

**GENERAL SPECIFICATIONS**

1. CODE COMPLIANCE: THE CONTRACTOR SHALL COMPLY WITH ALL THE LAWS, ORDINANCES, RULES, AND REGULATIONS OF THE LOCAL GOVERNMENT, OF THE NATIONAL FIRE PROTECTION ASSOCIATION, OF THE NATIONAL ELECTRIC CODE, AND OF THE PUBLIC UTILITIES HAVING JURISDICTION OVER ANY OF THE SYSTEMS HEREIN SPECIFIED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND PAYING FOR ALL NECESSARY PERMITS, APPROVALS, AND INSURANCES.
2. DEFINITIONS:
  - A. "PROVIDE" UNDER THIS CONTRACT IS DEFINED AS FURNISH AND INSTALL.
  - B. "CONCEALED" UNDER THIS CONTRACT IS DEFINED AS HIDDEN BY ARCHITECTURAL WALLS AND CEILINGS.
  - C. "EXPOSED" UNDER THIS CONTRACT IS DEFINED AS VISIBLE TO VIEW.
  - D. "INDICATED" UNDER THIS CONTRACT IS DEFINED AS SHOWN IN THE CONTRACT DOCUMENTS.
3. SCOPE OF WORK: PROVIDE ALL WORK INDICATED IN THE CONTRACT DOCUMENTS.
4. CONTRACT DOCUMENTS: THE CONTRACT DOCUMENTS SHALL BE CONSIDERED AS DIAGRAMMATIC AND FOR BIDDING PURPOSES ONLY. ATTENTION IS CALLED TO THE FACT THAT WHILE THE DOCUMENTS ARE GENERALLY TO SCALE AND ARE AS ACCURATE AS THE SCALE WILL PERMIT, ALL IMPORTANT DIMENSIONS SHALL BE DETERMINED IN THE FIELD. IN ADDITION, THE CONTRACT DOCUMENTS ARE NOT TO BE CONSIDERED AS CONSTRUCTION DRAWINGS. THE DOCUMENTS DO NOT INDICATE EVERY FITTING, ELBOW, OFFSET, VALVE, PULL BOX OR SIMILAR COMPONENTS WHICH ARE REQUIRED TO COMPLETE THE PROJECT WORK. PREPARE FIELD CONSTRUCTION DRAWINGS AS REQUIRED TO INSURE PROPER INSTALLATION. ALL NECESSARY OFFSETS AND FITTINGS, TO INSTALL THE SYSTEMS AS DIAGRAMMED, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
5. EQUIPMENT AND MATERIALS:
  - A. ALL EQUIPMENT AND MATERIALS INSTALLED SHALL BE NEW, UNLESS INDICATED OTHERWISE, AND THE CURRENT MODEL FOR WHICH REPLACEMENT PARTS ARE AVAILABLE. SUBSTITUTIONS WILL ONLY BE ACCEPTED AT THE DISCRETION OF THE OWNER'S REPRESENTATIVE OR THE ENGINEER.
  - B. THE CONTRACTOR SHALL INSTALL AND CONNECT ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH THE BEST ENGINEERING PRACTICE AND, UNLESS OTHERWISE SHOWN OR SPECIFIED, THE CONTRACTOR SHALL FOLLOW THE MANUFACTURERS PUBLISHED INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS.
  - C. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL REQUIRED AUXILIARY ITEMS COMPLETE.
  - D. ALL EQUIPMENT SHALL BE MOUNTED VIBRATION FREE.
6. SHOP DRAWINGS: EQUIPMENT (AND MATERIALS) SHOP DRAWINGS ARE TO BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO THE EQUIPMENT OR MATERIALS PURCHASE AND INSTALLATION. IF ANY EQUIPMENT OR MATERIALS ARE INSTALLED BEFORE THEY ARE ACCEPTED, THE CONTRACTOR SHALL BE LIABLE FOR ITS REMOVAL AND REPLACEMENT, AT NO EXTRA CHARGE TO THE OWNER, IF IN THE OPINION OF THE ENGINEER THE EQUIPMENT OR MATERIAL DOES NOT COMPLY WITH THE INTENT OF THE DRAWINGS AND SPECIFICATIONS.
7. COORDINATION: THE CONTRACTOR SHALL INSTALL ALL DUCTWORK, PIPING, RACEWAYS, CIRCUITRY, CONDUIT, ETC., AS HIGH AS POSSIBLE AND PARALLEL OR PERPENDICULAR TO THE BUILDING WALLS IN A NEAT WORKMANLIKE MANNER. AVOID CONFLICT WITH THE EXISTING EQUIPMENT, LIGHTS, ETC. IF CONFLICT WITH THE EXISTING DOES OCCUR, THE CONTRACTOR SHALL RE-ROUTE CONFLICTING PROJECT WORK AS DIRECTED BY THE OWNER'S REPRESENTATIVE AT NO ADDITIONAL COST.
8. PARTITIONS AND DUCTWORK: THE CONTRACTOR SHALL REPAIR ALL OPENINGS IN WALLS, CEILINGS, FLOORS, ROOF, ETC., WHICH ARE CREATED BY DEMOLITION AND/OR NEW PROJECT WORK. THE REPAIRS SHALL BE WITH MATERIALS AND FINISHES TO MATCH THE EXISTING. ANY OPENINGS AND/OR PENETRATIONS OF FIRE RATED PARTITIONS SHALL BE SEALED WITH U.L. APPROVED FIRE STOPPING MATERIALS TO MAINTAIN THE FIRE-RESISTANT INTEGRITY OF THE PARTITION. ALL OPENINGS IN DUCTWORK AND PIPING, AS A RESULT OF DEMOLITION WORK, SHALL BE CAPPED AND SEALED AIR/WATER-TIGHT AND INSULATED TO MATCH EXISTING.
9. SITE CLEAN-UP: UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL THOROUGHLY CLEAN THE CONTRACT AREA AND ALL OTHER AREAS USED FOR STORAGE, STAGING, ETC. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO WASHING AND/OR REPAIRING GLASS, REMOVING SPOTS AND STAINS, CLEANING ALL FIXTURES AND WASHING ALL FLOORS, WALLS, AND CEILINGS (IF APPROPRIATE).
10. GUARANTEES: ALL NEW EQUIPMENT, MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED IN FULL, FROM DEFECT, FOR ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THIS WORK BY THE OWNER'S REPRESENTATIVE UNLESS OTHERWISE NOTED. SUCH DEFECTS SHALL BE CORRECTED BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER. SEE MECHANICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
11. TESTS AND DEMONSTRATIONS: THE CONTRACTOR SHALL TEST ALL EQUIPMENT INSTALLED UNDER THIS CONTRACT AND DEMONSTRATE TO THE OWNER ITS PROPER OPERATION(S).
12. EQUIPMENT SERVICE ACCESS: PROVIDE ACCESS DOORS IN DRYWALL CEILINGS AND PARTITIONS TO SERVICE EQUIPMENT, BALANCE DIFFUSERS, AND EXPOSE JUNCTION BOXES. COORDINATE THE EXACT LOCATIONS AND STYLE OF FLANGELESS ACCESS DOORS WITH THE ARCHITECT.
13. EQUIPMENT IDENTIFICATION: ALL EQUIPMENT SHALL BE IDENTIFIED BY LABELING THE TITLE OF THE EQUIPMENT AS DETERMINED BY THE OWNER'S REPRESENTATIVE. IF THE OWNER'S REPRESENTATIVE DOES NOT EXPRESS A PREFERENCE, THEN THE IDENTIFICATION SHALL BE TAKEN FROM THE DRAWINGS AND LOCATED IN A POSITION THAT IS CLEARLY VISIBLE. THE LETTERS SHALL BE NO LESS THAN 2-INCHES HIGH.
14. THE CONTRACTOR SHALL AT ALL TIMES AND ON A CONTINUING BASIS, KEEP THE AREA OF WORK AND PREMISES FREE FROM ALL REFUSE AND WASTE MATERIALS CAUSED BY THE CONSTRUCTION WORK. ALL SUCH REFUSE SHALL BE REMOVED FROM THE PROPERTY, UNLESS OTHERWISE SPECIFIED OR DIRECTED, SO THAT THE AREA OF WORK AND PREMISES PRESENT A NEAT, ORDERLY, AND WORKMANLIKE APPEARANCE.
15. WITHIN 90 DAYS AFTER THE DATE OF SYSTEM ACCEPTANCE, THE CONTRACTOR SHALL FURNISH TO THE ENGINEER, FOR DELIVERY TO THE OWNER, FOUR, (4) BOUND AND INDEXED COPIES OF AN APPROVED OPERATIONS AND MAINTENANCE, (O&M) INSTRUCTION MANUAL. THE SUBMISSION OF A PARTS LIST OR EQUIPMENT TECHNICAL DATA ONLY WILL NOT BE CONSIDERED ACCEPTABLE AS OPERATIONS AND MAINTENANCE DATA. EACH O&M MANUAL COPY SHALL HAVE A LIST CONTAINING THE NAME AND TELEPHONE NUMBER OF THE LOCAL MANUFACTURERS REPRESENTATIVE OR SUPPLIER WITH AN ITEMIZED LIST OF THE PRODUCTS THEY SUPPLIED AND ARE CONTAINED IN THIS MANUAL. THE OPERATIONS AND MAINTENANCE MANUALS SHALL CONTAIN SHOP DRAWING SUBMITTALS, WITH REVIEW COMMENTS, BALANCING REPORTS, PARTS LISTS AND MANUFACTURERS PRINTED OPERATION AND MAINTENANCE DATA FOR EACH ITEM FOR WHICH SHOP DRAWINGS ARE SPECIFIED.
16. WITHIN 90 DAYS AFTER THE DATE OF SYSTEM ACCEPTANCE, THE CONTRACTOR SHALL FURNISH TO THE ENGINEER, AS PART OF THE OWNER'S OPERATIONS AND MAINTENANCE MANUALS, ONE, (1) SET OF REPRODUCIBLE DRAWINGS, MECHANICALLY DRAFTED, INDICATING ANY CONSTRUCTION CHANGES MADE TO THE ORIGINAL CONTRACT DRAWINGS. EACH DRAWING SET SUBMITTED SHALL BE CLEARLY LABELED "RECORD DRAWINGS".
17. ALL MATERIAL WITHIN RETURN AIR PLENUM SHALL BE NONCOMBUSTIBLE OR SHALL BE LISTED AND LABELED AS HAVING A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TEST IN ACCORDANCE WITH ASTM E 84 OR UL 723 PER IBC 602.2.1. THE CONTRACTOR SHALL REPORT TO THE ARCHITECT IF ANY EXISTING MATERIAL DOES NOT MEET THE REQUIREMENTS.
18. PROVIDE DIRECT POSITIVE VENTILATION FROM THE PROJECT WORK AREA TO OUTSIDE OF THE BUILDING FOR ALL WORK INVOLVING AN OPEN FLAME. SUBMIT A WRITTEN METHOD OF PROCEDURE, (MOP) FOR APPROVAL PRIOR TO BEGINNING THIS OPERATION. THE WORK MAY NOT PROCEED UNTIL THE MOP HAS BEEN APPROVED WITH THE SIGNATURE OF AN AUTHORIZED REPRESENTATIVE OF THE OWNER.
19. COORDINATE THE FINAL LOCATIONS OF ALL DUCTWORK AND SUPPLY AIR REGISTERS WITH THE LIGHTING, CABLE TRAYS, CONDUITS, STRUCTURAL COMPONENTS AND OWNERS EQUIPMENT PRIOR TO THE FABRICATION AND INSTALLATION.

**MECHANICAL SPECIFICATIONS**

**GENERAL**

1. MAKE NO CHANGES WITHOUT THE WRITTEN PERMISSION FROM THE ARCHITECT.
2. ALL MATERIAL AND EQUIPMENT INDICATED ON THE PLANS AND DESCRIBED IN THE SPECIFICATIONS SHALL BE PROVIDED BY THE CONTRACTOR NEW AND SHALL BE IN NEW CONDITION AT ACCEPTANCE OF WORK.
3. THIS CONTRACTOR SHALL GUARANTEE ALL MATERIALS, LABOR AND EQUIPMENT FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE. COMPRESSORS SHALL HAVE A FULL FIVE-YEAR WARRANTY. CONTRACTOR SHALL PAY FOR ANY REPAIRS OR REPLACEMENTS CAUSED BY DEFECTIVE WORKMANSHIP OR FAULTY MATERIALS AS CONSTRUCTED HEREIN WITHIN THE PERIOD COVERED BY THE GUARANTEE.
4. SCAFFOLDING, RIGGING AND HOISTING: UNLESS OTHERWISE SPECIFIED, CONTRACTOR SHALL FURNISH ALL SCAFFOLDING, RIGGING, HOISTING, AND SERVICES NECESSARY FOR ERECTION AND DELIVERY INTO THE PREMISES OF ANY EQUIPMENT AND APPARATUS FURNISHED, AND REMOVAL OF SAME FROM PREMISES WHEN NO LONGER REQUIRED.
5. CONTRACTOR SHALL MAKE AN ON-SITE INSPECTION TO DETERMINE FULLY THE EXISTING CONDITIONS AND THE EXTENT OF DEMOLITION.
6. LOCATION OF EQUIPMENT, PIPING, AND OTHER MECHANICAL WORK IS INDICATED DIAGRAMMATICALLY BY THE DRAWINGS. DETERMINE EXACT LOCATIONS ON THE JOB SITE, SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF OTHER CONTRACTORS.
7. CONTRACTOR ASSUMES RESPONSIBILITY FOR PROPER ARRANGEMENT OF PIPES, DUCTS, ETC., TO CONNECT APPROVED EQUIPMENT IN A PROPER AND APPROVED MANNER. FOLLOW EQUIPMENT MANUFACTURER'S DETAILED INSTRUCTIONS AND THE CONTRACT DOCUMENTS. NOTIFY THE ARCHITECT BEFORE PROCEEDING. NO EQUIPMENT INSTALLATION OR CONNECTIONS SHALL BE MADE IN A MANNER THAT VIOLATES THE MANUFACTURER'S WARRANTY.
8. SEE ARCHITECTURAL DRAWINGS FOR SUPPORT DETAILS OF ALL ROOF MOUNTED EQUIPMENT AND FOR THE LOCATION OF ROOF PENETRATIONS.
9. UNLESS OTHERWISE NOTED, ALL SPECIFIED EQUIPMENT IS LESS THAN 200 POUNDS. SEE ARCHITECTURAL AND/OR STRUCTURAL DRAWINGS FOR SUPPORT DETAILS OF ALL EQUIPMENT GREATER THAN 200 LBS.
10. INSTALL EACH ITEM OF EQUIPMENT IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
11. INSTALL ELECTRIC VAV BOX AND DUCT HEATERS, NEW PIPING AND DUCTWORK SO AS TO PROVIDE A MINIMUM OF 3"-6" CLEARANCE IN FRONT OF ALL ELECTRIC HEATER TERMINAL PANELS.
12. INSTALL ALL WORK IN A NEAT AND WORKMANLIKE MANNER, USING ONLY WORKMEN THOROUGHLY QUALIFIED IN THE TRADE OF DUTIES THEY ARE TO PERFORM. ROUGH WORK WILL BE REJECTED.
13. CUTTING AND PATCHING SHALL BE DONE BY THE APPROPRIATE TRADE UNLESS OTHERWISE REQUIRED BY TRADE CUSTOM OR SPECIFIED UNDER ANOTHER SECTION OF THE SPECIFICATIONS. CONTRACTOR SHALL FURNISH SKETCHES SHOWING THE LOCATIONS AND SIZES OF ALL OPENINGS, CHASES, ETC. REQUIRED. CONTRACTOR IS LIABLE FOR CUTTING OR PATCHING MADE NECESSARY BY HIS FAILURE TO MAKE PROPER ARRANGEMENTS IN THIS RESPECT.
14. DO NOT CUT STRUCTURAL MEMBERS WITHOUT THE APPROVAL OF THE ARCHITECT AND ALL SUCH CUTTING SHALL BE DONE IN A MANNER AS DIRECTED BY THEM.
15. TEST ALL SYSTEMS. SYSTEMS SHALL OPERATE SATISFACTORILY AS DESIGNED AND INTENDED. REPORT ANY DEFICIENCIES TO ARCHITECT.
16. THE CONTRACTOR SHALL X-RAY SLAB/ROOF BEFORE CORE DRILLING. COORDINATE WITH BUILDING MANAGEMENT.
17. COORDINATE ALL DUCT SHAFT LOCATION AND SIZES WITH GENERAL CONTRACTOR PRIOR TO FABRICATION.
18. COORDINATE ALL ROOFTOP UNIT DUCT CONNECTION SIZE AND LOCATIONS WITH GENERAL CONTRACTOR PRIOR TO FABRICATIONS.
19. THE INLET DUCTWORK, SERVING THE VAV TERMINAL UNITS, SHALL BE ROUND RIGID EQUAL IN SIZE TO THE UNIT'S INLET CONNECTION, UNLESS INDICATED OTHERWISE. REFER TO THE AIR TERMINAL SCHEDULE AND DETAILS FOR INLET SIZES.
20. ALL DUCT SIZES INDICATED ARE CLEAR INSIDE DIMENSIONS AND SHALL BE INCREASED, WHERE SOUNDLINING IS INDICATED, TO COMPENSATE FOR THE LINING THICKNESS.
21. ALL RETURN AIR DUCT OPENINGS ABOVE CEILING SHALL BE COVERED WITH 1/2" MESH SCREEN.
22. ALL ROUND RUNOUTS AND FLEXIBLE DUCTWORK TO A SINGLE CEILING DIFFUSER SHALL BE SAME SIZE AS DIFFUSER NECK.
23. ALL DUCTWORK SHALL BE SOUND LINED 10' FROM THE INLET AND OUTLET OF FAN OR TERMINAL VAV BOX.
24. FLEXIBLE DUCTS SHALL NOT BE INSTALLED IN NO-CEILING SPACE, ABOVE DRY WALL CEILING OR OTHER INACCESSIBLE SPACES.
25. WHENEVER THE VOLUME DAMPER IS ABOVE DRY WALL CEILING OR INACCESSIBLE SPACE, PROVIDE REMOTE CABLE CONTROL DAMPER SYSTEM. INSTALL CONTROLLER AT AIR DEVICE FACE. THE REMOTE DAMPER SYSTEM SHALL BE BY YOUNG REGULATOR MODEL 270-275 SHALL BE THE TERMINATION DEVICE.
26. PROVIDE ACCESS PANELS FOR EACH TERMINAL BOX AND OTHER CEILING-HUNG EQUIPMENT ABOVE DRY WALL CEILING OR INACCESSIBLE CEILING. CONSULT WITH EQUIPMENT MANUFACTURER FOR LOCATIONS OF ACCESS PANELS AND QUANTITY.

**SHOP DRAWINGS**

1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR THE FOLLOWING MATERIALS AND EQUIPMENT:
  - A. ALL HEATING AND COOLING EQUIPMENT
  - B. ROOFTOP UNITS
  - C. KITCHEN HOODS
  - D. MAKEUP AIR UNIT
  - E. VIBRATION ISOLATORS
  - F. PIPE AND PIPE FITTINGS
  - G. SHEET METAL DUCTWORK AND ACCESSORIES
  - H. INSULATION
  - I. FANS
  - J. FLEXIBLE DUCT
  - K. VAV TERMINAL BOXES
  - L. AIR DEVICES
  - M. TEMPERATURE CONTROLS
  - N. TESTING AND BALANCING REPORTS
  - O. OPERATION AND MAINTENANCE MANUALS
2. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF MECHANICAL EQUIPMENT ELECTRICAL REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR. CONTRACTOR ORIGINATED MODIFICATIONS TO THE MECHANICAL EQUIPMENT ELECTRICAL INSTALLATION, DUE TO DEVIATIONS FROM THE MECHANICAL EQUIPMENT'S "BASIS OF DESIGN" OR "PROTOTYPE" ELECTRICAL DATA, SHALL BE AT A COST TO THE MECHANICAL CONTRACTOR.

