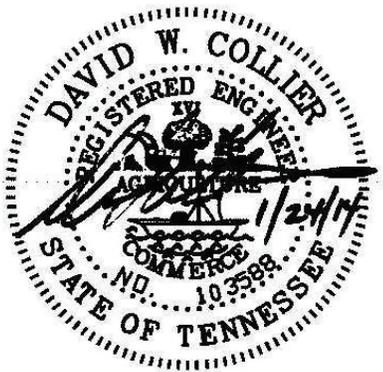


PROJECT MANUAL

HVAC RENOVATIONS AT HENDERSON COUNTY COURTHOUSE LEXINGTON, TENNESSEE

PHASE 2

PROJECT 13-061



January 24, 2014

DW Collier Engineering, Inc.
720 Broadway Street, Suite 100
South Fulton, Tennessee 38257

HVAC RENOVATIONS
at
Henderson County Courthouse
Phase 2

LEXINGTON, TENNESSEE

TABLE OF CONTENTS

DIVISION 0 **BIDDING REQUIREMENTS, CONTRACT FORMS, & CONDITIONS OF THE CONTRACT**

 Bid Form

DIVISION 1 **GENERAL REQUIREMENTS**

 Section 01560 Temporary Controls

 Section 01600 Materials and Equipment

DIVISION 15 **MECHANICAL SPECIFICATIONS**

 Section 15010 Basic Mechanical Requirements

 Section 15140 Supports and Anchors

 Section 15190 Mechanical Identification

 Section 15260 Piping Insulation

 Section 15290 Duct Work Insulation

 Section 15510 Hydronic Piping

 Section 15610 Duct Work

 Section 15990 Test and Balance

END OF TABLE OF CONTENTS

BID FORM

DATE: _____

TO: Jennifer Fesmire
Henderson County Director of Finance
17 Monroe St., 2nd Floor
PO Box 495
Lexington, TN 38351

FROM: _____
(NAME OF BIDDER)

(ADDRESS OF BIDDER)

(CITY, STATE, AND ZIP CODE)

FOR: HVAC Renovations at Henderson County Courthouse
Phase 2
Lexington, Tennessee

The undersigned, as Bidder, hereby declares that the only person, or persons, interested in the Bid as principal or principals, is or are, named herein and that no other person than herein mentioned has any interest in this Bid or in the contract to be entered into; that this Bid is made without connection with any other person, company or parties, making a bid, and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the places where the Work is to be done, that he has examined the Drawings and the Project Manual for the Work and The Contract Documents relative to the Work to be performed.

The Bidder proposes and agrees, if this Bid is accepted, to contract with the Owner in the form of contract as provided by the owner, furnishing thereby all services, labor, and materials to complete the construction of the project in full and complete accordance with the noted, described, and reasonably intended requirements of the Contract Documents.

The Bidder, if awarded a contract, and assuming receiving a Notice to Proceed within 2 calendar days of bid date hereby agrees to commence work under this contract on or before the date specified by the Owner and to achieve Substantial Completion of the project on or before June 1, 2014. THE SYSTEM MUST BE AVAILABLE TO PROVIDE COOLING FOR THE FACILITY ON OR BEFORE MAY 9, 2014.

The Bidder agrees to perform all of the work described in the Construction Documents for a lump sum price of:

_____ (\$ _____)

Base Bid

List of Sub Contractors:

1. _____

2. _____

3. _____

The Bidder offers the following Alternates to the Base Bid. These Alternates add to the above base bid.

Alternate No. 1: _____

Add _____

The Bidder agrees that his bid may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

The Bidder acknowledges by his signature that the Owner reserves the right to reject any and all bids, to evaluate bids and to accept any bid or bids which, in his opinion, may be in the best interest of the Owner.

The Undersigned hereby affirms and states that the prices quoted herein constitute the gross total costs for the work involved in the respective items and that this cost also includes taxes, insurance, royalties, transportation charges, use of tools and equipment, superintendents, overhead, profits and other work, services, and conditions necessarily involved in the work done and the materials furnished, in accordance with the requirements of the Contract.

Receipt of the following Addenda to the Contract Documents is acknowledged:

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

After Notice to Proceed is received, the Bidder will immediately begin and complete our work within the contract time.

By: _____
Signature and Title Date

Firm Name: _____
State of Incorporation

Mailing Address: _____
Post Office Box or Street Address

City State Zip Code

Telephone Number

Contractor's License No. _____
Expiration Date

License Classification Applying to Bid: _____

(Affix Corporate Seal)

END OF BID FORM

SECTION 01560 TEMPORARY CONTROLS

REQUIREMENTS INCLUDED

1. Provide and maintain methods, equipment and temporary construction, as necessary to provide control over environmental conditions at the construction site and related areas under contractor's control; remove physical evidence of temporary facilities at completion of work. Coordinate specific requirements for noise and dust and debris control with Owner.

DUST CONTROL

1. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere or other areas of existing buildings, as applicable.

DEBRIS CONTROL

1. Maintain all areas under contractor's control free of extraneous debris.
2. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
 - a. Provide containers for deposit of debris
 - b. Prohibit overloading of trucks to prevent spillage's on access and haul routes
 - c. Provide periodic inspection of traffic areas to enforce requirements.
3. Schedule periodic collection and disposal of debris.
 - a. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

POLLUTION CONTROL

1. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
2. Provide equipment and personnel, perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids.
 - a. Excavate and dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
3. Take special measures to prevent harmful substances from entering public waters.
 - a. Prevent disposal of waste, effluents, chemicals, or other such substance adjacent to streams, or in sanitary sewers.
4. Provide system for control of atmospheric pollutants.
 - a. Prevent toxic concentrations of chemicals.
 - b. Prevent harmful dispersal of pollutants into the atmosphere.
5. Asbestos has been determined to be present in certain areas of the proposed construction activities. Care shall be exercised as necessary in the areas of the insulated hydronic heating piping and the insulated domestic water piping. The owner has contracted with a licensed abatement firm to remove the insulation from these systems in the vicinity of the work. Other portions of these systems shall not be disturbed.

END OF SECTION 01560

SECTION 01600 MATERIAL AND EQUIPMENT

PART 1 GENERAL

SECTION INCLUDES

1. Products.
2. Transportation and handling.
3. Storage and protection.
4. Product options.
5. Substitutions.

PRODUCTS

1. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
2. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
3. Provide interchangeable components of the same manufacturer, for similar components.

TRANSPORTATION AND HANDLING

1. Transport and handle products in accordance with manufacturer's instructions.
2. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
3. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

STORAGE AND PROTECTION

1. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
2. For exterior storage of fabricated products, place on sloped supports, above ground.
3. Provide off-site storage and protection when site does not permit on-site storage or protection.
4. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
5. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.
6. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
7. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

PRODUCT OPTIONS

1. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
2. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
3. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

SUBSTITUTIONS

1. Engineer will consider requests for Substitutions only during the bidding period to requirements specified in this Section.
2. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
3. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
4. A request constitutes a representation that the Bidder
 - a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - b. Will provide the same warranty for the Substitution as for the specified product.
 - c. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - d. Waives claims for additional costs or time extension which may subsequently become apparent.
 - e. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
5. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION 01600

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Replacement of air handlers, condensing units, VAV terminals, and controls.

1.2 RELATED WORK

- A. Division 1 - General Requirements: All applicable requirements apply to the Work of this Section unless otherwise amended.

- B. Plumbing System: As described by the following sections.

Not Applicable.

- C. Fire Protection System: As described by the following sections.

Not Applicable.

- D. Heating, Ventilating, and Air Conditioning System: As described by the following sections.

1. Section 15140 - Supports and Anchors.
2. Section 15190 - Mechanical Identification.
3. Section 15260 - Piping Insulation
4. Section 15290 - Ductwork Insulation.
5. Section 15510 - Hydronic Piping
6. Section 15610 - Ductwork.
7. Section 15990 - Test and Balance

1.3 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEM DESCRIPTION

- A. Provide complete operational heating, ventilating, and air conditioning system as follows:

1. New VAV air handlers
2. Condensing units with refrigerant piping
3. VAV terminals with hot water coils and piping
4. New ductwork in basement
5. New controls. Controls shall be by Trane and shall be an extension of the BAC system at the Henderson County Justice Center
6. Misc electrical and concrete work

1.4 TESTING

- A. Provide analysis and testing required by the individual respective Sections.

1.5 SUBMITTALS

- A. All equipment shall be submitted, with descriptive data, to the Designer for approval or rejection. All equipment shall be submitted in an indexed, bound brochure with six copies. All items shall be submitted at one time. Partial pre-submittals will be considered only as an expediency upon special request.
- B. Each submittal brochure shall be signed, on the index page by Contractor. This signature shall indicate the Contractor has examined all data therein and found same to be in order.
- C. All items submitted that are not as submitted shall have any and all characteristics that differ clearly highlighted.

1.6 COORDINATION

- A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all of the contract documents and shall verify this information at the building site. **THE DESIGN DRAWINGS ARE NOT INTENDED AS SHOP DRAWINGS AND THE CONTRACTOR SHALL VERIFY ALL SPACE REQUIREMENTS AND CLEARANCES FOR THE INSTALLATION OF THE MECHANICAL WORK WITH THE WORK OF ALL OTHER TRADES PRIOR TO BEGINNING ANY DUCT OR PIPE FABRICATION OR INSTALLATION.** Failure to properly coordinate all work prior to installation shall result in the Contractor correcting all misplaced work at no cost to the Owner.
- B. The drawings indicate required size and pints of termination of pipes and ducts, and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to install piping and ducts in such a manner as to conform to structure, avoid obstructions, preserve headroom, and keep openings and passageways clear without further instruction or cost to the Owner.
- C. Shop drawings shall be furnished by this section, indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.
- D. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings.
- E. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the space available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.
- F. The Contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of the other trades, and report to the Architect any discrepancies or interferences that are discovered. Failure to report such discrepancies and interferences shall result in the correcting of these errors or omissions by the Contractor at his own expense. All work installed under this division which deviates from the drawings

and specifications without prior approval of the Architect shall be altered by the Contractor at his own expense to comply with the drawings and specifications as directed by the Architect.

1.7 REGULATORY REQUIREMENTS

- A. All work shall be executed and inspected in accordance with all local or state codes, laws, ordinances, rules and regulations applicable to the particular class of work. The Contractor shall include in his quotation all applicable service charges, fees, permits, royalties, and other similar costs in connection therewith. If, to the knowledge of the Contractor, the drawings or specifications are at variance with the above mentioned laws, rules, and regulations, he shall promptly notify the Architect in writing so any necessary changes can be provided for in his contract. If the Contractor performs any work without notice as required above, he shall bear all costs arising therefrom.

1.8 PROJECT RECORD DOCUMENTS

- A. Heating, Ventilating, and Air Conditioning System: provide record "as built" drawings indicating final heating, ventilating, and air conditioning system.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01705 - Project Closeout.
- B. Submit data as required by each respective section.

1.10 GUARANTEE

- A. Contractor shall guarantee all work performed under this contract to be free from defects in materials and workmanship for a period of one year from the general contractors date of substantial completion. Latent defects arising during this period shall, upon notification by the owner and architect, be promptly corrected by the contractor at no additional cost to the Owner.
- B. Air cooled compressors shall have extended 5-year warranties; one year parts and labor and additional four years parts only.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Use only new and undamaged materials as specified in the respective related sections.

2.2 EQUIPMENT FURNISHED BY OTHERS

- A. Make final connections to all equipment as indicated on the drawings. Coordinate with the equipment supplier. Make all final connections per the manufacturer's installation instructions.

2.3 SUBSTITUTIONS

- A. Submit only materials which meet or exceed all requirements of those specified.

PART 3 EXECUTION

3.1 EXECUTION

- A. Execute all work in accordance with the requirements of the Contract Documents.
- B. Install all equipment, devices, accessories, etc. in strict accordance with the Manufacturer's installation guidelines and recommendations.

3.2 WORKMANSHIP

- A. All work required by the respective related sections shall be performed by a mechanic or craftsman with a demonstrated ability to perform the work required.
- B. Perform all work to local established trade standards.

3.3 STARTERS

- A. It shall be the responsibility of this section to furnish all required starters and motor controllers for all mechanical devices. Starters shall be equipped with all accessory inputs necessary to accomplish the specified sequence of operations.
- B. Starters shall be mounted and wired by Division 16.
- C. Starters shall be weatherproof where required.
- D. Manual Controllers
 - 1. Manual Motor Controller:
NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for overload element, red pilot light, auxiliary contact, and push button operator.
 - 2. Fractional Horsepower manual Controller:
NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, pilot light, and toggle operator.
- E. Magnetic Controllers
 - 1. Magnetic starters shall be NEMA 2 or NEMA 4 (combination non-fused for 3-phase motors) type with auxiliary contacts as required to match the specified sequence of control. Starters shall be Furnas, Allen and Bradley or Cutler hammer - no other substitutes.
 - 2. Starters shall have solid state overload protection.
 - 3. Auxiliary contracts shall be normally open or normally closed as required for proper control. Provide integral control transformers when required, with fused primary and secondary. Refer to the sequence of operations for all systems and provide auxiliary

contacts as starters as necessary. (Including Fire Alarm System Interlock)

3.4 SITE REVIEWS

- A. No piping "Plumbing, Gas or Drainage" shall be covered or concealed until reviewed by the Architect or Engineer. If the work is concealed without their approval it shall be uncovered at the expense of the Contractor.
- B. The Contractor shall notify the Architect when the work is at a point to be observed.

3.5 SERVICE CONNECTIONS

- A. Make arrangements for the new gas service to the building with the local utility company and pay all cost for the services, connection to the main in the street and for the meter assembly.

