SEISMIC GENERAL REQUIREMENTS

1. THE PROJECT HAS SEISMIC LOAD SUPPORT REQUIREMENTS BASED ON THE SEISMIC USE GROUP (OCCUPANCY) DESIGNATION OF THE FACILITY OF "IV" AND SEISMIC DESIGN CATEGORY "C". REFER TO DRAWING S0.01 FOR ADDITIONAL INFORMATION.
2. SEISMIC DESIGN REQUIREMENTS FOR MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE PROVIDED AS REQUIRED BY 2017 OHIO BUILDING CODE CHAPTER 16, SECTION 1613 EARTHQUAKE LOADS AND BY REFERENCE, THE AMERICAN SOCIETY OF STRUCTURAL ENGINEERS (ASCE) STANDARD 7-10 "MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES" (2010).
3. CHAPTER 13 OF ASCE 7-10 DEFINES THE REQUIREMENTS FOR THE MECHANICAL AND ELECTRICAL COMPONENTS.
4. THE COMPONENT IMPORTANCE FACTOR, Ip SHALL BE 1.5 FOR ALL COMPONENTS PER ASCE 7-10, 13.1.3 SINCE THE COMPONENTS ARE REQUIRED TO FUNCTION FOR LIFE SAFETY PURPOSES AFTER AN EARTHQUAKE AS WELL AS THE COMPONENTS ARE ALL LOCATED WITHIN AN OCCUPANCY CATEGORY "IV" STRUCTURE.
5. ASCE 7-10, TABLE 13.6-1 DEFINES THE SEISMIC AMPLIFICATION FACTOR Ap AND RESPONSE FACTOR Rp FOR EACH COMPONENT THAT SHALL BE USED IN DETERMINING THE ATTACHMENT REQUIREMENTS.
6. CERTAIN COMPONENTS TO BE SEISMICALLY BRACED AND SUPPORTED ARE TO ALSO INCLUDE VIBRATION ISOLATION WHERE INDICATED.
7. COMPONENTS OR SYSTEMS CAN BE INSTALLED IN A MANNER TO REDUCE SEISMIC BRACING OR SUPPORT REQUIREMENTS. ALL MECHANICAL AND ELECTRICAL SYSTEMS MUST FUNCTION AFTER AN EARTHQUAKE. EQUIPMENT, COMPONENTS, PIPING, DUCTWORK, CONDUIT, COMMUNICATION CABLING, ETC. SHALL BE SEISMICALLY BRACED. GENERAL GUIDELINES OR APPROACH FOR PROJECT SYSTEMS:
   - A. DUCTWORK IS DESIGNED TO BE LESS THAN 6 SQ. FT., NO SEISMIC BRACING.
   - B. PIPING SHOULD BE HUNG TIGHT TO STRUCTURE WITH THREADED ROD LESS THAN 12", NO SEISMIC BRACING IF INSTALLED IN THIS MANNER.
   - C. HVAC SYSTEMS IN-LINE WITH DUCT SYSTEM (FANS, HUMIDIFIERS) ARE LESS THAN 75 LBS., NO SEISMIC BRACING.
   - D. FLOOR OR GRADE SET EQUIPMENT, TO BE ANCHORED TO EQUIPMENT PAD AND IN TURN SECURED TO THE FLOOR.
   - E. FIRE SUPPRESSION PIPING SHALL BE SEISMIC BRACED PER THE REQUIREMENTS OF NFPA 13.
   - F. FLOOR/WALL MOUNTED ELECTRICAL EQUIPMENT, PANELBOARDS, AUTOMATIC TRANSFER SWITCHES, ETC. SHALL BE SEISMICALLY BRACED/SUPPORTED.
   - G. LIGHTING FIXTURES SHALL BE SUPPORTED INDEPENDENTLY OF SUSPENDED CEILING SYSTEMS.
   - H. CEILING FANS SHALL BE SEISMICALLY BRACED/SUPPORTED.
   - I. CONDUITS 2.5" AND LARGER SHALL BE SEISMICALLY BRACED/SUPPORTED.

SEISMIC CONTROL SPECIFICATIONS

PART 1 - GENERAL

1.1 SUMMARY
- A. THIS SECTION INCLUDES THE FOLLOWING:
  1. SEISMIC CONTROL REQUIREMENTS.

1.2 PERFORMANCE REQUIREMENTS
- A. SEISMIC CERTIFICATION AND ANALYSIS:
  1. EACH TRADE CONTRACTOR SHALL RETAIN A SPECIALTY CONSULTANT OR EQUIPMENT MANUFACTURER TO DEVELOP A SEISMIC RESTRAINT SYSTEM AND PERFORM SEISMIC CALCULATIONS IN ACCORDANCE WITH THE OBC AND ASCE 7, AND ADDITIONAL REQUIREMENTS SPECIFIED IN THIS SECTION. A PROFESSIONAL ENGINEER EXPERIENCED IN SEISMIC RESTRAINT DESIGN AND INSTALLATION AND LICENSED IN THE STATE OF OHIO SHALL BE RESPONSIBLE FOR CALCULATIONS, RESTRAINT SELECTIONS AND INSTALLATION DETAILS.
  2. THE SEISMIC RESTRAINT DESIGN SHALL CLEARLY INDICATE THE ATTACHMENT POINTS TO THE BUILDING STRUCTURE AND DESIGN FORCES IN ALL HORIZONTAL AND VERTICAL AXES AT THE ATTACHMENT POINTS. THE SEISMIC RESTRAINT ENGINEER SHALL COORDINATE ALL ATTACHMENTS WITH THE BUILDING'S STRUCTURAL ENGINEER OF RECORD, WHO SHALL VERIFY THE ATTACHMENT METHODS AND THE ABILITY OF THE BUILDING STRUCTURE TO ACCEPT THE LOADS IMPOSED.
  3. THE SEISMIC RESTRAINT DESIGN SHALL BE BASED ON ACTUAL EQUIPMENT DATA (DIMENSIONS, WEIGHT, CENTER OF GRAVITY, ETC.) OBTAINED FROM SUBMITTALS OR THE MANUFACTURERS. THE EQUIPMENT MANUFACTURER SHALL VERIFY THAT THE ATTACHMENT POINTS ON THE EQUIPMENT CAN ACCEPT THE COMBINATION OF SEISMIC, WEIGHT, AND OTHER LOADS IMPOSED. FOR LIFE SAFETY SYSTEMS AND OTHER SYSTEMS THAT MUST REMAIN OPERATIONAL DURING AND AFTER AN EARTHQUAKE, THE MANUFACTURER SHALL PROVIDE CERTIFICATION THAT THE EQUIPMENT CAN ACCEPT THE LOADS IMPOSED AND REMAIN OPERATIONAL.
  4. ANALYSIS SHALL INCLUDE CALCULATED DEAD LOADS, STATIC SEISMIC LOADS, AND CAPACITY OF MATERIALS UTILIZED FOR THE CONNECTION OF THE EQUIPMENT OR SYSTEM TO THE STRUCTURE. ANALYSIS SHALL DETAIL ANCHORING METHODS, BOLT DIAMETER, EMBEDMENT AND/OR WELDED LENGTH. ALL SEISMIC RESTRAINT DEVICES SHALL BE DESIGNED TO ACCEPT, WITHOUT FAILURE, THE FORCES DETAILED IN THE CODE ACTING THROUGH THE EQUIPMENT OR SYSTEM'S CENTER OF GRAVITY.

1.3 SUBMITTALS
- A. DELEGATED-DESIGN SUBMITTAL: THE SEISMIC RESTRAINT DESIGN, CONSISTING OF CALCULATIONS, RESTRAINT SELECTION, INSTALLATION DETAILS, AND OTHER DOCUMENTATION, SHALL BE SUBMITTED. THIS SUBMITTAL SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER, AS STATED ABOVE. THIS SUBMITTAL WILL BECOME PART OF THE PROJECT DESIGN CALCULATIONS, INCLUDED IN THE PROJECT RECORDS, AND WHEN REQUIRED, WILL BE SUBMITTED TO THE AUTHORITY HAVING JURISDICTION.
- B. SEISMIC RESTRAINT DEVICES: PRODUCT DATA, VERIFICATION OF SEISMIC CAPABILITIES AND INSTALLATION DETAILS.
- C. WELDING CERTIFICATES.
- D. FIELD QUALITY-CONTROL TEST REPORTS.

1.4 QUALITY ASSURANCE
- A. COMPLY WITH SEISMIC-RESTRAINT REQUIREMENTS IN THE OBC UNLESS REQUIREMENTS IN THIS SECTION ARE MORE STRINGENT.
- B. WELDING: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE - STEEL."
- C. ALL SEISMIC RESTRAINTS AND COMBINATION ISOLATOR / RESTRAINTS SHALL HAVE VERIFICATION OF THEIR SEISMIC CAPABILITIES. MANUFACTURERS MAY VERIFY THEIR CAPABILITIES BY TESTING THAT IS WITNESSED BY AN INDEPENDENT PROFESSIONAL ENGINEER OR AN ASSOCIATION THAT HAS DEVELOPED A UNIFORM SET OF TEST STANDARDS. INDEPENDENT APPROVAL CAN ALSO BE OBTAINED BY AGENCIES SUCH AS OSHPD (OFFICE OF STATEWIDE HEALTH, PLANNING AND DEVELOPMENT) FROM THE STATE OF CALIFORNIA, NES, ICBO ES, FACTORY MUTUAL, UNDERWRITERS LAB, RECOGNIZED INDUSTRY STANDARDS ORGANIZATIONS SUCH AS VISCMA, ETC.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES
- A. SEISMIC RESTRAINT DEVICES MAY INCLUDE ANY MANUFACTURER'S SYSTEM(S) SUITABLE FOR THE BUILDING CONSTRUCTION APPLICATION.
- B. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
  1. THE VMC GROUP (VIBRATION MOUNTING AND CONTROLS)
  2. MASON INDUSTRIES
  3. KINETICS NOISE CONTROL.

GENERAL NOTES - HVAC

1. PROVIDE COMPLETE AND FUNCTIONAL HVAC SYSTEMS PER HVAC PLANS INCLUDING FURNISHING, INSTALLING, TESTING AND WARRANTY OF ALL WORK.
2. WORK SHALL BE IN ACCORDANCE WITH THE 2017 OHIO BUILDING AND MECHANICAL CODES INCLUDING REFERENCED CODES AND STANDARDS, ALL FEDERAL, STATE, AND LOCAL CODES AND ALL APPLICABLE LAWS, ORDINANCES AND REGULATIONS.
3. WORK SHALL BE PERFORMED USING BEST QUALITY INSTALLATION PRACTICE BY A QUALIFIED TRADE CONTRACTOR AND THEIR QUALIFIED SUBCONTRACTORS. ALL CONTRACTORS SHALL BE LICENSED AND BE BONDED FOR THE WORK.
4. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH OSHA AND OWNER SAFETY STANDARDS AND PRACTICES. ALL ON SITE PERSONNEL SHALL BE SAFETY TRAINED AND OWNER CERTIFIED.
5. OBTAIN REQUIRED PERMITS RELATED TO THE WORK AND PAY ALL PERMIT AND INSPECTION FEES.
6. THE AUTHORITY HAVING JURISDICTION SHALL INSPECT AND APPROVE ALL WORK. PROVIDE A FINAL CERTIFICATE OF APPROVAL FROM THE AUTHORITY HAVING JURISDICTION AND PRESENT TO THE OWNER BEFORE REQUESTING FINAL PAYMENT AND RELEASE OF RETAINAGE.
7. ALL EQUIPMENT AND MATERIAL REQUIRED FOR COMPLETE AND FUNCTIONAL HVAC SYSTEMS ARE INCLUDED IN THE CONTRACT.

GENERAL REQUIREMENTS - HVAC

1. PROTECT ALL FURNISHED MATERIAL AND EQUIPMENT FROM THEFT AND DETERIORATION OR CONTAMINATION DUE TO WEATHER OR CONSTRUCTION ACTIVITIES.
2. PROTECT OWNERS PROPERTY AND PROPERTY OF OTHER CONTRACTORS.
3. REMOVE ALL CONSTRUCTION DEBRIS FROM SITE. RECYCLE DEBRIS WHERE POSSIBLE. DISPOSE OF ALL HAZARDOUS MATERIAL IN ACCORDANCE WITH ENVIRONMENTAL LAWS.
4. PROVIDE ALL CUTTING AND PATCHING REQUIRED TO INSTALL MATERIAL AND EQUIPMENT.
5. PROVIDE APPROPRIATE FIRESTOPPING SYSTEM FOR ANNULAR SPACE OPENINGS AROUND DUCT AND PIPE PENETRATIONS THROUGH FIRE RESISTANCE RATED CONSTRUCTION. ANNULAR SPACE OPENINGS AT DUCT OR PIPE PENETRATIONS IN NON RATED CONSTRUCTION TO BE CLOSED AIR AND WATER TIGHT.
6. MATERIALS AND EQUIPMENT SHALL BE ONE OF THE BRAND OR MANUFACTURERS LISTED OR AN APPROVED EQUAL.
7. ELECTRONIC SHOP DRAWINGS SHALL BE PROVIDED IN .PDF FORMAT FOR THE ENGINEER'S APPROVAL FOR ALL MATERIALS AND EQUIPMENT. SHOP DRAWINGS SHALL BE SPECIFICALLY EDITED TO ELIMINATE SUPERFLUOUS INFORMATION AND SHALL CLEARLY SHOW SPECIFICS FOR THE MATERIAL AND EQUIPMENT PROVIDED.
8. COORDINATE INSTALLATION OF ACTUAL EQUIPMENT AND SYSTEMS PROVIDED WITH OTHER TRADES AND NEW OR EXISTING CONDITIONS.
9. INSTALL ALL MATERIALS AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND REQUIREMENTS. PROVIDE REQUIRED CLEARANCES TO MEET CODE REQUIREMENTS, MANUFACTURER'S RECOMMENDATIONS AND MAINTENANCE SERVICE.
10. ALL WORK AREAS SHALL BE CLEANED TO MATCH ORIGINAL CONDITION.
11. PROVIDE TESTING, ADJUSTING AND BALANCING (TAB) REPORTS FOR AIR AND WATER SYSTEMS. A CERTIFIED AABC OR NEBB FIRM SHALL PROVIDE THE BALANCE.
12. PROVIDE FINAL COORDINATION/INSTALLATION DRAWINGS TO THE OWNER IN BOUND PAPER AS WELL AS ELECTRONIC FORMAT FOR RECORD.
13. MAINTAIN RECORD DRAWINGS AND PROVIDE TO THE OWNER OR HIS AGENT.
14. PROVIDE TWO (2) BOUND, PAPER COPIES OF ALL OPERATING AND MAINTENANCE MANUALS. PROVIDE AN ELECTRONIC COPY OF THE OPERATING AND MAINTENANCE MANUAL.
15. PROVIDE WARRANTY FOR ALL WORKMANSHIP, EQUIPMENT AND MATERIAL. WARRANTY SHALL BE 1 YEAR FOR PART AND LABOR, PROVIDE EXTENDED WARRANTY PERIOD FOR PARTS AND/OR LABOR AS IDENTIFIED OR AS STANDARD FOR CERTAIN ITEMS OF EQUIPMENT.

