

MECHANICAL SYMBOLS AND ABBREVIATIONS

NOTE: NOT ALL SYMBOLS AND ABBREVIATIONS SHOWN ARE NECESSARILY USED ON THE DRAWINGS

GENERAL NOTES

- PERFORM ALL WORK IN ACCORDANCE WITH ALL APPLICABLE CODES AND AUTHORITIES HAVING JURISDICTION. PROVIDE ALL PERMITS, INSPECTIONS, LICENSES AND FEES. FURNISH ALL LABOR, EQUIPMENT, SUPPLIES AND MATERIALS NECESSARY TO PROVIDE COMPLETE AND OPERATIONAL SYSTEMS.
- THE DRAWINGS AND SPECIFICATIONS INDICATE THE GENERAL DESIGN AND ARRANGEMENT OF PIPES, FIXTURES, EQUIPMENT, SYSTEMS, ETC. INFORMATION SHOWN IS DIAGRAMMATIC IN CHARACTER AND DOES NOT NECESSARILY INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. DO NOT SCALE THE DRAWINGS FOR DIMENSIONS. TAKE ALL DIMENSIONS, MEASUREMENTS, EQUIPMENT LOCATIONS, LEVELS, ETC FROM THE ARCHITECTURAL DRAWINGS AND FROM THE EQUIPMENT TO BE FURNISHED. PIPING MAY BE RELOCATED OR OFFSET FOR PROPER CLEARANCES OR TO AVOID CONFLICTS WITH OTHER TRADES. THE DESIGN INTENT (I.E. PITCHES, VELOCITIES, PRESSURE DROPS, VOLTAGE DROPS, ETC) CANNOT BE GREATLY ALTERED WITHOUT THE APPROVAL OF THE ARCHITECT. THE COST OF THESE DEVIATIONS TO AVOID INTERFERENCE'S SHALL BE PART OF THE ORIGINAL CONTRACT BID.
- CONFER AND COOPERATE WITH ALL OTHER TRADES TO COORDINATE THEIR WORK. COORDINATION SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO MATERIALS AND EQUIPMENT ROUTED IN CEILING AND WALL CAVITIES, EQUIPMENT ARRANGEMENT IN MECHANICAL SPACES, INCLUDING EQUIPMENT CLEARANCE REQUIREMENTS, ELEVATIONS AND DIMENSIONS OF STRUCTURAL MEMBERS AND OPENINGS, ETC. NOTIFY THE ARCHITECT OF ANY CONFLICTS.
- BASE FINAL INSTALLATION OF MATERIALS AND EQUIPMENT ON ACTUAL DIMENSIONS AND CONDITIONS AT THE PROJECT SITE. FIELD MEASURE FOR MATERIALS AND EQUIPMENT REQUIRING EXACT FIT. NO EXTRAS WILL BE GIVEN FOR THE CONTRACTOR'S FAILURE TO FIELD COORDINATE.
- THE OWNER OR ENGINEER ARE NOT RESPONSIBLE FOR THE CONTRACTOR'S SAFETY PRECAUTIONS OR FOR MEANS, METHODS, TECHNIQUES, CONSTRUCTION SEQUENCES, OR PROCEDURES REQUIRED TO PERFORM THE WORK.
- LOCATE ALL EQUIPMENT THAT MUST BE SERVICED, OPERATED, OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS. EQUIPMENT SHALL INCLUDE (BUT NOT LIMITED TO) VALVES, MOTORS, CONTROLS, SWITCHGEAR, DRAIN FRONTS AND DRAIN TRAYS FOR BETTER ACCESSIBILITY. FURNISH ACCESS DOORS FOR THIS PURPOSE. MINOR DEVIATIONS FROM THE DRAWINGS MAY BE ALLOWED TO PROVIDE FOR BETTER ACCESSIBILITY. ANY CHANGES SHALL BE APPROVED BY THE ARCHITECT AND CONSTRUCTION MANAGER/GENERAL CONTRACTOR PRIOR TO MAKING THE CHANGE.
- PROVIDE ACCESS DOORS, WALL OPENINGS, ROOF OPENINGS OR ANY OTHER CONSTRUCTION REQUIREMENT NEEDED TO ACCOMMODATE THE MECHANICAL EQUIPMENT. LOCATIONS OF THESE OPENINGS SHALL BE SUBMITTED IN SUFFICIENT TIME TO BE INSTALLED IN THE NORMAL COURSE OF WORK.
- COORDINATE ELECTRICAL REQUIREMENTS OF APPROVED MECHANICAL EQUIPMENT WITH THE ELECTRICAL SUB-CONTRACTOR PRIOR TO THE PURCHASE AND INSTALLATION OF ANY ELECTRICAL EQUIPMENT, DEVICES, WIRING, OR CONDUIT.
- PROVIDE GENERAL CONTROL WIRING, THERMOSTATS, MOTORIZED DAMPERS AND CONDUIT ASSOCIATED WITH HVAC EQUIPMENT. COORDINATE THE LOCATION OF ALL THERMOSTATS, ROOM SENSORS, ETC WITH THE ARCHITECT AND ALL OTHER TRADES PRIOR TO INSTALLATION. IF A CONFLICT WITH MILLWORK, LIGHT SWITCHES, WINDOWS, ETC EXISTS, NOTIFY THE ARCHITECT OF THE POTENTIAL INTERFERENCE PRIOR TO INSTALLATION. INSTALL THERMOSTATS WITH PROTECTIVE LOCKING COVER, CENTERED AT 4'-0" ABOVE FINISHED FLOOR, UNLESS OTHERWISE INDICATED. COMPLY WITH THE PROVISIONS OF THE AMERICANS WITH DISABILITIES ACT (ADA) AND THE TEXAS ACCESSIBILITY'S STANDARD (TAS).
- ALL DIMENSIONS SHOWN ON THE DRAWINGS FOR DUCTWORK ARE NET INSIDE CLEAR DIMENSIONS. FOR RECTANGULAR DUCT, THE FIRST FIGURE OF THE DUCT SIZE INDICATES THE DIMENSION OF THE FACE SHOWN. VERIFY THAT THE DUCTWORK SPECIFIED WILL FIT IN THE SPACE AVAILABLE USING THE ARCHITECTURAL, STRUCTURAL AND ELECTRICAL DRAWINGS AS REFERENCE PRIOR TO FABRICATION AND INSTALLATION. ROUND DUCT OF EQUAL NET INSIDE CLEAR AREA MAY BE USED IN LIEU OF RECTANGULAR DUCT.
- PROVIDE TURNING VANES ON ALL RECTANGULAR SUPPLY, EXHAUST AND RETURN DUCTWORK INCLUDING THE TOP AND BOTTOM OF VERTICAL DUCTS.
- PROVIDE A LOCKING QUADRANT VOLUME DAMPER AT THE TAP OF EACH RUN-OUT TO SUPPLY AND EXHAUST AIR DEVICES FOR BALANCING PURPOSES. THE RUN-OUT DUCT SIZE IS THE SAME SIZE AS THE DIFFUSER OR GRILLE NECK SIZE UNLESS OTHERWISE NOTED ON PLAN.
- WHERE DAMPERS ARE LOCATED ABOVE HARD CEILINGS PROVIDE CONCEALED YOUNG REGULATORS. REGULATORS SHALL NOT BE LOCATED IN CORRIDORS, PATIENT CARE, OR TREATMENT AREAS. EACH REGULATOR SHALL BE LABELED PER THE SPECIFICATIONS.
- CEILING SPACE IS NEEDED AS A RETURN AIR PLENUM IN CERTAIN AREAS. FOLLOW ALL APPLICABLE CODES AS TO MATERIALS ALLOWED FOR USE IN AIR PLENUMS. COORDINATE ALL WORK TO PROVIDE RETURN OF AIR FROM ALL LOCATIONS. PROVIDE ALL CEILING RETURN GRILLES WITH RETURN SOUND ATTENUATOR AS DETAILED.
- REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION OF ALL FIRE RATED WALLS AND CEILINGS. PROVIDE FIRE DAMPERS AND/OR COMBINATION FIRE/SMOKE DAMPERS IN DUCTWORK AT ALL LOCATIONS WHERE DUCTS PASS THROUGH FIRE RATED ASSEMBLY. MECHANICAL SUB-CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING FIRE AND FIRE/SMOKE DAMPERS. COORDINATE CONSTRUCTION REQUIREMENTS AND PROVISIONS FOR CONNECTIONS TO FIRE ALARM SYSTEM.
- INTERIOR CONCEALED DUCTWORK: DUCTWORK ON VARIABLE AIR VOLUME SYSTEMS BETWEEN AIR HANDLING UNIT DISCHARGE AND TERMINAL UNIT INLET SHALL BE CONSTRUCTED TO 6" W.G. AND SEALED TO SMACNA CLASS A. DUCT WORK DOWN STREAM OF TERMINAL UNITS SHALL BE CONSTRUCTED TO 1" W.G. AND SEALED TO SMACNA CLASS C. ALL DUCT WORK ASSOCIATED WITH CONSTANT VOLUME AIR HANDLING EQUIPMENT SHALL BE CONSTRUCTED TO 2" W.G. AND SEALED TO SMACNA CLASS B. SEAL ALL SEAMS WITH MASTIC SEALANT UL 181 LISTED FOR THE APPLICATION USED. SEALANT SHALL BE DESIGNED FOR USE ON METAL DUCT AND FLEXIBLE DUCT.
- INTERIOR EXPOSED DUCTWORK APPLICATION: RECTANGULAR AND ROUND SUPPLY AND RETURN DUCTWORK LOCATED IN EXPOSED INTERIOR AREAS SHALL BE INTERNALLY LINED WITH DUCT LINER AND EXTERNALLY PAINTED. REFER TO ARCHITECT FOR COLOR SELECTION.
- PROVIDE VIBRATION ISOLATORS FOR MOTOR DRIVEN EQUIPMENT UNLESS NOTED OTHERWISE. PROVIDE ISOLATION AS INDICATED OR AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.
- EXPAND OR REDUCE DUCTS AT EQUIPMENT CONNECTIONS BASED ON THE EQUIPMENT PURCHASED. WITH TRANSITIONS NOT TO EXCEED 30 DEGREES. SIZES SHOWN ON SCHEDULES, ETC. ARE FOR GUIDANCE ONLY. ASPECT RATIO SHALL BE NO GREATER THAN 4:1, PER SMACNA'S GUIDELINES.
- ALL DUCTS WITH A DIMENSION GREATER THAN 12" PASSING THRU A NON-RATED WALL SHALL HAVE THE OPENING FRAMED IN WITH METAL STUDS. COORDINATE OPENING SIZE AND LOCATION WITH OTHER TRADES.
- ALL EQUIPMENT LISTED TO UL508A OR UL 1995 SHALL HAVE A SHORT CIRCUIT CURRENT RATING (SCCR) OF THE ASSEMBLY MEETING OR EXCEEDING THE RATING OF THE PANEL FROM WHICH IT IS POWERED. SCCR RATINGS MAY BE REDUCED BASED ON ACTUAL CALCULATIONS BASED ON ACTUAL CONSTRUCTION AND IN ACCORDANCE WITH NEC. RATING SHALL BE STAMPED ON EQUIPMENT AT THE FACTORY. REFER TO ELECTRICAL FOR ADDITIONAL INSTRUCTIONS.

SYMBOLS

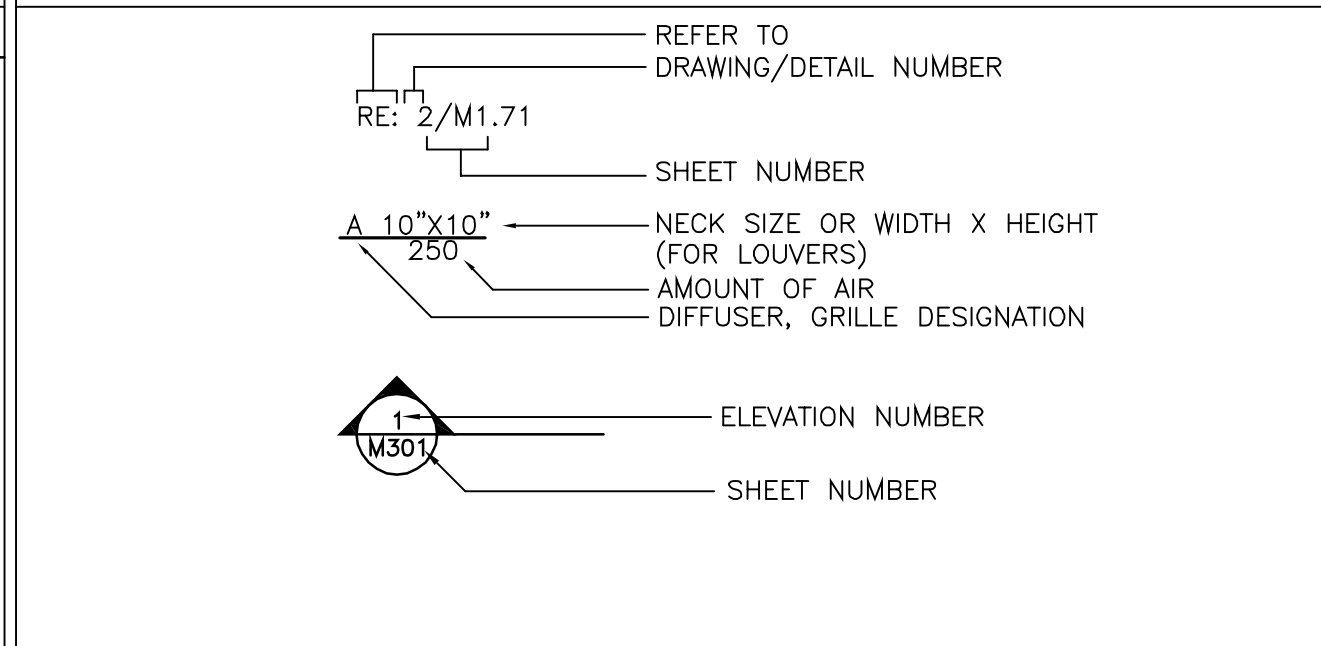
SYMBOL	DESCRIPTION
	ACOUSTICAL DUCT LINING (FIGURES SHOWN ARE INSIDE DUCT DIMENSIONS)
	SUPPLY AIR DUCT UP (POSITIVE PRESSURE)
	RETURN, EXHAUST OR OUTSIDE AIR INTAKE DUCT UP (NEGATIVE PRESSURE)
	SUPPLY AIR DUCT DOWN (POSITIVE PRESSURE)
	RETURN, EXHAUST OR OUTSIDE AIR INTAKE DUCT DOWN (NEGATIVE PRESSURE)
	ROUND DUCT UP
	ROUND DUCT DOWN
	RECTANGULAR DUCT SQUARE ELBOW WITH TURNING VANES
	RECTANGULAR DUCT RADIUS ELBOW
	ROUND DUCT RADIUS ELBOW
	TRANSITION CONCENTRIC UNLESS TOP LEVEL (TOP LVL) OR BOTTOM LEVEL (BOT LVL) IS NOTED
	TRANSITION, RECTANGULAR TO ROUND CONCENTRIC UNLESS TOP LEVEL (TOP LVL) OR BOTTOM LEVEL (BOT LVL) IS NOTED
	SQUARE CEILING DIFFUSER (SUPPLY) (4-WAY UNLESS OTHERWISE INDICATED)
	SQUARE CEILING GRILLE (RETURN OR EXHAUST)
	T = THERMOSTAT/TEMPERATURE SENSOR
	H = HUMIDISTAT/HUMIDITY SENSOR
	DUCT SPLITTER WITH DAMPER
	MOTORIZED DAMPER
	MANUAL VOLUME DAMPER
	FIRE DAMPER
	FIRE SMOKE DAMPER

BASIS OF MECHANICAL DESIGN

PRIMARY MECHANICAL CODES:
 MECHANICAL: 2021 INTERNATIONAL MECHANICAL CODE (WITH CITY AMENDMENTS).
 ENERGY: 2015 INTERNATIONAL ENERGY CODE (WITH CITY AMENDMENTS).