3.6 SEISMIC RESTRAINTS FOR MECHANICAL

- A. Provide seismic restraints in accordance with the requirements of the Standard Building Code, for the following:
 - 1. All natural gas piping.
 - 2. All other piping 2-1/2" diameter and larger and all conduits 2-1/2" diameter or larger. Exception: Piping suspended by individual hangers 12" or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
 - 4. All rectangular ducts with cross-sectional area 6 square foot or larger. Exception: No bracing is required if the duct is suspended by hangers 12" or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2" of the top of the duct with a minimum of two #10 sheetmetal screws.
- B. Restraints for ductwork and piping (where required) shall be in accordance with S.M.A.C.N.A. Seismic Restraint Manual as applicable for each portion of the work.
- C. Where possible, hangers and supports for ducts and pipes shall not exceed a length of 12".
- D. All seismic bracing components and devices shall be by a single manufacturer. Components shall be MASON Industries or approved equivalent.

END OF THIS SECTION.

SECTION 15140

SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Pipe and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.02 RELATED SECTIONS:

- A. Section 15420 - Natural Gas Piping

1.03 REFERENCES:

- A. ASME B31.1 - Power Piping.
- B. ASME B31.2 - Fuel Gas Piping.
- C. ASME B31.5 - Refrigeration Piping.
- D. ASME B31.9 - Building Services Piping.
- E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS:

- A. Manufacturers:
 - 1. a) Grinnel.
 - b) Or Equal.
- B. Gas Piping
 - 1. Conform to ASME B31.9.
 - 2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 inches and over: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

5. Hangers for Hot Pipe Sizes 6 inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
16. Roof Support: Polycarbonate pipe stand, Micro Industries Model 24R or Equal.

2.02 ACCESSORIES:

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.03 INSERTS:

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING:

- A. Metal Flashing: 26 gage galvanized steel.
- B. Metal Counter flashing: 22 gage galvanized steel.
- C. Lead Flashing:
 1. Waterproofing: 5 lb/ft² sheet lead.
 2. Soundproofing: 1 lb/ft² sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.05 EQUIPMENT CURBS:

Not used

2.06 SLEEVES:

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe of 18 gage galvanized steel.

- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Galvanized steel.
- E. Sleeves for Rectangular Ductwork: Galvanized steel.
- F. Fire stopping Insulation: Glass fiber type, non-combustible.
- G. Sealant: Acrylic.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. Install in accordance with manufacturer's instructions.

3.02 INSERTS:

- A. Provide inserts for placement in concrete formwork.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.03 PIPE HANGERS AND SUPPORTS:

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers within 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.

- J. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- K. All ductwork and piping shall be provided with seismic restraints in accordance with The Seismic Restraint Manual: Guidelines for Mechanical Systems dated 1991, as published by SMACNA and in accordance with local codes.
- L. Do not support new installations from existing duct work, piping, or conduit.

3.04 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extended 6 inches beyond supported equipment.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING:

- A. Provide flexible flashing and metal Counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on both sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on both sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp devise.
- D. Seal drains watertight to adjacent materials.
- E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.
- F. Provide curbs for mechanical roof installations 14 inches minimum height above roofing surface. Flash and counterflash with sheet metal; seal weathertight. Attach Counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- G. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.06 SLEEVES:

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.07 SCHEDULES:

HANGER ROD (inches)	PIPE SIZE (inches)	HANGER SPACING (feet)
3/8	1/2 to 1-1/4	6.5
3/8	1-1/2 to 2	10
1/2	2-1/2 to 3	10
5/8	4 to 6	10
7/8	8 to 12	14
5/8	PVC (all sizes)	6
1/2	C.I. Bell and Spigot (or No-Hub) and at Joints	5

END OF SECTION

SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.02 REFERENCES:

- A. ASME A13.1 - Scheme for the Identification of Piping Systems.

PART 2 - PRODUCTS

2.01 NAMEPLATES:

- A. Manufacturers:
 - 1. Brady, Seton or Carlton.
- B. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS:

- A. Manufacturers:
 - 1. Brady, Seton or Carlton.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Chart: Typewritten letter size list in anodized aluminum frame.

2.03 STENCILS:

Not used.

2.04 PIPE MARKERS:

- A. Manufacturers:
 - 1. Brady, Seton or Carlton.
- B. Color: Conform to ASME A13.1.
- D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

- E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 CEILING TACKS:

- A. Manufacturers:
 - 1. Brady, Seton or Carlton.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
 - 1. Yellow - HVAC equipment.
 - 2. Red - Fire dampers/smoke dampers.

2.06 PAINTING:

- A. Manufacturers: Products recognized for pipe application. Paint applied directly to elastomeric insulation shall be made specifically for that purpose.
- B. Description: Paint all exposed gas piping. Employ qualified craftsman with a minimum of three years experience in pipe painting.
- C. Color code as follows:
 - 1. Yellow - Natural Gas.

PART 3 EXECUTION

3.01 PREPARATION:

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces for painting.

3.02 INSTALLATION:

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic pipe marker complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

- F. Identify air handling units with tags.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- J. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closet to equipment.
- K. Identify thermostats to correspond with related equipment.

END OF SECTION

SECTION 15260

PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED SECTIONS:

- A. Section 15190 - Mechanical Identification
- B. Section 15510 - Hydronic Piping

1.03 REFERENCES:

- A. ASTM C195 - Mineral Fiber Thermal Insulation Cement
- B. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
- C. ASTM C449 - Mineral Fiber and Hydraulic-setting Thermal Insulating and Finishing Cement.
- D. ASTM 534 - Performed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- E. ASTM C547 - Mineral Fiber and Performed Pipe Insulation.

1.04 QUALITY ASSURANCE:

- A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84.

1.05 QUALIFICATIONS:

- A. Applicator: Company specializing in performing the work of this section with a minimum of three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver, store protect and handle products to site under provisions of Section 15010.
- B. Deliver materials to site in original factory packaging, labelled with manufacture's identification, including product density and thickness
- C. Store insulation in original wrapping and protect form weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufactures of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.01 GLASS FIBER:

- A. Manufacturers: Owen's -Corning, Manville, or equal.
- B. Installation: ASTM C547; rigid molded, noncombustible.
 - 1. 'K' ('ksi') value: ASTM C335, 0.24 at 75 degrees F.
 - 2. Minimum Service Temperature: -20 degrees F.
 - 3. Maximum Service Temperature: 300 degrees F.
 - 4. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket
 - 1. ASTM C921, White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
 - 3. Secure with self sealing longitudinal laps and butt strips.
 - 4. Secure outward with outward clinch expanding staples and vapor barrier mastic.
- D. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive
 - 1. Compatible with insulation.
- F. Insulating Cement/Mastic
 - 1. ASTM C185; hydraulic setting on mineral wool.

PART 3 EXECUTION

3.01 Examination:

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION:

- B. Install materials in accordance with manufacture's instructions.
- C. On exposed piping, locate insulation and cover seams in least visible locations.
- D. Insulated cold pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory applied or field applied.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness of adjacent pipe.
 - 3. Finish with glass cloth and vapor barrier adhesive.
 - 4. PVC fitting covers may be used.
 - 5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

6. Insulate entire system including fittings, valves, unions, flanges, strainer, flexible connections, and expansion joints.

E. For insulated pipes covering fluids above ambient temperature:

1. Provide standard jackets, with vapor barrier, factory applied or field applied.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
3. Finish with glass cloth and adhesive.
4. PVC fitting covers may be used.
5. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but level and seal ends of insulation.
6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Inserts and Shields

1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shields and piping under the finish jacket.
4. Insert Configuration: Minimum of 6 inches long, of same thickness and contour as adjoining insulation; maybe factory fabricated.
5. Insert Materials: Hydrous calcium silicate insulation as manufactured by Pipe Shield Incorporated.
6. Pipe shields minimum gauge thickness shall be as per MSS SP-69.

F. Finish insulation at supports, protrusions, and interruptions.

G. Insulation on P/T ports, pump suction and discharge flange pressure ports, circuit setters, calibrated balancing valves, pressure ports, etc. shall be readily removable such that access to the ports can be readily made without destroying the insulation.

3.03 GLASS FIBER INSULATION SCHEDULE:

PIPING SYSTEMS	PIPE SIZE	THICKNESS (Inch)
Hot Water Supply and Return	All	2"
Refrigerant Piping	All	1"

END OF SECTION

SECTION 15290

DUCT WORK INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Duct work insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.02 REFERENCES:

- A. ASTM C553 - Mineral Fiber and Blanket and Felt Insulation.
- B. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM E96 - Water Vapor Transmission of Materials.
- D. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- E. UL 723- Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE:

- A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84.

1.05 QUALIFICATIONS:

- A. Applicator: Company specializing in performing the work of this section with a minimum of three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver, store protect and handle products to site under provisions of Section 15010.
- B. Deliver materials to site in original factory packaging, labeled with manufacture's identification, including product density and thickness
- C. Store insulation in original wrapping and protect form weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufactures of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.01 GLASS FIBER, FLEXIBLE:

- A. Manufacturers: Owens - Corning, Manville, or equal.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' ('ksi') value: ASTM C553, 0.29 at 75 degrees F.
 2. Maximum Service Temperature: 250 degrees F.
 3. Maximum moisture absorption: 0.20 percent by volume.
 4. Density : 1.5 lb/cu ft.
- C. Vapor Barrier Jacket
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Transmission: ASTM E96; 0.04 perm inches.
 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Tie Wire: Annealed steel, 16 gage.

2.02 GLASS FIBER DUCT LINER, FLEXIBLE:

- A. Manufacturers: Owens - Corning, Manville, or equal.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. 'K' ('ksi') value: ASTM C518, 0.28 at 75 degrees F.
 2. Maximum Service Temperature: 250 degrees F.
 3. Density : 1.5 lb/cu ft.
 4. Maximum velocity on Coated Air Side: 4,000 ft/min..
- C. Adhesive
1. Waterproof fire retardant type.
- D. Liner Fasteners: Galvanized steel, welded with integral head.

PART 3 EXECUTION

3.01 Examination:

- A. Verify that Duct work has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION:

- A. Install materials in accordance with manufacture's instructions.
- B. Insulated duct work conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jackets.
 3. Continue insulation through walls, sleeves, pipe hangers, and other duct penetrations.
 4. Insulate entire system including fittings, valves, unions, flanges, fire dampers, flexible connections, and expansion joints.

- C. Insulated duct work conveying air above ambient temperature:
 - 1. Provide with or without standard vapor barrier jackets.
 - 2. Insulate fittings and joints. Where service is required, bevel and seal ends of insulation.
- D. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier and wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.
 - 4. Seal vapor penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

END OF SECTION

SECTION 15510
HYDRONIC PIPING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Condenser Water Piping.
- B. Chilled Water Piping.

1.2 RELATED WORK

- A. Section 15140 - Supports and Anchors.
- B. Section 15260 - Piping Insulation.
- C. Section 15515 - Hydronic Specialties.

1.3 REFERENCES

- A. ANSI/ASME - Boiler and Pressure Vessel Code.
- B. ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- C. ANSI/ASME B16.29 - Wrought copper and wrought copper alloy solder joint drainage fittings.
- D. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- E. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9.

1.5 SUBMITTALS

- A. Include data on pipe materials, pipe fittings, valves, and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Pipe: DWV (Drain Waste and Vent) piping, Minimum 1-1/4" size. Provide 45-degree wye with brass cleanout at each change in direction. Insulate per 15260.

2.2 HEATING WATER PIPING

- A. Steel pipe: ASTM A53 or A120 schedule 40 black.
 - 1. Fittings: ANSI/ASTM B16.3, Malleable Iron or ASTM A234, forged steel welding type.
 - 2. Joints: Screwed, or ANSI/AWS D1.1, welded.
 - 3. Joints may be screwed on piping 2" and smaller

2.3 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2" and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2": 150 psig forged steel slip-on flanges or weld neck for ferrous piping; bronze flanges for copper piping; 1/16" thick preformed neoprene.

2.4 GLOBE VALVES

- A. Up to 2": Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, screwed ends, with backseating capacity and repackable under pressure.
- B. Over 2": Iron body, bronze trim, rising stem, handwheel, OS&Y plug-type disc, flanged ends, renewable seat and disc.

2.5 BALL VALVES (Pipes 2" and smaller)

- A. Up to 2": Bronze one piece body, full port, stainless steel ball, Teflon seats and stuffing box ring, extended lever handle, and balancing stops, solder or threaded ends with union.
- B. Over 2": Cast steel body, full port, chrome plated steel ball, Teflon seat and stuffing box seals, extended lever handle, flanged.

2.6 PLUG COCKS

- A. Up to 2": Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends, with one wrench operator with set screw.

2.7 BUTTERFLY VALVES

- A. Iron body, stainless steel disc, resilient replaceable seat for service to 250° Fahrenheit, lug ends, extended neck, gear reduced wheel operator.

2.8 SWING CHECK VALVES

- A. Up to 2": Bronze 45 degree swing disc, screwed ends.

- B. Over 2": Iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

2.9 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

2.10 RELIEF VALVES

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions. Provide traps at all unit condensate drain pans.

3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain slope to drain. Provide all required supports, anchors, cross-breaking and seismic restraints as necessary.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Provide clearance for installation of insulation, and access to valves and fittings.
- F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with the Engineer.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level. Install hose-end drain valves at the base of all risers to permit draining of piping on upper floors. Hose ends shall accept standard garden hose.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Insulate all Condensate Drain Piping.

- J. Locate all valves and specialties so as to be readily accessible. Where large ceiling spaces are available, all valves and specialties shall be no higher than 3'-0" above the finished ceiling.

3.3 APPLICATION

- A. Provide di-electric unions at all piping connections of dis-similar metals.
- B. Use ball valves for all piping 2" and under. Use butterfly valves for all piping 2-1/2" and larger.
- C. All valves shall have extended handles to clear the insulation covering.

END OF THIS SECTION

SECTION 15610

DUCTWORK

PART 1 - GENERAL

1.01 SCOPE:

- A. This section includes, but is not limited to, furnishing and installing the following:
 - 1. All low pressure heating, ventilating, and air conditioning supply, return, outside air, and exhaust ductwork.
 - 2. Low pressure ductwork accessories.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Duct insulation shall be as specified in Section 15290 - Ductwork Insulation.