DUCTWORK LEGEND

Symbol	Description
20/12 20/12	RECTANGULAR DUCT FIRST FIGURE IS SIDE SHOWN
10"Ø 10"Ø	ROUND DUCT DIAMETER INDICATED
24/14Ø 24/14Ø	FLAT OVAL DUCT FIRST FIGURE IS SIDE SHOWN
	DOUBLE WALL DUCT INTERIOR LINER PERFORATED
	DUCT WITH INTERIOR ACOUSTIC LINER
	FABRIC DUCT
	STAINLESS STEEL DUCT
	FLEXIBLE FABRIC STEEL DUCT
	INSULATED FLEXIBLE DUCT
R	CHANGE OF ELEVATION R = RISE, D = DROP
	ELBOW WITH TURNING VANES
20/12	ROUND RUNOUT DUCT TAP TO RECTANGULAR DUCT WITH SPIN-IN FITTING, SEE DETAIL
10"Ø	ROUND RUNOUT DUCT FITTING IN ROUND DUCT MAIN
	VOLUME DAMPER
FD	FIRE DAMPER
S	DUCT MOUNTED SMOKE DETECTOR
	SUPPLY DUCT SECTION - RISE, DROP
	RETURN DUCT SECTION - RISE, DROP
	VARIABLE AIR VOLUME UNIT WITH ELECTRIC REHEAT COIL
S1-8" 300	SUPPLY AIR DEVICE S1 SEE SCHEDULE AND DETAIL 8" NECK SIZE 300 = REQUIRED AIR FLOW (CFM)
R1	TRANSFER AIR DEVICE R1 DEVICE TAG, SEE SCHEDULE AND DETAIL
R1 300	RETURN/EXHAUST DEVICE TAG: R=RETURN, E=EXHAUST 300 = REQUIRED AIR FLOW (CFM) DEVICE SIZE AS INDICATED IN AIR DEVICE SCHEDULE
S2-24/12 300-8' 6"	SIDEWALL AIR DEVICE SEE AIR DEVICE SCHEDULE 24/12 = DEVICE SIZE 300 = AIR FLOW (CFM) 8' 6" = MOUNTING HEIGHT (AFF)
(E) 120	EXISTING AIR DEVICE REBALANCE TO AIR FLOW INDICATED
T	ROOM TEMPERATURE SENSOR
C	CO/NO_2 SENSOR
	PUSH BUTTON

GENERAL LEGEND

Symbol	Description
EC	ELECTRICAL CONTRACTOR.
FC	FIRE PROTECTION CONTRACTOR.
GC	GENERAL CONTRACTOR.
HC	HVAC CONTRACTOR.
PC	PLUMBING CONTRACTOR.
TC	TEMPERATURE CONTROLS CONTRACTOR.
NIC	NOT IN CONTRACT.
AFF	ABOVE FINISHED FLOOR - TO BOTTOM OF ITEM UNLESS INDICATED OTHERWISE IN DRAWING.
(E)	EXISTING.
ES	EQUIPMENT SUPPLIER.
EM	EMERGENCY.
MH	MOUNTING HEIGHT.
S	SURFACE MOUNTED.
WP	WEATHER PROOF.
3	NOTE SYMBOL - APPLIES ONLY TO SHEET ON WHICH IS SHOWN.
2	DETAIL NOTE SYMBOL - APPLIES ONLY TO DETAIL ON WHICH IS SHOWN.
H-1	EQUIPMENT REFERENCE SYMBOL. ELECTRICAL CONNECTION REQUIRED.
H-1	EQUIPMENT REFERENCE SYMBOL. NO ELECTRICAL CONNECTION REQUIRED.
123	ROOM NUMBER.
B / H2	DETAIL SYMBOL DETAIL "B" SHOWN ON SHEET H2.
A / H1	SECTION SYMBOL SECTION "A" DESIGNATION, SHOWN ON SHEET H1.
A / H1	EXTERIOR ELEVATION SYMBOL ELEVATION "A" DESIGNATION, SHOWN ON SHEET H1.
	CONNECTION, NEW TO EXISTING.
FD1	UP TO SYMBOL UP TO "FD1", SHOWN ON FLOOR ABOVE.
	1 HOUR FIRE PROTECTION SEE SPECIFICATION FOR PENETRATION DETAILS
	2 HOUR FIRE PROTECTION SEE SPECIFICATION FOR PENETRATION DETAILS
	3 HOUR FIRE PROTECTION SEE SPECIFICATION FOR PENETRATION DETAILS
	ITEM TO BE REMOVED.
	EXISTING TO REMAIN.
	NEW ITEM.

PIPING LEGEND

Symbol	Description
	INDICATES DIRECTION OF FLOW
CD	CONDENSATE DRAIN
L	REFRIGERANT - LIQUID
S	REFRIGERANT - SUCTION
HG	REFRIGERANT - HOT GAS
0.375"L 0.625"S 0.625" HG	REFRIGERANT LINE SET BETWEEN CONDENSING UNIT AND AHU. 0.375"L = LIQUID PIPE SIZE 0.625"S = SUCTION PIPE SIZE 0.625" HG = HOT GAS BYPASS SIZE
	CAP
	CONNECTION, BOTTOM
	CONNECTION, TOP
	CONNECTION, SIDE
	ELBOW, 90°, LONG RADIUS
	ELBOW, 45°, LONG RADIUS
	ELBOW, TURNED UP
	ELBOW, TURNED DOWN

HVAC INDEX OF DRAWINGS

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STATE OF OHIO
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63822
REGISTERED PROFESSIONAL ENGINEER
JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402
PROJECT # 23001

City of Middletown
Fire Station No. 83 & Headquarters
1830 Yankee Road, Middletown, Ohio 45044

ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
LEGENDS & SCHEDULES

SHEET NO.
H0.1

DUCT INSULATION SCHEDULE

QUALITY ASSURANCE

INSULATION SHALL MEET NFPA 255, 25 FLAME SPREAD & 50 SMOKE DEVELOPMENT, UL 181, NFPA 90A/90B, ASTM 1136, AND ASTM...

MINIMUM INSULATION THICKNESS SHALL COMPLY WITH ASHRAE 90.1-2010

PRODUCTS

- PROTECTIVE METAL JACKET COVERS - 0.016" ALUMINUM.

EXECUTION

- INSULATION SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- DUCTWORK SHALL BE SEALED PRIOR TO INSTALLATION OF INSULATION.
- ALL EXTERIOR DUCT INSULATION SHALL BE SEALED WATERTIGHT.
- REINSULATE DUCTWORK WHERE EXISTING INSULATION IS DAMAGED IN CONNECTION OF NEW DUCTWORK
- ALL INSULATION VAPOR BARRIERS SHALL BE MAINTAINED.
- ADHESIVE SHALL BE APPLIED TO AID INSTALLATION.
- REQUIRED INTERNAL DUCT LINING IS INDICATED ON DRAWINGS. LINED DUCTWORK NEED NOT BE FURTHER INSULATED.
- DUCT COILS, REHEAT BOX COILS, CONTROL DAMPER, FIRE DAMPERS & SMOKE DAMPERS SHALL BE INSULATED IF SYSTEM INSULATION IS INDICATED.
- ALL INSULATION SHALL BE MARKED WITH MANUFACTURER, "R" VALUE, FLAME SPREAD & SMOKE DEVELOPMENT.

SYSTEM	INSULATION THICKNESS	TYPE	LOCATION	NOTES
SUPPLY AIR DUCT	1.5"	1	CONCEALED	
SUPPLY AIR DUCT	2"	2	EXPOSED - UNCONDITIONED	
SUPPLY AIR DUCT	-	-	EXPOSED - CONDITIONED	
OUTDOOR AIR DUCT & PLEMUNS	2"	2	EXPOSED	
RETURN AIR DUCT	-	-	CONCEALED	
RETURN AIR DUCT	-	-	EXPOSED	
RETURN AIR DUCT	1"	4	AHU-1 RETURN DUCT	2
RELIEF AIR DUCT & PLENUMS	-	-	EXPOSED	
EXHAUST AIR DUCT & PLENUMS	-	-	CONCEALED	
EXHAUST AIR DUCT & PLENUMS	-	-	EXPOSED	
TYPE I KITCHEN HOOD EXHAUST DUCT	1.5"	3	INTERIOR	1

TYPE	BASIS OF DESIGN	APPROVED EQUALS	DESCRIPTION
1	OWENS-CORNING SOFTR TYPE 75	KNAUF JOHN MANVILLE MANSON CERTAIN TEED	MATERIAL FIBERGLASS DUCT WRAP ON DUCT K = 0.30 @ 75 DEG. F. DENSITY - 0.75 PCF JACKET - FOIL REINFORCED JOINTS - OVERLAPPING STAPLE ALL JOINTS AT 6" CENTERS. FASTENERS - MECHANICAL ON 24" & WIDER DUCT. ADHESIVE - NONE TAPE - 3" WIDE
2	OWENS-CORNING TYPE 703	KNAUF JOHN MANVILLE MANSON CERTAIN TEED	MATERIAL FIBERGLASS BOARD ON DUCT K = 0.23 @ 75 DEG. F. DENSITY - 3.0 PCF JACKET - ASJ JOINTS - BUTT FASTENERS - METAL PINS & CLIPS ON 12" CENTERS ADHESIVE - NONE TAPE - 3" WIDE VAPOR PATCHED
3	3M FIRE BARRIER DUCT WRAP 615	UNIFRAX	HIGH TEMPERATURE FIBROUS BLANKET FIBERGLASS REINFORCED ALUMINIZED POLYESTER FOIL. DENSITY - 6.0 PCF CONTINUOUS USE LIMIT = 1000 DEG. C. R-VALUE - 6.3 @ 77 DEG. F. SMOKE DEVELOP INDEX - 0 FLAME SPREAD INDEX - 0 TAPE - FSK S.S. BANDING MATERIAL
4	OWENS-CORNING QUIET R ROTARY DUCT LINER	KNAUF JOHN MANVILLE MANSON CERTAIN TEED	MATERIAL FIBERGLASS DUCT LINER K = 0.23 @ 75. DEG. F JACKET - NONE JOINTS - BUTT FASTERNERS - METAL PINS & CLIPS ON 12" CENTERS ADHESIVE COMPLIES WITH ASTM C916 TAPE - NONE LEADING NOSE - METAL NOSING

NOTES:

1. PROVIDE TWO LAYERS OF FIRE BARRIER WRAP ON ALL INTERIOR KITCHEN HOOD EXHAUST DUCT.
2. DUCTWORK DIMENSION NOTED ON DRAWING IS OPEN DUCT INTERIOR DIMENSION.

PIPE INSULATION SCHEDULE

QUALITY ASSURANCE

PRODUCTS SHALL COMPLY WITH ASTM E84 FIRE, SMOKE RATINGS:
- INDOORS - FLAME SPREAD RATING OF 25 OR LESS, SMOKE DEVELOPED RATING OF 50 OR LESS.
- OUTDOORS - FLAME SPREAD RATING OF 75 OR LESS, SMOKE DEVELOPED RATING OF 150 OR LESS.

GREEN GUARD INDOOR AIR QUALITY CERTIFIED.

THICKNESSES SHALL COMPLY WITH MOST CURRENT VERSION OF ASHRAE 90.1.

PRODUCTS

REQUIREMENTS ARE FOR BOTH SUPPLY & RETURN SYSTEMS.

MANUFACTURERS:

FIBERGLASS - JOHNS MANVILLE, OWENS CORNING, KNAUF, MANSON INSULATION

CALCIUM SILICATE - PABCO, CALSILITE, JOHNS MANVILLE (IIG)

FLEXIBLE ELASTOMERIC - AEROFLEX, ARMACELL, RUBATEX

POLYISOCYANURATE - ITW

EXECUTION

INSTALLATION PER MANUFACTURER'S RECOMMENDATIONS.

COLD SERVICE PIPE INSULATION AND VAPOR BARRIER/JACKET TO BE CONTINUOUS THRU FLOOR AND WALL SLEEVES AT ALL PIPE DEVICES AND PUMP CASINGS.

INSULATION AND VAPOR BARRIER TO BE CONTINUOUS AT PIPE HANGERS AND SUPPORTS ON HORIZONTAL PIPING.

VERTICAL PIPE SUPPORTS SHALL ATTACH DIRECTLY TO PIPE. INSULATE SUPPORT AND OTHER SURFACES WITH FLEXIBLE CLOSED CELL INSULATION, SAME THICKNESS AS SYSTEM INSULATION ON COLD SERVICE PIPES TO PREVENT CONDENSATION.

EXISTING PIPE INSULATION THAT IS DAMAGED, REMOVED OR NOT PRESENT WITHIN THE CONSTRUCTION AREA SHALL BE INSULATED PER SCHEDULE FOR THE SYSTEM SERVICE INDICATED.

INSULATION MAY BE OMITTED ON HOT WATER VALVES AND DEVICES 2" AND SMALLER PIPE SIZE (EXCEPT WITHIN 12" OF AIR REHEAT BOXES), HOT WATER PIPING WITHIN UNIT HEATERS, EXPOSED COOLING COIL CONDENSATE PIPING AND SAFETY RELIEF VALVE PIPING. SEE HEATING COIL PIPING DETAIL.

SYSTEM & SIZE	INSULATION THICKNESS	TYPE	LOCATION
REFRIGERANT LIQUID	0.75"	E1, E2	INTERIOR (E1) / EXTERIOR (E2)
REFRIGERANT HOT GAS	0.75"	E1, E2	INTERIOR (E1) / EXTERIOR (E2)
REFRIGERANT SUCTION	0.75"	E1, E2	INTERIOR (E1) / EXTERIOR (E2)
COOLING COIL CONDENSATE	0.5"	F1	INTERIOR

TYPE	BASIS OF DESIGN	APPROVED EQUALS	DESCRIPTION
F1	OWENS CORNING #ALL SERVICE JACKET	- KNAUF #1000° PIPE, - JOHNS MANVILLE #MICRO-LOK HP	PREFORMED, TUBULAR, INORGANIC GLASS FIBER WITH RESIN BONDING. K=0.24 @ 100 DEG. F, 3.5 - 5.5 PCF. WHITE FSRK JACKET. LONGITUDINAL LAP, SELF-SEALING ADHESIVE. ELBOWS, TEES, VALVES, CAPS, ETC., WHITE ONE PIECE, PREMOLDED 25/50 0.20" PVC FITTING COVERS WITH HIGH DENSITY FIBERGLASS INSULATION INSERTS SAME THICKNESS, K=0.26 EQUAL TO ZESTON OR PROTO.
E1	AEROFLEX #AEROCEL EPDM	- ARMACELL - RUBATEX	FLEXIBLE, PRE-FORMED, CLOSED CELL, EPDM ELASTOMERIC TUBULAR INSULATION, OR SHEET INSULATION. K=0.25 @ 75 DEG. F. CLEAN PIPE SURFACE WITH DENATURED ALCOHOL PRIOR TO INSULATING.
E2	ARMACELL #AP ARMAFLEX FS	- AEROFLEX - RUBATEX	FLEXIBLE, PRE-FORMED, CLOSED CELL, ELASTOMERIC TUBULAR INSULATION. CLEAN PIPE SURFACE WITH DENATURED ALCOHOL PRIOR TO INSULATING. K=0.25 @ 75 DEG. F. 25/50 FLAME/SMOKE RATING. PROVIDE 0.20" ROLL ALLOY ALUMINUM EMBOSSED JACKET, SEAM SIDE DOWN WITH 0.50" WIDE, 0.015" S.S. STRAP AND SEALS EQUAL TO PABCO-CHILDERS METALS/GERRARD.

PIPING SYSTEMS - HVAC

GENERAL NOTES:

QUALITY ASSURANCE:

PIPING SHALL CONFORM TO OBC REQUIREMENTS.

PIPING SHALL COMPLY WITH ASME B31.9 "BUILDING SERVICES PIPING".

WELDING PROCEDURES & TESTING SHALL COMPLY WITH ANSI STANDARD B31.1.0.

PRODUCTS

REINFORCED FORGED WELDING OUTLETS EQUAL TO BONNET WELDOLET AND THREADOLET MAY BE USED WHERE BRANCH IS TWO SIZES SMALLER THAN THE MAIN.

DIELECTRIC CONNECTORS SHALL BE PROVIDED AT CONNECTIONS BETWEEN FERROUS & COPPER PIPING.

PIPING WITHIN 2'-0" OF SMALL HEATING/COOLING UNITS MAY BE TYPE "C3" PIPING.

MECHANICALLY FORMED TEES AND COUPLING (T-DRILL) ARE NOT PERMITTED

MECHANICAL JOINT PIPING SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURED RECOMMENDATIONS.

