



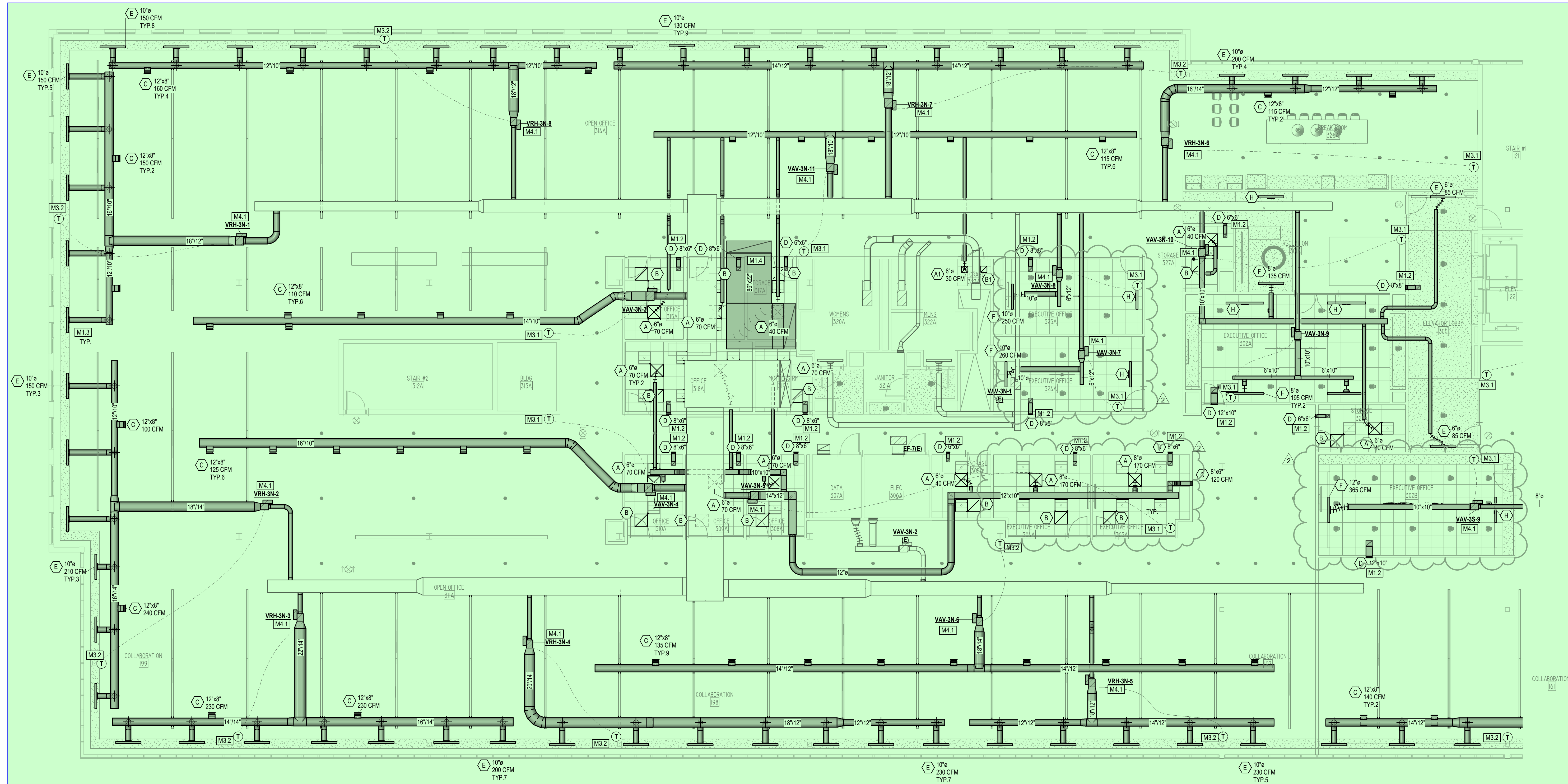
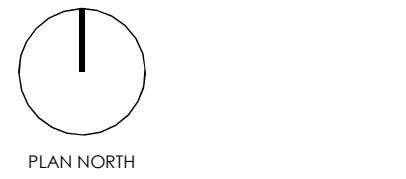


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PLANO, TX 75093

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**1 MECHANICAL PLAN - SUITE 300**  
M2.06A 1/8" = 1'-0"

**MECHANICAL GENERAL NOTES**

1. PROVIDE DIFFUSERS AND AIR GRILLES ACCORDING TO BASE BUILDING STANDARD.
2. CONTRACTOR SHALL COORDINATE WITH STRUCTURAL CONDITIONS AT THE SITE AND PROVIDE ALL CLEARANCES AS INDICATED.
3. CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL ELECTRICAL POWER REQUIREMENTS.
4. THERMOSTAT OR BUILDING MANAGEMENT SYSTEM SHALL HAVE CAPABILITY TO SET BACK OR SHUT DOWN THE SYSTEM BASED ON DAY OF THE WEEK AND TIME OF THE DAY, AND PROVIDE A READILY ACCESSIBLE MANUAL OVERRIDE THAT WILL RETURN TO THE PRESETBACK OR SHUTDOWN SCHEDULE WITHOUT REPROGRAMMING.
5. ZONE TEMPERATURE SENSOR CONTROL SHALL PROVIDE A TEMPERATURE RANGE OR DR DEADBAND OF AT LEAST 5°F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS CAPABLE OF BEING SHUT OFF OR REDUCED TO A MINIMUM.
6. CONTRACTOR SHALL NOTIFY ENGINEER ALL DISCREPANCIES BETWEEN EXISTING DUCTWORK AND DUCTWORK SHOWN ON DRAWINGS, WHICH MAY REQUIRE MODIFICATIONS (PRIOR TO FABRICATION OF ANY DUCTWORK).
7. PROVIDE RETURN AIR BOOTS WHERE WALLS ARE TO DECK. SIZE BASED ON 600 FPM MAXIMUM AIR VELOCITY.
8. CONTRACTOR TO VERIFY THE FIRE RATINGS OF WALLS AND PROVIDE FIRE DAMPERS AS REQUIRED. IF A RETURN AIR BOOT IS REQUIRED TO BE INSTALLED IN A FIRE RATED WALL, THE BOOT SHALL BE PROVIDED WITH A FIRE DAMPER.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO HAVE VERIFIED EXISTING JOBSITE CONDITIONS DURING THE BIDDING PERIOD, SO HE WILL HAVE OBTAINED THE SCOPE OF MECHANICAL WORK INVOLVED AS A RESULT OF ARCHITECTURAL MODIFICATIONS TO THE EXISTING STRUCTURE. THE SCOPE OF THE WORK SHALL INCLUDE MATERIALS AND DUCTWORK CONSISTING OF DEVICES, EQUIPMENT OR APPARATUS WHICH MUST BE RELOCATED, RELOCATED OR REMOVED EITHER TEMPORARILY OR PERMANENTLY, OR WHICH MUST BE PROVIDED SO THAT THE INDICATED REMODELING MAY BE ACCOMPLISHED. NOT ALL EXISTING CONDITIONS ARE NECESSARILY INDICATED ON THE DRAWINGS.
10. PROVIDE INSULATION FOR ALL NEW PIPING AND DUCTWORK THAT MEETS THE 2021 IECC ENERGY CODE AS SPECIFIED.

**# MECHANICAL KEYED NOTES**

- M1.2 PROVIDE RETURN AIR TRANSFER BOOT. SIZE AS INDICATED. RE: DETAIL 9M6.01.
- M1.3 PROVIDE REMOTE DAMPER OPERATOR FOR DAMPERS ABOVE GYPSUM CEILING. RE: DETAIL 7M6.01.
- M1.4 ROUTE NEW RETURN DUCT FROM OPENING. CONNECT TO EXISTING RETURN DUCT. PROVIDE TRANSITIONS AS NECESSARY. PROVIDE BOOT AT END OF DUCT. SIZE AS INDICATED.
- M3.1 PROVIDE THERMOSTAT AT APPROXIMATE LOCATION SHOWN. THERMOSTAT SHALL BE INSTALLED AT SAME ELEVATION AS LIGHT SWITCHES. COORDINATE FINAL LOCATION WITH ARCHITECT AND OTHER TRADES TO AVOID CONFLICTS.
- M3.2 MOUNT NEW THERMOSTAT ON EXISTING STRUCTURAL COLUMN. PROVIDE INSULATION PAD BETWEEN THERMOSTAT AND COLUMN.
- M4.1 PROVIDE VAV TERMINAL UNIT AT APPROXIMATE LOCATION SHOWN. SUPPORT UNIT FROM STRUCTURE. PROVIDE ALL CLEARANCES AS REQUIRED BY EQUIPMENT MANUFACTURER. COORDINATE WITH ADJACENT PIPING, WALLS, CONDUIT, STRUCTURAL MEMBERS, ETC. RE: DETAIL XXMM.XX.

2 PR-1 03/16/2023  
1 100% CD 08/11/2022

Issue

Project Number: Project Number

Project Director: DBR

Quality Assurance: DBR

Drawn By: DBR

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DBR Project Number 220195.000