**MECHANICAL SPECIFICATIONS**

**EQUIPMENT**

1. GENERAL:
  - A. REFER TO EQUIPMENT SCHEDULES FOR ADDITIONAL REQUIREMENTS.
  - B. ALL EQUIPMENT SHALL BE IDENTIFIED BY STENCILING THE TITLE OF THE EQUIPMENT AS DETERMINED BY THE OWNER'S REPRESENTATIVE. IF THE OWNER'S REPRESENTATIVE DOES NOT EXPRESS A PREFERENCE THEN IDENTIFICATION SHALL BE TAKEN FROM THE PLANS AND SHALL BE LOCATED IN A POSITION THAT IS CLEARLY VISIBLE. THE LETTERS SHALL BE MADE WITH BLACK PAINT AND SHALL BE NOT LESS THAN 2" HIGH. THE TITLES SHALL BE SHORT AND CONCISE.
2. ROOFTOP UNITS AND DOAS SYSTEM: SEE SEPARATE SPECIFICATION SECTIONS.
3. AIR DEVICES:
  - A. STEEL CONSTRUCTION WITH ENAMEL FINISH.
  - B. ACCEPTABLE MANUFACTURERS: TITUS OR NAILOR.
4. VAV BOXES:
  - A. VAV BOXES SHALL BE TRANE, TITUS, OR NAILOR TO MATCH EXISTING.
  - B. BOXES SHALL BE ARI CERTIFIED AND LABELED. ELECTRIC HEATING COILS SHALL BE UL LABELED.
  - C. PROVIDE WITH DDC CONTROLS.
5. FANS:
  - A. EACH FAN SHALL BE AMCA CERTIFIED AND LABELED.
  - B. EACH FAN SHALL BE UL LISTED AND LABELED.
  - C. ALL WIRING AND CONDUIT PROVIDED AS PART OF THE UNIT SHALL BE IN ACCORDANCE WITH NEC.
  - D. ACCEPTABLE MANUFACTURERS: COOK, GREENHECK OR PENN.
6. FIRE DAMPERS:
  - A. U.L. 555 LABELED, TYPE B FIRE DAMPERS. DAMPERS SHALL BE DYNAMIC TYPE WITH CONTINUOUS STAINLESS STEEL SPRING CURTAIN AND 165' LINKAGE. INSTALLATION SHALL BE IN ACCORDANCE WITH ALL U.L. AND MANUFACTURER REQUIREMENTS.
  - B. DAMPERS SHALL BE INSTALLED IN SLEEVES OR COLLARS WITHIN THE WALL, FLOOR OR CEILING CONSTRUCTION IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
  - C. THE DAMPER BLADES SHALL BE LOCATED OUT OF THE AIR STREAM (B-TYPE) AND CONSTRUCTED OF MINIMUM 24-GAUGE, GALVANIZED STEEL.
  - D. ACCEPTABLE MANUFACTURERS: RUSKIN DIBDO.
7. ACCESS PANELS: PROVIDE ACCESS PANELS IN DUCTWORK IN A LOCATION TO SERVICE FIRE DAMPERS. ACCESS PANELS SHALL BE OF THE INSULATED DOOR TYPE. ON ALL INSULATED DUCTS AND SHALL NOT BE COVERED BY DUCT INSULATION. ACCESS PANELS SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SMACNA STANDARDS. MINIMUM SIZE OF ACCESS PANELS SHALL BE 12" X 12" EXCEPT WHERE DUCT IS LESS THAN 14" WIDE IN WHICH CASE ONE DIMENSION SHALL BE 12" AND THE OTHER SHALL BE 2" LESS THAN THE DUCT WIDTH. ACCESS DOOR SHALL BE ACCESSIBLE.

**DUCT SMOKE DETECTORS**

1. DUCT SMOKE DETECTORS: PROVIDE WHERE SHOWN ON THE DRAWINGS, IONIZATION TYPE AIR DUCT SMOKE DETECTORS. DETECTION CHAMBER SHALL BE CAPABLE OF BEING REMOVED WITHOUT BREAKING CONDUIT CONNECTIONS, OR REQUIRING AN ACCESS PANEL IN THE DUCT. THE TEST AND ANNUNCIATING STATION SHALL BE CALIBRATED TO ACTUATE AT A NOMINAL 2% LIGHT OBSTRUCTION PER FOOT. DETECTOR SHALL BE OF SUCH DESIGN THAT PARTICLES OF DUST AND INSECTS LARGER IN SIZE THAN 20 MICRONS SHALL BE INCAPABLE OF FREE ENTRY INTO THE SMOKE CHAMBER AND ITS SENSITIVITY SHALL NOT BE AFFECTED BY CHANGES IN AIR VELOCITY ENCOUNTERED IN THE AIR DUCT OR BY RAPID CHANGES OF AIR PRESSURE, TEMPERATURE OR HUMIDITY. THE DETECTOR SHALL HAVE TWO SETS OF ALARM RELAY CONTACTS AND FRONT ACCESSIBILITY FOR ALL REQUIRED MAINTENANCE. DETECTOR SHALL BE EST DH 400 ACDCP OR APPROVED EQUAL.
2. DUCT SMOKE DETECTORS: DUCT SMOKE DETECTORS SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR, INSTALLED BY THE MECHANICAL CONTRACTOR AND WIRED BY THE ELECTRICAL CONTRACTOR.

**PIPE AND PIPE FITTINGS**

1. GENERAL: ALL PIPING SHALL BE CUT ACCURATELY FROM DIMENSIONS ESTABLISHED AT THE PROJECT SITE WITH ALLOWANCES MADE FOR THE CLEARANCE OF WINDOWS, DOORS, AND OTHER OPENINGS. ALL PIPING SHALL BE INSTALLED PARALLEL OR PERPENDICULAR TO THE BUILDING CONSTRUCTION AND SHALL BE INSTALLED SO AS TO ALLOW FOR EXPANSION AND DRAINAGE. ALL PIPING SYSTEMS SHALL BE INSTALLED COMPLETE.
2. CONDENSATE DRAIN PIPING OUTSIDE THE BUILDING: CPVC.
3. IDENTIFICATION: ALL PIPING SHALL BE IDENTIFIED BY NAME AND DIRECTIONAL FLOW ARROWS IN ACCORDANCE WITH ASME A13.1 STANDARDS.
4. SLOPE ALL CONDENSATE PIPING TOWARDS DRAIN AT 1/8" PER FOOT. INSTALL OTHER PIPING AT A UNIFORM GRADE OF 0.2 PERCENT UPWARD IN DIRECTION OF FLOW.
5. INSTALL DRAINS, CONSISTING OF A TEE FITTING, NPS 3/4 BALL VALVE, AND SHORT NPS 3/4 THREADED NIPPLE WITH CAP, AT LOW POINTS IN PIPING SYSTEM MAINS AND ELSEWHERE AS REQUIRED FOR SYSTEM DRAINAGE.

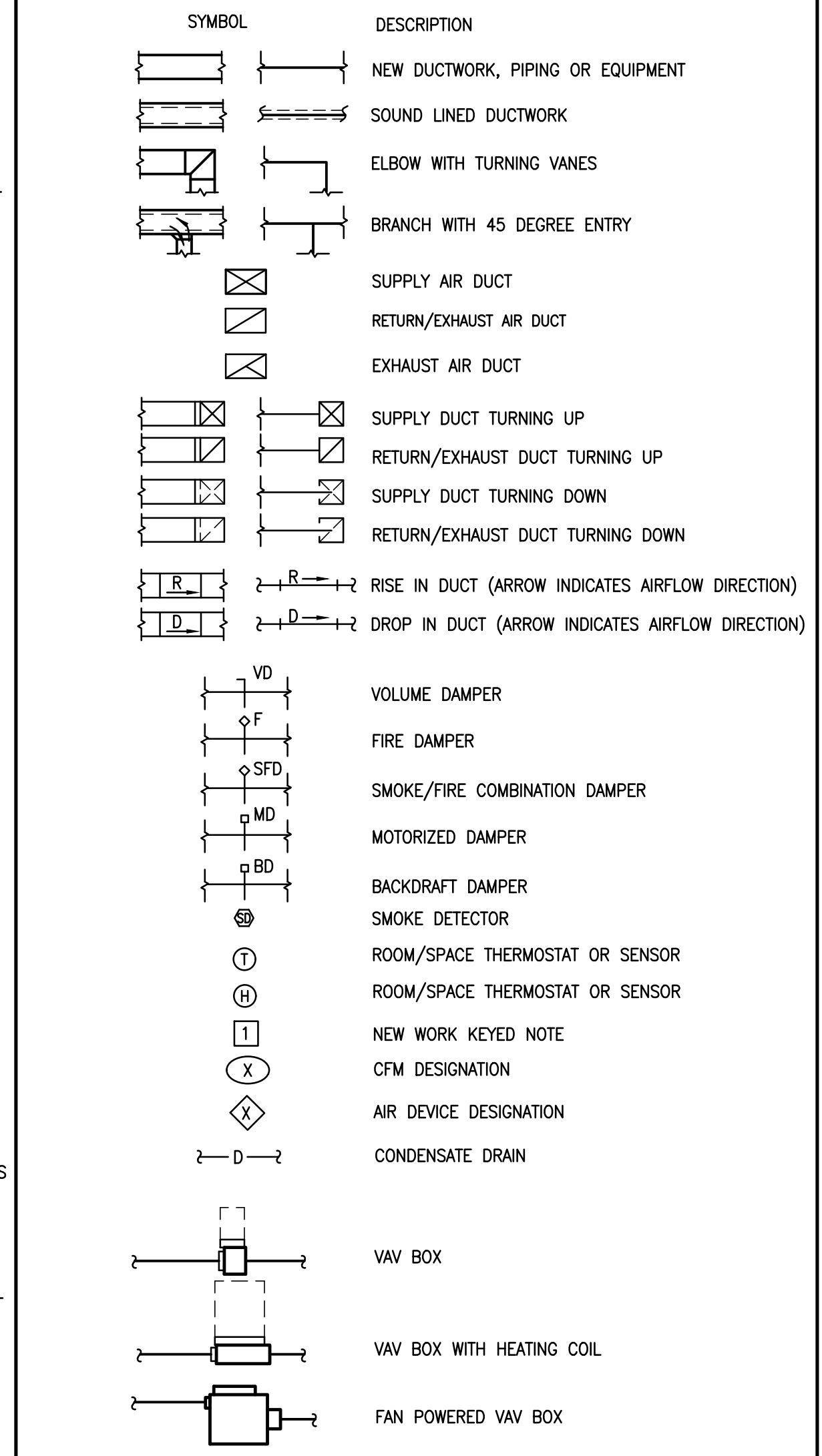
**VIBRATION ISOLATORS**

1. PROVIDE COMBINATION SPRING AND DOUBLE DEFLECTION NEOPRENE ISOLATION HANGERS FOR ALL SUSPENDED FANS AND EQUIPMENT 100 LBS. OR GREATER.
2. PROVIDE DOUBLE DEFLECTION NEOPRENE ISOLATION HANGERS FOR SUSPENDED FANS AND EQUIPMENT LESS THAN 100 LBS.
3. QUANTITY AND LOCATION OF ISOLATORS SHALL BE AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.
4. AFTER INSTALLATION AND START-UP, CONTRACTOR SHALL THOROUGHLY CHECK EACH ITEM OF EQUIPMENT FOR VIBRATION TRANSMISSION TO THE STRUCTURE OR EXCESSIVE NOISE, AND IF EITHER OCCURS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTING THE FAULTY SITUATION IMMEDIATELY.

**DUCTWORK**

1. GENERAL: CONSTRUCT ALL DUCTWORK AND ACCESSORIES UPSTREAM OF VAV BOXES IN ACCORDANCE WITH THE LATEST EDITION OF SMACNA STANDARDS FOR 4" PRESSURE CLASS AND SEAL CLASS A. CONSTRUCT ALL OTHER DUCTWORK FOR 2" PRESSURE CLASS AND SEAL CLASS A.
2. THE SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS AND OTHER IMPERFECTIONS.
3. METAL DUCTWORK: UNLESS OTHERWISE NOTED, FABRICATE ALL DUCTWORK, HOUSING, DAMPERS, AND ALL OTHER DUCT RELATED ACCESSORIES FROM GALVANIZED STEEL SHEETS.
  - A. GALVANIZED STEEL SHEETS: LOCK-FORMING QUALITY; COMPLYING WITH ASTM A 653/A 653M; DUCTS SHALL HAVE MILL-PHOSPHATIZED FINISH FOR SURFACES EXPOSED TO VIEW.
4. KITCHEN HOOD EXHAUST AIR DUCTWORK (GREASE DUCT SERVING TYPE I HOODS): SHALL BE INSTALLED TO ALLOW FOR THERMAL EXPANSION AND WITHOUT DIPS OR TRAPS THAT MAY COLLECT RESIDUES. JOINTS, SEAMS, AND PENETRATIONS SHALL BE MADE WITH A CONTINUOUS, LIQUID-TIGHT WELD OR BRAZE ON THE EXTERNAL SURFACE OF THE DUCTWORK AS INDICATED IN THE CURRENT INTERNATIONAL MECHANICAL CODE SECTION 506.3.2. THE DUCTWORK SHALL BE CONSTRUCTED FROM ONE OF THE FOLLOWING:
  - A. COMMERCIAL QUALITY, CARBON-STEEL SHEETS NOT LESS THAN 0.0575-INCHES (16 GAUGE) IN THICKNESS. THE SHEET METAL SHALL HAVE AN OILED, MATTE FINISH.
  - B. STAINLESS-STEEL SHEETS NOT LESS THAN 0.0450-INCHES (18 GAUGE) THICKNESS.
  - C. FACTORY-BUILT COMMERCIAL KITCHEN GREASE DUCTS THAT ARE LISTED AND LABELED IN ACCORDANCE WITH UL 1978 AND INSTALLED IN ACCORDANCE WITH SECTION 304.1 OF THE CURRENT INTERNATIONAL MECHANICAL CODE.

**MECHANICAL LEGEND**



**ABBREVIATIONS**

AC	AIR CONDITIONING
AHU	AIR HANDLING UNIT
ARI	AMERICAN REFRIGERATION INSTITUTE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASHRAE	AMERICAN SOCIETY OF HEATING REFRIGERATION AND AIR CONDITIONING ENGINEERS
ATC	AUTOMATIC TEMPERATURE CONTROLS
BTUH	BRITISH THERMAL UNITS PER HOUR
CFM	CUBIC FEET PER MINUTE
COND	CONDENSATE
CV	CONSTANT VOLUME
DN	DOWN
DOAS	DEDICATED OUTSIDE AIR SYSTEM
DWG	DRAWING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
ESP	EXTERNAL STATIC PRESSURE
EXH	EXHAUST
F	DEGREES FAHRENHEIT
FD	FIRE DAMPER
FT	FEET
H	HEIGHT
H2O	WATER
HP	HORSEPOWER
IN	INCHES
MAU	MAKE-UP AIR UNIT
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MD	MOTORIZED DAMPER
MIN	MINIMUM
NC	NOISE CRITERIA; NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NO	NUMBER; NORMALLY OPEN
OA	OUTSIDE AIR
PD	PRESSURE DROP
RA	RETURN AIR
RTU	ROOFTOP UNIT
RH	RELATIVE HUMIDITY
SA	SUPPLY AIR
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
SQ	SQUARE
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
W	WIDTH

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Architect is not responsible for any dimensions scaled from drawings. Dimensions noted take precedence.

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NEW BUILDING FOR:  
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 6300 WOODYARD ROAD,  
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DRAWING	DATE
<input type="checkbox"/> DD MEETING #1	07/16/2019
<input type="checkbox"/> DD MEETING #2	09/06/2019
<input type="checkbox"/> DD MEETING #3	10/06/2023
<input type="checkbox"/> BID SET	11/15/2023
<input checked="" type="checkbox"/> AVL. COORD / BID SET	12/08/2023
<input type="checkbox"/> PERMIT SET	

