



Revision table with columns for DATE, REVISION, and CHECKED/DRAWN

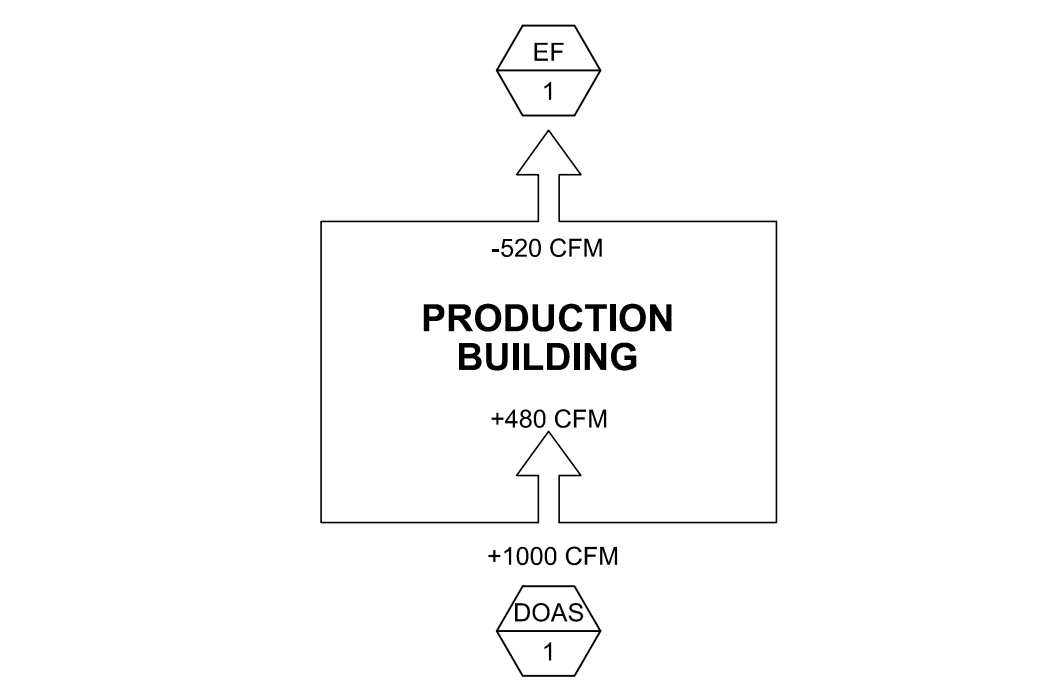
REFRIGERANT PIPING NOTES
REFRIGERANT PIPE SIZING AND ROUTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR...

ELECTRICAL COORDINATION NOTES
1. ALL ELECTRICAL WORK SHALL CONFORM TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (NFPA 70)...

BUILDING PRESSURIZATION TABLE
SYSTEM OUTSIDE AIR (CFM) EXHAUST AIR (CFM)
DOAS-1 +1000 -
EF-1 - -520

HVAC DESIGN DATA
LOCATION DAYTONA BEACH, FLORIDA
CLIMATE ZONE 2A
OUTDOOR AIR DESIGN CONDITIONS SUMMER WINTER BUILDING CONSTRUCTION

VENTILATION CALCULATIONS
MECHANICAL VENTILATION: THE VENTILATION RATE FOR EACH UNIT WAS CALCULATED PER THE 2017 FBC-MECHANICAL, SECTION 403.3 OUTDOOR AIR AND LOCAL EXHAUST AIRFLOW RATES.
Vbz = BREATHING ZONE VENTILATION
Az = ZONE FLOOR AREA (SF)
Pz = ZONE POPULATION (PEOPLE)
Rp = PEOPLE OUTDOOR AIR RATE (CFM/PERSON)
Ra = AREA OUTDOOR AIR RATE (CFM/SF)
Ez = ZONE AIR DISTRIBUTION EFFECTIVENESS
Voz = ZONE OUTDOOR AIRFLOW RATE
SCH OA = SCHEDULED OUTSIDE AIRFLOW RATE
Vbz = RpPz + RaAz (EQUATION 4-1)
Voz = Vbz/Ez (EQUATION 4-2)



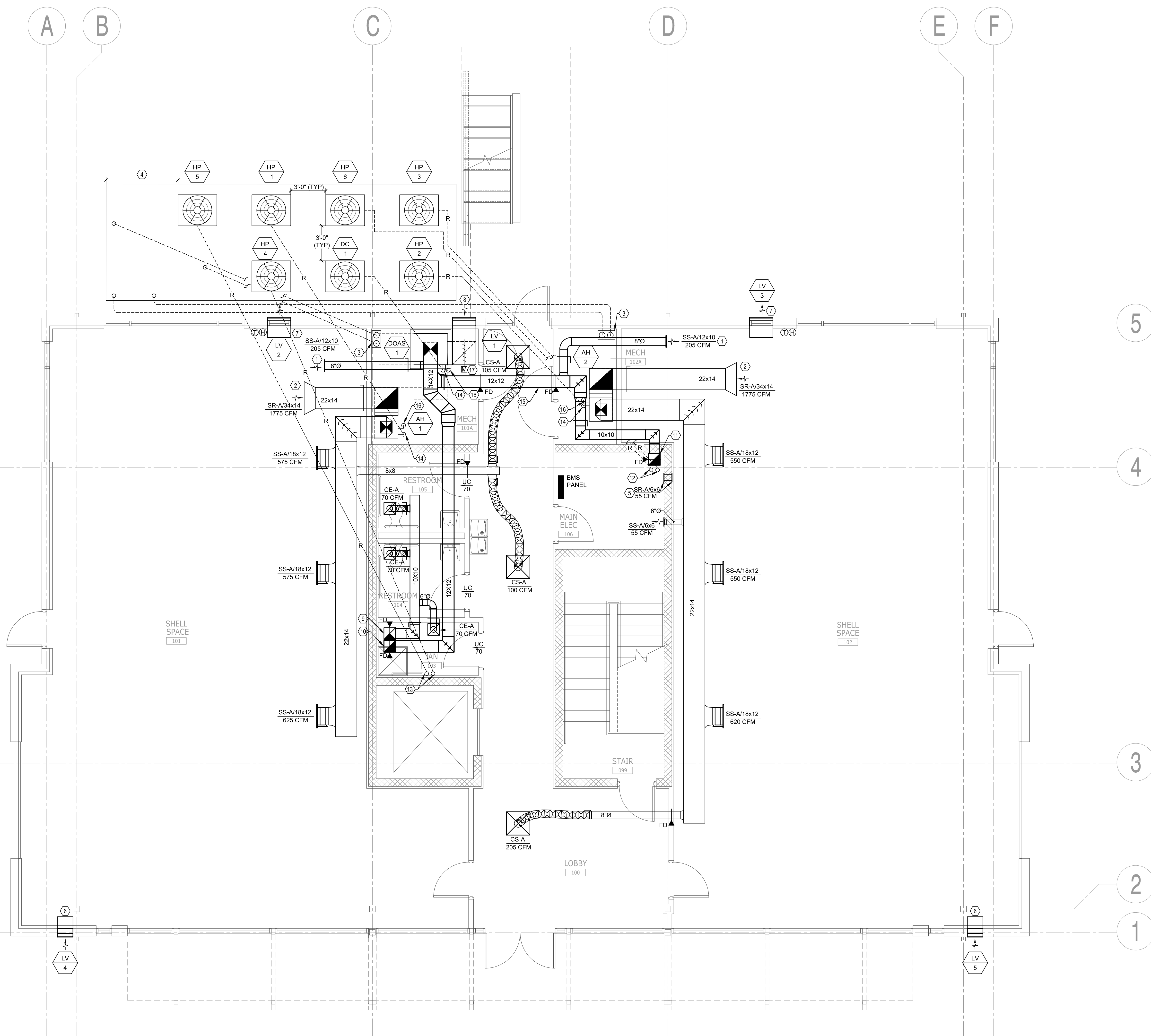
1 1.001 NOT TO SCALE
PRODUCTION BUILDING PRESSURIZATION

GENERAL NOTES
1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS.
2. REFER TO TYPICAL DETAILS FOR ADDITIONAL INFORMATION REGARDING THE INSTALLATION OF DUCTWORK, PIPING, AND EQUIPMENT.
3. THE CONTRACTOR IS EXPECTED TO ORDER MATERIALS IN SUFFICIENT TIME TO AVOID DELAYING THE COMPLETION OF THE PROJECT...

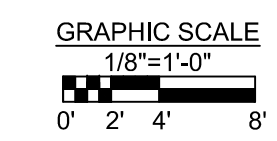
HVAC ABBREVIATIONS
ABBREV. DESCRIPTION
AC ALTERNATING CURRENT
AFF ABOVE FINISHED FLOOR
AFMS AIRFLOW MEASURING STATION

MECHANICAL LEGEND
SYMBOL DESCRIPTION
GENERAL
CS-A 100 CFM OR SS/12X6 100 CFM AIR DEVICE TAG
UC 100 UNDER CUT DOOR AIR FLOW AMOUNT (CFM)
1 OR 2 REFERENCE NOTE
X X-X DETAIL NUMBER SHEET DETAIL APPEARS
X X-X TYPE OF EQUIPMENT EQUIPMENT NUMBER
X-X-X SECTION NUMBER SHEET SECTION APPEARS
POINT OF DISCONNECTION
POINT OF CONNECTION
HVAC
24x12 RECTANGULAR DUCT, FIRST FIGURE IS DIMENSION OF SIDE SHOWN (IN INCHES)
24x12Ø FLAT OVAL DUCT, FIRST FIGURE IS DIMENSION OF SIDE SHOWN (IN INCHES)
24Ø ROUND DUCT, DIAMETER SHOWN (IN INCHES)
SUPPLY DUCT RISER
RETURN DUCT RISER
EXHAUST DUCT RISER
SUPPLY DUCT DOWN
RETURN DUCT DOWN
EXHAUST DUCT DOWN
DUCT CONTINUES
MANUAL VOLUME DAMPER
BACKDRAFT DAMPER
MOTORIZED DAMPER
FIRE DAMPER (HORIZONTAL)
FIRE DAMPER (VERTICAL)
SMOKE DAMPER (HORIZONTAL)
SMOKE DAMPER (VERTICAL)
COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
DUCT-MOUNTED SMOKE DETECTOR
DUCT ACCESS DOOR - TOP
DUCT ACCESS DOOR - BOTTOM
DUCT ACCESS DOOR - SIDE
DUCT RISE OR DROP IN DIRECTION OF FLOW
SQUARE TO ROUND DUCT TRANSITION
TERMINAL UNIT
CROSS HATCHED AREA = MINIMUM CLEARANCE FOR HEATER ACCESS, MAINTAIN CLEARANCE.
SINGLE LINE DUCTWORK
BELL MOUTH TAP W/MVD
MVD HAS REMOTE CONTROL IN RIGID CEILING
FLEXIBLE DUCT
SUPPLY OUTLET (SEE AIR DEVICE SCHEDULE)
RETURN INLET (SEE AIR DEVICE SCHEDULE)
RETURN INLET WITH BALANCING DAMPER
EXHAUST INLET (SEE AIR DEVICE SCHEDULE)
LINEAR DIFFUSER
ELBOW WITH TURNING VANES
ROTATING BEACON LIGHT
CARBON MONOXIDE SENSOR
CARBON DIOXIDE SENSOR
NITROGEN OXIDE SENSOR
SMOKE DETECTOR AV ANNUNCIATOR
HUMIDISTAT
REFRIGERANT SENSOR
DUCT SMOKE DETECTOR
THERMOSTAT
TEMPERATURE SENSOR

NOTES:
1. THIS IS A GENERAL COMPILATION OF SYMBOLS AND NOT ALL SYMBOLS SHOWN MAY BE USED ON THE CONTRACT DRAWINGS.
2. SCREENED SYMBOLS OR TEXT (EXAMPLE: AHU) INDICATE EXISTING EQUIPMENT OR CONDITIONS.
3. SCREENED AND DASHED AND LINES INDICATE LINES HIDDEN IN VIEW.