1.03 MATERIALS AND EQUIPMENT:

- A. STANDARDS: Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), "Duct Manual - Low Velocity Systems", latest issue.
- B. The material list of this specification is comprehensive in nature. It is not intended that all materials will necessarily be required, but that those required for the work be selected from this listing, unless otherwise specifically indicated.
- C. SHEET METAL - LOW PRESSURE:
 - 1. All low pressure heating, ventilating, and air conditioning ductwork, unless otherwise stated or noted shall be galvanized steel.
 - a. Galvanized steel shall be copper bearing (less than 0.40%) hot dipped galvanized steel sheet metal conforming to ASTM A-93 with galvanized coating not lighter than 0.90 ounces per square foot.
 - b. Aluminum shall be aluminum base alloy having not more than 0.40% copper, a minimum tensile strength of 16,000 psi, and the ability to satisfactorily make a Pittsburgh lock seam. Sheet shall conform to ASTM B-209.
- D. DUCTMATE SYSTEM:
 - 1. Transverse duct joints over 30" shall be made with the Ductmate System, or an approved equal. The Ductmate System components shall be of standard catalogue manufacturer as supplied by Ductmate Industries, Inc..
 - 2. The installation of the Ductmate System shall be in accordance with the manufacturer's printed instruction and installation manuals.
 - 3. The standard Ductmate System joint is the equivalent of a SMACNA "J" connection. The Ductmate - JR System joint is the equivalent of a SMACNA "E" connection.

Construction of the duct, such as gauge, reinforcing, etc., shall be as indicated in the addendum to the SMACNA manuals as provided by the manufacturer and as tested by Pittsburgh Testing Laboratory.

E. DUCTWORK - LOW PRESSURE:

1. Except as hereinafter specified, or otherwise stated on the Drawings, low pressure ductwork shall be constructed and installed in strict accordance with the latest edition of the SMACNA Standards.

F. ACCESSORIES - LOW PRESSURE:

1. Solder - 50% lead and 50% tin.
2. Flux - Muriatic acid killed with zinc or non-acid flux in paste form.
3. Turning Vanes - Airfoil type with no projecting edges inside duct.
4. Air Deflecting Vanes - Barber-Colman "Deflectrol"; Anemostat; Tuttle & Bailey, or approved equal.
5. Volume and Shut-Off Dampers - Die formed blades with interlocking edges, no lighter than 16 gauge with a maximum blade dimension of 10" wide and 42" long. Blade axles to be 1/2" diameter minimum rustproofed steel. All dampers shall have Teflon bearings. Control rods shall be 1/4" diameter minimum rustproofed steel.
 - a. Volume dampers shall be of the opposed blade type.
 - b. Shut-off dampers may be of the opposed blade type of parallel blade type.
6. Round manual balancing dampers in branch runouts shall be no lighter than 20 gauge galvanized steel with 20 gauge galvanized steel blade. Axle shaft shall be 3/8" diameter minimum with molded synthetic bearings. Furnished with locking hand quadrant, damper shall be equal to Ruskin Model MDRS25.
7. Fire Dampers - Ruskin Model 1BD, Type B, or approved equal interlocking blade, certified to meet Fire Underwriters' standards and shall carry UL label. Blades must not be in airstream. The fusible link shall be rated at 212°F.
8. Access Doors - Louvers & Dampers, Inc., Series FD-1622; Airson "Duct-Port"; Affco, or approved equal. Install "Duct-Port" type where indicated on the Drawings.
9. Flexible ducts shall be Flexmaster Type 3, Wiremold, Thermaflex, or approved equal, insulated trilaminate duct with a polyethylene outer jacket. The outer jacket shall be fire retardant and a vapor barrier. The flexible duct shall be a UL 181 Class 1 air duct that complies with NFPA Standards 90A and 90B.
10. Flexible connections - Ventfabrics "Ventglas LA", or approved equal, Neoprene coated heavy glass fabric.
11. Insulation for low pressure lined ductwork shall be 1" thick monolithic glass fiber blanket of 1.5 lbs. per cubic foot density which shall meet the requirements of NFPA 90A and 90B and have a flame spread classification of less than 25 and smoke and

fuel contributed rating of less than 50. Liner shall withstand 4000 FPM air velocity without erosion or delamination. Adhere liner with smooth side towards air stream, to all interior sides of duct with fire resistant adhesive in exact manner recommended by manufacturer. All ducts over 24" in width or breadth shall have liner additionally secured with sheet metal screws and washers, or stud welded pins and clips. All duct size shown are sheet metal sizes allowance has made for internal duct liner where applicable.

G. DUCTWORK - MEDIUM PRESSURE:

- A. All supply ductwork from discharge of VAV air handlers to the inlet of the air terminal device shall be classified as medium pressure.
- B. All round medium pressure ductwork shall be SPIROoval as manufactured by Lindab or equal.
- C. All medium pressure ductwork shall be G90 galvanized steel conforming to ASTM standards A653 and A924.
- D. All medium pressure duct and fittings shall be constructed per SMACNA's Duct Construction Standards (+10 in W.G.).
- E. All duct fittings for medium pressure shall be factory fittings installed per manufacturer's recommendations.'
- F. The radius of all 90 and 45 degree elbows shall be 1.0 times the major axis.
- G. Rectangular and rectangular-to-round shop-built duct shall be fabricated and braced as per SMACNA Duct Construction Standards (+10 in WG).
- H. All round medium pressure duct shall be constructed using a spiral lockseam

1.04 SUBMITTALS:

- A. Submit shop drawings for volume dampers, fire dampers, access doors, and flexible duct.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Use only new and undamaged materials as specified in this section.

2.2 SUBSTITUTIONS

- A. Submit only materials which meet or exceed all requirements of those specified.

PART 3 EXECUTION

3.1 CONNECTIONS

- A. All joints and seams of all duct work, for all applications, shall be sealed with duct sealer prior to the application of the external insulation. The Engineer shall be provided with the opportunity to inspect the medium pressure ductwork prior to the application of the duct wrap to verify this requirement. The contractor shall provide three days notice to the Engineer to schedule inspection.

END OF SECTION 15610.

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Testing, adjusting, and balancing of air systems.
- B. Measurement of final operating condition of the HVAC systems.

1.02 REFERENCES:

- A. AABC - National Standards for total system balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE III - Practices for measuring, Testing, Adjusting, and Balancing of HVAC Systems.
- D. NEEB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.03 SUBMITTALS:

- A. Submit under provisions of Section 15010.
- B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
- C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and systems and equipment to achieve specified performance.
- D. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- E. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
- F. Provide final report in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- G. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
- H. Test Reports: Indicate data forms containing information indicated in Schedules.

1.04 QUALITY ASSURANCE:

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance..
- B. Maintain one copy of document on-site.

1.05 QUALIFICATIONS:

- A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with a minimum three years experience certified by AABC.or other approved agency.
 - B. Perform Work under supervision of AABC Certified Test and Balance Engineer.
- 1.06 SEQUENCING:
- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 EXAMINATIONS:

- A. Verify that all systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in-place. IF required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating in the correct direction.
 - 7. Air coil fins are cleaned and combed.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlet are installed and connected.
 - 10. Duct system leakage is minimized.
- B. Submit Field reports: Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work implies acceptance of existing conditions.

3.02 PREPARATION:

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES:

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 ADJUSTING:

- A. Ensure recorded data represents actual measured or observed field conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been corrected.
- D. Leave systems in proper working order, replace belt guards, close access doors, close doors to electrical switch boxes, and restore thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE:

- A. Adjust air handling and distribution systems to provide required design supply and return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Picot tube traverse of entire cross sectional area of duct.
- C. Measure air flow rates at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speed. Provide drive changes as required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet and inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of the filters.
- I. Adjust outside air balancing dampers, return air, and exhaust air dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme points.

END OF SECTION

HVAC RENOVATIONS AT HENDERSON CO. COURTHOUSE

HVAC MODIFICATIONS

17 Monroe Avenue
LEXINGTON, TN 38351

MECHANICAL:
DW COLLIER ENGINEERING, INC.
720 BROADWAY ST SUITE 100
SOUTH FULTON, TENNESSEE 38257
(731) 479-2115 FAX: (731) 479-8018
EMAIL: office@dwcei.com



ELECTRICAL:
HALL ENGINEERING, LLC
1 A STREET, SUITE 100
JACKSON, TENNESSEE 38305
(731) 424-5300
EMAIL: jay@halleng.net



SHEET INDEX

MECHANICAL DWGS:

MD1.1 - BASEMENT HVAC DEMOLITION
M1.1 - BASEMENT HVAC MODIFICATIONS
M1.2 - HVAC ELEVATIONS
M2.1 - HVAC SCHEDULES & DETAILS

ELECTRICAL DWGS:

ED1.1 - BASEMENT ELECTRICAL DEMOLITION
E1.1 - BASEMENT ELECTRICAL MODIFICATIONS
E2.1 - PANEL SCHEDULE & SPECIFICATIONS

CODE INFORMATION:

ICC INTERNATIONAL BUILDING CODE, 2006 EDITION, INCLUDING ICC INTERNATIONAL MECHANICAL CODE, 2006 EDITION.

ICC INTERNATIONAL FIRE CODE 2006 EDITION.

ICC INTERNATIONAL FUEL GAS CODE, 2006 EDITION.

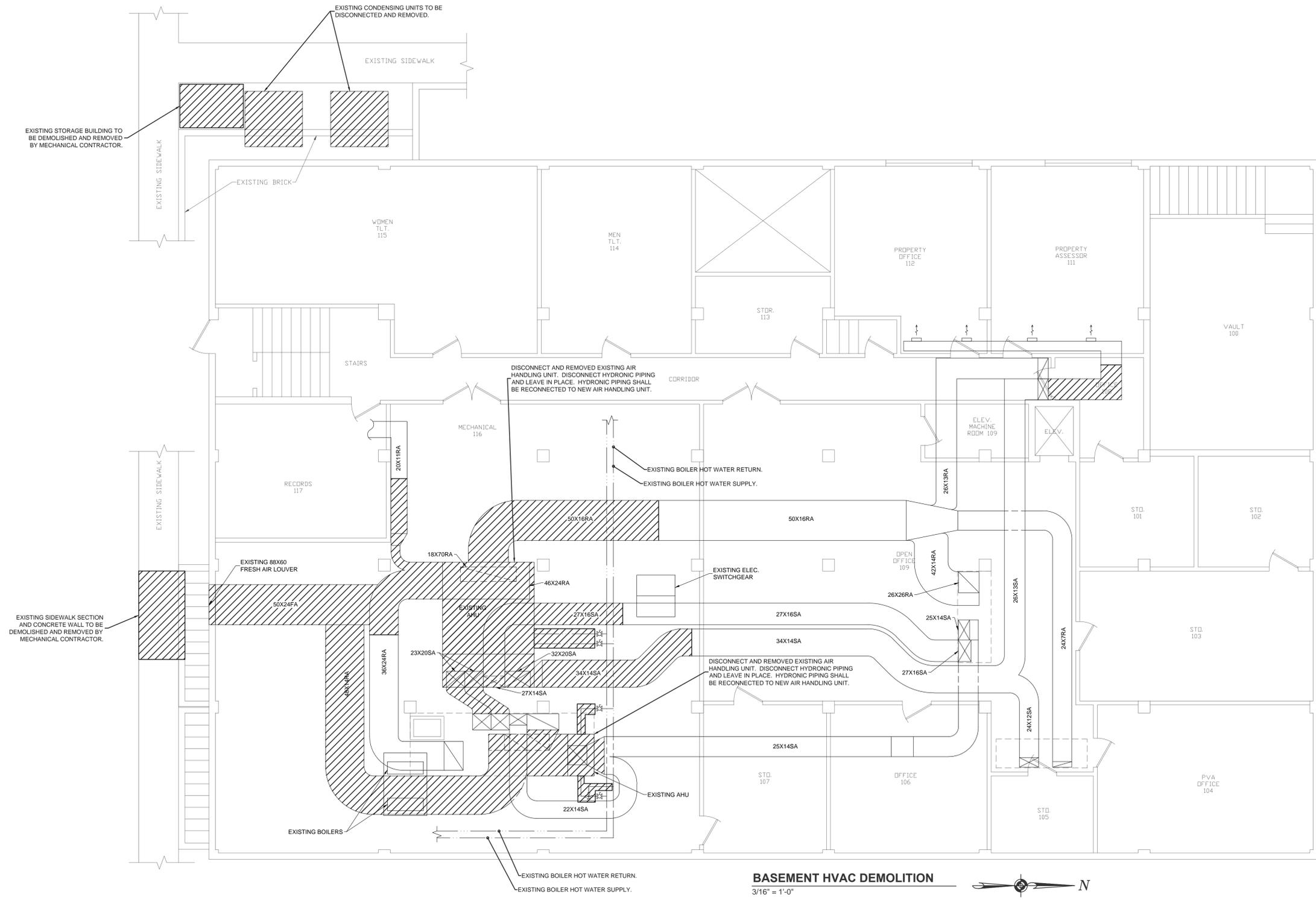
ICC INTERNATIONAL ENERGY CONSERVATION CODE, 2006 EDITION.

NFPA 101 LIFE SAFETY CODE, 2006 EDITION AND NFPA 70 NATIONAL ELECTRIC CODE, 2008 EDITION.

OCCUPANCY GROUP: ASSEMBLY (A-3) AND BUSINESS

CONSTRUCTION TYPE: V (B), UNSPRINKLERED

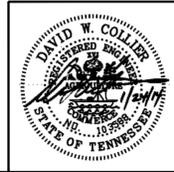
3 STORY



BASEMENT HVAC DEMOLITION
3/16" = 1'-0"



LEGEND	
	TO BE DEMOLISHED.
	EXISTING HVAC TO REMAIN.