REVISIONS/ADDENDUMS

**SPECIFICATIONS, SYMBOLS, AND ABBREVIATIONS**

**M001**

1 OF 14 SHEETS

216118

GENERAL SPECIFICATIONS	MECHANICAL SPECIFICATIONS	MECHANICAL SPECIFICATIONS	MECHANICAL SPECIFICATIONS
<p>5. KITCHEN HOOD EXHAUST GREASE DUCTWORK CLEANOUTS AND OPENINGS: SHALL BE PROVIDED IN ACCORDANCE WITH CURRENT INTERNATIONAL MECHANICAL CODE. CLEANOUT OPENINGS SHALL BE CONSTRUCTED OF THE SAME MATERIAL AS, AND AT LEAST AS THICK AS, THE GREASE DUCT. HORIZONTAL CLEANOUT LOCATIONS AND DIMENSIONS SHALL BE IN ACCORDANCE WITH CURRENT INTERNATIONAL MECHANICAL CODE SECTION 506.3.9. WHERE CLEANOUT OPENINGS ARE LOCATED IN DUCTS WITHIN A FIRE RESISTANCE RATED ENCLOSURE, ACCESS OPENINGS SHALL BE PROVIDED IN ACCORDANCE WITH CURRENT INTERNATIONAL MECHANICAL CODE SECTION 506.3.11.</p> <p>6. KITCHEN HOOD EXHAUST GREASE DUCTWORK SHALL BE SUBJECTED TO A LEAKAGE AND LIGHT TEST PRIOR TO BEING USED OR CONCEALED, PER CURRENT INTERNATIONAL MECHANICAL CODE SECTION 506.3.2.5.</p> <p>7. MANUAL VOLUME DAMPERS: SHALL BE AS INDICATED IN THE SMACNA DUCT STANDARDS FOR DUCTWORK LESS THAN 12-INCHES ON THE LONGEST SIDE. THE DAMPERS FOR DUCTWORK OVER 12-INCHES IN LENGTH SHALL BE OF AN OPPOSED, MULTI-BLADE CONFIGURATION. THE DAMPERS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL AND REINFORCED TO PREVENT VIBRATION. THE DAMPERS SHALL HAVE SWIVEL END BEARINGS AT ONE END OF THE BLADE AND A LOCKING QUADRANT, OR REGULATOR, AT THE OPPOSITE END CLEARLY MARKED FOR POSITION. THE MULTI-BLADE DAMPERS SHALL HAVE STEEL WASHERS AT THE ENDS OF THE DAMPER RODS WITH SELF-ALIGNING BLADE INTERCONNECTING HARDWARE.</p> <p>8. FLEXIBLE CONNECTORS: PROVIDE AT THE DISCHARGE AND INLET OPENINGS OF ALL AIR HANDLING UNITS, FAN COIL UNITS AND INLINE FANS WITH DUCTWORK CONNECTIONS. THE FLEXIBLE CONNECTORS SHALL BE CONSTRUCTED FROM A FLAME RETARDANT NEOPRENE COATED GLASS FABRIC, (30 OUNCES PER SQUARE YARD). THE DUCT CONNECTORS SHALL BE ASSEMBLED COMPLETELY AIRTIGHT WITH SEWED AND CEMENTED SEAMS AND INSTALLED TO ALLOW FOR 1-INCH OF FREE MOVEMENT. THE FLEXIBLE DUCT CONNECTORS SHALL BE AS MANUFACTURED BY DURODYNE OR GENERAL RUBBER CORPORATION. CONTRACTOR SHALL BRACE DUCTWORK (AS REQUIRED) AT ALL FLEXIBLE CONNECTORS TO ENSURE THAT DUCTWORK IS KEPT IN ALIGNMENT.</p> <p>9. FLEXIBLE DUCT: PROVIDE INSULATED U.L. LISTED CLASS 1 DUCT COMPLYING WITH NFPA 90A. MAXIMUM LENGTH SHALL BE 6 FEET. FLEXIBLE AIR CONNECTORS SHALL NOT BE ACCEPTABLE. FLEXMASTER, THERMAFLEX, WIREMOLD, OR CLEVAFLX.</p> <p>10. TURNING VANES: PROVIDE TURNING VANES MANUFACTURED OF GALVANIZED STEEL PER SMACNA IN ALL MITERED ELBOWS 30 DEGREES OR MORE. PROVIDE SINGLE WALL FOR DUCTS UP TO 48" WIDE AND DOUBLE WALL FOR LARGER DIMENSIONS.</p> <p>11. WHERE DUCTS PASS THROUGH NON-FIRE-RATED INTERIOR PARTITIONS AND EXTERIOR WALLS AND ARE EXPOSED TO VIEW, COVER THE OPENING BETWEEN THE PARTITION AND DUCT OR DUCT INSULATION WITH SHEET METAL FLANGES OF SAME METAL THICKNESS AS THE DUCT. OVERLAP OPENINGS ON FOUR SIDES BY AT LEAST 1-1/2 INCHES.</p> <p>12. EXPOSED DUCTWORK: TRIM DUCT SEALANTS FLUSH WITH METAL. CREATE A SMOOTH AND UNIFORM EXPOSED BEAD. DO NOT USE TWO-PART TAPE SEALING SYSTEM. GRIND WELDS TO PROVIDE SMOOTH SURFACE FREE OF BURRS, SHARP EDGES, AND WELD SPLATTER.</p> <p>13. HANGER AND SUPPORT INSTALLATION:</p> <p>A. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," CHAPTER 5, "HANGERS AND SUPPORTS."</p> <p>B. BUILDING ATTACHMENTS: CONCRETE INSERTS, POWDER-ACTUATED FASTENERS, OR STRUCTURAL-STEEL FASTENERS APPROPRIATE FOR CONSTRUCTION MATERIALS TO WHICH HANGERS ARE BEING ATTACHED.</p> <p>1) WHERE PRACTICAL, INSTALL CONCRETE INSERTS BEFORE PLACING CONCRETE.</p> <p>2) INSTALL POWDER-ACTUATED CONCRETE FASTENERS AFTER CONCRETE IS PLACED AND COMPLETELY CURED.</p> <p>3) USE POWDER-ACTUATED CONCRETE FASTENERS FOR STANDARD-WEIGHT AGGREGATE CONCRETES OR FOR SLABS MORE THAN 4 INCHES THICK.</p> <p>4) DO NOT USE POWDER-ACTUATED CONCRETE FASTENERS FOR LIGHTWEIGHT-AGGREGATE CONCRETES OR FOR SLABS LESS THAN 4 INCHES THICK.</p> <p>5) DO NOT USE POWDER-ACTUATED CONCRETE FASTENERS FOR SEISMIC RESTRAINTS.</p> <p>C. HANGER SPACING: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE," TABLE 5-1, "RECTANGULAR DUCT HANGERS MINIMUM SIZE," AND TABLE 5-2, "MINIMUM HANGER SIZES FOR ROUND DUCT," FOR MAXIMUM HANGER SPACING; INSTALL HANGERS AND SUPPORTS WITHIN 24 INCHES OF EACH ELBOW AND WITHIN 48 INCHES OF EACH BRANCH INTERSECTION.</p> <p>D. HANGERS EXPOSED TO VIEW: THREADED ROD AND ANGLE OR CHANNEL SUPPORTS.</p> <p>E. SUPPORT VERTICAL DUCTS WITH STEEL ANGLES OR CHANNEL SECURED TO THE SIDES OF THE DUCT WITH WELDS, BOLTS, SHEET METAL SCREWS, OR BLIND RIVETS; SUPPORT AT EACH FLOOR AND AT A MAXIMUM INTERVALS OF 16 FEET.</p> <p>F. INSTALL UPPER ATTACHMENTS TO STRUCTURES. SELECT AND SIZE UPPER ATTACHMENTS WITH PULL-OUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED.</p> <p>14. DUCT CLEANING</p> <p>A. CLEAN NEW DUCT SYSTEM BEFORE TESTING, ADJUSTING, AND BALANCING.</p> <p>B. USE DUCT CLEANING METHODOLOGY AS INDICATED IN NADCA ACR, THE NADCA STANDARD FOR THE ASSESSMENT, CLEANING, AND RESTORATION OF HVAC SYSTEMS.</p> <p>15. INSTALL ALL DUCTWORK ABOVE CEILING AND HOLD TIGHT TO UNDERSIDE OF STRUCTURE ABOVE UNLESS OTHERWISE INDICATED.</p> <p>16. INSTALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" FROM ANY EXHAUST OR PLUMBING VENT.</p> <p>17. INSTALL CEILING AIR DEVICES IN GRID AS CLOSE AS POSSIBLE TO LOCATION SHOWN ON PLAN. COORDINATE LOCATION WITH LIGHT FIXTURES AND SPRINKLER HEADS.</p> <p>18. HOLD ALL DUCTWORK RUNNING PARALLEL TO A RATED WALL A MINIMUM OF 6" AWAY FROM THE WALL.</p> <p>19. CHANGES TO DUCT DUE TO FIELD CONDITIONS SHALL BE MADE ONLY IF THE FRICTION LOSS IS MAINTAINED AND SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL.</p> <p>20. LEAKAGE</p> <p>A. ALL DUCTS SHALL BE SEALED, JOINT AND SEAMS SHALL COMPLY WITH SECTION 603.9 OF INTERNATIONAL MECHANICAL CODE.</p> <p>B. ALL NEW DUCTS AND PLENUMS SHALL BE LEAK-TESTED IN ACCORDANCE WITH THE SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL FOR OPERATING PRESSURE GREATER THAN 3" WC, THE LEAKAGE RATE SHALL BE EQUAL TO OR LESS THAN 4.0 AS DETERMINED IN C403.2.9.1.3, INTERNATIONAL ENERGY CODE.</p> <p>C. PERFORM ALL TESTING AFTER THE SEALS HAVE CURED COMPLETELY AND BEFORE COVERING WITH INSULATION OR CONCEALING IN CONSTRUCTION.</p> <p>D. LEAKAGE TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE.</p>	<p>INSULATION</p> <p>1. ALL DUCT INSULATION AND COVERINGS SHALL HAVE A FIRE AND SMOKE HAZARD RATING AS TESTED UNDER PROCEDURE ASTM-E-84, NFPA 255 AND UL 723 NOT EXCEEDING A FLAME SPREAD RATING OF 25 AND A SMOKE DEVELOPED RATING OF 50. THE PRODUCTS SHALL BE BY JOHNS MANVILLE, KNAUF INSULATION, OWENS CORNING, CERTAINTED, MANSON, OR ARMACELL BY ARMAFLEX.</p> <p>2. AIR CONDITIONING DUCTS WITHIN THE BUILDING ENVELOPE: INSULATE ALL NEW SUPPLY AIR AND RETURN AIR DUCTS WITH A FORMALDEHYDE FREE FIBERGLASS, FLEXIBLE BLANKET INSULATION, FACED WITH AN FSK FIRE RESISTIVE VAPOR BARRIER JACKET WITH A 2" TAB ON ONE EDGE. INSULATION SHALL BE WRAPPED ON DUCTS WITH FACING OVERLAPPING ALL JOINTS AT LEAST 2" AND HELD IN PLACE WITH 1/2" OUTWARD CLINCHING STAPLES ON 4" CENTERS. STAPLES AND SEAMS ARE TO BE SEALED WITH A BRUSH COAT OF VAPOR BARRIER MASTIC.</p> <p>a. UNCONDITIONED SPACE DUCTS: INSULATION SHALL BE 1-1/2" THICK AND HAVE A MINIMUM R VALUE OF 6.</p> <p>b. CONDITIONED SPACE: INSULATION IS NOT REQUIRED UNLESS OTHERWISE INDICATED.</p> <p>3. DUCT LINING: WHERE INDICATED, SOUND LINE DUCTWORK IN LIEU OF EXTERNAL INSULATION. LINING SHALL BE FIBER GLASS OR FLEXIBLE ELASTOMERIC DUCT LINER AND HAVE A MINIMUM R VALUE OF 6. LINER SHALL BE 1-1/2" THICK UNLESS OTHERWISE NOTED. THE SIZES OF SOUND LINED DUCTS SHOWN ON THE DRAWINGS SHALL BE DIMENSIONS INSIDE THE SOUND LINING. DUCT LINING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. STICK CLIPS WHERE USED SHALL NOT COMPRESS SOUND LINING MORE THAN 10% OF ITS NORMAL THICKNESS. LINER SHALL BE U.L. APPROVED FOR USE IN ACCORDANCE WITH NFPA PAMPHLET 90A.</p> <p>4. PENETRATIONS</p> <p>a. INSULATION INSTALLATION AT ROOF PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH ROOF PENETRATIONS.</p> <p>b. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.</p> <p>c. INSULATION INSTALLATION AT FIRE-RATED WALL AND PARTITION PENETRATIONS:</p> <p>1) DUCTWORK: TERMINATE INSULATION AT FIRE DAMPER SLEEVES FOR FIRE-RATED WALL AND PARTITION PENETRATIONS. EXTERNALLY INSULATE DAMPER SLEEVES TO MATCH ADJACENT INSULATION AND OVERLAP DUCT INSULATION AT LEAST 2 INCHES.</p> <p>5. WHEREVER DUCTWORK OR OTHER ITEMS PASS THROUGH FIRE RATED WALLS AND FLOORS, THE CONTRACTOR SHALL ADEQUATELY FIRE STOP THE SPACE BETWEEN THE ITEMS AND THE MASONRY OR THE SPACE BETWEEN THE ITEM AND SLEEVE. FIRE STOP SHALL BE A NON-COMBUSTIBLE, NON-MELTING, APPROVED MATERIAL.</p> <p>TEST AND BALANCING</p> <p>1. SCOPE:</p> <p>E. AN INDEPENDENT CONTRACTOR WITH NEBB OR AABC CERTIFICATION SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, SERVICES AND PERFORM ALL OPERATIONS REQUIRED FOR COMPLETE BALANCING OF THE MECHANICAL SYSTEMS AND RELATED WORK AS INDICATED ON THE DRAWINGS AND SPECIFIED HEREIN.</p> <p>F. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE", NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS", SMACNA'S "HVAC SYSTEMS - TESTING, ADJUSTING, AND BALANCING", AND IN THIS SECTION.</p> <p>G. BALANCING SHALL NOT BE PERFORMED UNTIL ALL MECHANICAL EQUIPMENT IS PROPERLY INSTALLED AND IS 100% OPERATIONAL. ALL TEMPERATURE CONTROLS ARE INSTALLED AND CALIBRATED AND ALL SYSTEMS ARE CLEANED, PIPING AND STRAINERS FLUSHED, AND CLEAN FILTERS INSTALLED.</p> <p>H. IT IS THE INTENT OF THIS SPECIFICATION TO ENSURE THAT THE ENTIRE PROJECT IS SUBSTANTIALLY COMPLETE SO THAT ALL COMPONENTS OF ALL MECHANICAL SYSTEMS CAN BE PUT INTO NORMAL OPERATION WITH ALL WINDOWS AND DOORS CLOSED AND BALANCED IN THAT CONDITION. IN NO CASE IS THE CONTRACTOR TO PERFORM HIS WORK IN PIECEMEAL FASHION.</p> <p>2. QUALITY ASSURANCE: SUBMIT TO OWNER THREE (3) COPIES OF BALANCING AND TESTING RECORDS SPECIFIED HEREIN SHOWING THE MECHANICAL SYSTEMS HAVE BEEN BALANCED AND ARE DELIVERING SPECIFIED QUANTITIES.</p> <p>3. EACH PIECE OF EQUIPMENT SHALL BE IDENTIFIED AS TO LOCATION, SERVICE, MANUFACTURER AND MODEL NUMBER. THIS INFORMATION SHALL BE RECORDED AND INCLUDED IN THE FINAL BALANCE REPORT.</p> <p>4. AFTER ADJUSTMENTS ARE COMPLETED, THE MECHANICAL SYSTEMS SHALL BE TESTED, AND THE FOLLOWING INFORMATION RECORDED AND INCLUDED IN THE FINAL BALANCE REPORT:</p> <p>A. ROOFTOP UNITS AND DOAS UNIT:</p> <p>1) BLOWER RPM</p> <p>2) MOTOR FULL LOAD AMPS</p> <p>3) VOLTAGE</p> <p>4) AIR FLOW - TOTAL</p> <p>5) AIR FLOW - OUTSIDE AIR</p> <p>6) AIR FLOW - RETURN AIR</p> <p>7) STATIC PRESSURE - SUCTION</p> <p>8) STATIC PRESSURE - DISCHARGE</p> <p>9) STATIC PRESSURE - TOTAL</p> <p>10) ENTERING AIR TEMPERATURE (DB) HEATING AND COOLING</p> <p>11) LEAVING AIR TEMPERATURE (DB) HEATING AND COOLING</p> <p>12) ENTERING AIR TEMPERATURE (WB) COOLING</p> <p>13) LEAVING AIR TEMPERATURE (WB) COOLING</p> <p>B. AIR DEVICES:</p> <p>1) EACH AIR DEVICE SHALL BE IDENTIFIED AS TO LOCATION AND SERVICE</p> <p>2) SIZE, TYPE AND MANUFACTURER OF AIR DEVICE LISTED</p> <p>3) REQUIRED CFM AND TEST RESULTANT CFM EACH DEVICE</p> <p>C. VAV BOXES:</p> <p>1) INLET STATIC PRESSURE</p> <p>2) MINIMUM AND MAXIMUM PRIMARY AIR CFM SETPOINTS</p> <p>3) HEATING COIL KW, VOLTAGE AND AMPS</p> <p>4) SUPPLY AIR TEMPERATURE (COOLING AND HEATING)</p> <p>D. FANS:</p> <p>1) TOTAL AIR FLOW</p> <p>2) EXTERNAL STATIC PRESSURE</p> <p>3) MOTOR FULL LOAD AMPS</p> <p>4) VOLTAGE</p> <p>E. DUCT SMOKE DETECTORS: PRESSURE DIFFERENTIAL ACROSS INLET AND OUTLET TAPS OF DETECTORS.</p> <p>5. AFTER THE SYSTEMS HAVE BEEN BALANCED AND ALL ADJUSTMENTS COMPLETED, RUN A SIX HOUR TEST ON BOTH HEATING AND COOLING CYCLE TO DETERMINE IF SYSTEM IS RESPONDING TO TEMPERATURE CONTROLS. THERMOSTAT TEMPERATURE READING, AND AN INDEPENDENT TEMPERATURE MEASUREMENT AT THE THERMOSTAT SHALL BE RECORDED AT EACH THERMOSTAT.</p>	<p>TEMPERATURE CONTROL - SEE BOOK SPECIFICATION "230923 DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC"</p>	



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 Project #: 19161

GALILEE BAPTIST CHURCH

6300 WOODYARD ROAD,  
 UPPER MARLBORO, MD 20772

DRAWING	DATE
<input type="checkbox"/> DD MEETING #1	07/16/2019
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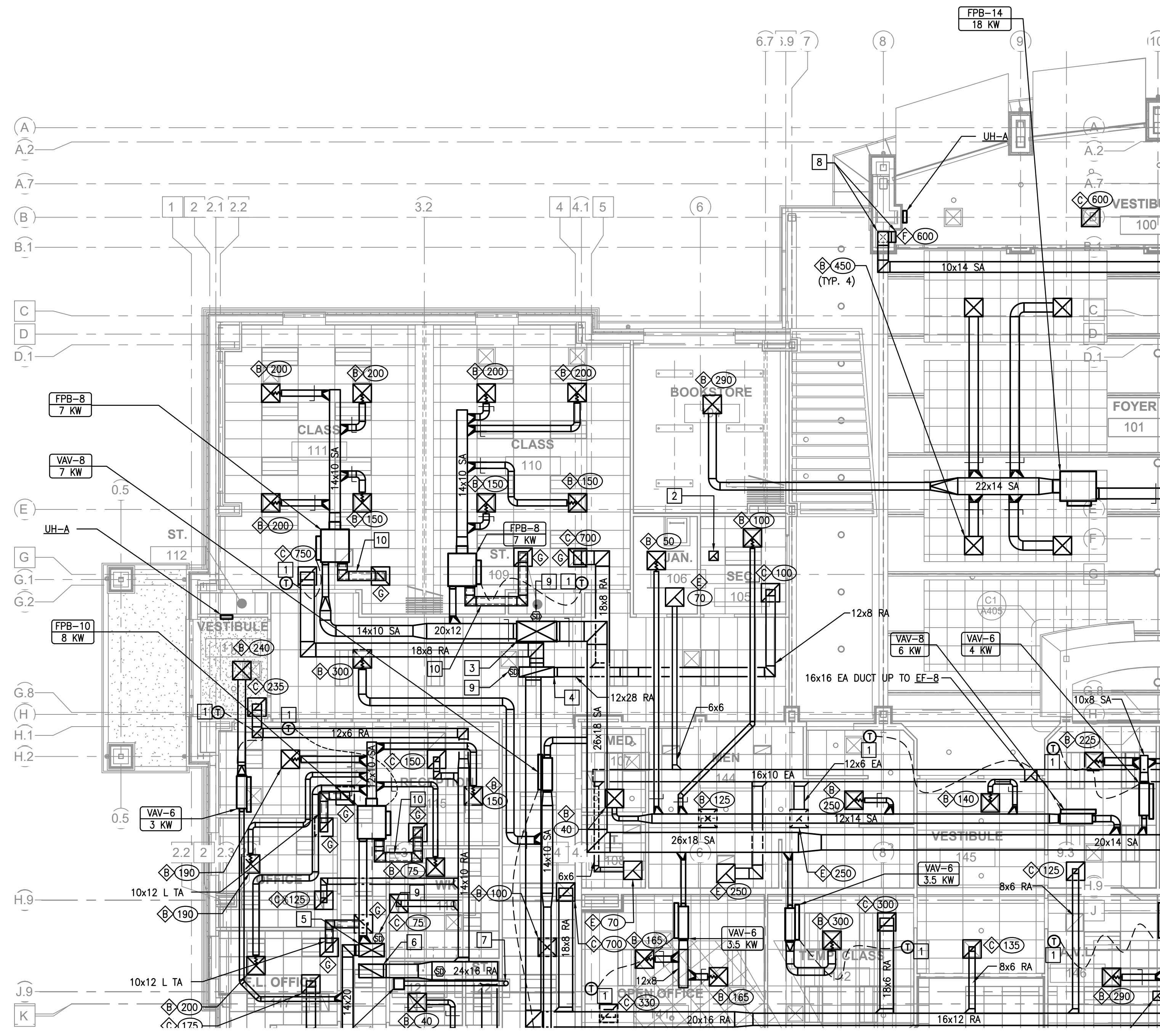
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MECHANICAL SPECIFICATIONS

M002

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216118



**PARTIAL FLOOR PLAN – SECTION 'A' MECHANICAL**  
 SCALE: 1/8" = 1'-0"

**MECHANICAL PLAN NOTES**

- 1 COORDINATE THERMOSTAT LOCATION WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL PER ADA STANDARDS.
- 2 12x12 EA DUCT UP TO EF-11 DOWN TO 12' 6" AFF. COVER OPENING WITH WIRE MESH SCREEN
- 3 FULL SIZE SA DOWN FROM RTU-6. BRANCH DUCTWORK CONNECTS HORIZONTALLY TO FULL SIZE SA.
- 4 FULL SIZE RA DOWN FROM RTU-6. BRANCH DUCTWORK CONNECTS HORIZONTALLY TO FULL SIZE RA.
- 5 FULL SIZE SA DOWN FROM RTU-5. BRANCH DUCTWORK CONNECTS HORIZONTALLY TO FULL SIZE SA.
- 6 FULL SIZE RA DOWN FROM RTU-5. BRANCH DUCTWORK CONNECTS HORIZONTALLY TO FULL SIZE RA.
- 7 6" EA DUCT UP TO ROOF.
- 8 14"x14" SA DOWN TO 7'-0" AFF. INSTALL BOTTOM OF DIFFUSER AT 7'-0" AFF.
- 9 INSTALL SMOKE DETECTOR IN VERTICAL DUCT DROP.
- 10 SIZE DUCTWORK TO INDUCED AIR INLET SIZE OF FAN POWERED VAV UNIT. PROVIDE 1" INTERNAL SOUND LINING.

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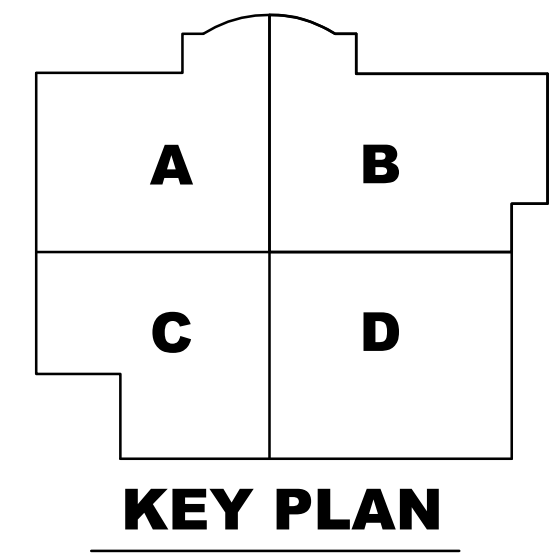
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NEW BUILDING FOR:  
**GALILEE BAPTIST CHURCH**  
 6300 WOODYARD ROAD,  
 UPPER MARLBORO, MD 20772

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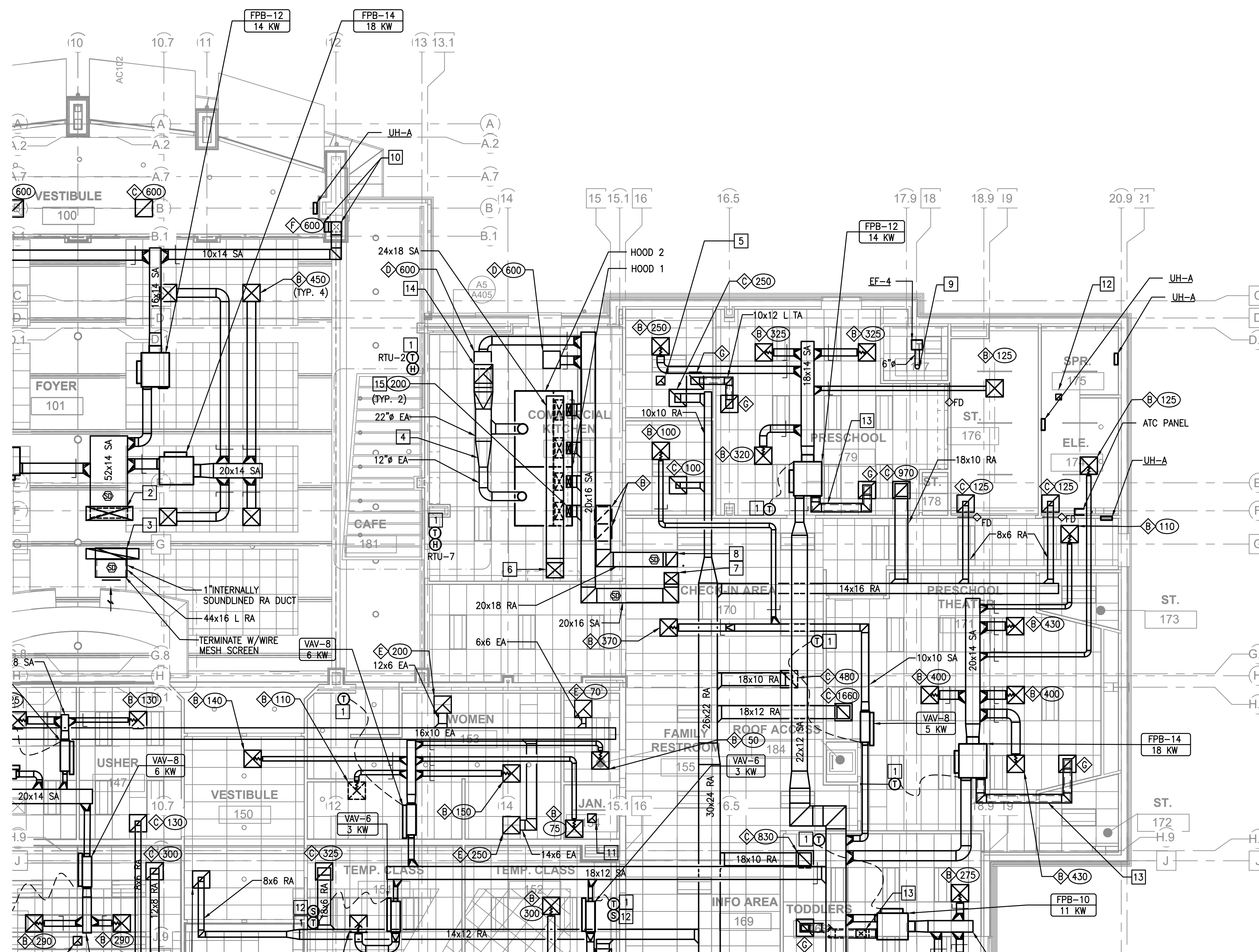
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**FIRST FLOOR PLAN  
 SECTION 'A'  
 MECHANICAL**