PROJECT DESIGN VALUES:
 OUTDOOR DESIGN TEMPERATURE (SUMMER): 99°F (DRY BULB), 77°F (WET BULB)
 AMBIENT TEMPERATURE AT CONDENSING UNITS: 105°F (DRY BULB, SUMMER)
 OUTDOOR DESIGN TEMPERATURE (WINTER): 22°F (DRY BULB)
 INDOOR DESIGN TEMPERATURE (SUMMER): 75°F (DRY BULB), 50% RH
 INDOOR DESIGN TEMPERATURE (WINTER): 72°F (DRY BULB)
 OUTSIDE AIR REQUIREMENTS: PER IMC TABLE 403.3

DRAWING/DETAIL REFERENCE



MISCELLANEOUS

- DRAWING NOTE REFERENCE (I.E., NOTES BY SYMBOL)
- CONNECTION INTO EXISTING

ABBREVIATIONS

AD	ACCESS DOOR	KW	KILOWATT
A/C	AIR CONDITIONING UNIT	L	LENGTH
A/E	ARCHITECT/ENGINEER	LAT	LEAVING AIR TEMPERATURE
AFF	ABOVE FINISHED FLOOR	LPC	LOW PRESSURE CONDENSATE
AHJ	AUTHORITY HAVING JURISDICTION	LPS	LOW PRESSURE STEAM
AFS	AIR FLOW SWITCH	LB	POUNDS
AHU	AIR HANDLING UNIT	LRA	LOCKED ROTOR AMPS
APPROX	APPROXIMATE	LWT	LEAVING WATER TEMPERATURE
BAS	BUILDING AUTOMATION SYSTEM	MAX	MAXIMUM
BHP	BRAKE HORSE POWER	MBH	1000 BRITISH THERMAL UNITS / HOUR
BTU	BRITISH THERMAL UNIT PER HOUR	MCA	MINIMUM CIRCUIT AMPACITY
C/A	COMBUSTION AIR	MFR	MANUFACTURER
CC	COOLING COIL	MIN	MINIMUM
CFH	CUBIC FEET PER HOUR	N/A	NOT APPLICABLE
CFM	CUBIC FEET PER MINUTE	N/O,N/C	NORMALLY OPEN, NORMALLY CLOSED
CLG	CEILING	O/A	OUTSIDE AIR/FRESH AIR
CU	EQUIPMENT DRAIN	ODD	OPPOSED BLADE DAMPER
D	DEGREES	O/C	ON CENTER
DB	DRY BULB	PH	PHASE
DN	DOWN	PROVIDE	FURNISH AND INSTALL
DX	DIRECT EXPANSION	PRV	PRESSURE REDUCING VALVE
(E)	EXISTING	PSI	POUNDS PER SQUARE INCH
EAT	ENTERING AIR TEMPERATURE	R/A	RETURN AIR
E/A	EXHAUST AIR	RE:	REFERENCE, REFER TO
EDH	ELECTRIC DUCT HEATER	RH	RELATIVE HUMIDITY
EF	EXHAUST FAN	RL	REFRIGERANT LIQUID
EQUIP	EQUIPMENT	RLA	RUNNING LOAD AMPS
ESP	EXTERNAL STATIC PRESSURE	RM	ROOM
EWT	ENTERING WATER TEMPERATURE	RPM	REVOLUTIONS PER MINUTE
F	DEGREES FAHRENHEIT	RS	REFRIGERANT SUCTION
FCU	FAN COIL UNIT	S/A	SUPPLY AIR
FD	FIRE DAMPER	SD	SMOKE DETECTOR
FLA	FULL LOAD AMPS	SF	SQUARE FOOT, SUPPLY FAN SPECIFICATIONS
FLR	FLOOR	SPECS	SPECIFICATIONS
FPVAV	FAN POWERED VAV	T, TSTAT	THERMOSTAT, ROOM SENSOR
FSD	FIRE SMOKE DAMPER	T/A	TRANSFER AIR
FT	FOOT, FEET	THRU	THROUGH
FT, WG	FEET WATER GAUGE	TSP	TOTAL STATIC PRESSURE
GA	U.S. GAUGE	TSTAT	THERMOSTAT OR ROOM SENSOR
GPM	GALLONS PER MINUTE	TYP	TYPICAL
H	HEIGHT	UL	UNDERWRITERS LABORATORIES, INC.
HP	HORSEPOWER	UH	UNIT HEATER
HPC	HIGH PRESSURE CONDENSATE	V	VOLTS
HPS	HIGH PRESSURE STEAM	VAV	VARIABLE AIR VOLUME
HWR	HEATING WATER RETURN	VEL	VELOCITY
HWS	HEATING WATER SUPPLY	VFD	VARIABLE FREQUENCY DRIVE
HZ	HERTZ	W/	WITH
IN.	INCH, INCHES	WB	WET BULB
IN, WG	INCHES WATER GAUGE	W/O	WITHOUT
J-BOX	JUNCTION BOX		

ARCHITECTURE

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SAINT TERESA
 OF CALCUTTA
 CATHOLIC
 CHURCH

PARISH
 HALL

13517 ALTA VISTA ROAD
 FORT WORTH, TX 76262

CONSTRUCTION
 DOCUMENTS

Drawing Title:

HVAC LEGENDS & NOTES

Project No.

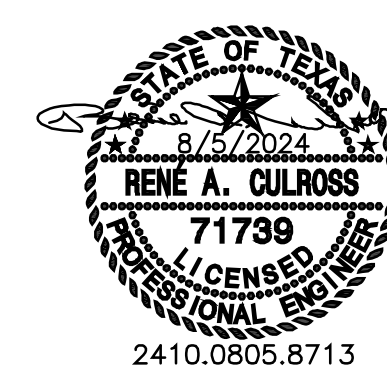
2403

Date:

08/05/2024

Sheet No.

MO.1



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SECTION 4 – SUPPLEMENTARY CONDITIONS FOR MECHANICAL WORK

1.1.1 GENERAL CONDITIONS
A. All work covered by this section of these specifications shall be accomplished in accordance with the respective drawings, information of instructions to bidders, general requirements and the supplementary general conditions of these specifications.
B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contract subcontracts or trades as may be issued for bidding purposes only. The contract documents are the combined Architectural, Structural, Plumbing, Heating, Ventilating and Air Conditioning and Electrical drawings and specifications. All drawings and specifications are on file in the Architect's office, and each Bidder shall thoroughly acquaint himself with all of the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract. They shall be considered as bound therewith in the event partial sets of plans and specifications shall be deemed evidence of the review and examination of all drawings, specifications and details issued for this project. No allowances will be made because of the Contractor's unfamiliarity with any portion of the complete set of documents.
C. All equipment and materials shall be manufactured in the United States of America.

1.1.2 SCOPE
A. The work included under this specification consists of the furnishing of all labor, materials, tools, transportation, services, etc. which are applicable and necessary to complete the installation of the systems specified herein; all as described in these specifications, as illustrated on the accompanying drawings, or as directed by the Architect.
B. In general, the various lines and ducts to be installed by the various trades under this specification shall be run as indicated, as specified herein, as required by particular conditions at the site and as required to conform to the generally accepted standards so as to complete the work in a neat and satisfactorily workable condition. The Contractor shall conform to the lines of the building unless otherwise noted.
C. The construction details for the building are illustrated on the Architectural and Structural Drawings. Each Contractor shall thoroughly acquaint himself with the details before submitting his bid, as no allowance will be made because of the Contractor's unfamiliarity with these details. Place all inserts to accommodate the ultimate installation of pipe hangers in the forms before concrete is poured. Set sleeves in place in forms before concrete is poured, and in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to preclude that general construction.

1.1.3 INSPECTION OF SITE
A. The Contractors shall visit the site, verify all existing items shown on plans or specified herein, and familiarize himself with the existing conditions, hazards, existing grades, actual formations, soil conditions, and local requirements involved, and submission of bids shall be deemed evidence of their visit to the site and their acceptance of the conditions in full consideration, and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.
1.1.4 SITES, LOCATIONS AND ELEVATIONS
A. Locations and elevations of the various utilities included within the scope of this work have been obtained from City and/or other substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without guarantee as to accuracy. The Contractor shall examine the site, shall verify to their own satisfaction the locations, elevations and availability of all utilities and services required and shall adequately inform themselves as to their relation to the work; the submission of bids shall be deemed evidence thereof.
1.1.5 CODE REQUIREMENTS
A. All work shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Architect, and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies, and all authorities having jurisdiction over the work, or services thereto. In all cases where alterations to, or deviations from the drawings and specifications are required by the authority having jurisdiction, the Contractor shall report same in writing to the Owner and secure his approval before proceeding. Upon completion of the work, the Contractor shall provide complete utility service connections, as directed, and submit, as required, all necessary drawings; he shall secure all permits and inspections necessary in connection with his work and pay all legal fees on account thereof. In the absence of other applicable local codes acceptable to the Architect, the National Electrical Code and International Plumbing Code shall apply to this work.
1.1.6 RECORDS FOR THE OWNER
A. The Contractor shall obtain at his own expense a complete, full-size set of prints on which he shall keep an accurate record of the installation of all materials and systems covered by his contractual agreement. The record shall indicate the location of all equipment and the routing of all systems. All conduit buried in concrete slabs and below grade shall be located by dimension unless a surface mounted device in each space indicates the exact location. He shall then obtain at his expense one complete reproducible set of the original drawings on which he shall neatly transfer his notations and deliver these drawings to the Engineer at job completion before the final payment for delivery to the Owner.
B. In addition to the above, the Contractor shall accumulate during the job progress the following data in duplicate prepared in a neat brochure or pocket folder bonding for subsequent delivery to the Owner. The Contractor shall include in his bid the cost of binding into a book:
1. All warranties, guarantees, and manufacturer's directions on equipment and material covered by the Contract.
2. Copies of approved shop drawings and submittals.
3. Copies of sequence of operations for all equipment covered by Contract.
1.1.7 MATERIALS AND WORKMANSHIP
A. All materials, unless otherwise specified, shall be new, free from any defects and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model and quality, unless otherwise specified.
B. All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, adjusted and conditioned as recommended by the Manufacturers, or all indicated in their published literature, unless specifically herein specified to the contrary. All work under this contract shall be performed by competent workmen and executed in a neat and workmanlike manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials and the temporary pegging of open lines during construction. At completion, the installation shall be thoroughly cleaned, and all tools, equipment, obstruction or debris present as a result of this Contract shall be removed from the premises.
1.1.8 STORAGE AND PROTECTION
A. Provide adequate facilities for items furnished under these specifications which are subject to damage if exposed to elements. Take such precautions as necessary to properly protect apparatus from damage. Failure to comply with this provision will be sufficient cause for rejection of the particular apparatus involved.
1.1.9 COOPERATION
A. All work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.
B. Maintaining contact and being familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed shall be the responsibility of this trade, as will the installation of the required systems in their several stages, at the proper time to expedite this contract and avoid unnecessary delays in the progress of other contracts, and meet all requirements of progress schedules set up by the Architect.
C. Should any question arise between trades as to the placing of lines, ducts, conduits, fixtures or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Architect for instructions.
1.1.10 SCHEDULE OF MATERIAL AND EQUIPMENT
A. The Contractor shall submit for approval a complete schedule of material and equipment which is to be installed under the contract. The schedule shall be submitted within 30 days after the award of this contract and prior to the installation or fabrication of any of the material involved. The schedule shall include for materials the Manufacturer's name, Catalog Number, Type and Trade Name; in addition, for equipment, attach Manufacturer's Engineering Data and Specification Sheet.

1.1.11 SHOP DRAWINGS AND SUBMITTALS

1.1.11.1 GENERAL CONDITIONS
A. Provide Submittals and Shop Drawings (3 copies minimum) for the following equipment and layout:
1. Ductwork fabrication details and layout at 1/4" = 1'-0" scale.
2. Mechanical equipment cut sheets including all performance characteristics, accessories, drawings, wiring diagrams, etc. Accessories shall be clearly labeled to show what is and is not provided.
3. Piping details showing materials used and joining/sealing methods.
4. Piping layout at 1/8" = 1'-0" scale.
B. Equipment shall not be ordered until approved by the Architect and Engineer of Record. The Contractor shall allow two (2) weeks for design team review of submittals.
1.1.11.2 DRAWINGS AND SPECIFICATIONS
A. The drawings show, diagrammatically, the locations of the various lines, ducts, conduits, fixtures and equipment and the method of connecting and joining them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements of the building and in cooperation with other sub-contractors and, in all cases, shall be subject to the approval of the Contractor, the Contractor reserves the right to make any reasonable change in the location of any part of this work without additional cost to the Owner.
B. Should any changes be deemed necessary by the Contractor in items shown on the contract drawings, shop drawings and descriptions, the reason for the proposed changes shall be submitted to the Owner for approval.
C. Exceptions and inconsistencies in plans and specifications shall be brought to the contractor's attention before bids are submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate his particular apparatus.
D. The Contractor shall lay out his work maintaining all lines, grades and dimensions according to these drawings with due consideration for other trades and verify all dimensions at the site prior to any fabrication or installation. Should the layout be impractical, the Contractor shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.
E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation to tabulation of the various units of material and/or work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor or any Sub-contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.1.11.3 ARCHITECT'S APPROVAL
A. In any statement under this contract where "approval" is required or requested, it is understood that such approval must be obtained from the Architect in writing before proceeding with the work. A sufficient number of copies of any such proposal shall be submitted to the Architect.
B. The approval by the Architect of any materials, changes, drawings, etc., submitted by the Contractor will be considered as general and to aid the contractor in expediting his work, such approval as may be given does not in any way relieve the Contractor from the necessity of furnishing the materials and performing all work as required by the drawings and specifications.
1.1.11.4 LOCAL RESTRICTIONS
A. The Contractor shall become familiar with all rules and regulations of the City, County and State, or any other authority having jurisdiction over this project. If it is the Contractor's opinion that any work or materials shown on the drawings or specifications do not comply with these rules and regulations as to size, type, capacity and quality, he must make it known prior to the submission of his bid, which shall be deemed evidence of compliance; otherwise, the Contractor shall be responsible for the approval of the materials, installation, fabrication, and the existing conditions indicate disapproval, he shall correct same with materials approved by the Architect at no additional cost to the Owner.

1.1.12 ELECTRICAL WIRING
A. Except for such items as are normally wired up at their point of manufacture and so delivered, and unless specifically noted to the contrary herein, the Electrical Subcontractor will do all electric wiring of every character for power supply. The Mechanical Subcontractor shall erect all motors in place ready for connections and shall furnish with each such motor a starter of the type specified and deliver it in good condition to the Electrical Subcontractor at the job. The Electrical Subcontractor will mount all such starters, as directed, furnishing supporting structures where necessary. The Owner and other Subcontractors shall furnish with each item requiring electrical connections, the necessary instructions and wiring diagrams to the Electrical Subcontractor. The Electrical Subcontractor shall refer to the Specifications to determine the Scope of the Work.
1.1.13 LAR REPAIRS AND EQUIPMENT
A. All large apparatus and equipment which is specified or shown to be furnished or installed under this Contract, and which may be too large to be moved into its final position through the normal building openings, planned, shall be placed by this Subcontractor in its approximate final position. This shall be accomplished through cooperation and coordination with other Subcontractors before any obstructing structure is installed. All apparatus shall be cribbed up from the floor by this Subcontractor and cared for as specified under "Storage and Protection" or as directed by the Architect.
1.1.17 RESPONSIBILITY
A. The Contractor will be held responsible for the satisfactory and complete execution of all work included. He shall produce complete finished operating systems and provide all incidental items required as part of his work, regardless of whether such item is particularly specified or indicated.
1.1.18 CLEAN UP
A. Clean up trash and debris caused by the work of this Section, keeping premises, streets, sidewalks and adjacent areas clean and neat at all times.
B. Dispose of such materials outside the limits of the project site to approved locations.
1.1.19 PAINTING
A. Upon completion, clean all pipes and equipment before painting. Painting of mechanical equipment and piping is specified in architectural Painting Section.
1.1.20 ACCESS DOORS
A. Access doors are to be provided by the Contractor. Contractor will closely coordinate locations of valves, etc. in order to have access to all concealed portions of the system requiring periodic service. Prepare shop drawings for coordination of all access doors, locating same for installation by General Contractor. Access door locations shall be approved by Architect or Owner before installation.
1.1.21 FLAME SPREAD PROPERTIES OF MATERIALS
A. All materials and adhesives used for acoustical linings and insulation, jackets, tapes, etc. shall conform to Interim Federal Standard Flame-spread Properties of Materials, Inc. Fed. Std. No. 00336A (comm. NBS). The classification shall not exceed No. 2, with the range of indices between 0 and 25 for these classifications as listed in the Federal Specifications for the basic materials, the finishes, adhesives, etc. specified for each system, and shall be such that when completely assembled the total will not exceed an index of 50 in Classification 111 as listed in the Federal Specifications. Modifications shall be made to insulating materials, etc. as required to comply with the Federal Specifications.
1.1.22 GUARANTEE
A. The Contractor shall furnish a written guarantee in triplicate, warranting all materials, equipment and labor furnished by him to be free of all defects for a period of one year from date of final acceptance by the Owner. He shall further guarantee that all equipment shall meet the characteristics, capacities and workmanship specified and within the warranty period, the defects and/or equipment will be repaired or made good without cost to the Owner. The Contractor further agrees to correct warranty deficiencies within 48 hours of notification by management.
B. REFERENCE DOCUMENTS: Conditions of the Contract and Division 01 "General Requirements" are made a part of this section whether attached hereto or not.

SECTION 4 – HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS (CONT.)

4.1.1 SCOPE
A. Provide complete air supply, return, outside air and exhaust systems including fans, terminal devices and other components specified herein.
4.1.2 SUBMITTALS
A. Shop Drawings: Submit complete shop drawings, in accordance with Section 1, indicating materials, quantities, sizes and installation details.

SECTION 4 – HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS (CONT.)

