	
2.D	440	125	220	8"ø	10"ø	8,530	2.5	277V-1ø	(3)	
2.E	480	125	240	8"ø	10"ø	10,235	3.0	277V-1ø	(3)	
2.F	600	200	300	10"ø	10"ø	11,945	3.5	277V-1ø	(3)	
2.G	360	85	180	6"ø	10"ø	6,825	2.0	277V-1ø	(3)	

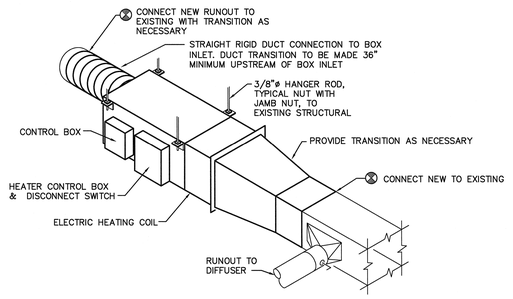
(1) INLET SIZE IS ROOM TERMINAL BOX INLET SIZE.

(2) RUNOUT SIZE IS AS SCHEDULED AND SHOWN ON EXISTING DRAWINGS. DUCT TRANSITION SHALL OCCUR 36" BEFORE BOX INLET. VERIFY BALANCING DAMPER TO REMAIN OR PROVIDE NEW FOR EACH BOX.

(3) SCR CONTROLS.

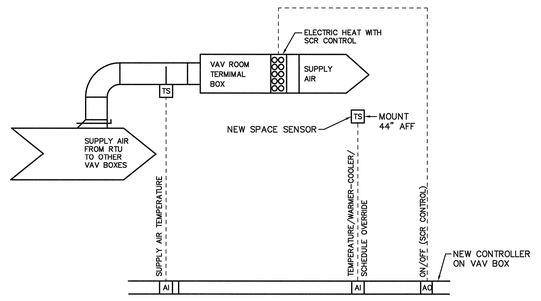
REGISTER, GRILLE & DIFFUSER SCHEDULE

SYMBOL	C.F.M.	NECK SIZE	TYPE	RUNOUT SIZE	REMARKS
(A)	0-750	22"X22"	2'X2' LAY-IN R.A. REGISTER	-	



A M-102 VAV ROOM TERMINAL BOX DETAIL

SCALE: NONE



TYPICAL VAV ROOM TERMINAL BOXES

SEQUENCE OF OPERATION

A. THE VARIABLE VOLUME (VAV) TERMINAL UNIT SHALL BE CONTROLLED IN STANDALONE MODE AND INDEPENDENT OF SYSTEM PRESSURE FLUCTUATIONS BY AN DDC CONTROLLER UTILIZING ELECTRIC ACTUATION.

B. BOX INLET AIR VALVE POSITION SHALL MODULATE BASED ON SPACE TEMPERATURE SETPOINTS COMPARED TO SUPPLY AIR TEMPERATURE. WITH A DROP IN SPACE TEMPERATURE BELOW COOLING SETPOINT, COOLING CFM SHALL MODULATE FROM MAXIMUM TO MINIMUM. AS SPACE TEMPERATURE CONTINUES TO DROP BELOW HEATING SETPOINT, BOX'S INLET CFM SHALL INCREASE TO HEATING CFM INDICATED AND BOX'S ELECTRIC HEAT SHALL BE ENERGIZED IN STAGES. UPON A RISE IN SPACE TEMPERATURE, THE REVERSE SEQUENCE SHALL OCCUR.

C. SPACE TEMPERATURE SENSOR SHALL PROVIDE FOR SPACE TEMPERATURE WARMER/COOLER ADJUSTMENT WITH PROGRAMMED RANGE LIMITS. SPACE TEMPERATURE SETPOINTS SHALL HAVE OCCUPIED AND UNOCCUPIED SCHEDULE PROGRAMMING.

D. ACTIVATION OF THE OVERRIDE PUSHBUTTON AT THE SPACE TEMPERATURE SENSOR SHALL SWITCH ROOM TERMINAL UNIT CONTROL SEQUENCES FROM THE UNOCCUPIED TO THE OCCUPIED MODE FOR A PROGRAMMABLE TIME PERIOD.