NOTICE
ALL RIGHTS RESERVED
This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

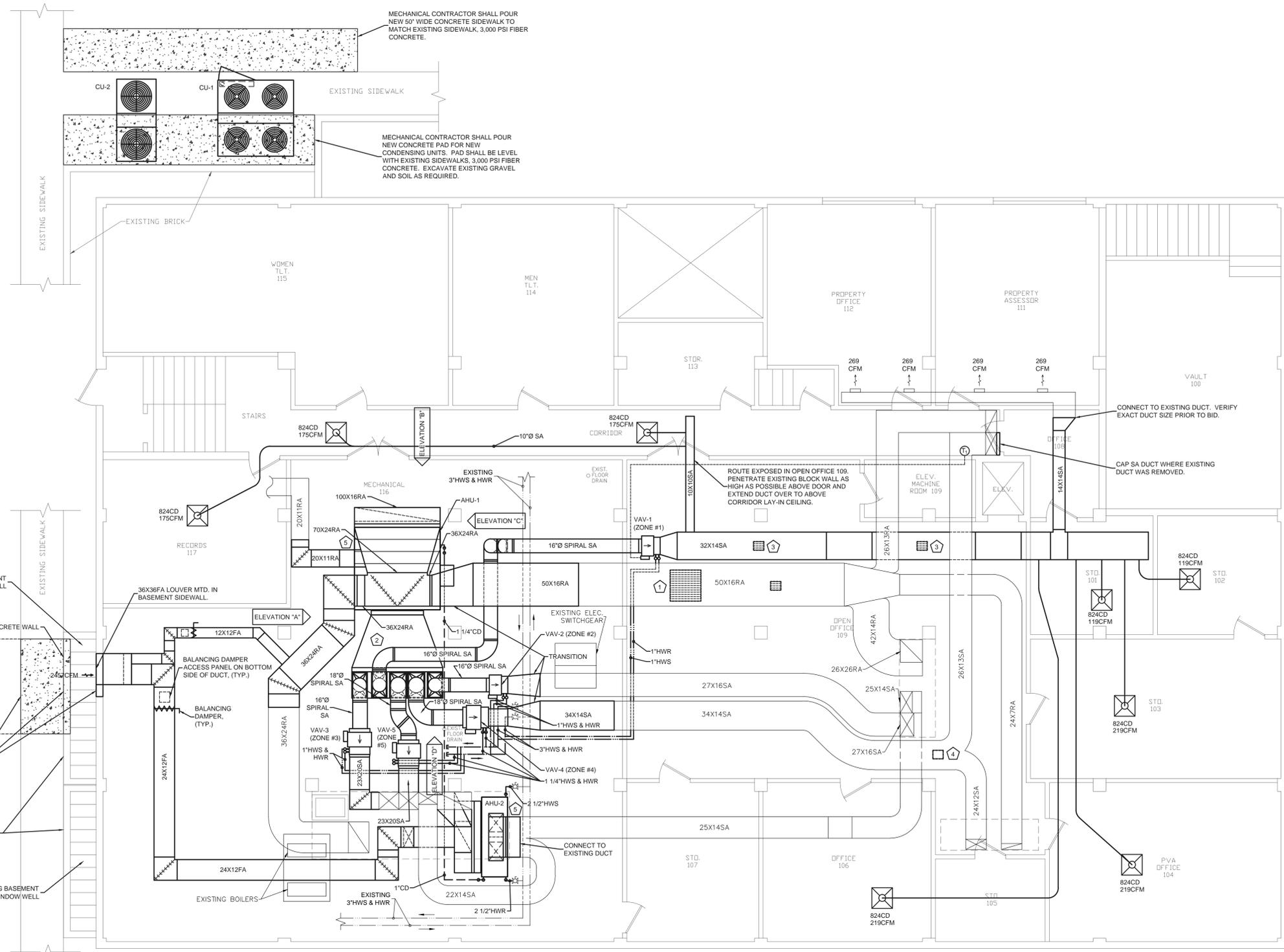
REVISION	DATE	COMMENT
	1/24/14	RELEASED FOR BID

ORIGINAL ISSUE DATE: 1/24/14	
SCALE: 3/16" = 1'-0"	
CHECKED: DWC	APPROVED: DWC
DRAWN BY: JCB	



DW COLLIER
ENGINEERING, INC.
720 BROADWAY STREET
SUITE 100
SOUTH FULTON, TN 38257
PH. (731) 479-2115
FAX (731) 479-8018
office@dwcei.com

SHEET TITLE: BASEMENT HVAC DEMOLITION	JOB NUMBER: 13-061
PROJECT: HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS 17 MONROE AVENUE LEXINGTON, TN 38351	SHEET NUMBER: MD1.1



NOTE:
 ASBESTOS HAS BEEN DETERMINED TO BE PRESENT IN CERTAIN AREAS OF THE PROPOSED CONSTRUCTION ACTIVITIES. CARE SHALL BE EXERCISED AS NECESSARY IN THE AREAS OF THE INSULATED HYDRONIC HEATING PIPING AND THE INSULATED DOMESTIC WATER PIPING. THE OWNER HAS CONTRACTED WITH A LICENSED ABATEMENT FIRM TO REMOVE THE INSULATION FROM THESE SYSTEMS IN THE VICINITY OF THE WORK. OTHER PORTIONS OF THESE SYSTEMS SHALL NOT BE DISTURBED.

- GENERAL NOTES:**
- 1) DEMOLISH AND REPLACE EXISTING TWO AIR HANDLERS, CONDENSING UNITS, PIPING, DUCTWORK, ELECTRICAL, ETC. AS SHOWN ON THESE SHEETS TO PROVIDE FOR A NEW AND OPERABLE HVAC SYSTEM. ALL DUCT WORK AND AIR DISTRIBUTION OF THE UPPER FLOORS SHALL REMAIN AS IS.
 - 2) NO COMPLETE ROOM-BY-ROOM REBALANCE IS REQUIRED. THE T&B CONTRACTOR SHALL ADJUST AND SET THE TOTAL CFM FOR EACH AIR HANDLER, THE TOTAL SUPPLY AIR FOR EACH ZONE, THE FRESH AIR FLOW RATE, AND THE HOT WATER FLOW TO EACH VAV TERMINAL.
 - 3) DUE TO THE SIZE OF AHU-1, EXCAVATION WILL BE REQUIRED ON THE SOUTH LAWN OF THE COURTHOUSE TO EXPOSE AN EXISTING BASEMENT WINDOW WELL. THE CONCRETE WALL OF THE WINDOW WELL WILL BE REQUIRED TO BE CUT AND REMOVED BY THIS CONTRACTOR TO PROVIDE ACCESS TO THE EXISTING LOUVERED OPENING IN THE BASEMENT WALL. FORM, POUR, AND REPLACE CONCRETE WALL. REPLACE SIDEWALK AND RESEED LAWN IN DISTURBED AREA.
 - 4) CONCRETE WORK WILL ALSO BE REQUIRED FOR CONDENSING UNIT PAD. SEE THESE SHEETS.
 - 5) SEE SPECIFICATIONS FOR HYDRONIC PIPING REQUIREMENTS.
 - 6) ALL NEW DUCT WORK IN THE MECHANICAL ROOM SHALL BE MASTIC SEALED AND INSULATED WITH RIGID BOARD INSULATION ADHERED TO THE DUCT. ALL SUPPLY TO BE 2" THICK. ALL RETURN TO BE 1" THICK.
 - 7) HVAC GRILLE COLORS TO MATCH EXISTING.
 - 8) ALL NEW HOT WATER PIPING SHALL HAVE 2" INSULATION. (KRAFT BACK FIBERGLASS)
 - 9) ALL CONDENSATE DRAINAGE PIPING SHALL BE TYPE 1" COPPER. ROUTE TRAPPED CONDENSATE PIPING ACROSS FLOOR AND TERMINATE AT EXISTING FLOOR DRAIN. STABILIZE PIPING ACCORDINGLY TO PREVENT FROM MOVING.
 - 10) INSULATE ALL NEW DUCT OUTSIDE OF MECHANICAL ROOM AS FOLLOWS: WRAP ALL NEW DUCTS WITH 2" THICK FOIL BACKED FIBERGLASS INSULATION EQUAL TO CERTAINTED SOFT TOUCH DUCT WRAP, TYPE TS, R-5 MINIMUM. SECURE EXTERNAL INSULATION TO RECTANGULAR DUCTWORK WITH TAPE AND STAPLES. AND INSTALL PANDUIT STRAPS ON 4' CENTERS TO PREVENT SAGGING. SECURE EXTERNAL INSULATION TO ROUND DUCTWORK WITH TAPE AND STAPLES.

LEGEND	
	SUPPLY AIR DIFFUSER
	RETURN AIR GRILLE
	EXHAUST/TRANSFER AIR GRILLE
	THERMOSTAT
	TURNING VANE
	SUPPLY AIR
	RETURN AIR
	FRESH AIR/OUTSIDE AIR
	EXISTING HOT WATER RETURN
	EXISTING HOT WATER SUPPLY
	NEW HOT WATER RETURN
	NEW HOT WATER SUPPLY
	CONDENSATE
NECK SIZE LAY-IN CEILING SIZE (24"x24") RAG - RETURN AIR GRILLE CD - CEILING DIFFUSER EAG - EXHAUST AIR GRILLE SWG - SIDEWALL GRILLE TAG - TRANSFER AIR GRILLE (8)(24)(RAG) (XXXCFM)	
AIR FLOW RATING NOTE: ROUND BRANCH RUNOUT SIZE SAME SIZE AS DIFFUSER NECK UNLESS OTHERWISE SPECIFIED ON DRAWING.	

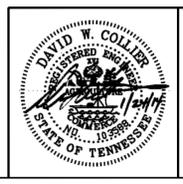
NOTE:
 MECHANICAL CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND DISPOSAL OF THE EXISTING ABANDONED BOILER LOCATED IN THE MECHANICAL ROOM. BOILER SHALL BE REMOVED THRU THE OPENING IN THE BASEMENT SIDEWALL AFTER EXCAVATING.

NOTE:
 ALL SPIRAL ELBOWS ARE SHOWN AS SHORT RADIUS TYPE.

BASEMENT HVAC MODIFICATIONS
 3/16" = 1'-0"



- KEYED NOTES:**
- 1) NAILOR 5130 HD 36"x36" RA GRILLE W/INTEGRAL DAMPER IN BOTTOM OF EXISTING RETURN TRUNK FOR 3,241CFM RETURN AIR.
 - 2) FLARE TRANSITION: 32"x61" (UNIT CONNECTION SIZE) X 106" X 32" X 61" L. CONSTRUCT PER SMACNA FOR MEDIUM PRESSURE SERVICE.
 - 3) NAILOR 61D 12"x10" DOUBLE DEFLECTION SA GRILLE W/INTEGRAL DAMPER IN BOTTOM OF NEW SUPPLY TRUNK FOR 375CFM SUPPLY AIR.
 - 4) PATCH, SEAL AND PROPERLY INSULATE OPENING IN EXISTING DUCT.
 - 5) PROVIDE NEW 6" HIGH, 3,000 PSI FIBER CONCRETE PAD.



NOTICE
 ALL RIGHTS RESERVED
 This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

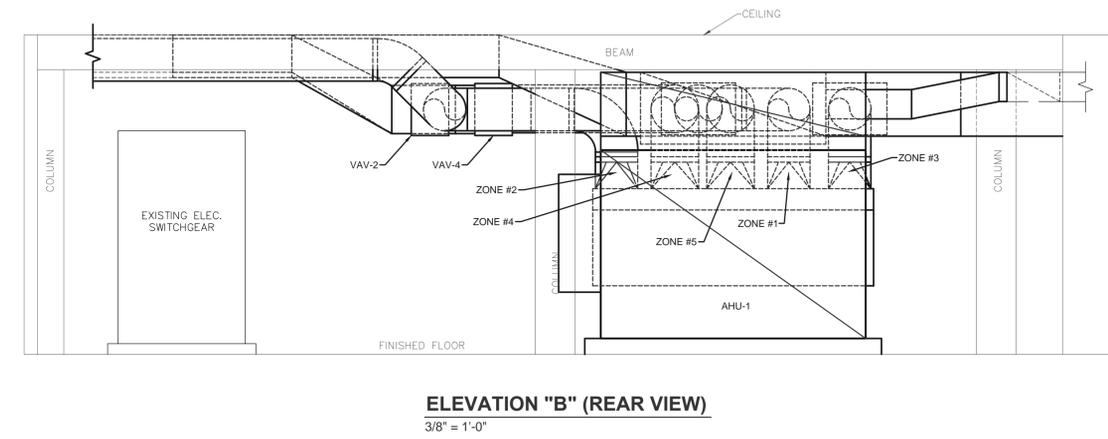
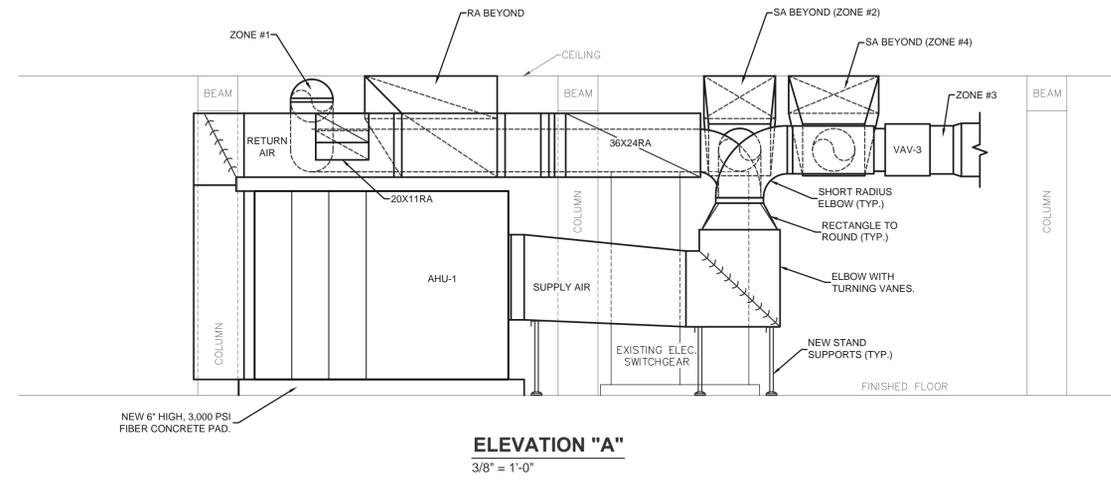
REVISION	DATE	COMMENT
	1/24/14	RELEASED FOR BID