AS | TG | JD | JD

**MECHANICAL PLAN - SUITE 300**  
**M2.06A**

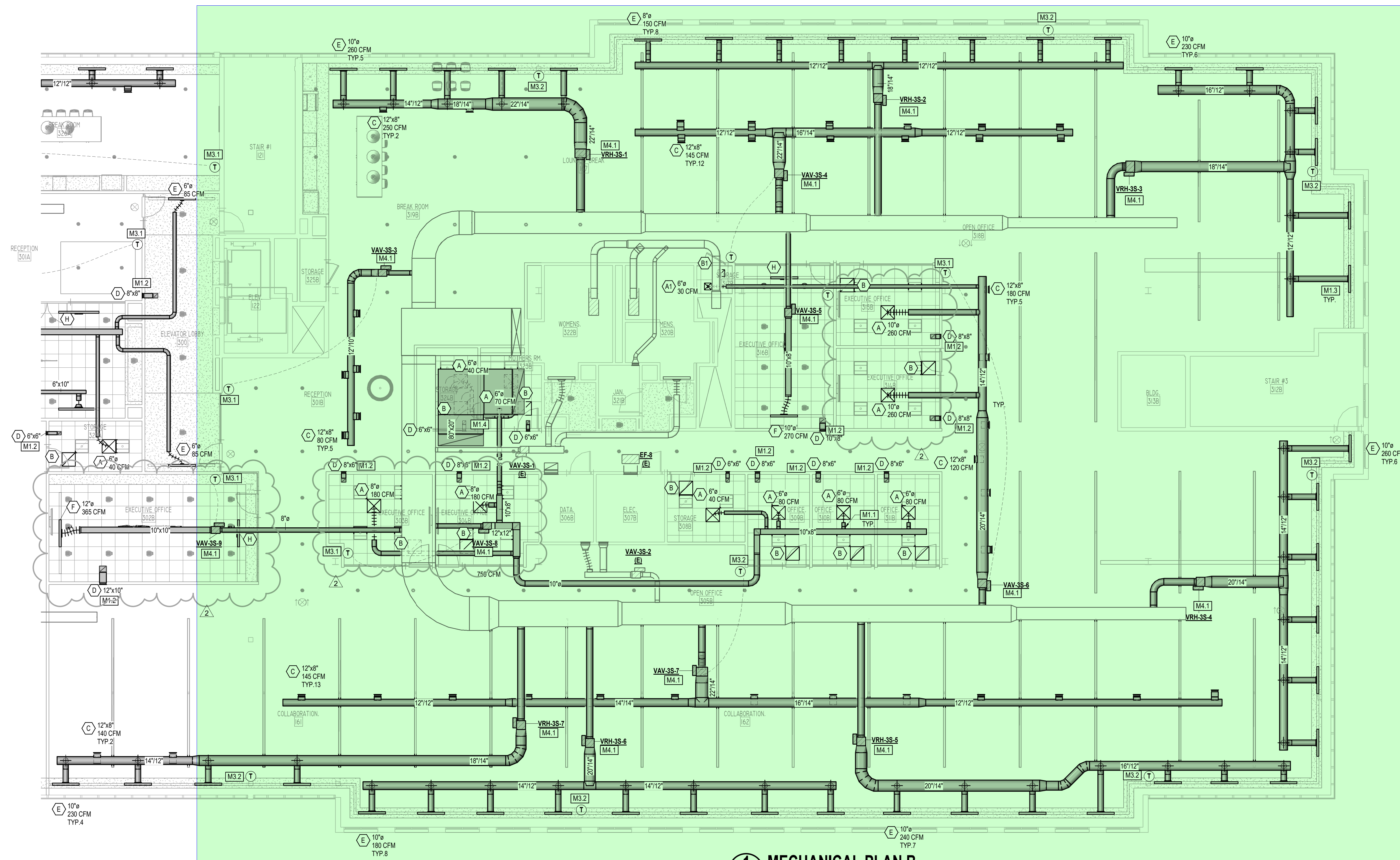


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**MECHANICAL PLAN B**  
M2.06B 1/8" = 1'-0"

**MECHANICAL GENERAL NOTES**

1. PROVIDE DIFFUSERS AND AIR GRILLES ACCORDING TO BASE BUILDING STANDARD.
2. CONTRACTOR SHALL COORDINATE WITH STRUCTURAL CONDITIONS AT THE SITE AND PROVIDE ALL CLEARANCES AS INDICATED.
3. CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL ELECTRICAL POWER REQUIREMENTS.
4. THERMOSTAT OR BUILDING MANAGEMENT SYSTEM SHALL HAVE CAPABILITY TO SET BACK OR SHUT DOWN THE SYSTEM BASED ON DAY OF THE WEEK AND TIME OF THE DAY. AND PROVIDE A READILY ACCESSIBLE MANUAL OVERRIDE THAT WILL RETURN TO THE PRESETBACK OR SHUTDOWN SCHEDULE WITHOUT REPROGRAMMING.
5. ZONE TEMPERATURE SENSOR CONTROL SHALL PROVIDE A TEMPERATURE RANGE OR DEADBAND OF AT LEAST 5°F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS CAPABLE OF BEING SHUT OFF OR REDUCED TO A MINIMUM.
6. CONTRACTOR SHALL NOTIFY ENGINEER ALL DISCREPANCIES BETWEEN EXISTING DUCTWORK AND DUCTWORK SHOWN ON DRAWINGS, WHICH MAY REQUIRE MODIFICATIONS (PRIOR TO FABRICATION OF ANY DUCTWORK).
7. PROVIDE RETURN AIR BOOTS WHERE WALLS ARE TO DECK. SIZE BASED ON 600 FPM MAXIMUM AIR VELOCITY.
8. CONTRACTOR TO VERIFY THE FIRE RATINGS OF WALLS AND PROVIDE FIRE DAMPERS AS REQUIRED. IF A RETURN AIR BOOT IS REQUIRED TO BE INSTALLED IN A FIRE RATED WALL, THE BOOT SHALL BE PROVIDED WITH A FIRE DAMPER.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO HAVE VERIFIED EXISTING JOBSITE CONDITIONS DURING THE BIDDING PERIOD, SO HE WILL HAVE OBTAINED THE SCOPE OF MECHANICAL WORK INVOLVED AS A RESULT OF ARCHITECTURAL MODIFICATIONS TO THE EXISTING STRUCTURE. THE SCOPE OF THE WORK SHALL INCLUDE MATERIALS AND DUCTWORK CONSISTING OF DEVICES, EQUIPMENT OR APPARATUS WHICH MUST BE REROUTED, RELOCATED OR REMOVED EITHER TEMPORARILY OR PERMANENTLY, OR WHICH MUST BE PROVIDED SO THAT THE INDICATED REMODELING MAY BE ACCOMPLISHED. NOT ALL EXISTING CONDITIONS ARE NECESSARILY INDICATED ON THE DRAWINGS.
10. PROVIDE INSULATION FOR ALL NEW PIPING AND DUCTWORK THAT MEETS THE 2021 IECC ENERGY CODE AS SPECIFIED.

**# MECHANICAL KEYED NOTES**

- M1.1 PROVIDE SPIN-IN FITTING WITH LOCKING QUADRANT BUTTERFLY DAMPER FOR ALL ROUND DUCT CONNECTIONS TO RECTANGULAR DUCT. TYPICAL. RE: DETAIL 41M6.01.
- M1.2 PROVIDE RETURN AIR TRANSFER BOOT. SIZE AS INDICATED. RE: DETAIL 91M.01.
- M1.3 PROVIDE REMOTE DAMPER OPERATOR FOR DAMPERS ABOVE GYPSUM CEILING. RE: DETAIL 71M6.01.
- M1.4 ROUTE NEW RETURN DUCT FROM OPENING. CONNECT TO EXISTING RETURN DUCT. PROVIDE TRANSITIONS AS NECESSARY. PROVIDE BOOT AT END OF DUCT. SIZE AS INDICATED.
- M3.1 PROVIDE THERMOSTAT AT APPROXIMATE LOCATION SHOWN. THERMOSTAT SHALL BE INSTALLED AT SAME ELEVATION AS LIGHT SWITCHES. COORDINATE FINAL LOCATION WITH ARCHITECT AND OTHER TRADES TO AVOID CONFLICTS.
- M3.2 MOUNT NEW THERMOSTAT ON EXISTING STRUCTURAL COLUMN. PROVIDE INSULATION PAD BETWEEN THERMOSTAT AND COLUMN.
- M4.1 PROVIDE VAV TERMINAL UNIT AT APPROXIMATE LOCATION SHOWN. SUPPORT UNIT FROM STRUCTURE. PROVIDE ALL CLEARANCES AS REQUIRED BY EQUIPMENT MANUFACTURER. COORDINATE WITH ADJACENT PIPING, WALLS, CONDUIT, STRUCTURAL MEMBERS, ETC. RE: DETAIL XXMX.XX.

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Issue

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Quality Assurance: DBR  
Drawn By: DBR

**MECHANICAL PLAN -  
SUITE 301  
M2.06B**

SINGLE INLET VAV BOX WITH ELECTRIC HEAT SCHEDULE										
MARK	COOLING CFM		HEATING CFM		ELEC. HEATING		INLET SIZE	VOLTS/PHASE/ HZ	MFR	MODEL NO.
	MAX.	MIN.	MAX.	MIN.	KW	NO. OF STEPS				
VRH-3N-1	1050	315	735	495	7.0	SCR	10"Ø	460/3/60	METALAIR	TH-500
VRH-3N-2	1420	425	995	670	9.4	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3N-3	1980	590	1305	875	12.4	SCR	14"Ø	460/3/60	METALAIR	TH-500
VRH-3N-4	1610	485	1130	760	10.7	SCR	14"Ø	460/3/60	METALAIR	TH-500
VRH-3N-5	1150	345	805	540	7.6	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3N-6	800	240	560	375	5.3	SCR	10"Ø	460/3/60	METALAIR	TH-500
VRH-3N-7	1170	350	820	550	7.8	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3N-8	1640	550	1290	865	12.2	SCR	14"Ø	460/3/60	METALAIR	TH-500
VRH-3S-1	1800	540	1260	845	12.0	SCR	14"Ø	460/3/60	METALAIR	TH-500
VRH-3S-2	1200	360	840	565	8.0	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3S-3	1380	415	970	650	9.2	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3S-4	1560	470	1095	735	10.4	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3S-5	1680	505	1180	790	11.2	SCR	14"Ø	460/3/60	METALAIR	TH-500
VRH-3S-6	1440	430	1010	680	9.6	SCR	12"Ø	460/3/60	METALAIR	TH-500
VRH-3S-7	1200	360	840	565	8.0	SCR	12"Ø	460/3/60	METALAIR	TH-500

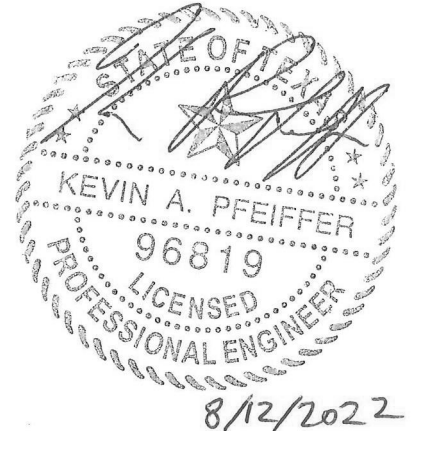
- NOTES:
1. PROVIDE AEROCROSS MULTI-POINT CENTER AVERAGING VELOCITY SENSOR IN PRIMARY AIR INLET.
  2. PROVIDE TERMINAL UNIT CASING WITH 1" INTERNALLY LINED FIBERGLASS FREE INSULATION.
  3. PROVIDE TERMINAL UNIT WITH INTEGRAL DISCONNECT SWITCH.
  4. PROVIDE ELECTRIC REHEAT COIL WITH 0-10V SCR MODULATING CAPACITY CONTROL.