1 FLOOR PLAN - FIRST FLOOR - MECHANICAL
M1.101 1/4"=1'-0"



REFERENCE NOTES

- ① OUTSIDE AIR DUCT SERVING THE SPACE WITH DISCHARGE DIRECTLY TO THE SPACE. PROVIDE SIDEWALL SUPPLY AIR DEVICE AND BALANCING DAMPER IN THE DUCT AS SHOWN AND BALANCE AIRFLOW TO VALUE INDICATED.
- ② PROVIDE FLARED END DUCT FITTING AT END OF RETURN AIR DUCT AS SHOWN. COVER ENTIRE OPENING WITH 18 GAUGE 1/4 INCH BY 1/4 INCH WELDED WIRE MESH.
- ③ PROVIDE TWO (2) 8-INCH SCHEDULE 80 PVC SLEEVES THROUGH THE FLOOR TO THE EXTERIOR. ROUTE SLEEVES UNDERGROUND TO THE CONCRETE HOUSEKEEPING PAD AND TURN UP. FILL ALL OPEN ENDS WITH EXPANDABLE FOAM TO CREATE AN AIR AND WATER TIGHT SEAL. SLEEVES ARE INTENDED TO ACCOMMODATE ANY REFRIGERANT PIPING NEEDS OF ANY HVAC EQUIPMENT THAT MAY BE ADDED TO THE FIRST FLOOR SPACES IN THE FUTURE.
- ④ PROVIDE A 4-INCH THICK, CONTINUOUS CONCRETE HOUSEKEEPING PAD ON GRADE FOR GRADE MOUNTED EQUIPMENT. PROVIDE PAD WITH 6X6-W1.4XW1.4 WELDED WIRE FABRIC AT MID-DEPTH OF SLAB THROUGHOUT. TURN DOWN EDGES OF WIRE MESH 90 DEGREES INTO THICKENED EDGE ALONG ALL EDGES. PROVIDE 8" WIDE X 12" DEEP THICKENED EDGE (4" ABOVE GRADE, 8" BELOW GRADE), WITH 2-#4 CONTINUOUS BARS, ONE AT TOP CORNER, OTHER AT 3" FROM BOTTOM OF THICKENED EDGE. PROVIDE CORNER BARS AT ALL CORNERS. PROVIDE COMPACTION OF SOIL BELOW SLAB TO 95% OF MODIFIED PROCTOR, AND PROVIDE 4,000 PSI CONCRETE. EXTEND THE PAD AN ADDITIONAL 6 FEET PAST THE LAST HEAT PUMP CONDENSING UNIT FOR FUTURE HVAC EQUIPMENT.
- ⑤ SIDEWALL RETURN AIR TRANSFER DUCT FROM THE ELECTRICAL ROOM MOUNTED AS HIGH IN THE WALL AS POSSIBLE. PROVIDE INDICATED AIR DEVICE ON BOTH SIDES OF THE DUCT.
- ⑥ WALL LOUVER FOR FUTURE OUTSIDE AIR INTAKE USE. PROVIDE 12-INCH DEEP GALVANIZED STEEL BACK PAN FULL SIZE OF LOUVER AND SEAL BACK PAN AIR AND WATER TIGHT. INSULATE BACK PAN WITH INSULATION TO PREVENT CONDENSATION.
- ⑦ WALL LOUVER FOR FUTURE EXHAUST AIR DISCHARGE USE. PROVIDE 12-INCH DEEP GALVANIZED STEEL BACK PAN FULL SIZE OF LOUVER AND SEAL BACK PAN AIR AND WATER TIGHT. INSULATE BACK PAN WITH INSULATION TO PREVENT CONDENSATION.
- ⑧ OUTSIDE AIR INTAKE LOUVER. PROVIDE GALVANIZED STEEL DUCT FULL SIZE OF LOUVER EXTENDING THE DISTANCE OF DOAS-1 UNIT WIDTH. PROVIDE DUCT EXTENSION AND CONNECTION FROM LOUVER DUCT TO UNIT. CONNECT LOUVER DUCT FULL SIZE OF UNIT CONNECTION.
- ⑨ 8x8 EXHAUST AIR DUCT RISER UP TO FLOOR ABOVE. PROVIDE FIRE DAMPER AT FLOOR PENETRATION WITH ACCESS PANEL IN RISER ABOVE.
- ⑩ 10x10 OUTSIDE AIR DUCT RISER UP TO FLOOR ABOVE. PROVIDE FIRE DAMPER AT FLOOR PENETRATION WITH ACCESS PANEL IN RISER ABOVE.
- ⑪ 10x10 OUTSIDE AIR DUCT RISER UP TO FLOOR ABOVE. PROVIDE FIRE DAMPER AT FLOOR PENETRATION WITH ACCESS PANEL IN RISER ABOVE.
- ⑫ REFRIGERANT PIPING SLEEVE FROM AIR HANDLING UNITS AH-3 AND AH-6 DOWN FROM ABOVE. ROUTE SLEEVE AND PIPING DOWN UNDERGROUND OUT TO GRADE MOUNTED HEAT PUMPS HP-3 AND HP-6. COORDINATE FINAL LOCATION IN ELECTRICAL ROOM CORNER WITH ELECTRICAL GEAR IN THE ROOM TO AVOID ANY INTERFERENCE.
- ⑬ REFRIGERANT PIPING SLEEVE FROM AIR HANDLING UNITS AH-4 AND AH-5 DOWN FROM ABOVE. ROUTE SLEEVE AND PIPING DOWN UNDERGROUND OUT TO GRADE MOUNTED HEAT PUMPS HP-4 AND HP-5. COORDINATE FINAL LOCATION IN JANITOR'S CLOSET WITH MOP SINK IN THE ROOM TO AVOID ANY INTERFERENCE.
- ⑭ ROUTE REFRIGERANT SLEEVE AND PIPING FROM AIR HANDLING UNIT UNDERGROUND OUT TO GRADE MOUNTED HEAT PUMP/CONDENSING UNIT.
- ⑮ 10x10 OUTSIDE AIR DUCT ACROSS THE CORRIDOR TO MECHANICAL ROOM 102A AND ELECTRICAL ROOM VERTICAL SHAFT. PROVIDE FIRE DAMPER IN DUCT AT EACH WALL PENETRATION.
- ⑯ ROUTE UNIT CONDENSATE TO HUB DRAIN AND TERMINATE INDIRECTLY. CONDENSATE PIPE SIZE SHALL MATCH UNIT CONNECTION. HUB DRAIN CONNECTS TO THE STORM SYSTEM.
- ⑰ MOTORIZED DAMPER IN OUTSIDE AIR DUCT RISER TO DOAS-1 INTAKE.



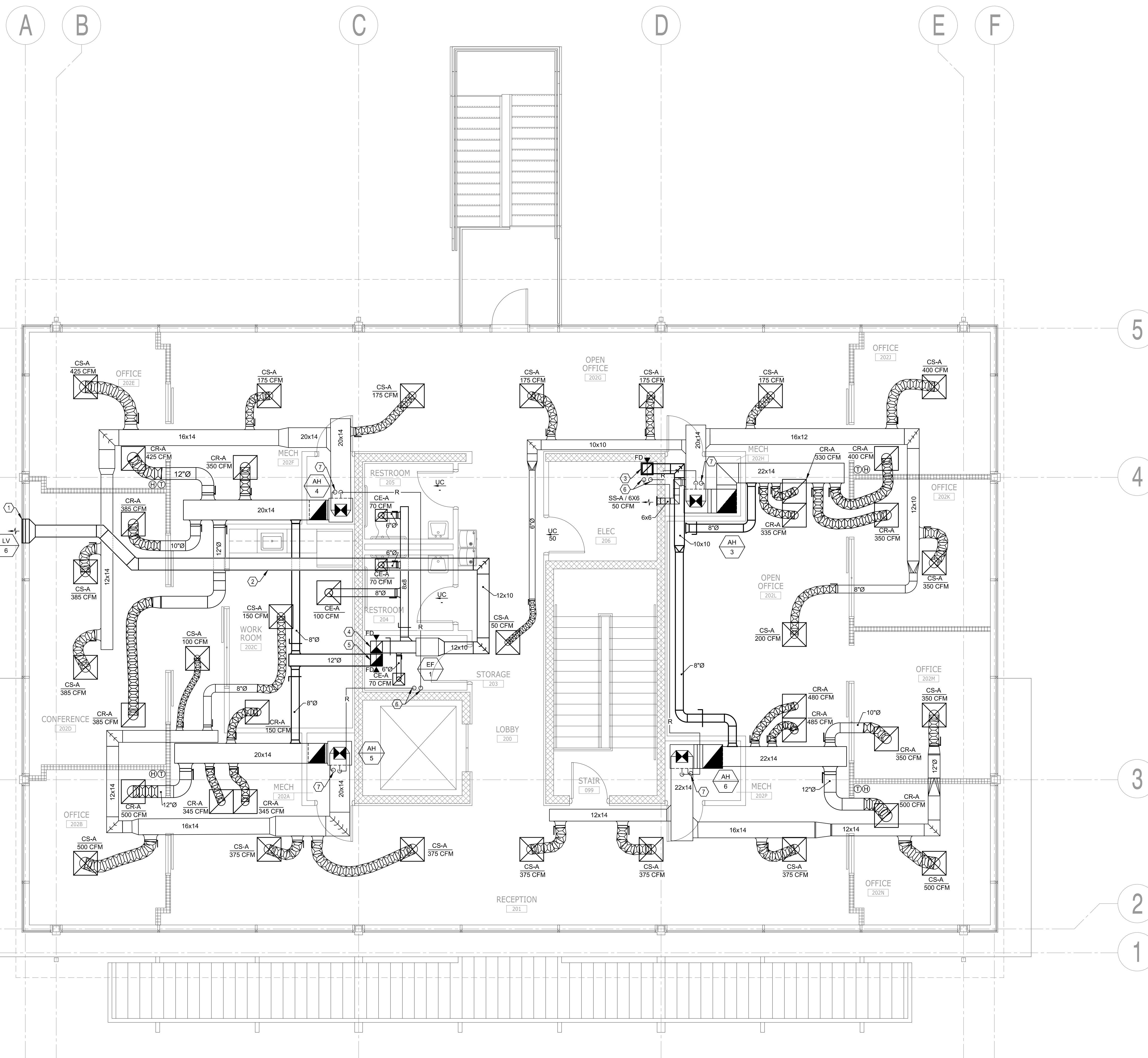
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FLOOR PLAN - FIRST FLOOR - MECHANICAL

ERAU PRODUCTION BUILDING
EMBRY-RIDDLE AERONAUTICAL UNIVERSITY, DAYTONA BEACH, FLORIDA

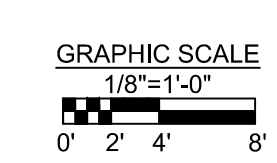
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Sheet no.: **M1.101**



REFERENCE NOTES

- 1 EXHAUST AIR LOUVER IN EXTERIOR WALL. COORDINATE FINAL LOCATION WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS. PROVIDE 12-INCH DEEP GALVANIZED STEEL BACK PAN FULL SIZE OF LOUVER AND CONNECT 12X10 EXHAUST DUCT INTO BACK PAN.
- 2 ROUTE 12X10 EXHAUST DUCT HIGH IN TRUSS SPACE TO PASS OVER DUCTS BELOW. PROVIDE TRANSITIONS AND OFFSETS UP AND DOWN IN DUCT TO ACHIEVE INTENDED ROUTING.
- 3 10X10 SUPPLY AIR DUCT UP FROM BELOW. PROVIDE FIRE DAMPER IN DUCT AT FLOOR PENETRATION WITH ACCESS PANEL IN THE DUCT RISER ABOVE THE FLOOR.
- 4 8X8 EXHAUST AIR DUCT UP FROM BELOW. PROVIDE FIRE DAMPER IN DUCT AT FLOOR PENETRATION WITH ACCESS PANEL IN THE DUCT RISER ABOVE THE FLOOR.
- 5 10X10 SUPPLY AIR DUCT UP FROM BELOW. PROVIDE FIRE DAMPER IN DUCT AT FLOOR PENETRATION WITH ACCESS PANEL IN THE DUCT RISER ABOVE THE FLOOR.
- 6 REFRIGERANT PIPING SLEEVES THROUGH THE FLOOR DOWN TO FLOOR BELOW. ROUTE REFRIGERANT PIPING FROM RESPECTIVE AIR HANDLING UNIT OUT TO GRADE MOUNTED HEAT PUMP.
- 7 ROUTE UNIT CONDENSATE TO HUB DRAIN AND TERMINATE INDIRECTLY. CONDENSATE PIPE SIZE SHALL MATCH UNIT CONNECTION. HUB DRAIN CONNECTS TO THE STORM SYSTEM.

1 FLOOR PLAN - SECOND FLOOR - MECHANICAL
M1.102 1/4"=1'-0"



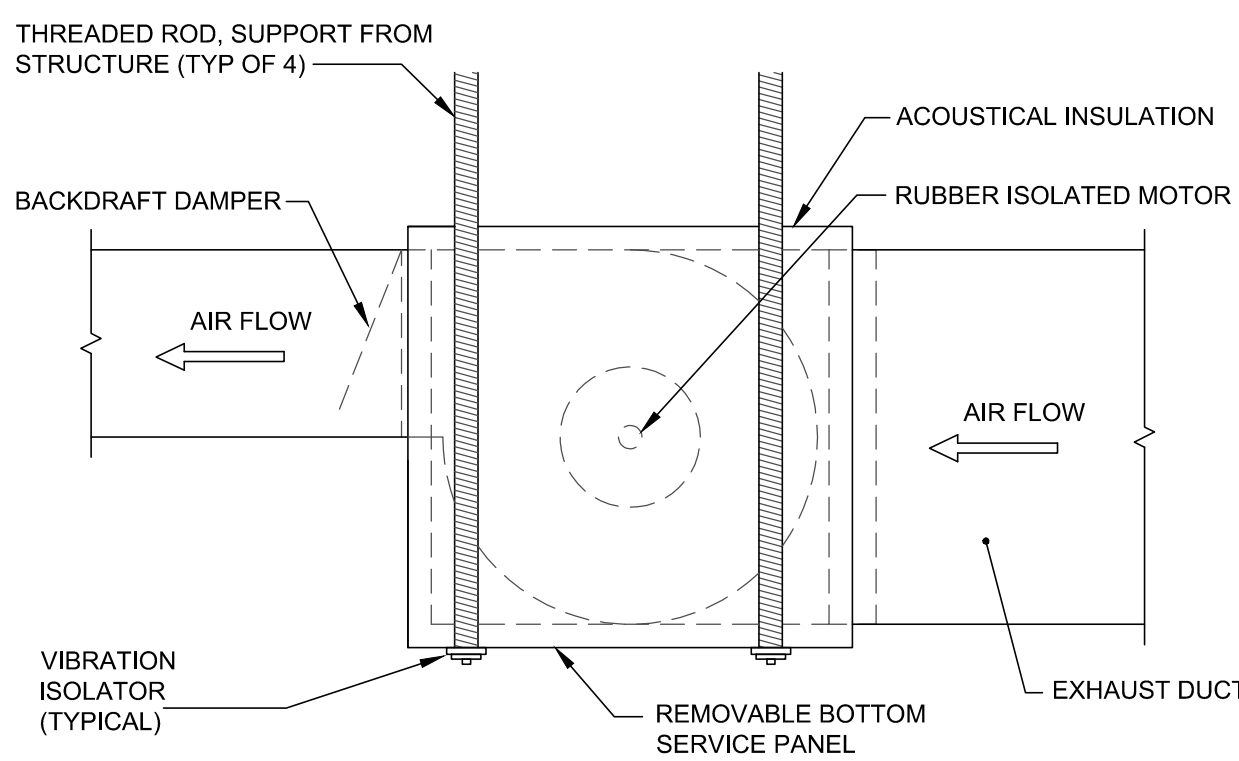
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FLOOR PLAN - SECOND FLOOR - MECHANICAL