**M101**

3 OF 14 SHEETS



**PARTIAL FLOOR PLAN – SECTION 'B' MECHANICAL**  
SCALE: 1/8" = 1'-0"

**MECHANICAL PLAN NOTES**

- 1 COORDINATE SENSOR LOCATION WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL PER ADA STANDARDS.
- 2 52x14 SA UP TO RTU-2. TRANSITION TO RTU-2 SA OPENING SIZE IN VERTICAL.
- 3 44x16 RA UP TO RTU-2. TRANSITION TO RTU-2 RA OPENING SIZE IN VERTICAL.
- 4 PROVIDE FIRE WRAP AROUND GREASE DUCT COMPLETELY. 3M FIRE BARRIER DUCT WRAP 615+, 2 LAYER WRAP.
- 5 12x12 EA DUCT UP TO EF-10 DOWN TO 11' AFF. COVER OPENING WITH WIRE MESH SCREEN
- 6 24x18 OA UP TO MAU-1.
- 7 20x16 SA UP TO RTU-2. TRANSITION TO RTU-7 SA OPENING SIZE IN VERTICAL.
- 8 20x18 RA UP TO RTU-2. TRANSITION TO RTU-7 RA OPENING SIZE IN VERTICAL.
- 9 6" EA DUCT UP TO ROOF.
- 10 14"x14" SA DOWN TO 7'-0" AFF. INSTALL BOTTOM OF DIFFUSER AT 7'-0" AFF.
- 11 12x12 EA DUCT UP TO EF-9 DOWN TO 9' AFF. COVER OPENING WITH WIRE MESH SCREEN.
- 12 8x8 EA DUCT UP TO EF-13 DOWN TO 11' AFF. COVER OPENING WITH WIRE MESH SCREEN
- 13 SIZE DUCTWORK TO INDUCED AIR INLET SIZE OF FAN POWERED VAV UNIT. PROVIDE 1" INTERNAL SOUND LINING.
- 14 26x26 EA RISE TO KEF-1.
- 15 CONNECT TO HOOD HVAC CONNECTION.

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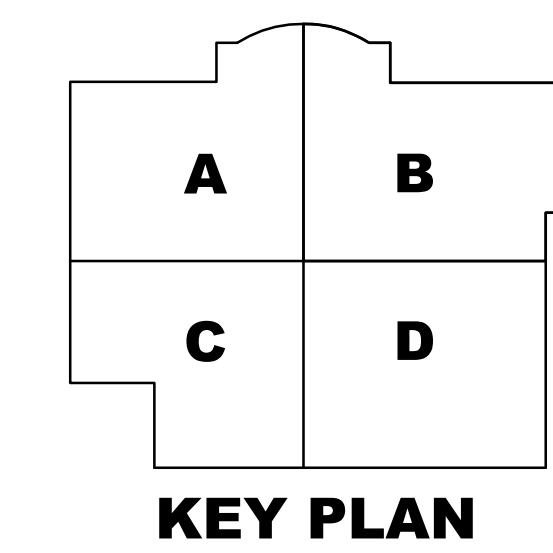
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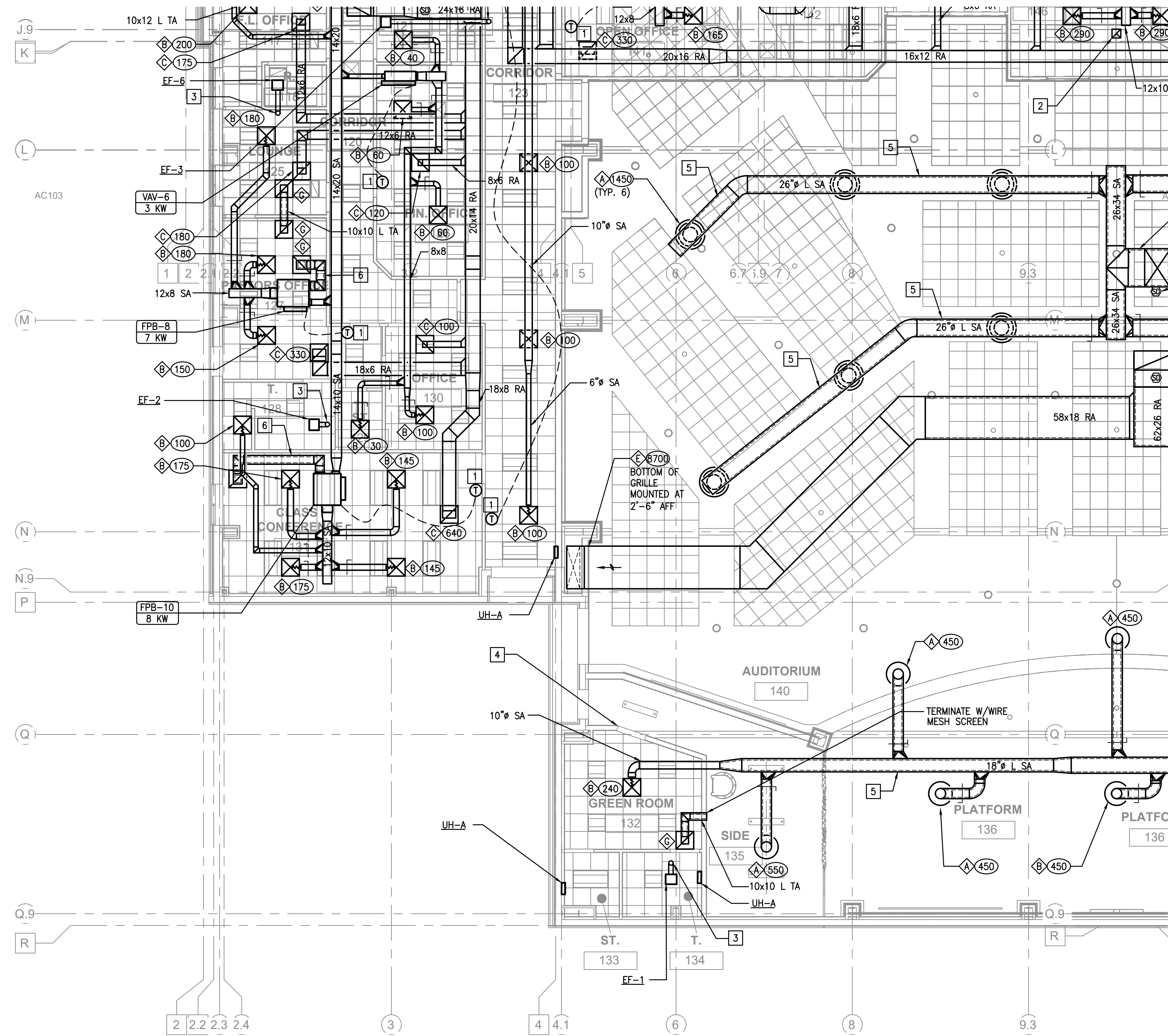


**FIRST FLOOR PLAN  
SECTION 'B'  
MECHANICAL**

**M102**

4 OF 14 SHEETS

216118



**PARTIAL FLOOR PLAN – SECTION 'C' MECHANICAL**  
 SCALE: 1/8" = 1'-0"

- MECHANICAL PLAN NOTES**
- 1 COORDINATE SENSOR LOCATION WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL PER ADA STANDARDS.
  - 2 12x12 EA DUCT UP TO EF-12 DOWN TO 11' AFF. COVER OPENING WITH WIRE MESH SCREEN
  - 3 6" EA DUCT UP TO ROOF.
  - 4 UNDERCUT DOOR 3/4".
  - 5 PROVIDE 1" INTERNAL SOUND LINING.
  - 6 SIZE DUCTWORK TO INDUCED AIR INLET SIZE OF FAN POWERED VAV UNIT. PROVIDE 1" INTERNAL SOUND LINING.

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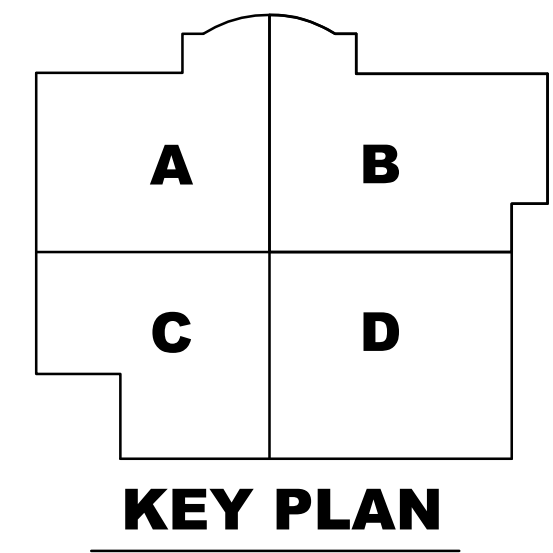
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**FIRST FLOOR PLAN  
 SECTION 'C'  
 MECHANICAL**

**M103**

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REVISIONS/ADDENDUMS

**FIRST FLOOR PLAN  
 SECTION 'D'  
 MECHANICAL**

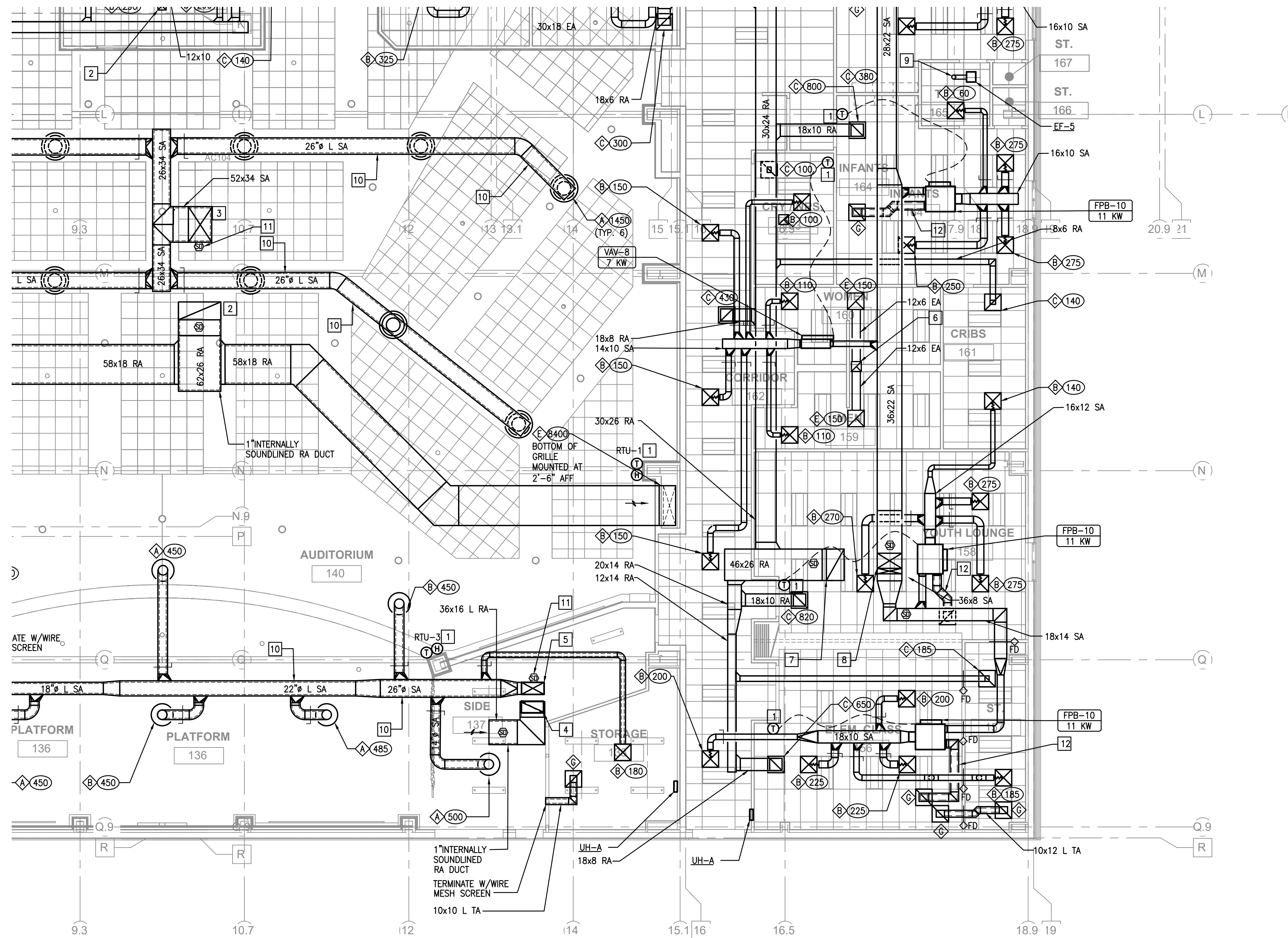
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216118

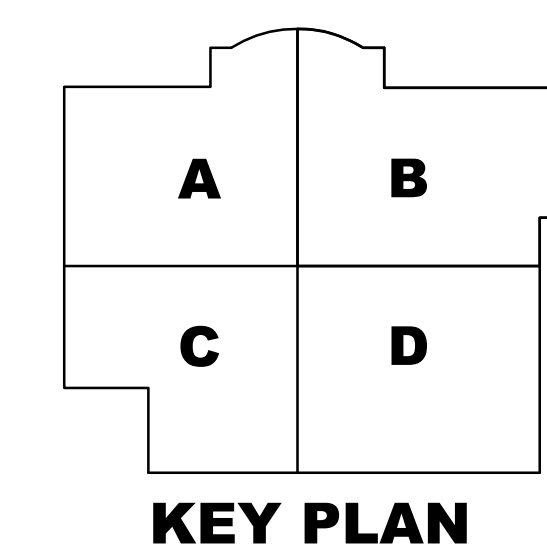
**MECHANICAL PLAN NOTES**

- 1 COORDINATE SENSOR LOCATION WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL PER ADA STANDARDS.
- 2 62x26 RA UP TO RTU-1. TRANSITION IN VERTICAL AND SEPARATE INTO TWO SEPARATE DUCTS, 76x20 RA AND 76x11 EA.
- 3 52x32 SA UP TO RTU-1. TRANSITION TO RTU-1 SA OPENING SIZE IN VERTICAL.
- 4 36x16 RA UP TO RTU-3. TRANSITION TO RTU-3 RA OPENING SIZE IN VERTICAL.
- 5 32x18 SA UP TO RTU-3. TRANSITION TO RTU-3 SA OPENING SIZE IN VERTICAL.
- 6 16x16 EA DUCT UP TO FF-7
- 7 46x26 RA UP TO RTU-4. TRANSITION TO RTU-4 RA OPENING SIZE IN VERTICAL.
- 8 36x22 SA AND 36x8 SA UP TO 36x30 SA UP TO RTU-4. TRANSITION WITH PAIR OF PANTS. TRANSITION 36x30 SA TO RTU-4 SA OPENING SIZE IN VERTICAL.
- 9 6" EA DUCT UP TO ROOF.
- 10 1" INTERNALLY SOUND LINED SA DUCT. NO EXTERNAL INSULATION WHERE DUCT IS SOUND LINED.
- 11 INSTALL SMOKE DETECTOR IN VERTICAL DUCT DROP.
- 12 SIZE DUCTWORK TO INDUCED AIR INLET SIZE OF FAN POWERED VAV UNIT. PROVIDE 1" INTERNAL SOUND LINING.



**PARTIAL FLOOR PLAN – SECTION 'D' MECHANICAL**

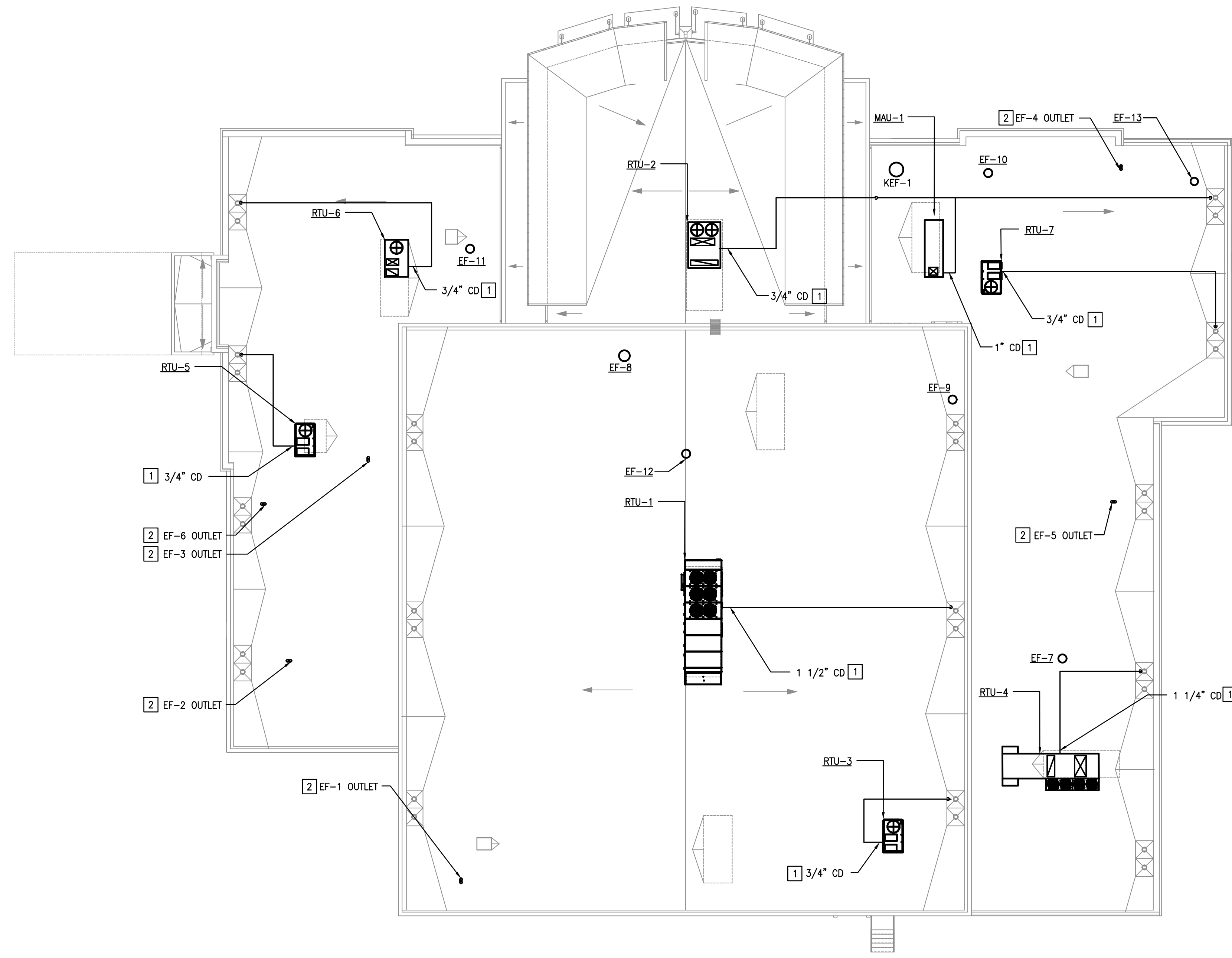
SCALE: 1/8" = 1'-0"



**KEY PLAN**

**MECHANICAL PLAN NOTES**

- 1 PROVIDE CONDENSATE DRAIN TRAP. SEE DETAIL ON SHEET M501. ROUTE TO NEAREST ROOF DRAIN.
- 2 6" EXHAUST DUCT GOOSENECK DISCHARGE. SEE DETAIL ON SHEET M501.