SINGLE INLET COOLING ONLY VAV BOX SCHEDULE						
MARK	CFM		INLET SIZE	VOLTS/PHH Z	MFR	MODEL NO.
	MAX.	MIN.				
VAV-3N-3	660	265	8"Ø	115/1/60	METALAIR	TH-500
VAV-3N-4	750	300	10"Ø	115/1/60	METALAIR	TH-500
VAV-3N-5	800	320	10"Ø	115/1/60	METALAIR	TH-500
VAV-3N-6	1,215	490	12"Ø	115/1/60	METALAIR	TH-500
VAV-3N-7	260	105	6"Ø	115/1/60	METALAIR	TH-500
VAV-3N-8	250	100	6"Ø	115/1/60	METALAIR	TH-500
VAV-3N-9	300	160	8"Ø	115/1/60	METALAIR	TH-500
VAV-3N-10	365	155	8"Ø	115/1/60	METALAIR	TH-500
VAV-3N-11	800	320	10"Ø	115/1/60	METALAIR	TH-500
VAV-3S-3	400	160	8"Ø	115/1/60	METALAIR	TH-500
VAV-3S-4	1,740	700	14"Ø	115/1/60	METALAIR	TH-500
VAV-3S-5	270	110	6"Ø	115/1/60	METALAIR	TH-500
VAV-3S-6	1,450	580	12"Ø	115/1/60	METALAIR	TH-500
VAV-3S-7	1,885	755	14"Ø	115/1/60	METALAIR	TH-500
VAV-3S-8	750	300	10"Ø	115/1/60	METALAIR	TH-500
VAV-3S-9	365	150	8"Ø	115/1/60	METALAIR	TH-500

- NOTES:
1. PROVIDE AEROCROSS MULTI-POINT CENTER AVERAGING VELOCITY SENSOR IN PRIMARY AIR INLET.
  2. PROVIDE TERMINAL UNIT CASING WITH 1" INTERNALLY LINED FIBERGLASS FREE INSULATION.
  3. EMCS CONTRACTOR SHALL PROVIDE 24VAC TO PRIMARY AIR INLET DAMPER ACTUATOR.

AIR DEVICE SCHEDULE				
MARK	MFR & MODEL	TYPE	REMARKS	
A	PRICE SPD	24"x24" PLAQUE FACE SUPPLY AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR LAY-IN CEILING OR HARD CEILING. DEPENDING ON CEILING TYPE. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. SIZE NECK ACCORDING TO DRAWING.	
B	PRICE PDDR	24"x24" PERFORATED FACE RETURN / EXHAUST AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR LAY-IN CEILING OR HARD CEILING. DEPENDING ON CEILING TYPE. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. PROVIDE 15"Ø NECK OPEN TO PLENUM UNLESS OTHERWISE NOTED ON DRAWINGS. PROVIDE O.D.B. WHEN USED FOR DUCTED EXHAUST.	
A1	PRICE SPD	12"x12" PLAQUE FACESUPPLY AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR LAY-IN CEILING OR HARD CEILING. DEPENDING ON CEILING TYPE. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. SIZE NECK ACCORDING TO DRAWING.	
B1	PRICE PDDR	12"x12" PERFORATED FACE RETURN / EXHAUST AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR LAY-IN CEILING OR HARD CEILING. DEPENDING ON CEILING TYPE. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPE. PROVIDE 8"Ø NECK OPEN TO PLENUM UNLESS OTHERWISE NOTED ON DRAWINGS. PROVIDE O.D.B. WHEN USED FOR DUCTED EXHAUST.	
C	PRICE S10	SIDEWALL SUPPLY AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR SURFACE MOUNT. 3/4" BLADE SPACING. DOUBLE DEFLECTION WITH FRONT BLADES PARALLEL TO LONG DIMENSION. PROVIDE O.D.B. PROVIDE SIZE ACCORDING TO DRAWING.	
D	PRICE S30	SIDEWALL RETURN / EXHAUST AIR GRILLE	ALUMINUM CONSTRUCTION WITH FRAME FOR SURFACE MOUNT. 3/4" BLADE SPACING. 35° DEFLECTION WITH BLADES PARALLEL TO LONG DIMENSION. PROVIDE O.D.B. WHEN USED FOR DUCTED EXHAUST. PROVIDE SIZE ACCORDING TO DRAWING.	
E	PRICE CF	2.5' SINGLE WIDTH SUPPLY SLOT WITH FLOWBAR HIGH THROW PATTERN CONTROLLER	ALUMINUM CONSTRUCTION. PROVIDE PATTERN CONTROLLERS ENTIRE LENGTH OF SLOT. PROVIDE 4" EXTERNALLY INSULATED PLENUM AS SHOWN ON DRAWINGS. CONNECT PLENUM TO NECK OF SLOT DIFFUSER. PROVIDE ROUND INLET SIZED AS INDICATED ON PLAN. PROVIDE BORDER TYPE 8 FOR INSTALLATION WITHIN HARD CEILING. PROVIDE REMOTE DAMPER OPERATOR WHEN LOCATED ABOVE INACCESSIBLE CEILINGS.	
F	PRICE CF	4 FOOT LONG 1.5' SINGLE WIDTH SUPPLY SLOT WITH FLOWBAR HIGH THROW PATTERN CONTROLLER	ALUMINUM CONSTRUCTION. PROVIDE PATTERN CONTROLLERS ENTIRE LENGTH OF SLOT. PROVIDE 4" EXTERNALLY INSULATED PLENUM AS SHOWN ON DRAWINGS. CONNECT PLENUM TO NECK OF SLOT DIFFUSER. PROVIDE ROUND INLET SIZED AS INDICATED ON PLAN. PROVIDE TRIMMED BORDER TYPE TO BE INSTALLED WITHIN LAY-IN CEILING. PROVIDE REMOTE DAMPER OPERATOR WHEN LOCATED ABOVE INACCESSIBLE CEILINGS.	
G	PRICE CF	6 FOOT LONG 1.5' SINGLE WIDTH SUPPLY SLOT WITH FLOWBAR HIGH THROW PATTERN CONTROLLER	ALUMINUM CONSTRUCTION. PROVIDE PATTERN CONTROLLERS ENTIRE LENGTH OF SLOT. PROVIDE 6" EXTERNALLY INSULATED PLENUM AS SHOWN ON DRAWINGS. CONNECT PLENUM TO NECK OF SLOT DIFFUSER. PROVIDE ROUND INLET SIZED AS INDICATED ON PLAN. PROVIDE TRIMMED BORDER TYPE TO BE INSTALLED WITHIN LAY-IN CEILING. PROVIDE REMOTE DAMPER OPERATOR WHEN LOCATED ABOVE INACCESSIBLE CEILINGS.	
H	PRICE CF	1.5' SINGLE WIDTH RETURN SLOT WITH FLOWBAR JET THROW PATTERN CONTROLLER	ALUMINUM CONSTRUCTION. PROVIDE PATTERN CONTROLLERS ENTIRE LENGTH OF SLOT. PROVIDE SLOT LENGTH AS SHOWN ON DRAWINGS. PROVIDE TRIMMED BORDER TYPE TO BE INSTALLED WITHIN LAY-IN CEILING. PROVIDE RETURN SLOT WITH RETURN AIR LIGHT SHIELD.	

- NOTES:
1. INSULATE BACK/PAN OF ALL DEVICES.
  2. PROVIDE FRAME TO MATCH CEILING TYPE INDICATED ON ARCHITECTS REFLECTED CEILING PLAN.
  3. PAINT INTERIOR SURFACES OF DUCTWORK VISIBLE FROM FACE OF RETURN AIR GRILLES FLAT BLACK.