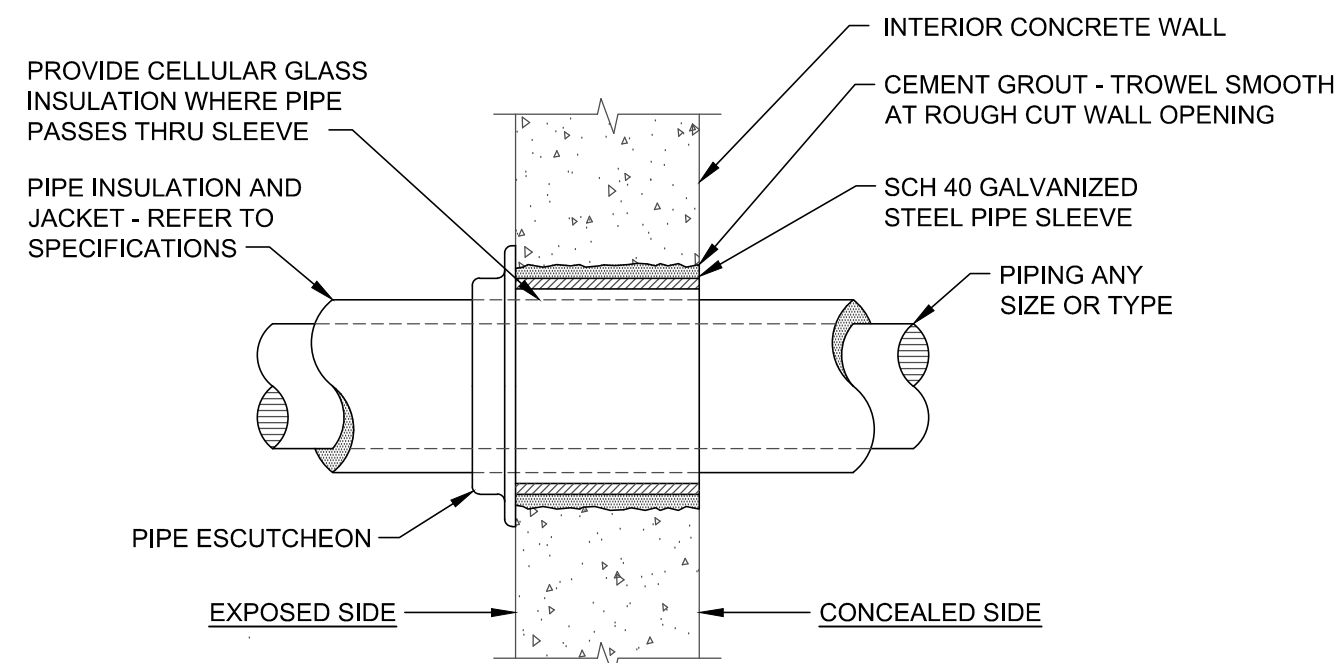
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M1.102

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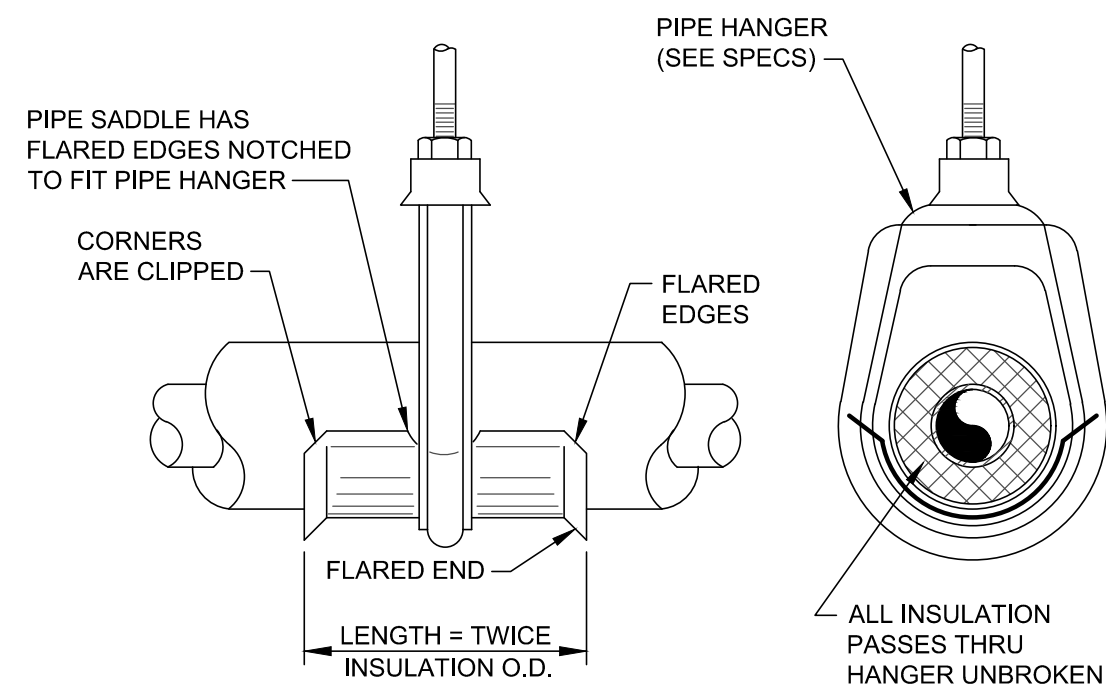


10 FAN - CABINET FAN
M1.501 NOT TO SCALE

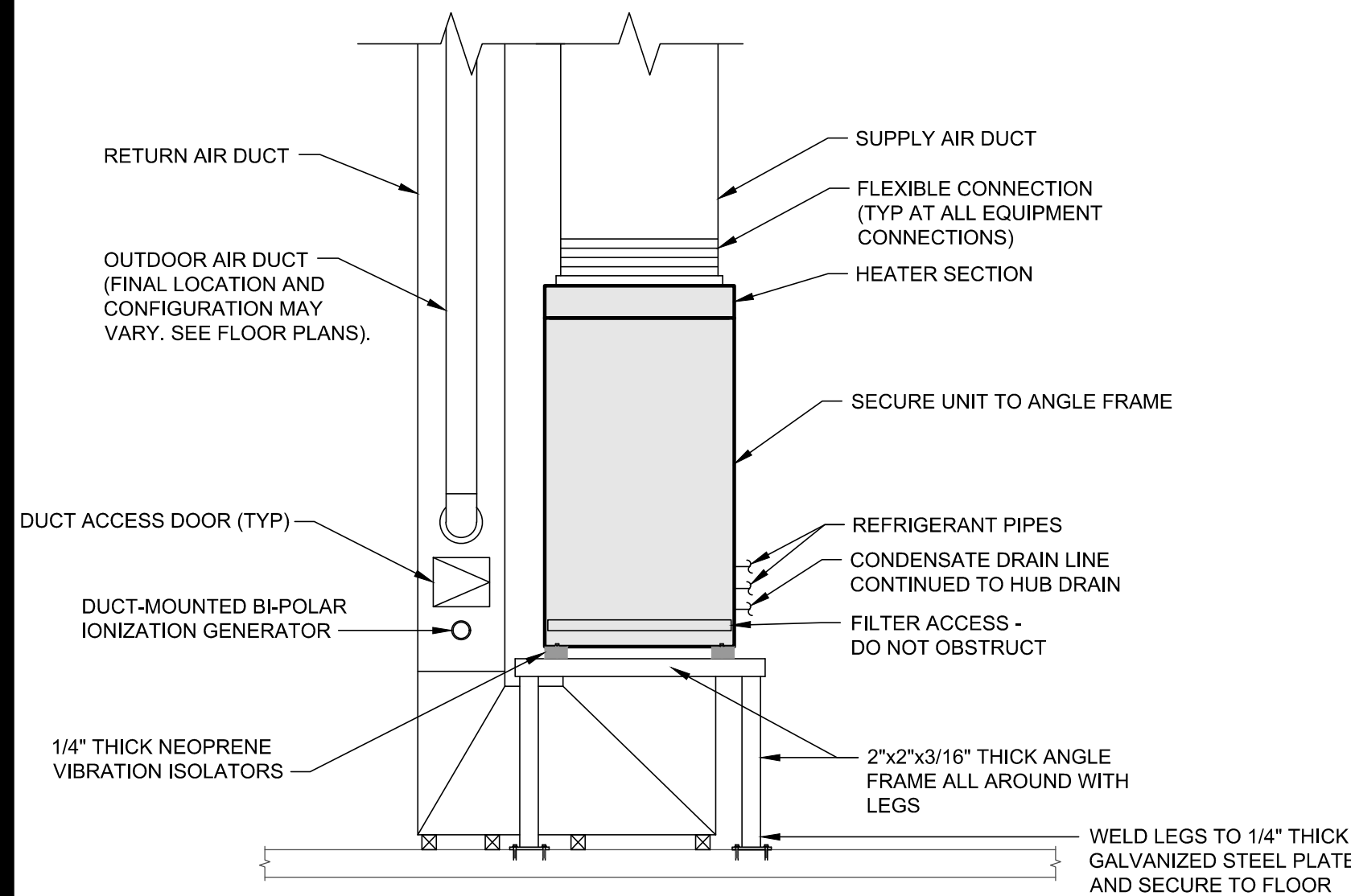


NOTES:
1. ANY UNINSULATED PIPES PASSING THRU INTERIOR WALLS MUST BE SEALED BETWEEN PIPE AND SLEEVE WITH CAULK AND FINISHED SMOOTH.