4.1.3 COORDINATION
A. Install materials and equipment at proper time to keep pace with the general construction and the work of the other trades involved.
4.1.4 WARRANTY
A. The Mechanical Sub-contractor shall warrant all material, workmanship and equipment for a period of one year after final acceptance by the Owner. The warranty specifically implies that any defective portion becoming defective during this period will be repaired, replaced or otherwise made good at no additional cost to the Owner. It shall further include replacement or refrigerant loss not due to Owner negligence. Compressors shall contain an additional four-year warranty.
4.2.1 DUCTWORK
A. Rigid Ductwork: All air conditioning and exhaust ductwork, plenum, casings and sheet metal, connections shall be fabricated of new joint-forming quality galvanized prime grade sheets.
B. Rectangular Low Pressure Ducts: Constructed of the following minimum gauges:
Largest Dimension of Duct Gauge of Metal
Up to 12" No. 26 U.S. Gauge
13" to 30" No. 24 U.S. Gauge
31" to 54" No. 22 U.S. Gauge
C. Round Low Pressure Ducts: "SNAP-LOK" as manufactured by United Sheet Metal Company.
D. Rectangular Ductwork Fittings: Fabricated per SMACNA Standards for low-pressure ductwork(2-inch pressure class).
E. Round Ductwork Fittings: As manufactured by United Sheet Metal Co., and/or as detailed on the drawings.
F. Flexible Connections: Connections to air conditioning units and fans shall be flexible connections which shall be neoprene coated glass fabric weighing not less than 30 ounces per square yard and at least 1/16" thick.
G. At the Contractor's option, 2" insulated flexible duct may be used for final run out to air devices when installed per manufacturer's installation instructions. Flexible run outs shall not exceed 5-feet extended length.
H. Access doors shall be provided for access to all dampers, fusible links, and where required for maintenance and cleaning operations. Access doors serving insulated ducts shall be double-skin doors with one inch of insulation on the door. Where duct size permits, the access doors shall be 16-inches by 18-inches. Access doors shall be as manufactured by MILCOR.
4.3.1 INSULATION
A. A. All rectangular sheet metal ducts shall be insulated with 1.5-inch" thick, 3/4" lb density fiberglass-faced insulation, or as required to meet a minimum installed R-value of 5.0. Install with all joints overlapped and neatly sealed.
B. All round sheet metal ducts shall be insulated with 2" thick, 3/4" lb density fiberglass-faced insulation, or as required to meet a minimum installed R-value of 5.0. Install with all joints overlapped and neatly sealed with UL 181 listed sealant.
C. Insulate refrigerant piping with 3/8" thick ARMAFLEX. Apply insulation with all joints firmly butted together.
4.4.1 FILTERS
A. Filters shall be 1" throw away type and shall be Farr 30-30 filter or equal types by Cambridge or Microtron. Maximum velocity through filter media shall be 500 fpm.
4.5.1 SPLIT SYSTEM AIR HANDLING UNITS
A. Split system air handling units shall consist of an indoor fan and coil, connected to a remote air-cooled condensing unit, along with related refrigerant piping and accessories. Fan section and cooling coil shall be a companion unit with the condensing unit; rated to produce the minimum refrigerant capacity as scheduled, taking into consideration all correction factors, altitude adjustments and piping losses.
B. Fan coil unit shall consist of a direct-expansion cooling coil, insulated drain pan, condenser fan, 240V motor and centrifugal blower assembly. Complete factory pre-wired including a 24V control circuit transformer.
C. Fan shall be forward curved, mounted on motor shaft, dynamically and statically balanced. The fan shall deliver scheduled cfm. The multi-speed fan motor shall be factory lubricated, have internal overload protection, be resiliently mounted and shall not exceed 1 hp. Fan-motor assembly shall be removable for service.
D. Cooling coil shall be constructed with aluminum plate fins mechanically bonded to nonferrous tubing with joints brazed. Coil shall have factory-installed refrigerant metering device and refrigerant line fittings which permit mechanical connections. Units shall be provided with appropriate accessories and components for heat pump operation.
E. Condensate pans shall be equipped with primary and auxiliary drain connections.
F. Cooling control kit shall contain 60VA-control circuit (24V) transformer, indoor fan relay, line voltage terminal block and low voltage terminal strip.
G. Thermostats for air units shall be programmable, low voltage with sub-base "manual" switching over from heating to cooling and a fan "on" or "automatic" switch and 7-day 2-event programming.
4.5.2 SPLIT SYSTEM AIR COOLED CONDENSING UNITS
A. Condensing units shall be assembled on a heavy-gauge integral steel base. Units will be weather proofed and include hermetic compressor, condenser coil, fans and motors, controls and holding charge of refrigerant. Units shall have removable panels which allow access to all controls and motor components.
B. Unit Frame: One-piece welded assembly of heavy-gauge zinc-coated steel. Exterior surfaces will be cleaned, phosphatized and finished with an air-dry enamel finish.
C. Direct-drive, hermetic reciprocating compressor with integral suction accumulator; two-point lubrication for each bearing and connecting rod; and well; suction and discharge valves; and rubber-in-shear isolators. Motors will be suction gas cooled and have a voltage utilization range plus or minus 10 percent or nameplate voltage. Two winding thermostats embedded between the three motor windings will protect against excessive winding temperatures.
D. Condenser Fan and Motors: Direct drive fans, statically and dynamically balanced, with steel blades and zinc-plated sheet hubs. Motors with permanently lubricated ball bearings, built-in current and thermal overload protection, and weather-tight slingers over bearings.
E. Condenser Coil: Air-cooled; configured aluminum fin secondary surfaces mechanically bonded to primary surface of 3/8-inch outside seamless copper tubing. Sub-cooling circuit(s) with liquid accumulator(s) standard. Factory testing at 450 psig air pressure, low voltage with
4.5.3 REFRIGERANT AND CONDENSATE DRAIN PIPING
A. Refrigerant piping shall be pre-charged type "T" copper or type "T" hard copper with wrought solder joint fittings.
B. Condensate drain piping shall be type "m" copper or schedule 40 PVC, where permitted by Local Code.
4.5.4 SYSTEM CHARGING AND STARTUP
A. Supply the initial charge of refrigerant as required to completely charge the system. Any loss of refrigerant or oil during testing period or initial runs shall be replaced by the Mechanical Sub-contractor at his cost.
B. The systems shall be charged only after they have been tested and rendered free of leaks and thoroughly evacuated using a vacuum pump and a reliable vacuum dehydration indicator, following standard recommended procedures.
C. Mechanical Sub-contractor shall operate all systems until the satisfactory performance of specification requirements is demonstrated to the complete satisfaction of the Contractor. Prior to, and during operation, all controls and other appurtenances and devices shall be adjusted and calibrated. Test all safety devices and make ready for automatic operation. All systems shall be calibrated, and all fans and other rotating parts shall be properly lubricated and checked for correct alignment.
D. The Mechanical Sub-contractor, during operation and balancing periods, shall instruct the Contractor's and Owner's Personnel in the operation and control of the systems and maintenance schedule.

4.6.1 EXHAUST FANS

A. In-line Exhaust Fans shall be direct drive, forward curved, centrifugal blower type, fan wheel and scroll shall be constructed of galvanized steel. Fan wheel shall be dynamically balanced. The fan housing shall be constructed of galvanized steel and acoustically lined for quiet operation. Fan housing shall be provided with mounting lugs for suspension above a ceiling. Provide fan with an integral aluminum gravity back-draft damper. The motor shall be permanently lubricated with built-in thermal overload protection. Provide a safety disconnect switch mounted to the exterior of the fan enclosure. Fans shall be AMCA rated.
B. Ceiling Exhaust Fans shall be direct drive, forward curved, centrifugal blower type, fan wheel and scroll shall be constructed of galvanized steel. Fan wheel shall be dynamically balanced. The fan housing shall be constructed of galvanized steel and acoustically lined for quiet operation. Provide fan with an integral aluminum gravity back-draft damper. The ceiling ventilator shall be furnished with a white, metal ceiling exhaust grille. Provide mounting kit for suspension from structure with rubber-in-shear vibration isolators. Provide manufacturer's standard roof jack or wall cap, and transition fittings. The motor shall be permanently lubricated with built-in thermal overload protection. Fans shall be AMCA rated.
4.7.1 ELECTRIC UNIT HEATERS
A. Electric unit heater cabinet shall be constructed of heavy gauge steel casing. Individual adjustable louvers with 30 degrees downward stops shall be furnished to provide desired control of discharge air. All metal surfaces of the enclosure shall be phosphate coated to resist corrosion and finished in decorative baked enamel. Mounting brackets designed for either ceiling or wall swivel mounting shall be factory furnished.
B. Fans shall be aluminum, direct drive and designed specifically for unit heater application. protect fans by means of a corrosive resistant welded fan guard.
C. All heaters shall be UL listed and meet the requirements of the national electric code.
D. Provide unit heater with a 24v control transformer, thermostat, relays and other control devices as necessary for the control of the unit. Thermostat shall be factory wired internally in the heater or remote mounted on a wall and served by low voltage wiring concealed inside conduct as indicated on drawings.
E. Motors shall be totally enclosed, designed for continuous operation and equipped with built-in thermal overload protection.
F. Electric unit heaters shall be OMark/Morley, Berko, Markel or approved equal.

SECTION 5 – SYSTEM BALANCING

5.1.1 SCOPE
A. Testing, adjustment and start-up of mechanical systems shall be performed by personnel certified by the American Air Balance Council or similar organization. Testing, adjusting and balancing shall be performed by an independent 3rd party contractor. All necessary test equipment, instruments, materials and labor required for performing all the tests described shall be provided as part of the work of this division.
B. Upon completion of the installation and start-up of the mechanical equipment, check, adjust and balance systemic components to obtain optimum conditions in each conditioned space in the building.
C. Prior to requesting a final inspection, this sub-contractor shall prepare and submit to the architect/engineer of record complete reports on the balance and operations of the system, bearing the seal of a certified air balance technician. In this report, the origin conditions, test methods, startup and final conditions after balancing of all equipment shall be clearly indicated.
D. Make an inspection in the building during the opposite season from that in which the initial adjustments were made and, at the time, make any necessary modifications to the initial adjustments required to produce optimum operation of the systemic components to produce the property conditions in each conditioned space.
5.1.2 WORK INCLUDED
A. The balancing technician shall be responsible for inspecting, adjusting, balancing and logging the data on the performance of fans, all dampers in the duct systems and all air distribution devices. The mechanical contractor and the suppliers of the equipment installed shall all cooperate with the balancing technician to provide all necessary data on the design and proper application of the systemic components and shall furnish all labor and materials required to eliminate any deficiencies or improper-performance.
B. During the balancing, the temperature regulation shall be adjusted for proper relationship between controlling instruments and calibrated by the temperature controls sub-contractor using data submitted by the balancing technician. The total variation shall not exceed 3 degrees from the present median temperature during the entire temperature survey period.
C. In all fan systems, balance the air quantities to be between plus 10- to minus 5-percent of the values shown on the plans. It shall be the obligation of the mechanical contractor to furnish or revise fan drives and/or motors, if necessary, without cost to the contractor, to attain the specified air volume.
5.1.3 RECORDS
A. Before final acceptance is made, the balancing technician shall prepare a detailed, written report.
B. The data shall be neatly entered on appropriate forms together with any typed supplements required to completely document all results.
C. Written explanations of any abnormal conditions shall be included. All this shall be assembled into a suitable brochure, and a total of four copies shall be provided.
D. The typed test data sheets and correlation of the test results shall be certified to be true and correct by a certified air balance technician over the signature of the subcontractor. Such signature shall be executed by an officer if the subcontracting firm is a corporation, a partner if a partnership, or by the owner if a sole ownership. This data shall be delivered to designated members of the building operating personnel not less than three days after the tests are complete settings, reading, etc. shall be prepared and submitted in quadruplicate.
5.1.4 INSTRUCTIONS
A. During the test periods, the balancing technician shall instruct the building maintenance personnel in the construction and operation of all equipment.

ARCHITECTURE

SCOTT MARTSOLF - ARCHITECT

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Phone: (817) 820-0005

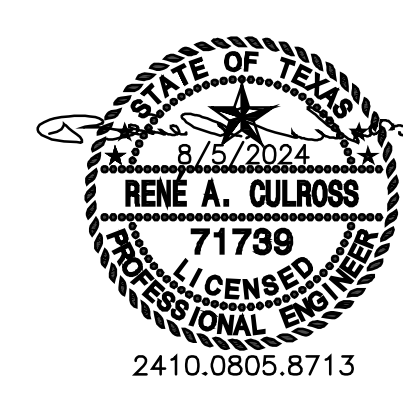
**SAINT TERESA
OF CALCUTA
CATHOLIC
CHURCH**

**PARISH
HALL**

13517 ALTA VISTA ROAD
FORT WORTH, TX 76262

**CONSTRUCTION
DOCUMENTS**

Drawing Title: HVAC SPECIFICATIONS	
Project No. 2403	Date: 08/05/2024
	Sheet No. MO.2



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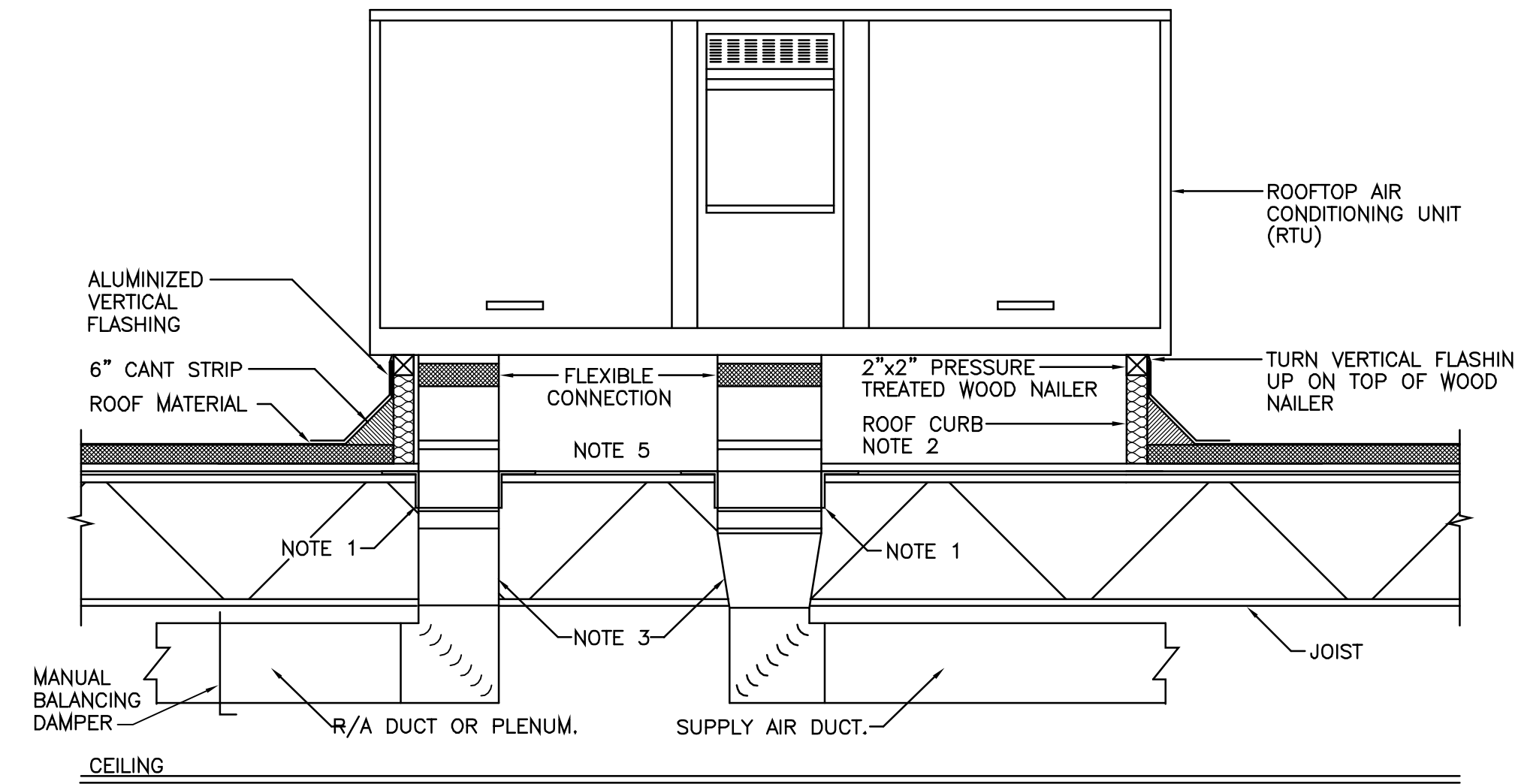
13517 ALTA VISTA ROAD
FORT WORTH, TX 76262