**ROOF PLAN**  
SCALE: 1/16" = 1'-0"

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Project #: 19161

NEW BUILDING FOR:  
**GALILEE BAPTIST CHURCH**  
6300 WOODYARD ROAD,  
UPPER MARLBORO, MD 20772

DRAWING	DATE
<input type="checkbox"/> DD MEETING #1	07/16/2019
<input type="checkbox"/> DD MEETING #2	09/06/2019
<input type="checkbox"/> DD MEETING #3	10/06/2023
<input type="checkbox"/> BID SET	11/15/2023
<input checked="" type="checkbox"/> AVL COORD / BID SET	12/08/2023
<input type="checkbox"/> PERMIT SET	

REVISIONS/ADDENDUMS

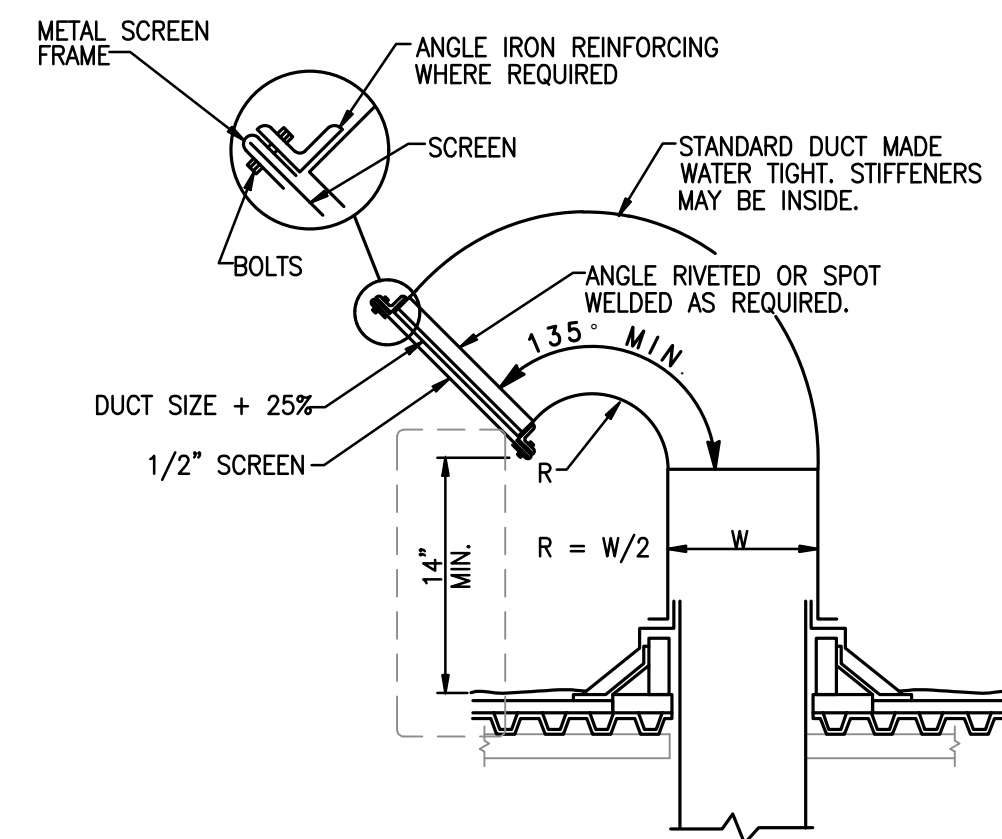
**ROOF PLAN  
MECHANICAL**

**M105**  
7 OF 14 SHEETS

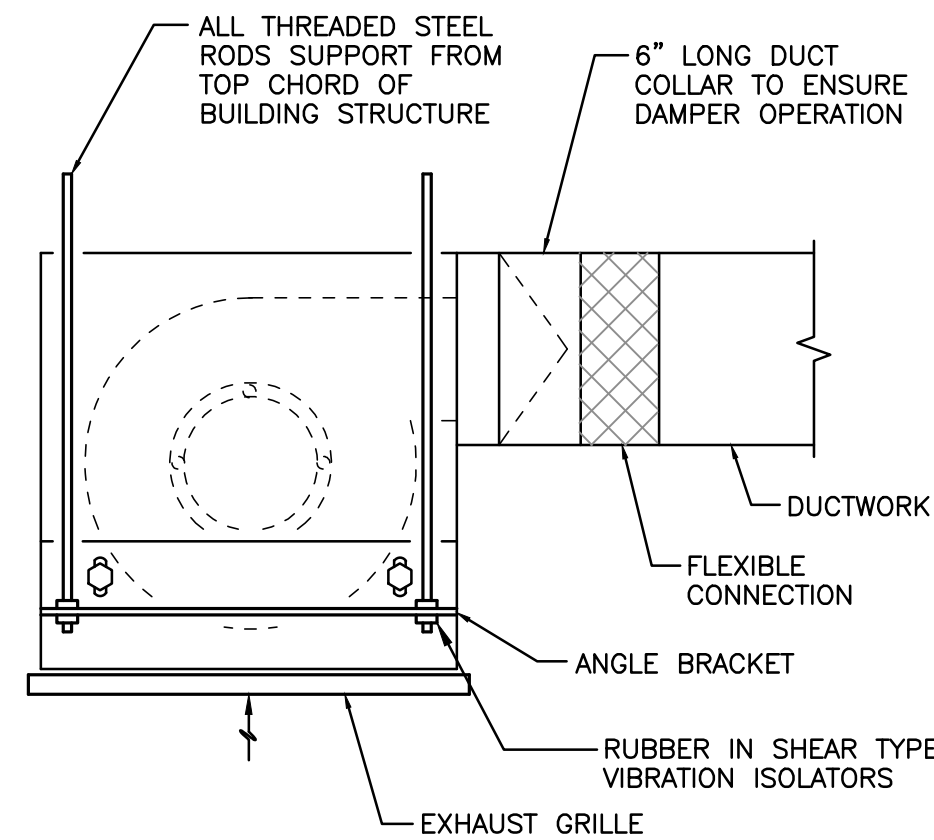
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NEW BUILDING FOR:  
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 UPPER MARLBORO, MD 20772

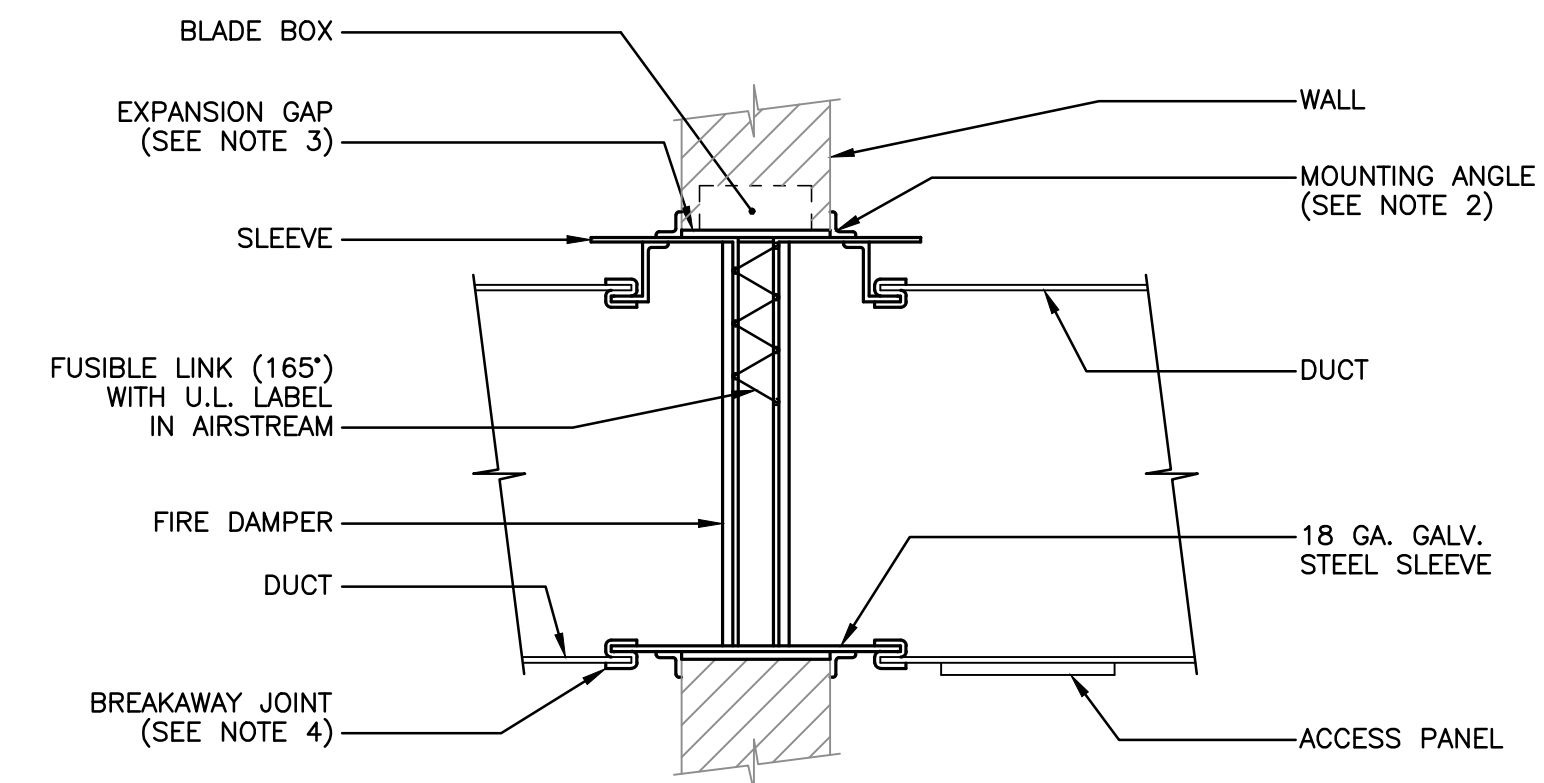


**TYPICAL GOOSENECK DETAIL**  
 NOT TO SCALE



NOTE:  
 CONTROL SHALL BE VIA THERMOSTAT

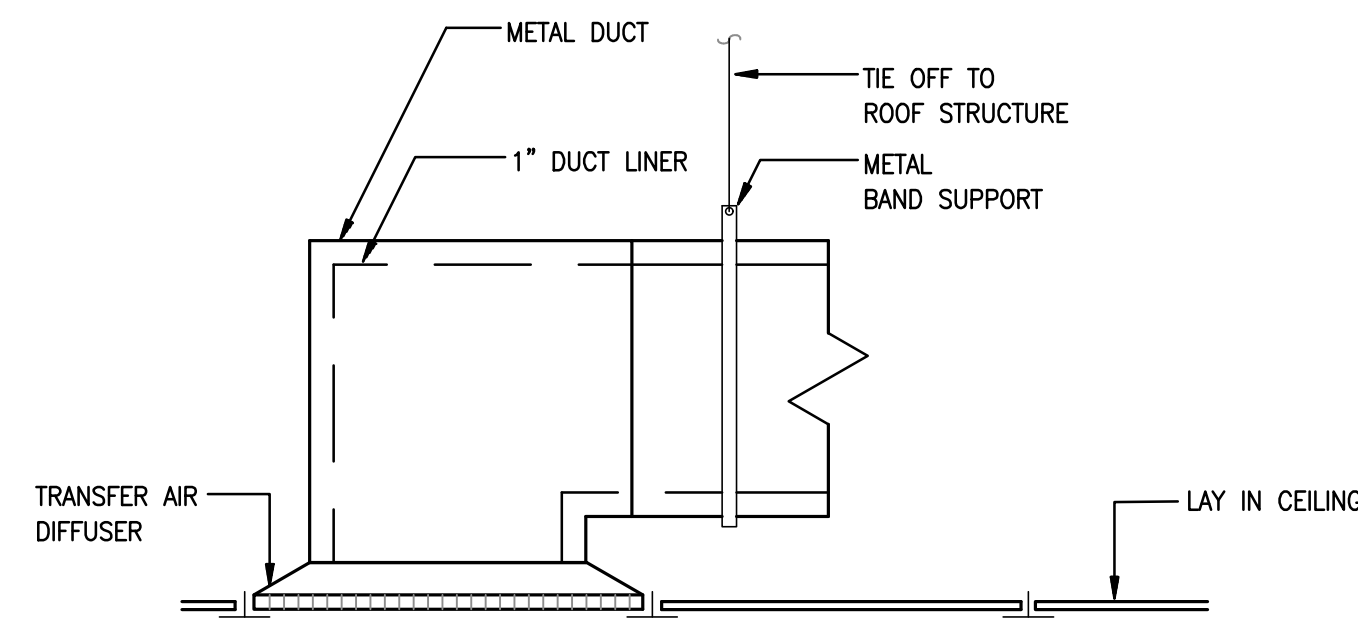
**CABINET EXHAUST FAN DETAIL**  
 NOT TO SCALE



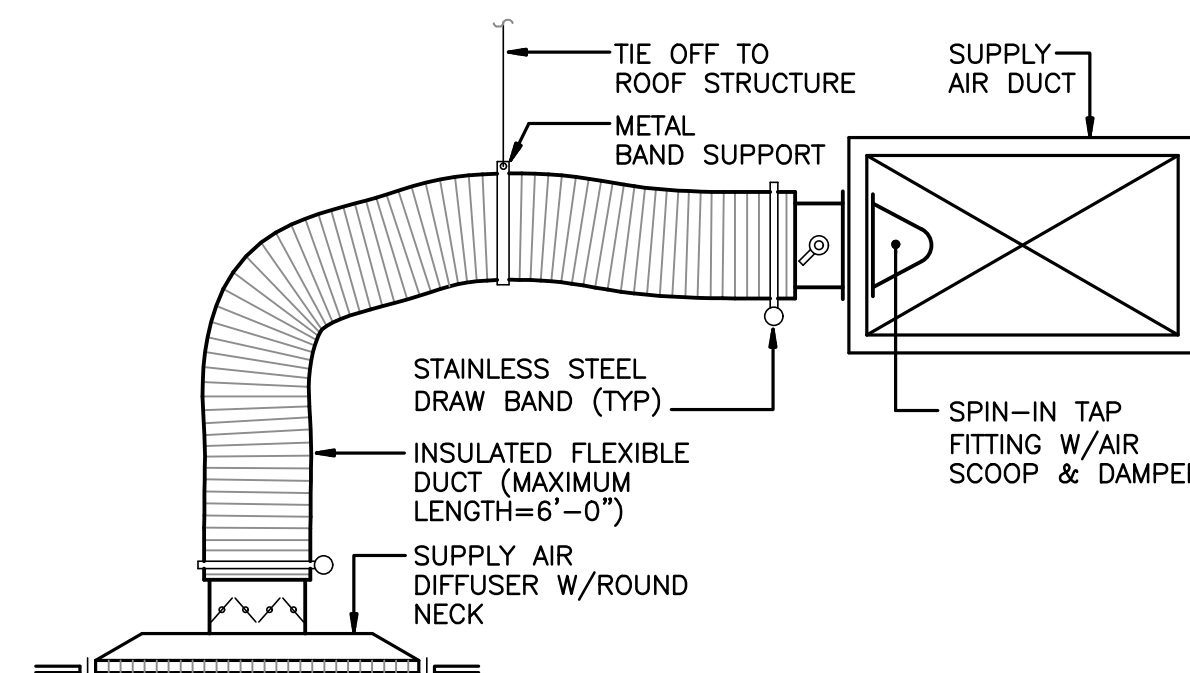
NOTES

1. FIRE DAMPER AND SLEEVE SHALL BE A FACTORY INSTALLED ASSEMBLY BY THE DAMPER MANUFACTURER.
2. MOUNTING ANGLES SHALL BE INSTALLED ON ALL SIDES OF DAMPER SLEEVE BOTH SIDES OF WALL. ANGLES SHALL NOT OVERLAP EACH OTHER AT CORNERS. ANGLE SHALL BE INSTALLED TIGHT TO WALL AND SECURED TO SLEEVE ONLY WITH 1/4" - 20 BOLTS MAX. 6" ON CENTERS. ANGLES SHALL BE MIN. 1-1/2" x 1-1/2" x 16 GAUGE STEEL.
3. PROVIDE EXPANSION GAP BETWEEN WALL AND SLEEVE. GAP SHALL BE A MINIMUM OF 1/8" FOR EVERY 12" OF SLEEVE WIDTH AND 1/8" FOR EVERY 12" OF SLEEVE DEPTH, OR PER DAMPER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
4. PROVIDE BREAKAWAY JOINT BETWEEN SLEEVE AND DUCT WITH STANDARD SLIP CONNECTOR (NO SCREWS ARE ALLOWED) ON BOTH SIDES OF WALL.
5. WHERE THIS DETAIL CONFLICTS WITH THE DAMPER MANUFACTURER'S INSTALLATION INSTRUCTIONS, THE MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED.
6. CONTRACTOR SHALL NOTE MANUFACTURER'S INSTALLATION STICKERS ON DAMPER. STICKERS SHALL NOT BE REMOVED OR TAMPED WITH.