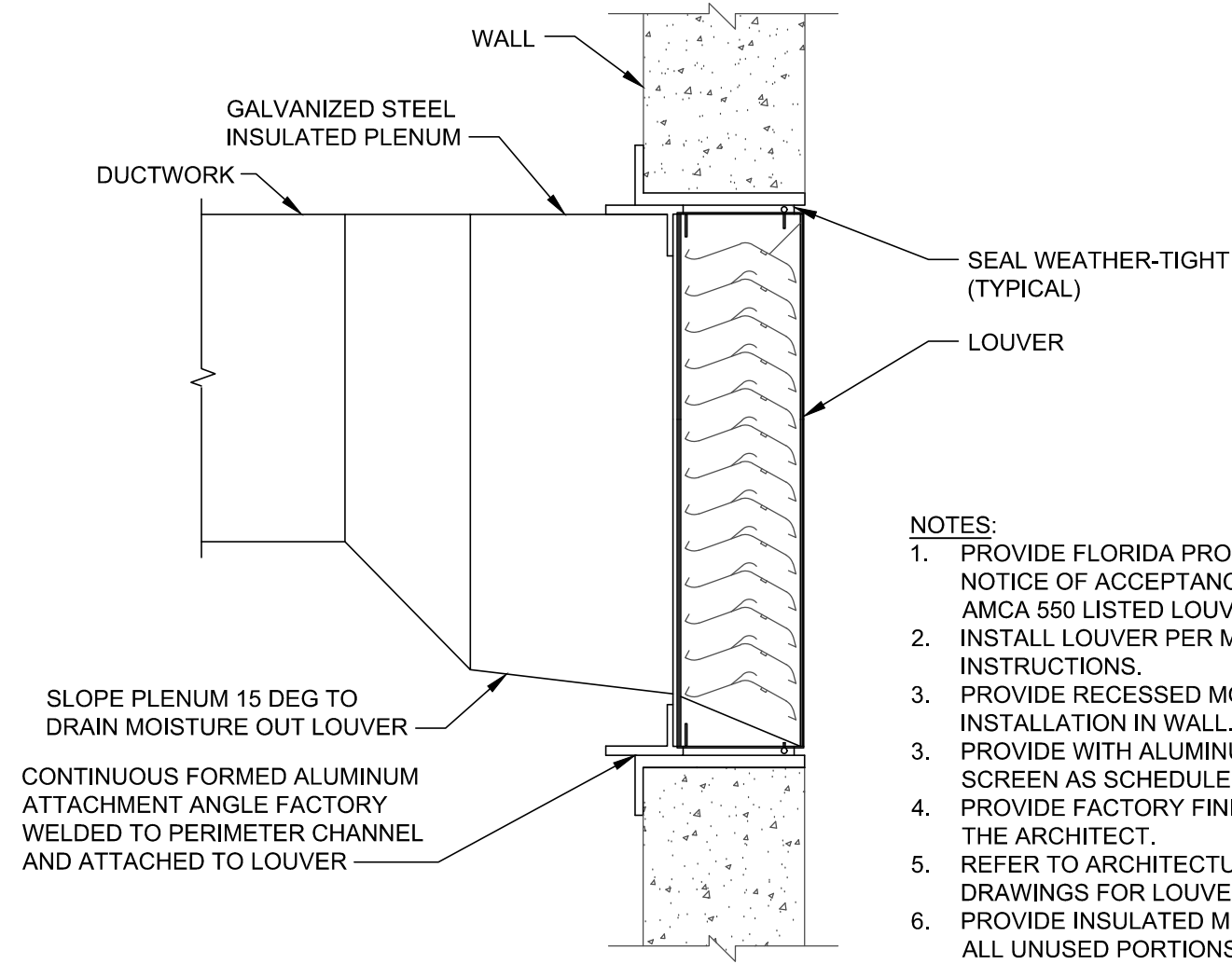
9 PIPE PENETRATION - INTERIOR WALL (NON-RATED)
M1.501 NOT TO SCALE



8 PIPE SUPPORT - INSULATED HANGER
M1.501 NOT TO SCALE

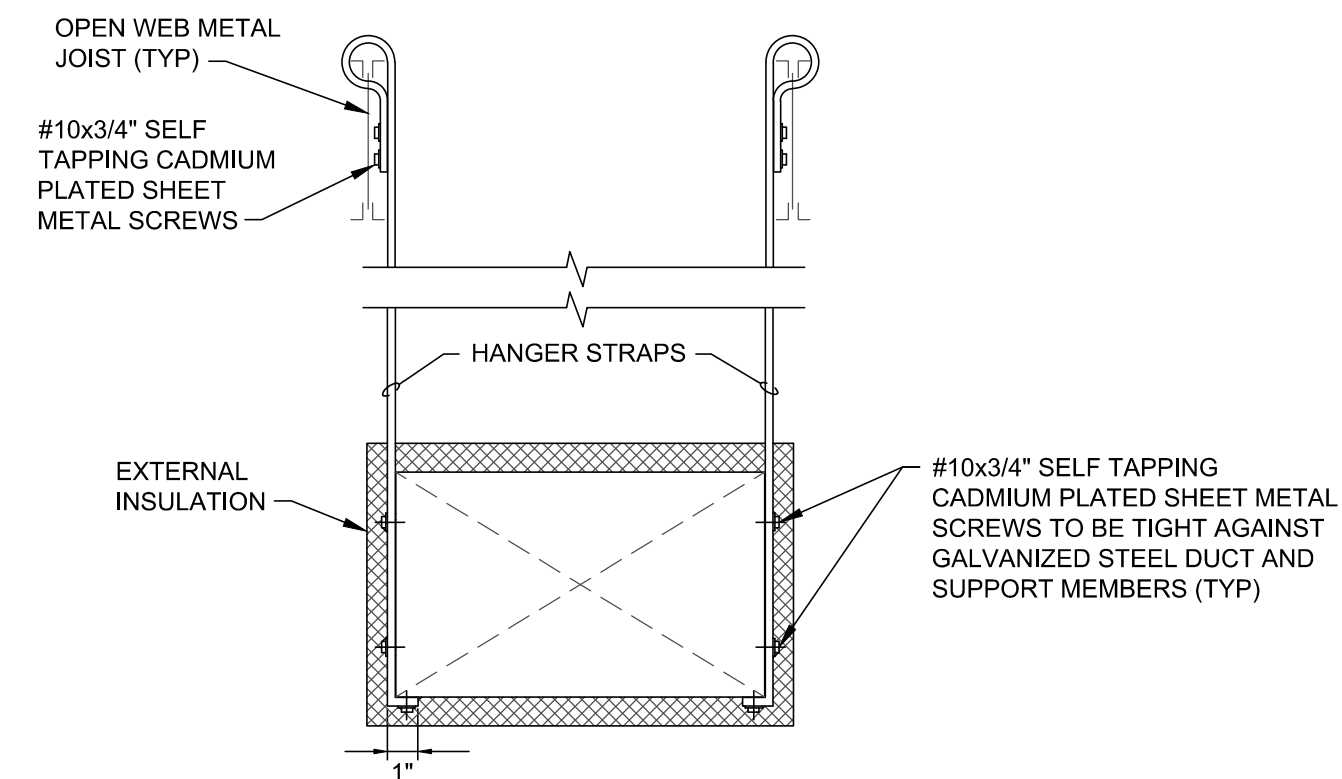


7 AH SUPPORT DETAIL
M1.501 NOT TO SCALE



NOTES:
1. PROVIDE FLORIDA PRODUCT APPROVED/MIAMI-DADE NOTICE OF ACCEPTANCE RATED AND AMCA 540 AND AMCA 550 LISTED LOUVER.
2. INSTALL LOUVER PER MANUFACTURER'S INSTRUCTIONS.
3. PROVIDE RECESSED MOUNTING FRAME FOR FLUSH INSTALLATION IN WALL.
4. PROVIDE WITH ALUMINUM BIRDSCREEN OR INSECT SCREEN AS SCHEDULED.
5. PROVIDE FACTORY FINISH/COLOR AS SELECTED BY THE ARCHITECT.
6. PROVIDE INSULATED METAL PANEL TO BLANK-OFF ALL UNUSED PORTIONS OF LOUVER.

6 LOUVER TO DUCT CONNECTION
M1.501 NOT TO SCALE

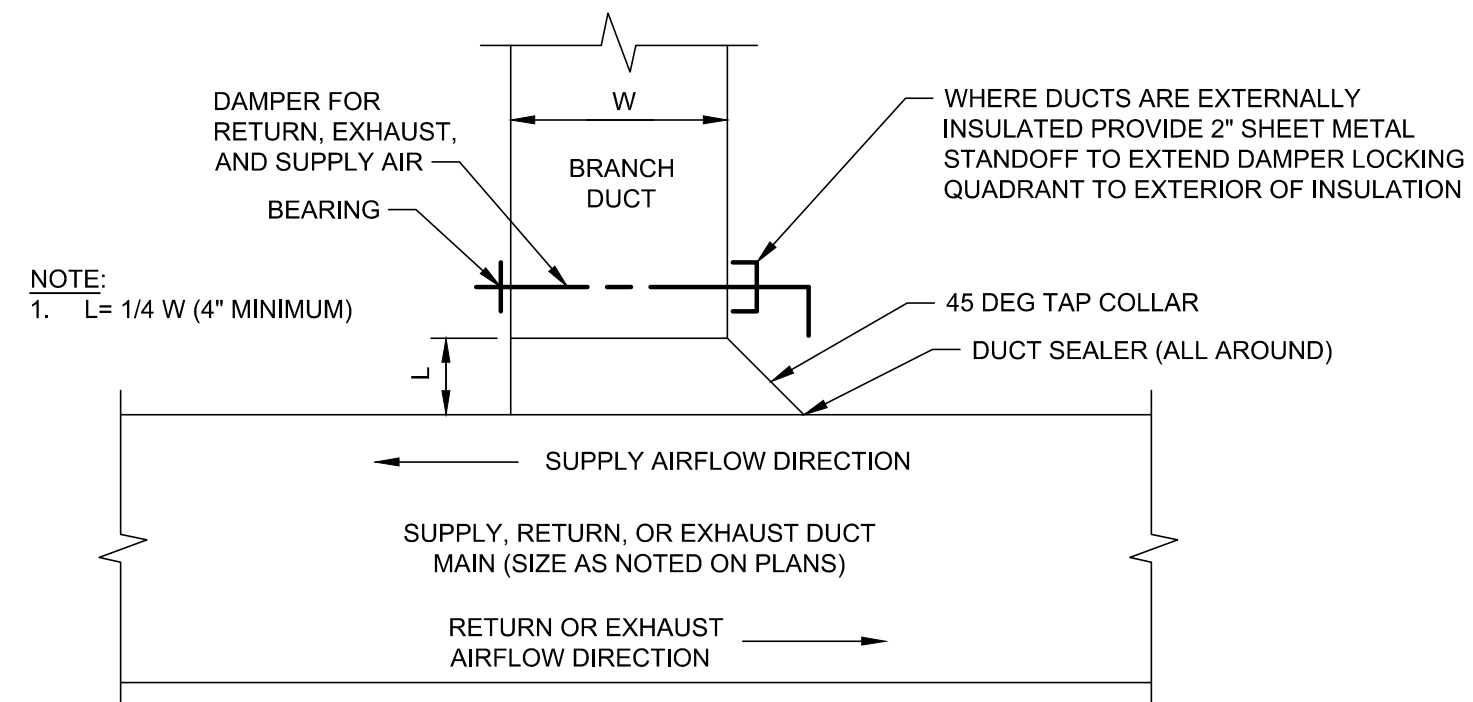


RECTANGULAR DUCT HANGER SIZES

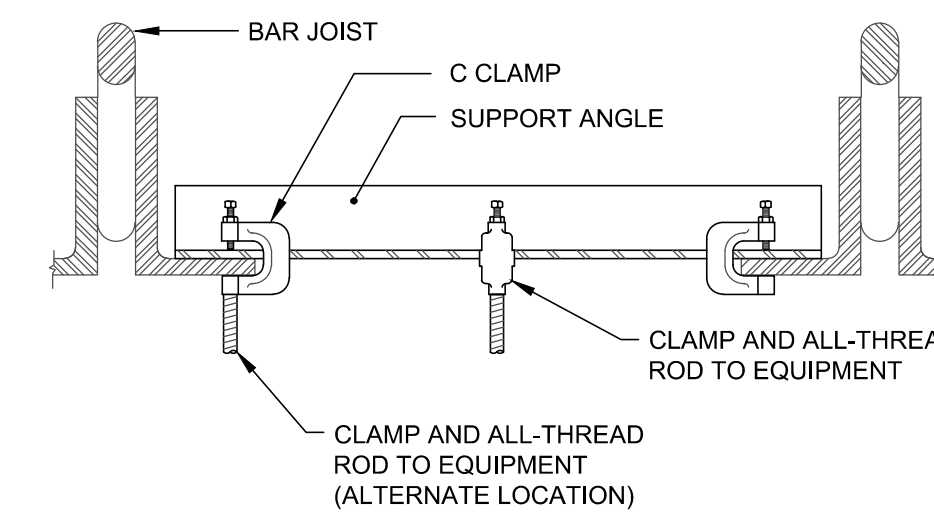
MAXIMUM SIDE	HANGER	HORIZONTAL SUPPORT MEMBER	MAXIMUM SPACING
30"	1" x 18 GAGE STRAP	NONE REQUIRED	10'-0"

1. NO POP RIVETS ALLOWED.
2. DUCTS SHALL BE INSULATED AS REQUIRED BY THE SPECIFICATIONS.

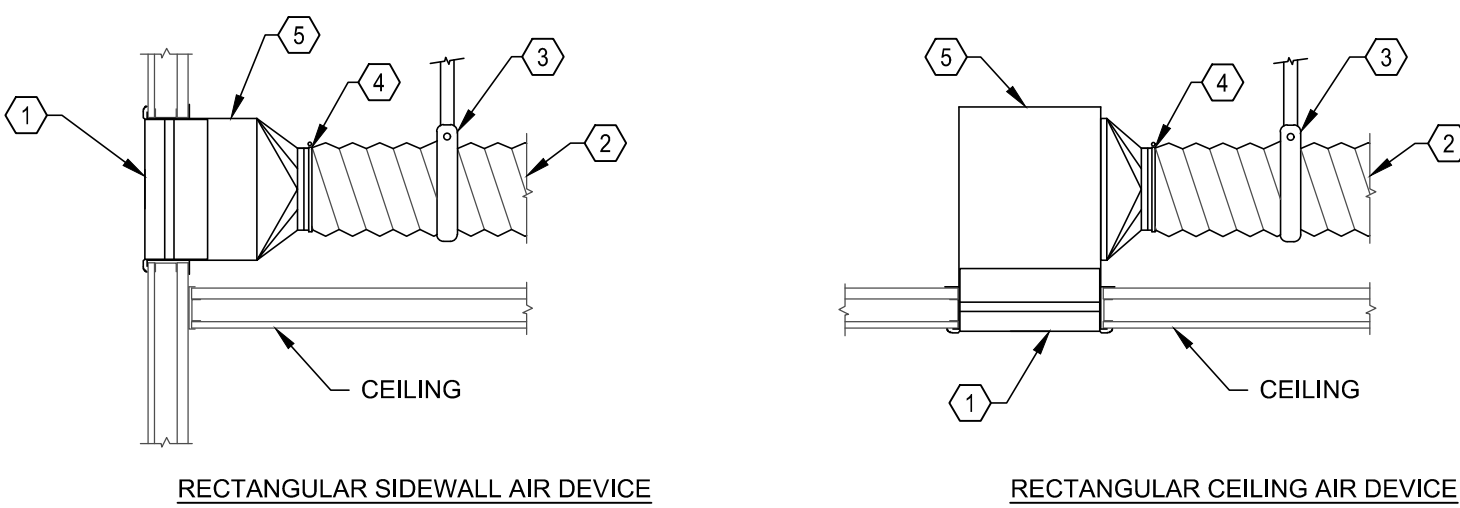
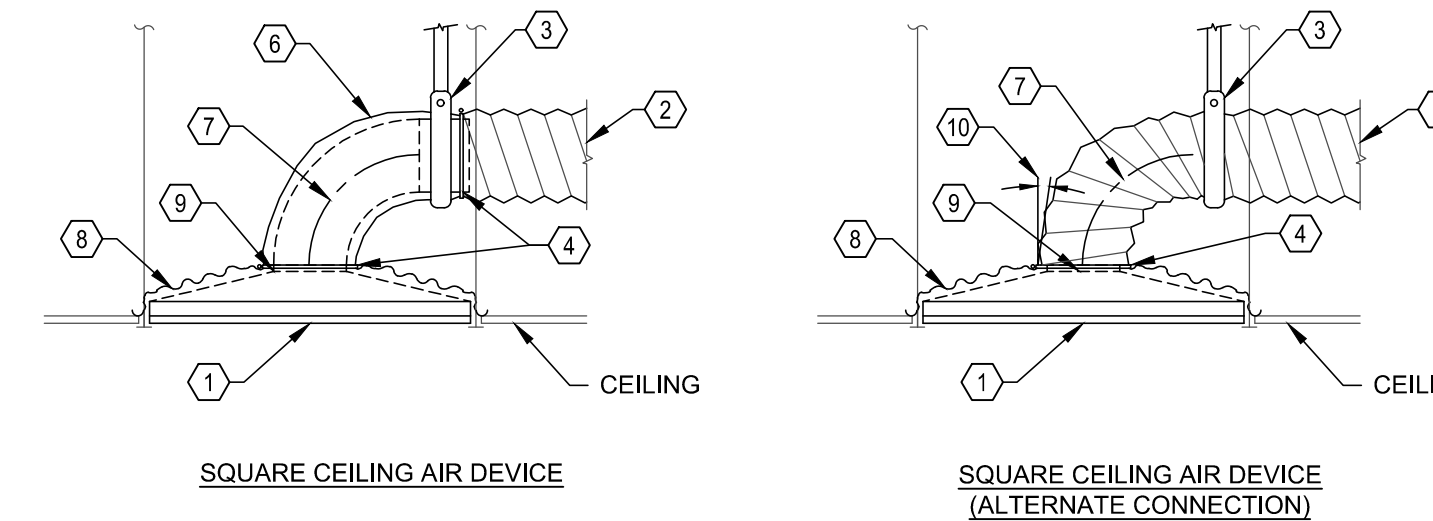
5 DUCT STRAP HANGERS
M1.501 NOT TO SCALE