CONSTRUCTION
DOCUMENTS

Drawing Title: HVAC (ALT)
ADDITIONAL SCHEDULE
SPECIFICATIONS AND DETAILS

Project No. 2403 Date: 08/05/2024

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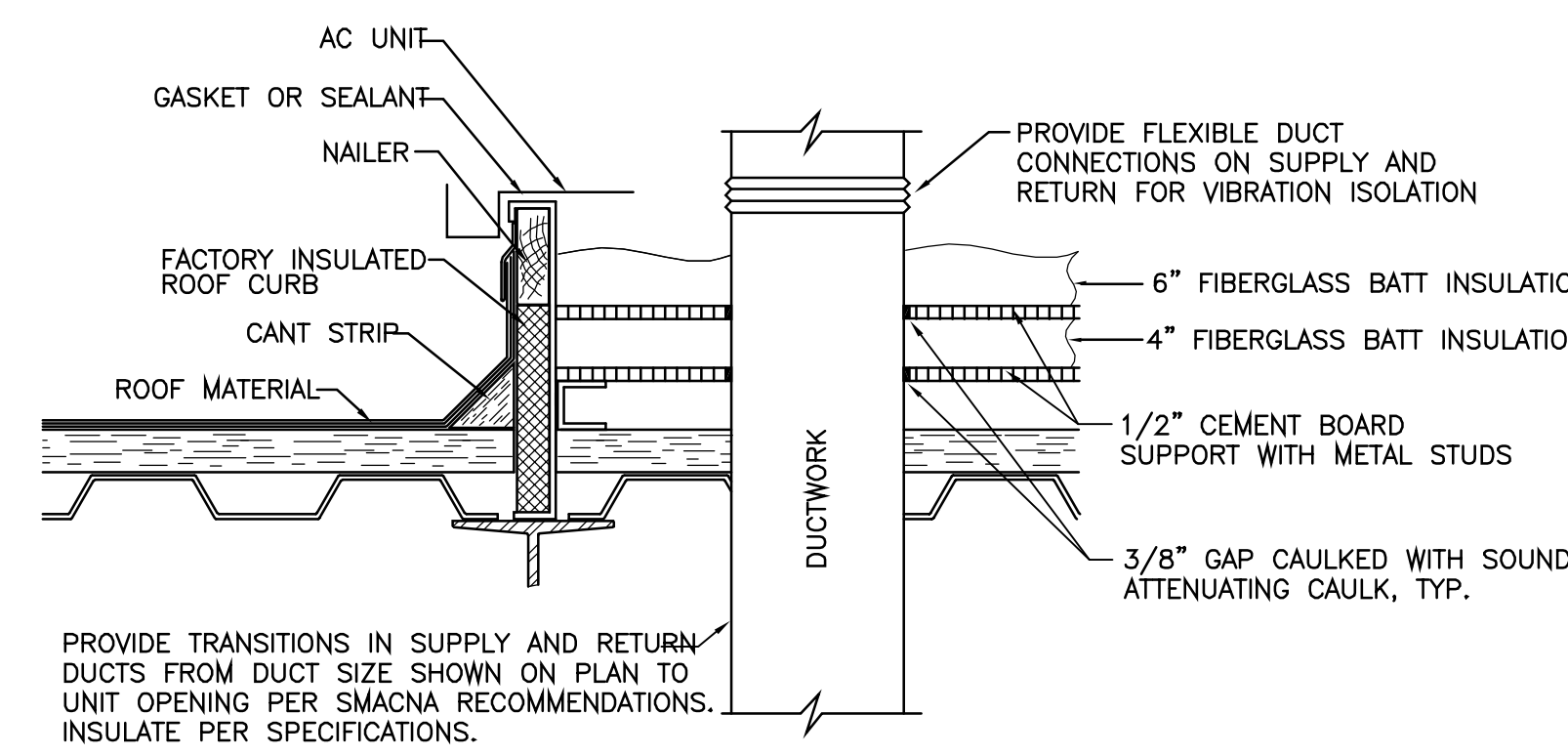


NOTES

- REFER TO STRUCTURAL DRAWINGS FOR SUPPORT REQUIREMENTS.
- ALL RTU'S SHALL BE "PLUMB" AND SET LEVEL ON ROOF IN BOTH DIRECTIONS. THE VERTICAL DIMENSION OF THE CURB WALLS SHALL BE TAPERED AS REQUIRED TO COMPENSATE FOR THE ROOF SLOPE AND ALLOW THE RTU TO SET LEVEL. REFER TO THE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SLOPE INFORMATION. CURB TO BE FACTORY INSULATED WITH MIN R-8 RIGID INSULATION, MIN 14" HIGH.
- PROVIDE TRANSITION AND/OR OFFSET AS INDICATED OR REQUIRED.
- THIS DETAIL IS TYPICAL FOR ALL RTU INSTALLATIONS.
- REFER TO DETAIL THIS SHEET FOR SOUND ATTENUATION INSTALLATION.

1 TYPICAL ROOFTOP UNIT MOUNTING

SCALE: NO SCALE



2 ROOFTOP UNIT
SOUND ATTENUATION AND CURB INSTALLATION

SCALE: NO SCALE

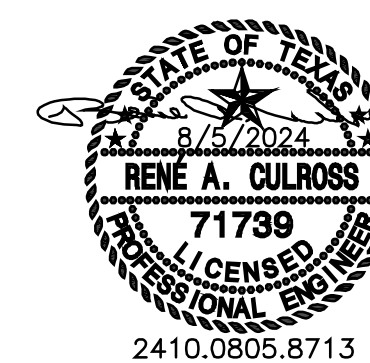
MARK RTU	ARRANGEMENT	NOMINAL TONNAGE (TONS)	PACKAGED AC UNIT WITH ELECTRIC HEAT SCHEDULE												UNIT WEIGHT (LBS)	SEER (EER)	DESIGN BASIS MANUFACTURER/ MODEL SERIES	REMARKS												
			EVAPORATOR FAN				POWER CONNECTION				HEATING PERFORMANCE DATA								COMPRESSOR		CONDENSER				NET COOLING PERFORMANCE DATA					
			UNIT CFM	O/A CFM	EXT. SP	HP	V	PH	MCA	MOCP	INPUT KW	CAP (MBH)	ENTERING DB	LEAVING DB					NO. STAGES	QTY	RLA EACH	REF TYPE	QTY FANS	FLA EACH	CAPACITY (MBH) SENS	LAT	TOTAL	AMB DB	ENTERING DB	WB
1	VERTICAL	10	4,000	800	0.8	5	208	3	147	150	30	96	65	90	2	2	22.4	R-410A	1	1.5	88.7	20.7	109.4	105	80.0	67.0	1,000	(10.8)	CARRIER 50TCD	1 THROUGH 15
2	VERTICAL	10	4,000	800	0.8	5	208	3	147	150	30	96	65	90	2	2	22.4	R-410A	1	1.5	88.7	20.7	109.4	105	80.0	67.0	1,000	(10.8)	CARRIER 50TCD	1 THROUGH 15
3	VERTICAL	5	2,000	400	0.7	1.0	208	3	29.5	45	30	97	10	55	1	1	17.6	R-410A	1	2.5	46.3	10.8	57.1	105	78.9	64.6	825	13	CARRIER 50TCD	1 THROUGH 15

REMARKS:

- EXTERNAL STATIC PRESSURE ("WG") INCLUDES DUCTWORK, BALANCING DAMPERS AND AIR DEVICES ONLY
- CAPACITIES LISTED ARE NET FROM UNIT DISCHARGE. UNITS SHALL PERFORM TO LISTED CAPACITIES.
- TRANE IS THE BASIS FOR DESIGN. CONTRACTOR IS RESPONSIBLE FOR VARIATIONS IN FIT AND ELECTRICAL SERVICE.
- UNIT WIRING INCLUDES ELECTRIC HEATER.
- PROVIDE GALVANIZED INSULATED FACTORY ROOF CURB TO MATCH ROOF SLOPE.
- PROVIDE FACTORY HAIL GUARDS
- UNIT PERFORMANCE MUST SATISFY BOTH SENSIBLE AND LATENT CAPACITY REQUIREMENTS
- PROVIDE WITH SMOKE DETECTOR INTERLOCKED TO SUPPLY FAN AS REQUIRED BY CODE. (2000 CFM GREATER)
- PROVIDE FACTORY PROGRAMMABLE THERMOSTAT, 7 DAY/2-EVENT, WITH DATA PORT FOR CONNECTION TO FUTURE FACILITY MANAGEMENT SYSTEM.
- PROVIDE WITH INTEGRAL DISCONNECT AND A DUPLEX, 115-V, GFI RECEPTACLE WITH 15A MOCP (INCLUDE TRANSFORMER IF REQUIRED. OUTLET SHALL BE ENERGIZED EVEN IF THE UNIT MAIN DISCONNECT IS OPEN).
- PROVIDE WITH STAINLESS STEEL OR CORROSION RESISTANT CONDENSATE DRAIN PAN.
- PROVIDE WITH CRANKCASE HEATER.
- PROVIDE WITH CONTROLS TRANSFORMER.
- PROVIDE SINGLE POINT ELECTRICAL CONNECTION.
- PROVIDE WITH 0-100-PERCENT DRY BULB ECONOMIZER WITH BAROMETRIC RELIEF.

4.7.1 PACKAGED ROOF TOP UNITS

- A. Casing:
- Galvanized steel painted with baked enamel.
 - Galvanized-steel liner.
 - Insulated with fiberglass.
 - Stainless-steel or corrosion resistant drain pan.
- B. Supply-Air Fan: Belt driven, forward curved, centrifugal.
- C. Condenser-Coil Fan: Direct-driven propeller.
- D. Supply-Air Refrigerant Coil:
- Aluminum-plate fins and seamless copper tube.
 - Baked phenolic coating.
- F. Hot-Gas Reheat Refrigerant Coil:
- Aluminum-plate fins and seamless copper tube.
 - Baked phenolic coating.
- G. Electric-Resistance Heating:
- Open-coil resistance wire.
 - SCR controller.
- H. Refrigerant Circuit Components:
- Number of Refrigerant Circuits: One.
 - Compressor: Hermetic scroll.
 - Refrigerant Charge: R-410A.
 - Low-ambient kit.
 - Hot-gas reheat valve.
- I. Filters: Disposable, pleated.
- J. Outdoor- and Return-Air Mixing Dampers: 0 to 100 percent economizer with motorized dampers and hood.
- K. Electrical Power Connection: Single.
- L. Basic Unit Controls: Programmable wall-mounted thermostat.
- M. Accessories:
- Duplex electrical outlet.
 - Low-ambient kit.
 - Hail guards.
 - Roof Curbs.
 - Vibration isolators.
 - Wind restraints.



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SPLIT SYSTEM - ELECTRIC HEAT SCHEDULE																																	
MARK CU-AHU	SERVES	AIR HANDLER										AIR COOLED CONDENSING UNIT										COOLING PERFORMANCE DATA				DESIGN BASIS		REMARKS					
		ARRANGEMENT	UNIT CFM	O/A CFM	ESP	HP	SINGLE CIRCUIT/FUSE				HEATING		UNIT WT LBS	COMPRESSORS		FANS		POWER		CAPACITY (MBH)	AMB DB DEG-F	ENTERING DB DEG-F	MIN SEER	MODEL SERIES (CARRIER - CU/AHU)									
							ENT DB DEG-F	PH	MCA	MOCF	MBH	STAGES		INPUT KW (@208V)	NO.	RLA EACH	TYPE	NO.	FLA						CONNECTION V	PH	MCA		MOCF	WT LBS	TOTAL SENS		
1	LOBBY	VERTICAL	1,200	240	0.5	0.5	208	1	78.3	80	55.0	26.4	1	7.8	150	1	9.0	410A	1	1.2	208	3	12.5	20	200	34.0	32.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11
1a	LOBBY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11
2	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
3	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
4	LOBBY	VERTICAL	1,200	240	0.5	0.5	208	1	78.3	80	55.0	26.4	1	7.8	150	1	9.0	410A	1	1.2	208	3	12.5	20	200	34.0	32.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11
5	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
6	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
7	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
8	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
9	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
10	SANCTUARY	VERTICAL	2,000	400	0.5	0.5	208	1	62.0	70	65.0	35.2	1	12.5	150	1	13.7	410A	1	1.5	208	3	21.4	35	150	54.3	42.0	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11,12
11	NARTHEX	VERTICAL	1,600	320	0.5	0.5	208	1	78.3	80	55.0	38.5	2	11.3	200	1	13.7	410A	1	1.2	208	3	18.3	30	220	43.0	34.5	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11
12	NARTHEX	VERTICAL	1,600	320	0.5	0.5	208	1	78.3	80	55.0	38.5	2	11.3	200	1	13.7	410A	1	1.2	208	3	18.3	30	220	43.0	34.5	105	77.6	63.9	14.0	24AHA4 / FV4C	1,2,3,4,5,6,7,8,9,10,11

REMARKS:

- AIR HANDLER POWER CONNECTION INCLUDES HEATING COIL.
- EXTERNAL STATIC PRESSURE ("WG") INCLUDES DUCTWORK, BALANCING DAMPERS AND AIR DEVICES ONLY.
- SIZE, ROUTE, INSULATE AND PROVIDE APPURTENANCES FOR DX PIPING SYSTEMS, IN STRICT ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTRUCTIONS.
- LISTED CAPACITIES ARE FOR THE AIR HANDLER UNIT AND CONDENSER UNIT COMBINATION. UNITS SHALL PERFORM TO LISTED CAPACITIES.
- CARRIER IS THE BASIS FOR DESIGN. CONTRACTOR IS RESPONSIBLE FOR VARIATIONS FROM DESIGN BASIS IN FIT AND ELECTRICAL SERVICE.
- SEER / EER RATINGS ARE AT ARI CONDITIONS FOR CONDENSING UNIT ONLY.
- PROVIDE FILTER DRYER AND SIGHT GLASS ON THE DX LINES.
- PROVIDE FILTER RACK, PLACE AND ORIENT FOR EASY FILTER ACCESS.
- FOR LONG DX LINE RUNS, USE MANUFACTURER'S PUBLISHED LONG LINE INSTALLATION GUIDELINES.
- PROVIDE CONDENSER COIL HAIL GUARDS.
- PROVIDE FACTORY PROGRAMMABLE THERMOSTAT, 7-DAY/4-EVENT.
- TWINNED UNIT - SEE PLAN. PROVIDE WITH TWINNING KIT.

FAN SCHEDULE												
MARK EF.	TYPE	LOCATION	CFM	EXT SP IN WG	MOTOR DATA			DRIVE	MAX SONES	WEIGHT	MANUFACTURER/ MODEL SERIES	REMARKS
					HP/W	VOLTS	PH					
1	CEILING	RESTROOM	480	0.5	175	120	1	DIRECT	1.0	35	LOREN COOK/GC	1,2,3,4,5
2	CEILING	RESTROOM	480	0.5	175	120	1	DIRECT	1.0	35	LOREN COOK/GC	1,2,3,4,5
3	CEILING	RESTROOM	90	0.2	60W	120	1	DIRECT	1.0	20	LOREN COOK/GC	1,2,3,6
4	CEILING	RESTROOM	90	0.2	60W	120	1	DIRECT	1.0	20	LOREN COOK/GC	1,2,3,6

REMARKS:

- PROVIDE FACTORY MOUNTED HARDWARE FOR SUSPENSION FROM BUILDING STRUCTURE INCLUDING RIS ISOLATORS.
- PROVIDE FACTORY PRE-WIRED DISCONNECT SWITCH WITH MOTOR THERMAL OVERLOAD PROTECTION.
- PROVIDE WITH FACTORY ROOF CAP (MODEL 634) OR WALL CAP (MODEL 843BL), AS REQUIRED, AND GRAVITY BACKDRAFT DAMPER.
- PROVIDE WITH TIMELOCK FOR CONTINUOUS OPERATION DURING OCCUPIED HOURS.
- PROVIDE WITH EC MOTOR OR FAN SPEED CONTROL FOR BALANCING PURPOSES.
- INTERLOCKED START STOP WITH LIGHT SWITCH.

ELECTRIC UNIT HEATER														
MARK LH.	SERVES	ARRANGEMENT	CFM	CONNECTION				CAPACITY			WEIGHT LBS	DESIGN BASIS MODEL SERIES	REMARKS	
				MCA	MOCF	KW	V	PH	MBH	STAGES				TEMP RISE
1	RISER ROOM	HORIZONTAL	350	14.5	20.0	3.0	208	1	9.2	1	25	30	MUH	1,2,3,4
	SHELL SPACE	HORIZONTAL	350	24.0	30.0	5.0	208	1	17.0	1	25.0	30	MUH	1,2,3,4

REMARKS:

- MOUNT UNIT AT 7'-0" ABOVE FINISHED FLOOR.
- QMARK/MARLEY IS THE BASIS OF DESIGN. CONTRACTOR IS RESPONSIBLE FOR VARIATIONS FROM DESIGN BASIS IN FIT AND ELECTRICAL SERVICE.
- PROVIDE UNIT MOUNTED THERMOSTAT.
- PROVIDE FACTORY MOUNTING HARDWARE.

AIR DEVICE SCHEDULE									
MARK	SERVES	NECK SIZE	FACE SIZE	MOUNTING	TYPE	MATERIAL	MAXIMUM NC	DESIGN BASIS MANUFACTURER/ MODEL SERIES	REMARKS
A	SUPPLY	6,8,10,12,14	24" x 24"	CEILING	LOUVERED	STEEL	30	TITUS/TMSA	1,2,3
B	SUPPLY	6,8	12" x 12"	CEILING	LOUVERED	STEEL	30	TITUS/TMSA	1,2,3
C	SUPPLY	VARIES	(NOTE 1)	SIDEWALL	AERO-BLADE	STEEL	30	TITUS/22RS	3
H	RETURN/EXHAUST	22" x 22"	24" x 24"	CEILING	PERFORATED	STEEL	30	TITUS/PAR	1,2,3
J	RETURN/EXHAUST	22" x 10"	24" x 12"	CEILING	PERFORATED	STEEL	30	TITUS/PAR	1,2,3
K	RETURN/EXHAUST	10" x 10"	12" x 12"	CEILING	PERFORATED	STEEL	30	TITUS/PAR	1,2,3
L	RETURN/EXHAUST	VARIES	(NOTE 1)	SURFACE	AERO-BLADE	STEEL	30	TITUS/22RS	4,5,6

REMARKS:

- PROVIDE MOUNTING FRAME TO BE COMPATIBLE WITH TYPE OF CEILING IN WHICH THE DEVICE IS TO BE MOUNTED. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR CEILING TYPES.
- PROVIDE WHITE BAKED ENAMEL FINISH.
- WHERE ROUND NECK SIZE IS NOTED ON DUCTWORK PLAN, PROVIDE RECTANGULAR TO ROUND DUCT COLLAR.
- PROVIDE MODEL "MPI" INSULATED PLENUM WITH NECK SIZE AS NOTED ON HVAC FLOOR PLAN.
- PROVIDE (3) SLOTS.
- PROVIDE PRIME COAT OF PAINT TO MATCH ADJACENT CEILING COLOR OR SPECIAL ARCHITECTURAL DESIGN. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN.