C M-102 CONTROL DIAGRAMS

SCALE: NONE

REVISION	
DATE	DESCRIPTION

VAV BOX REPLACEMENT
BRUNSWICK COUNTY GOVERNMENT COMPLEX
BUILDING B - ANNEX
BOLIVIA, NORTH CAROLINA

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
1425 STONE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PH: (910)452-4210 FAX: (910)452-4211
E-MAIL: CHEATHAM@CHEATHAMPA.COM
NC LICENSE #C-1073

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER SEAL 17856 KENNETH LYNCH

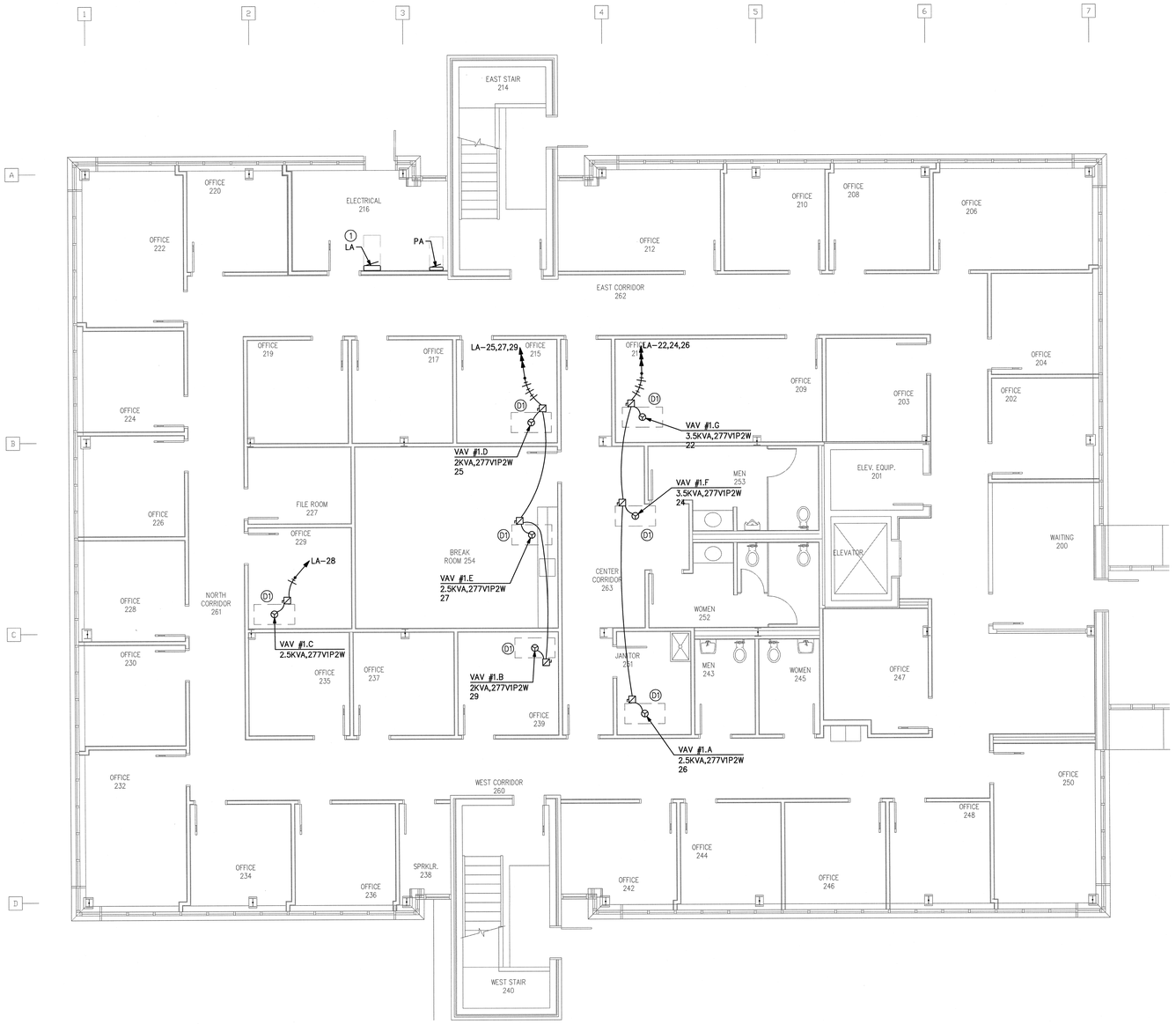
DESIGNED BY	KL
DRAWN BY	TWT
CHECKED BY	KL
JOB NUMBER	19015

BUILDING B 2ND FLOOR VAV BOX REPLACEMENT

SHEET M-102

OF OF 2

DATE APRIL 12, 2019



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

GRAPHIC SCALE: 0 2 4 8 (1"=1'-0")
PLAN NORTH
TRUE NORTH

KEYED NOTES – DEMOLITION WORK:

(D1) DISCONNECT EXISTING VAV BOX POWER TO ACCOMMODATE REMOVAL. REMOVE EXISTING 120V CIRCUITRY BACK TO SOURCE PANEL PA FOR EXISTING VAV BOX TO BE REMOVED. NEW CIRCUITRY FOR NEW EQUIPMENT SHALL BE AS INDICATED.

KEYED NOTES – NEW WORK:

(1) EXISTING PANEL LA (SQUARE–D NF TYPE, CATALOG #I225478843002000l). PROVIDE (5) 15A/1P (18kAIC) CIRCUIT BREAKERS AT POSITIONS 25,26,27,28, AND 29. UTILIZE EXISTING SPARE CIRCUIT BREAKERS AT POSITIONS 22 AND 24.