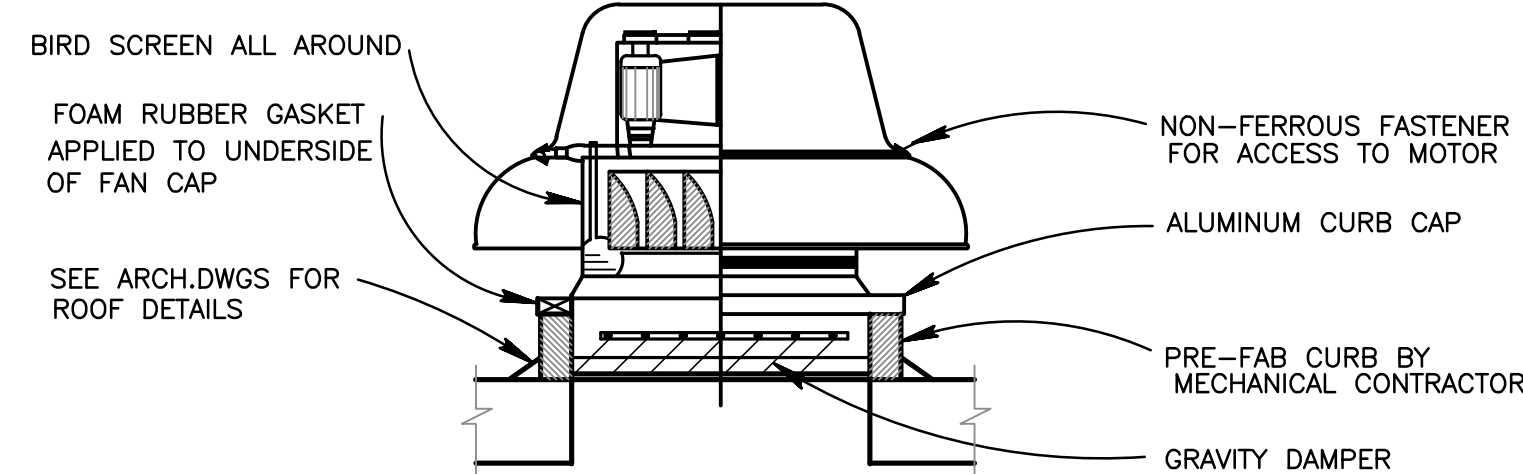
**FIRE DAMPER DETAIL-WALL INSTALLATION**  
 NOT TO SCALE



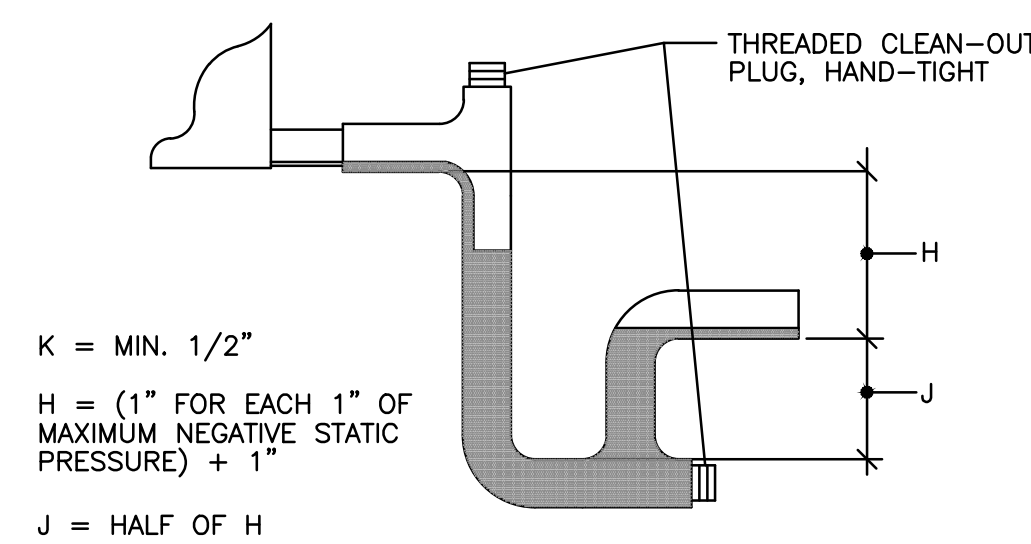
**TRANSFER AIR DIFFUSER DETAIL**  
 NOT TO SCALE



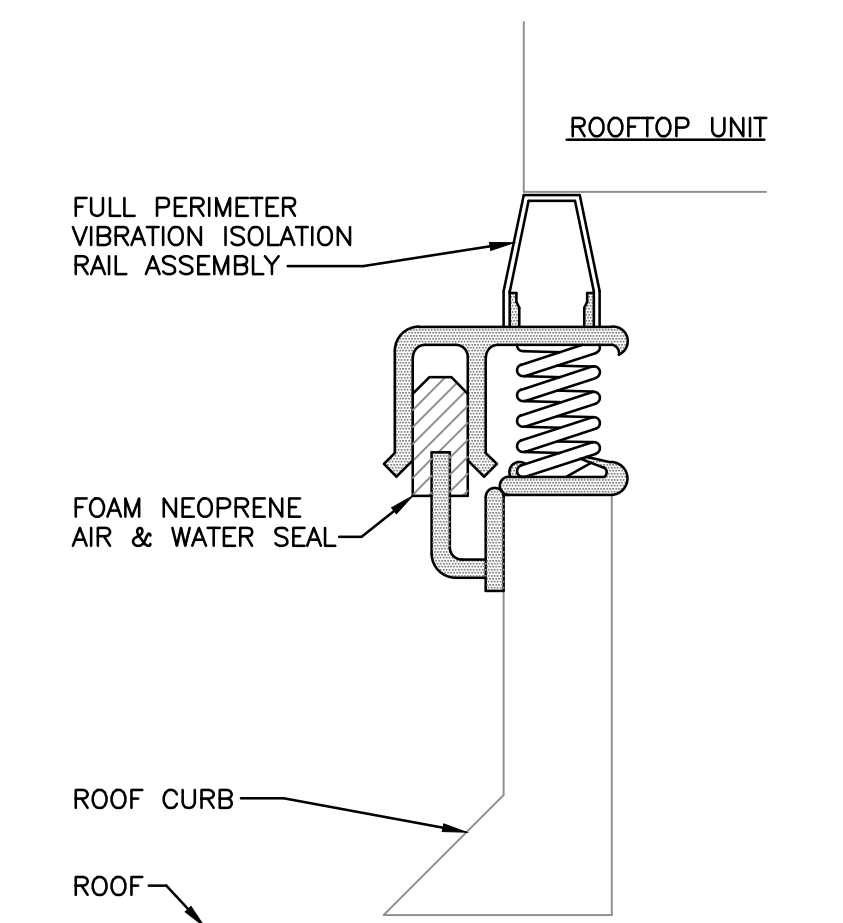
**FLEXIBLE DUCT INSTALLATION DETAIL**  
 NOT TO SCALE



**ROOF MOUNTED EXHAUST FAN DETAIL**  
 NOT TO SCALE



**NEGATIVE PRESSURE TRAP**  
 NO SCALE DET-159



**ROOFTOP VIBRATION ISOLATION DETAIL**  
 NOT TO SCALE D-119 SEC:15160

DRAWING	DATE
<input type="checkbox"/> DD MEETING #1	07/16/2019
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<input type="checkbox"/> BID SET	11/15/2023
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REVISIONS/ADDENDUMS

**MECHANICAL DETAILS**

**M501**  
 8 OF 14 SHEETS



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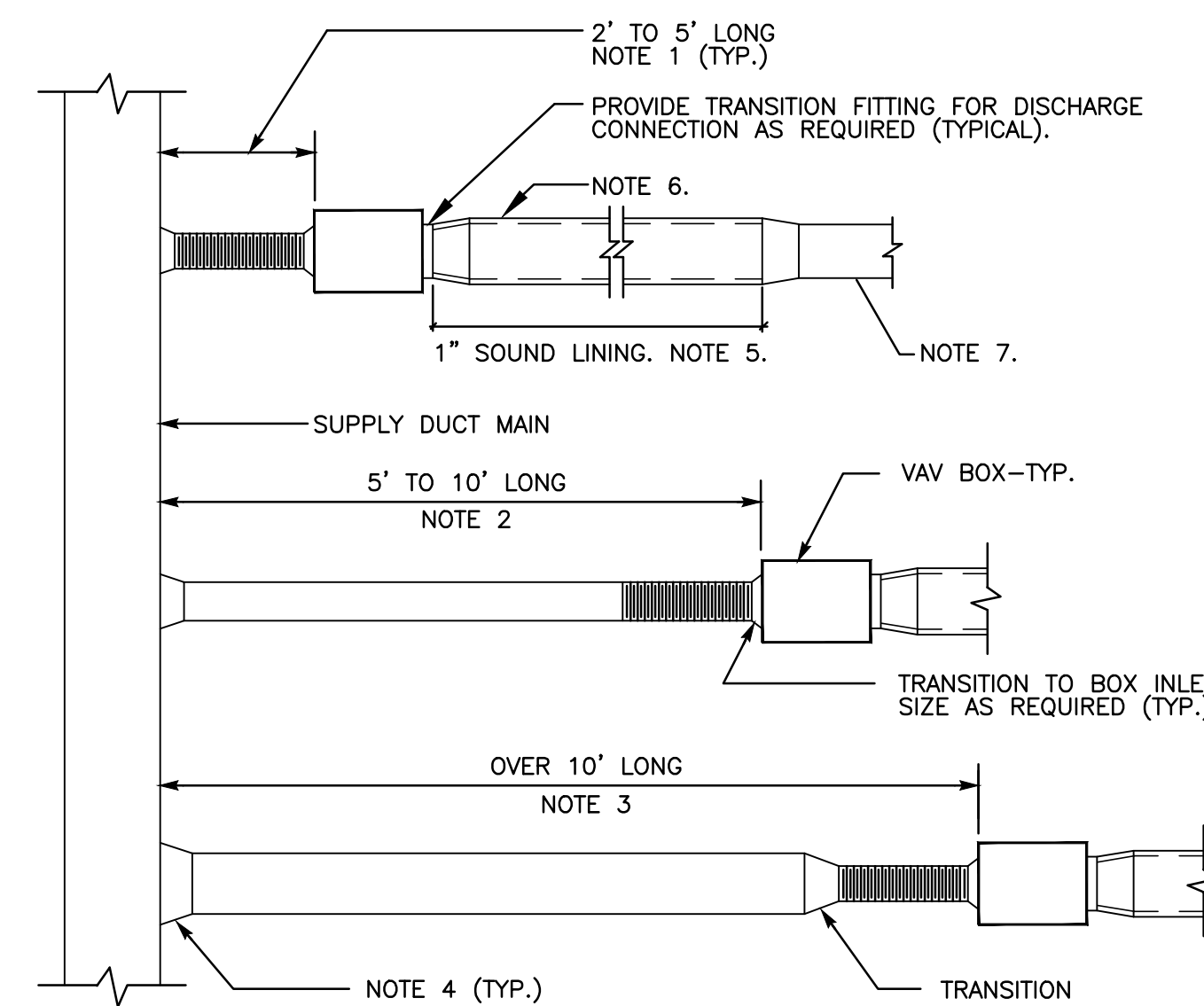
REVISIONS/ADDENDUMS

**MECHANICAL DETAILS**

**M502**

9 OF 14 SHEETS

216118



**NOTES:**

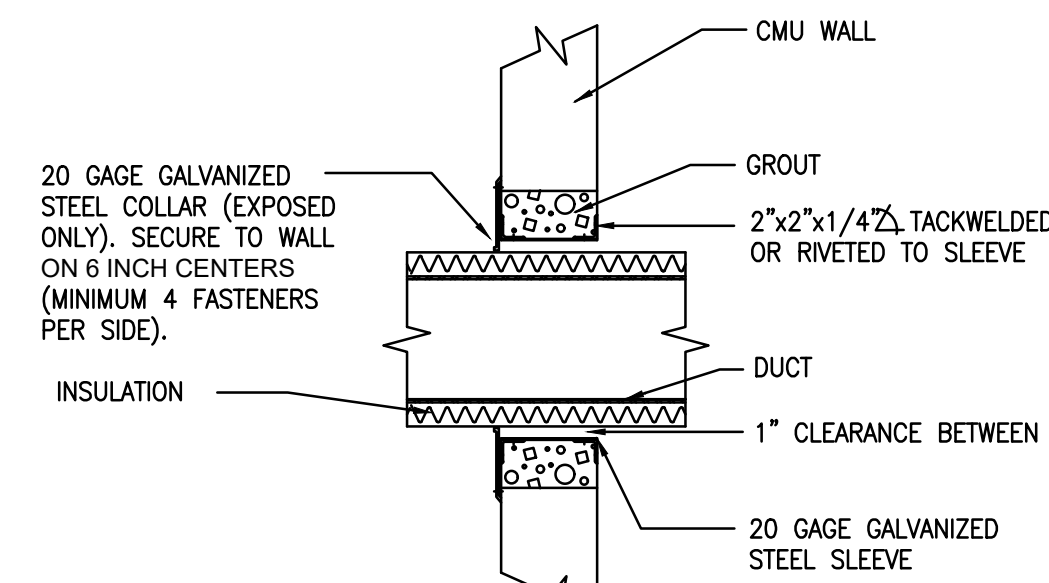
1. PROVIDE 2' MIN. STRAIGHT FLEXIBLE DUCT AT BOX INLET (TYPICAL).
2. PROVIDE 5' MAX. FLEXIBLE DUCT OF STANDARD INLET DUCT SIZE PLUS SHEET METAL DUCT OF STANDARD INLET DUCT SIZE FOR COMBINED LENGTH UP TO 10' MAX (SEE SCHEDULE FOR SIZES).
3. PROVIDE 5' MAX. FLEXIBLE DUCT OF STANDARD INLET DUCT SIZE PLUS SHEET METAL DUCT OF INCREASED INLET DUCT SIZE FOR COMBINED LENGTH OVER 10' LONG (SEE SCHEDULE FOR SIZES).

STANDARD INLET DUCT SIZE	5"ø	6"ø	8"ø	10"ø	12"ø	14"ø
INCREASED INLET DUCT SIZE	6"ø	8"ø	10"ø	12"ø	14x12	18x12

4. PROVIDE RECTANGULAR TO ROUND, CONICAL TAP, OR EQUIVALENT AT EACH CONNECTION TO SUPPLY DUCT MAIN.
5. RUN LINING FOR 10 FT. OR THRU FIRST ELBOW (TYPICAL).
6. PROVIDE DOWNSTREAM TRANSITION WHERE SHOWN ON PLANS (TYPICAL).

**VAV BOX DETAIL**

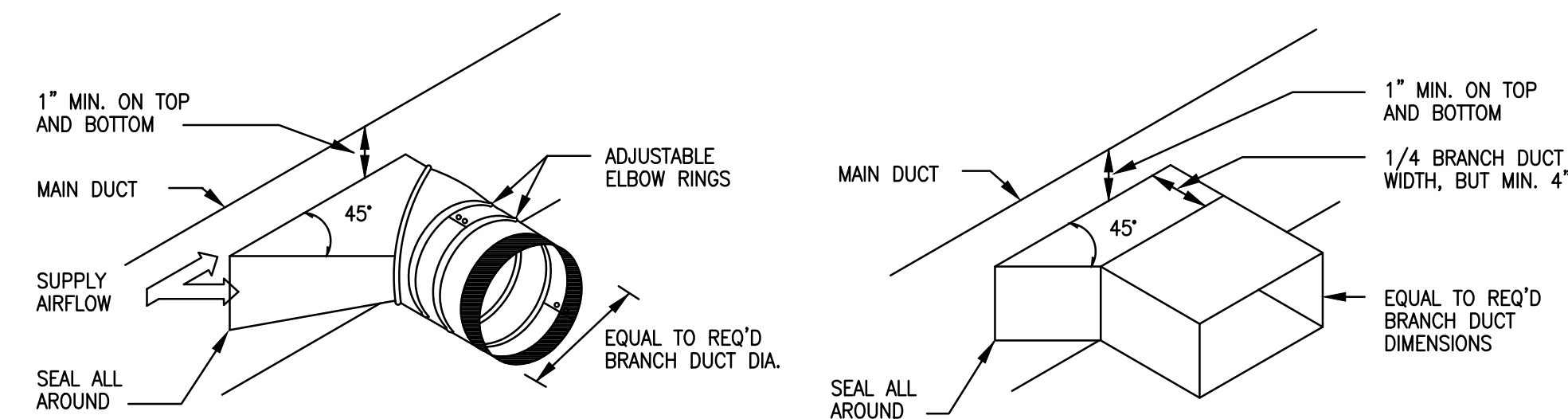
NOT TO SCALE



**NOTES:**  
 (NOT APPLICABLE TO FIRE-RATED WALLS)

**DUCT PENETRATION THROUGH WALL**

NOT TO SCALE

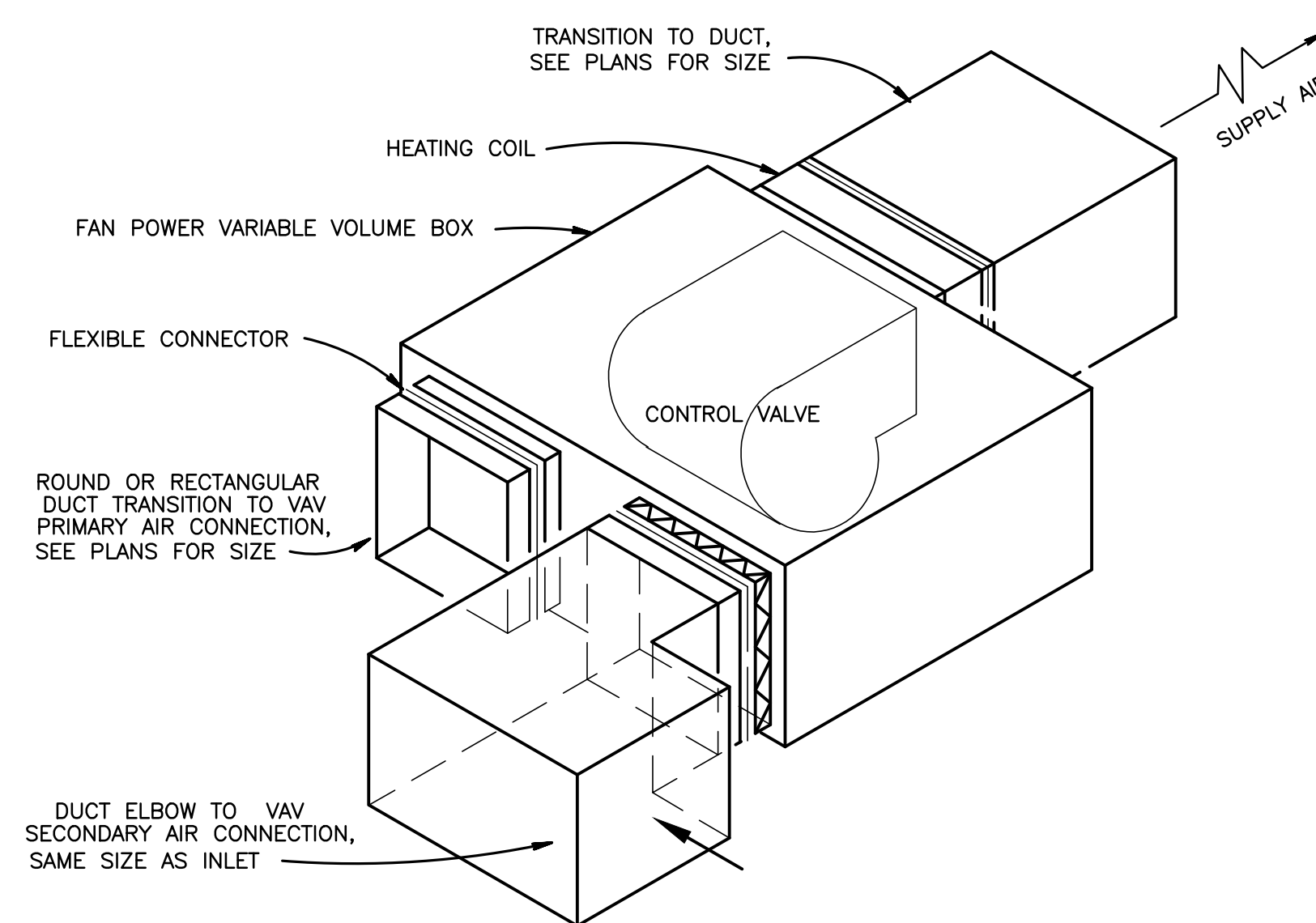


**NOTES:**

1. PROVIDE MANUAL BALANCING DAMPER AT ALL BRANCH TAKE-OFFS TO AIR DEVICES AND AS INDICATED ON PLANS FOR BRANCH DUCTS.

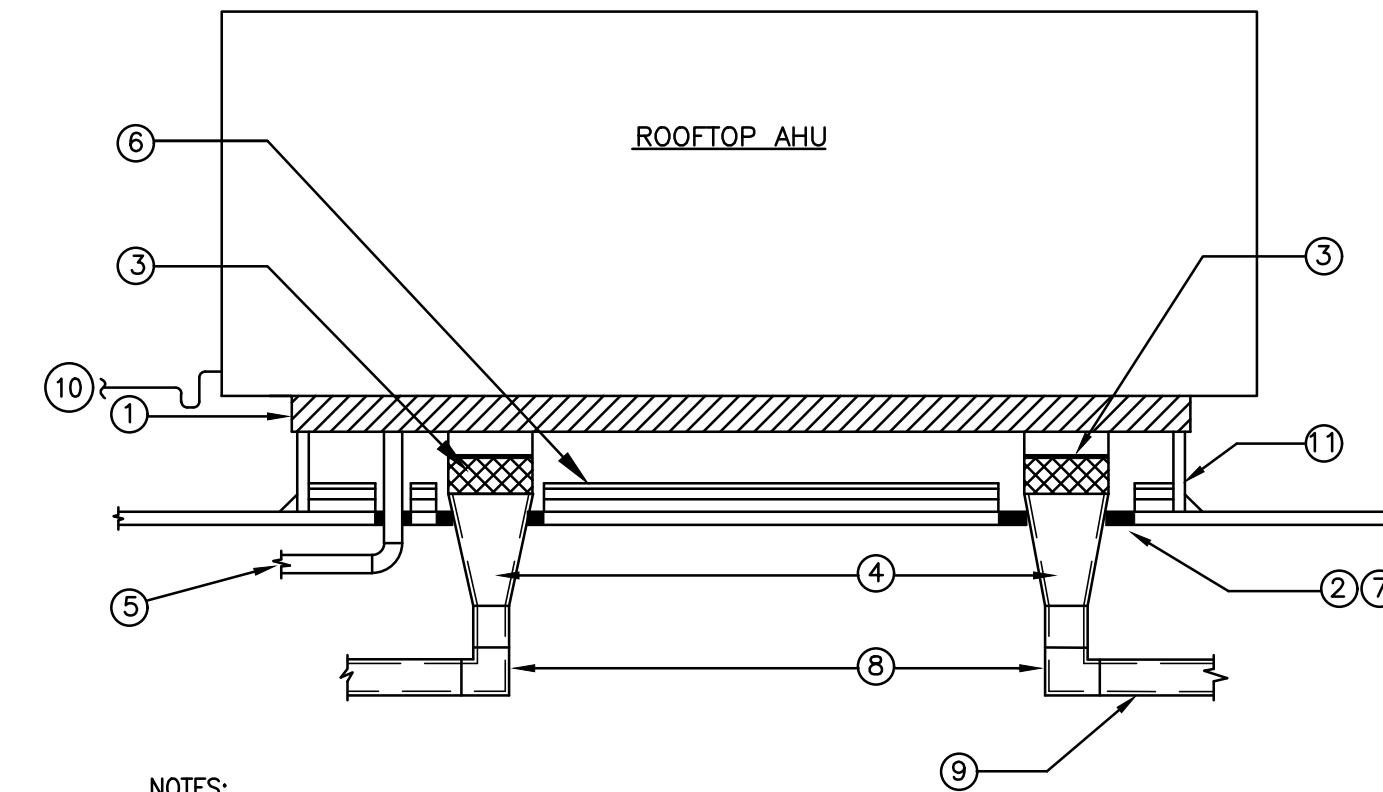
**TYPICAL DUCT BRANCH TAKE-OFF FITTING**