4 TYPICAL DUCT BRANCH CONNECTION
M1.501 NOT TO SCALE



3 EQUIPMENT SUPPORT - JOIST ATTACHMENT
M1.501 NOT TO SCALE



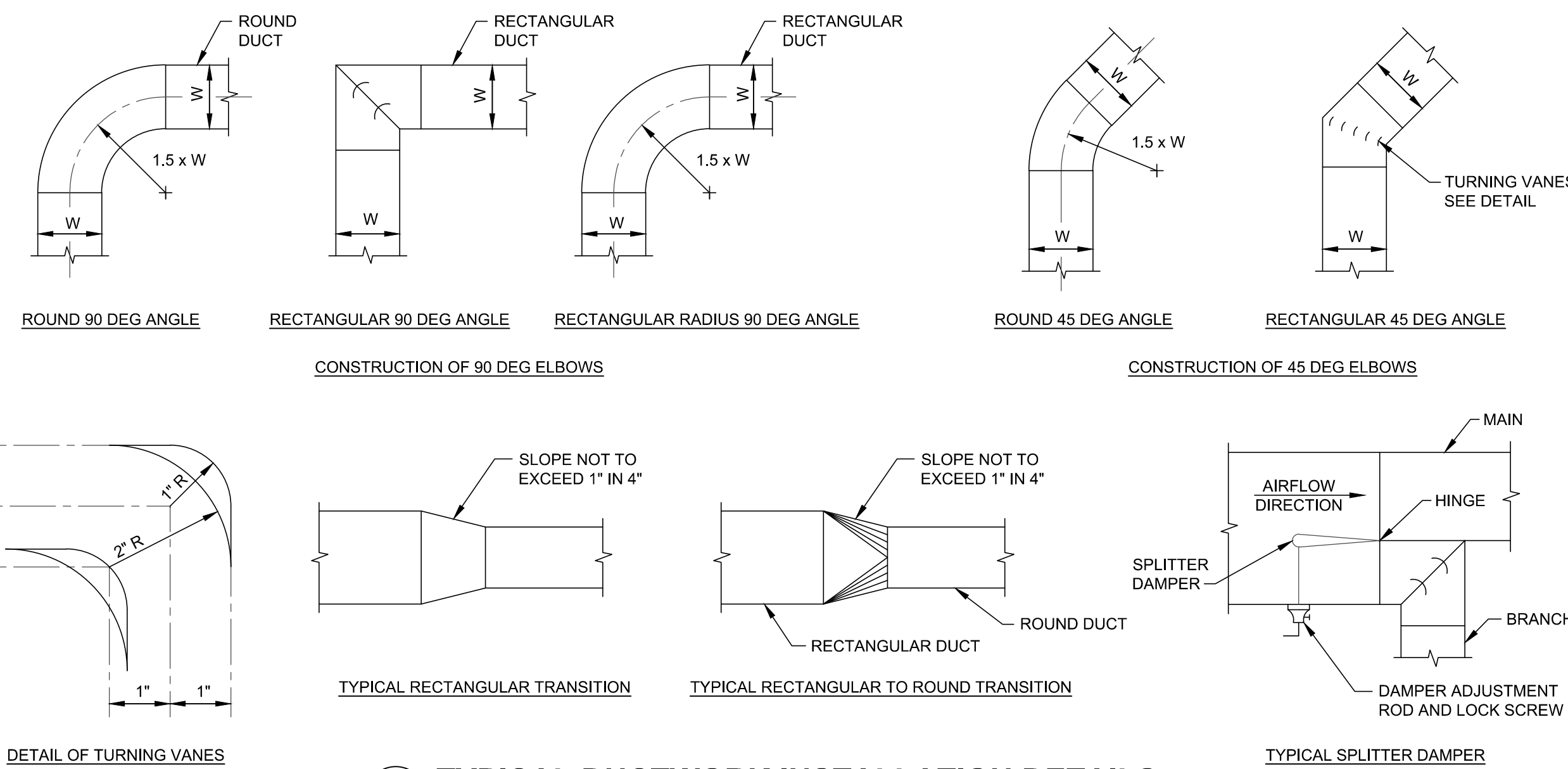
DETAIL NOTES

- USE INSULATED FLEXIBLE DUCTWORK ONLY AS INDICATED ON THE CONTRACT DRAWINGS.
- MAXIMUM FLEXIBLE DUCT SAG BETWEEN SUPPORTS POINTS SHALL BE 1/2" PER FOOT.
- FLEXIBLE DUCTS SHALL BE ONE-PIECE AND SHALL NOT BE SPLICED TOGETHER.
- EXTEND FLEXIBLE DUCT INSULATION TO DUCT/AIR DEVICE INSULATION AND SEAL WITH MASTIC.

DETAIL REFERENCE NOTES

- AIR DEVICE.
- INSULATED FLEXIBLE DUCT CONTINUED TO RIGID DUCTWORK.
- PROVIDE FULL PERIMETER SUPPORT ON OUTSIDE OF INSULATION OF ALL ROUND DUCTWORK. MINIMUM WIDTH OF STRAP SHALL BE 1-1/2 INCHES.
- DRAW-TIGHT OR SCREW-TIGHT BANDS OF NONCORROSIVE MATERIALS TO ATTACH INNER LINER OF FLEXIBLE DUCT TO RIGID DUCTWORK. INNER LINER OF FLEX DUCT SHALL BE SEALED WITH MASTIC AND MECHANICALLY ATTACHED TO RIGID DUCTWORK. SEAL OUTER SKIN OF DUCT.
- INSULATED, GALVANIZED STEEL AIR DEVICE BOOT AND TRANSITION TO ROUND DUCT.
- INSULATED, RIGID METAL ELBOW.
- MINIMUM 1.5 TIMES THE DUCT DIAMETER.
- 2 INCH BATT INSULATION OVERLAPPING EDGES OF CEILING DIFFUSERS BY 2 INCHES.
- AIR DEVICE NECK SIZE TO MATCH FLEXIBLE DUCT SIZE.
- MAXIMUM OFFSET IS 7 DEG FROM VERTICAL

2 TYPICAL AIR DEVICE FLEXIBLE CONNECTIONS
M1.501 NOT TO SCALE



1 TYPICAL DUCTWORK INSTALLATION DETAILS
M1.501 NOT TO SCALE

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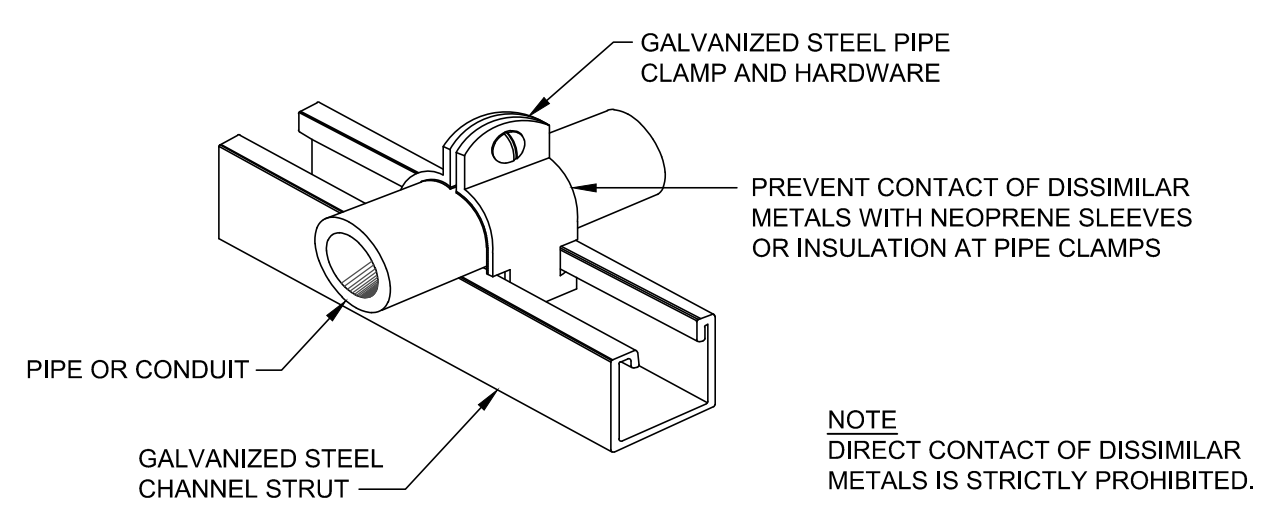
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DETAILS - MECHANICAL

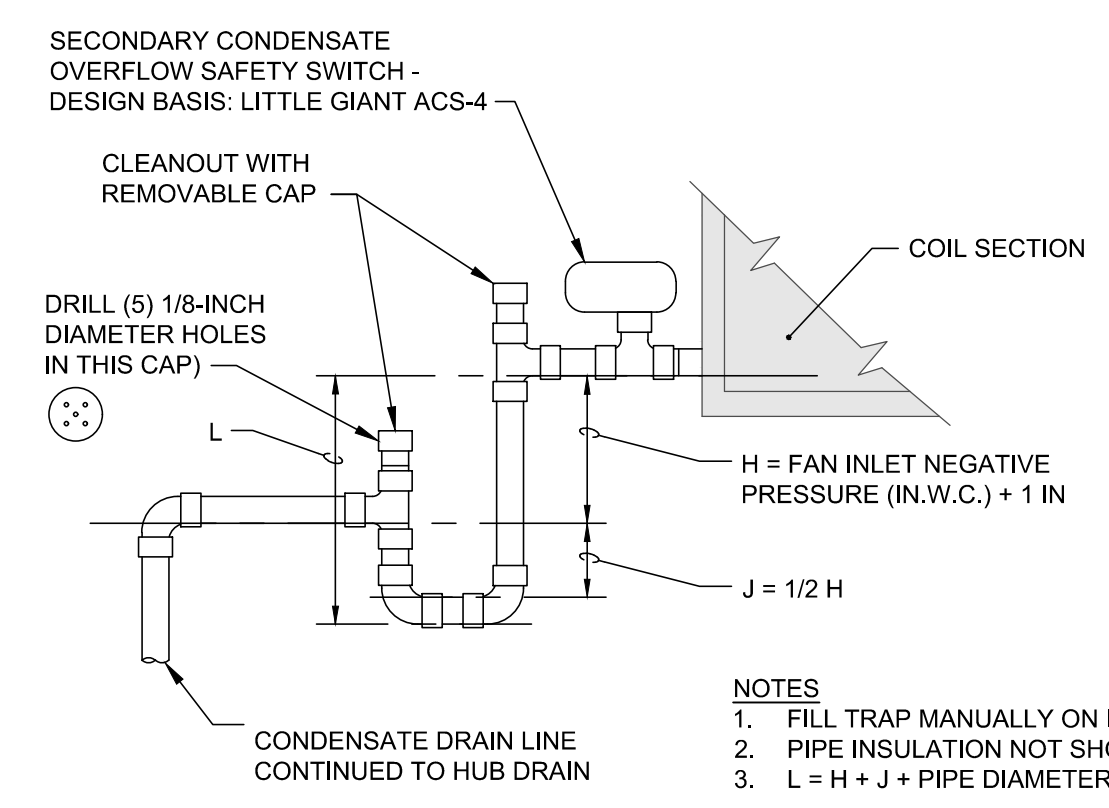
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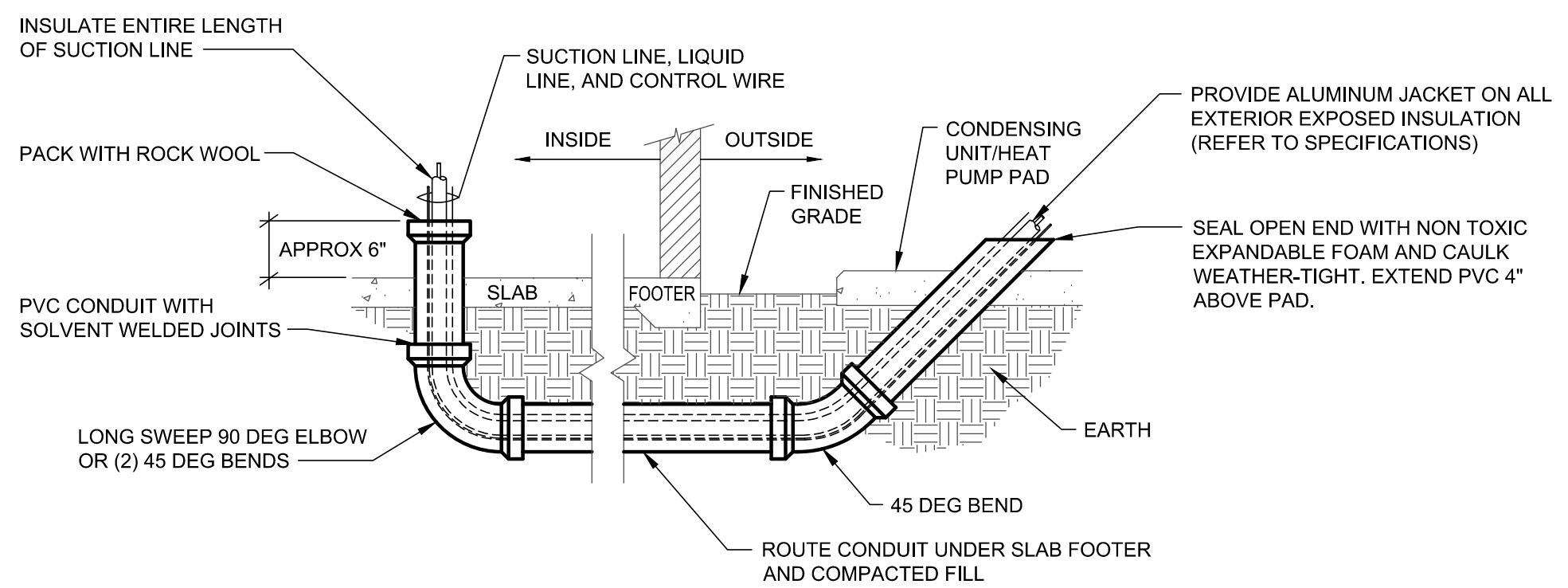
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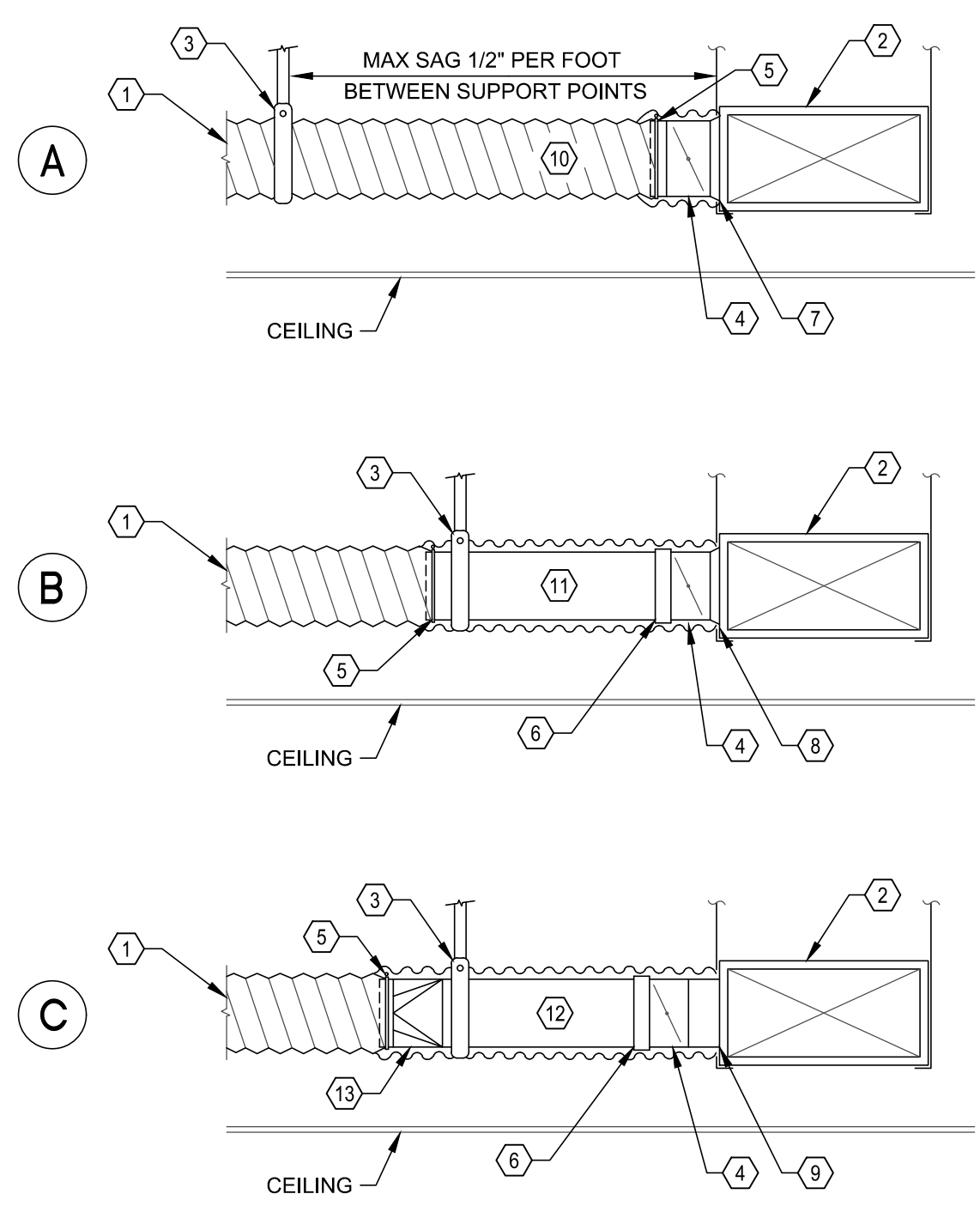
5 TYPICAL PIPE SUPPORT
 M1.502 NOT TO SCALE