LA (EXISTING PANEL)

ROOM: ELECTRICAL 216
MOUNTING: SURFACE
FED FROM: MDA
NOTE: EXISTING SQUARE–D NF TYPE

VOLTS: 480Y/277V 3P 4W
BUS AMPS: 100
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	20/1	EXIT LTG	0.3			2	20/1	1ST FLOOR LTG	2.57		
3	20/1	EMERGENCY LTG		1.88		4	20/1	1ST FLOOT LTG		2.16	
5	20/1	EMERGENCY LTG			1.39	6	20/1	1ST FLOOR LTG			2.19
7	20/3	FAN BOX 1.10	1.27			8	20/1	CORRIDOR LTG	1.13		
9	|	|		1.27		10	20/1	FAN BOX 1.2		3.04	
11	|	|			1.27	12	30/1	FAN BOX 1.1			5.53
13	20/1	FAN BOX 1.8	4.03			14	30/1	FAN BOX 1.3	5.53		
15	20/1	FAN BOX 1.9		3.04		16	30/1	FAN BOX 1.4		5.53	
17	20/1	ELEC WALL HTR			1	18	20/1	FAN BOX 1.5			4.03
19	20/1	FAN BOX 1.7	3.04			20	20/1	FAN BOX 1.6	2.27		
21	20/1	ELEC WALL HTR		3		22	20/1	(*) VAV #1.G		3.5	
23	20/1	ELEC WALL HTR			3	24	20/1	(*) VAV #1.F			3.5
25	15/1	(**) VAV #1.D	2			26	15/1	(**) VAV #1.A	2.5		
27	15/1	(**) VAV #1.E		2.5		28	15/1	(**) VAV #1.C		2.5	
29	15/1	(**) VAV #1.B			2	30	–/1	SPACE ONLY			0
								TOTAL CONNECTED KVA BY PHASE	24.6	28.4	23.9
								TOTAL CONNECTED AMPS BY PHASE	88.9	103	86.3

	CONN KVA	CALC KVA			CALC KVA
LIGHTING	11.6	14.5	(125%)	TOTAL LOAD	81.2
LARGEST MOTOR	5.53	1.38	(25%)	BALANCED 3–PHASE AMPS	97.7
HEATING	65.3	65.3	(100%)		
COOLING	39.8	0	(0%)		