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SCOTT MARTSOLF - ARCHITECT

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SAINT TERESA
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CHURCH

PARISH
HALL

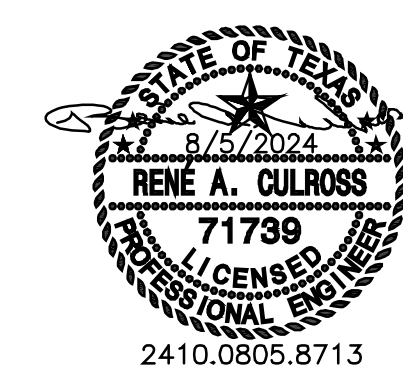
13517 ALTA VISTA ROAD
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CONSTRUCTION
DOCUMENTS

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HVAC SCHEDULES

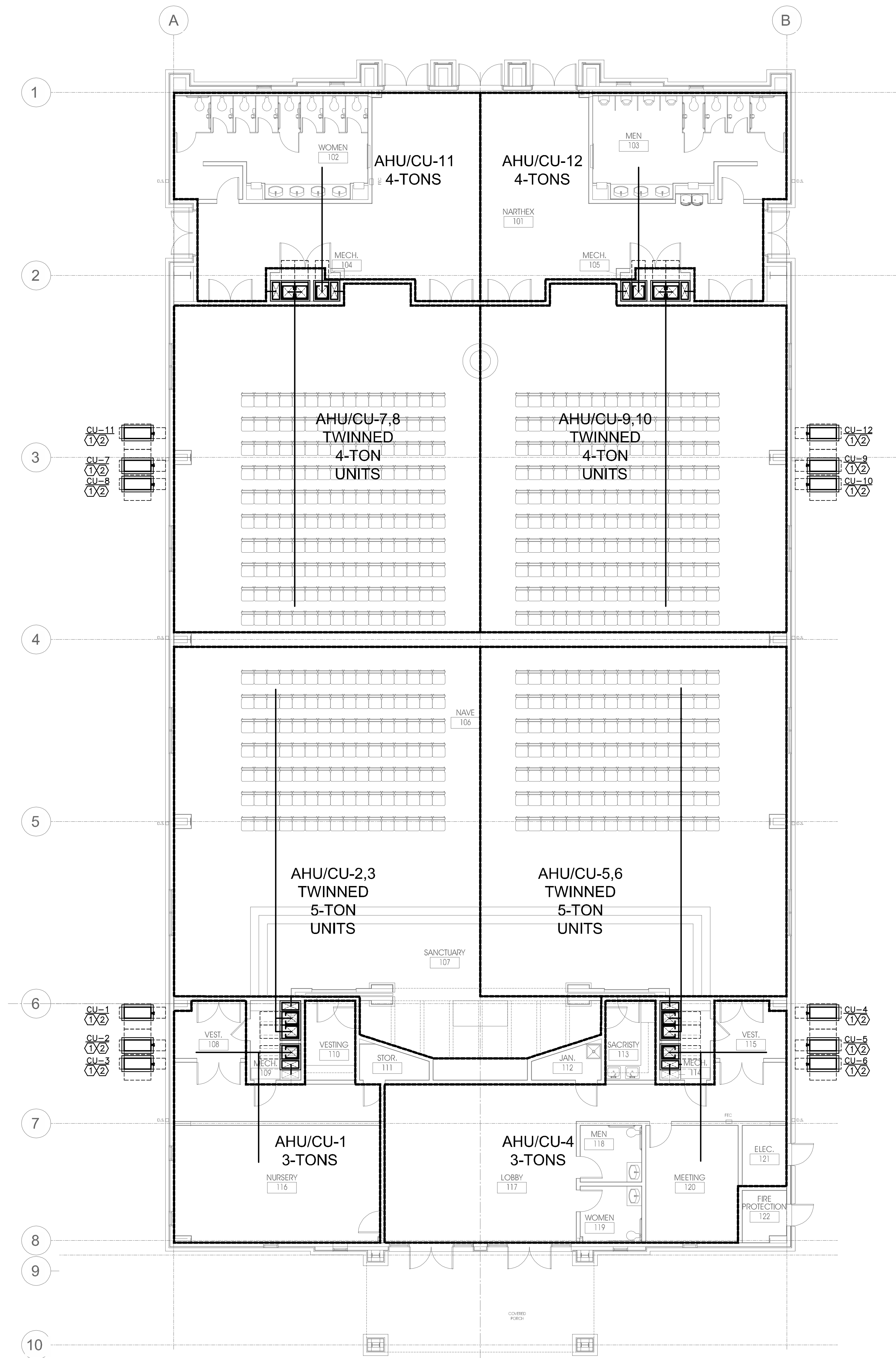
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Sheet No. MO.3



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GENERAL NOTES THIS SHEET
1. REFER TO NOTES ON M0.1 FOR ADDITIONAL INSTRUCTIONS.



1 1ST FLOOR - HVAC ZONING PLAN
Scale: 1/8" = 1'-0"

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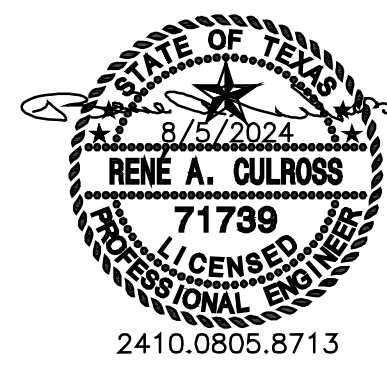
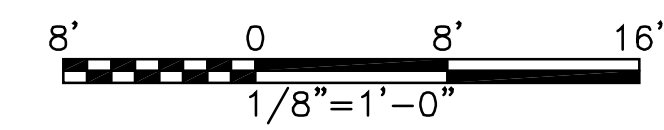
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FORT WORTH, TX 76262

**CONSTRUCTION
DOCUMENTS**

Drawing Title:
1ST FLOOR
HVAC ZONING PLAN

Project No. 2403 Date: 08/05/2024

Sheet No.
M1.1



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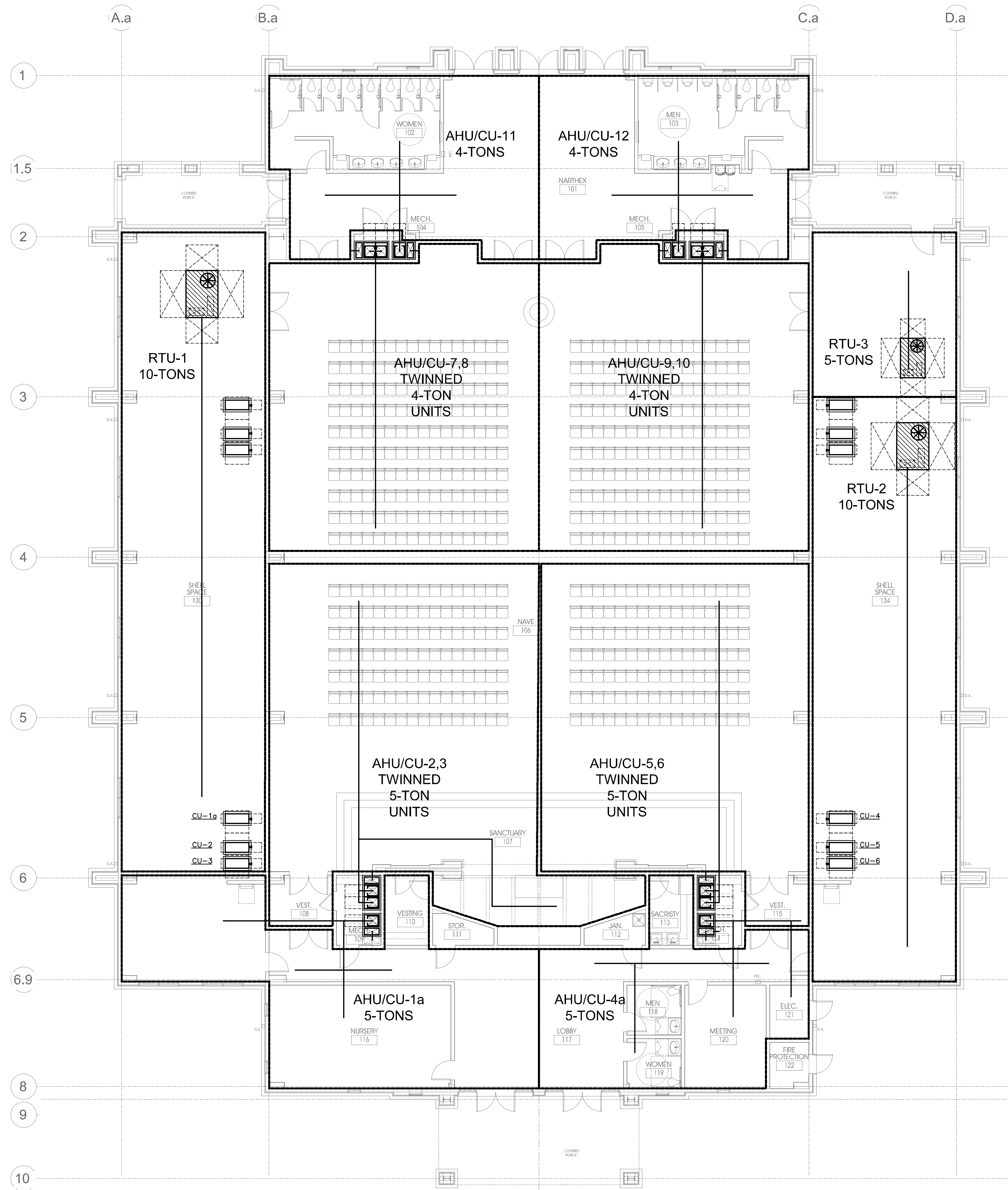
CONSTRUCTION
DOCUMENTS

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1ST FLOOR
HVAC ZONING PLAN

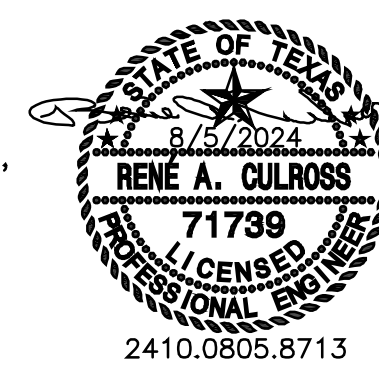
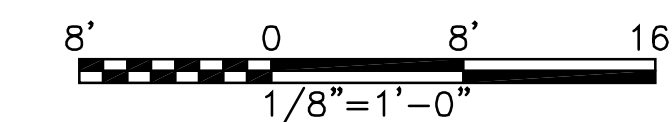
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Sheet No.
M1.1a

GENERAL NOTES THIS SHEET
1. REFER TO NOTES ON M0.1 FOR ADDITIONAL INSTRUCTIONS.



1 1ST FLOOR (ALT) - HVAC ZONING PLAN
Scale: 1/8" = 1'-0"



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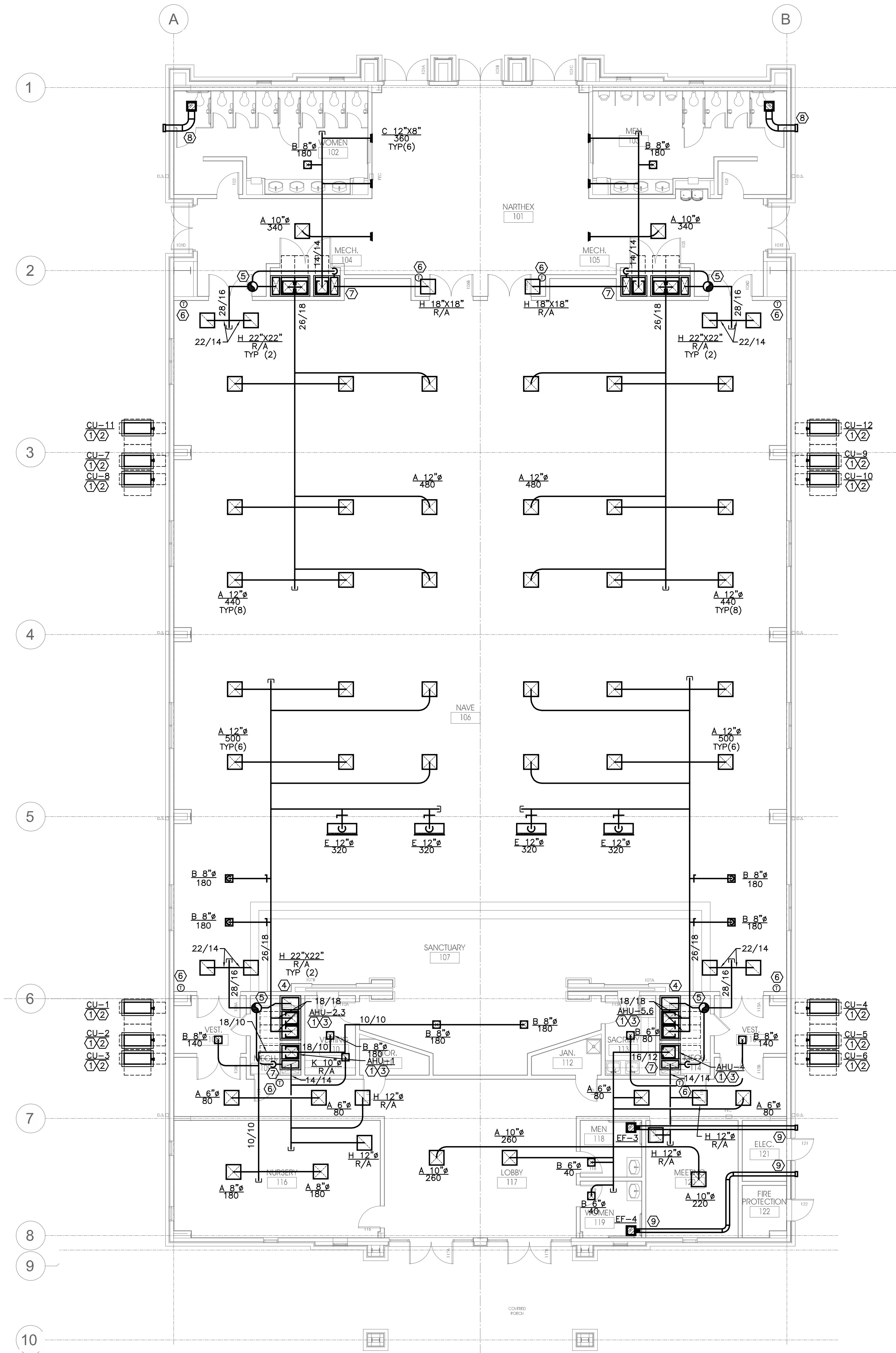
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CONSTRUCTION
DOCUMENTS

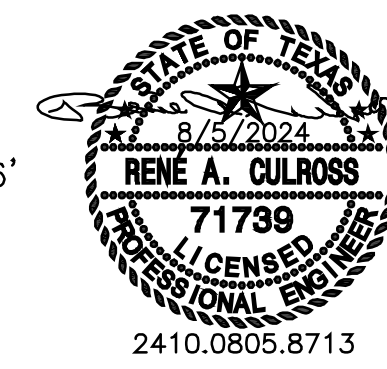
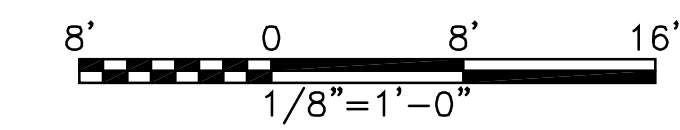
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Project No. 2403	Date: 08/05/2024
Sheet No. M2.1	

GENERAL NOTES THIS SHEET

1. REFER TO NOTES ON M0.1 FOR ADDITIONAL INSTRUCTIONS.



1 1ST FLOOR - HVAC PLAN
Scale: 1/8" = 1'-0"