3 TYPICAL CONDENSATE DRAIN
 M1.502 NOT TO SCALE

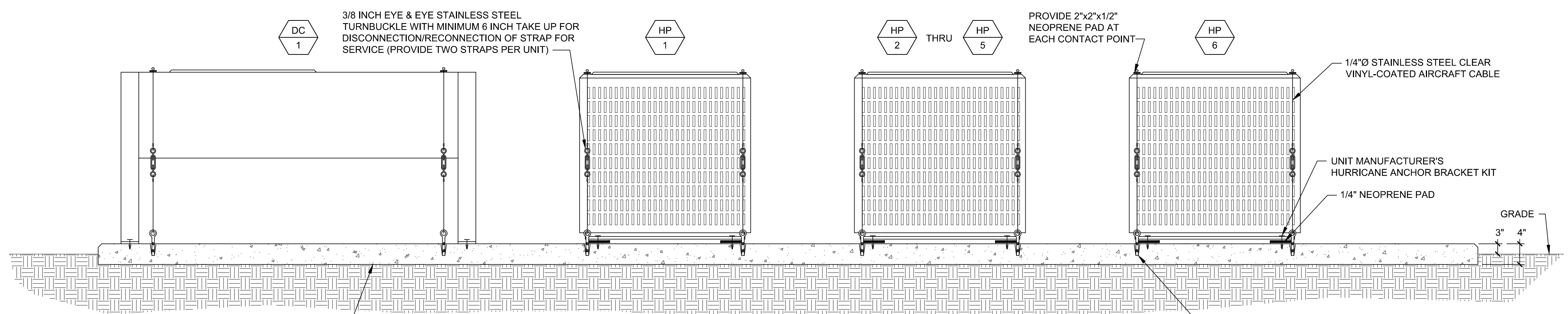


4 BURIED CONDUIT FOR REFRIGERANT LINES AND CONTROLS
 M1.502 NOT TO SCALE

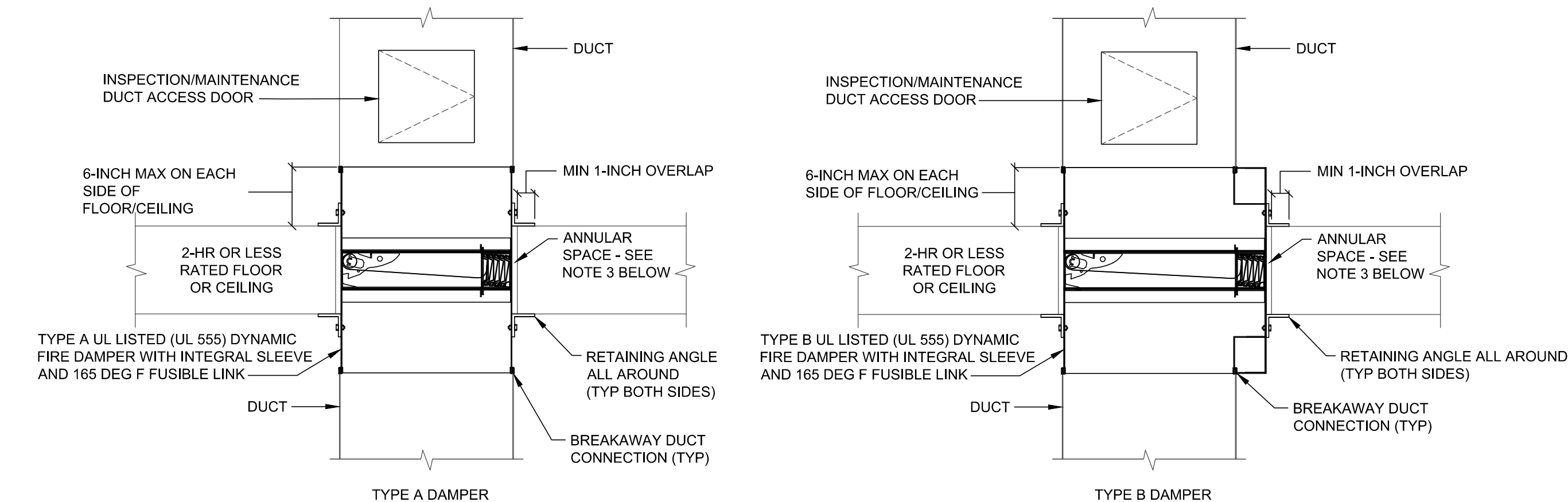


- DETAIL REFERENCE NOTES**
- INSULATED FLEXIBLE DUCT CONTINUED TO AIR DEVICE.
 - INSULATED SUPPLY DUCT (SIZE AS SHOWN ON PLANS).
 - PROVIDE FULL PERIMETER SUPPORT ON OUTSIDE OF INSULATION OF ALL ROUND DUCTWORK. MINIMUM WIDTH OF STRAP SHALL BE 1-1/2 INCHES. MAX SUPPORT SPACING = 5'-0".
 - VOLUME DAMPER WITH 2" STAND-OFF FOR INSULATION AND LOCKING QUADRANT PLATE.
 - DRAW-TIGHT OR SCREW-TIGHT BANDS OF NONCORROSIVE MATERIALS TO ATTACH INNER LINER OF FLEXIBLE DUCT TO RIGID DUCTWORK. INNER LINER OF FLEX DUCT SHALL BE SEALED WITH MASTIC AND MECHANICALLY ATTACHED TO RIGID DUCTWORK.
 - ADJUSTABLE CLAMP SEALED WITH MASTIC AND MECHANICALLY ATTACHED TO RIGID DUCTWORK.
 - BELL MOUTH ROUND TAP MOUNTED IN SIDE OF DUCT UNLESS SPECIFICALLY SHOWN OTHERWISE. APPLY DUCT SEALER AT ALL DUCT CONNECTIONS. IF FLEX DUCT IS EQUAL TO OR GREATER THAN RECTANGULAR DUCT DEPTH USE METHOD "C".
 - PROVIDE BELLMOUTH ROUND TAP. APPLY DUCT SEALER AT ALL DUCT CONNECTIONS. IF FLEX DUCT IS EQUAL TO OR GREATER THAN RECTANGULAR DUCT DEPTH USE METHOD "C".
 - RECTANGULAR TAP WITH 45 DEGREE TRANSITION.
 - INSULATED FLEXIBLE DUCTWORK.
 - INSULATED RIGID ROUND DUCTWORK.
 - INSULATED RECTANGULAR DUCTWORK.
 - RECTANGULAR TO ROUND TRANSITION.