(*) NEW LOAD ON EXISTING C/B; (**) NEW C/B

ABBREVIATIONS

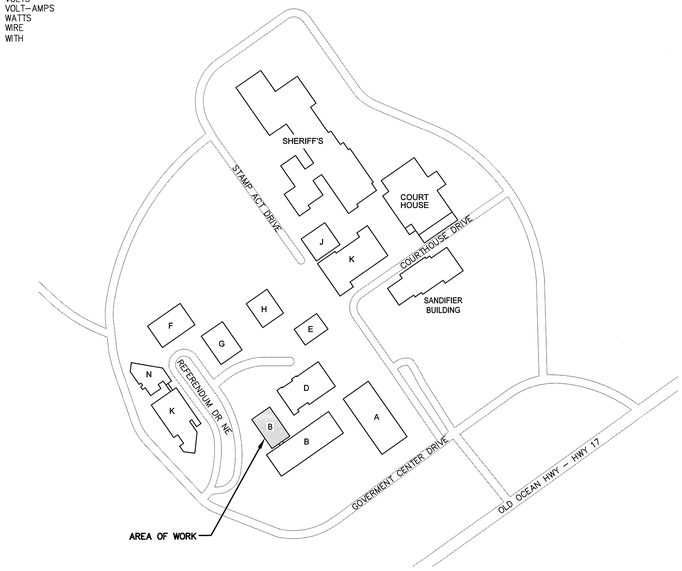
AFF	ABOVE FINISHED FLOOR
AIC	AMPS INTERRUPTING CAPABILITY
BKR	BREAKER
C	CONDUIT
C/B	CIRCUIT BREAKER
CLG	CEILING
CKT	CIRCUIT
CU	COPPER
DIA	DIAMETER
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSED
EXSTG	EXISTING
G	EQUIPMENT GROUND
IMC	INTERMEDIATE METAL CONDUIT
K	KILO (THOUSAND)
LED	LIGHT EMITTING DIODE
LTG	LIGHTING
MC	MECHANICAL CONTRACTOR
MCB	MAIN CIRCUIT BREAKER
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
NTS	NOT TO SCALE
P	PHASE OR POLE
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
PVC	POLYVINYL CHLORIDE
REQ.	REQUIRED
RGC	RIGID GALVANIZED CONDUIT
RGS	RIGID GALVANIZED STEEL
S/N	SOLID NEUTRAL
TYP	TYPICAL
UL	UNDERWRITERS LABORATORY
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
V	VOLTS
VA	VOLT–AMPS
W	WATTS
W	WIRE
W/	WITH

MISC. ELECTRICAL SYMBOL LEGEND

- EQUIPMENT CONNECTION
- PANELBOARD, SEE PANEL SCHEDULE
- HOMERUN DESIGNATION, #12 CONDUCTORS UNLESS NOTED OTHERWISE.
  - EQUIPMENT GROUND CONDUCTOR
  - PHASE CONDUCTOR
  - NEUTRAL CONDUCTOR
- DISCONNECT PROVIDED WITH EQUIPMENT — BY EC
- A / E–508 — LETTER INDICATES ELEVATION OR DETAIL; NUMBER INDICATES PLAN OR SECTION; SHEET NUMBER WHERE PLAN, SECTION, ELEVATION OR DETAIL IS DRAWN

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 BID.
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 **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. COORDINATE DEVICE AND EQUIPMENT MOUNTING HEIGHTS WITH OTHER DISCIPLINE DRAWINGS, CASEWORK DETAILS & SUBMITTALS, EQUIPMENT DETAILS & SUBMITTALS, ETC.
10. 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.
11. PENETRATIONS OF SMOKE PARTITIONS SHALL BE SEALED IN ACCORDANCE WITH REQUIREMENTS OF THE STATE BUILDING CODE. COORDINATE WORK TO INSURE THAT SMOKE PARTITION SEALING IS COMPLETED.
12. 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.
13. COORDINATE PRECISE LOCATION OF HVAC EQUIPMENT WITH THE MECHANICAL CONTRACTOR.
14. FOR HVAC EQUIPMENT, VERIFY CIRCUIT BREAKER RATINGS, FUSE RATINGS, AND WIRE SIZES. IF RATINGS DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE 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.
15. IF HORSEPOWER OR LOAD RATINGS OF EQUIPMENT DIFFER FROM THOSE INDICATED ON THE DRAWINGS, NOTIFY THE 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 , 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. ABANDONED CIRCUITRY (RACEWAY & CONDUCTORS) SHALL BE REMOVED IN ITS ENTIRETY FROM ITS SOURCE. ABANDONED LOW VOLTAGE CABLING SHALL BE REMOVED IN ITS ENTIRETY UNLESS OTHERWISE NOTED.
22. SHARED NEUTRAL CONDUCTORS SHALL NOT BE USED UNLESS SPECIFICALLY INDICATED SO ON HOMERUN CIRCUITRY DESIGNATIONS.
23. 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.
24. LOAD CIRCUITS SHALL BE INSTALLED AS INDICATED ON THE DRAWINGS. CIRCUITRY REVISIONS WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING BY THE ENGINEER.