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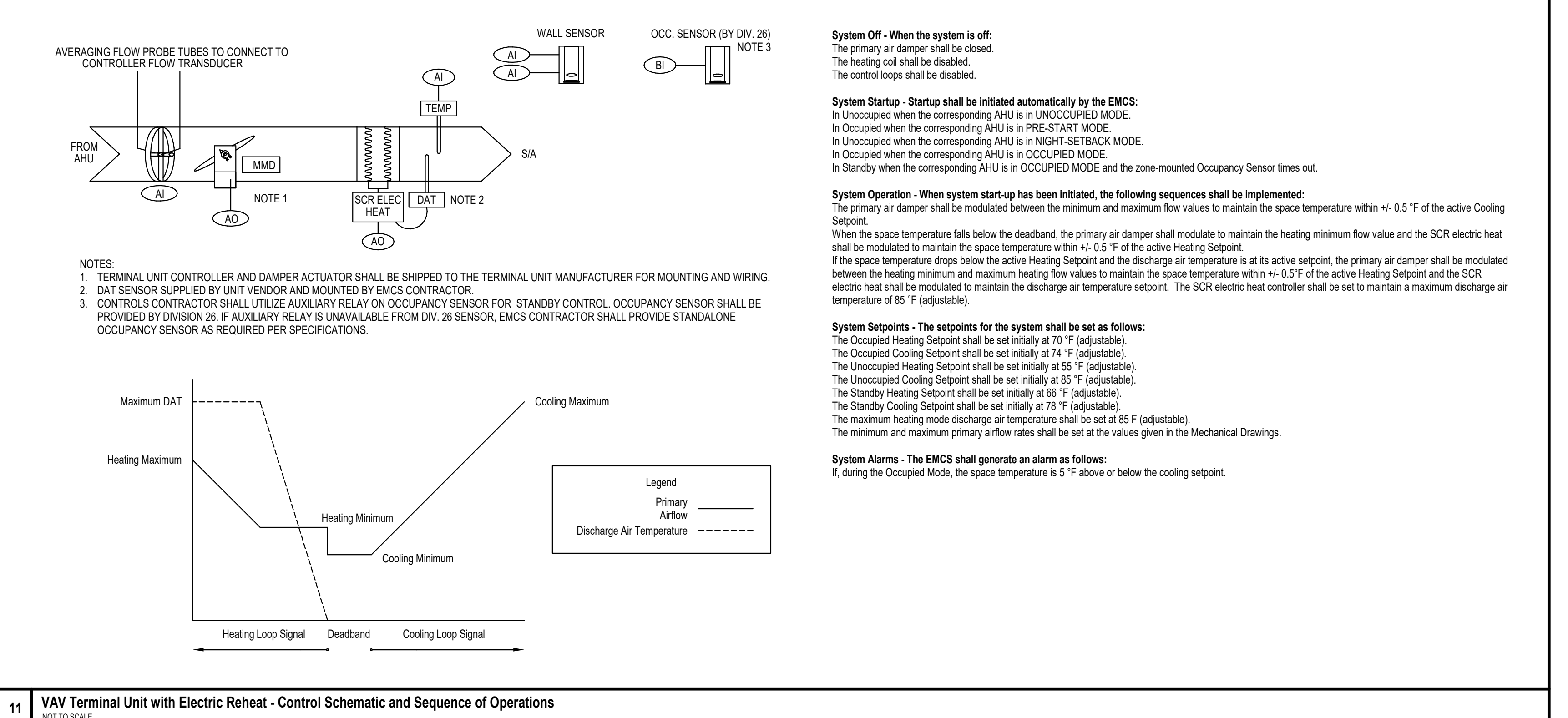
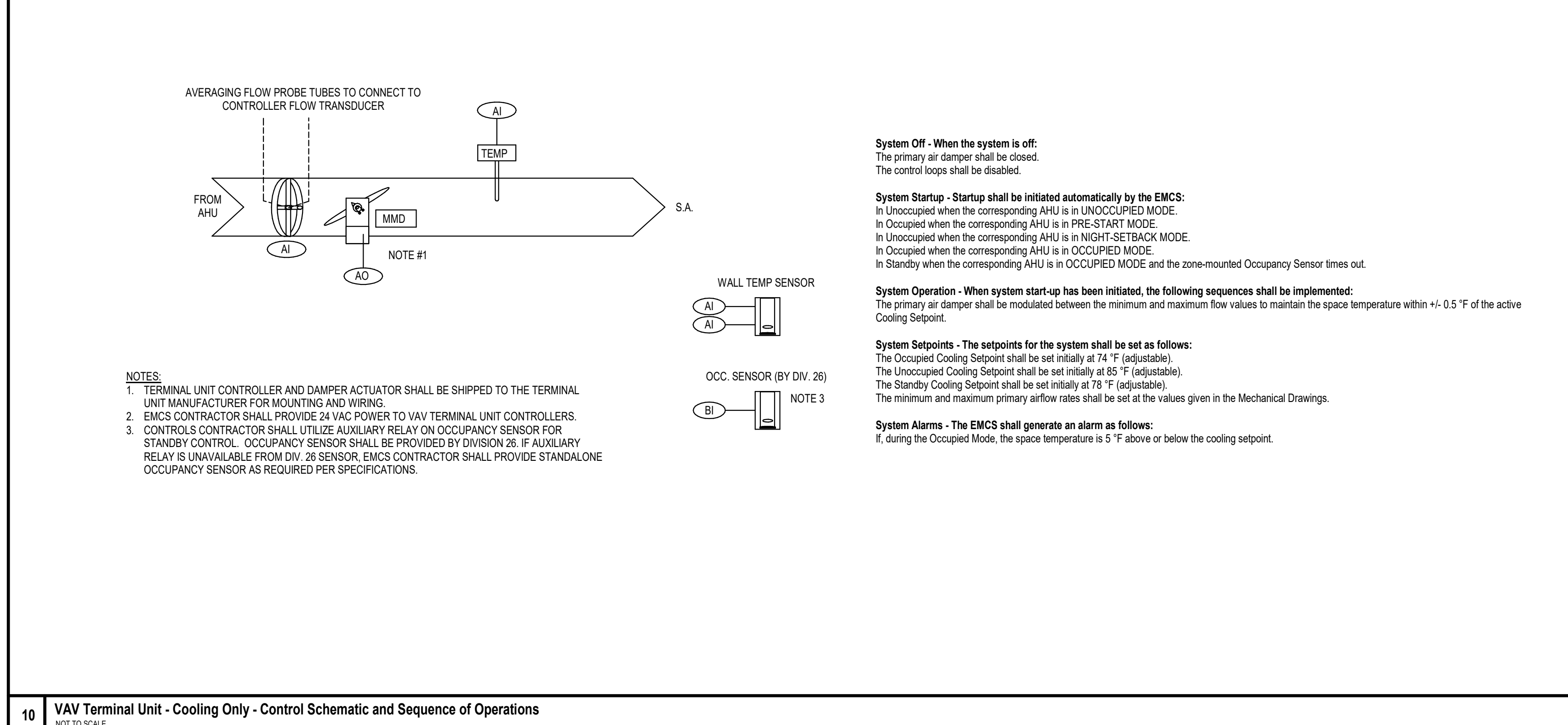
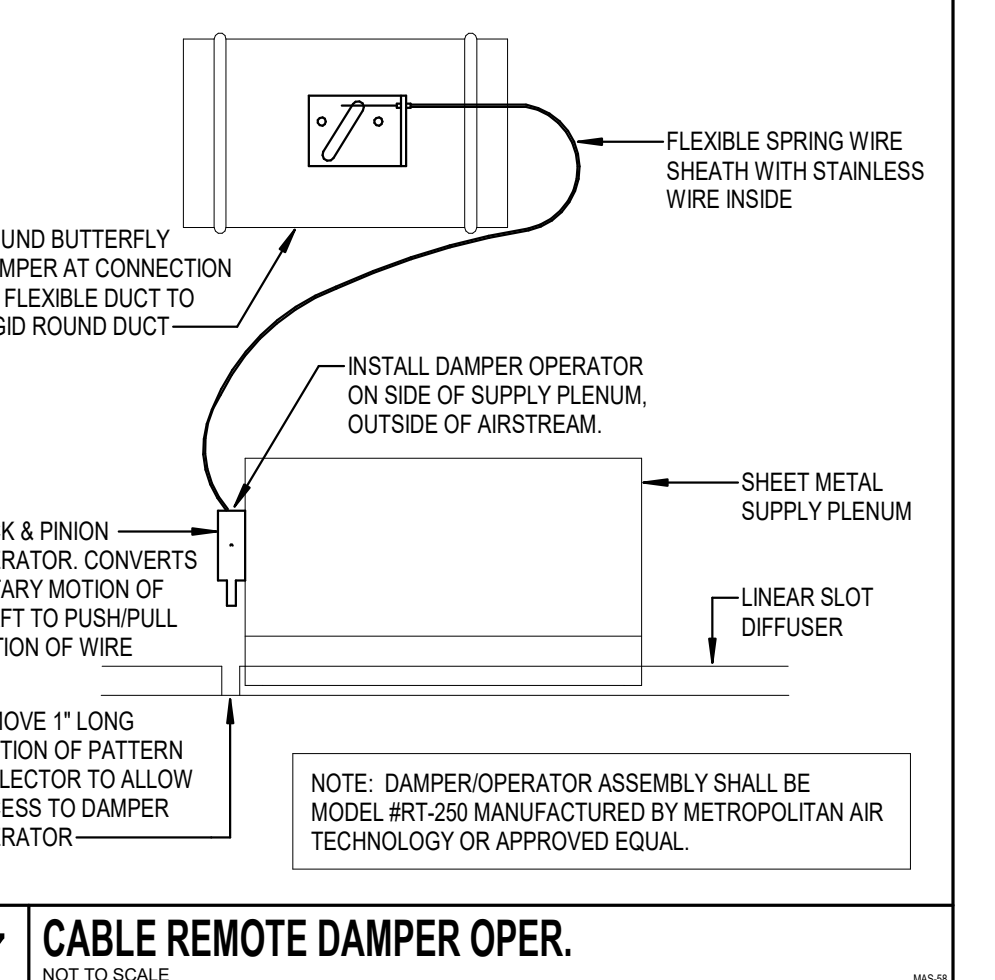
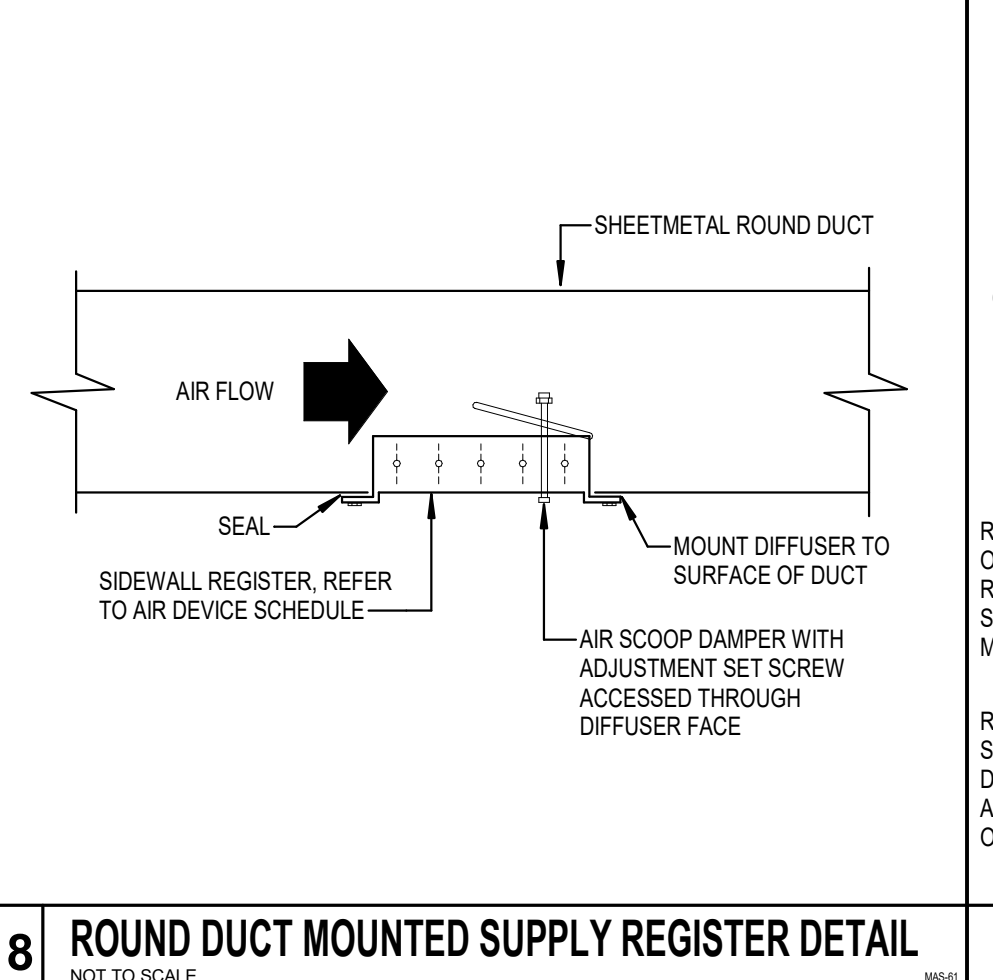