ORIGINAL ISSUE DATE: 1/24/14
SCALE: 3/16" = 1'-0"
CHECKED: DWC
APPROVED: DWC
DRAWN BY: JCB

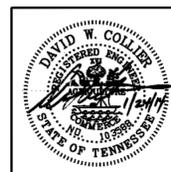
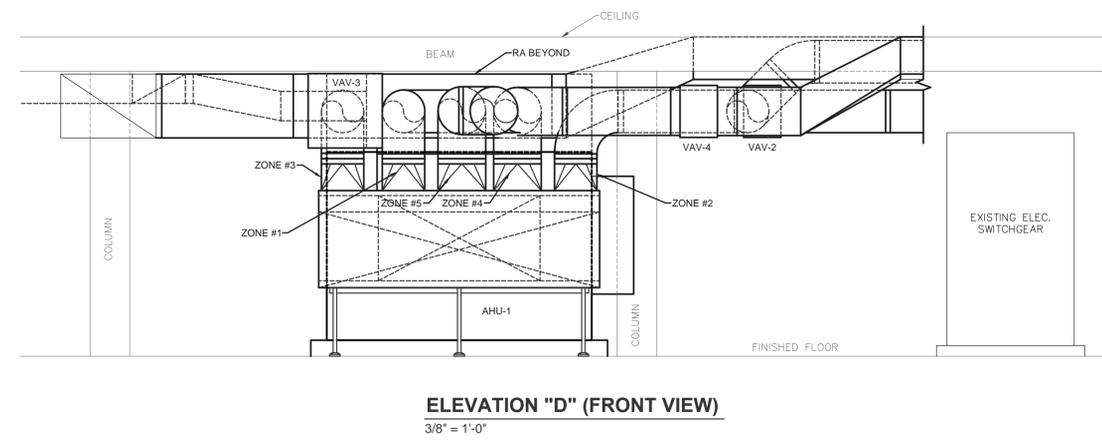
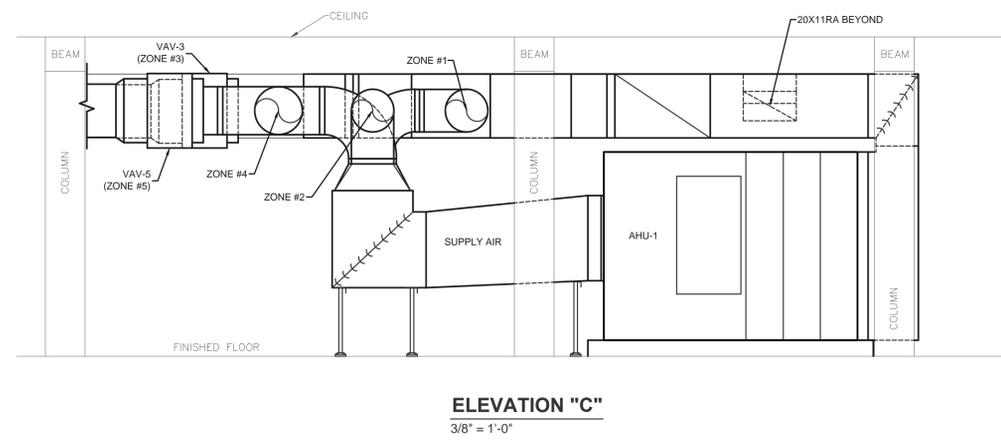


DW COLLIER ENGINEERING, INC.
 720 BROADWAY STREET SUITE 100
 SOUTH FULTON, TN 38257
 PH. (731) 479-2115
 FAX (731) 479-8018
 office@dwcei.com

SHEET TITLE: BASEMENT HVAC MODIFICATIONS	JOB NUMBER: 13-061
PROJECT: HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS 17 MONROE AVENUE LEXINGTON, TN 38351	SHEET NUMBER: M1.1



NOTE:
ALL SPIRAL ELBOWS ARE SHOWN AS SHORT RADIUS TYPE.



NOTICE
ALL RIGHTS RESERVED
This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

REVISION	DATE	COMMENT
	1/24/14	RELEASED FOR BID

ORIGINAL ISSUE DATE: 1/24/14	
SCALE: 3/8" = 1'-0"	
CHECKED: DWC	APPROVED: DWC
DRAWN BY: JCB	



DW COLLIER
ENGINEERING, INC.
720 BROADWAY STREET
SUITE 100
SOUTH FULTON, TN 38257
PH. (731) 479-2115
FAX (731) 479-8018
office@dwcei.com

SHEET TITLE: HVAC ELEVATIONS	JOB NUMBER: 13-061
PROJECT: HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS 17 MONROE AVENUE LEXINGTON, TN 38351	SHEET NUMBER: M1.2

MECHANICAL NOTES:

- ALL WORK SHALL BE EXECUTED AND INSPECTED IN ACCORDANCE WITH ALL LOCAL AND STATE CODES, LAWS, ORDINANCES, RULES AND REGULATIONS APPLICABLE TO THE PARTICULAR CLASS OF WORK. IF, TO THE KNOWLEDGE OF THE CONTRACTOR, THE DRAWINGS AND SPECIFICATIONS ARE IN CONFLICT WITH THE ABOVE, HE SHALL PROMPTLY NOTIFY THE ENGINEER IN WRITING SO THAT ANY NECESSARY CHANGES CAN BE PROVIDED FOR IN HIS CONTRACT. IF THE CONTRACTOR PERFORMS ANY WORK WITHOUT NOTICE AS REQUIRED, HE SHALL BEAR ALL COSTS OF CORRECTIVE ACTION.
- THE CONTRACTOR SHALL INCLUDE IN HIS QUOTATION ALL APPLICABLE SERVICE CHARGES, FEES, PERMITS, ROYALTIES, AND OTHER SIMILAR COSTS IN CONNECTION WITH THE WORK. OBTAIN PERMITS, AND REQUEST INSPECTIONS FROM AUTHORITY HAVING JURISDICTION.
- INSTALL WORK IN LOCATIONS SHOWN ON DRAWINGS, UNLESS PREVENTED BY PROJECT CONDITIONS. FOR PURPOSES OF CLARITY AND LEGIBILITY, DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC, AND ALTHOUGH SIZE AND LOCATION OF EQUIPMENT ARE DRAWN TO SCALE WHENEVER POSSIBLE, THE CONTRACTOR SHALL REVIEW THE STRUCTURAL, ELECTRICAL, ARCHITECTURAL, FIRE PROTECTIONS, ETC. DRAWINGS AND DETERMINE AREAS OF INTERFERENCE. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF INTERFERENCE'S PRIOR TO FABRICATION OF DUCTWORK OR PIPING.
- THE DRAWINGS INDICATE REQUIRED SIZE AND POINTS OF TERMINATION OF PIPES AND DUCTS, AND SUGGEST PROPER ROUTES OF PIPE TO CONFORM TO STRUCTURE, AVOID OBSTRUCTIONS AND PRESERVE CLEARANCES. HOWEVER, IT IS NOT INTENDED THAT DRAWINGS INDICATE ALL NECESSARY OFFSETS, AND IT SHALL BE THE WORK OF THIS SECTION TO INSTALL PIPING AND DUCTS IN SUCH A MANNER AS TO CONFORM TO STRUCTURE, AVOID ALL OBSTRUCTIONS, PRESERVE HEADROOM AND KEEP OPENINGS AND PASSAGEWAYS CLEAR WITHOUT FURTHER INSTRUCTION OR COST TO THE OWNER.
- CONTRACTOR SHALL GUARANTEE ALL WORK PERFORMED UNDER THIS CONTRACT TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF CERTIFICATE OF SUBSTANTIAL COMPLETION.
- MOTORS FOR ALL MECHANICAL EQUIPMENT SHALL BE FURNISHED BY SUPPLIERS OF SUCH EQUIPMENT AND SHALL BE THE TYPE THAT HAS CHARACTERISTICS SUITABLE FOR CONTINUOUS OPERATING CONDITIONS.
- TRANSPORT AND HANDLE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- STORE AND PROTECT PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, WITH SEALS AND LABELS INTACT AND LEGIBLE.
- ALL MECHANICAL EQUIPMENT, AS APPLICABLE, SHALL HAVE U.L. LISTING OR EQUIVALENT. VERIFY THAT EACH PIECE OF EQUIPMENT OR SYSTEM HAS BEEN CHECKED FOR PROPER LUBRICATION, DRIVE ROTATION, BELT TENSION, CONTROL SEQUENCE, OR FOR OTHER CONDITIONS WHICH MAY CAUSE DAMAGE.
- DEMONSTRATE OPERATION AND MAINTENANCE OF PRODUCTS TO OWNER'S PERSONNEL ONE WEEK PRIOR TO DATE OF FINAL INSPECTION.
- EXECUTE FINAL CLEANING PRIOR TO FINAL PROJECT ASSESSMENT.
- SEISMICALLY RESTRAIN HVAC EQUIPMENT, GAS PIPING AND HYDRONIC PIPING AS REQUIRED BY LOCAL CODE. PROVIDE SUPPORT AND EQUIPMENT REQUIRED TO CONTROL EXPANSION AND CONTRACTION OF PIPING. PROVIDE LOOPS, PIPE OFFSETS, AND SWING JOINTS, OR EXPANSION JOINTS WHERE REQUIRED.
- ENTIRE HVAC SYSTEM SHALL BE BALANCED BY A CERTIFIED TEST & BALANCE CONTRACTOR. ALL AIR FLOW RATES SHALL BE WITHIN 5% OF SPECIFIED FLOW RATE. PROVIDE CERTIFIED TEST & BALANCE REPORT AT END OF PROJECT.
- DISPOSE OF CONDENSATE IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS. PROVIDE TRAP IN CONDENSATE DRAIN LINE AT EACH COIL OR 90° FURNACE IN ACCORDANCE WITH PUBLISHED MANUFACTURER'S INSTRUCTIONS. CONDENSATE PIPING SHALL BE SCH 40 PVC UNLESS NOTED OTHERWISE OR PROHIBITED BY CODES. INSULATE CONDENSATE DRAIN PIPING, SLOPE TO DRAIN, AND TERMINATE IN ACCORDANCE WITH CODE OR AS SHOWN ON THESE DRAWINGS.
- PROVIDE NON-CONDUCTING DIELECTRIC CONNECTIONS WHEREVER JOINTING DISSIMILAR METALS.
- ALL DUCTWORK SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH THE 2005 EDITION 'SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE'; AND AS INDICATED. PROVIDE RADIUS ELBOW OR TURNING VANES IN ALL 90° ELBOWS. PROVIDE DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED. DUCTWORK SHALL BE FABRICATED FROM ASTM A525 AND ASTM A527 GALVANIZED STEEL SHEET, LOCK-FORMING QUALITY, HAVING 99.99 ZINC COATING OF IN CONFORMANCE WITH ASTM A980. ALL DUCTS SHALL BE GALVANIZED STEEL UNLESS OTHERWISE NOTED ON DRAWINGS. DUCTBOARD WILL NOT BE ACCEPTED.
- PROVIDE TEMPORARY PROTECTION FOR EQUIPMENT DURING CONSTRUCTION TO PREVENT DAMAGE TO EQUIPMENT AND COILS. PROVIDE AND INSTALL A NEW, CLEAN SET OF FILTERS FOR EACH SYSTEM AT PROJECT COMPLETION.
- FLEXIBLE DUCTWORK SHALL BE EQUIVALENT TO THERMAFLEX WITH R-5.0 MINIMUM, R-8.0 IF IN ATTIC SPACE, FIBERGLASS INSULATION AND VAPOR BARRIER. FLEXIBLE DUCTWORK SHALL BE U.L. LISTED AND APPROVED.
- SEAL ALL LONGITUDINAL AND TRANSVERSE SEAMS BEFORE APPLYING INSULATION. SEALANT SHALL BE NON-HARDENING, WATER RESISTANT, FIRE RESISTIVE, COMPATIBLE WITH MATING MATERIALS, LIQUID USED ALONE OR WITH TAPE, OR HEAVY MASTIC.
- LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.
- PROVIDE CANVAS, FLAME RETARDANT DUCT CONNECTORS AT ALL CONNECTIONS OF FANS TO DUCTWORK.
- ALL LOW VOLTAGE CONTROL WIRING SHALL BE PROVIDED BY DIV 15. CONTROL WIRING SHALL BE PROVIDED IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL CODES. CONTROL WIRING CONCEALED IN WALLS, LOCATED OUTDOORS, OR INSTALLED IN RETURN AIR PLENUM SHALL BE INSTALLED IN CONDUIT. CONDUIT BY DIV 15.
- ROUTE REFRIGERANT LINES FROM OUTDOOR UNITS TO COOLING COIL. SIZE PER MANUFACTURER'S RECOMMENDATIONS AND PROVIDE ADDITIONAL CHARGE AS REQUIRED. INSULATE REFRIGERANT LINES WITH 1 1/2" ARMAFLEX INSULATION. ALL EXPOSED REFRIGERANT PIPING INSTALLED OUTDOORS SHALL BE RIGID COPPER. ROUTE ALL REFRIGERANT PIPING PLUMB AND SQUARE WITH THE BUILDING AS POSSIBLE. EXTERIOR PIPING SHALL BE INSTALLED ON UNISTRUT AND SECURED WITH UNISTRUT CLAMPS. UNISTRUT TO BE ANCHORED TO CONCRETE PAD.
- ROUND DUCT BRANCH SIZE SHALL BE SAME AS NECK SIZE SPECIFIED FOR DIFFUSER, UNLESS OTHERWISE NOTED ON DRAWINGS.
- ALL EXTERIOR WALL LOUVERS USED FOR MECHANICAL EXHAUST, MECHANICAL FRESH AIR INTAKE, OR MECHANICAL COMBUSTION AIR SHALL BE METAL/ALUMINUM EXTRUDED ALUMINUM, WITH 1/4" INSECT SCREEN OR EQUAL.
- VERIFY FLOOR PLAN AND WALL/FLOOR/CEILING RATINGS WITH ARCHITECTURAL PLANS. PROVIDE RATED PENETRATIONS AT EACH INSTANCE WHERE MECHANICAL INSTALLATION PENETRATES A RATED ASSEMBLY. PENETRATIONS SHALL BE PER DETAILS ON THE DRAWINGS OR SOME OTHER U.L. LISTED DESIGN.
- NATURAL GAS PIPING, IF SHOWN ON THESE DRAWINGS, SHALL BE SCH. 40 BLACK STEEL ABOVE GROUND, PAINT PIPING LOCATED OUTDOORS. ALL NATURAL GAS PIPING PERMANENTLY CONCEALED IN WALLS, CHASES, ETC. SHALL HAVE WELDED CONNECTIONS. IF APPROVED BY THE LOCAL GAS UTILITY, PIPE BELOW GRADE MAY BE DRISCOPEPE 6500, OR APPROVED POLYETHYLENE TYPE, INSTALLED TO CONFORM TO MANUFACTURER'S RECOMMENDATIONS AND LOCAL UTILITY REQUIREMENTS.
- UNLESS OTHERWISE NOTED ON DRAWINGS, AIR DISTRIBUTION SHALL BE AS FOLLOWS OR EQUAL:
 - CEILING SUPPLY, LAY-IN CEILINGS - NAILOR 6500 SERIES, TYPE L FRAME, FULLY LOUVERED FACE, NO FILLER PANEL, FLUSH WITH CEILING, LESS DAMPER.
 - SIDEWALL OR DRYWALL CEILING SUPPLY - NAILOR 610 SERIES, DOUBLE DEFLECTION, LESS DAMPER, WITH PLASTER RING
 - CEILING RETURN AND EXHAUST, LAY-IN CEILINGS - NAILOR 4360 SERIES, FLUSH FACE, LUMP DAMPER.
 - SIDEWALL OR DRYWALL CEILING RETURN - NAILOR 5130HHD WITH PLASTER RING.
 - LINEAR BAR SUPPLY GRILLES - NAILOR 49-240, LESS DAMPER, WITH PLASTER RING.
- INSTALL AIR DISTRIBUTION SYMMETRICALLY WHERE POSSIBLE. ALL AIR DISTRIBUTION MOUNTING FRAMES SHALL MATCH CEILING TYPE. VERIFY CEILING AND COLORS WITH ARCHITECTURAL DRAWINGS. ALL AIR DISTRIBUTION SHALL HAVE POWDER COAT FINISH. GRILLES INSTALLED IN SIDEWALL OF DUCT SHALL MATCH DUCT FINISH AND COLOR. PROVIDE PREINSULATED SUPPLY GRILLES, WHERE ADAPTERS ARE USED, PAINT TO MATCH GRILLE.
- DUCT PENETRATIONS THROUGH 1 HR. FIRE RATED WALLS DO NOT REQUIRE FIRE DAMPERS PROVIDED THE FOLLOWING MINIMUM REQUIREMENTS ARE MET:
 - THE DUCT DOES NOT EXCEED 100 SQ. INCHES.
 - THE DUCT IS 0.0217" INCH MINIMUM STEEL.
 - THE DUCT SHALL CONTINUE, WITH NO OPENINGS, FOR A MINIMUM OF FIVE FEET FROM THE RATED WALL.
 - THE DUCT IS INSTALLED ABOVE A CEILING.
- UNLESS SHOWN OTHERWISE ON DRAWINGS, FRESH AIR DUCTWORK SHALL BE ROUND GALVANIZED DUCT WITH 2" FOIL-BACKED INSULATION. EXHAUST DUCTS DO NOT REQUIRE INSULATION. PROVIDE ACCESSIBLE BALANCING DAMPER. SIZE DUCT AS FOLLOWS: 1-100 CFM - 6", 101-400 CFM - 8", 201-400 CFM - 10". SEE NOTE 25 FOR INTAKE LOUVER REQUIREMENTS. EACH FRESH AIR INTAKE DUCT SHALL BE PROVIDED WITH AN ACCESSIBLE BALANCING DAMPER. EXHAUST DUCTS DO NOT REQUIRE INSULATION.
- CONDENSATE DRAINS, ELECTRICAL CONDUIT AND NATURAL GAS PIPING SHALL NOT BE ROUTED IN THE ROOF CURB OR UNIT HOUSING. CONDENSATE PIPING, ELECTRICAL CONDUIT AND NATURAL GAS PIPING SHALL PENETRATE THE ROOF, AS APPLICABLE, ADJACENT TO THE ROOF CURB AND CONNECT TO THE UNIT EXTERNALLY.
- PROVIDE AND INSTALL HARDWIRED THERMOSTATS FOR EACH SYSTEM. THERMOSTAT INSTALLATION SHALL BE IN ACCORDANCE WITH ALL LOCAL CODES. THERMOSTATS SHALL BE INSTALLED AT 48" AFF. THERMOSTATS SHALL BE 7-DAY PROGRAMMABLE STYLE. MERCURY OPERATED THERMOSTATS ARE NOT ACCEPTABLE.
- ALL SHEETMETAL SURFACES VISIBLE BEHIND ANY HVAC GRILLE SHALL BE PAINTED FLAT BLACK.
- CONTRACTOR SHALL IDENTIFY ALL SCHEDULED EQUIPMENT AND ASSOCIATED THERMOSTATS. IDENTIFICATION SHALL BE ENGRAVED TAG PERMANENTLY ADHERED TO EQUIPMENT. THERMOSTATS MAY BE IDENTIFIED WITH PERMANENT INK ON INSIDE OF REMOVABLE COVER.
- THIS CONTRACTOR SHALL EXAMINE THE ENTIRE DRAWING PACKAGE AND INCLUDE ALL NECESSARY MATERIAL AND LABOR TO PROVIDE A COMPLETE AND OPERABLE SYSTEM AS INDICATED IN THE ENTIRE DRAWING SET FOR HIS RESPECTIVE SYSTEMS.
- ALL RECTANGULAR OR SQUARE ELBOWS OR TEES SHALL BE INSTALLED WITH TURNING VANES AS PER SMACNA GUIDELINES.