KEY PLAN
SCALE: NONE

REVISION

DATE	DESCRIPTION

VAV BOX REPLACEMENT
BRUNSWICK COUNTY GOVERNMENT COMPLEX
BUILDING B – ANNEX
BOLIVIA, NORTH CAROLINA

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PHONE: (910) 452–0181 FAX: (910) 452–4211
E–MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C–1073

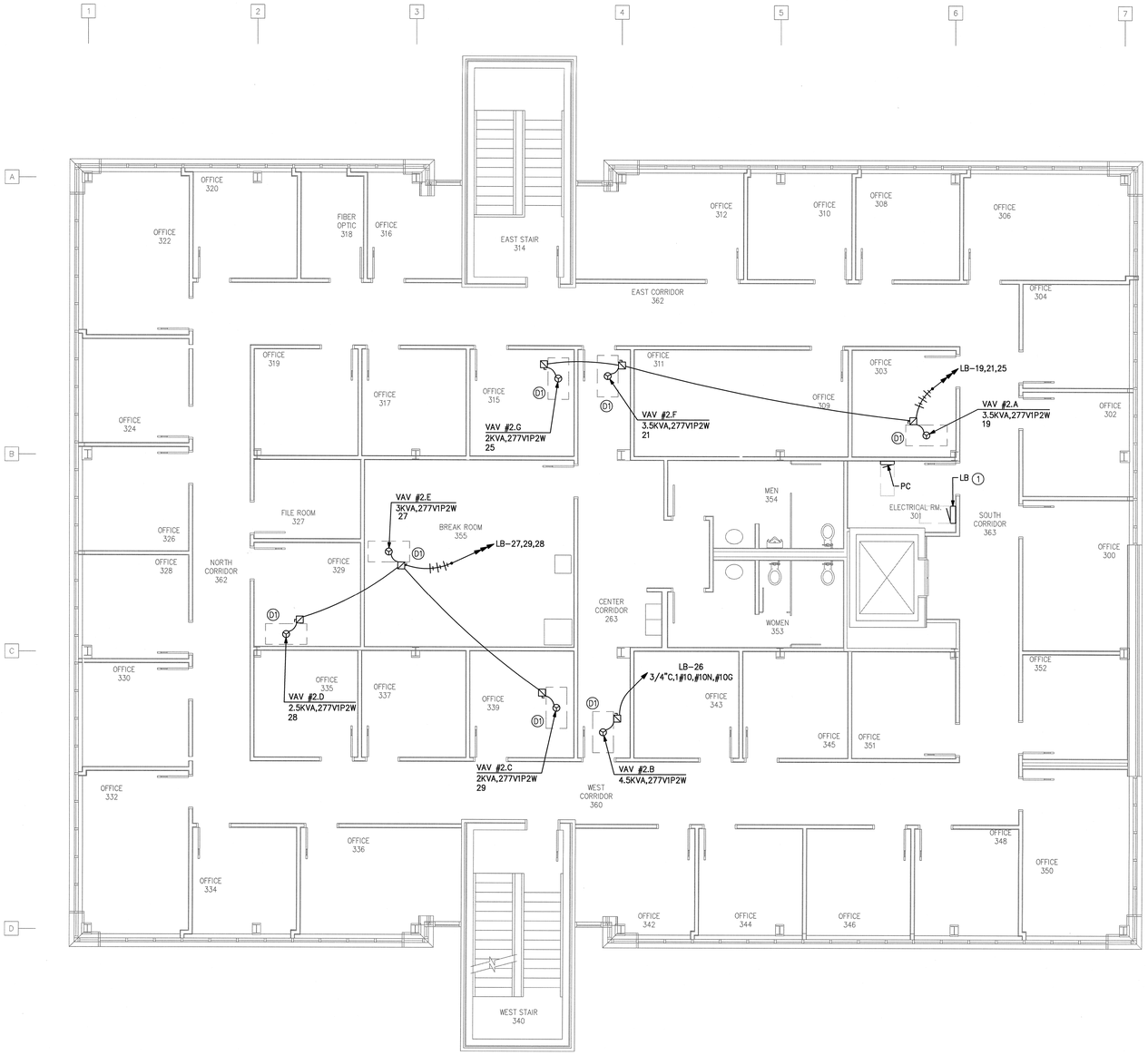
PROFESSIONAL ENGINEER SEAL 17599 MARK A. CIARROCCA

DESIGNED BY	KAF
DRAWN BY	KAF
CHECKED BY	MAC
JOB NUMBER	19015

ELECTRICAL NOTES, LEGEND, SCHEDULE, & FIRST FLOOR POWER PLAN

SHEET
E–101
OF DF 2.

DATE
APRIL 12, 2019



1 E-102 ELECTRICAL POWER PLAN
SCALE: 3/16" = 1'-0"

GRAPHIC SCALE: 1/8"=1'-0"
0 2 4 8
PLAN NORTH
TRUE NORTH

KEYED NOTES – DEMOLITION WORK:

(D1) DISCONNECT EXISTING VAV BOX POWER TO ACCOMMODATE REMOVAL. REMOVE EXISTING 120V CIRCUITRY BACK TO SOURCE PANEL PA FOR EXISTING VAV BOX TO BE REMOVED. NEW CIRCUITRY FOR NEW EQUIPMENT SHALL BE AS INDICATED.

KEYED NOTES – NEW WORK:

(1) EXISTING PANEL LB (SQUARE-D NF TYPE, CATALOG #I225478843003000I), PROVIDE (4) 15A/1P (18kAIC) CIRCUIT BREAKER AT POSITIONS 25,27,28, AND 29. PROVIDE (1) 25A/1P (18kAIC CIRCUIT BREAKER AT POSITION 26. UTILIZE EXISTING SPARE CIRCUIT BREAKERS AT POSITIONS 19 AND 21.