UNIONS:
COPPER TUBING - WROUGHT OR CAST COPPER, CLASS 150, SOLDERED ENDS
THREADED STEEL PIPE - MALLEABLE IRON W/GROUND SEAT, 300 LB SCREWED ENDS

FLANGES:
COPPER TUBING - CLASS 150 CAST COPPER ALLOY, SOLDERED
STEEL PIPE - CLASS 150 SLIP-ON OR WELD NECK
GASKETS - 1/16" THICK FULL FACE COMPRESSED SHEET GASKET SUITABLE FOR PRESSURE AND TEMPERATURE RANGES OF THE APPLICATION

BULB WELLS FOR TEMPERATURE SENSING SPECIFIED IN THE CONTROLS AND INSTRUMENTATION SECTION SHALL BE FURNISHED BY THE CONTROL SUBCONTRACTOR AND INSTALLED BY THE PIPING CONTRACTOR. OTHER TYPES OF CONTROL DEVICES (DIFFERENTIAL PRESSURE SWITCHES, FLOW METERS, ETC.) SHALL ALSO BE INSTALLED BY THE PIPING CONTRACTOR. DEVICES, FITTINGS (TEES, WELDOLETS, THREADOLETS), LOCATIONS AND INSTALLATION DETAILS SHALL BE CLOSELY COORDINATED WITH THE CONTROLS SUBCONTRACTOR AND DEVICE MANUFACTURER'S INSTRUCTIONS.

AUTOMATIC CONTROL VALVES SHALL BE FURNISHED BY THE CONTROLS SUBCONTRACTOR FOR INSTALLATION BY THE HVAC PIPING CONTRACTOR. FLARE FITTINGS FOR FLARE END VALVES SHALL BE PROVIDED BY THE HVAC PIPING CONTRACTOR.

EXECUTION

PIPE AND TUBING SHALL BE CUT AND FABRICATED TO FIELD MEASUREMENTS AND RUN PARALLEL TO NORMAL BUILDING LINES. PIPE INTERIOR SHALL BE CLEANED OF FOREIGN MATTER AND BURRS BEFORE ERECTION OF PIPE.

SUPPORT PIPING FROM BUILDING STRUCTURE WITH RODS, ANGLES & CLAMPS ATTACHED TO STRUCTURE. HANG PIPING WITH CLEVIS HANGER OR ROLLER SUPPORTS. HANGERS SHALL BE INSTALLED ON CENTERS AS RECOMMENDED BY MANUFACTURER.

PIPING SHALL BE PITCHED FOR DRAINAGE. THE LOW POINTS SHALL BE FITTED WITH A 3/4" BALL DRAIN VALVE WITH HOSE THREAD ADAPTOR.

PROVIDE PIPING SLEEVES AT FLOORS, WALLS & ROOFS IN NEW CONSTRUCTION. EXISTING WALL TO BE SAW CUT TO PASS NEW PIPING.

PIPING SHALL NOT BE RUN ABOVE ELECTRICAL SWITCHGEAR OR PANELBOARDS, NOR ABOVE THE ACCESS SPACE OF SUCH EQUIPMENT - NEC ARTICLE 384.

ANNULAR SPACE AROUND PIPING THRU ALL WALLS SHALL BE SEALED OFF WITH PERMANENT PLIABLE CAULKING OR APPROVED PATCHING SEALANT.

CLOSE OPEN ENDS OF PIPING DURING CONSTRUCTION.

CLEAN INTERIOR PIPING AFTER INSTALLATION BY FLUSHING WITH CLEAN POTABLE WATER TO CLEAR ALL INTERNAL DEBRIS.

TESTING

PIPING SHALL BE AIR TESTED AT 50% HIGHER THAN MAXIMUM SYSTEM OPERATING PRESSURE FOR EIGHT (8) HOURS BEFORE FLUSHING

IDENTIFICATION & MARKING

PLASTIC SNAP-ON PIPE MARKERS SHALL BE INSTALLED ON PIPING INDICATING SERVICE AND DIRECTION OF FLOW.

PIPING SYSTEM	TYPE
COIL CONDENSATE DRAINAGE	C3
COPPER TUBE REFRIGERANT PIPING - AHU	C1
COPPER COIL REFRIGERANT PIPING - IT SPLIT SYSTEM	C1

TYPE	DESCRIPTION	TYPE	DESCRIPTION
C1	BRAZED COPPER REFER TO SPECIFICATION 23 2300 FOR INFORMATION	C3	SOLDERED COPPER TYPE "DWV" HARD COPPER ASTM B88 CAST DWV COPPER FITTINGS 95-5 SOLDER

DUCT CONSTRUCTION MATERIAL SCHEDULE

DUCTWORK SYSTEM SCHEDULE

DUCTWORK SYSTEMS	LOCATION	MATERIAL	SMACNA CLASS. SP. CONSTR.	SMACNA CLASS. SEAL CLASS	NOTES
RETURN AIR	CONCEALED	G1	-2"	C	
RETURN AIR	EXPOSED	G2	-2"	C	1
OUTDOOR SUPPLY AIR	ALL	G1	+4"	A	
EXHAUST AIR	CONCEALED	G1	-2"	C	
EXHAUST AIR	EXPOSED	G2	-2"	C	1
AIR TRANSFER	ALL	G1	-1"	NOT REQ'D.	
SUPPLY AIR - VAV UPSTREAM	CONCEALED	G1	+4"	A	
SUPPLY AIR - VAV UPSTREAM	EXPOSED	G2	+4"	A	1
SUPPLY AIR - VAV DOWNSTREAM	CONCEALED	G1	+1"	C	
SUPPLY AIR - VAV DOWNSTREAM	EXPOSED	G2	+1"	C	1
SUPPLY AIR - CONSTANT VOLUME	CONCEALED	G1	+3"	B	
FLEXIBLE DUCTWORK - SUPPLY	CONCEALED OR UNCONDITIONED	C1	+10" -5"	N.A.	
TYPE 1 KITCHEN HOOD EXHAUST	CONCEALED	SS1	-2"	C	2
TYPE 1 KITCHEN HOOD EXHAUST	EXPOSED	SS2	-2"	C	2
DOMESTIC WATER HEATER	INTAKE / FLUE	P1	-2" / +4"	A	
GAS FIRED UNIT HEATER	INTAKE / FLUE	P1	-2" / +4"	A	
RADIANT HEATER INTAKE	ALL	G1	-2"	A	
RADIANT HEATER FLUE - TYPE B	APP. BAY	D1	+4"	A	
GEAR DRYER EXHAUST	DECON	SS1	+2"	C	

DUCTWORK MATERIALS SCHEDULE

TYPE	MATERIAL	DESCRIPTION
C1	CHLORINATED POLYETHYLENE	BLACK INNER FABRIC WITH GALVANIZED STEEL HELIX REINFORICING, R = 6.0 (MIN.) FIBERGLASS INSULATION, REINFORCED METALIZED VAPOR BARRIER, 0.05 PERM, UL 181, CLASS 1 DUCT, MEET NFPA 90A & 90B, 25/50 FLAME/SMOKE SPREAD
D1	ALUMINUM / GALVANIZED DOUBLE WALL	DOUBLE WALL TYPE B VENT. REFER TO SPEC. 235100.
G1	GALVANIZED STEEL	24 GA. MIN., HOT DIPPED, GALVANIZED BOTH SIDES, G90 PER ASTM A653.
G2	GALVANIZED STEEL	24 GA. MIN., HOT DIPPED, HEAT TREATED GALVANNEALED BOTH SIDES PER ASTM A653, PAINT COLOR SELECTION BY ARCHITECT, FINAL PAINTING BY G.C., A40 PER ASTM A653.
P1	POLYPROPYLENE	SCHEDULE 40 POLYPROPYLENE UL 1738 HIGH TEMPERATURE RATED, 230 DEG. F FLUE GAS RATING CENTROTHERM INNOFLUE SINGLE WALL OR EQUAL.
SS1	STAINLESS STEEL KITCHEN EXHAUST DUCT	TYPE 304 STAINLESS STEEL SHEET CONSTRUCTION: 18 GA. MIN. - ASTM A480. JOINTS & SEAMS: CONTINUOUSLY WELDED FINISH: CONDITION A, NO ADDITIONAL FINISH. FITTINGS/TRANSITIONS: ELBOWS SHALL BE RADIUSED. DUCT ACCESSORIES: PROVIDE BOLTED AND GASKETED LIQUID TIGHT CLEANOUT DOORS IN THE SIDE OF THE DUCT AT 20FT CENTERS IN HORIZONTAL RUNS.
SS2	STAINLESS STEEL KITCHEN EXHAUST DUCT	TYPE 304 STAINLESS STEEL SHEET CONSTRUCTION: 18 GA. MIN. - ASTM A480. JOINTS & SEAMS: CONTINUOUSLY WELDED. FINISH: CONDITION A, NO. 4 (BRUSHED)/ NO. 8 (MIRROR) POLISH FINISH WITH WELDS GROUND SMOOTH AND POLISHED. FITTINGS/TRANSITIONS: ELBOWS SHALL BE RADIUSED. DUCT ACCESSORIES: PROVIDE BOLTED AND GASKETED LIQUID TIGHT CLEANOUT DOORS IN THE SIDE OF THE DUCT AT 20FT CENTERS IN HORIZONTAL RUNS.

NOTES:

1. DUCTWORK SYSTEMS ARE TO MATCH BASE MATERIALS FOR CONCEALED AND EXPOSED INSTALLATIONS.
2. PROVIDE 2 LAYERS OF FIRE BARRIER WRAP ON ALL INTERIOR KITCHEN HOOD EXHAUST DUCT.

DUCT CONSTRUCTION GENERAL REQUIREMENTS

QUALITY ASSURANCE

- COMPLY WITH GENERAL WELDING PERSONNEL & PROCEDURES UNDER AWS D1.1/D1.1M, AWS D1.2/D1.2M & AWS D9.1/D9.1M.
- COMPLY WITH GENERAL DUCT CONSTRUCTION STANDARDS UNDER SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE - THIRD EDITION AND MOST CURRENT VERSION OF APPLICABLE ASHRAE 90.1 SECTION 6.4.4 AND ASHRAE 62.1 SECTIONS 5 & 7.
- COMPLY WITH SEISMIC REQUIREMENTS PRESCRIBED UNDER SMACNA DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE THIRD EDITION & ASCE/SEI 7.

PRODUCTS

ROUND OR FLAT OVAL SINGLE WALL DUCTWORK - 2" S.P. AND HIGHER
- CONTINUOUS HELICAL (SPIRAL) LOCK SEAM CONSTRUCTION.
- SLIP CONNECTIONS; GASKETED FLANGES ARE NOT ACCEPTABLE.
- USE 45 DEG. LATERAL TEES WHEREVER POSSIBLE.
- 90 DEG. TEES SHALL BE CONICAL SPIN-IN TYPE.
- DIE STAMPED ELBOWS, r/D = 1.5 (MIN.)
- RADIUSED, ANGLED (15° MAX.) OR MITERED (15° MAX.) OFFSETS.
- CONCENTRIC TRANSITIONS, 0 = 45° MAX.
- ECCENTRIC TRANSITIONS, 0 = 30° MAX.

ROUND OR FLAT OVAL DOUBLE WALL DUCTWORK - 2" S.P. AND HIGHER (SAME AS ABOVE EXCEPT:)
- INSULATION THICKNESS PER INSULATION SCHEDULE FOR INTENDED SERVICE.
- PERFORATED INNER LINER/SOLID INNER LINER.
- OUTER PRESSURE SHELL.

ROUND DUCTWORK - 1" S.P. OR LESS (SAME AS ABOVE EXCEPT:)
- LONGITUDINAL SEALED SEAM CONSTRUCTION ACCEPTABLE AT FINAL AIR DEVICE ONLY.
- STANDARD TEES ALLOWED.
- SEGMENTED ELBOWS ALLOWED.

RECTANGULAR DUCTWORK - 2" S.P. AND HIGHER
- FLAT SLIP, STANDING DRIVE OR GASKETED FLANGE DUCT SYSTEM CONNECTIONS.
- RADIUS OR SQUARE THROAT WITH DOUBLE WALL TURNING VANES ELBOW.
- 45 DEG. ENTRY OR CONICAL SPIN-IN BRANCH CONNECTIONS.
- RADIUSED, ANGLED (15° MAX.) OR MITERED (15° MAX.) OFFSETS.
- CONCENTRIC TRANSITIONS, 0 = 45° MAX.
- ECCENTRIC TRANSITIONS, 0 = 30° MAX.
- BRANCH DUCTS SHALL BE CONICAL TEE FITTINGS.
- SQUARE THROAT, RADIUS HEEL 90° ELBOWS ARE NOT PERMITTED.

RECTANGULAR DUCTWORK - 1" S.P. OR LESS (SAME AS ABOVE EXCEPT:)
- TURNING VANES IN ELBOWS NOT REQUIRED FOR AIR VELOCITIES LESS THAN 800 FPM.
- STRAIGHT TAP AND STANDARD SPIN-IN BRANCH CONNECTIONS PERMITTED.

FLEXIBLE DUCTWORK - SUPPLY/RETURN/TRANSFER/EXHAUST
- PROVIDE MANUFACTURED DUCT SUPPORTS AT 90 DEGREE ELBOWS TO CEILING AIR DEVICES.
- FLAME SPREAD LESS THAN 25, SMOKE DEVELOPMENT LESS THAN 50.

DUCT SEALANT & GASKETS
- GALVANIZED DUCT SEALANT - WATER BASED SYNTHETIC LATEX EMULSION, GRAY IN COLOR.
- FLANGE GASKETS - BUTYL RUBBER, NEOPRENE, OR EPDM POLYMER W/ POLYISOBUTYLENE PLASTICIZER.
- ALUMINUM DUCT SEALANT - ALUMINUM SILICONE, GRAY IN COLOR.
- PVC COATED DUCT SEALANT - PVS SEALANT OR CAULK/MINERAL IMPREGNATED FIBER TYPE.

DUCT HANGER SUPPORTS
- DUCT HANGER SUPPORTS SHALL DIRECTLY ATTACH TO DUCTWORK.
- EXTERIOR DUCT INSULATION WRAP SHALL BE APPLIED OVER DUCT AND HANGER SUPPORTS.
- ANGLE OR UNISTRUT SUPPORTS SHALL BE INSULATED A MINIMUM OF 4" BEYOND DUCT BEARING POINT TO PREVENT CONDENSATION.

EXECUTION
- DRAWINGS INDICATE GENERAL LOCATION OF DUCTWORK. COORDINATE DUCT LAYOUT CAREFULLY WITH OTHER TRADES TO AVOID CONFLICT. PROVIDE OFFSETS AS REQUIRED.
- SPAN DUCTWORK FROM STRUCTURAL CONCRETE/STEEL MEMBERS OR SUPPLEMENTARY STEEL SHAPES.
- FOR EXPOSED DUCTWORK, GRIND WELDS SMOOTH AND POLISH AND TRIM SEALANTS FLUSH WITH DUCT SURFACES.
- PROTECT DUCTWORK DURING CONSTRUCTION AND CLEAN PRIOR TO SYSTEM OPERATION.
- ROUTE DUCTWORK TO AVOID PASSING THRU TRANSFORMER VAULTS OR ABOVE ELECTRICAL SWITCHGEAR OR PANELBOARDS PER NEC REQUIREMENTS.
- SEAL DUCTS ACCORDING TO SMACNA SEAL CLASS NOTED IN SCHEDULE.
- SYSTEMS OPERATING AT 3" S.P. OR HIGHER AND ALL EXTERIOR DUCTWORK SHALL REQUIRE DUCT PRESSURE TESTING.
- WET DUCT SYSTEMS SHALL BE PITCHED FOR DRAINAGE. PROVIDE TRAPPED DRAIN AT SYSTEM LOW POINTS AND PIPE TO LOCAL DRAIN POINT.
- ALL EXPOSED DUCTWORK SHALL BE PAINTED TO MATCH BASE MATERIAL COLORS. PAINTING BY G.C.