AIR HANDLER SCHEDULE:

TAG	AHU-1	AHU-2
AREA SERVED	ADMINISTRATIVE	COURTROOM
MANUFACTURER	TRANE	TRANE
MODEL NUMBER	CSA805A	TWE240E84A
TYPE	MULTI ZONE VAV	SINGLE ZONE VAV
SUPPLY AIR CFM	18,507	6,400
OUTSIDE AIR CFM (MIN)	707	1,750
TOTAL FAN STATIC (IN H2O)	4.705	1.75
COOLING DATA		
ENTERING AIR (DB/WB)	75.90/63.28	80.74/67.29
LEAVING AIR (DB/WB)	52.06/51.95	58.07/55.52
SENSIBLE COOLING	470.53 MBH	174.80 MBH
TOTAL COOLING CAP.	612.72 MBH	250.01 MBH
REFRIGERANT	R-410A	R-410A
CUTOUT TEMP (F°)	45	43
COIL CIRCUITS	4	2
COIL FACE AREA (FT2)	34.94	21.65
ROWS	6	3
HEATING DATA		
POSITION	NA	RE HEAT
COIL FACE AREA	NA	21.65 FT2
HEATING CAPACITY	NA	380.2 MBH
FLUID FLOW RATE	NA	39.0 GPM
FLUID PRESSURE DROP	NA	2.44 FT WC
ENTERING FLUID TEMP	NA	180F
LEAVING FLUID TEMP	NA	160F
Cv RATING	NA	32
ENTERING AIR TEMP	NA	60 F
LEAVING AIR TEMP	NA	115 F
FAN DATA		
ELECTRICAL	208/3/60	208/3/60
FAN HP	25	5
MCA	34.0	18.1
MOCP	150	25
WEIGHT (LBS.)	3443	970
NOTES	1,2,3,4,5,6,7	1,2,3,4,5,6

NOTES:

- VARIABLE FREQUENCY DRIVE AND INTEGRAL SERVICE DISCONNECT PROVIDED WITH AIR HANDLER
- SUPPLY AND RETURN AIR SMOKE DETECTORS WITH REMOTE ANNUNCIATOR PANEL IN BASEMENT CORRIDOR
- 2" INTERNAL FILTERS
- INSTALL ON NEW CONCRETE PAD OR RAILS TO ALLOW FOR ADEQUATE CONDENSATE TRAP
- PROVIDE PROPERLY TRAPPED CONDENSATE DRAIN
- INSTALL INTERNAL VULNERATION ISOLATION FOR FAN
- BELT DRIVE PLENUM FAN

CONDENSING UNIT SCHEDULE:

TAG	CU-1	CU-2
AIR SYSTEM	AHU-1	AHU-2
MANUFACTURER	TRANE	TRANE
MODEL NUMBER	RAJJC40EE	TTA240E3
NOMINAL TONS	40 (FOUR STAGES)	20 (TWO STAGES)
CONDNR EAT AIR TEMP.	98'	98'
ELECTRICAL	208/3/60	208/3/60
MCA	193	98
MOCP	225	110
WEIGHT (LB)	3120	970
NOTES	ALL	ALL

NOTES:

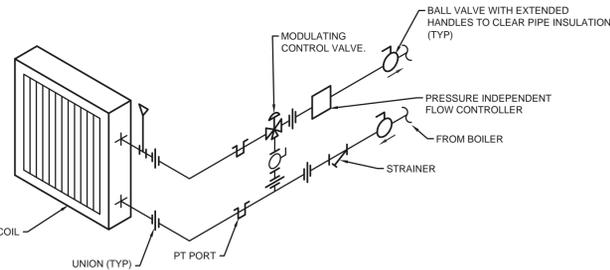
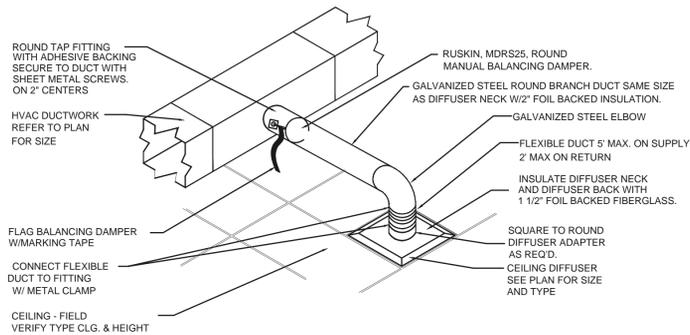
- INSTALL ON LEVEL PAD
- HIGH AND LOW PRESSURE SWITCHES
- CRANKCASE HEATER
- LOW AMBIENT
- 5-YEAR COMPRESSOR WARRANTY
- SIGHT GLASS AND LIQUID LINE DRIER
- INSTALL PER MANUFACTURER'S RECOMMENDATIONS FOR CLEARANCES
- SIZE REFRIGERANT LINE IN EXCESS OF 50' (HORIZONTAL) OR 20' (VERTICAL) AS PER MANUFACTURER'S RECOMMENDATION
- ALL REFRIGERANT PIPING INSTALLED OUTDOORS SHALL BE RIGID COPPER CLAMPED TO UNISTRUT, ANCHOR UNISTRUT TO CONCRETE PAD. ROUTE PIPING PLUMB AND SQUARE TO BLDG.

VAV AIR TERMINAL SCHEDULE:

TAG	VAV-1 (ZONE #1)	VAV-2 (ZONE #2)	VAV-3 (ZONE #3)	VAV-4 (ZONE #4)	VAV-5 (ZONE #5)
MANUFACTURER	TRANE	TRANE	TRANE	TRANE	TRANE
UNIT MODEL	VCWF16	VCWF16	VCWF16	VCWF24RT	VCWF24RT
QUANTITY REQUIRED	1	1	1	1	1
PRIMARY INLET	16"	16"	16"	24"x16"	24"x16"
CFM (MAX)	3241	3241	3115	4417	4530
CFM (MIN)	1200	1200	1200	1800	1800
APD @ COOLING AIRFLOW (IN H2O)	0.766	0.749	0.710	0.867	0.906
COOLING INLET VELOCITY (FT/MIN)	2321	2295	2231	1656	1699
VALVE HEATING AIRFLOW (CFM)	1500	1500	1500	1800	1800
EA TEMP	55.00	55.00	55.00	55.00	55.00
LA TEMP	111.74	111.74	111.74	112.36	112.36
COIL HEATING CAPACITY (MBH)	92.30	92.30	92.30	111.97	111.97
FLUID FLOW (GPM)	6.15	6.15	6.15	7.46	7.46
ENTERING FLUID TEMP.	180°F	180°F	180°F	180°F	180°F
LEAVING FLUID TEMP.	160°F	160°F	160°F	160°F	160°F
CONTROL TRANSFORMER	.05 KVA, 120-24 VOLT				
ELECTRICAL	120/1/60	120/1/60	120/1/60	120/1/60	120/1/60
NOTES:	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3

NOTES:

- INTEGRAL FACTORY DISCONNECT SWITCH
- 1" INTERNAL MATTE INSULATION
- FLOW RING



NOTE:
CONTROLS SHALL BE PROVIDED BY HVAC EQUIPMENT MFR.