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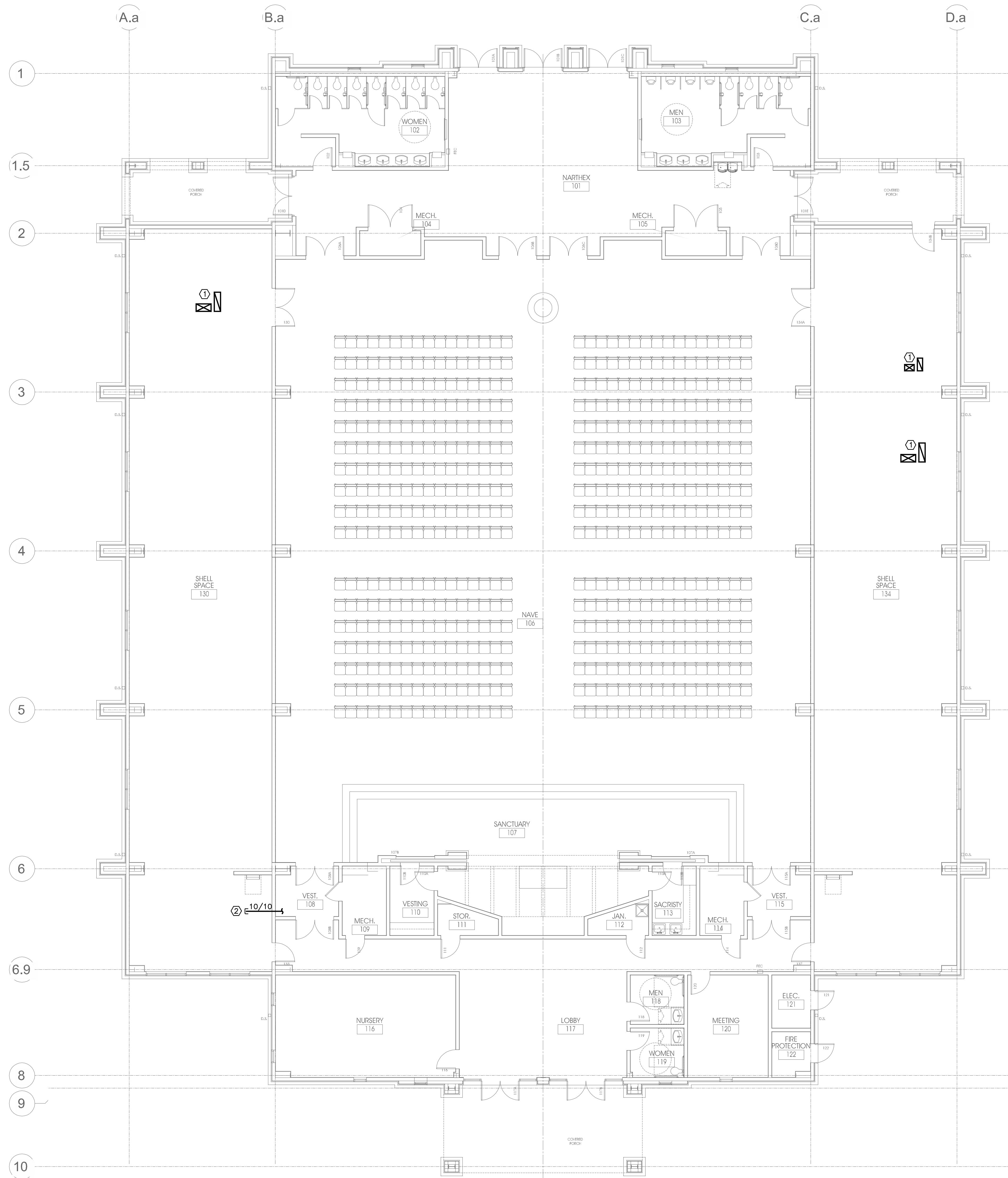
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CONSTRUCTION
DOCUMENTS

Drawing Title:
1ST FLOOR
ALTERANATE HVAC PLAN

Project No. 2403 Date: 08/05/2024

Sheet No.
M2.1a



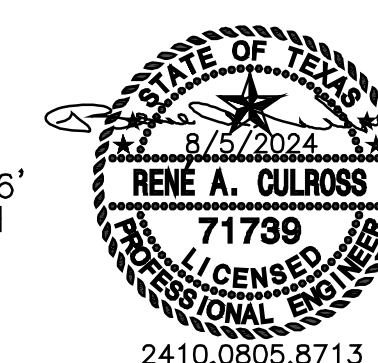
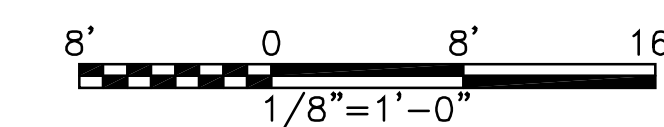
1 1ST FLOOR (ALT) - HVAC PLAN
Scale: 1/8" = 1'-0"

GENERAL NOTES THIS SHEET

1. REFER TO NOTES ON M0.1 FOR ADDITIONAL INSTRUCTIONS.
2. REFER TO M2.1 FOR BASE BID WORK. WORK SHOWN ON THIS SHEET PERTAINS TO ALTERNATE ONLY.

NOTES BY SYMBOL "1"

1. EXTEND FULL-SIZE SUPPLY AND RETURN 2- FEET INTO SHELL SPACE AND CAP FOR FUTURE.
2. EXTEND 10/10 FROM AHU-16 3- FEET INTO SHELL SPACE AND CAP FOR FUTURE. REFER TO M2.1 FOR CONTINUATION AND ADDITIONAL INSTRUCTIONS.



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CONSTRUCTION
DOCUMENTS

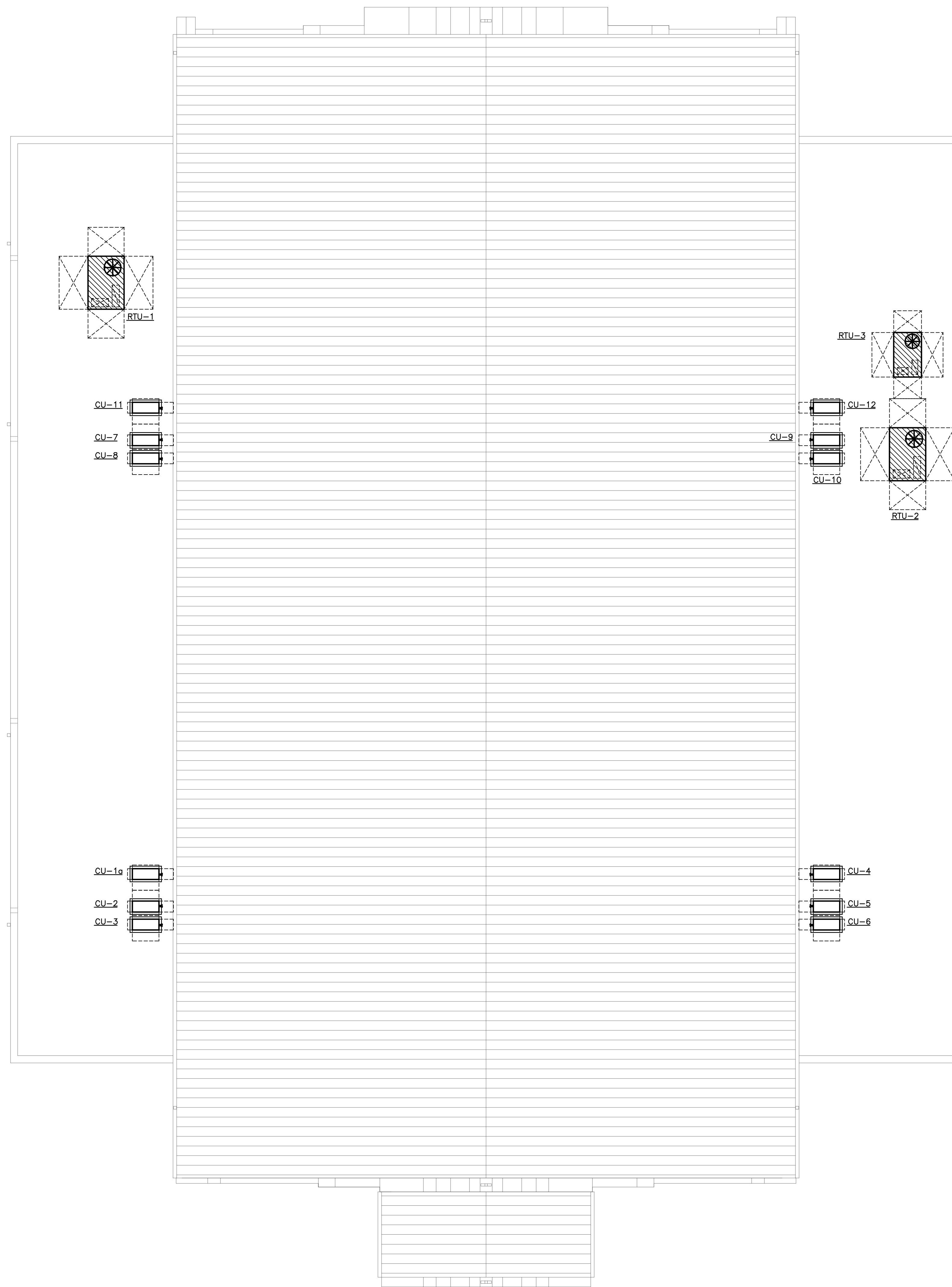
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ROOF
ALTERANATE HVAC PLAN

Project No. 2403 Date: 08/05/2024

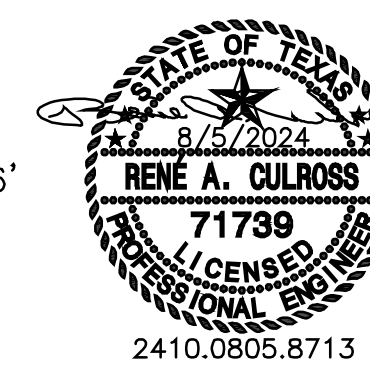
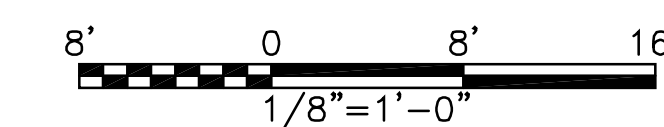
Sheet No.
M2.2a

GENERAL NOTES THIS SHEET

1. REFER TO NOTES ON M0.1 FOR ADDITIONAL INSTRUCTIONS.
2. MAINTAIN MANUFACTURER'S SERVICE AND AIR FLOW CLEARANCES.
3. MAINTAIN 10- FEET SEPARATION BETWEEN OUTDOOR AIR INTAKE LOCATIONS AND ANY EXHAUST DISCHARGE OR PLUMBING VENTS.



1 ROOF (ALT) - HVAC PLAN
Scale: 1/8" = 1'-0"



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CONSTRUCTION
DOCUMENTS

Drawing Title:

HVAC DETAILS

Project No.
2403

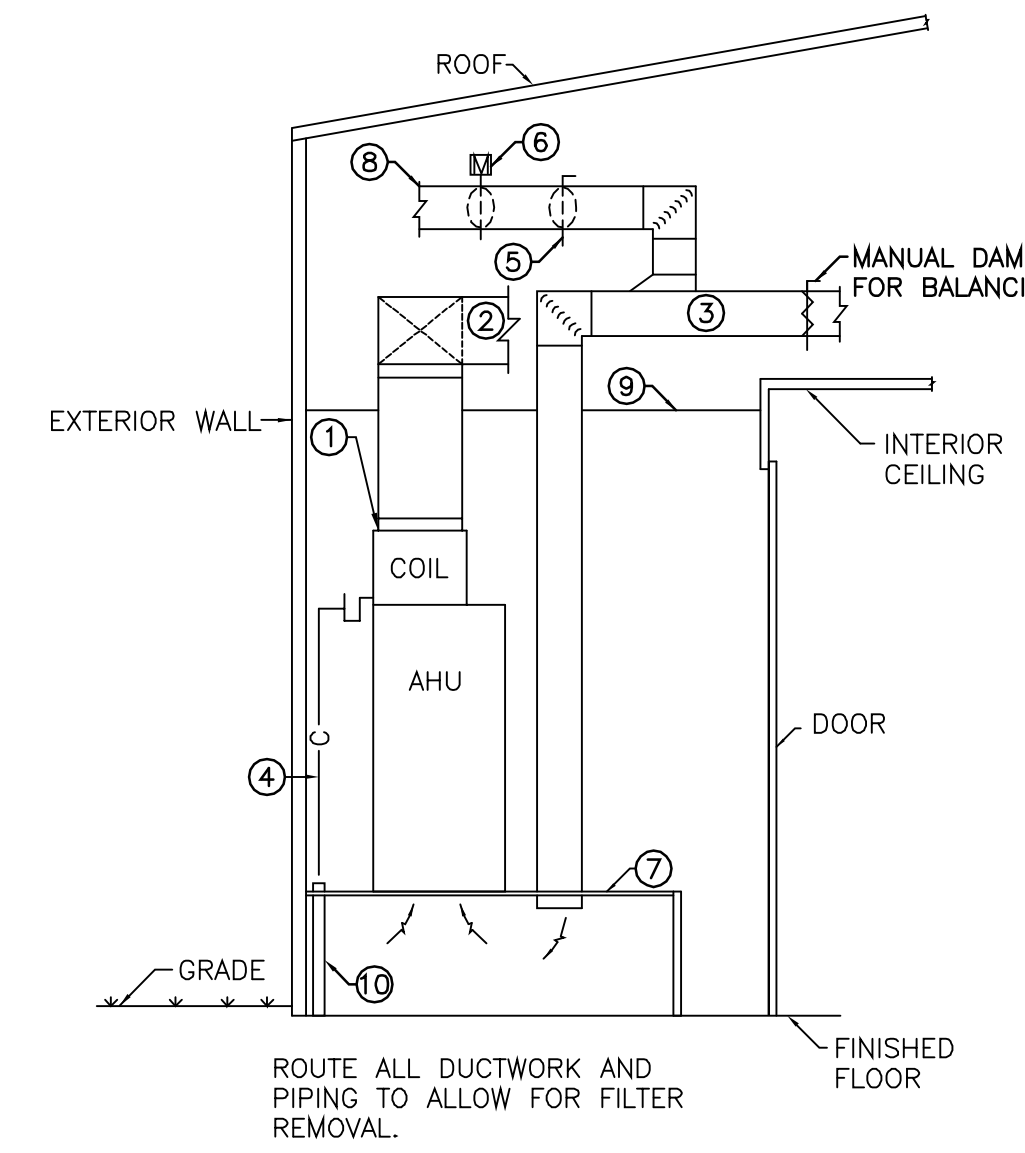
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08/05/2024

Sheet No.

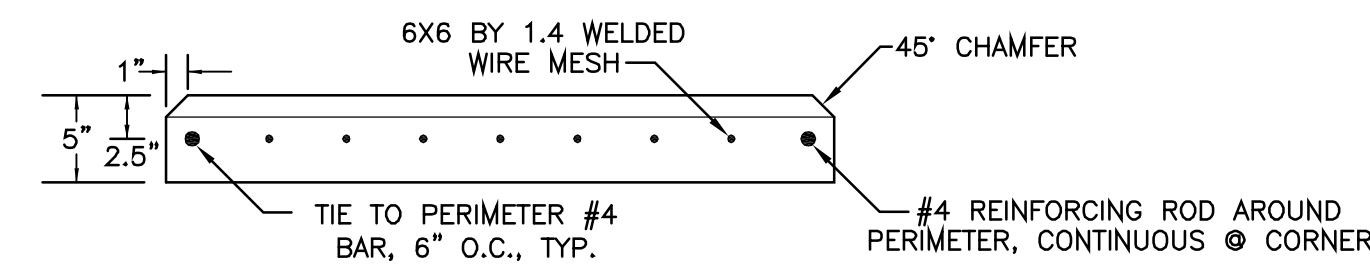
M3.1

NOTES BY SYMBOL "Ⓢ" (THIS DETAIL ONLY):

1. PROVIDE FLEXIBLE DUCT CONNECTION BETWEEN AHU AND SUPPLY DUCT.
2. DUCT SIZE AND LOCATION AS SHOWN ON PLANS. PROVIDE TURNING VANES IN RECTANGULAR ELBOWS.
3. RETURN AIR DUCT, SIZE AND LOCATE AS INDICATED ON PLAN. PROVIDE TURNING VANES IN RECTANGULAR ELBOWS.
4. CONTRACTOR TO ROUTE 1" CONDENSATE DRAIN TO PLUMBING STANDPIPE (UNLESS OTHERWISE INDICATED ON PLUMBING PLANS) FOR MULTIPLE FURNACE INSTALLATIONS, CONNECT 1" DRAIN FROM EACH UNIT TO A 1 1/4" COMMON HEADER, ADD A CONDENSATE TRAP AND DRAIN INTO PLUMBING STANDPIPE.
5. MANUAL DAMPER, BALANCE O/A AS SCHEDULED.
6. MOTORIZED DAMPER, INTERLOCK WITH FURNACE FAN MOTOR TO OPEN WHEN FAN MOTOR IS ENERGIZED, CONTRACTOR SHALL MAKE ALL CONNECTIONS.
7. CONTRACTOR SHALL PROVIDE A RAISED FLOOR PLENUM. PLENUM SHALL BE CONSTRUCTED OF ANGLE IRON AND SHEET METAL TO SUPPORT FURNACE. PROVIDE 1" JOHNS-MANVILLE PERMACOTE LINACOUSITIC INSULATION ON ALL SURFACES INSIDE PLENUM. PLENUM HEIGHT SHALL BE 18" MINIMUM.
8. OUTSIDE AIR INTAKE DUCT, SIZE AND ROUTING OF O/A DUCT SHALL BE AS SHOWN ON PLANS, CONNECT TO MAIN OUTDOOR AIR DUCT. MAIN OUTDOOR AIR DUCT CONNECTED TO O/A INTAKE LOUVER. LOUVER SHALL BE AS SCHEDULED AND LOCATED PER PLANS. SEAL ALL EXTERIOR WALL PENETRATIONS WEATHER TIGHT.
9. WHERE CEILING IS THE FIRE BARRIER/SEPARATION, PROVIDE FIRE DAMPER AT CEILING PENETRATION AND AN ACCESS PANEL TO ALLOW FULL ACCESS TO THE FIRE DAMPER.
10. STANDPIPE UP THROUGH PLENUM. SEAL PLENUM AIRTIGHT AROUND STANDPIPE. REFERENCE PLUMBING FOR EXACT LOCATION. IF STANDPIPE IS NOT CAST IRON, WRAP PIPE WITH ONE LAYER OF 3M FIREGUARD WRAP, MODEL 15A.