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REGISTERED PROFESSIONAL ENGINEER
JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402
PROJECT # 23001

City of Middletown

Fire Station No. 83 & Headquarters

1830 Yankee Road, Middletown, Ohio 45044

ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
MATERIAL SCHEDULES

SHEET NO.
H0.2

EQUIPMENT NOTES

DS-1	DUCT SILENCER BASIS OF DESIGN: VIBRO-ACOUSTICS AIRFLOW: 8,010 CFM PRESSURE DROP: 0.2" CASING: 22 Ga GALVANIZED MEDIA FILL: ACOUSTIC GRADE GLASS FIBER REFER TO SPECIFICATION 23 3330 FOR SOUND DISSIPATION CHARACTERISTICS DIMENSIONS: 60"L / 38" W / 24" H

KITCHEN HOOD - KH-1 SCHEDULE

RESIDENTIAL RANGE HOOD.
CAPTIVE AIRE #2424-WRH
FEATURES:

- 5' LENGTH
- EXHAUST COLLAR WITH STANDARD WRAPPER. H.C. TO COORDINATE WRAPPER DIMENSIONS WITH G.C.
- STAINLESS STEEL BACKSPLASH
- TOUCHSCREEN USER INTERFACE
- RECESSED LED LIGHTS
- 1-1/4" GAS SOLENOID VALVE WITH COOKING SURFACE SHUTOFF
- INTEGRATED FIRE SUPPRESSION SYSTEM
- INTEGRATED SYSTEM CONTROLS (INTERLOCK WITH BAS)
- GREASE FILTER WITH GREASE CUP

HOOD TO INCLUDE TEMPERATURE SENSOR WHICH WILL AUTOMATICALLY START EF-4 (REMOTE KITCHEN EF) WHEN TEMPERATURE EXCEEDS 125° (ADJ)

HOOD POWER:120V/1PH/8MCA/15MOCP

REFER TO DETAIL 3, SHEET H3.4 FOR INSTALLATION DIAGRAM.

AIR DEVICE SCHEDULE

GENERAL NOTES
BASIS OF DESIGN: PRICE
EQUAL BY TITUS, TUTTLE & BAILEY

MAXIMUM SOUND LEVEL AT NC-25 AT INDICATED AIR FLOW.

BALANCING DAMPER GENERALLY PROVIDED IN DUCT, NOT AT DEVICE.

STANDARD WHITE BAKED ACRYLIC FINISH UNLESS NOTED OTHERWISE.
DEVICES NOTED WITH PC-12 FINISH SHALL HAVE COLOR SELECTED BY THE ARCHITECT, FINAL PAINTING BY THE G.C.

DIFFUSERS SHALL BE 4-WAY THROW UNLESS OTHERWISE NOTED OR INDICATED ON DRAWINGS.

VERIFY CEILING TYPE AND PROVIDE APPROPRIATE MOUNTING FRAME WHERE REQUIRED.

TAG	DESCRIPTION	MODEL NO.	MATERIAL	ACCESSORIES	NOTES
S1 & S1A	2'X2' SQUARE PLAQUE DIFFUSER ROUND DUCT CONNECTION	SPD (ASPD)	STEEL (A) = ALUMINUM	INSULATED BACKPAN (STYLE 31)	
S2 & S2A	12"X12"SQUARE PLAQUE DIFFUSER ROUND DUCT CONNECTION	SPD (ASPD)	STEEL (A) = ALUMINUM	INSULATED BACKPAN (STYLE 31)	1
S3	SPIRAL DUCT GRILLE DEVICE SIZE - REFER TO FLOOR PLAN DOUBLE DEFLECTION BLADES - 3/4" SPACING AIR SCOUP & BALANCING DAMPER	520	ALUMINUM	AIR SCOUP BALANCING DAMPER PC-12	
S4	LOUVERED SUPPLY GRILLE DOUBLE DEFLECTION W/ LONG FRONT BLADES 3/4" BLADE SPACING	520	STEEL	BALANCING DAMPER	
R1	RETURN GRILLE DEVICE SIZE - 24" X 24" 45° HORIZONTAL BLADES 1/2" SPACING	635	ALUMINUM		
R2	RETURN GRILLE DEVICE SIZE - 24" X 12" 45° HORIZONTAL BLADES 1/2" SPACING BLADES PARALLEL TO LONG DIMENSION	635	ALUMINUM		
R3	RETURN GRILLE DEVICE SIZE PER DRAWING 45° HORIZONTAL BLADES 1/2" SPACING	635	ALUMINUM	SURFACE MOUNT FRAME	
E1	RETURN GRILLE DEVICE SIZE - 24" X 24" 45° HORIZONTAL BLADES 1/2" SPACING	635	ALUMINUM		
E2	RETURN GRILLE DEVICE SIZE - 24" X 12" 45° HORIZONTAL BLADES 1/2" SPACING BLADES PARALLEL TO LONG DIMENSION	635	ALUMINUM		
E3	EXHAUST GRILLE DEVICE SIZE - 12" X 12" 45° HORIZONTAL BLADES 1/2" SPACING	635	ALUMINUM		1
E4	RETURN GRILLE DEVICE SIZE - REFER TO FLOOR PLAN 45° HORIZONTAL BLADES 1/2" SPACING BLADES PARALLEL TO LONG DIMENSION	635	ALUMINUM	PC-12	2

NOTES:
1. DEVICE TO BE SURFACE MOUNTED IN CENTER OF ACOUSTIC CEILING PAD FOR LAY-IN APPLICATION.
2. DUCT MOUNTED TO END OF DUCTWORK.

FAN & ROOF VENTILATOR SCHEDULE

3400

BASIS OF DESIGN - GREENHECK
REFER TO SPECIFICATIONS FOR OTHER MANUFACTURERS

VFD DRIVEN MOTORS SHALL BE PROVIDED WITH SHAFT GROUNDING RINGS, VFD DUTY MOTORS.

REFER TO INSTALLATION DETAILS.

TAG	SERVICE	DESCRIPTION	MODEL NUMBER & SIZE	ROOF OPENING (L x W)	CAPACITY		ELECTRICAL		ELECTRIC				DRIVE TYPE		MOUNTING					APPLICATION				ACCESSORIES & OPTIONS								CONTROLS						NOTES
					AIRFLOW (CFM)	E.S.P. (IN. W.C.)	MOTOR HP	V/PH	DISCONNECT WITH FAN	DISCONNECT BY E.C.	VFD	ECM	DIRECT	BELT	ROOF CURB	BASE/FLOOR	SUSPENDED, INLINE	WALL	CEILING	UL 705 GREASE RATED	UL 864 SMOKE CONTROL	HIGH TEMP (ABOVE 200 °F)	EXPLOSION PROOF	VIBRATION ISOLATION	INSULATION HOUSING	WALL HOUSING + GUARD	SLOPNG ROOF CURB	HINGED ROOF CURB	CURB EXTENSION	POWDER COAT FINISH	EPOXY INTERIOR FINISH	DDC CONNECTION	MANUALON/OFF SWITCH	DIAL SPEED CONTROLLER	HOA CONTROLLER	MOTORIZED DAMPER	GRAVITY DAMPER	
EF-1	APPARATUS BAY	INLINE CENTRIFUGAL	SQ-20-M2-VG	-	6,560	1	3	460 / 3	●			●	●				●							●								●			●	●		2
EF-2	LIVING QUARTERS	DOWNBLAST CENTRIFUGAL	G-095-VG	12.5 x 12.5	450	0.75	1/6	120 / 1	●			●	●		●																	●			●	●		2
EF-3	OFFICE	DOWNBLAST CENTRIFUGAL	G-095-VG	12.5 x 12.5	400	0.75	1/6	120 / 1	●			●	●		●																	●			●	●		2
EF-4	KITCHEN HOOD	UPBLAST CENTRIFUGAL	DU33HFA (SEE NOTE 1)	16 x 16	750	1"	1/3	120 / 1	●			●	●		●					●								●									●	1
EF-5	TOG	INLINE CENTRIFUGAL	SQ-99-VG	-	550	0.75	1/4	120 / 1	●			●	●				●							●								●			●	●		2, 3
EF-6	DECON	INLINE CENTRIFUGAL	SQ-90-VG	-	300	0.5	1/10	120 / 1	●			●	●				●							●								●			●	●		2
EF-7	HOSE DRYING TOWER	UPBLAST CENTRIFUGAL	CUE-090-VG	12.5 x 12.5	450	0.25	1/10	120 / 1	●			●	●		●																	●			●	●		2
EF-8	TRAINING TOWER	UPBLAST CENTRIFUGAL	CUE-160-VG	18.5 x 18.5	2,255	0.25	1/2	120 / 1	●			●	●		●																	●			●	●		2
EH-1	EF-5	GRAVITY RELIEF VENTILATOR	GRSR-10	12.5 x 12.5	550	-	-	-							●																							
IF-1	GEAR DRYING CABINET	INLINE CENTRIFUGAL	SQ-140-VG	-	900	0.25	3/4	120 / 1	●			●	●				●					●		●								●			●	●		2

NOTES:
1. EXHAUST FAN PROVIDED WITH CAPTIVE AIRE KITCHEN HOOD. FAN IS POWERED AND CONTROLLED THROUGH KITCHEN HOOD.
2. REFER TO HOA CONTROLLER FOR INSTALLATION & WIRING.
3. FAN POWERED THROUGH STORM SHELTER UPS PROVIDED BY E.C.

LOUVER SCHEDULE

GENERAL NOTES
BASIS OF DESIGN: GREENHECK
EQUAL BY: POTTORFF, RUSKIN, AIROLITE

MAXIMUM 500 FPM ON INTAKE LOUVERS, 1000 FPM ON EXHAUST LOUVERS.
MINIMUM 50% FREE AREA

PRIME COAT PAINT COLOR. FINAL COLOR SELECTION BY ARCHITECT, PAINTED BY G.C.

TAG	DESCRIPTION	LOCATION	MODEL NO.	MATERIAL	ACCESSORIES	NOTES
L-I-1	FIXED BLADE LOUVER DEVICE SIZE - 108"x48" LOUVER FRAME SIZE - 6" FRAME MIN. 50% FREE AREA	AHU-1 INTAKE	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-I-2	FIXED BLADE LOUVER DEVICE SIZE - 72"x48" LOUVER FRAME SIZE - 6" FRAME MIN. 50% FREE AREA	APPARATUS BAY INTAKE	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-I-3	FIXED BLADE LOUVER DEVICE SIZE - 24"x24" LOUVER FRAME SIZE - 6" FRAME	GEAR DRYER INTAKE	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-I-4	FIXED BLADE LOUVER DEVICE SIZE - 36"x36" LOUVER FRAME SIZE - 6" FRAME	TRAINING TOWER	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-E-1	FIXED BLADE LOUVER DEVICE SIZE - 84"x36" LOUVER FRAME SIZE - 6" FRAME MIN. 50% FREE AREA	AHU-1 RELIEF	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-E-2	FIXED BLADE LOUVER DEVICE SIZE - 48"x36" LOUVER FRAME SIZE - 6" FRAME MIN. 50% FREE AREA	APPARATUS BAY EXHAUST	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-E-3	FIXED BLADE LOUVER DEVICE SIZE - 24"x18" LOUVER FRAME SIZE - 6" FRAME	GEAR DRYER	ESD-635	ALUMINUM	BLACK BIRDSCREEN	
L-E-4	FIXED BLADE LOUVER DEVICE SIZE - 18"x18" LOUVER FRAME SIZE - 6" FRAME	EF-6	ESD-635	ALUMINUM	BLACK BIRDSCREEN	

AIR TERMINAL UNIT SCHEDULE - ELECTRIC

GENERAL NOTES
UNITS ARE VARIABLE AIR VOLUME, ELECTRIC REHEAT.

CV - CONSTANT VOLUME
VV- VARIABLE VOLUME

DESIGN BASIS- PRICE MODULE SDV

UNITS TO HAVE SCR CONTROL
DISCONNECT SWITCH PROVIDED WITH UNIT.

ENTERING AIR TEMP. (DEG. F) 55
MAX AIR PRES. DROP INCL. HW COIL. 0.6" S.P.

MAX. NC 25, WITH 10db ROOM ABSORBTION AT 1.5" SP AND MAX AIR FLOW.

UNIT. NO.	INLET SIZE	TYPE	COOLING MAX. (CFM)	COOLING MIN. (CFM)	HEATING CFM	MBH	KW	LAT	V/PH	SEE NOTES
1-1	7	VV	360	75	225	11	3.2	95	460 / 3	
1-2	7	VV	450	90	315	13.6	4.0	95	460 / 3	
1-3	12	VV	1200	240	840	36.3	10.6	95	460 / 3	
1-4	9	VV	610	125	430	18.6	5.4	95	460 / 3	
1-5	10	VV	825	165	580	25.1	7.3	95	460 / 3	
1-6	8	VV	675	205	475	20.5	6.0	95	460 / 3	
1-7	8	CV	550	550	550	23.8	7.0	95	460 / 3	
1-8	8	VV	350	105	245	10.6	3.1	95	460 / 3	
1-9	7	VV	370	75	260	11.2	3.3	95	460 / 3	
1-10	14	VV	1675	335	1175	50.8	14.9	95	460 / 3	
1-11	6	VV	350	70	245	10.6	3.1	95	460 / 3	
1-12	8	VV	530	110	375	16.2	4.7	95	460 / 3	
1-13	6	VV	315	65	225	9.7	2.8	95	460 / 3	
1-14	9	VV	610	125	430	18.6	5.4	95	460 / 3	
1-15	6	CV	325	325	325	14.0	4.1	95	460 / 3	
1-16	5	VV	165	35	120	5.2	1.5	95	460 / 3	
1-17	5	VV	80	20	80	3.5	1.0	95	460 / 3	
1-18	5	VV	175	35	125	5.5	1.6	95	460 / 3	
1-19	7	VV	500	100	350	15.9	4.7	95	460 / 3	
1-20	10	CV	750	750	750	32.4	9.5	95	460 / 3	

CONDENSING UNIT SCHEDULE - IT SPLIT SYSTEM

BASIS OF DESIGN: MITSUBISHI/TRANE
EQUAL BY: DAIKIN, LG, LIEBERT

OUTDOOR UNIT TEMPERATURE RANGE: 115°F DB TO -40°F DB. UNIT SHALL BE CAPABLE OF STARTING AT ANY TEMPERATURE WITHIN THE OPERATING RANGE.

UNIT	FAN COIL UNIT SERVED	AREA SERVED	COOLING CAPACITY	COOLING CAPACITY	REFRIGERANT PIPING		MAX PIPING LENGTH (FT)	REFRIGERANT		ELECTRICAL			DIMENSIONS			UNIT WEIGHT (LBS)	MODEL NO.	NOTES
			MBH @ 95°F	MBH @ -40°F	GAS	LIQUID		TYPE	FACTORY CHARGE (LBS)	V/PH	MCA	MOCP	WIDTH	DEPTH	HEIGHT			
CD-IT	FC-IT	IT ROOM	30	30	5/8	3/8	225	R-410A	7	208V / 1PH	19	26	31-13/16	11-13/16	24-13/16	151	PUY-A30NHA7	ALL

NOTES:
1. PROVIDE FRONT AND SIDE WIND BAFFLE KIT TO PROVIDE LOW AMBIENT COOLING.
2. INVERTER DUTY COMPRESSOR.
3. PROVIDE HAIL GUARD.
4. ADDITIONAL REFRIGERANT CHARGE BY H.C.
5. BACNET CONNECTION.

FAN COIL UNIT SCHEDULE - IT SPLIT SYSTEM

BASIS OF DESIGN: MITSUBISHI/TRANE
EQUALS BY: DAIKIN, LG, LIEBERT

- COOLING CAPACITIES BASED ON 95°F OUTDOOR AIR TEMP.

UNIT	DESCRIPTION	MOUNTING	CONDENSING UNIT	CFM	E.S.P.	COOLING CAPACITY				REFRIGERANT PIPING		ELECTRICAL			CABINET DIMENSIONS			UNIT WEIGHT (LBS)	MODEL NO.	NOTES
						SENS. MBH	TOTAL MBH	EAT (DB/WB)	LAT (DB/WB)	GAS	LIQUID	V/PH	MCA	MOCP	WIDTH	DEPTH	HEIGHT			
FC-IT	SPLIT SYSTEM	WALL MOUNTED	CD-IT	450	-	21	30	76/64	55/54	5/8	3/8	208V / 1PH	1	NOTE 1	35-23/64	9-11/32	11-25/32	46	PKA-A30KA8	ALL

NOTES:
1. PROVIDE FLUSH MOUNT REMOTE TEMPERATURE SENSOR.
2. PROVIDE BACNET INTERFACE.
3. PROVIDE CONDENSATE PUMP.