NOT TO SCALE



**FAN POWERED VAV BOX DETAIL**

NOT TO SCALE

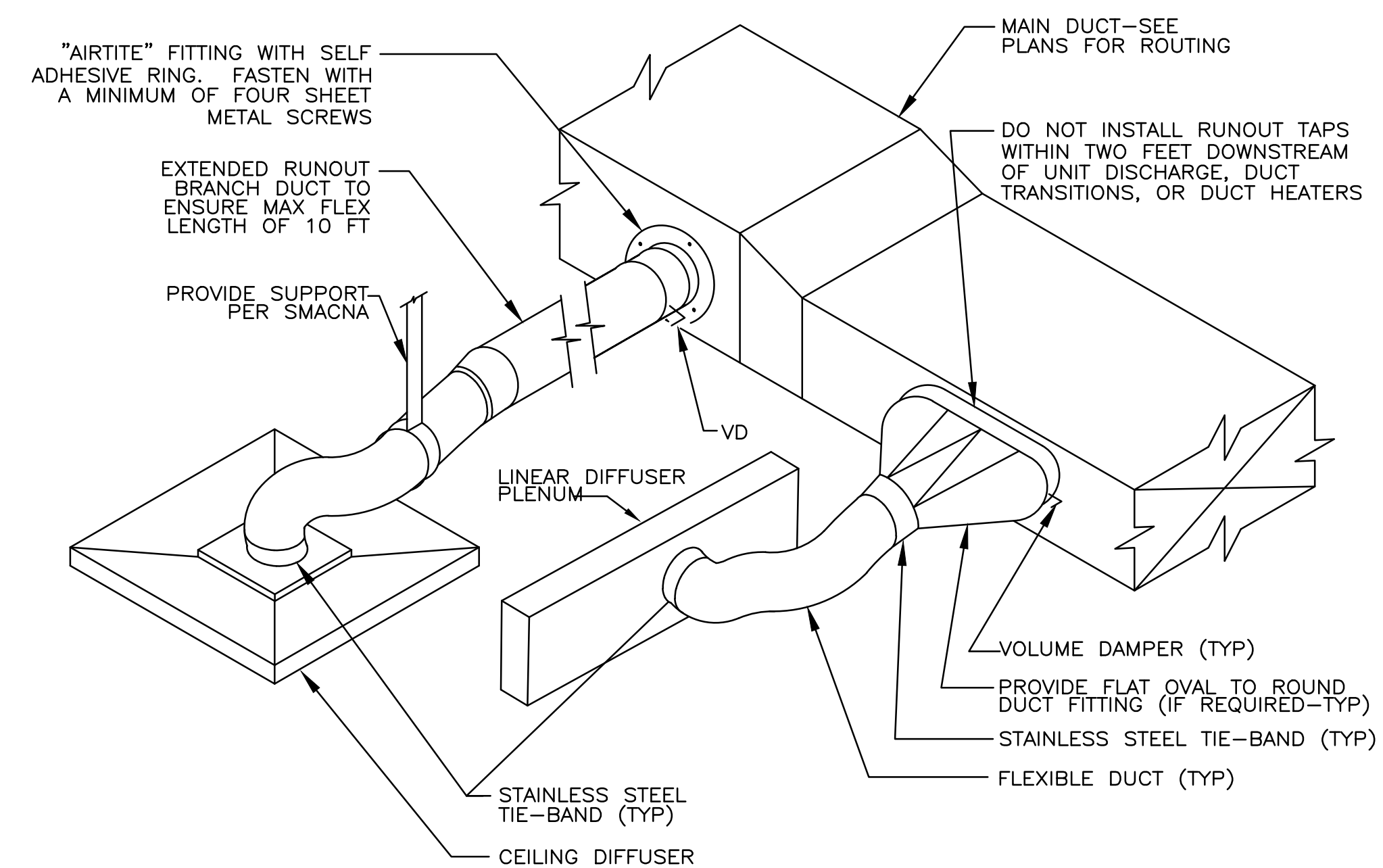


**NOTES:**

1. PROVIDE SPRING ISOLATION RAILS WITHIN CUSTOMIZED CURB. THE SPRING ISOLATION SHALL BE OF 2" DEFLECTION.
2. MECHANICAL CONTRACTOR SHALL COORDINATE ROOF OPENINGS FOR ACTUAL EQUIPMENT PURCHASED AND FOR REQUIREMENTS OF INSTALLATION METHODS USED.
3. PROVIDE 6" MINIMUM FLEXIBLE DUCT CONNECTION AT SUPPLY AND RETURN DUCT.
4. TRANSITION IN VERTICAL.
5. POWER SUPPLY WITHIN CURB.
6. PROVIDE 3" MINIMUM SEMI-RIGID INSULATION OVER ROOF INSIDE CURB. COVER WITH 2 LAYERS OF 5/8" FRT PLYWOOD WITH STAGGERED JOINTS. SEAL JOINTS & EDGES WITH NON-HARDENING SEALER.
7. PACK ALL OPENINGS THRU ROOF WITH ACOUSTIC MATERIAL. PROVIDE NON-HARDENING SEALER ABOVE AND BELOW.
8. PROVIDE BOTH SUPPLY AND RETURN DUCTS WITH 2" SOUNDING LINING FOR 25 FEET FROM UNIT.
9. PROVIDE SUPPLY DUCT OF 16 GAUGE SHEET METAL FOR 25 FEET FROM UNIT.
10. CONDENSATE DRAIN WITH TRAP. TERMINATE AT NEAREST ROOF DRAIN.
11. ROOF CURB.

**ROOFTOP AHU DETAIL**

NOT TO SCALE



**CEILING DIFFUSER HOOK-UP DETAIL**

NOT TO SCALE

### ROOF TOP A/C UNIT SCHEDULE

RTU NO	GENERAL DATA				SUPPLY AIR FAN DATA							DX COOLING COIL DATA						COMPRESSOR DATA				
	SERVICE	NET TOTAL CAP (MBH)	NET SENS CAP (MBH)	OA QTY (CFM)	UNIT TYPE	AIR QTY (CFM)	EXT SP (INS WG)	FAN TYPE	FAN RPM	DRIVE TYPE	MOTOR BHP	MOTOR HP	ROWS/ FPI	ENT AIR °F		COIL LVG AIR °F		UNIT LVG AIR °F		QTY	TYPE	REFRIGERANT TYPE
													DB	WB	DB	WB	DB	WB				
RTU-1	SANCTUARY	790.2	453.1	7970	SINGLE ZONE VAV	17,400	1.5	DIRECT DRIVE & VFD	1,626	DIRECT	20.2	(2) 15	3/14	74.6	65.1	47.9	47.9	66.2	55.8	6	DIGITAL SCROLL	R-410A
RTU-2	ENTRY CONCOURSE	180.9	121.43	1050	MULT-ZONE VAV	5090	1.73	BC PLENUM	1,363	DIRECT	-	3.0	-	78.2	66.5	54.8	54.3	56.9	55.1	2	SCROLL	R-410A
RTU-3	STAGE	143.1	103.6	1050	SINGLE ZONE VAV	4280	1.99	BC PLENUM	1618	DIRECT	-	4.6	-	73.0	64.0	52.8	52.3	-	-	1	SCROLL	R-410A
RTU-4	CLASSES	433.6	255.7	4290	MULT-ZONE VAV	10,900	2.0	DIRECT DRIVE & VFD	1325	DIRECT	10.02	(2) 7.5	3/12	74.1	64.7	50.3	49.9	88.0	64.5	2	DIGITAL SCROLL	R-410A
RTU-5	OFFICES	89.7	61.3	580	MULT-ZONE VAV	2550	1.5	BC PLENUM	1341	DIRECT	-	3.0	-	78.2	66.4	54.6	54.2	56.7	55.0	1	SCROLL	R-410A
RTU-6	CLASSES	143.0	93.5	1130	MULT-ZONE VAV	4500	1.4	BC PLENUM	1658	DIRECT	-	4.6	-	77.3	66.6	56.2	55.6	58.8	56.6	2	SCROLL	R-410A
RTU-7	KITCHEN	66.8	46.1	250	SINGLE ZONE VAV	2065	1.8	BC PLENUM	1306	DIRECT	-	3.0	-	73.8	63.0	50.9	50.6	53.8	51.9	1	SCROLL	R-410A

RTU NO	HEATER DATA		CONDENSER FAN DATA		EXHAUST FAN DATA			ELECT DATA			APPROX OPERATING WEIGHT (LBS) (W/O CURB)	EER	IEER	ROOF TOP UNIT BASIS OF DESIGN	NOTES		
	HEATER TYPE	INPUT CAP (MBH)	OUTPUT CAP (MBH)	FAN TYPE	DRIVE TYPE	ESP	FAN BHP	FAN RPM	VOLTS	MCA						MOCP	
RTU-1	NATURAL GAS FIRED	1200.0	972.0	PROPELLER	DIRECT	1.0	5.1	1548	460	3	188.3	200	12,253	11.7	11.7	TRANE HORIZON MODEL OANG080C3	13-36
RTU-2	NATURAL GAS FIRED	250.0	202.5	PROPELLER	DIRECT	-	-	-	460	3	41.0	50	2331	11.9	18.0	TRANE PRECEDENT MODEL YHJ180	1, 2, 4-11, 13
RTU-3	NATURAL GAS FIRED	250.0	202.5	PROPELLER	DIRECT	-	-	-	460	3	33.0	45	1,487	10.8	15.8	TRANE PRECEDENT MODEL YHJ150	1, 3-11, 13
RTU-4	NATURAL GAS FIRED	400.0	324.0	PROPELLER	DIRECT	1.0	1.77	1333	460	3	109.6	125.0	8025	11.2	11.2	TRANE HORIZON MODEL OANDS40A4	13-24, 26-36, 39
RTU-5	NATURAL GAS FIRED	120.0	97.2	PROPELLER	DIRECT	-	-	-	460	3	21.0	25	1,151	12.1	17.1	TRANE PRECEDENT MODEL YHJ090	1, 2, 4-11, 13, 37, 38
RTU-6	NATURAL GAS FIRED	250.0	202.5	PROPELLER	DIRECT	-	-	-	460	3	33.0	45.0	1,467	12.1	15.8	TRANE PRECEDENT MODEL YHJ150	1, 2, 4-11, 13, 37, 38
RTU-7	NATURAL GAS FIRED	150.0	121.5	PROPELLER	DIRECT	-	-	-	460	3	18.0	20.0	1,133	12.1	12.1	TRANE PRECEDENT MODEL YHJ072	1, 3-11, 13

- NOTES:**
- FACTORY MOUNTED BACNET DDC CONTROLLER
  - PROVIDE MULTIPLE ZONE VAV CONTROLS, COMPLETE WITH SUPPLY FAN VFD, DISCHARGE AIR TEMPERATURE SENSOR AND DUCT STATIC PRESSURE SENSOR WITH FAN PRESSURE OPTIMIZATION CONTROL SEQUENCE.
  - PROVIDE SINGLE ZONE VAV CONTROLS, COMPLETE WITH SUPPLY FAN VFD, DISCHARGE AIR TEMPERATURE SENSOR AND ZONE TEMPERATURE SENSOR
  - COMPARATIVE ENTHALPY ECONOMIZER WITH BAROMETRIC RELIEF DAMPER
  - MERV-13 FILTERS
  - HOT GAS REHEAT
  - STAINLESS STEEL DRAIN PAN
  - CONDENSER HAIL GUARDS
  - FACTORY INSTALLED DISCONNECT SWITCH AND PHASE MONITOR
  - PROVIDE OUTDOOR AIRFLOW MEASURING SYSTEM
  - STAINLESS STEEL HEAT EXCHANGER
  - UNIT TO HAVE 3 COMPRESSORS WITH 5 CAPACITY STEPS
  - ROOF CURB
  - BACNET INTERFACE
  - DOUBLE WALL 2" R13 INSULATION ON ALL CABINET SIDES AND BOTTOM PANEL
  - ENTIRE CABINET EXTERIOR PREPRINTED
  - DIGITAL SCROLL COMPRESSORS
  - RUBBER SLEEVES ON CAPILLARIES OFF THE DISTRIBUTOR TUBES THAT PREVENTS TUBE RUBS AND LEAKS
  - CONDENSATE OVERFLOW SWITCH
  - ACTIVE (VFD) HEAD PRESSURE CONTROL LOW AMBIENT CONTROL
  - CONTROL DISPLAY TD7 - FACTORY MOUNTED
  - DAMPER LEAKAGE CLASS 1A
  - MODULATING OA & RA DAMPER W/ECONOMIZER
  - NON FUSED DISCONNECT "CIRCUIT BREAKER"
  - GAS INDIRECT HEAT 20:1 TURNDOWN MODULATING HEAT
  - ERV - COMPOSITE CONSTRUCTION WITH FROST CONTROL WITH VFD. SEE ENERGY RECOVERY SYSTEM SCHEDULE FOR ENERGY RECOVERY WHEEL INFORMATION.
    - A. ERV ON METAL TRACK FOR EASE OF SERVICING
    - B. ERV ROTATION SENSOR
  - EXHAUST DAMPERS - GRAVITY
  - EXHAUST FAN MOTOR TYPE - DDP W/ VFD (NO BELT DRIVES ALLOWED TO ENHANCE SERVICEABILITY)
  - AIRFLOW MONITORING: OUTSIDE AIRFLOW MONITORING; SUPPLY AND EXHAUST FAN WITH PIEZO RINGS/TAPS
  - MERV-13 FILTERS
  - CONDENSER HAILGUARDS
  - HOT GAS REHEAT - FIN AND TUBE MODULATING HGRH
    - A. MODULATING HGRH WITH 6" GAP
  - SUPPLY FAN - DDP W/VFD (NO BELT DRIVES ALLOWED TO ENHANCE SERVICEABILITY)
    - A. SF ON METAL TRACK FOR EASE OF SERVICING
  - CONTROLS - SINGLE ZONE VAV WITH UC600 BACNET CONTROLLER
    - A. FACTORY SEQUENCE PROVIDED; CUSTOM SEQUENCING AT ADDITIONAL COST
  - WARRANTY
    - A. 12/18 PARTS WARRANTY
    - B. 2ND THRU 5TH YEAR COMPRESSOR PARTS ONLY
    - C. 25 YEAR STAINLESS STEEL HEAT EXCHANGER PARTS ONLY
  - FACTORY STARTUP
  - 2 STAGE HEATING
  - UNIT INSTALLED HUMIDISTAT.
  - GAS INDIRECT HEAT 10:1 TURNDOWN MODULATING HEAT

### ENERGY RECOVERY SYSTEM SCHEDULE

GENERAL		RTU-1	
RTU SERVICE:		ROOF	
LOCATION:			
<b>PERFORMANCE DATA: COOLING SEASON</b>			
OUTDOOR AIRSTREAM		SUPPLY AIRSTREAM	
DRY BULB (°F):	90.2	DRY BULB (°F):	76.5
WET BULB (°F):	73.9	WET BULB (°F):	66.4
AIRFLOW (CFM):	8505	AIRFLOW (CFM):	7970
EXHAUST AIRSTREAM		RETURN AIRSTREAM	
DRY BULB (°F):	86.4	DRY BULB (°F):	73.0
WET BULB (°F):	71.7	WET BULB (°F):	63.9
AIRFLOW (CFM):	8505	AIRFLOW (CFM):	7970
SUPPLY SENSIBLE EFFICIENCY:	0.78	SUPPLY LATENT EFFICIENCY:	0.73
SUPPLY AIR PRESSURE LOSS:	0.43 IN WG	EXHAUST AIR PRESSURE LOSS:	0.43 IN WG
TOTAL CAPACITY:	219.00 MBH	SENSIBLE CAPACITY:	113.81 MBH
SENSIBLE CAPACITY:	113.81 MBH	LATENT CAPACITY:	105.19 MBH
<b>PERFORMANCE DATA: HEATING SEASON</b>			
OUTDOOR AIRSTREAM		SUPPLY AIRSTREAM	
DRY BULB (°F):	14.0	DRY BULB (°F):	59.7
WET BULB (°F):	10.0	WET BULB (°F):	54.4
AIRFLOW (CFM):	8505	AIRFLOW (CFM):	7970
EXHAUST AIRSTREAM		RETURN AIRSTREAM	
DRY BULB (°F):	27.3	DRY BULB (°F):	73.0
WET BULB (°F):	27.1	WET BULB (°F):	63.9
AIRFLOW (CFM):	8505	AIRFLOW (CFM):	7970
SUPPLY SENSIBLE EFFICIENCY:	0.78	SUPPLY LATENT EFFICIENCY:	0.73
SUPPLY AIR PRESSURE LOSS:	0.43 IN WG	EXHAUST AIR PRESSURE LOSS:	0.43 IN WG
TOTAL CAPACITY:	681.09 MBH	SENSIBLE CAPACITY:	394.74 MBH
SENSIBLE CAPACITY:	394.74 MBH	LATENT CAPACITY:	287.35 MBH
BASIS OF DESIGN: TRANE ERV-86170C			
NOTE: PROVIDE THE UNIT WITH FILTERS AT THE RECOVERY WHEEL RETURN AND OUTDOOR AIRSTREAMS.			

### ENERGY RECOVERY SYSTEM SCHEDULE

GENERAL		RTU-4	
RTU SERVICE:		ROOF	
LOCATION:			
<b>PERFORMANCE DATA: COOLING SEASON</b>			
OUTDOOR AIRSTREAM		SUPPLY AIRSTREAM	
DRY BULB (°F):	90.2	DRY BULB (°F):	79.4
WET BULB (°F):	73.9	WET BULB (°F):	68.1
AIRFLOW (CFM):	4054	AIRFLOW (CFM):	3850
EXHAUST AIRSTREAM		RETURN AIRSTREAM	
DRY BULB (°F):	83.6	DRY BULB (°F):	73.0
WET BULB (°F):	70.2	WET BULB (°F):	63.9
AIRFLOW (CFM):	4004	AIRFLOW (CFM):	3800
SUPPLY SENSIBLE EFFICIENCY:	0.62	SUPPLY LATENT EFFICIENCY:	0.58
SUPPLY AIR PRESSURE LOSS:	0.98 IN WG	EXHAUST AIR PRESSURE LOSS:	1.00 IN WG
TOTAL CAPACITY:	82.8 MBH	SENSIBLE CAPACITY:	42.9 MBH
SENSIBLE CAPACITY:	42.9 MBH	LATENT CAPACITY:	39.9 MBH
<b>PERFORMANCE DATA: HEATING SEASON</b>			
OUTDOOR AIRSTREAM		SUPPLY AIRSTREAM	
DRY BULB (°F):	10.0	DRY BULB (°F):	47.7
WET BULB (°F):	10.0	WET BULB (°F):	46.7
AIRFLOW (CFM):	4054	AIRFLOW (CFM):	3850
EXHAUST AIRSTREAM		RETURN AIRSTREAM	
DRY BULB (°F):	36.5	DRY BULB (°F):	73.0
WET BULB (°F):	36.3	WET BULB (°F):	63.9
AIRFLOW (CFM):	4004	AIRFLOW (CFM):	3800
SUPPLY SENSIBLE EFFICIENCY:	0.63	SUPPLY LATENT EFFICIENCY:	0.59
SUPPLY AIR PRESSURE LOSS:	1.00 IN WG	EXHAUST AIR PRESSURE LOSS:	1.00 IN WG
TOTAL CAPACITY:	260.03 MBH	SENSIBLE CAPACITY:	160.18 MBH
SENSIBLE CAPACITY:	160.18 MBH	LATENT CAPACITY:	99.85 MBH
BASIS OF DESIGN: TRANE ERV-4136C			
NOTE: PROVIDE THE UNIT WITH FILTERS AT THE RECOVERY WHEEL RETURN AND OUTDOOR AIRSTREAMS.			

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<p>Architect is not responsible for any dimensions scaled from drawings. Dimensions noted take precedence.</p>	<p><b>D</b></p>
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**DESIGN TECH INC.**  
 Engineering Services  
 10410 Kensington Parkway, Suite 200  
 Kensington, MD 20895  
 Phone: 301 949-2068 • Fax: 301 949-2069  
 Project #: 19161

**NEW BUILDING FOR:**

# GALILEE BAPTIST CHURCH

6300 WOODYARD ROAD,  
UPPER MARLBORO, MD 20772

DRAWING	DATE
<input type="checkbox"/> DD MEETING #1	07/16/2019
<input type="checkbox"/> DD MEETING #2	09/06/2019
<input type="checkbox"/> DD MEETING #3	10/06/2023
<input type="checkbox"/> BID SET	11/15/2023
<input checked="" type="checkbox"/> AVL COORD / BID SET	12/08/2023
<input type="checkbox"/> PERMIT SET	

REVISIONS/ADDENDUMS

## MECHANICAL SCHEDULES

# M503

10 OF 14 SHEETS

**B**

**C**

**A**

Architect is not responsible for any dimensions scaled from drawings. Dimensions noted take precedence.