SEQUENCE OF OPERATIONS

PROVIDE BUILDING AUTOMATION SYSTEM (BAS) TO PROVIDE THE FOLLOWING HVAC CONTROL. THE BAS SHALL BE ACCESSIBLE VIA PASSWORD PROTECTED INTERNET LOGIN FOR REMOTE MONITORING AND ADJUSTMENT OF SETPOINTS. CONNECTION TO INTERNET WILL BE PROVIDED BY OWNER.

PROVIDE SIX NEW THERMOSTATS. COORDINATE LOCATION OF EACH THERMOSTAT WITH ENGINEER. THREE THERMOSTATS ON SECOND FLOOR (ONE FOR AHU-2 COURTROOM AND TWO FOR AHU-1 VAV BOXES). TWO THERMOSTATS ON FIRST FLOOR. ONE THERMOSTAT IN THE BASEMENT.

BAS SHALL PROVIDE FOR AN OCCUPIED AND UNOCCUPIED CONTROL SCHEDULE. EACH ZONE THERMOSTAT SHALL HAVE AN OVERRIDE FEATURE TO ALLOW OCCUPANTS TO ACHIEVE OCCUPIED SPACE TEMPERATURES DURING AFTER HOUR OPERATION. DURATION OF OVERRIDE SHALL BE ADJUSTABLE.

SUPPLY AND RETURN DUCT MOUNTED SMOKE DETECTORS SHALL STOP UNIT SUPPLY FAN ON ALARM PROVIDED BY REMOTE ANNUNCIATOR PANEL. DUCT DETECTORS AND REMOTE ANNUNCIATOR PANEL BY BAS SUPPLIER.

BAS SHALL PROVIDE FOR STAGING OF CONDENSING UNIT COMPRESSORS

THE BAS SHALL BE CONNECTED TO THE EXISTING BAS AT THE HENDERSON COUNTY JUSTICE CENTER TO ALLOW OPERATION, ADJUSTMENT, AND MONITORING OF THE COURTHOUSE HVAC SYSTEM BY THE MAINTENANCE PERSONNEL AT THE JUSTICE CENTER.

OCCUPIED MODE AHU-1:

ZONE THERMOSTATS SHALL RESET TO OCCUPIED TEMPERATURE

BOILERS FACTORY CONTROLS ARE ENABLED AND BOILERS ARE OPERATING UNDER FACTORY CONTROLS TO MAINTAIN HOT WATER LOOP TEMPERATURE AS DICTATED BY OUTSIDE AIR TEMPERATURE. BOILER LOOP PUMP IS ON-LINE (THRU BOILER CONTROLS).

AHU SUPPLY FAN IS OPERATING AND VARIABLE FREQUENCY DRIVE IS MODULATING THE SUPPLY FAN SPEED TO MAINTAIN THE SETPOINT. PROVIDE DISCHARGE DUCT PRESSURE SENSOR FOR VFD CONTROL. THE DISCHARGE DUCT STATIC PRESSURE SENSOR SHALL BE USED AS A REFERENCE POINT BUT USE THE CFM READINGS AND PERCENT OPEN ON THE VAV BOXES TO DETERMINE VFD INPUT.

TWO-POSITION AHU FRESH AIR INTAKE DAMPERS IS OPEN (NO ECONOMIZER FUNCTION)

IF THE OUTSIDE AIR TEMPERATURE IS ABOVE 60 DEGREES, THE REFRIGERATION SHALL PROVIDE STAGES OF COOLING TO MAINTAIN LEAVING AIR TEMPERATURE SET POINT. PROVIDE DISCHARGE AIR TEMPERATURE SENSOR IN SUPPLY DUCT FOR DISCHARGE AIR TEMPERATURE CONTROL.

EACH ZONE THERMOSTAT SHALL CONTROL ITS RESPECTIVE VAV TERMINAL. ON A CALL FOR COOLING, VAV TERMINAL SHALL PROVIDE A MODULATED FLOW OF SUPPLY AIR TO THE SPACE. ON A CONTINUED DROP IN SPACE TEMPERATURE ONCE THE VAV TERMINAL HAS MINIMIZED AIR FLOW, THE THREE WAY VALVE ON THE HEATING COIL SHALL GO TO MINIMUM FLOW THRU HEATING COIL. ON A CONTINUED DROP IN SPACE TEMPERATURE, THE THREE WAY VALVE SHALL MODULATE TO ALLOW MORE WATER FLOW THROUGH THE COIL. THE REVERSE SHALL OCCUR ON A RISE IN SPACE TEMPERATURE.

UNOCCUPIED MODE AHU-1:

ZONE THERMOSTATS SHALL RESET TO NIGHT SET BACK TEMPERATURE.

BOILERS AND REFRIGERATION ARE OFF LINE.

AHU FRESH AIR INTAKE IS CLOSED AND SUPPLY FAN RUNS AT MINIMUM SPEED.

ON A CALL FOR COOLING FROM ANY SPACE THERMOSTAT, BAS SHALL ENABLE REFRIGERATION AND DISCHARGE AIR CONTROL. WHEN CALL IS SATISFIED, REFRIGERATION IS DISABLED AND THE SUPPLY FAN CONTINUES TO RUN AT MINIMUM SPEED. FRESH AIR INTAKE REMAINS CLOSED

ON A CALL FOR HEAT FROM ANY SPACE THERMOSTAT, THE BAS SHALL ENABLE BOILERS TO PROVIDE HEAT. FRESH AIR INTAKE REMAINS CLOSED

BAS SHALL PROVIDE FOR A POLLING AND ZONE PRIORITY FEATURE TO DETERMINE OPERATION OF AHU.

OCCUPIED MODE AHU-2:

ZONE THERMOSTAT SHALL RESET TO OCCUPIED TEMPERATURE

BOILERS FACTORY CONTROLS ARE ENABLED AND BOILERS ARE OPERATING UNDER FACTORY CONTROLS TO MAINTAIN HOT WATER LOOP TEMPERATURE AS DICTATED BY OUTSIDE AIR TEMPERATURE. BOILER LOOP PUMP IS ON-LINE (THRU BOILER CONTROLS).

THE TWO POSITION AHU FRESH AIR INTAKE IS OPEN (NO ECONOMIZER FUNCTION)

ON A CALL FOR COOLING, THE SUPPLY FAN AND THE STAGES OF REFRIGERATION SHALL OPERATE AS PER THE SPACE THERMOSTAT AND THE VFD TO SATISFY THE CALL.

ON A CALL FOR HEAT, THE SUPPLY FAN AND THE MODULATING THREE-WAY HOT WATER VALVE ON THE REHEAT COIL SHALL OPERATE AS PER THE VFD AND THE SPACE THERMOSTAT TO SATISFY THE CALL.

PROVIDE FOR DEHUMIDIFICATION OF THE SPACE VIA OPERATION OF THE REHEAT COIL AND COOLING COIL SIMULTANEOUSLY

UNOCCUPIED MODE AHU-2:

ZONE THERMOSTAT SHALL RESET TO NIGHT SET BACK TEMPERATURE.

BOILERS ARE OFF LINE.

AHU FRESH AIR INTAKE IS CLOSED AND SUPPLY FAN IS OFF

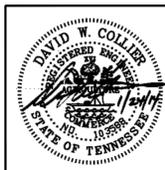
ON A CALL FOR COOLING FROM SPACE THERMOSTAT, BAS SHALL ENABLE REFRIGERATION AND START SUPPLY FAN. WHEN CALL IS SATISFIED, REFRIGERATION IS DISABLED AND THE SUPPLY FAN STOPS. FRESH AIR INTAKE REMAINS CLOSED.

ON A CALL FOR HEAT FROM SPACE THERMOSTAT, THE BAS SHALL ENABLE BOILERS TO PROVIDE HEAT AND STARTS THE SUPPLY FAN. WHEN CALL IS SATISFIED, BOILERS ARE DISABLED AND SUPPLY FAN STOPS. FRESH AIR INTAKE REMAINS CLOSED.

POINTS LIST:

- EACH ZONE TEMPERATURE AND THERMOSTAT SET POINT
- VAV TERMINAL LEAVING AIR TEMPERATURE
- VAV TERMINAL HOT WATER VALVE POSITION
- VAV AIR VALVE PERCENT
- AHU SUPPLY FAN SPEED PERCENTAGE
- AHU LEAVING AIR TEMPERATURE
- AHU RETURN AIR TEMPERATURE
- AHU COMPRESSORS STATUS
- AHU FRESH AIR INTAKE STATUS
- OSA TEMPERATURE DB
- BOILER STATUS
- BOILER LOOP TEMPERATURE
- BOILER PUMP STATUS

BAS PROVIDER SHALL PROVIDE A DETAILED SUBMITTAL FOR REVIEW PRIOR TO ANY PROCUREMENT AND INSTALLATION. SUBMITTAL SHALL INCLUDE EQUIPMENT CUT SHEETS, WIRING DIAGRAMS, POINTS LISTS, AND SEQUENCE OF OPERATION. BAS PROVIDER SHALL PROVIDE 16 HOURS OPERATIONAL TRAINING TO THE OWNER'S STAFF ON THE PROGRAMMING AND OPERATION OF THE BAS.



NOTICE

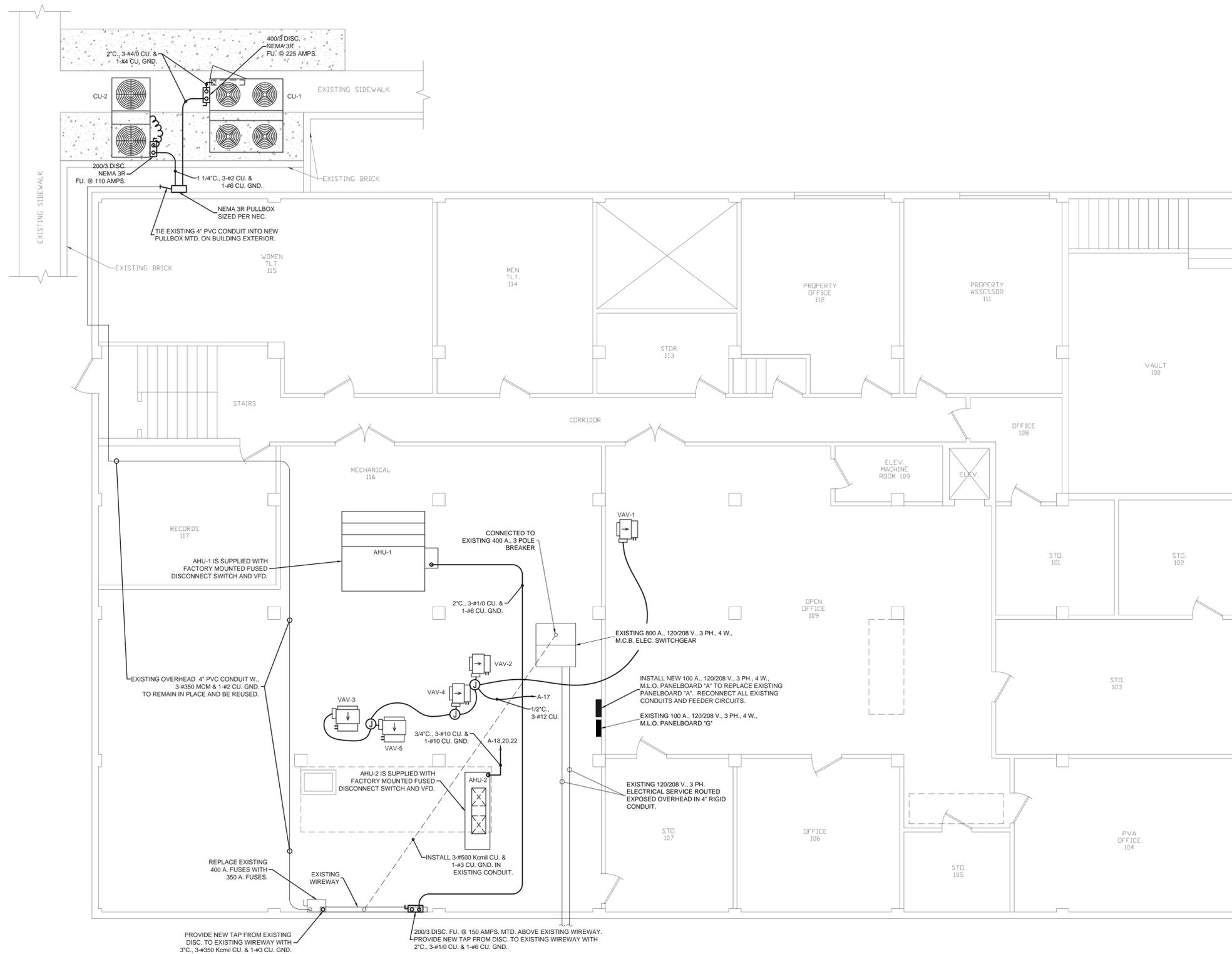
ALL RIGHTS RESERVED
This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

REVISION	DATE:	COMMENT:	ORIGINAL ISSUE DATE:
	1/24/14	RELEASED FOR BID	1/24/14
			SCALE: AS SHOWN
			CHECKED: DWC APPROVED: DWC
			DRAWN BY: JCB



DW COLLIER
ENGINEERING, INC.
720 BROADWAY STREET
SUITE 100
SOUTH FULTON, TN 38257
PH. (731) 479-2115
FAX (731) 479-8018
office@dwcwi.com

SHEET TITLE:	HVAC SCHEDULES & DETAILS	JOB NUMBER:	13-061
PROJECT:	HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS	SHEET NUMBER:	M2.1
17 MONROE AVENUE LEXINGTON, TN 38351			

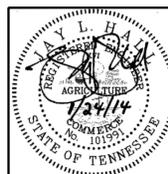


BASEMENT ELECTRICAL MODIFICATIONS

3/16" = 1'-0"



HALL
Engineering LLC
1A Street, Suite 100
Jackson, Tennessee 38301
731-424-5300
jay@halleng.net