ELECTRIC DUCT REHEAT COIL SCHEDULE

GENERAL NOTES
BASIS OF DESIGN: RAYWALL

UNIT NO.	DESCRIPTION	MODEL	DUCT WIDTH	DUCT HEIGHT	EAT (°F)	LAT (°F)	KW	VOLT / PH	AIR FLOW (CFM)	DIMENSIONS			WEIGHT (LBS)	NOTES
										L (IN.)	D (IN.)	H (IN.)		
DH-1	DUCT MOUNTED HEATER	RAYWALL #4PD15-1812-2-3	18"	12"	0	50	15	480V / 3PH	900	11-1/2"	9-1/8"	11"	34	1, 2

NOTES:
1. INTEGRAL DISCONNECT SWITCH.
2. DDC CONNECTION.

VARIABLE FREQUENCY DRIVES

GENERAL NOTES
ALL VFD'S SHALL BE FROM SAME MANUFACTURER
ALL VFD'S SHALL HAVE A BACNET COMMUNICATION CARD
VFD'S FULL LOAD AMPS SHALL BE EQUAL TO OR GREATER THAN THE SUM OF THE INDIVIDUAL MOTOR FULL LOAD AMPS.
VFD FURNISHED BY THE H.C., INSTALLATION BY THE E.C.

TAG	SERVICE	VOLTAGE / PHASE	HP	ENCLOSURE	NOTES
VFD-SF	AHU-1 SUPPLY AIR FAN	460 / 3	20	NEMA 1	1
VFD-RF	AHU-1 RETURN AIR FAN	460 / 3	5	NEMA 1	1

NOTES:
1. INTEGRAL DISCONNECT SWITCH WITH DRIVE.

RADIANT HEATER SCHEDULE - GAS

GENERAL NOTES
BASIS OF DESIGN: RE-VERBER-RAY
EQUAL BY: REFER TO SPECIFICATION

UNIT NO.	MODEL #	SERVICE	MOUNTING	MODULATING RANGE (MBH)	BLAST MODE (MBH)	AMPS	VOLT/PH	DIMENSIONS L	WEIGHT (LBS)	MOUNTING HEIGHT (FT)	NOTES
RH-1	MP-50-150	APPARATUS BAY	CEILING SUSPENDED	97.5 - 150	155	5	120 / 1	50' - 9"	235	16'-8"	1, 2, 3
RH-2	MP-50-150	APPARATUS BAY	CEILING SUSPENDED	97.5 - 150	155	5	120 / 1	50' - 9"	235	16'-8"	1, 3
RH-3	MP-50-150	APPARATUS BAY	CEILING SUSPENDED	97.5 - 150	155	5	120 / 1	50' - 9"	235	16'-8"	1, 3
RH-4	MP-50-150	APPARATUS BAY	CEILING SUSPENDED	97.5 - 150	155	5	120 / 1	50' - 9"	235	16'-8"	1, 3
RH-5	MP-25-80	APPARATUS BAY	CEILING SUSPENDED	52 - 80	85	5	120 / 1	26' - 5"	145	16'-8"	1, 2, 3
RH-6	MP-25-80	APPARATUS BAY	CEILING SUSPENDED	52 - 80	85	5	120 / 1	26' - 5"	145	16'-8"	1, 2, 3

NOTES:
1. PROVIDED WITH MICROPROCESSOR BASED THERMOSTAT, MODEL #TH-PUI. CAPABLE OF TOGGLING BLAST MODE OPERATION.
2. PROVIDE SIDE SHIELD TO PROJECT HEAT AWAY FROM UPPER STORAGE AREA / SIDEWALL.
3. TYPE B ROOF VENT. FINAL PAINTING BY G.C., COLOR SELECTION BY H.C. UTILIZE HIGH TEMPERATURE RESISTANT PAINT FOR FLUES.

GAS FIRED UNIT HEATER SCHEDULE

GENERAL NOTES
BASIS OF DESIGN: MODINE

UNIT NO.	MODEL #	MOUNTING	(MBH) INPUT/OUTPUT	CFM	AMPS	VOLT/PH	DIMENSIONS			WEIGHT	NOTES
							L (IN.)	D (IN.)	H (IN.)		
GUH-1	PTC-260	CEILING SUSPENDED	260 / 242	4,585	10.95	120 / 1	42.5"	34.8"	31.3"	265	1, 2, 3

NOTES:
1. CONDENSATE NEUTRALIZING KIT.
2. STANDARD CONVENIENCE PACKAGE WITH DISCONNECT SWITCH, CONDENSATE PUMP, AND LOW VOLTAGE T-STAT CONNECTIONS.
3. STAINLESS STEEL HEAT EXCHANGER.

ELECTRIC UNIT HEATER SCHEDULE

GENERAL NOTES
BASIS OF DESIGN: RAYWALL

UNIT NO.	DESCRIPTION	MANUFACTURER / MODEL	MOUNTING	KW	MBH	AIR FLOW (CFM)	DIMENSIONS			VOLTAGE / PHASE	NOTES
							W (IN.)	D (IN.)	H (IN.)		
EUH-1	MIDSIZED FAN FORCED WALL HEATER	RAYWALL 305 SERIES #E3055T2DWB	WALL RECESSED	1.5	5	100	9-1/4"	3-5/8"	12-1/8"	120 / 1	2, 3, 4
EUH-2	VERTICAL MOUNTED FAN FORCED UNIT HEATER	RAYWALL 5100 SERIES #HF2B5103N	WALL BRACKET	3.3	11.2	400	14-15/32"	6-1/2"	17-3/4"	208 / 3	1, 2, 3
EUH-3	VERTICAL MOUNTED FAN FORCED UNIT HEATER	RAYWALL 5100 SERIES #F2F5105N	WALL BRACKET	5	17.1	400	14-15/32"	6-1/2"	17-3/4"	208 / 3	1, 2, 3

1

NOTES:
1. WALL MOUTING BRACKET #A5105.
2. DISCONNECT SWITCH WITH UNIT.
3. INTEGRAL THERMOSTAT.
4. PROVIDE SURFACE MOUNT FRAME #305EX32 ON UNIT LOCATED IN STORM SHELTER RESTROOM.

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EXPIRATION DATE 12/21/2023

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PROJECT # 23001

City of Middletown
Fire Station No. 83 & Headquarters
1830 Yankee Road, Middletown, Ohio 45044

ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION
1	11/10/23	BULLETIN 5

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
EQUIPMENT SCHEDULES

SHEET NO.
H0.3

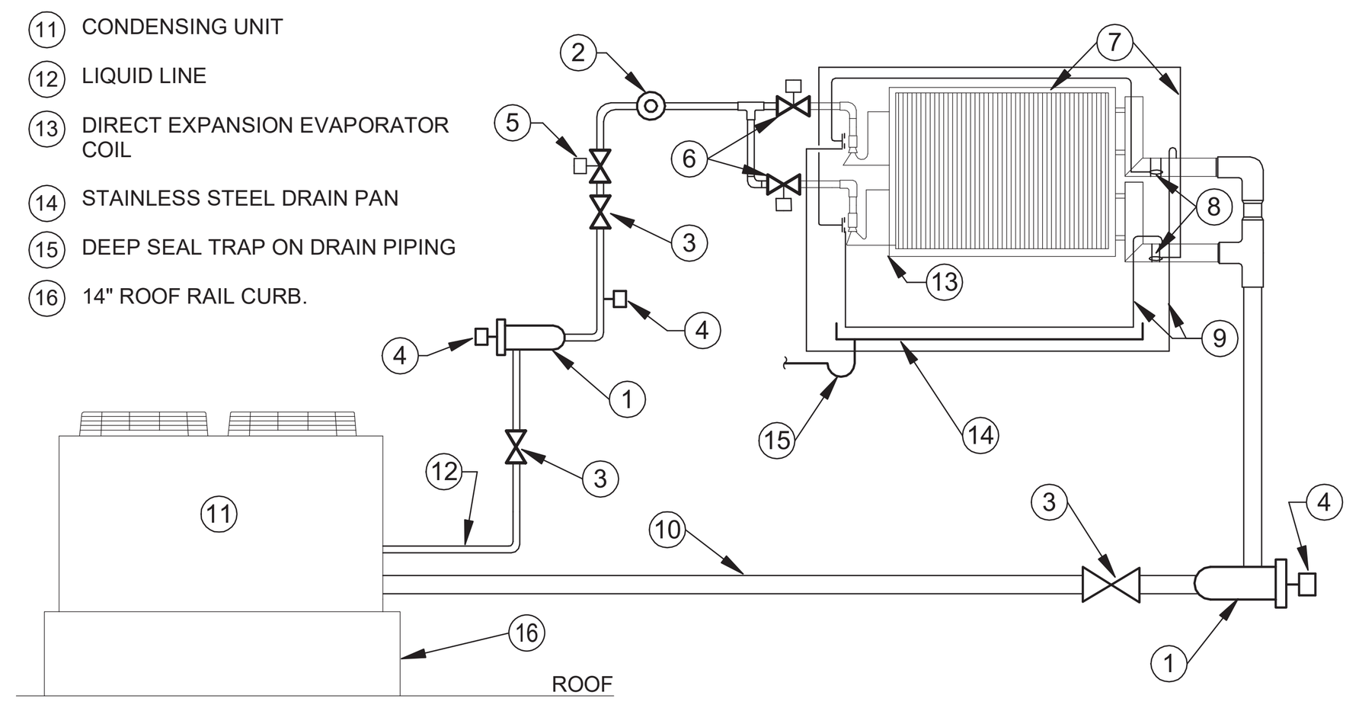
GENEAL AHU NOTES

1. THE AIR HANDLING UNIT AND ASSOCIATED CONDENSING UNIT SHOWN ON THIS SHEET, HAVE BEEN PRE-PURCHASED BY THE PROJECT CONSTRUCTION MANAGER. UNIT DATA IS REPORTED FOR INFORMATION ONLY.
2. THE H.C. SHALL COORDINATE WITH THE CONSTRUCTION MANAGER TO RECEIVE SHIPMENT OF THE AHU AND CONDENSING UNIT AT THE PROJECT SITE AND INSTALL THE NEW AIR HANDLING UNIT.
3. THE H.C. SHALL PROVIDE THE REFRIGERANT COIL COMPONENTS SPECIFIED IN DETAIL 1, THIS SHEET. REFER TO UNIT MANUFACTURERS RECOMMENDATIONS FOR COMPONENTS.
4. THE H.C. SHALL PROVIDE ALL ADDITIONAL REFRIGERANT CHARGE REQUIRED.

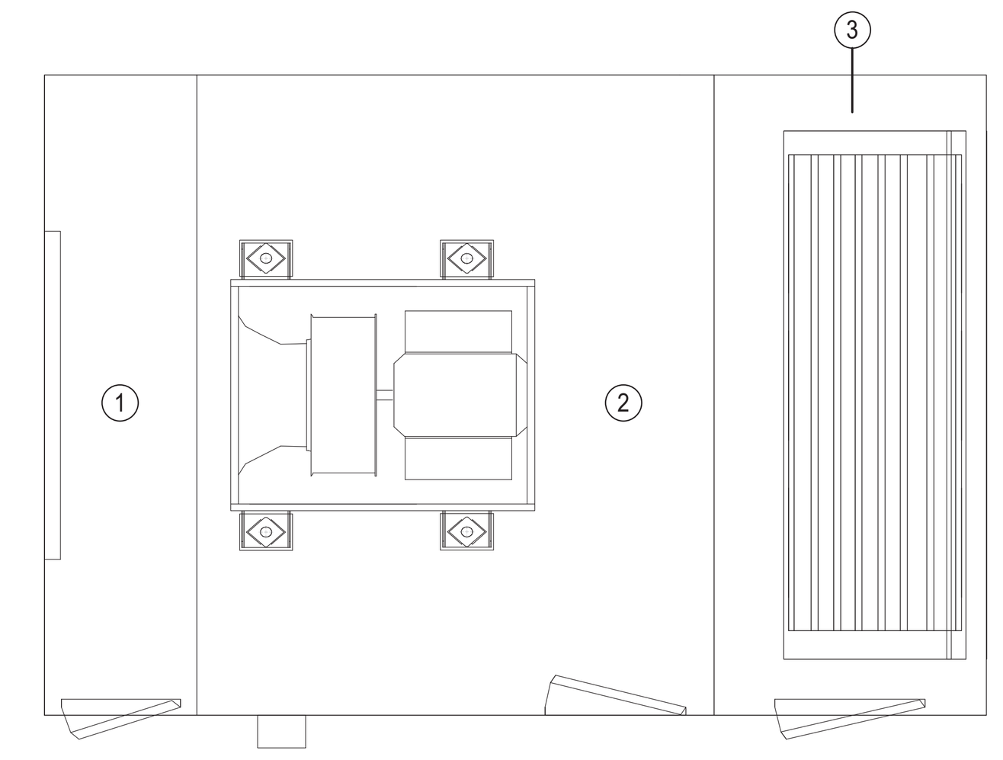
(1) REPLACEABLE CARTRIDGE TYPE FILTER DRIER
(2) SIGHT GLASS
(3) BALL SHUTOFF VALVE
(4) ACCESS PORT
(5) SOLENOID LIQUID VALVE
(6) EXPANSION VALVE
(7) EXPANSION VALVE CAPILLARY TUBES
(8) EXPANSION VALVE THERMAL BULBS
(9) EXPANSION VALVE EQUALIZER LINES
(10) SUCTION LINE
(11) CONDENSING UNIT
(12) LIQUID LINE
(13) DIRECT EXPANSION EVAPORATOR COIL
(14) STAINLESS STEEL DRAIN PAN
(15) DEEP SEAL TRAP ON DRAIN PIPING
(16) 14" ROOF RAIL CURB.

GENERAL NOTES

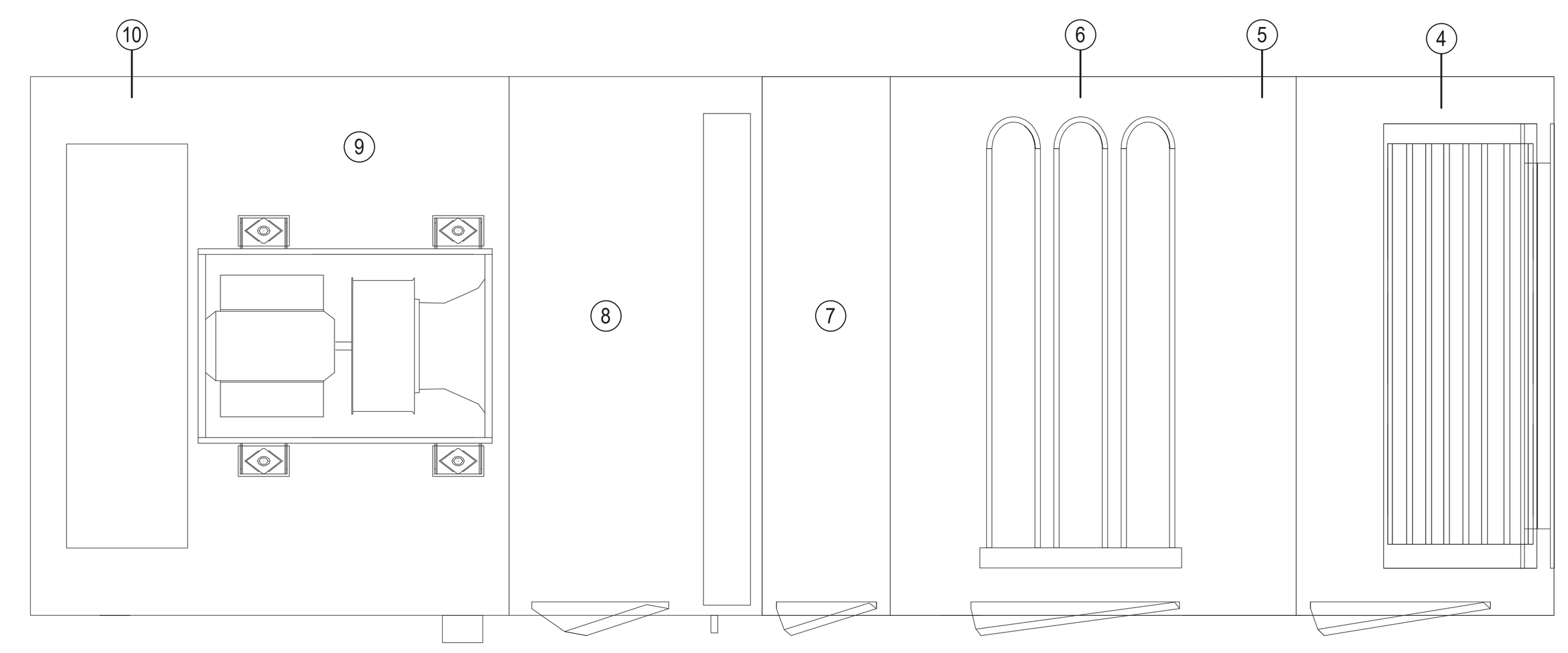
A. COMPRESSOR UNITS SHALL HAVE BRAIDED FLEXIBLE CONNECTIONS ON COMPRESSOR SIDE.
B. PIPE SIZES SHALL BE PER MANUFACTURERS RECOMMENDATIONS.
C. REFER TO MANUFACTURERS RECOMMENDATION FOR EXPANSION, SHUTOFF AND SOLENOID VALVE SIZES.
D. PIPING LAYOUT AND CONFIGURATION SHALL BE INSTALLED PER MFGR'S RECOMMENDATIONS.
E. REFRIGERANT SPECIALTIES ARE SHOWN FOR SCHEMATIC PURPOSES ONLY AND SHALL BE COORDINATED PER MFGR'S INSTALLATION INSTRUCTIONS.