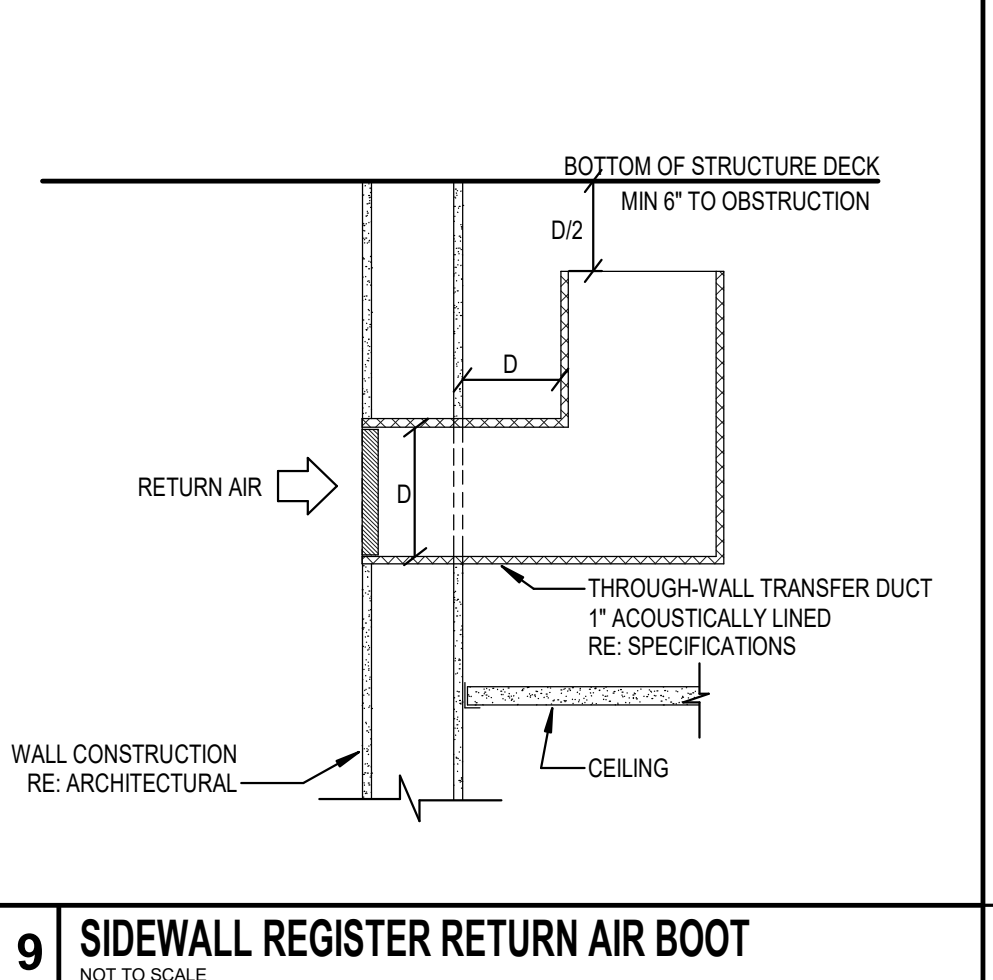
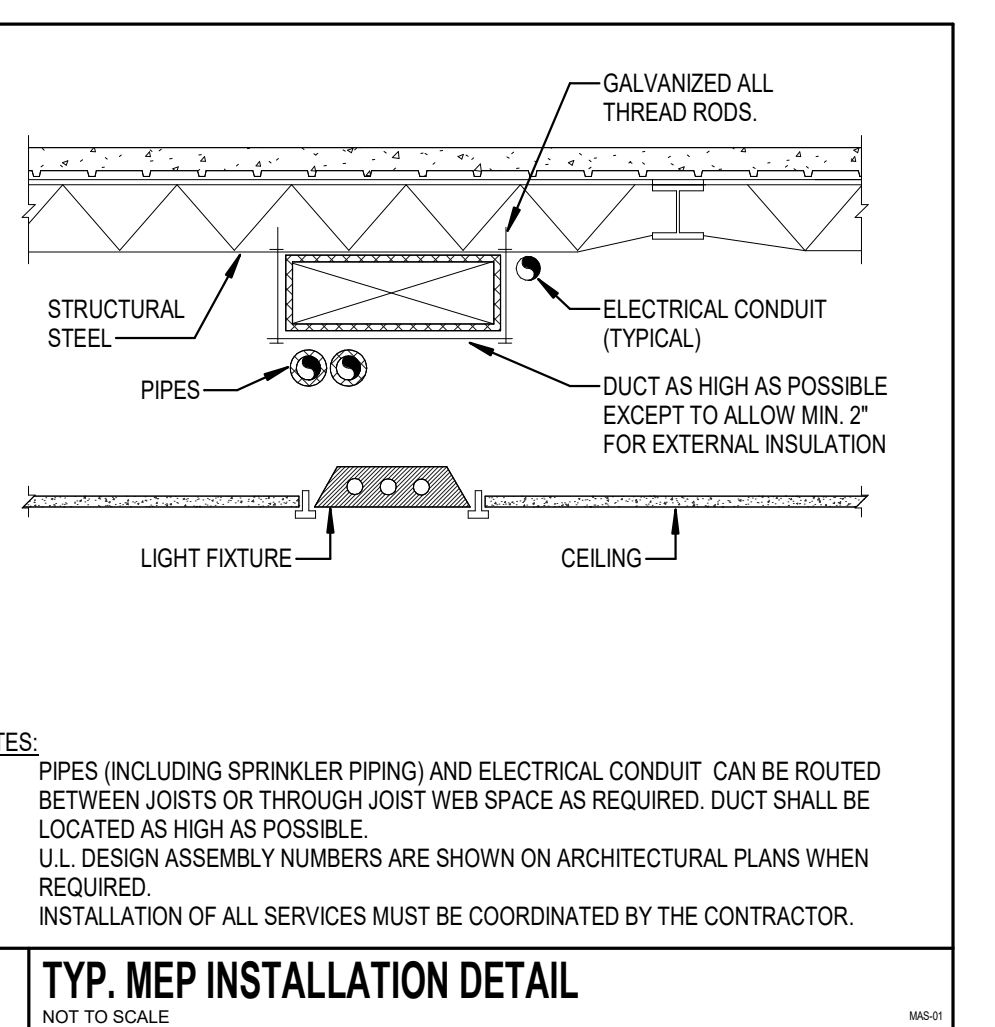
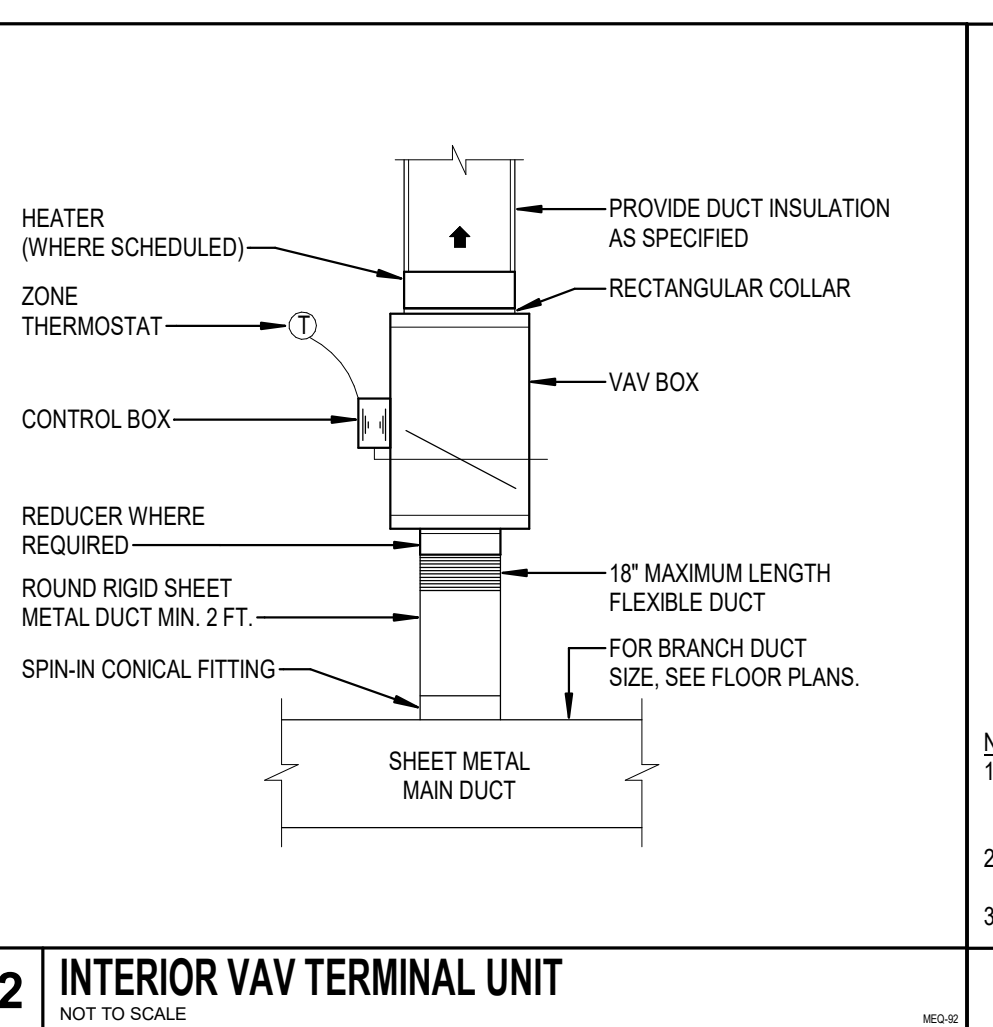
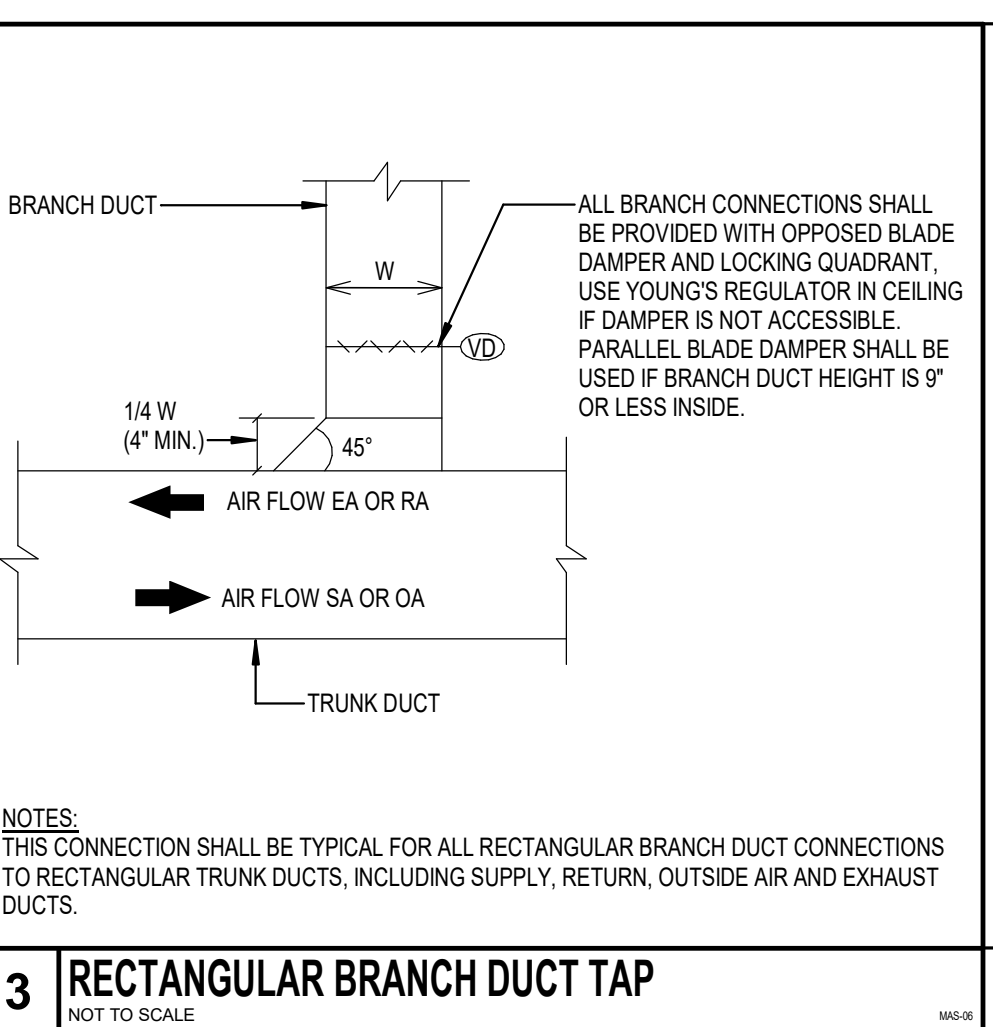
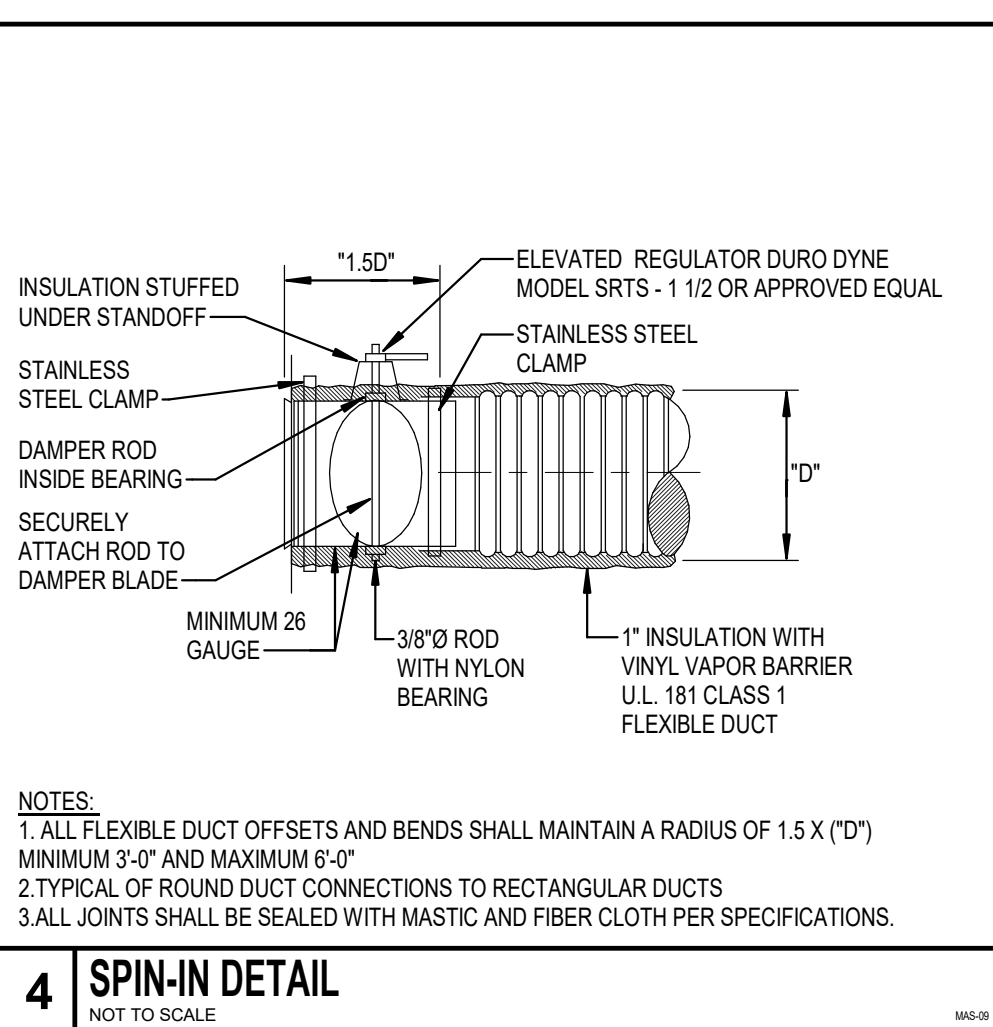