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NEW BUILDING FOR:  
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 6300 WOODYARD ROAD,  
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DRAWING	DATE
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<input type="checkbox"/> BID SET	11/15/2023
<input checked="" type="checkbox"/> AVL COORD / BID SET	12/08/2023
<input type="checkbox"/> PERMIT SET	

REVISIONS/ADDENDUMS

**MECHANICAL SCHEDULES**

AIR DEVICE SCHEDULE							
<b>ROUND DIFFUSER</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
400-650	14"ø	45.5"	5-18-15	0.022	<30	TITUS TMRA	1-4
1200-1400	20"ø	45.5"	8-12-21	0.031	<30	TITUS TMRA	1-4
<b>CEILING DIFFUSER</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
0-149	6"ø	24x24	2-4-7	0.063	<20	TITUS TMSA	1-4
150-200	8"ø	24x24	2-3-5	0.036	<20	TITUS TMSA	1-4
201-399	10"ø	24x24	4-6-12	0.044	<20	TITUS TMSA	1-4
400-600	12"ø	24x24	6-9-18	0.068	<25	TITUS TMSA	1-4
<b>CEILING GRILLE</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
50-174	8x6	24x24	-	-	< 20	TITUS 50F	1-3
175-320	12x8	24x24	-	-	< 20	TITUS 50F	1-3
321-750	18x10	24x24	-	-	< 20	TITUS 50F	1-3
751-1199	18x18	24x24	-	-	< 20	TITUS 50F	1-3
1200-1500	22x22	24x24	-	-	< 20	TITUS 50F	1-3
<b>LAMINAR FLOW SUPPLY DIFFUSER</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
0-600	12"ø	24x24	7.75	0.04	< 20	CAPTIVEAIRE DI-PSP	1-3
<b>ALUMINUM GRILLE</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
0-400	SIZE ON PLAN	24x24	-	-	< 20	TITUS 350FL	1-3
6000-9000	58"x18"	60"x20"	-	-	< 20	TITUS 350FL	1-3
<b>SIDEWALL DIFFUSER</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
550-650	10x14	12x16	16-24-35	0.016	< 20	TITUS 350FL	1-4
<b>TRANSFER GRILLE</b>							
CFM RANGE	NECK (IN)	FACE (IN)	THROW	MAX APD	MAX NC	BASIS OF DESIGN	NOTES
50-500	INLET SIZE ON PLAN +2"	24x24	-	-	< 20	TITUS 50F	1-3

**NOTES:**  
 1. ALL DIFFUSERS AND GRILLES SHALL BE PROVIDED WITH A BORDER COMPATIBLE WITH THE INSTALLED CEILING SYSTEM. REFER TO THE ARCHITECTURAL REFLECTED CEILING PLANS FOR CEILING TYPES.  
 2. ALL CEILING DIFFUSERS, (CD) SHALL HAVE A 4-WAY BLOW PATTERN UNLESS INDICATED OTHERWISE.  
 3. COORDINATE COLOR WITH ARCHITECT  
 4. OPPOSED BLADE VOLUME DAMPER

MAKE-UP AIR UNIT SCHEDULE	
<b>GENERAL DESIGNATION:</b>	MAU-1 HOSPITALITY KITCHEN ROOF MAKE-UP AIR UNIT W/ EXHAUST FAN
<b>SERVICE:</b>	
<b>LOCATION:</b>	
<b>UNIT TYPE:</b>	
<b>SUPPLY AIR FAN DATA</b>	FORWARD CURVED DOWNBLAST END 2664 CFM O.A. INTAKE POSITION: 0.5 IN WG EXT / TOTAL STATIC PRESS: 1,333 RPM FAN SPEED: 2 HP, 1.43 BHP FAN DRIVE DATA:
<b>EXHAUST AIR FAN DATA</b>	ANPA 22 7900 CFM EXT / TOTAL STATIC PRESS: 1.0 IN WG FAN SPEED: 1,604 RPM FAN DRIVE DATA: 7.5 HP, 5.85 BHP
<b>HEATING SECTION DATA</b>	INDIRECT GAS-FIRED HEATER TYPE: 215.4 MBH / 174.5 MBH INPUT / OUTPUT CAPACITY:
<b>FILTER DATA</b>	(8) 12"x20"x2" PLEATED MEDIA MERV 10
<b>QUANTITY / SIZE:</b>	
<b>FILTER TYPE:</b>	
<b>EFFICIENCY:</b>	
<b>ELECTRICAL DATA:</b>	480V / 3 PH / 60 Hz APPROX OPERATING WEIGHT: 1161 LBS. (Exc Curb Wt) BASIS OF DESIGN: CAPTIVEAIRE EA2-IBT-400
<b>NOTES:</b>	1. THE MAKE-UP AIR UNIT, KEF-1 OPERATION SHALL AUTOMATICALLY ACTIVATE WHENEVER COOKING OPERATIONS OCCUR. THE ACTIVATION OF THE EXHAUST FAN SHALL OCCUR THROUGH AN INTERLOCK WITH THE HOODS. 2. PROVIDE MAKE-UP AIR UNIT WITH THE FOLLOWING ACCESSORIES: • DOUBLE WALL CONSTRUCTION • REMOVABLE ACCESS PANELS • ROOF CURB W/ 1-INCH INSULATION, METAL LINER • WEATHERHOOD W/ BIRSCREEN • SMOKE DETECTOR • REMOTE KITCHEN PANEL • THRU THE CURB ELECTRICAL / GAS PROVISIONS • 115V FACTORY WIRING CONVENIENCE OUTLET • HINGED CURB CAP MOUNTED W/ CABLES 3. SEE CAPTIVE AIRE HOOD DETAILS FOR FURTHER INFORMATION.

FAN SCHEDULE										
FAN NO.	LOCATION	SERVICE	PERFORMANCE DATA			MOTOR DATA		APPROX OPERATING WT (LBS) (Exc Curb)	BASIS OF DESIGN	NOTES
			AIR QTY (CFM)	ESP (IN WG)	FAN RPM	POWER RATING (HP)	VOLTS PH			
EF-1	ROOM 134	TOILET EXHAUST	70	0.25	900	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-2	ROOM 128	TOILET EXHAUST	70	0.25	900	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-3	ROOM 121	TOILET EXHAUST	70	0.25	900	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-4	ROOM 177	TOILET EXHAUST	70	0.25	900	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-5	ROOM 165	TOILET EXHAUST	70	0.25	900	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-6	ROOM 118A	TOILET EXHAUST	70	0.25	850	15 W	115 / 1	12	GREENHECK SP-A90	4
EF-7	ROOF	TOILET EXHAUST	300	0.5	1332	1/4	115 / 1	29	GREENHECK G-095-VG	1,2
EF-8	ROOF	TOILET EXHAUST	1180	0.5	974	1/2	115 / 1	54	GREENHECK G-140-VG	1,2
KEF-1	ROOF	KITCHEN	3134	1.5	1372	2	460 / 3	172	ECON-AIR EADU180H	1,3,5
EF-9	ROOF	JANITOR	175	0.5	1467	1/10	115 / 1	28	GREENHECK G-080-VG	1,6
EF-10	ROOF	SEC.	175	0.5	1467	1/10	115 / 1	28	GREENHECK G-080-VG	1,6
EF-11	ROOF	SEC.	175	0.5	1467	1/10	115 / 1	28	GREENHECK G-080-VG	1,6
EF-12	ROOF	AVL	175	0.5	1467	1/10	115 / 1	28	GREENHECK G-080-VG	1,6
EF-13	ROOF	ELECTRICAL	100	0.25	1474	1/15	115 / 1	19	GREENHECK G-060-VG	1,7

**NOTES:**  
 1. PROVIDE FANS WITH THE FOLLOWING ACCESSORIES AS INDICATED.  
 A. PRE-FABRICATED, ALUMINUM ROOF CURB, (18-INCHES HIGH)  
 B. NEMA-1 DISCONNECT SWITCH  
 C. UNIT MOUNTED VARIABLE SPEED CONTROL  
 2. EXHAUST FAN SHALL OPERATE CONTINUOUSLY DURING THE OCCUPIED HOURS OF USAGE WITH SWITCH OVERRIDE DURING UNOCCUPIED HOURS.  
 3. FAN SHALL BE INTERLOCKED TO OPERATE WITH KITCHEN HOOD  
 4. PROVIDE FANS WITH THE FOLLOWING ACCESSORIES AS INDICATED.  
 A. STANDARD DISCONNECT  
 B. GRAVITY BACKDRAFT DAMPER  
 C. PROVIDE WITH VFD FOR BALANCING AND SOFT START  
 D. INTERLOCK WITH LIGHT SWITCH  
 5. SEE CAPTIVE AIRE HOOD DETAILS FOR FURTHER INFORMATION.  
 6. EXHAUST FAN SHALL OPERATE CONTINUOUSLY 24/7.  
 7. INTERLOCK WITH NEW WALL SWITCH, INSTALL NEXT TO DOOR

UNIT HEATER SCHEDULE	
<b>DESIGNATION:</b>	UH-A
<b>UNIT TYPE:</b>	WALL MOUNTED, FAN FORCED ENTRY
<b>SERVICE:</b>	
<b>OUTPUT CAPACITY:</b>	2.0 KW, (6820 BTU/Hr.)
<b>ELECTRICAL DATA:</b>	208 V / 1 PH / 60HZ 8.3 AMPS
<b>BASIS OF DESIGN:</b>	QMARK MODEL CWH3404F
<b>NOTE:</b>	PROVIDE UNIT HEATER WITH THE FOLLOWING ACCESSORIES: • SLEEVE FOR RECESSED INSTALLATION (CWH352) • BUILT-IN DISCONNECT SWITCH • INTEGRAL THERMOSTAT • 5-YEAR LIMITED WARRANTY

VAV TERMINAL UNIT SCHEDULE					
<b>(VAV-#) SHUT-OFF VAV UNIT</b>					
#	PRIMARY AIR		LINER	BASIC UNIT SP (IN WG)	BASIS OF DESIGN
	(#) INLET SIZE	MAX (CFM)			
6	300		1" ECOSHIELD	0.1	TRANE MODEL VCEF
8	600		1" ECOSHIELD	0.12	TRANE MODEL VCEF
10	950		1" ECOSHIELD	0.12	TRANE MODEL VCEF
12	1500		1" ECOSHIELD	0.15	TRANE MODEL VCEF
14	2000		1" ECOSHIELD	0.15	TRANE MODEL VCEF
<b>NOTES:</b> 1. REFER TO FLOOR PLAN FOR INDIVIDUAL UNIT HEATER CAPACITY. 2. ALL VAV UNITS WITH AN ELECTRIC HEATER CAPACITY OF 1.5 KW OR LESS SHALL BE RATED AT 120V/1PH. ELECTRIC HEATER CAPACITIES GREATER THAN 1.5 KW SHALL BE RATED AT 480V/3PH. 3. CONTROLLERS SHALL BE PROVIDED BY THE ATCS CONTRACTOR. 4. NC SHALL BE UNDER <25 5. INTEGRAL DISCONNECT SWITCH 6. MAXIMUM PRESSURE DROP SHALL NOT EXCEED 0.3 IN. WG. 7. ADJUST MAXIMUM PRIMARY AIR TO TOTAL ADD-UP CFM. 8. ADJUST MINIMUM PRIMARY AIR TO 30% OF MAXIMUM OR 75 CFM PER KW, WHICHEVER IS GREATER UNLESS OTHERWISE INDICATED.					

FAN POWERED VAV UNIT SCHEDULE									
<b>(FPB-#) FAN POWERED UNIT</b>									
#	PRIMARY AIR		BASIC UNIT SP (IN WG)	MOTOR HP	MOTOR TYPE	LINER	VOLTAGE	PHASE	BASIS OF DESIGN
	(#) INLET SIZE	MAX (CFM)							
6	440		0.1	1/3	ECM	1" ECOSHIELD	208	1	TITUS MODEL DTFS-B
8	700		0.1	1/3	ECM	1" ECOSHIELD	208	1	TITUS MODEL DTFS-B
10	1000		0.1	1/3	ECM	1" ECOSHIELD	208	1	TITUS MODEL DTFS-C
12	1800		0.1	1/2	ECM	1" ECOSHIELD	208	1	TITUS MODEL DTFS-D
14	2100		0.1	3/4	ECM	1" ECOSHIELD	208	1	TITUS MODEL DTFS-E
<b>NOTES:</b> 1. ELECTRIC HEATERS SHALL BE 208V/1Ø FOR UNITS 4KW AND BELOW & 480V/3Ø FOR UNITS ABOVE 4KW. SEE PLANS FOR ELECTRIC CAPACITY IN KW. 2. MAXIMUM PRESSURE DROP SHALL NOT EXCEED 0.3 IN. WG. 3. ADJUST MAXIMUM PRIMARY AIR TO TOTAL ADD-UP CFM. 4. ADJUST MINIMUM PRIMARY AIR TO 30% OF MAXIMUM OR 75 CFM PER KW, WHICHEVER IS GREATER UNLESS OTHERWISE INDICATED. 5. ADJUST FAN TO TOTAL ADD-UP CFM. 6. FAN MOTORS SHALL BE 208V/1Ø. 7. FAN EXTERNAL STATIC PRESSURE SHALL BE A MINIMUM 0.3 IN WG. (PRESSURE DROP DOES NOT INCLUDE FILTER, HEATING COIL OR BOX LOSSES.) 8. REPLACE INLET FILTER AT END OF CONSTRUCTION. 9. SOUND DATA SHALL BE OBTAINED FROM TESTS CONDUCTED IN ACCORDANCE WITH AHRI STANDARD 880-98. 10. PROVIDE DOUBLE CAMMED BOTTOM ACCESS.									

**RTU-1 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
136	Auditorium	8705	0.06	522	120	1170	5	5850	6372	0.8	7965	16400	0.49

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-3 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
132	Green Room	214	0.06	13	5	2	5	10	23	0.8	29	170	0.17
133	Storage	39	0.12	5	0	0	0	0	5	0.8	6	70	0.09
135	Side	367	0.12	44	0	0	0	0	44	1.8	24	550	0.04
136	Platform	1761	0.06	106	70	124	5	620	726	0.8	908	2735	0.33
137	Side	377.8	0.06	23	0	0	5	0	23	0.8	29	500	0.06
138	Storage	334	0.12	40	0	0	0	0	40	0.8	50	180	0.28
		3092.8		231		127		630	861		1046	4205	

maximum Zp 0.3300  
System Ventilation Efficiency (Ev) 0.8200 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 861 from equation 4-7  
OA intake flow rate (Vot) 1050 from equation 4-9  
req'd minimum OA percentage 24.97027

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-5 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
113	Vestibule	94	0.06	6	0	0	5	0	6	0.8	8	240	0.03
115	Reception	507	0.06	30	10	5	7.5	37.5	67.5	0.8	84	340	0.25
116	Office	157	0.06	9	5	2	5	10	19	0.8	24	190	0.13
117	Fl. Office	168	0.06	10	5	2	5	10	20	0.8	25	200	0.13
119	Wk	139	0.06	8	5	1	5	5	13	0.8	15	150	0.21
122	SVR	67	0.12	8	0	0	5	0	8	0.8	10	40	0.25
125	Lounge	155	0.06	9	5	1	5	5	14	0.8	18	180	0.1
126	Fin Office	207	0.06	12	5	3	5	15	27	0.8	34	120	0.28
127	Pastor Office	283	0.06	17	5	3	5	15	32	0.8	40	330	0.12
129	Storage	32	0.12	4	0	0	6	0	4	0.8	5	30	0.17
130	Office	152	0.06	9	5	2	5	10	19	0.8	24	100	0.24
131	Class/Conference	494	0.06	30	35	23	7.5	172.5	202.5	0.8	253	640	0.4
		2455		152		42		280	432		541	2485	

maximum Zp 0.4000  
System Ventilation Efficiency (Ev) 0.7500 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 432 from equation 4-7  
OA intake flow rate (Vot) 576 from equation 4-9  
req'd minimum OA percentage 23.17907

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-7 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
180	Commercial Kitchen	741	0.12	89	20	14	7.5	105	194	0.8	243	2060	0.12
		741				14		105	194		243	2060	

maximum Zp 0.1200  
System Ventilation Efficiency (Ev) 1.0300 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 105 from equation 4-7  
OA intake flow rate (Vot) 101.9417 from equation 4-9  
req'd minimum OA percentage 4.948629

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-2 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
100	Vestibule	624	0.06	37	0	0	5	0	37	0.8	46	1200	0.04
101	Foyer	4744	0.06	285	10	72	7.5	540	825	0.8	1031	3600	0.29
104	Books	306	0.06	18	10	39	7	21	49	0.8	290	590	0.17
		5674		340		75		561	901		1126	5090	

maximum Zp 0.2900  
System Ventilation Efficiency (Ev) 0.8600 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 901 from equation 4-7  
OA intake flow rate (Vot) 1047.674 from equation 4-9  
req'd minimum OA percentage 20.58299

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-4 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
150	Vestibule	162	0.06	10	0	0	5	0	10	0.8	13	150	0.09
151	Temp Class	162	0.06	10	65	14	5	70	80	0.8	100	350	0.29
152	Temp Class	162	0.06	10	65	14	5	70	80	0.8	100	325	0.31
154	Janitor	40	0.12	5	5	0	5	0	5	0.8	6	290	0.02
156	Elem Storage	32	0.12	4	0	0	0	0	4	0.8	5	40	0.13
156	Elem Classroom	705	0.12	85	35	28	10	280	365	0.8	456	670	0.68
157	Storage	162	0.12	19	0	0	0	0	19	0.8	24	200	0.12
158	Youth Lounge	693	0.12	83	35	36	10	360	443	0.8	554	840	0.66
158	Youth Stor	26	0.12	3	0	0	0	0	3	0.8	4	30	0.13
161	Cribs	198	0.12	24	0	1	5	5	29	0.8	36	150	0.24
162	Corridor	1491	0.06	89	0	0	5	0	89	0.8	111	690	0.16
163	Cry/Nurse	149	0.06	9	5	8	5	40	49	0.8	61	110	0.55
164	Infants	471	0.18	85	25	23	10	230	315	0.8	394	850	0.46
166	Storage	14	0.12	2	0	0	0	0	2	0.8	3	25	0.12
167	Storage	15	0.12	2	0	0	0	0	2	0.8	3	25	0.12
168	Toddlers	477	0.12	57	25	24	10	240	297	0.8	371	875	0.42
170	Check in Area	692	0.06	42	0	0	5	0	42	0.8	53	400	0.13
171	Preschool Theatre	878	0.18	158	25	44	10	440	598	0.8	748	1550	0.48
172	Storage	44	0.12	5	0	0	0	0	5	0.8	6	150	0.04
173	Storage	42	0.12	5	0	0	0	0	5	0.8	6	600	0.01
176	Storage	171	0.12	21	0	0	5	0	21	0.8	26	135	0.19
179	Preschool	527	0.18	95	25	28	10	280	375	0.8	469	1035	0.45
182	Storage	148	0.12	18	0	14	0	0	18	0.8	23	390	0.06
183	Pantry	74	0.12	9	0	14	0	0	9	0.8	11	100	0.11
	Corridor Right	222	0.06	13	0	0	5	0	13	0.8	16	170	0.09
		7757				248		2015	2878		3599	10150	

maximum Zp 0.6800  
System Ventilation Efficiency (Ev) 0.4700 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 2015 from equation 4-7  
OA intake flow rate (Vot) 4287.234 from equation 4-9  
req'd minimum OA percentage 42.23876

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE

**RTU-6 VENTILATION SCHEDULE**

room #	room name	area (A) sf	Area OA rate (Ra, table 403.3) cfm/sf	Area OA (E-Ra*Ac) cfm	Occupant Density (table 403.3) ppf/1000sf	Zone Population (Pz) ppf	Ppl OA rate (Rp, table 403.3) cfm/person	Occupant OA (E-Rp*Ps) cfm	Breathing Zone OA (Vbz, eq 4-1) cfm	Zone Air Distribution Effectiveness (Ez) -	Zone OA (Voz) cfm	Supply Air Design (Vsz) cfm	OA Fraction (Zz, eq 4-5) -
105	Sec	89	0.12	11	0	0	8	0	11	0.8	14	300	0.05
106	MED	65	0.12	8	0	0	5	0	8	0.8	10	40	0.25
109	Storage	18	0.12	2	0	0	5	0	2	0.8	3	25	0.12
110	Class	630	0.06	38	65	41	5	205	243	0.8	304	700	0.43
111	Class	631	0.06	38	65	41	5	205	243	0.8	304	750	0.41
112	Storage	19	0.12	2	0	0	5	0	2	0.8	3	40	0.08
123	Corridor	720	0.06	43	0	0	5	0	43	0.8	54	400	0.14
141	OPEN OFFICE	314	0.06	19	5	15	5	75	94	0.8	118	340	0.35
142	Temp Class	126	0.06	8	65	13	5	65	73	0.8	93	300	0.3
145	Vestibule	253	0.06	15	0	0	5	0	15	0.8	19	140	0.14
146	Security	162	0.06	10	5	0	5	0	10	0.8	13	225	0.06
147	Usher	162	0.06	10	5	2	5	10	20	0.8	25	130	0.19
148	A.V.L.	162	0.06	10	5	2	5	10	20	0.8	25	580	0.04
148	Janitor	72	0.12	9	0	0	5	0	9	0.8	11	50	0.22
183	Corridor Left	609	0.06	37	0	0	5	0	37	0.8	46	300	0.15
		3878		241		114		570	811		1040	3980	

maximum Zp 0.4300  
System Ventilation Efficiency (Ev) 0.7200 from table 403.3.2.3.2  
Occupant Diversity (D) 1 no diversity in occupancy  
Uncorrected OA (Vou) 811 from equation 4-7  
OA intake flow rate (Vot) 1126.389 from equation 4-9  
req'd minimum OA percentage 28.30123

NOTES:  
VENTILATION BASED ON 2018 INTERNATIONAL MECHANICAL CODE