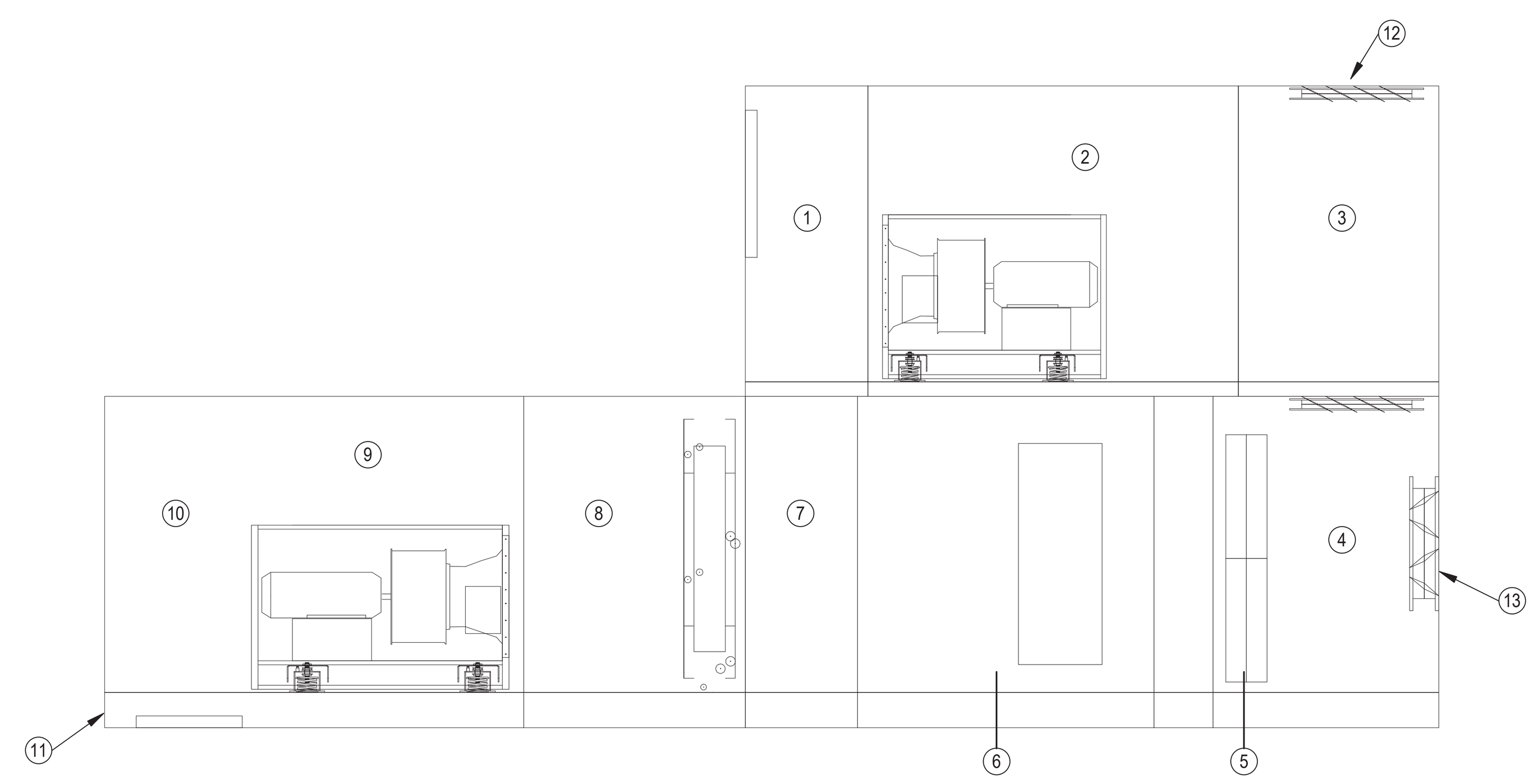
1 REFRIGERANT PIPING DETAIL
N.T.S.



AHU-1 TOP SECTION - PLAN
SCALE:1/2" = 1'-0"



AHU-1 BOTTOM SECTION - PLAN
SCALE:1/2" = 1'-0"



AHU-1 - ELEVATION
SCALE:1/2" = 1'-0"

(#) AHU NOTES

1. RETURN AIR PLENUM
   - ACCESS DOOR - 20" W x 38" H
   - END OPENING
2. RETURN AIR FAN
   - ACCESS DOOR 24" W x 38" H
   - LED MARINE LIGHT
3. MIXING SECTION - TOP HALF
   - RELIEF AIR DAMPER TOP
   - RETURN AIR DAMPER MIDDLE
   - ACCESS DOOR - 26" W x 38" H
4. MIXING SECTION - BOTTOM HALF
   - RELIEF AIR DAMPER MIDDLE
   - OUTSIDE AIR DAMPER END
   - ACCESS DOOR - 26" W x 58" H
5. COMBINATION FILTER SECTION
   - 2" MERV 8 & 4" MERV 13.
   - ACCESS DOOR - 12" W x 58" H
   - LED MARINE LIGHT.
6. ELECTRIC PREHEAT COIL WITH DISCONNECT SWITCH
7. ACCESS SECTION - 20"
   - LED MARINE LIGHT
   - ACCESS DOOR - 20" W x 58" H
8. DX COOLING COIL
   - ACCESS DOOR - 12" W x 52" H
   - LED MARINE LIGHT.
9. SUPPLY FAN
   - ACCESS DOOR - 30" W x 58" H
   - LED MARINE LIGHT.
10. SUPPLY AIR PLENUM
    - 54" W x 20" D. BOTTOM OPENING
    - METAL SAFETY GRATE OVER OPENING
    - LED MARINE LIGHT
    - ACCESS DOOR - 16" W x 58" H
11. 6" BASE RAIL
12. OUTSIDE AIR DAMPER
13. RELIEF AIR DAMPER

AIR HANDLING UNIT SCHEDULE

UNIT	AHU-1
UNIT LOCATION	MECHANICAL ROOM
DESCRIPTION	STACKED UNIT - DIRECT DRIVE PLENUM FANS
MANUF./SIZE LENGTH/WIDTH/HEIGHT	TRANE CSAA021 226.5 / 80 / 109
UNIT WEIGHT (LBS)	5,666
SUPPLY FAN	
FAN TYPE	DIRECT DRIVE PLENUM FAN
TOTAL AIR FLOW	10,875
EXTERNAL S.P. (INCHES W.G.)	2
FAN SIZE	22.25
MOTOR H.P / V-PH (EACH)	20 HP 460V/ 3PH
VARIABLE FREQUENCY DRIVE	BY H.C.
FILTER	
PRE-FILTER TYPE	2" MERV 8
FINAL FILTER TYPE	4" MERV 13
HEATING COIL - ELECTRIC - BASED ON 0°F DB OUTSIDE AIR, 68°F DB RETURN AIR	
HEATING AIR FLOW (CFM)	8,155
CAPACITY (MBH)	102
CAPACITY (KW)	30
ENT. AIR TEMP (DB)	44
LVG. AIR TEMP (DB)	53
VOLTAGE / PHASE	460 / 3
CONTROL TYPE	SCR
COOLING COIL - DX COIL - BASED ON 92.5°F DB / 75°F WB OUTSIDE AIR, 76°F DB / 50% RH RETURN AIR	
COOLING AIR FLOW (CFM)	10,875
MIN. FACE AREA (SQ. FT)	22.3
TOTAL CAPACITY (MBH)	399
SENS. CAPACITY (MBH)	296
ENT. AIR TEMP (DB/WB)	80.7 / 67
LVG. AIR TEMP (DB/WB)	55.9 / 54.3
REFRIGERANT TYPE	R-410A
COIL FACE VELOCITY (FPM)	523
RETURN FAN	
FAN TYPE	DIRECT DRIVE PLENUM FAN
TOTAL AIR FLOW	8,010
TOTAL S.P. (INCHES W.G.)	0.75
FAN SIZE	18.25
MOTOR H.P / V-PH	5 HP 460V / 3PH
VARIABLE FREQUENCY DRIVE	BY H.C.
MIN. OUTSIDE AIR (CFM)	2,865

CONDENSING UNIT SCHEDULE

UNIT	CD-1
UNIT LOCATION	ROOF
MANUFACTURER	TRANE
MODEL #	RAUJ
LENGTH / WIDTH / HEIGHT [IN]	88 / 60 / 74
UNIT WEIGHT [LBS]	1,936
COOLING CAPACITY [MBH]	417
REFRIGERANT	R-410A
SUCTION LINE SIZE	2-1/8
LIQUID LINE SIZE	2-1/8
REFRIGERANT CHARGE [LBS]	50
EER	11.4
MCA	63
MOCP	80
VOLTAGE / PHASE	460 / 3

0 1 2 4 6 8 10
SCALE: 1/2"=1'-0"

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TITLE
AHU-1 SCHEDULE

SHEET NO.
H0.4

FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. WELDED STAINLESS STEEL EXHAUST DUCT. DUCT WRAPPED WITH 2-LAYERS OF FIRE WRAP INSULATION.
2. PUSH BUTTON. ACTIVATES EF-1. REFER TO CONTROL DIAGRAM FOR ADDITIONAL INFORMATION.
3. RADIANT HEATER THERMOSTAT. REFER TO SHET H1.2.
4. CO/NO_2 CENTRAL CONTROLLER. MOUNT 4' A.F.F.
5. CO/NO_2 SENSOR. MOUNT 6' A.F.F.
6. MOTORIZED CONTROL DAMPER IN STORM SHELTER OUTSIDE AIR DUCT. POWERED CLOSED, FAIL OPEN. 120V POWER SUPPLY BY E.C.
7. G.C. SHALL PROVIDE SHROUD AROUND WALL OPENING / DUCT PENETRATION IN STORM SHELTER. REFER TO DETAILS 3 AND 4, SHEET S4.3 FOR REQUIRED DUCT OFFSET FOR PENETRATION SHROUD. 1
8. DOMESTIC HOT WATER HEATER BY P.C. REFER TO DETAIL 5, H3.5 FOR INSTALLATION INFORMATION.
9. DRYER VENT BOX. REFER TO DETAIL 6, SHEET H3.4.
10. REFER TO SHEET H1.2 FOR DUCT CONTINUATION.
11. PUSH BUTTON. ACTIVATES EF-8. REFER TO CONTROL DIAGRAM FOR ADDITIONAL INFORMATION.
12. RETURN AIR DUCT UP TO AHU-1. DUCTWORK STUBS THROUGH MEZZANINE FLOOR AND TERMINATES OPEN TO FIRST FLOOR PLENUM.
13. TRAINING TOWER VENTILATION INTAKE LOUVER/ DAMPER. MOUNT DAMPER 18" A.F.F.. PROVIDE 2-WAY, AUTOMATIC CONTROL DAMPER DIRECTLY INSIDE OF BUILDING. CONTROL DAMPER SHALL BE POWERED OPEN, FAIL CLOSED.
14. SURFACE MOUNTED UNIT HEATER.
15. PROVIDE ALUMINUM ESCUTCHEON AT DRYER VENT CEILING PENETRATION.
16. PROVIDE GRAVITY BACKDRAFT DAMPER IN DUCTWORK FOR GEAR DRYER EXHAUST.
17. GEAR DRYER FURNISHED BY OWNER. H.C. SHALL RECIEVE & INSTALL. ELECTRICAL CONNECTIONS BY E.C.
18. THE H.C. SHALL PROVIDE AN AUXILARY DRY CONTACT TO TIE INTO THE BUILDING CONTROL SYSTEM. COORDINATE AUXILIARY CONTACT MANUFACTURER WITH THE GEAR DRYING CABINET MANUFACTURER. REFER TO CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION.
19. DDC SYSTEM TEMPERATURE SENSOR. REFER TO CONTROL DIAGRAM 2, H4.3.
20. DUCT RISES HIGH IN ABOVE CEILING SPACE TO PROVIDE ACCESS TO ADJACENT VAV TERMINAL UNIT.
21. EXPOSED SUPPLY DUCT IN THIS ROOM SHALL BE INSULATED WITH TYPE 2 INSULATION.
22. EXPOSED EXHAUST DUCT IN THIS ROOM SHALL BE PAINTED BY THE G.C. PROVIDE PAINT-GRIP DUCT.
23. 10/10 TRANSFER DUCT OPEN TO ROOM AND OPEN ABOVE LAY-IN CEILING IN CORRIDOR.
24. UP TO O.A. PLENUM SEE H1.2.
25. UP TO EH-1.
26. UP TO EF-2.
27. DUCT DROPS TO 12" A.F.F. PROVIDE ALUMINUM ESCUTCHEON AROUND CEILING PENETRATION.

STORM SHELTER NOTE

PENETRATIONS THROUGH THE STORM SHELTER ENVELOPE LARGER THAN 3.5 SQUARE INCHES IN AREA FOR RECTANGULAR OPENINGS OR 2-1/16" DIAMETER SHALL BE PROVIDED WITH AN OPENING PROTECTIVE DEVICE. REFER TO STRUCTURAL DRAWINGS FOR DETAILS OF PROTECTIVE DEVICES.