2 FLEXIBLE DUCT TAPS TO RIGID DUCT
 M1.502 NOT TO SCALE



1 TYPICAL OUTDOOR EQUIPMENT INSTALLATION DETAIL
 M1.502 NOT TO SCALE

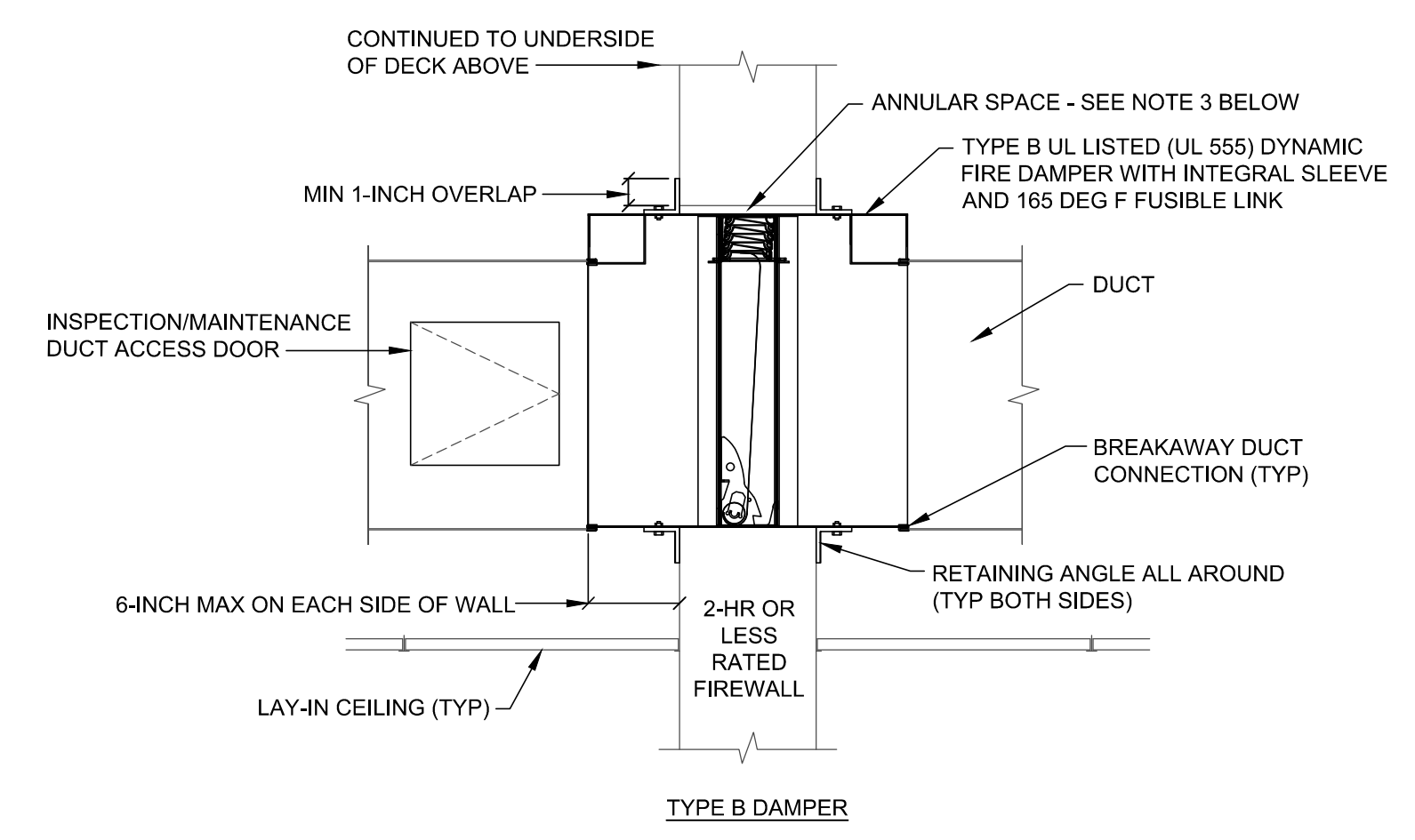


- NOTES**
- THE DESIGN BASIS IS A GREENHECK DFD-150X, TYPE B FIRE DAMPER. THE ACTUAL INSTALLED FIRE DAMPER'S INSTALLATION MANUAL WILL SUPERCEDE THIS DETAIL AND BE BASED ON THE WALL TYPE IN WHICH IT IS INSTALLED.
 - MAINTAIN A COPY OF THE FIRE DAMPER MANUFACTURER'S INSTALLATION INSTRUCTIONS ON SITE AND MAKE AVAILABLE FOR REVIEW BY THE AUTHORITY HAVING JURISDICTION.
 - ANNULAR SPACE BETWEEN DAMPER AND FLOOR OPENING SHALL BE 1/8-INCH PER FOOT OF WIDTH OF DAMPER WITH A MINIMUM CLEARANCE OF 1/4-INCH AND A MAXIMUM CLEARANCE OF 1-1/2-INCHS, UNLESS OTHERWISE RECOMMENDED BY DAMPER MANUFACTURER.
 - RETAINING ANGLE GAUGE: RETAINING ANGLES FOR 1-1/2 HOUR RATED DAMPERS WITH A WIDTH AND HEIGHT 48-INCHES OR LESS MUST BE A MINIMUM OF 20 GA. WIDTH OR HEIGHT GREATER THAN 48-INCHES MUST BE A MINIMUM OF 16 GAUGE.
 - RETAINING ANGLE SIZE: THE LEG OF THE RETAINING ANGLE ON THE DAMPER SLEEVE SHALL BE A MINIMUM OF 1-1/4-INCHES. THE LEG OF THE RETAINING ANGLE ON THE WALL SHALL BE LONG ENOUGH TO COVER THE ANNULAR SPACE AND OVERLAP THE WALL BY A MINIMUM OF 1-INCH.
 - RETAINING ANGLE ATTACHMENT TO SLEEVE: RETAINING ANGLES MUST BE ATTACHED TO THE DAMPER USING ONE OR MORE OF THE FOLLOWING METHODS OF ATTACHMENT (REFER TO LABEL ON OUTSIDE OF SLEEVE FOR "NO SCREW" AREA):
 - #10 (3/4-INCH MAX) SHEET METAL SCREWS
 - 1/4-INCH BOLTS AND NUTS
 - 3/16-INCH STEEL POP RIVETS
 - A MINIMUM OF TWO CONNECTIONS PER SIDE, TOP, AND BOTTOM, 12-INCHES O.C. MAXIMUM FOR OPENINGS OF 48-INCHES WIDE AND 36-INCHES HIGH AND LESS. DAMPERS GREATER THAN 48-INCHES WIDE OR 36-INCHES HIGH REQUIRE THE CONNECTIONS TO BE NO MORE THAN 6-INCHES O.C. THE ANGLES MUST BE ATTACHED TO ALL 4 SIDES OF THE SLEEVE. ENSURE THAT FASTENERS DO NOT INTERFERE WITH THE OPERATION OF THE DAMPER.
 - RETAINING ANGLE ATTACHMENT TO WALL/FLOOR - FOR TWO-SIDED ANGLE INSTALLATIONS THE RETAINING ANGLES SHALL NOT BE ATTACHED TO THE WALL.
 - SLEEVE GAUGE AND CONNECTION TYPE REQUIREMENTS - THE SIZE OF THE DAMPER/DUCT DETERMINES THE REQUIRED SLEEVE GAUGE AND THE REQUIRED DUCT TO SLEEVE CONNECTION (SEE TABLE BELOW). THE SLEEVE THICKNESS MUST ALSO NOT BE LESS THAN THE GAUGE OF THE CONNECTING DUCT. ANY DUCT CONNECTION OTHER THAN THE BREAKAWAY CONNECTIONS DESCRIBED BELOW ARE CONSIDERED RIGID.
 - SIZE THE ACCESS DOOR TO ALLOW INSPECTION AND REPLACEMENT OF THE FUSIBLE LINK. SEE TABLE BELOW FOR SIZES.

SLEEVE REQUIREMENTS		
SLEEVE GAUGE	DUCT DIMENSIONS	DUCT TO SLEEVE CONNECTION
14 GA - 10 GA	ALL DUCT SIZES	RIGID OR BREAKAWAY
16 GA	36-IN MAX WIDTH 24-IN MAX HEIGHT 24-IN MAX DIA	RIGID OR BREAKAWAY
24 GA	13-IN - 30-IN WIDE	BREAKAWAY ONLY
26 GA	12-IN WIDE AND UNDER	BREAKAWAY ONLY

ACCESS DOOR SIZE	
DUCT WIDTH	DOOR SIZE
6" THRU 18"	6"x12"

2 1-1/2 HOUR FIRE DAMPER ASSEMBLY - VERTICAL DUCT INSTALLATION
M1.503 NOT TO SCALE



- NOTES**
- THE DESIGN BASIS IS A GREENHECK DFD-150X, TYPE B FIRE DAMPER. THE ACTUAL INSTALLED FIRE DAMPER'S INSTALLATION MANUAL WILL SUPERCEDE THIS DETAIL AND BE BASED ON THE WALL TYPE IN WHICH IT IS INSTALLED.
 - MAINTAIN A COPY OF THE FIRE DAMPER MANUFACTURER'S INSTALLATION INSTRUCTIONS ON SITE AND MAKE AVAILABLE FOR REVIEW BY THE AUTHORITY HAVING JURISDICTION.
 - ANNULAR SPACE BETWEEN DAMPER AND WALL OPENING SHALL BE 1/8-INCH PER FOOT OF WIDTH OF DAMPER WITH A MINIMUM CLEARANCE OF 1/4-INCH AND A MAXIMUM CLEARANCE OF 1-1/2-INCHS, UNLESS OTHERWISE RECOMMENDED BY DAMPER MANUFACTURER.
 - RETAINING ANGLE GAUGE: RETAINING ANGLES FOR 1-1/2 HOUR RATED DAMPERS WITH A WIDTH AND HEIGHT 48-INCHES OR LESS MUST BE A MINIMUM OF 20 GA. WIDTH OR HEIGHT GREATER THAN 48-INCHES MUST BE A MINIMUM OF 16 GAUGE.
 - RETAINING ANGLE SIZE: THE LEG OF THE RETAINING ANGLE ON THE DAMPER SLEEVE SHALL BE A MINIMUM OF 1-1/4-INCHES. THE LEG OF THE RETAINING ANGLE ON THE WALL SHALL BE LONG ENOUGH TO COVER THE ANNULAR SPACE AND OVERLAP THE WALL BY A MINIMUM OF 1-INCH.
 - RETAINING ANGLE ATTACHMENT TO SLEEVE: RETAINING ANGLES MUST BE ATTACHED TO THE DAMPER USING ONE OR MORE OF THE FOLLOWING METHODS OF ATTACHMENT (REFER TO LABEL ON OUTSIDE OF SLEEVE FOR "NO SCREW" AREA):
 - #10 (3/4-INCH MAX) SHEET METAL SCREWS
 - 1/4-INCH BOLTS AND NUTS
 - 3/16-INCH STEEL POP RIVETS
 - A MINIMUM OF TWO CONNECTIONS PER SIDE, TOP, AND BOTTOM, 12-INCHES O.C. MAXIMUM FOR OPENINGS OF 48-INCHES WIDE AND 36-INCHES HIGH AND LESS. DAMPERS GREATER THAN 48-INCHES WIDE OR 36-INCHES HIGH REQUIRE THE CONNECTIONS TO BE NO MORE THAN 6-INCHES O.C. THE ANGLES MUST BE ATTACHED TO ALL 4 SIDES OF THE SLEEVE. ENSURE THAT FASTENERS DO NOT INTERFERE WITH THE OPERATION OF THE DAMPER.
 - RETAINING ANGLE ATTACHMENT TO WALL/FLOOR - FOR TWO-SIDED ANGLE INSTALLATIONS THE RETAINING ANGLES SHALL NOT BE ATTACHED TO THE WALL.
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 - SIZE THE ACCESS DOOR TO ALLOW INSPECTION AND REPLACEMENT OF THE FUSIBLE LINK. SEE ADJACENT TABLE FOR SIZES.

SLEEVE REQUIREMENTS		
SLEEVE GAUGE	DUCT DIMENSIONS	DUCT TO SLEEVE CONNECTION
14 GA - 10 GA	ALL DUCT SIZES	RIGID OR BREAKAWAY
16 GA	36-IN MAX WIDTH 24-IN MAX HEIGHT 24-IN MAX DIA	RIGID OR BREAKAWAY
16 GA	ALL DUCT SIZES	BREAKAWAY ONLY
18 GA	85-IN WIDE AND OVER	
20 GA	55-IN - 84-IN WIDE	
22 GA	31-IN - 54-IN WIDE	
24 GA	13-IN - 30-IN WIDE	
26 GA	12-IN WIDE AND UNDER	

ACCESS DOOR SIZE	
DUCT WIDTH	DOOR SIZE
6" THRU 18"	6"x12"
19" THRU 36"	12"x18"
37" AND ABOVE	18"x18"

1 1-1/2 HOUR FIRE DAMPER ASSEMBLY - HORIZONTAL DUCT INSTALLATION
M1.503 NOT TO SCALE

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DATE	REVISION	DRAWN	CHECKED

ISSUE FOR BID - 12/20/2019

DETAILS - MECHANICAL
ERAU PRODUCTION BUILDING
EMBRY-RIDDLE AERONAUTICAL UNIVERSITY, DAYTONA BEACH, FLORIDA

Date: 12/20/2019
Job no.: 2019-5743
Sheet no.: **M1.503**

Louver Schedule table with columns: MARK, MATERIAL, LOUVER SIZE, DESIGN CFM, FREE AREA (SF), VELOCITY (FPM), SERVICE, MAX PRESS DROP (IN.W.G.), ACCESS., NOTES, MANUFACTURER & MODEL NUMBER. Includes accessories and notes.

FAN SCHEDULE table with columns: MARK, MANUFACTURER, MODEL, APPLICATION, LOCATION, AIR FLOW (CFM), STATIC PRESSURE (IN.W.G.), DRIVE/TYP, WATTS, VOLTAGE/PHASE/HZ, UNIT REQUIREMENTS, ACCESSORIES, NOTES. Includes notes.

Dedicated Outside Air Split System Schedule table with sections: INDOOR UNIT, OUTDOOR UNIT, SYSTEM PERFORMANCE, and ACCESSORIES. Includes detailed specifications for indoor and outdoor units and system performance metrics.

Split System Air Handler Schedule table with columns: MARK, LOCATION, MANUFACTURER, MODEL, FAN, HEAT PUMP HEATING CAPACITY, AUXILIARY ELECTRIC HEATING COIL, ELECTRICAL, FILTERS, UNIT REQUIREMENTS, ACCESSORIES, NOTES. Includes detailed specifications for air handlers.

Air-Cooled Heat Pump Schedule table with columns: MARK, LOCATION, MANUFACTURER, MODEL NUMBER, NOMINAL TONS, REFRIGERANT, COMPRESSOR, CONDENSER FAN, UNIT REQUIREMENTS, ACCESSORIES, NOTES. Includes detailed specifications for heat pumps.

Air Device Schedule table with columns: MARK, MANUFACTURER, MODEL, TYPE, BORDER, AIR PATTERN, FACE/NECK, FINISH, MATERIAL, MAX NC LEVEL, MAX PRESS DROP (IN.W.G.), ACCESS., NOTES. Includes a neck sizing table and legend.



Revision table with columns: DATE, REVISION, DRAWN, CHECKED.



DATE	REVISION	CHECKED	DRAWN

12/20/2019
 2019-07-03
 M1.701
ERAU PRODUCTION BUILDING
 EMBRY-RIDDLE AERONAUTICAL UNIVERSITY, DAYTONA BEACH, FLORIDA

CONTROL SYSTEM GENERAL NOTES

- A BUILDING MANAGEMENT SYSTEM (BMS) SHALL BE PROVIDED AS PART OF THIS PROJECT.
- THE WORK SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:
 - MICROPROCESSOR BASED CONTROLLERS
 - SENSORS
 - ROUTERS AND COMMUNICATION
 - PANELS
 - SWITCHES
 - WIRING AND CONDUIT
 - SOFTWARE OPERATING SYSTEMS, PROGRAMMING, AND FULL OPERATOR WORKSTATION SYSTEM GRAPHICS
 - COMMISSIONING, CALIBRATION, ACTIVATION, AND DE-BUGGING
 - DEMONSTRATIONS AND TRAINING
- THE CONTRACTOR IS RESPONSIBLE FOR ALL STARTERS, RELAYS, AND WIRING REQUIRED TO ACCOMPLISH THE SEQUENCES OF OPERATION DEFINED ON THIS SHEET.
- ENSURE THAT THE MEASURED SIGNALS ARE COMMUNICATED QUICKLY TO THE CONTROL LOOPS (AND NOT DELAYED DUE TO NETWORK TIMING).
- ALL SET POINTS SHALL BE USER-ADJUSTABLE.
- SEQUENCES ARE PERFORMANCE-BASED AND GENERALLY DO NOT REFER TO SPECIFIC DEAD-BANDS, RESET RATIOS, DELAYS, AND RANGES REQUIRED FOR STABLE OPERATION. THESE PARAMETERS SHALL BE FULLY ADJUSTABLE AT THE OPERATOR SOFTWARE INTERFACE.
- COORDINATE THE RANGE, SET POINT, DEAD-BAND, CHARACTERISTICS AND MOUNTING LOCATIONS OF SENSORS WITH THE ACTUAL EQUIPMENT FURNISHED. INSTALL SENSORS, TUBING, AND WIRING TO BE ACCESSIBLE AND AS NOT TO IMPEDE OR ENCRDACH UPON EQUIPMENT SERVICE AND ACCESS AREAS.
- WHERE PROPOSED SEQUENCES COULD DEFEAT THE EQUIPMENT MANUFACTURER'S EQUIPMENT SAFETIES OR BE DETRIMENTAL TO THE EQUIPMENT CONTROLLED, ALERT THE ENGINEER PRIOR TO PROCEEDING WITH WORK.
- PROVIDE MODIFICATION TO THE SET POINTS, DEAD-BANDS, DELAYS AND RANGES BASED UPON THE ACTUAL PERFORMANCE OF THE CONTROLLED EQUIPMENT IN ORDER TO PROVIDE STABLE OPERATION WITHOUT EXCESSIVE CYCLING OR HYSTERESIS. DO NOT MODIFY THE SEQUENCE WITHOUT SUBMITTING AN ALTERNATE SEQUENCE TO THE ENGINEER FOR REVIEW AND APPROVAL.
- IN ADDITION TO SPECIFIC EQUIPMENT ALARMS NOTED IN THE CONTRACT DOCUMENTS, PROVIDE STANDARD ALARMS FOR ITEMS SUCH AS SENSOR FAILURE, OUT-OF-RANGE (HIGH/LOW LIMITS) AND SIMILAR ITEMS.
- COORDINATE SEQUENCES AND DATA ACQUISITION REQUIREMENTS AND PROVIDE FOR TREND LOGGING, REPORT GENERATION, CALCULATED RUN-HOURS, AND SIMILAR PREVENTATIVE MAINTENANCE FUNCTIONS.
- POWER WIRING SHALL NOT BE RUN IN THE SAME CONDUIT AS LOW VOLTAGE WIRING, SIGNAL, OR COMMUNICATIONS WIRING. FINAL CONNECTION TO SENSORS AND ACTUATORS MAY BE MADE WITH FLEXIBLE CONDUIT NOT TO EXCEED 30 INCHES IN LENGTH. COMMUNICATION CABLING CONCEALED ABOVE CEILING SHALL BE PLENUM-RATED AND MAY BE RUN WITHOUT CONDUIT, BUT SHALL BE SUPPORTED IN CABLE TRAY (WHERE AVAILABLE), OR SUPPORTED WITH BRIDAL RINGS. EXPOSED COMMUNICATION CABLING SHALL BE RUN IN CONDUIT, EXCEPT WHERE CABLE TRAY IS AVAILABLE TO BE USED.
- WIRING SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT VERSION OF THE NATIONAL ELECTRICAL CODE (NEC). CONDUCTORS SHALL BE COPPER, ONE-PIECE, INSTALLED WITHOUT SPLICES. WIRING SHALL BE COLOR-CODED.
- POWER (120V AND ABOVE) AND CONDUIT TO UNIT CONTROLLERS AND PANELS SHALL BE PROVIDED AND TERMINATED BY THE ELECTRICAL CONTRACTOR. TRANSFORMERS, DC POWER RECTIFIERS, AND EXTENSION OF LOW-VOLTAGE POWER TO ACTUATORS, TRANSMITTERS, AND SIMILAR CONTROL DEVICES AND SENSORS SHALL BE PROVIDED BY THE CONTROLS CONTRACTOR.
- "POWER BY DIV 26" REFERS TO POWER PROVIDED BY THE ELECTRICAL CONTRACTOR REGARDLESS OF THE PROJECT SPECIFICATION NUMBERING.
- ALL AIR-MOVING EQUIPMENT SHALL SHUTDOWN DURING A FIRE ALARM AND SHALL AUTOMATICALLY RETURN TO NORMAL OPERATION AFTER THE FIRE ALARM HAS BEEN CLEARED.