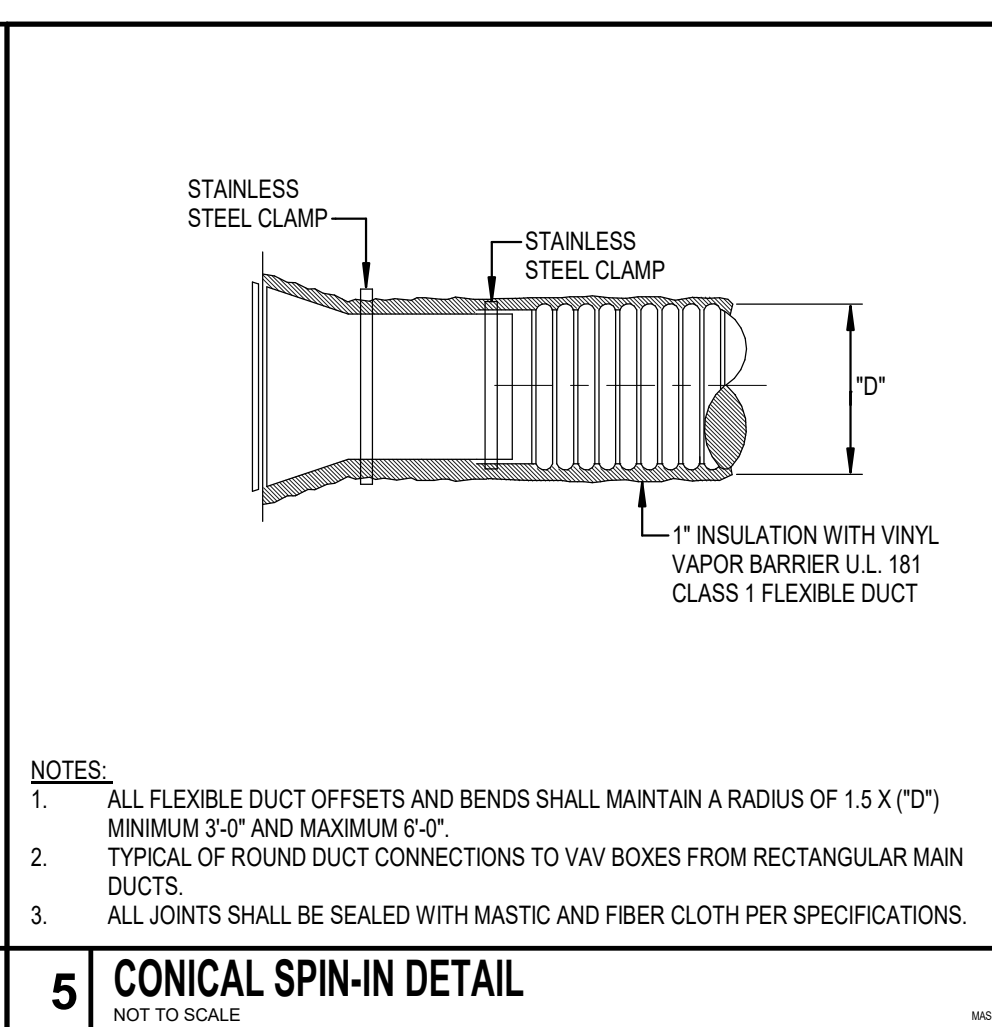
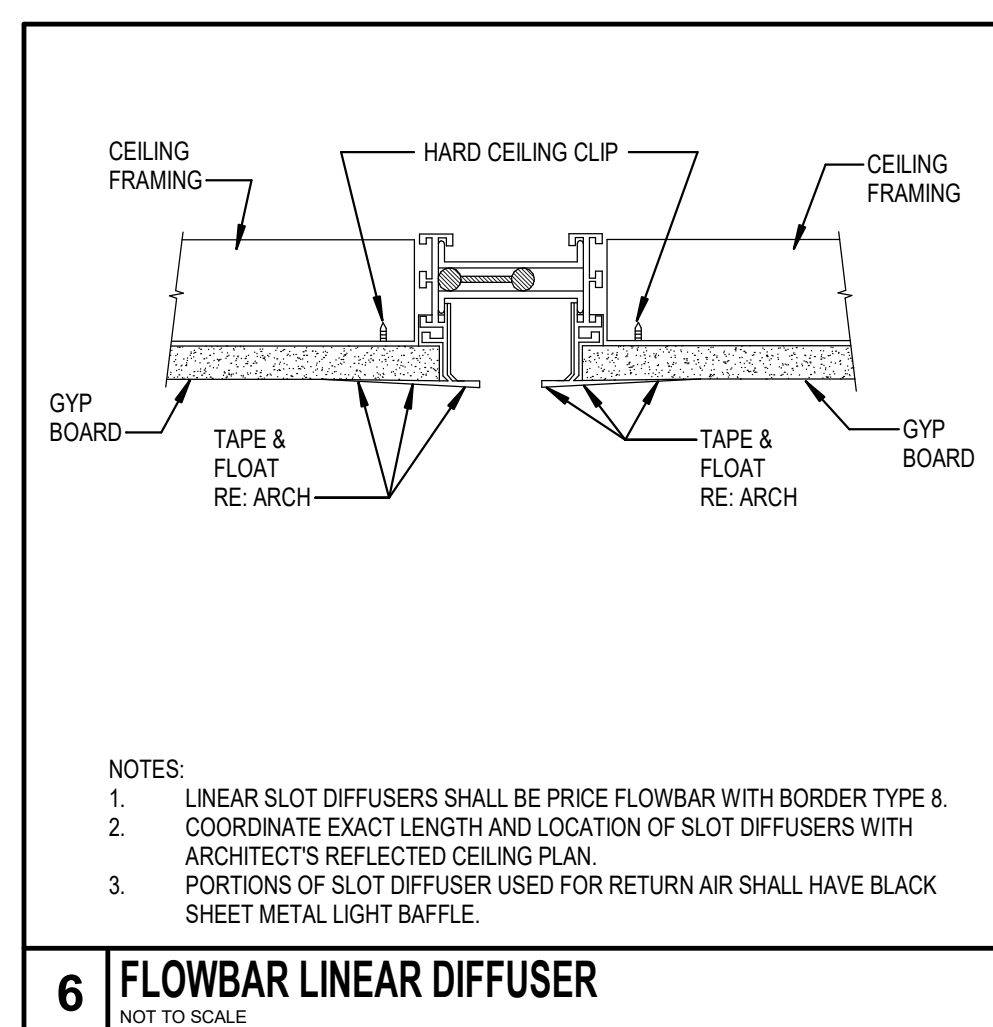
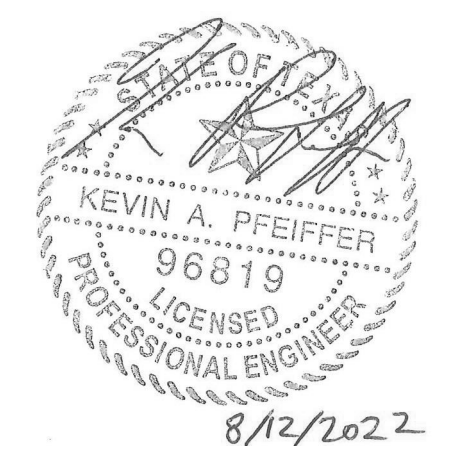
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 Drawn By: DBR