0 4 8 16 24 32 40
SCALE: 1/8"=1'-0"

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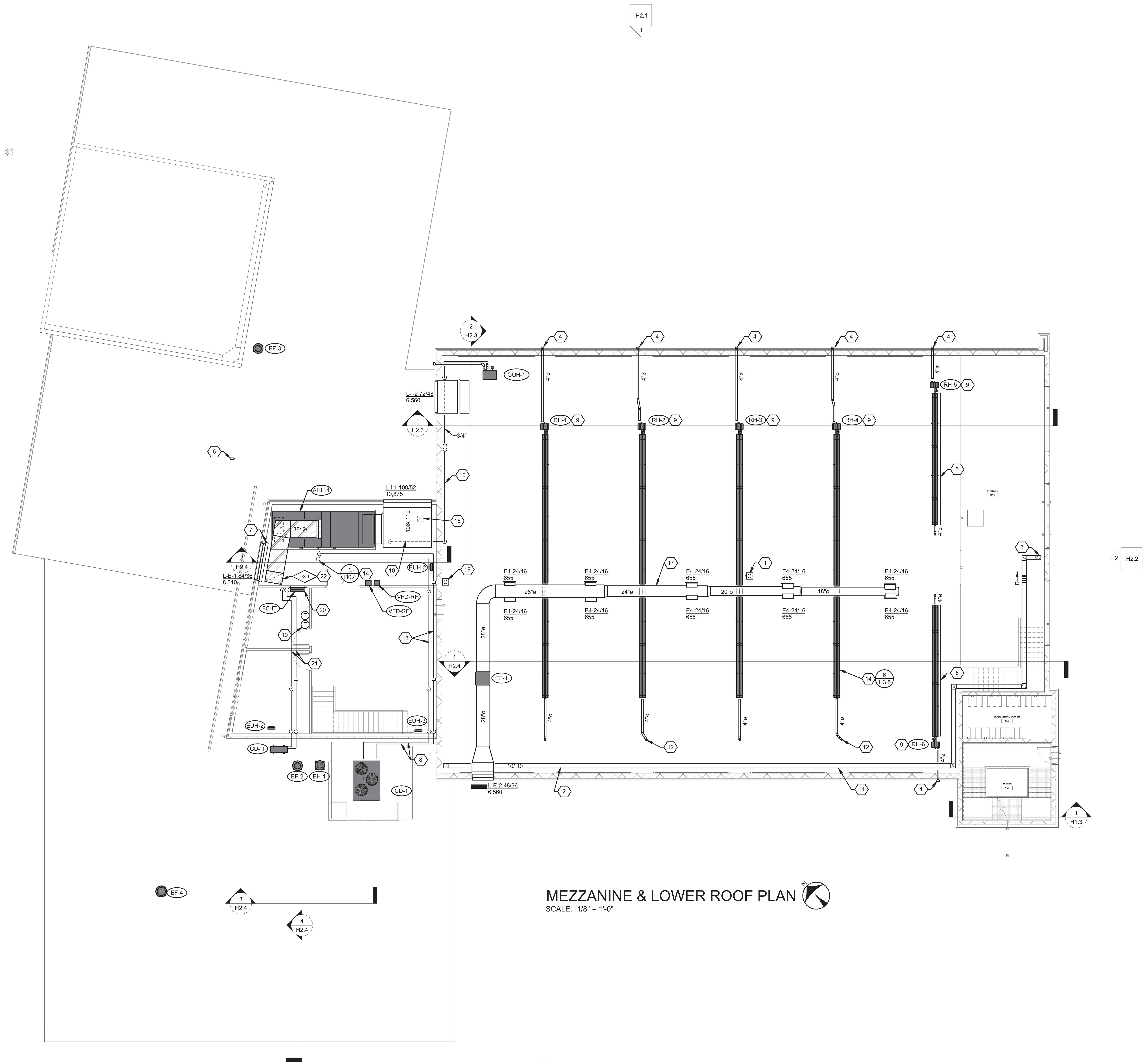
TITLE
GROUND FLOOR PLAN

SHEET NO.
H1.1



MEZZANINE & LOWER ROOF PLAN

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

CONSTRUCTION NOTES

1. CO / NO_2 SENSOR. MOUNT TO APPARATUS BAY ROOF STRUCTURE. MAINTAIN 5' DISTANCE FROM MAIN EXHAUST DUCTWORK.
2. SUPPORT DUCT FROM ROOF STRUCTURE.
3. DUCT DOWN TO DECON ROOM. REFER TO H1.1.
4. INTAKE HOOD. REFER TO RADIANT HEATER DETAIL FOR ADDITIONAL INFORMATION.
5. PROVIDE SIDE SHIELD FULL LENGTH OF RADIANT HEATER TO DEFLECT HEAT AWAY FROM ADJACENT WALL.
6. DOMESTIC WATER HEATER FLUE.
7. RELIEF AIR DAMPER. REFER TO CONTROL DRAWINGS FOR ADDITONAL INFORMATION.
8. PROVIDE ROOF PIPING SUPPORTS FOR ALL REFRIGERANT PIPING AS REQUIRED.
9. REFER TO TYPICAL APPARAUTS BAY SYSTEM COORDINATION DETAIL FOR RADIANT HEATER INSTALLATION.
10. ROUTE CONDENSATE DRAIN FROM GUH-1 TO FLOOR SINK IN MECHANICAL ROOM. SEAL MECHANICAL ROOM WALL PENETRATION.
11. OFFSET DUCTWORK AS REQUIRED TO PASS DUCT THROUGH GIRDER BEAM.
12. FLUE OFFSETS TO AVOID GIRDER BEAM.
13. SUCTION AND LIQUID REFRIGERANT PIPING FROM CONDENSING UNIT.
14. REFER TO DETAIL FOR INSTALLATION COORDINATION WITH OTHER TRADE.
15. STORM SHELTER INTAKE TAPS INTO BOTTOM OF PLENUM.
16. PROVIDE SIDE SHIELD TO DEFLECT HEAT AWAY FROM ADJACENT LIGHT. SHIELDING EXTENDS 1' PAST LIGHT. COORDINATE WITH ALL LIGHTS IN APPARATUS BAY. TYPICAL.
17. DUCT ANGLED TO FOLLOW TRUSS STRUCTURE.
18. CO/NO_2 SENSOR. MOUNT ADJACENT TO RAPPELLING WINDOW.
19. DDC TEMPERATURE SENSOR MONITORS IT ROOM TEMPERATURE. REFER TO CONTROL DIAGRAM 3, H4.3.
20. ROUTE CONDENSATE DRAIN INTO MECHANCIAL ROOM AND TERMINATE IN FLOOR DRAIN.
21. SEAL WALL PENETRATIONS WITH FIRE STOPPING SYSTEM FOR FM-200 ROOM FIRE SUPPRESSION SYSTEM.
22. DUCT SILENCER LOCATED IN VERTICAL RETURN DUCT RISE.

0 4 8 16 24 32 40

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

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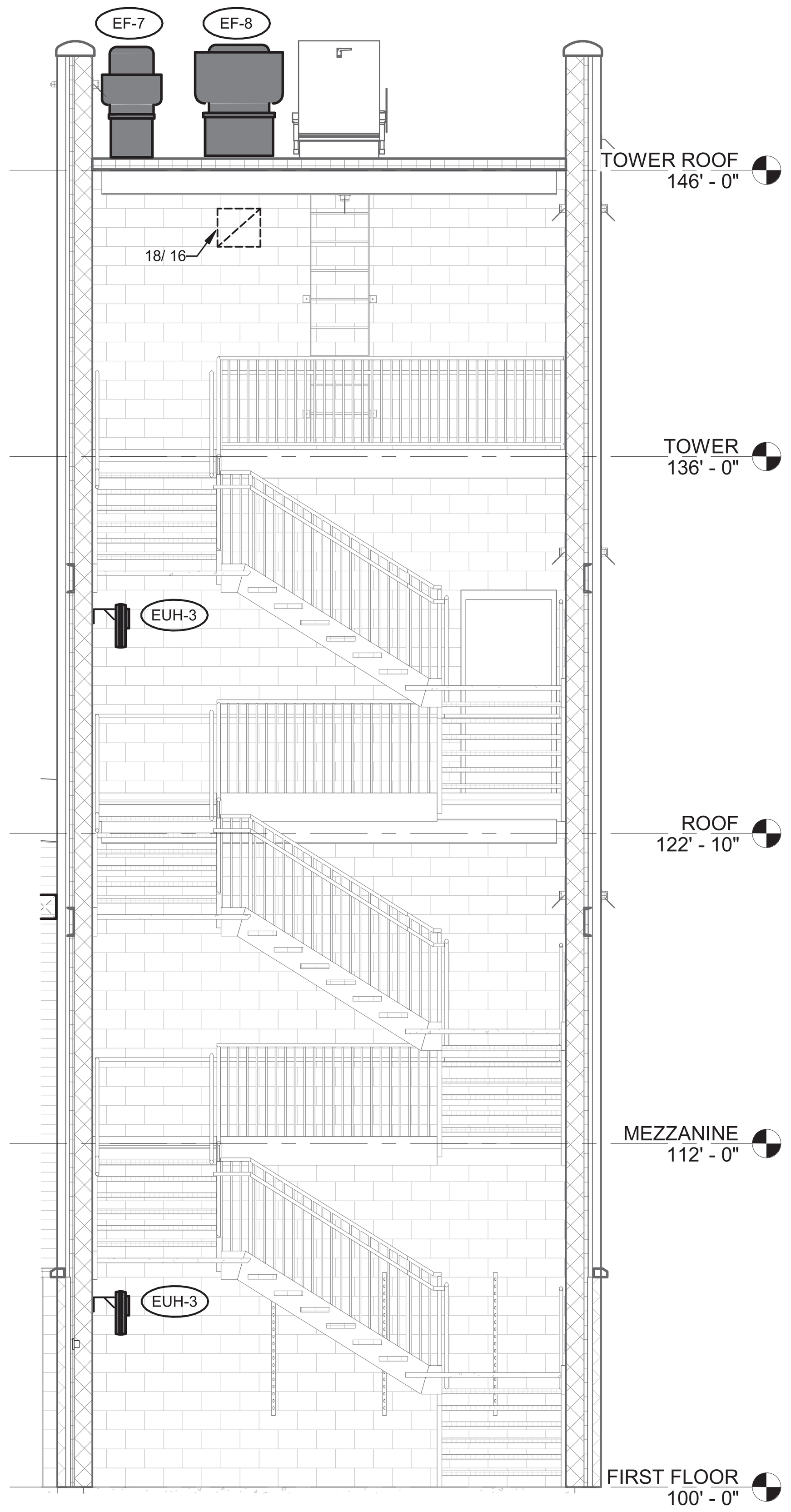
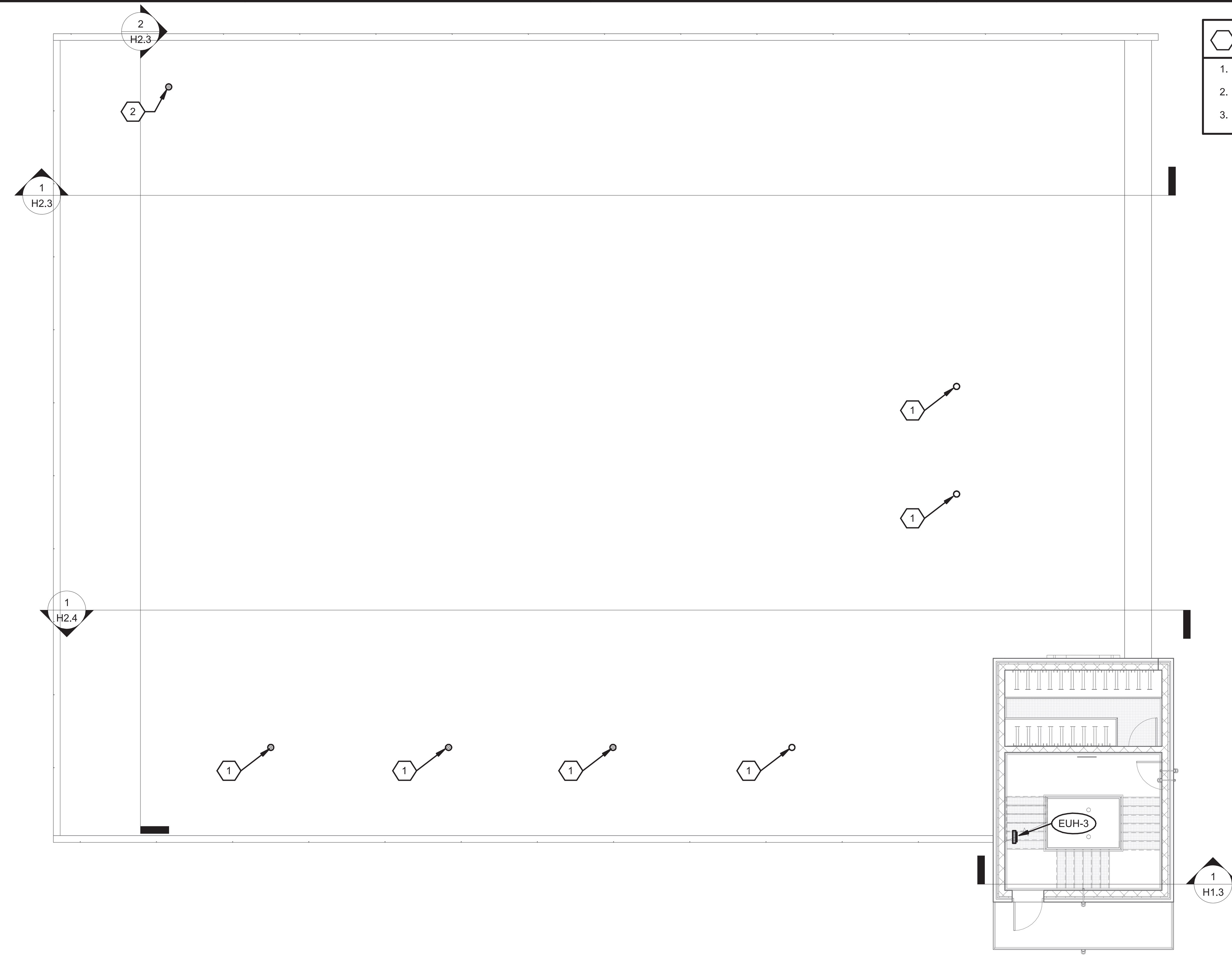
TITLE
MEZZANINE & LOWER ROOF PLAN

SHEET NO.
H1.2



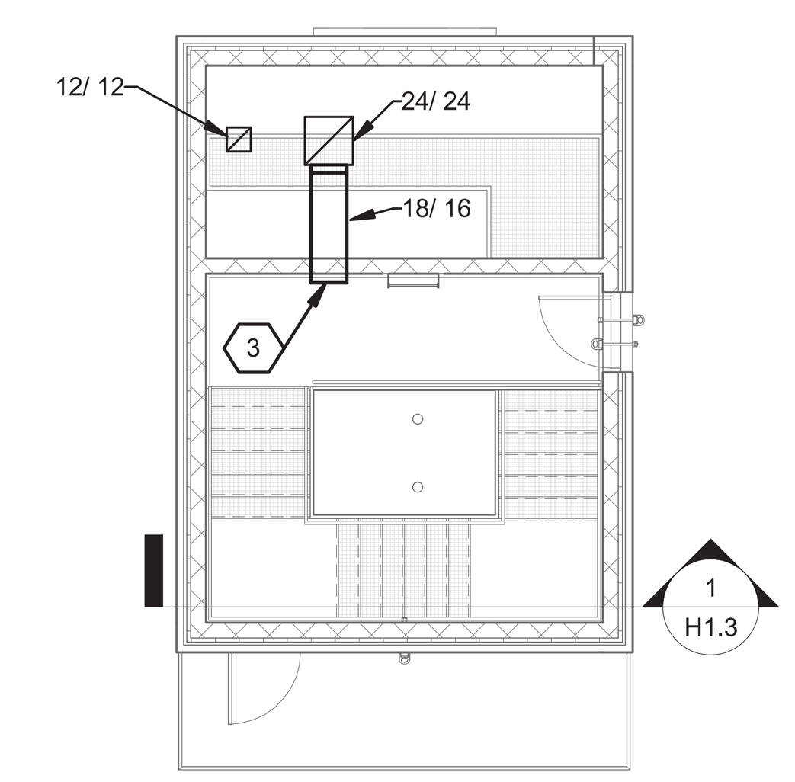
Section 1
SCALE: 1/4" = 1'-0"



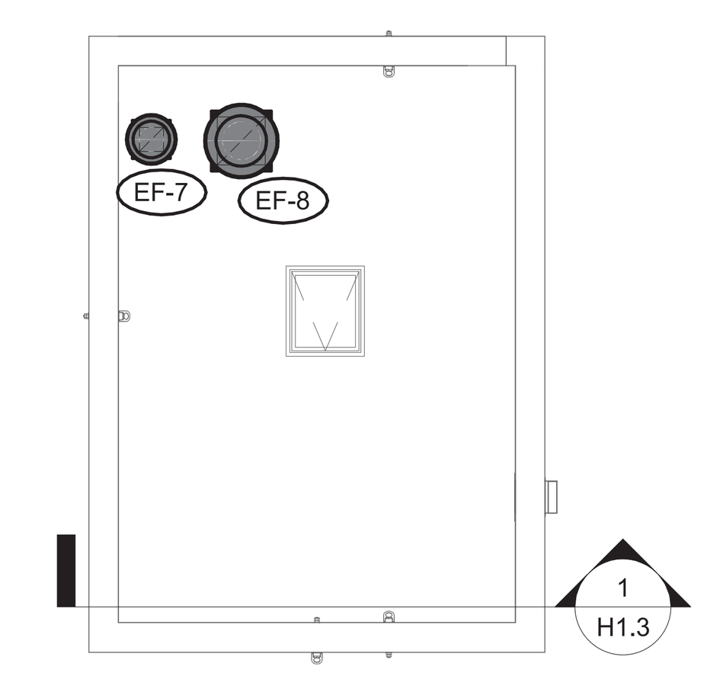
THIRD FLOOR PLAN
SCALE: 1/8" = 1'-0"