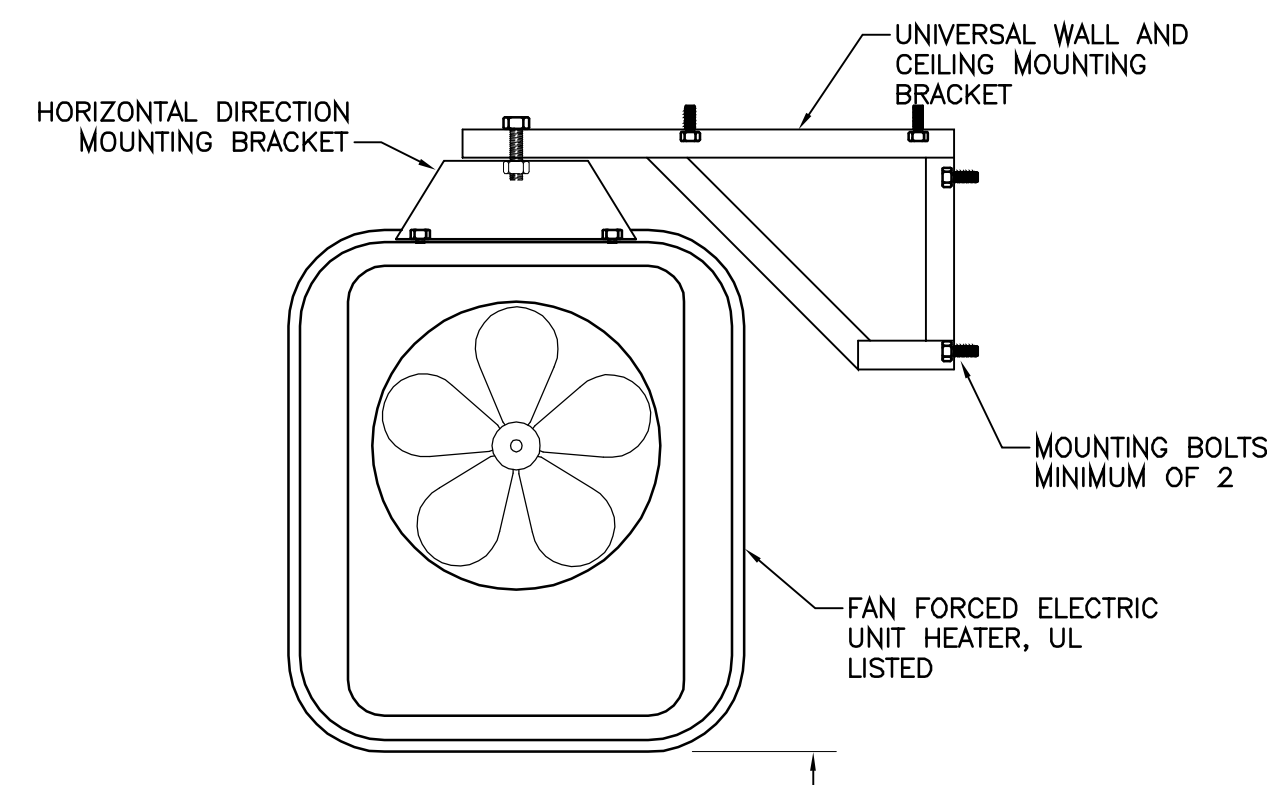


1 TYPICAL MECHANICAL ROOM DETAIL (WITH O/A INTAKE ON EXT. WALL)
SCALE: NO SCALE



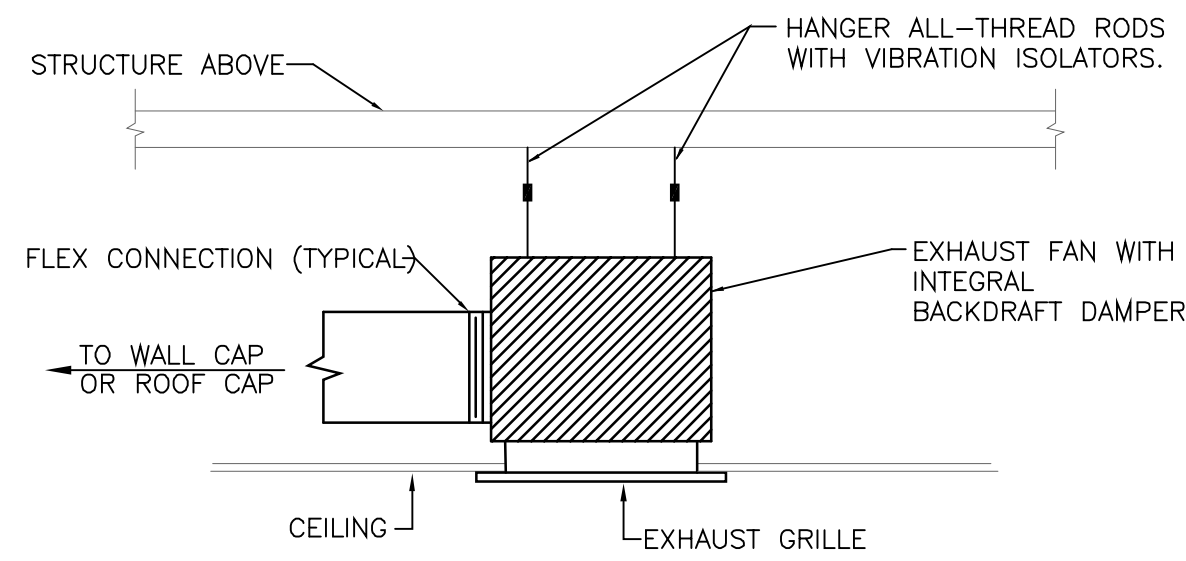
- NOTES
1. PAD SHALL EXTEND BEYOND EQUIPMENT 4" (MIN.) IN ALL DIRECTIONS.
 2. CONCRETE SHALL BE 2800 PSI TEST @ 28 DAYS, MIN.

2 TYPICAL SECTION THROUGH CONDENSING UNIT CONCRETE PAD
SCALE: NO SCALE

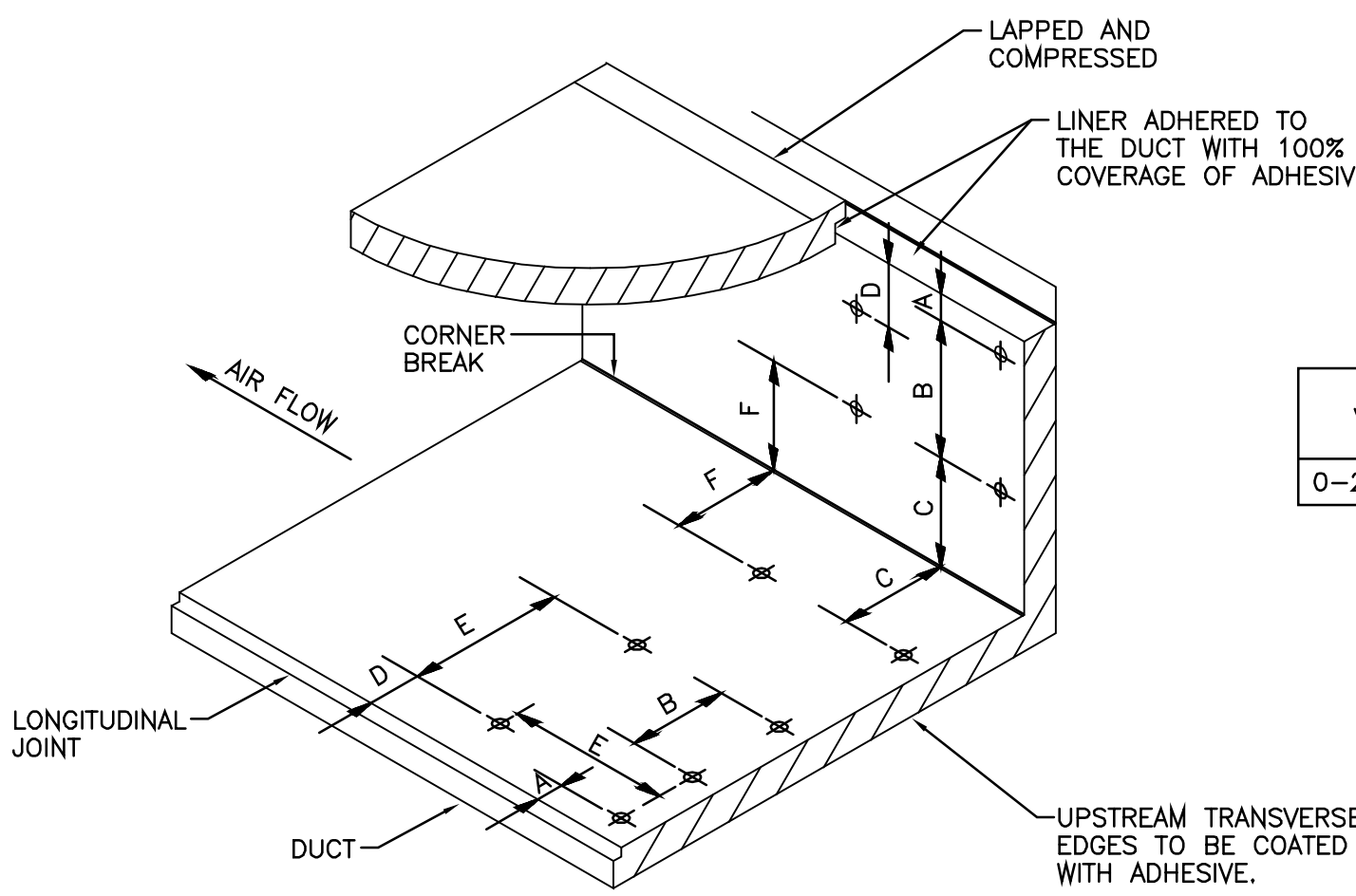


- NOTES
1. OBSERVE MANUFACTURER'S CLEARANCE REQUIREMENTS.
 2. PROVIDE WITH INTEGRAL THERMOSTAT AND CONTROL TRANSFORMER.

3 ELECTRIC UNIT HEATER MOUNTING
SCALE: NO SCALE



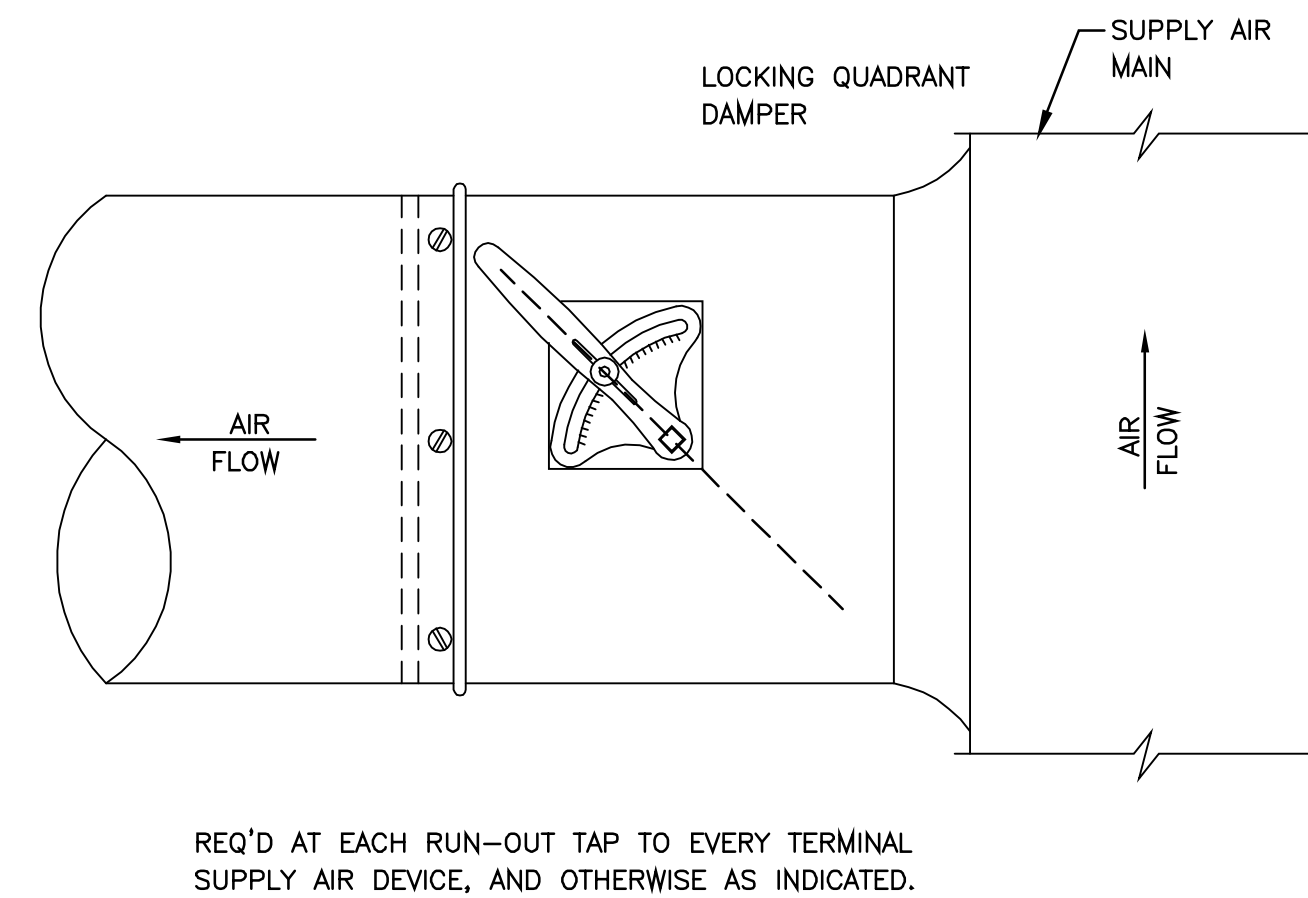
4 TYPICAL CEILING EXHAUST FAN
SCALE: NO SCALE



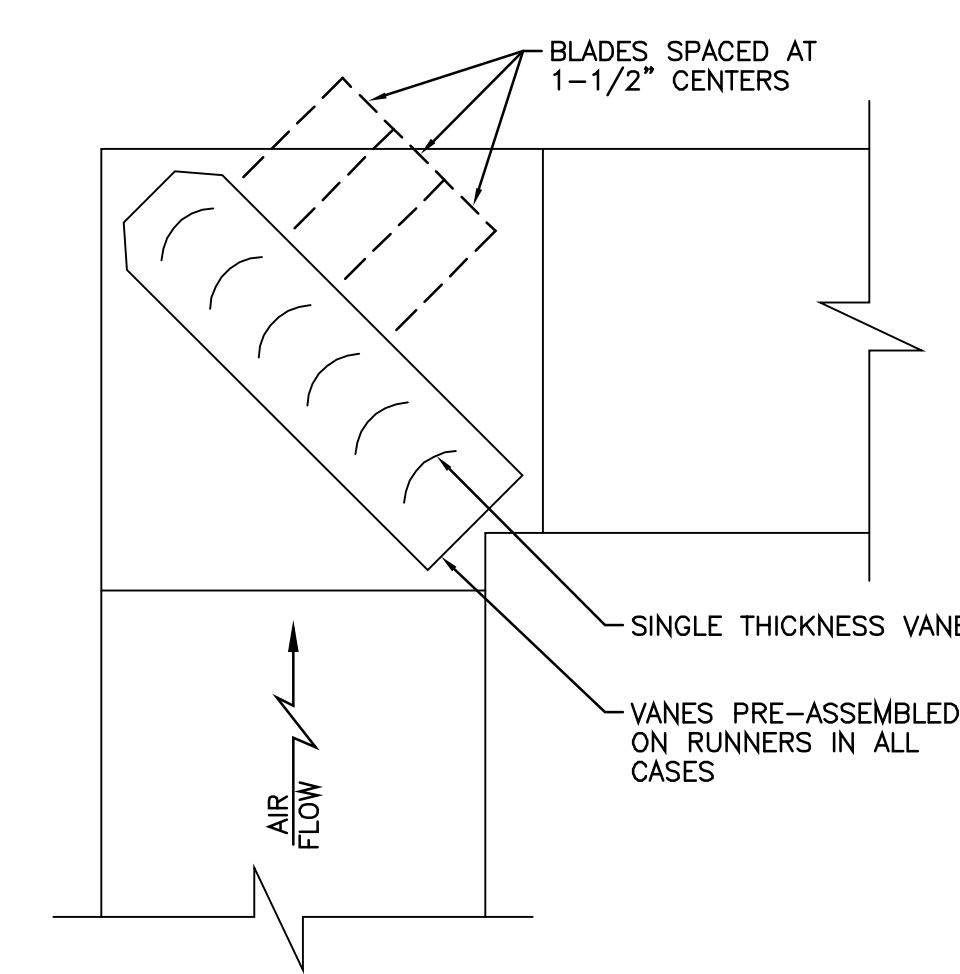
MAXIMUM SPACING FOR FASTENERS USED WITH FLEXIBLE DUCT LINER.