DBR Project Number 220195.000  
 AS TG JD JD

**MECHANICAL SCHEDULES M5.01**



**12 CONTROL SCHEMATIC LEGEND**  
NOT TO SCALE

AI	ANALOG INPUT	WS	WALL SENSOR
AO	ANALOG OUTPUT	TH	THERMOSTAT
DI	DIGITAL/BINARY INPUT	CO2	CARBON DIOXIDE SENSOR
DO	DIGITAL/BINARY OUTPUT	SP	SET POINT
MD	ON-OFF MOTORIZED DAMPER	SA	SUPPLY AIR
MM	MODULATING TYPE MOTORIZED DAMPER	RA	RETURN AIR
AFMS	AIR FLOW MEASURING STATION	O/A	OUTSIDE AIR
MCV	CONTROL VALVE MODULATING TYPE	HC	HEATING COIL
VFD	VARIABLE FREQUENCY DRIVE	CC	COOLING COIL
CSR	CURRENT SENSING RELAY	DX	DIRECT EXPANSION COOLING COIL
FRZ	FREEZE/STAT	PICCV	PRESSURE INDEPENDENT CHARACTERIZED CONTROL VALVE
HSL	HIGH STATIC LIMIT	AFC	AIRFLOW CROSS
SPT	STATIC PRESSURE TRANSMITTER	DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE TRANSDUCER		
FM	FLOW METER		
FS	FLOW SWITCH		
DAT	DISCHARGE AIR TEMPERATURE SENSOR		

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AS TG JD JD

SECTION 23 00 00 - MECHANICAL SPECIFICATIONS

PART I - GENERAL-MECHANICAL.

1-1 DESCRIPTION

All work on these Drawings shall be done in strict accordance with these Specifications. The Work included under this Contract shall consist of the furnishing and installation of all equipment and material necessary and required to form the complete and functioning system in all of its various phases, as all shown on the accompanying drawings and/or described in these Specifications.

1-2 WARRANTY

The Contractor shall guarantee the work for a period of one year beyond date of final acceptance. During that period, the Contractor shall repair or replace, at his own expense, any faults or imperfections that may arise due to defects in material and workmanship, including the loss of refrigerant and/or oil due to leaks. Defects shall include but not be limited to noisy operation, loose or missing parts, or noticeable deterioration of finish. During the period, the Contractor shall actually perform all service work required, including the servicing of air filters. All air conditioning compressors shall have parts and labor guarantees for a period of not less than 5 years beyond the date of Substantial Completion.

1-3 PROJECT CONDITIONS

The Contractor shall visit the Site of the Work and fully understand the conditions that affect the work, or the cost thereof, understand the existing utilities from which services will be supplied, verify locations of utility services, determine requirements for connections, and determine in advance that equipment and materials proposed for installation fit into the confines indicated.

1-4 PERMITS AND FEES

The Contractor shall arrange and pay for all permits, fees, test, and all inspections as required by Governmental Authorities.

1-5 COORDINATION WITH FIELD CONDITIONS

The Contract Documents are schematic in nature in that they are only to establish "Scope" and a minimum level of quality. All duct or pipe or equipment locations as indicated on the Documents do not indicate every transition, offset, or exact location. All transitions, offsets, and exact locations shall be established by actual field measurements, coordination with the structural architectural and reflected ceiling plans. All transitions, offsets, and relocations as required by actual field conditions shall be performed by the Contractor at no additional cost to the Owner.

1-6 SUBMITTALS

Contractor shall provide six sets of Shop Drawings and Submittals on all Mechanical equipment, insulation, air devices, ductwork (flexible and rigid), and thermostats. Any deviations from the specified items shall be listed on the cover sheet and clearly itemized for all deviations. The Contractor shall provide a complete digital copy of Owner's Manual to the Architect upon completion of the Work.

1-7 QUALITY ASSURANCE

All Work shall be performed in accordance with all State, Local, and Federal Codes and all Authorities and Jurisdiction.

1-8 EQUIPMENT IDENTIFICATION

All Mechanical equipment shall be identified by means of nameplates permanently attached to the equipment. Nameplates shall be engraved laminated plastic or etched metal.

1-9 TESTING AND BALANCING

Testing and balance shall be provided by the Mechanical Sub-Contractor, with the services of an Independent Test and Balance Agency. The Test and Balance Company shall specialize in such work, and be a member of Associated Air Balance Council (AABC). The forms used shall be based on recommendations of AABC. Upon completion of the Balancing and Testing, the Balancing Contractor shall complete the test data in report forms, and forward five copies to the Architect for evaluation. The final report shall contain logged results of all tests, including such data as:

- Tabulation of air volume at each outlet. (Balanced to within 5% design).
- Outside dry bulb and wet bulb temperature.
- Inside dry bulb and wet bulb temperatures in each conditioned space room or area.
- Actual fan capacities, RPM's and static pressures. Motor current and voltage readings at each fan.
- Entering and leaving air temperatures, DB and WB.

PART II - DUCTWORK-MECHANICAL.

2-1 METAL DUCTWORK

All ductwork shall be properly suspended or supported from the building structure. Hangers shall be galvanized steel straps or hot-dipped galvanized rod with thread pointed after installation. Strap hanger shall be attached to the bottom of the ductwork. The spacing, size and installation hangers shall be in accordance with the recommendations of latest edition of SMACNA space hangers as required to support ducts without sagging.

Ventlock No. 699 "Test Plugs" shall be provided in ductwork at all openings in ductwork required for testing and balancing.

2-1-1 DUCTWORK MATERIALS

Exposed Ductwork Materials : Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.

Sheet Metal : Except as otherwise indicated, fabricate ductwork from galvanized sheet, sheet complying with ASTM A527, lockforming quality, with G90 zinc coating in accordance with ASTM A 525, and mill phosphatized for exposed locations.

Stainless Steel Sheet : Where indicated, provided stainless steel complying with ASTM A167, Type 316, with No. 4 finish where exposed to view in occupied spaces. No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

Aluminum Sheet : Where indicated, provide aluminum sheet complying with ASTM B209, Alloy 3003, Temper H14.

- A. Non combustible and conforming to UL 181, Class 1 air duct materials.
- B. Flexible ducts: Flexmaster U.S.A. Inc. Type 5M, Thermaflex MK2, ATCO #036 or approved equal. Flexible duct shall be corrosion resistant galvanized steel formed and Mechanically locked to inner fabric with R-6 insulation when flexible ducts are located inside the thermal envelope and with R-8 insulation when located outdoors or outside of the building envelope. Flexible duct shall have reinforced metalized outer jacket comply with UL 181, Class 1 air duct.
- C. Sealants: Hard-Cast Iron Grip or approved equal, non-hardening, water resistant, fire resistive and shall not be a solvent curing product. Sealants shall be compatible with mating materials, liquid used alone or with tape or heavy mastic.
- D. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
  1. For exposed stainless steel ductwork, provide matching stainless steel support materials.
  2. For aluminum ductwork, provide aluminum support materials.

2-1-2 LOW PRESSURE DUCTWORK

- A. Fabricate and support in accordance with latest SMACNA low pressure duct construction standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by approved shop drawings. Obtain engineer's approval prior to using round duct in lieu of rectangular duct.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air-flow turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- E. Use crimp joints with bead for joining round duct sizes 6 inch smaller with crimp in direction of airflow.
- F. Use double nuts and lock washers on threaded rod supports.

2-1-3 MEDIUM AND HIGH PRESSURE DUCTS

- A. Fabricate and support in accordance with SMACNA high pressure duct construction standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's bends, and elbows with radius of not less than 1 1/2 times the width of duct on centerline. Where not possible and where rectangular elbows are used, provide air-flow turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal with glass fiber insulation. Weld in place.
- C. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
- D. Fabricate continuously welded medium and high pressure round and oval duct fittings two gages heavier than duct gages indicated in SMACNA standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Price coat welded joints.
- E. Provide standard 45 degree lateral WYE takeoffs unless otherwise indicated. The Contractor shall provide tee connections may be used.

2-1-4 EXECUTION

- A. Obtain Manufacturer's Inspection and acceptance of fabrication and installation of ductwork at beginning of installation.
- B. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide Pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- D. Connect terminal units to medium or high pressure ducts with four feet maximum length of flexible duct. Do not use flexible duct to change direction.
- E. Connect diffusers or troffer boots to low pressure ducts with 6 feet maximum, 4 feet minimum, length of flexible duct. Hold in place with strap or clamp.
- F. During construction provide temporary closures of metal liner with factory-applied edge coating to prevent construction dust from entering ductwork system.
- G. The interior surface of all ductwork shall be smooth. No sheet metal parts, tabs, angles, or anything else may project into the ducts for any reason, except as specified to be so. All seams and joints shall be external.
- H. All ductwork located exposed on roof shall be "Crowned" to prevent water from ponding. Reference insulation for additional requirements.
- I. Where ducts pass through floors, provide structural angles for duct support. Where ducts pass through walls in exposed areas, install suitable sheet metal escutcheons as closers.
- J. All angles shall be carried around all four sides of the duct or group of ducts. Angles shall overlap corners and be welded or riveted.
- K. All ductwork shall be fabricated in a manner to prevent the seams or joints being cut for the installation of grilles, registers, or ceiling outlets.

2-1-5 INSTALLATION OF FLEXIBLE DUCTS

- A. Maximum length: For any duct run using flexible ductwork, do not exceed 6'-0" extended length.
- B. Installation: Install in accordance with Section 3 of SMACNA's, "HVAC duct construction standards, metal and flexible".
- C. Provide spin-in fitting for all round flexible duct connections to rectangular duct. Spin-in fittings shall factory fabricated, and include an air extractor scoop and a balancing butterfly damper with a locking quadrant and handle. Balancing shall be at the spin-in fitting and not at the air distribution device.