LB (EXISTING PANEL)

ROOM: ELECTRICAL 301
MOUNTING: SURFACE
FED FROM: MDA
NOTE: EXISTING SQUARE-D NF TYPE

VOLTS: 480Y/277V 3P 4W
BUS AMPS: 100
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	20/1	CORRIDOR LTG	1.1			2	20/1	FAN BOX 2.1	4.03		
3	20/1	LTG		2.27		4	20/1	FAN BOX 2.4		2.27	
5	20/1	LTG			1.7	6	30/1	FAN BOX 2.2			5.18
7	20/1	LTG	1.88			8	30/1	FAN BOX 2.3	5.18		
9	20/1	LTG		1.66		10	30/1	FAN BOX 2.7		5.18	
11	20/1	SPARE			0	12	30/1	FAN BOX 2.5			5.18
13	20/1	FAN BOX 2.10	4.03			14	20/1	FAN BOX 2.6	4.03		
15	20/1	FAN BOX 2.9		3.04		16	20/1	SPARE		0	
17	20/1	FAN BOX 2.8			4.03	18	20/1	SPARE			0
19	20/1	(*) VAV #2.A	3.5			20	20/1	SPARE	0		
21	20/1	(*) VAV #2.F		3.5		22	20/1	SPARE		0	
23	20/1	SPARE			0	24	20/1	SPARE			0
25	15/1	(**) VAV #2.G	2			26	25/1	(**) VAV #2.B	4.5		
27	15/1	(**) VAV #2.E		3		28	15/1	(**) VAV #2.D		2.5	
29	15/1	(**) VAV #2.C			2	30	–/1	SPACE ONLY			0
								TOTAL CONNECTED KVA BY PHASE	30.3	23.4	18.1
								TOTAL CONNECTED AMPS BY PHASE	109	84.6	65.3