VELOCITY	UPSTREAM EDGE			MID-SECTION		
	A	B	C	D	E	F
0-2000 F.P.M.	3"	12"	12"	6"	18"	12"

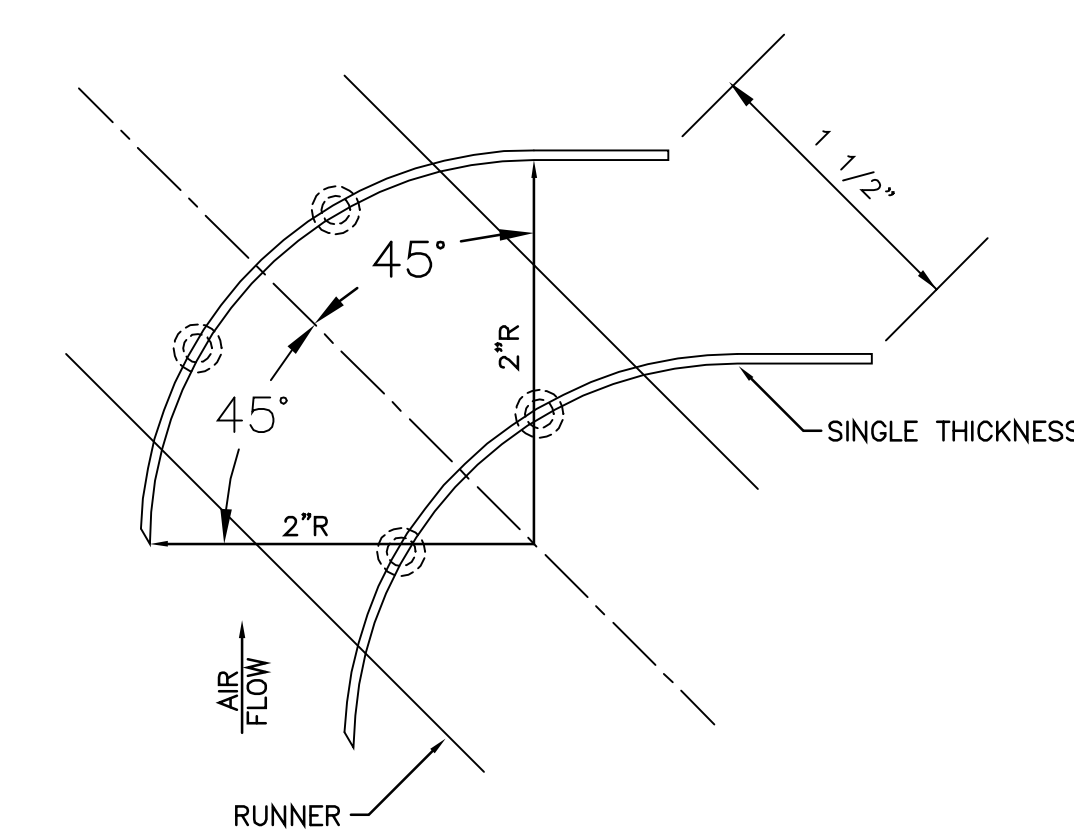
8 TYPICAL FLEXIBLE DUCT LINER INSTALLATION
SCALE: NO SCALE



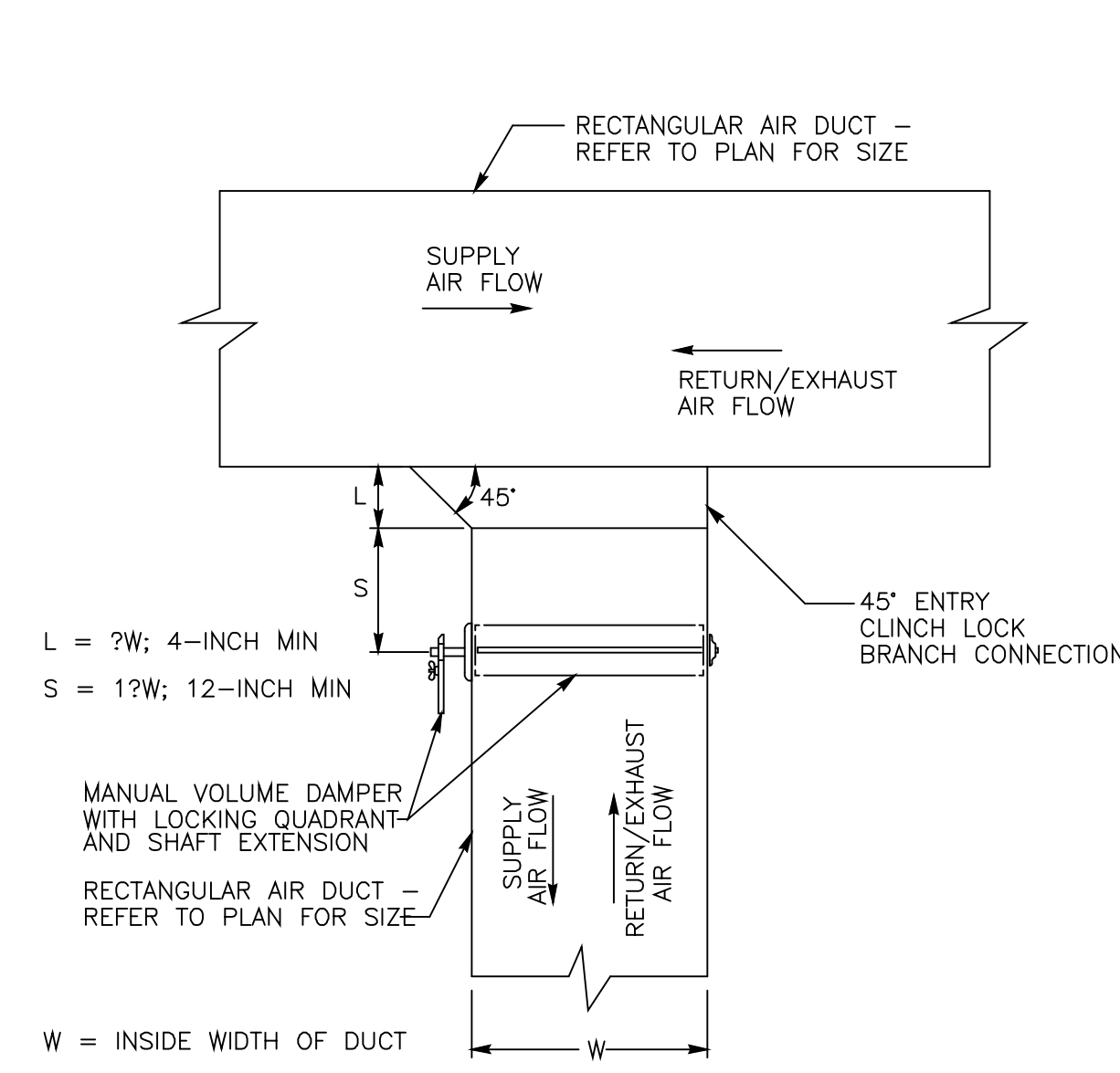
7 TYPICAL CONICAL TAP WITH MANUAL DAMPER
SCALE: NO SCALE



6 TYPICAL RECTANGULAR ELBOW
SCALE: NO SCALE

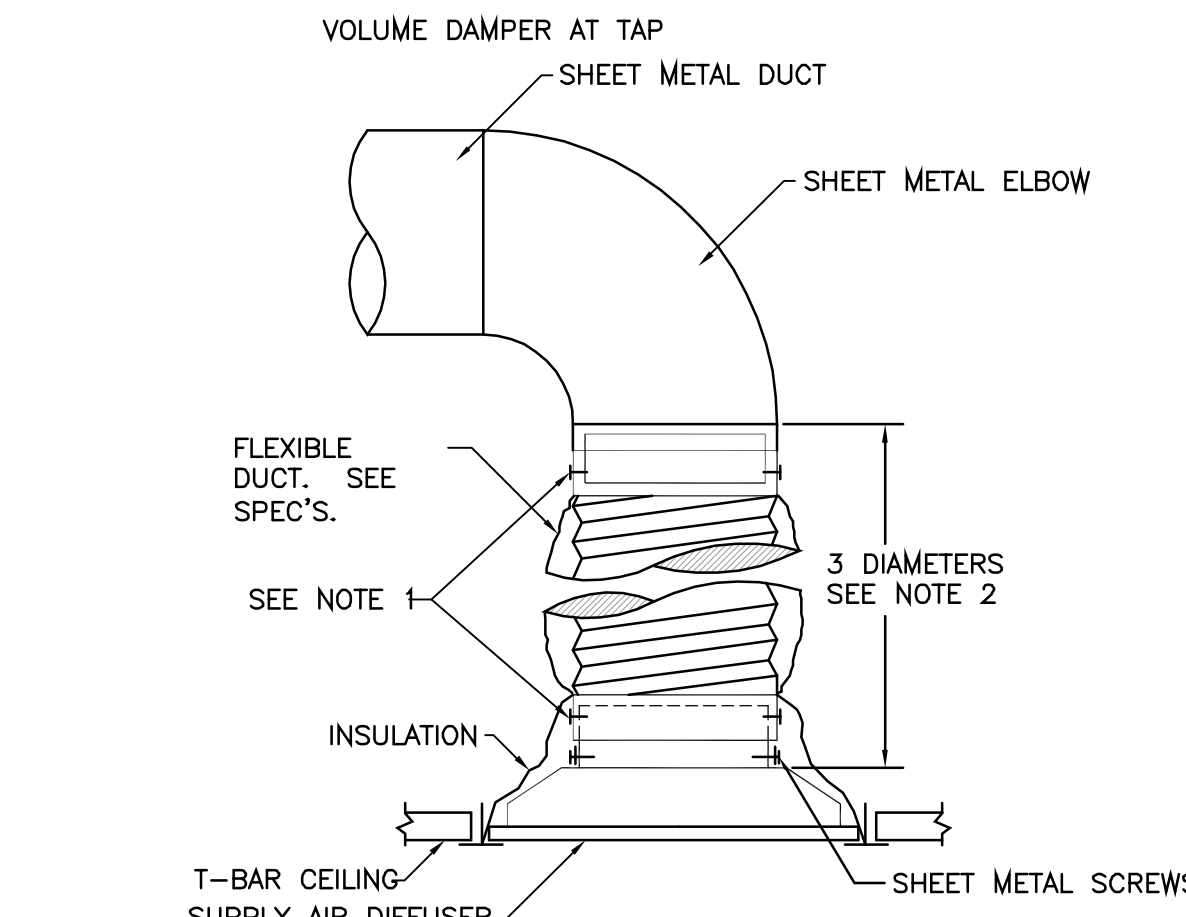


5 TYPICAL TURNING VANE
SCALE: NO SCALE



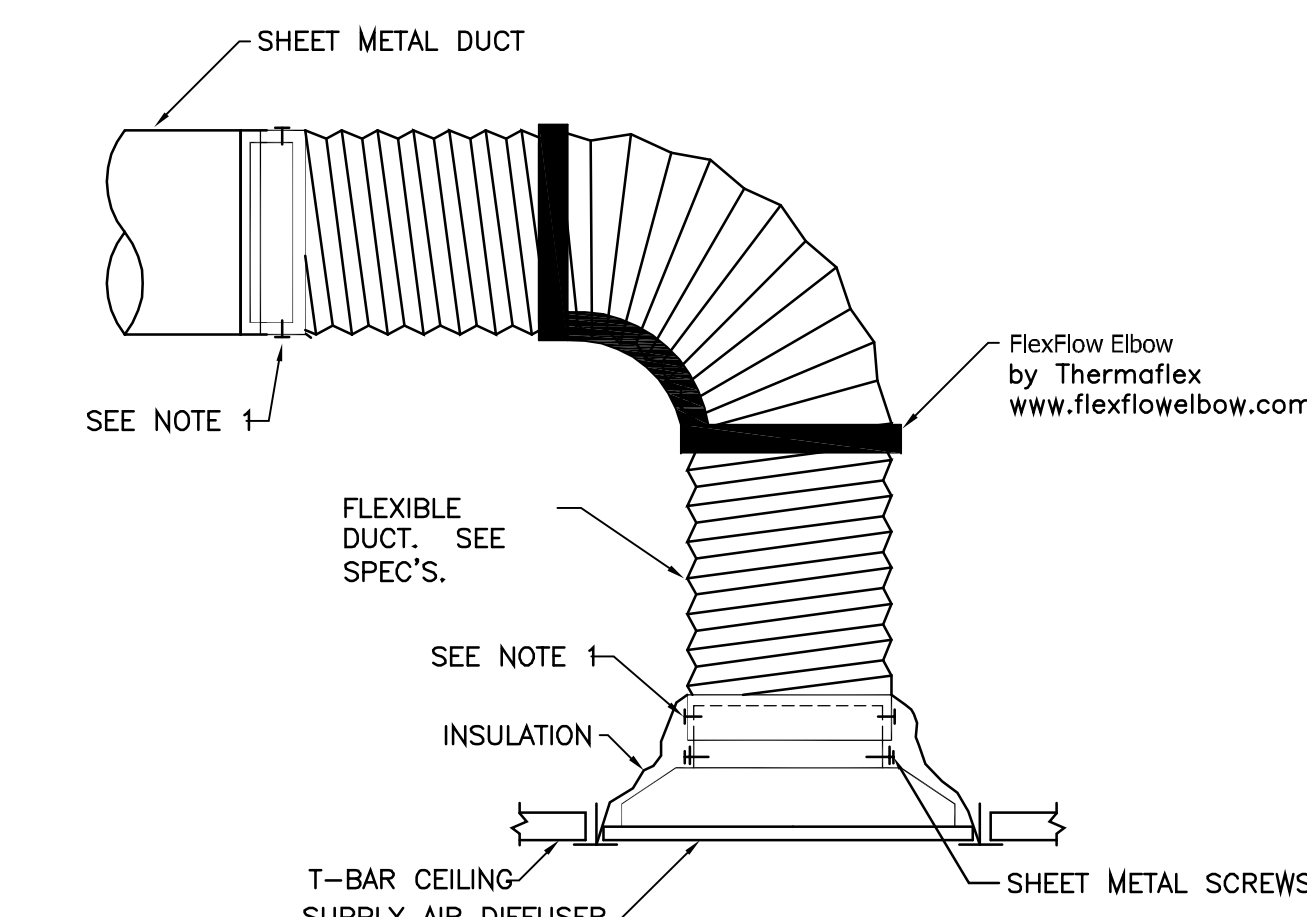
- NOTES
1. TYPICAL INSTALLATION DETAIL TO BE APPLIED TO RECTANGULAR BRANCH DUCT TAKEOFFS FROM RECTANGULAR TRUNK DUCTS. APPLIES TO SUPPLY, RETURN AND EXHAUST AIR DUCTS.

10 TYPICAL RECTANGULAR BRANCH TAKEOFF
SCALE: NO SCALE

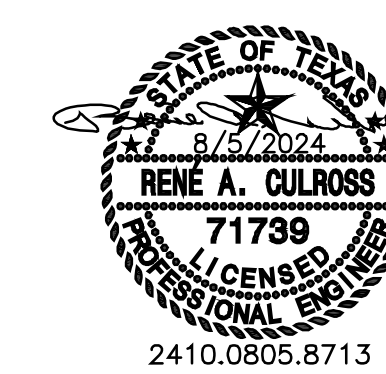


- NOTES
1. USE PLENUM COLLARS TO ATTACH FLEXIBLE DUCT. USE SHEET METAL SCREWS AND (2) WRAPS OF TAPE TO SECURE PLENUM COLLARS. ALTERNATE METHOD: BANDING DEVICE OR PANDUIT STRAP, IN LIEU OF SHEET METAL SCREWS. ALL TAPES AND SEALING MATERIALS SHALL COMPLY WITH UL181A FOR RIGID DUCT AND UL181B FOR FLEXIBLE DUCT.
 2. SECURE SHEET METAL DROP TO DIFFUSER NECK WITH A MIN. OF (3) SHEET METAL SCREWS AND (2)
 3. ALL FLEX DUCT SHALL BE INSTALLED WITHOUT KINKS, SAGGING, OR SHORT-RADIUS BENDS.

9 TYPICAL FLEXDUCT CONNECTIONS
SCALE: NO SCALE



- NOTES
1. USE PLENUM COLLARS TO ATTACH FLEXIBLE DUCT. USE SHEET METAL SCREWS AND (2) WRAPS OF TAPE TO SECURE PLENUM COLLARS. ALTERNATE METHOD: BANDING DEVICE OR PANDUIT STRAP, IN LIEU OF SHEET METAL SCREWS. ALL TAPES AND SEALING MATERIALS SHALL COMPLY WITH UL181A FOR RIGID DUCT AND UL181B FOR FLEXIBLE DUCT.
 2. IF A MINIMUM OF 2 DIAMETERS OF STRAIGHT RUN IS NOT AVAILABLE ABOVE THE REGISTER USE HARD DUCT SHORT RADIUS CONNECTION.
 3. ALL FLEX DUCT SHALL BE INSTALLED WITHOUT KINKS, SAGGING, OR SHORT-RADIUS BENDS.



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