2-1-6 DUCTWORK HANGERS AND SUPPORTS

- A. All ductwork shall be properly suspended or supported from the building structure. Hangers shall be galvanized steel straps or hot-dipped galvanized rod with threads pointed after installation. Strap hanger shall be attached to the bottom of the ductwork. Provide a minimum of two screws one at the bottom and one in the side of each strap on metal ductwork. The spacing, size and installation of hangers shall be in accordance with the recommendations of the latest SMACNA Edition.
- B. All duct risers shall be supported by angles or channels secured to the sides of the ducts at each floor with sheet metal screws or rivets. The floor supports may also be secured to ducts by rods, angles or flat bar to the duct joint or reinforcing. Structural steel supports for duct risers shall be provided under this division.

2-1-7 DUCTWORK JOISTS AND SEAMS

- A. All ductwork shall be constructed to Seal Class A, as referenced in SMACNA Standards.
- B. All non-welded joints and seams shall be sealed. This includes but is not limited to:
  1. Transverse joints.
  2. Longitudinal seams.
  3. Duct wall penetrations.
  4. Spin-ins, laps, and other branch connections.
  5. Access doors, access panels, and duct connections to equipment.
- C. Openings for rotating shafts shall be sealed with bushings.

2-2 DUCT INSULATION

All insulation shall be installed in accordance with the Manufacturer's recommendations and printed installation instructions. All items required for a complete and proper installation are not necessarily indicated on the Plans or in the Specifications. Provide all items required as per manufacturer's requirements. All toilet exhaust ductwork shall be unlined sheet metal with all joints sealed. Duct dimensions shown on Plans are clear inside dimensions.

2-2-1 EXTERNAL DUCT INSULATION

- A. Fasten all longitudinal and circumferential laps with outward clinching staples 3" on center. On rectangular ducts over 24" wide apply as above and hold insulation in place on bottom side with mechanical pins and clips on 12" centers.
- B. Seal all joints, fastener penetrations and other breaks in vapor barrier with 3 inch wide strips of white glass fabric embedded between two coats of vapor barrier mastic, chippers CP-30 or approved equal.
- C. All external duct insulation shall be Johns Manville Type 75 fiberglass duct wrap insulation with reinforced aluminum facing or approved equal.
- D. External duct wrap is required on all outside air ducts and supply air ducts that are not internally insulated. Duct wrap shall be provided as follows:
  1. 1 1/2" thick, 1/0 PCF density minimum when ducts are located in conditioned spaces.
  2. 2" thick with a minimum installed R-value as follows:
    - On roof or exterior of building: R-8
    - Located inside building envelope: R-6
    - Located outside the building thermal envelope: R-8

2-2-2 DUCT LINER

- A. Duct liner shall be kept clean and dry during transportation, storage and installation. Care should be taken to protect the liner from exposure to the elements or damage from mechanical abuse.
- B. All portions of duct designed to receive duct liner shall be completely covered with liner as specified. The smooth, black, acrylic-coated surfaces with flexible glass cloth reinforcement shall face the airstream. All duct liner shall be cut to assure tight, overlapped corner joints. The top piece shall be supported by the sidepieces. Duct liner shall be installed following the guidelines in the NAIMA "Duct Liner Installation Standard".
- C. The duct liner shall be tested according to erosion test method in UL 181 and shall be guaranteed to withstand velocities in the duct system up to 5000 FPM without surface erosion.
- D. Duct liner shall be adhered to the sheet metal with full coverage of an approved adhesive that conforms to ASTM C 916, and all exposed leading edges and transverse joints shall be coated with permacote factory-applied or field-applied edge coating and shall be neatly butted without gaps. Shop or field cuts shall be liberally coated with Johns Manville Supraseal? Duct butter and edge treatment or approved adhesive.
- E. Metal nosings shall be securely installed over transversely oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct.
- F. When velocity exceeds 4000 FPM (20.3 M/SEC), use metal nosing on every leading edge. Nosing may be formed on duct or be channel or zee attached by screws, rivets or welds.
- G. The liner shall further be secured with graham welding pins and washers on not more than 18 inch centers both vertical and horizontal surfaces, and the pins and washers shall be pointed up with adhesive.
- H. Duct liner shall be Knaf Insulation Atmosphere Duct Liner with ECOSSE Technology, Johns Manville Linacoustic RC duct liner with factory-applied edge coating and acrylic coating on the mat surface of airstream side or approved equal. The liner shall meet the life safety standards as established by NFPA 90A and 90B, FHC 2550 and limited combustibility and the air stream surface coating should contain an immobilized, EPA-registered, anti-microbial agent so it will not support microbial growth as tested in accordance with ASTM G21 and G22, the duct liner shall conform to the requirements of ASTM C 423 using a Type "A" mounting, and a thermal conductivity no higher than 0.24 BTU/(HR\*F2\*F) at 75 F mean temperature.
- I. Duct liner is required on all return air ductwork, return air boots and supply air ductwork downstream of the terminal units. Duct liner shall be provided as follows:
  1. 1" thick, 1.5 PCF density minimum; minimum installed R-value of 4.2 when ducts are located in conditioned spaces.
  2. 1 1/2" thick with a minimum installed R-value of 6 when ducts are located inside of the building thermal envelope.
  3. 2" thick with a minimum installed R-value of 8 when ducts are located outdoors OR outside of the building thermal envelope.
- J. Line supply and return ductwork at connection of HVAC unit to a point of 15 feet upstream and downstream of the equipment and in return air boots. Attach with full cover coat of cement, duct dimensions up to 16 inches, provide stick clips or screws and cap for dimension over 16 inches, space 16 inches O.C. maximum. Provide sheet metal liner cap over all leading edges of internal insulation exposed to air stream. R-value shall be in accordance with the requirements listed above.

2-2-3 EXPOSED DUCTWORK LOCATED INDOORS

- A. Duct routed exposed in occupied spaces shall be spiral and internally lined.
- B. Round and flat oval duct routed exposed shall be double wall with perforated inner liner and 1/2" thick layer of glass mineral wool insulation as manufactured by United McGill Company model no. Acoust-27 or approved equal. Insulation density shall be a minimum of 1.0 PCF.

2-2-4 AIR DEVICE AND MISCELLANEOUS DUCT INSULATION

- A. The backside of all supply air devices shall be insulated with taped and sealed 1 1/2 inch thick external duct wrap.
- B. The Contractor shall install an additional layer of 1 1/2 inch thick external fiberglass duct wrap on any portion of the supply air, return air, outside air, or exhaust air system that has condensation forming during any period of operation. The insulation shall be taped and sealed and located until all evidence of the condensation had been eliminated at no additional cost to the owner.

PART III: EQUIPMENT - MECHANICAL

3-1 AIR DISTRIBUTION

- A. Air distribution devices shall be selected at a maximum of 30 noise criteria and at a maximum of 0.06" W.G. total pressure drop. Approved Manufacturers are Metalaire, Titus, Price, Nailor, and Krueger.
- B. The backside of all supply air devices shall be insulated with taped and sealed 1 1/2" thick one lb. density fiberglass insulation with vapor barrier.

3-2 SOUND AND VIBRATION CONTROL

- C. Provide vibration isolation supports for equipment, piping, and ductwork to prevent transmission of vibration and noise to the building structure that may cause discomfort to the occupants.
- D. All items required for a complete and proper installation are not necessarily indicated on the plans or in the Specification. Provide all items required as per Manufacturers requirements and install as per Manufacturers recommendations and instructions.
- E. All vibration isolators shall be designed and treated for resistance to corrosion.

3-3 AIR FILTERS

- A. The following Manufacturers are approved subject to Specification Compliance: American Air Filter, Camfil, Air Guard Industries Inc., Cambridge, and Filtration Group.
- B. The filters shall be AAF PREpleat M11-HC, 2 inch thick or approved equal.
- C. Filters shall have a minimum of MERV 11 rating with initial resistance of 0.30 in.w.g. at 500 FPM face velocity.

3-4 Single duct VAV terminal box and fan powered terminal box.

- A. Terminals shall be certified under air standard 880-94.
- B. All electrical components shall be UL listed and shall be installed in accordance with the National Electrical Code. The entire terminal shall be UL listed as a complete assembly.
- C. Terminal casing for fan powered terminal boxes shall be minimum 20 gauge galvanized steel, internally lined with 1" natural fiber or fiberglass free insulation with R-value of 4.0 which complies with UL 181 with a regard to resistance to erosion and mold growth and NFPA 90A. Terminal casing for single duct vav boxes shall be minimum 22 gauge galvanized steel, internally lined with natural fiber or fiberglass free insulation with R-value of 2.0 which complies with UL 181 with a regard to resistance to erosion and mold growth and NFPA 90A. Exposed fiberglass is not acceptable. The insulation shall be mechanically fastened to the unit casing. The fasteners shall be weld pins. Lining material glued in coverage without mechanical fasteners are not acceptable. Any exposed insulation edges shall be coated with NFPA 90A approved sealant, or covered with galvanized brackets or foil tape. The terminal shall have round or oval duct collars for the primary air connections and a rectangular discharge suitable for hanged duct connection. The casing shall be designed for hanging from structure.
- D. Terminal inlet shall have a damper assembly with factory set and calibrated pressure independent control. The damper shall be heavy gauge steel with shaft rotating self-lubricating bearings. Shaft shall be clearly marked on the end to indicate damper position.
- E. Leakage around damper shall be less than 1% of the maximum CFM at 3" static pressure.
- F. Actuator shall be capable of supplying at least 35 in/lb. of torque to the damper shaft, and shall be mounted externally for service access. Terminals with internal actuator mounting or linkage connection must include gasketed access panel, removable without disturbing ductwork.
- G. Terminal boxes shall be provided with integral heater and all associated accessories as indicated. Heaters shall meet the scheduled performance.
- H. Sound ratings for the terminal shall not exceed 40 NC in the occupied space at 1.0 inch W.G. inlet static pressure, and discharge static pressure of .25 inch W.G. sound performance shall be in accordance with AHR 885, Appendix E. The terminal shall be provided with factory installed internal and external attenuators if sound requirements are not met.
- I. Fan powered terminal boxes shall be designed, built, and tested as a single unit including motor and fan assembly, electric heating coil (if schedule), and accessories.
- J. Approved VAV boxes are Titus, Metalaire, Price, Nailor and Krueger.

3-5 AUTOMATIC TEMPERATURE CONTROL

- A. Provide controls for all new equipment. All new controls and equipment shall be tied into the existing Building Management System.
- B. Refer to the base building sequence of operations for additional information on new equipment controls.
- C. All new controls components shall be base building standard.
- D. Controls shall be by base building controls manufacturer.
- G. Controls shall be installed under the supervision of the Manufacturer's Representative.

END OF SECTION



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MECHANICAL SPECIFICATIONS  
M7.01