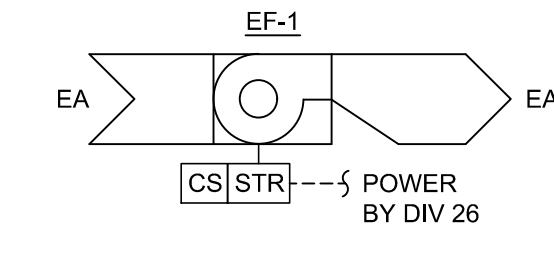
TYPICAL CONTROL POINT LIST

CONTROL POINT	AI	AO	BI	BO
OUTDOOR AIR TEMPERATURE (DEG F)	●	○	○	○
OUTDOOR AIR HUMIDITY (% RH)	●	○	○	○
OUTDOOR AIR ENTHALPY (BTUS/LB DRY AIR)	●	○	○	○
BUILDING FIRE ALARM	○	○	○	●
EF-1 ON/OFF	○	○	○	●
EF-1 STATUS (CURRENT SWITCH)	○	○	○	●
SPLIT SYSTEM CONTROLLER (SEE NOTE 2)	AI	AO	BI	BO
ZONE TEMPERATURE SENSOR 1 (DEG F)	○	○	○	○
ZONE HUMIDITY (% RH)	○	○	○	○
ZONE TEMPERATURE SET POINT (DEG F)	○	○	○	○
SYSTEM ENABLE/DISABLE	○	○	○	○
FAN	○	○	○	○
COOLING MODE	○	○	○	○
HEATING MODE - HEAT PUMP	○	○	○	○
HEATING MODE - AUX ELECTRIC HEAT	○	○	○	○
DUCT-MOUNTED SA TEMP SENSOR (DEG F)	○	○	○	○
RA NEEDLEPOINT BIPOLAR IONIZATION (ON/OFF)	○	○	○	○
100% OA SPLIT SYSTEM CONTROLLER (SEE NOTE 3)	AI	AO	BI	BO
SYSTEM ENABLE/DISABLE	○	○	○	○
MODE (COOLING/HEATING/ECONOMIZING)	○	○	○	○
OA DAMPER POSITION WITH END SWITCH	○	○	○	○
OA NEEDLEPOINT BIPOLAR IONIZATION (ON/OFF)	○	○	○	○
SA DUCT-MOUNTED TEMP SENSOR (DEG F)	○	○	○	○
ALARM	○	○	○	○

- NOTES**
- THIS SCHEDULE SHOWS THE MINIMUM POINTS REQUIRED. PROVIDE ALL POINTS AS REQUIRED FOR THE MECHANICAL EQUIPMENT TO PERFORM THE SEQUENCE OF OPERATIONS.
 - SPLIT SYSTEM CONTROLLERS SHALL HOUSE ALL OPERATING SEQUENCES FOR STAND-ALONE OPERATION IF COMMUNICATION TO BMS IS TEMPORARILY LOST.
 - 100% OA UNIT SHALL BE CONTROLLED BY THE MANUFACTURER'S CONTROLLER AND SHALL COMMUNICATE TO THE BMS VIA BACNET. THE POINTS LISTED ARE THE MINIMUM POINTS TO BE MONITORED/ADJUSTED THROUGH THE BMS.

CONTROL LEGEND

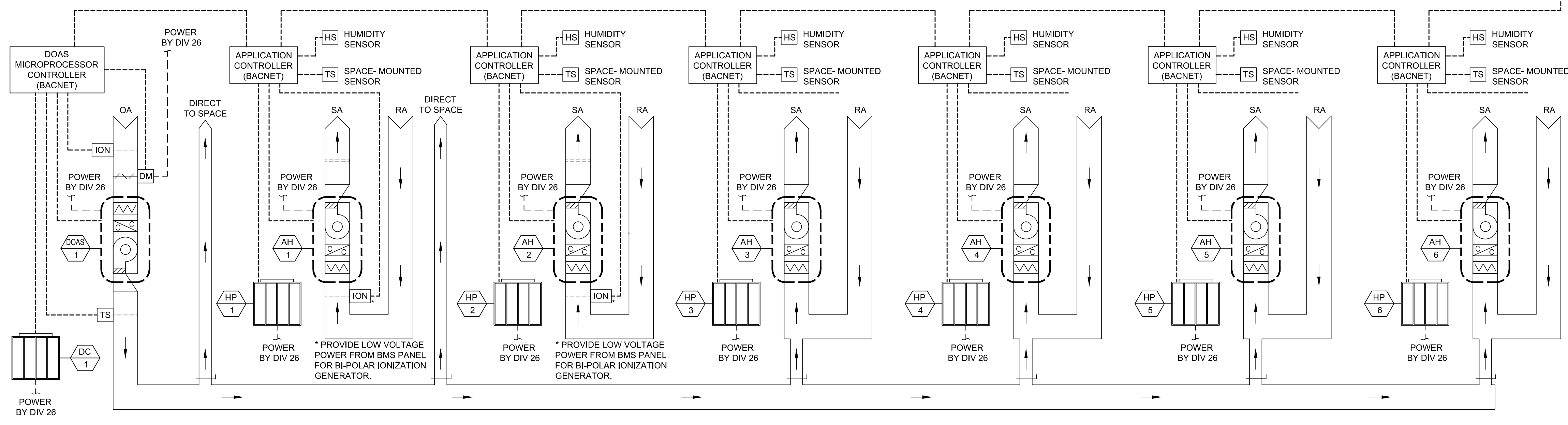
SYMBOL	DESCRIPTION
CS	CURRENT SWITCH
DM	DAMPER MOTOR - ELECTRIC
DPS	DIFFERENTIAL PRESSURE SWITCH
ES	ENTHALPY SENSOR
HS	HUMIDITY SENSOR
ION	BIPOLAR IONIZATION BAR
RLY	RELAY
SD	SMOKE DETECTOR
STR	MOTOR STARTER WITH RELAYS
T/HS	TEMPERATURE AND HUMIDITY SENSOR
TS	TEMPERATURE SENSOR
DIV 16	ELECTRICAL CONTRACTOR
F/A	FIRE ALARM SYSTEM
⊕	THERMOSTAT
— —	MANUAL DAMPER
— — —	CONTROL DAMPER
○	FAN
○/C	COOLING COIL
○/H	HEATING COIL
○/F	AIR FILTERS



THE INLINE FAN SERVING THE RESTROOMS AND JANITOR CLOSET SHALL BE CONTROLLED BY THE BMS TO OPERATE ON A TIME-OF-DAY SCHEDULE. THE TIME-OF-DAY SCHEDULE SHALL BE COORDINATED TO MATCH THE 100% DEDICATED OUTDOOR AIR SPLIT SYSTEM (DOAS) SCHEDULE. THE EXHAUST FAN STATUS WILL BE MONITORED BY THE BMS.

2 EXHAUST FAN SEQUENCE AND SCHEMATIC

M1.701 NOT TO SCALE



1 CONTROL SCHEMATIC BUILDING HVAC CONTROLS

M1.701 NOT TO SCALE

SEQUENCE OF OPERATION - BUILDING HVAC SYSTEM

SUPPLY FANS

THE SUPPLY FAN SHALL BE STARTED AND STOPPED BY THE BMS BASED ON AN OCCUPANCY SCHEDULE. THE FAN START SHALL BE SUBJECT TO SAFETIES SUCH AS FIRE ALARM, SMOKE DETECTORS, OVERLOADS, ETC.

PROVIDE INTEGRAL PUSH BUTTON OVERRIDE ON ZONE TEMPERATURE SENSOR TO START THE RESPECTIVE ZONE SPLIT SYSTEM. DEDICATED OUTSIDE AIR SYSTEM AND BUILDING EXHAUST FAN FOR 2 HOURS (ADJUSTABLE) DURING TIMES WHEN THE BMS SYSTEM HAS THE UNITS SCHEDULED OFF. THE FAN START SHALL BE SUBJECT TO SAFETIES SUCH AS FIRE ALARM, SMOKE DETECTORS, OVERLOADS, ETC.

OCCUPIED MODE

- DOAS-1 OUTSIDE AIR DAMPER SHALL OPEN
- DOAS-1 SHALL BE ENABLED TO OPERATE CONTINUOUSLY
- AH-1, AH-2, AH-3, AH-4, AH-5 AND AH-6 TEMPERATURE SET POINTS SHALL BE SWITCHED TO THE OCCUPIED MODE SET POINTS
- AH-1, AH-2, AH-3, AH-4, AH-5 AND AH-6 SHALL ENTER FAN-ON MODE AND CYCLE THE COOLING AND HEATING AS NEEDED TO MAINTAIN ZONE TEMPERATURE
- AH-1 AND AH-2 BI-POLAR IONIZATION GENERATOR SHALL BE INTERLOCKED WITH AIR HANDLING UNIT FAN TO ENERGIZE WHENEVER FAN OPERATES.

UNOCCUPIED MODE

- AH-1, AH-2, AH-3, AH-4, AH-5 AND AH-6 TEMPERATURE SET POINTS SHALL BE SWITCHED TO THE UNOCCUPIED MODE SET POINTS
- AH-1, AH-2, AH-3, AH-4, AH-5 AND AH-6 SHALL SWITCH TO FAN-AUTO MODE AND THE UNITS SHALL CYCLE AS NEEDED TO MAINTAIN THE ZONE TEMPERATURE
- DOAS-1 SHALL BE DISABLED AND SHALL NOT OPERATE IN THE UNOCCUPIED MODE
- DOAS-1 OUTSIDE AIR DAMPER SHALL CLOSE
- AH-1 AND AH-2 BI-POLAR IONIZATION GENERATOR SHALL CYCLE WITH THE FAN.

UNOCCUPIED MODE - HUMIDITY CONTROL

IF THE BUILDING HUMIDITY IN ANY ZONE RISES ABOVE THE UNOCCUPIED MAXIMUM SPACE RELATIVE HUMIDITY SET POINT THE FOLLOWING SHALL OCCUR:

- DOAS-1 SHALL REMAIN DISABLED AND THE DOAS-1 OUTDOOR AIR DAMPER SHALL REMAIN CLOSED
- AH-1, AH-2, AH-3, AH-4, AH-5 OR AH-6 SHALL BE SWITCHED TO FAN-ON MODE AND THE TEMPERATURE SET POINTS SHALL BE RESET 70 DEGREES F. THE UNIT(S) SERVING THE ZONE(S) WHERE THE HUMIDITY HAS BEEN DETERMINED TO BE ABOVE THE HUMIDITY SET POINT SHALL START AND SHALL OPERATE UNTIL THE SENSED HUMIDITY IS 5% BELOW THE UNOCCUPIED SET POINT.
- AH-1, AH-2, 1H-3, AH-4, AH-5 OR AH-6 SHALL REVERT TO THE UNOCCUPIED MODE WHEN THE ZONE RELATIVE HUMIDITY IS LOWERED 5% BELOW THE UNOCCUPIED HUMIDITY SET POINT

ECONOMIZER MODE (DOAS-1 ONLY):

WHEN THE OUTSIDE AIR ENTHALPY CONDITIONS AS MEASURED BY THE OUTSIDE AIR ENTHALPY SENSOR IS LESS THAN OR EQUAL TO 28 BTUS/LB OF DRY AIR, THE DOAS UNIT COMPRESSOR SHALL BE TURNED OFF AND THE DOAS SHALL DELIVER 100% OUTSIDE AIR TO THE BUILDING. ONCE THE OUTSIDE AIR ENTHALPY CONDITIONS AS MEASURED BY THE OUTSIDE AIR ENTHALPY SENSOR ARE GREATER THAN 28 BTUS/LB OF DRY AIR, THE DOAS SHALL RETURN TO NORMAL OCCUPIED MODE OPERATION.

SET POINTS (USER ADJUSTABLE)

OCCUPIED SPACE COOLING TEMPERATURE SET POINT:	75 DEG F
OCCUPIED SPACE HEATING TEMPERATURE SET POINT:	72 DEG F
UNOCCUPIED SPACE COOLING SET POINT:	80 DEG F
UNOCCUPIED SPACE HEATING SET POINT:	68 DEG F

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