NOTICE
ALL RIGHTS RESERVED
This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

REVISION	DATE	COMMENT
	1/24/14	RELEASED FOR BID

ORIGINAL ISSUE DATE: 1/24/14	
SCALE: 3/16" = 1'-0"	
CHECKED: DWC	APPROVED: DWC
DRAWN BY: JCB	



DW COLLIER
ENGINEERING, INC.
720 BROADWAY STREET
SUITE 100
SOUTH FULTON, TN 38257
PH. (731) 479-2115
FAX (731) 479-8018
office@dwcei.com

SHEET TITLE: BASEMENT ELECTRICAL MODIFICATIONS	JOB NUMBER: 13-061
PROJECT: HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS 17 MONROE AVENUE LEXINGTON, TN 38351	SHEET NUMBER: E1.1

VOLTAGE/PHASE/WIRES			120/208/3PH/4W	AIC		PANEL DESIGNATION	PANEL STYLE	NEW	PANEL SIZE	30 CIRCUITS
PANEL BUS SIZE			100 AMPS	MANUFACTURER	SQUARE D	A	EXISTING		NOTES:	
MAIN TYPE			MAIN LUG ONLY	ENCLOSURE TYPE	NEMA 1		NEW			
			AMP MB		NEMA 3R		EXISTING			
			ISOLATED GROUND BUS		SE RATED		SURFACE			
							FLUSH			
							INTEGRAL K TVSS		FEED TROUGH LUGS	
CKT #	C/B TRIP	LOAD	DESCRIPTION	LOAD IN KW			DESCRIPTION	LOAD	C/B TRIP	CKT #
				PH A	PH B	PH C				
1	20	1.0	EXISTING	2.0			EXISTING	1.0	20	2
3	20	1.0	EXISTING	2.0			EXISTING	1.0	20	4
5	20	1.0	EXISTING	2.0	2.0		EXISTING	1.0	20	6
7	20	1.0	EXISTING	2.0			EXISTING	1.0	20	8
9	20	1.0	EXISTING	2.0	2.0		EXISTING	1.0	20	10
11	20	1.0	EXISTING	2.0			EXISTING	1.0	20	12
13	20	1.0	EXISTING	2.0			EXISTING	1.0	20	14
15	20	1.0	EXISTING	2.0	2.0		EXISTING	1.0	20	16
17	20	2.0	VAV BOXES			4.2		2.2	25	18
19	20	0.0	SPARE	2.2			AIR HANDLER UNIT 'AHU-2'	2.2	25	20
21	20	0.0	SPARE	2.2				2.2	25	22
23	20	0.0	SPARE			0.0		0.0	20	24
25			SPACE	###						26
27			SPACE	###						28
29			SPACE	###						30
PHASE TOTALS				8.2	8.2	8.2				
PANEL TOTALS				24.6						
68 AMPS @ 208V / 3 PHASE CONNECTED										

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

- A. Refer to and comply with other sections of these Specifications for the installation of all electrical work.
- B. Drawings are diagrammatic; therefore, all conduit routing, fittings and accessories are not shown. Plan work around building details and with other trades.

1.2 CODES, ORDINANCES, INSPECTIONS AND PERMITS

- A. Contractor shall give all necessary notices; obtain all permits, and pay all governmental taxes, fees and other costs in connection with his work; file all necessary plans; prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain required Certificates of Inspection for his work and deliver same to the Architect-Engineer before request for acceptance and final payment of work.
- B. Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services. C. Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, State and Federal Governments, whether or not shown on the drawings and/or in these Specifications.

1.3 SITE UTILITIES

- A. Exterior utilities shall include all conduit and appurtenances outside of the building or as shown on the plans. Unless otherwise noted, utilities shall include complete tie-in with utility lines at no extra cost to the Owner.

1.4 SHOP DRAWINGS, SUBMITTALS AND SUBSTITUTIONS

- A. Submit manufacturer's catalog sheets and/or shop drawings covering all phases of work included in this contract.
- B. Submittals shall be arranged in sets and bound in folders.
- C. Submittals are required even though equipment being furnished is exactly as specified.

1.5 WARRANTY AND OPERATION INSTRUCTIONS

- A. This Contractor shall furnish a written certificate guaranteeing materials, equipment and labor furnished to be free of defects for a period of 1 year from and after the date of the final close-out inspection, and further agrees that if defects appear within stipulated guaranty period, same shall be replaced or made good without charge.
- B. Turn over to Owner all operation instructions and warranties furnished with equipment.

1.6 TESTING

- A. This Contractor shall perform megger testing of each conductor making up the service lateral and sub-panel feeders. The tests shall be performed with an applied potential of 1000 volts dc for 1 minute. These tests shall be performed with the conductors disconnected at each end. The minimum insulation resistance values shall not be less than two megohms.
- B. This Contractor shall perform megger testing of all circuits to determine the existence of grounds and short circuits. The tests shall be performed with an applied potential of 1000 volts dc for 1 minute. These tests shall be performed with all conductors connected and all switches in the closed position. The minimum insulation resistance values shall not be less than two megohms.
- C. This Contractor shall record the above test readings and furnish as part of the close-out documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be new and of the best quality normally used in good commercial practice, being essentially the standard products of reputable manufacture. Each major component shall bear a name plate stating name and address of the manufacturer and catalog number or designation. All materials shall be of the manufacturer's latest design standard, and bear Underwriters Laboratories, Inc. Label and the manufacturer's trade mark.
- B. All equipment shall be rated to withstand available fault currents shown on drawings as required by NFPA 70 (National Electrical Code). All distribution equipment shall be either fully protected or protected as part of a listed series rating. Equipment shall also have service entrance duty rating where required.

2.2 NAMEPLATES

- A. All Electrical Equipment shall be equipped with black laminated phenolic plastic nameplates with white core with lettering etched through the outer covering. 1/4" high lettering shall adequately describe the function or use of the equipment involved.

2.3 MOTOR STARTERS

- A. Manual starters shall be provided for single phase, fractional horsepower motors 1/2 horsepower and smaller or as noted on the drawings. Starters and control equipment for motors larger than 1/2 horsepower and for all polyphase motors shall be furnished under DIVISION 15.

2.4 CONDUIT

- A. Minimum size conduit shall be 1/2", unless indicated otherwise on the plans.
- B. All conduit used in concrete, earth, or damp locations shall be galvanized rigid, Intermediate metal conduit (IMC), or rigid PVC.
- C. Electrical metallic tubing shall be used in all areas where galvanized rigid or IMC is not required by these Specifications and the National Electrical Code.
- D. Flexible steel conduit shall be used to connect all motors and other moving electrical equipment. Liquid-tight flexible steel conduit, type U.A. as manufactured by Anaco or approved equal, shall be used in damp locations where flexible conduit is required.
- E. EMT shall be used for all branch circuit wiring U.L.O.

2.5 OUTLET BOXES

- A. Outlet boxes shall be provided for all devices. Mounting heights shall conform to ADA requirements.

2.6 WIRE AND CABLES

- A. Conductors shall be soft-drawn copper with THHN-THWN insulation of 75 deg C or higher, except fixture wiring which shall be #14 AF minimum.
- B. Conductors No. 8 and larger shall be stranded.
- C. All wiring shall be installed in conduit U.L.O.

2.7 EQUIPMENT DISCONNECT

- A. All disconnect switches shall be general-duty type, quick-make, quick-break or as shown on the Drawings. Disconnects for motor circuits shall be motor rated.
- B. Disconnect switches shall be furnished in NEMA 1 enclosures, except NEMA 3R or NEMA 12 shall be used in damp locations.
- C. Disconnect switches shall have a cover interlock, with defeat device, to prevent unauthorized personnel from opening the door when the switch is on.
- D. All disconnect switches shall be Square D[®]. Equal units, as manufactured by G. E., Cutler-Hammer, ITE or Westinghouse will be considered.
- E. Provide fusible switches and fuses where required by the manufacturer of the equipment served.

2.8 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit breakers shall be molded-case, quick-make and quick-break thermal-magnetic type. They shall have a trip indication independent of the "ON" or "OFF" positions. Breakers shall have a minimum interrupting capacity as required for the available fault current as shown on the drawings or be protected as part of a series rating. When a value is not indicated on the drawings, the contractor shall coordinate with the local utility company to determine the available fault current.
- B. Fuses shall be the type as indicated on the drawings and as manufactured by Bussman.

2.9 WIRING DEVICES

- A. Contractor shall furnish and install specification grade devices as listed below, or approved equal:
 - MANUFACTURER NO.
 - Single Pole Switch HUBBELL 1221-1
 - Double Pole Switch HUBBELL 1222-1
 - 3-Way Switch HUBBELL 1223-1
 - 4-Way Switch HUBBELL 1224-1
 - Duplex Receptacle HUBBELL 5362-1
 - Duplex Receptacle, GFI type HUBBELL GF-5362I
 - Duplex Receptacle, TVSS type LEVITON 5380-1
 - Duplex Receptacle, safety type HUBBELL 5G-62H
- B. Device plates shall be smooth ivory plastic and shall be designed for use with the device intended. Outdoor receptacles shall be installed in a weatherproof box equal to that manufactured by "Taymac" or "Carlon".

2.10 PANELBOARDS

- A. Panelboards shall be equipped with the type, size and number of circuit breakers arranged and numbered as shown on the drawings. Panelboards shall be enclosed in a steel cabinet complete with a door, door lock, circuit identification, directory holder, neutral bar and lugs for all cable connections. Where "SPACE" is indicated, space shall be bussed for future breakers. Bus shall be copper.

- Where panelboards are indicated to be flush mounted, for each two spares and/or spaces, stub one 3/4" conduit into accessible ceiling space.
- B. All panelboards shall be as manufactured by Square D[®] Company. Equal units as manufactured by Siemens or Cutler-Hammer will be considered.

2.11 LIGHTING

- A. The Contractor shall furnish all luminaires, lighting equipment and components as required for proper installation as listed in the Fixture Schedule, shown on the Drawings and specified herein.
- B. The Contractor shall furnish and install lamps and accessory wiring. Fixture to junction box wire insulation shall be rated at not less than 90°C.
- C. It shall be the responsibility of the Contractor to assure his count by type as well as voltage prior to ordering.
- D. All fluorescent ballasts, as indicated, shall be of the high-power factor type with resetting thermal protectors and their design and construction shall conform to the "Certified Ballast Manufacturer's Standards" for Class "F" Sound Rated A. Provide electronic ballasts where indicated on the drawings.
- E. Lens for fluorescent troffers shall be clear acrylic, Type KSH-12, (125) as manufactured by "KSH" or approved equal; except as shown on the drawings.
- F. Recessed incandescent fixtures shall have UL listed thermal cut-out protection.

2.12 TELEPHONE

- A. This Contractor shall furnish and install an Empty Conduit System and Outlet Boxes for the telephone system, as recommended and specified by the serving telephone company, described in these specifications and indicated on the drawings.
- B. Minimum size raceway for telephone type outlets shall be 3/4" conduit. Provide 1 conduit run to accessible ceiling from each outlet unless otherwise noted. Provide and leave in place a suitable nylon pull cord to facilitate the installation of the telephone cables. Provide factory bends for telephone conduit runs. Do not install more than two 90 degree bends without installing a pull box. For conduit runs longer than 100'-0", install a pull box.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be carried out in such a manner that the many components will function as a complete workable system, including any accessories required to accomplish such installation. Equipment shall be left properly adjusted and in satisfactory working order. Work is to be executed in conformity with best acceptable standard practices with the equipment being installed to allow for maximum accessibility and best appearance. Installation shall be such that future installations and expansions can be made with a minimum of expenditure.

3.2 DEMOLITION

- A. Remove all existing electrical distribution equipment within the walls and/or ceilings being removed. Panelboards, lights, all exposed conduit and surface mounted boxes shall be removed. Where conduit is concealed and boxes are flush in walls or ceilings, remove devices and conductors and provide blank covers on boxes.
- B. Where existing lighting fixtures, receptacles, switches, etc., are removed, remove all associated conductors. Remove all associated conduit, outlet boxes, etc., insofar as practical without causing damage to the building. Provide blank covers on all outlet boxes, junction boxes, etc., which cannot be removed.

3.3 DOWNTIME

- A. In the event that electrical service to any other facility must be interrupted, the Contractor shall obtain written approval from the Owner stating the area(s) of the existing facilities which will be affected, the time and date the interruption is to commence, and the duration of the interruption. Any interruption without prior written approval will not be permitted. The Contractor shall request such approval from the Owner, in writing, at least 72 hours in advance of the desired time of the interruption. The Contractor shall abide by the Owner's decisions in all instances.

- 3.4 Penetrations of four-hour rated walls, partitions, ceilings, and/or floors will not be permitted under any circumstances.

PANEL SCHEDULE & SPECIFICATIONS

NOT TO SCALE



NOTICE

ALL RIGHTS RESERVED
This drawing and the design shown are the property of Collier Engineering. The reproduction or use of this drawing, in whole or in part, without the expressed written consent of the engineer, is prohibited and any infringement is subject to legal action.

REVISION	DATE	COMMENT
	1/24/14	RELEASED FOR BID

ORIGINAL ISSUE DATE: 1/24/14	SCALE: NOT TO SCALE
CHECKED: DWC	APPROVED: DWC
DRAWN BY: JCB	



DW COLLIER
ENGINEERING, INC.
720 BROADWAY STREET
SUITE 100
SOUTH FULTON, TN 38257
PH. (731) 479-2115
FAX (731) 479-8018
office@dwcei.com

SHEET TITLE: PANEL SCHEDULE & SPECIFICATIONS	JOB NUMBER: 13-061
PROJECT: HENDERSON CO. COURTHOUSE HVAC MODIFICATIONS 17 MONROE AVENUE LEXINGTON, TN 38351	SHEET NUMBER: E2.1

HALL
Engineering LLC
1A Street, Suite 100
Jackson, Tennessee 38301
731-424-5300
jay@halleng.net