	CONN KVA	CALC KVA			CALC KVA
LIGHTING	8.6	10.8	(125%)	TOTAL LOAD	75.2
LARGEST MOTOR	5.18	1.3	(25%)	BALANCED 3-PHASE AMPS	90.5
HEATING	63.2	63.2	(100%)		
COOLING	63.2	0	(0%)		

(*) NEW LOAD ON EXISTING C/B; (**) NEW C/B

REVISION	
DATE	DESCRIPTION

VAV BOX REPLACEMENT
BRUNSWICK COUNTY GOVERNMENT COMPLEX
BUILDING B – ANNEX
BOLIVIA, NORTH CAROLINA

CHEATHAM AND ASSOCIATES, P.A.
CONSULTING ENGINEERS
3412 ENTERPRISE DRIVE
WILMINGTON, NORTH CAROLINA 28405
PHONE: (910)452-4510 FAX: (910)452-4211
E-MAIL: OFFICE@CHEATHAMPA.COM
NC LICENSE #C-1073

NORTH CAROLINA REGISTERED PROFESSIONAL ENGINEER 17526 MARK A. CIARROCCA
11 APR 2019

DESIGNED BY	KAF
DRAWN BY	KAF
CHECKED BY	MAC
JOB NUMBER	19015

ELECTRICAL SCHEDULE AND SECOND FLOOR POWER PLAN

SHEET
E-102

OF DF 2.

DATE
APRIL 12, 2019

BRUNSWICK COUNTY MINIMUM INSURANCE COVERAGE REQUIREMENTS

At contractor's expense, contractor shall procure and maintain the following recommended lines of insurance according the scope of work. The County may choose to elect higher or lower coverages according to the work performed. Contractors must be insurered by a licensed agent in North Carolina and rated A-VII or better by A.M. Best.

A. COMMERCIAL GENERAL LIABILITY
Covering all operations involved in this Agreement.
$2,000,000 General Aggregate
$2,000,000 Products/Completed Operations Aggregate
$1,000,000 Each Occurrence
$1,000,000 Personal and Advertising Injury Limit
$ 5,000 Medical Expense Limit

B. WORKERS' COMPENSATION
Statutory limits covering all employees, including Employer's Liability with limits of:
$500,000 Each Accident
$500,000 Disease - Each Employee
$500,000 Disease - Policy Limit

C. COMMERCIAL AUTOMOBILE LIABILITY
$1,000,000 Combined Single Limit – Any Auto

D. PROFESSIONAL LIABILITY
$1,000,000 Per Occurrence

E. POLLUTION LIABILITY INSURANCE
$1,000,000 Per Occurrence

When a contractor is required to bind pollution/environmental coverage, the contractor must provide evidence of continuation or renewal of liability insurance for a period of three (3) years following termination of the agreement.

ADDITIONAL INSURANCE AND INDEMNIFICATION REQUIREMENTS

A. Contractor agrees to defend, indemnify, and hold harmless Brunswick County, its officers, employees, and agents from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees, or other expenses or liabilities of every kind and character arising out of or relating to any and all claims, liens, demands, obligations, actions, proceedings, or causes of action of every kind in connection with or arising out of this Agreement and/or the performance hereof that are due in part or in the entirety of Contractor, its employees or agents. Contractor further agrees to investigate, handle, respond to, defend and dispose of same at its sole expense and agrees to bear all other costs and expenses related thereto.

The Contractor's General Liability policy shall be endorsed, specifically or generally, to include the following as Additional Insured:
BRUNSWICK COUNTY, ITS OFFICERS, AGENTS AND EMPLOYEES ARE INCLUDED AS ADDITIONAL INSURED UNDER CONTRACTOR'S GENERAL LIABILITY INSURANCE.

B. Before commencement of any work or event, Contractor shall provide a Certificate of Insurance in satisfactory form as evidence of the insurances required above.

C. Contractor shall have no right of recovery or subrogation against Brunswick County (including its officers, agents and employees), it being the intention of the parties that the insurance policies so affected shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

D. Brunswick County shall have no liability with respect to Contractor's personal property whether insured or not insured. Any deductible or self-insured retention is the sole responsibility of Contractor.

E. All certificates of insurance must provide that the policy or policies shall not be changed or cancelled without at least thirty (30) days prior written notice.

F. The Certificate of Insurance should note in the Description of Operations the following:
Department: Operation Services
Contract #: _____

G. Insurance procured by Contractor shall not reduce nor limit Contractor's contractual obligation to indemnify, hold harmless and defend Brunswick County for claims made or suits brought which result from or are in connection with the performance of this Agreement.

H. In the event Contractor receives Notice of Cancellation of Insurance required pursuant to this Agreement, Contractor shall immediately cease performance of all services and shall provide Notice to Brunswick County's Legal/Risk Management personnel within twenty-four (24) hours.

I. Certificate Holder shall be listed as follows;
ATTENTION: Brunswick County Risk Manager
30 Government Center Dr. NE
P.O. Box 249
Bolivia, NC 28422

J. If Contractor is authorized to assign or subcontract any of its rights or duties hereunder and in fact does so, Contractor shall ensure that the assignee or subcontractor satisfies all requirements of this Agreement, including, but not limited to, maintenance of the required insurances coverage and provision of certificate(s) of insurance and additional insured endorsement(s), in proper form prior to commencement of services.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS:

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

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

After the proposals are recieved - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low Bidder, the Bidder shall then file within seventy-two (72) hours of the notification of being the apparent lowest Bidder, the following:

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

OR

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

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

Identification of Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following Minority Business Enterprises (MBE) as construction subcontractors, vendors, suppliers, or providers of professional services.

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

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

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

Brunswick County AFFIDAVIT A – Listing of Good Faith Efforts

(Name of Bidder)

Affidavit of_____

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

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

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the Contractor, or available on State or local government-maintained lists, at least ten (10) days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 – (10 pts)** Made the construction plans, specifications, and requirements available for review by prospective minority businesses, or providing these documents to them at least ten (10) days before the bids are due.
- ❑ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses that provide assistance in recruitment of minority businesses.
- ❑ **5 – (10 pts)** Attended pre-bid meetings scheduled by the owner.
- ❑ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for Subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the Bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10 – (20 pts)** Provided quick pay agreements and policies to enable minority Contractors and suppliers to meet cash-flow demands.
- ❑ **11 – (20 pts)** A minimum of two (2) or all, if only one (1) is indicated, of the MBE firms indicated on the "Identification of Minority Business Participation" form are **Brunswick County** based.

The undersigned, if apparent low Bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of Contract to be executed with the Owner. Substitution of Contractors must be in accordance with NCGS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the Contract.

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title: _____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

Brunswick County **AFFIDAVIT B – Intent to Perform Contract with Own Workforce**

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform one hundred percent (100%) of the work required for the

_____ Contract.
(Name of Project)

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

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

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

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

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

Notary Public _____

My commission expires _____

Brunswick County AFFIDAVIT C – Portion of the Work to be Performed by Minority Firms

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

If the portion of the work to be executed by minority businesses as defined in NCGS143-128.2(g) is equal to or greater than the percentage goal listed in the Notice to Bidders of the Bidders total Contract price, then the Bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **seventy-two (72) hours** after notification of being low Bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the Contract with Minority Business Enterprises. Minority businesses will be employed as construction Subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required

Name and Phone #	*Minority Category	Work Description	Dollar Value

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

Pursuant to NCGS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a Contract with the Owner. Failure to fulfill this commitment may constitute a breach of the Contract.

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

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of_____, County of _____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires_____

Brunswick County AFFIDAVIT D – Good Faith Efforts

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

If the percentage goal of participation by minority business listed in the Notice to Bidders **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the Contract with Minority Business Enterprises. Minority businesses will be employed as construction Subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone #	*Minority Category	Work Description	Dollar Value

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

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

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

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

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

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

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

F. Copy of pre-bid roster.

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

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

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

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

Pursuant to NCGS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a Contract with the Owner. Failure to fulfill this commitment may constitute a breach of the Contract.

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

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

Notary Public_____

My commission expires _____