CONSTRUCTION NOTES

1. RADIANT HEATER FLUE.
2. GAS FIRED UNIT HEATER FLUE.
3. DUCT OPEN TO TRAINING TOWER.



TOWER - TOP LANDING
SCALE: 1/8" = 1'-0"



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

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

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ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

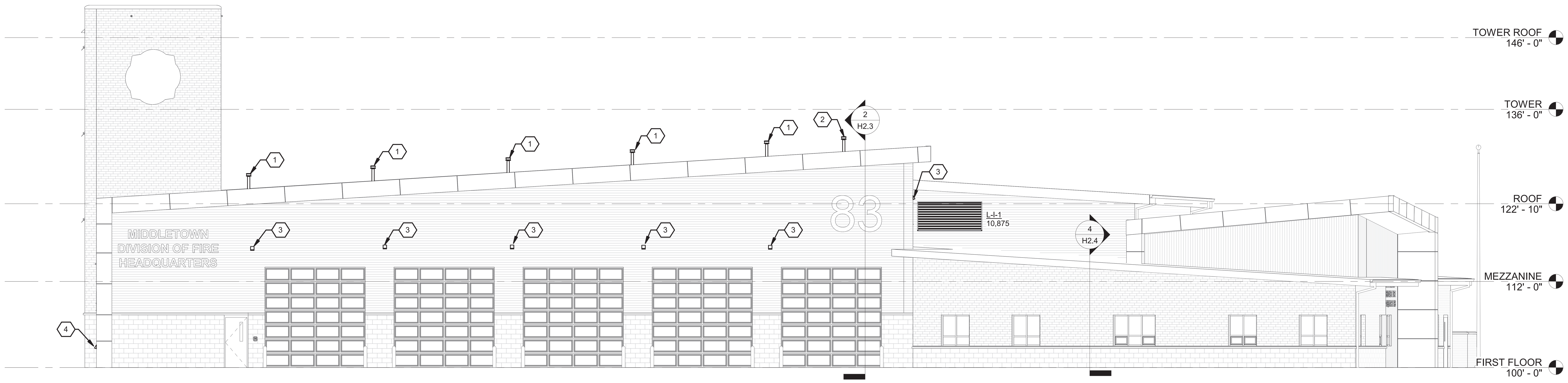
DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
APPARATUS BAY ROOF & TRAINING TOWER

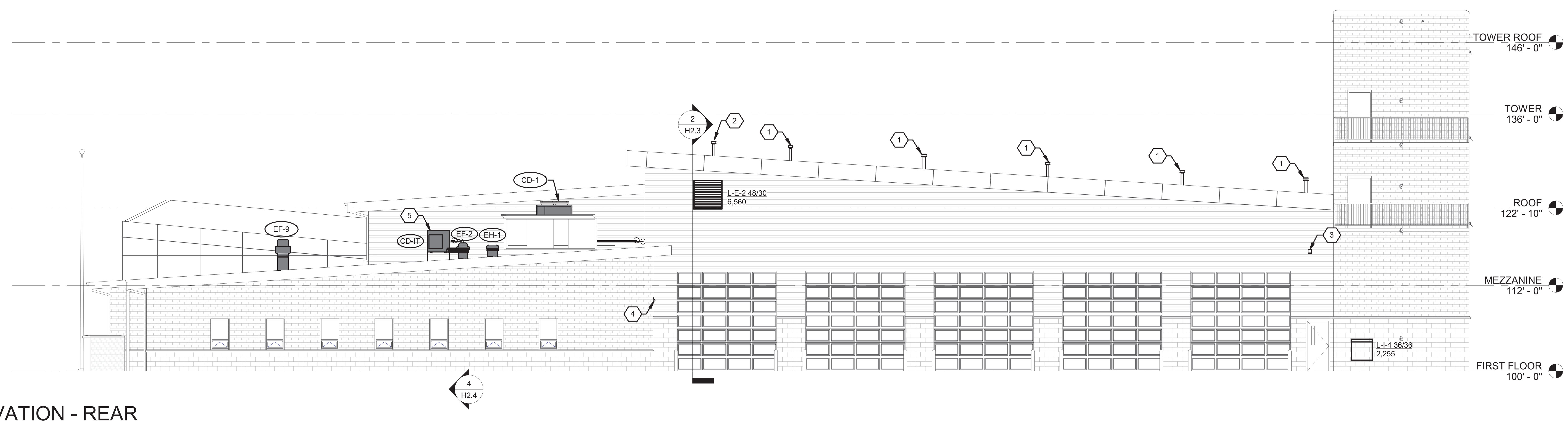
SHEET NO.
H1.3

CONSTRUCTION NOTES

1. RADIANT HEATER FLUE.
2. GAS FIRED UNIT HEATER FLUE.
3. INTAKE HOOD.
4. DRYER VENT.
5. MOUNT CONDENSING UNIT ON 14" ROOF RAIL CURB.



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



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

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

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EXPIRATION DATE 12/21/2023

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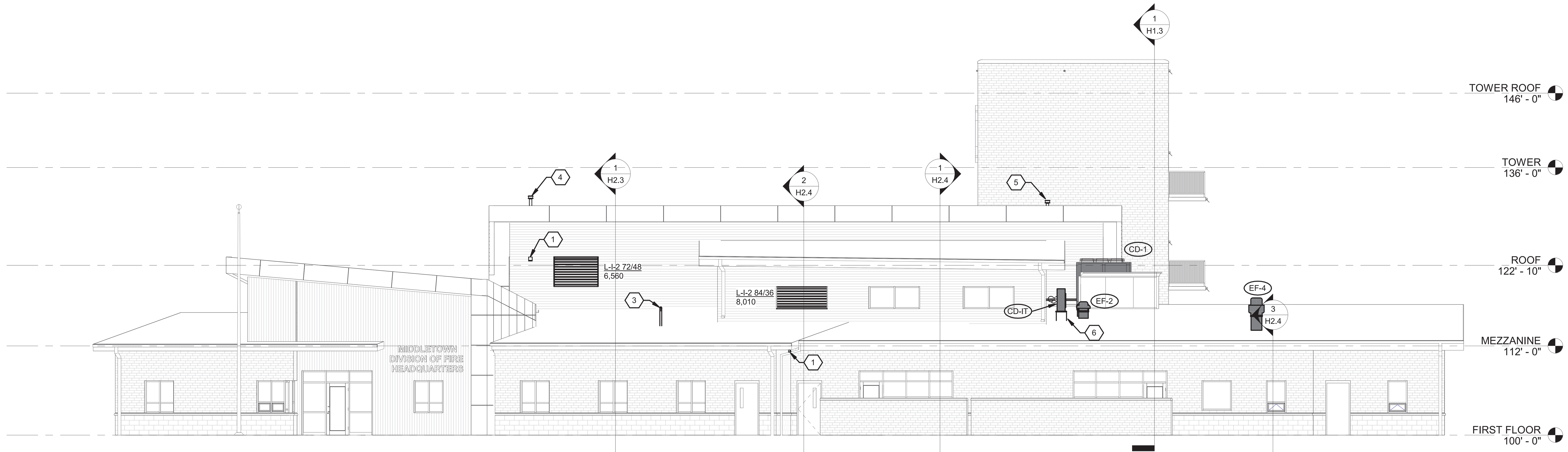
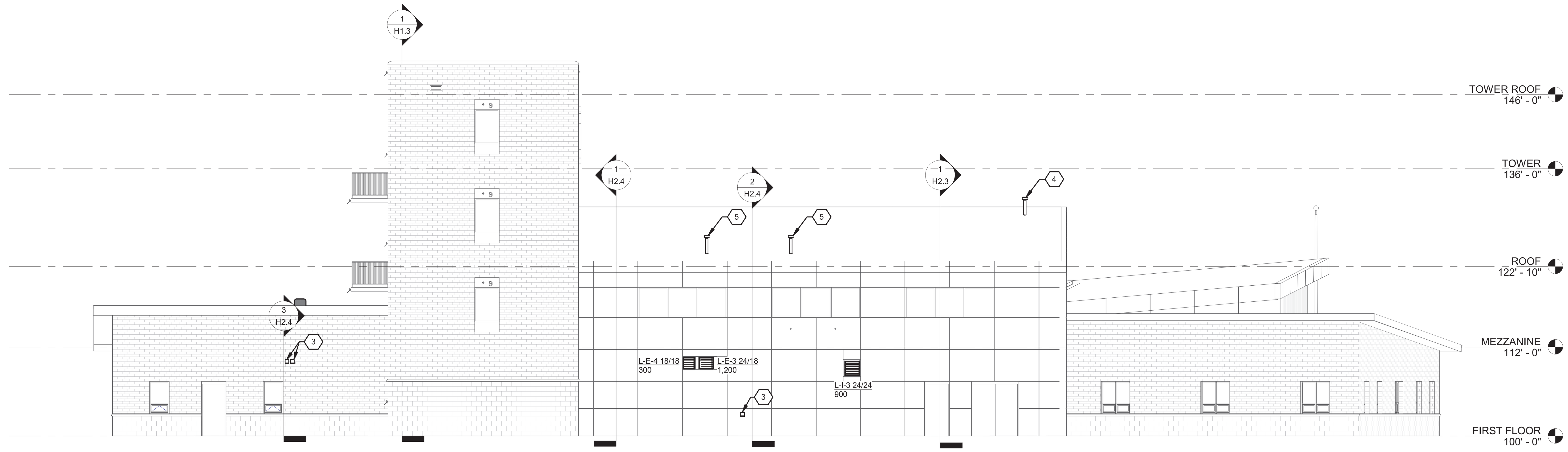
TITLE
ELEVATIONS

SHEET NO.
H2.1



ELEVATION - PARKING LOT

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



ELEVATION 4

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

CONSTRUCTION NOTES

1. INTAKE HOOD.
2. DRYER VENT HOOD.
3. DOMESTIC WATER HEATER FLUE.
4. GAS FIRED UNIT HEATER FLUE.
5. RADIANT HEATER FLUE.
6. MOUNT CONDENSING UNIT ON 14" RAIL CURB.

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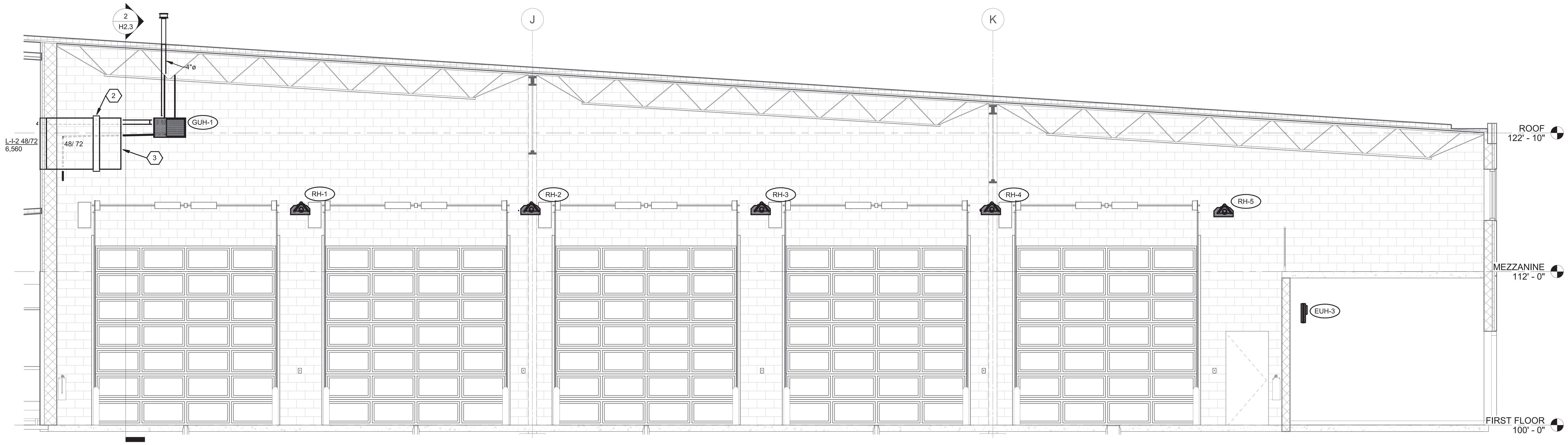
TITLE
ELEVATIONS

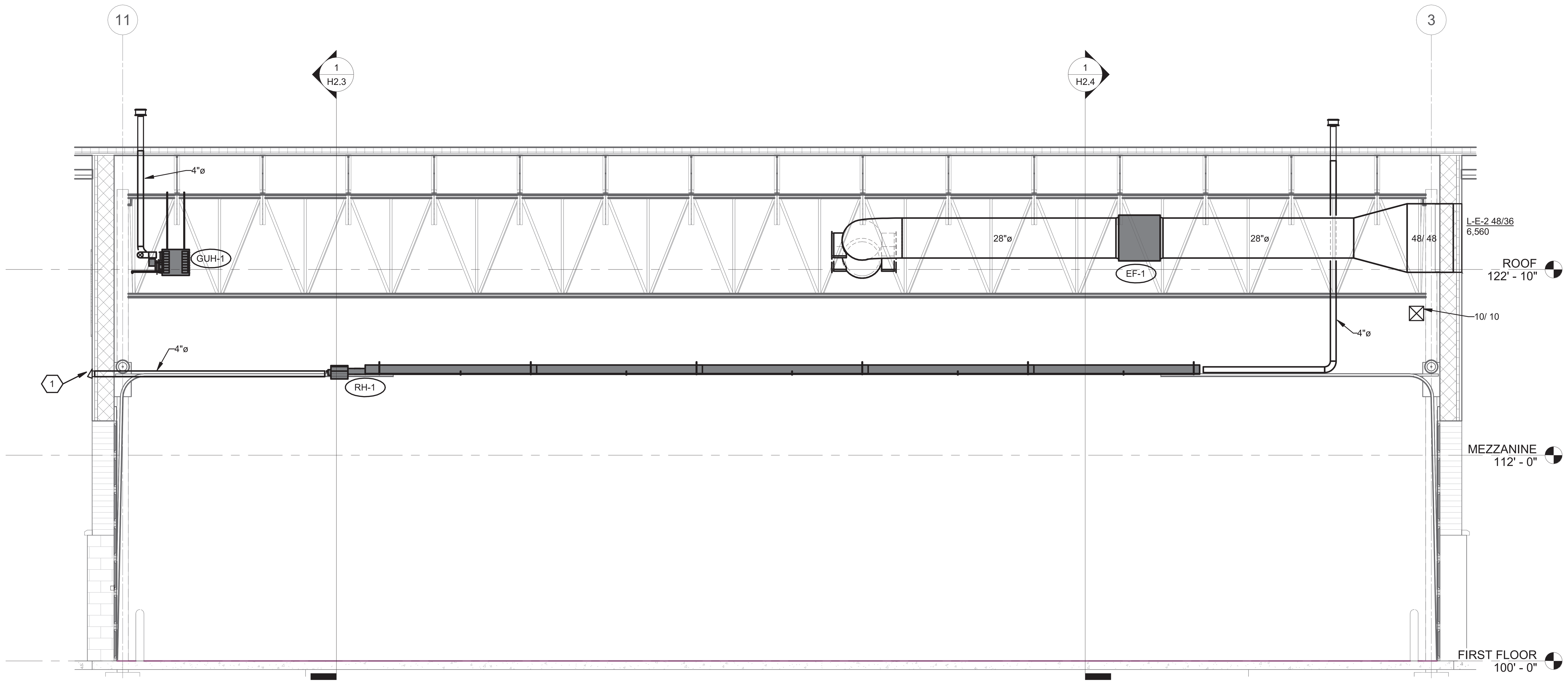
SHEET NO.
H2.2

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



APPARATUS BAY SECTION A

1 SCALE: 1/4" = 1'-0"



APPARATUS BAY SECTION B

2 SCALE: 1/4" = 1'-0"

CONSTRUCTION NOTES

1. INTAKE HOOD.
2. CONTROL DAMPER. REFER TO CONTROL DIAGRAM 4, H4.1.
3. DUCT END OPEN TO APPARATUS BAY.

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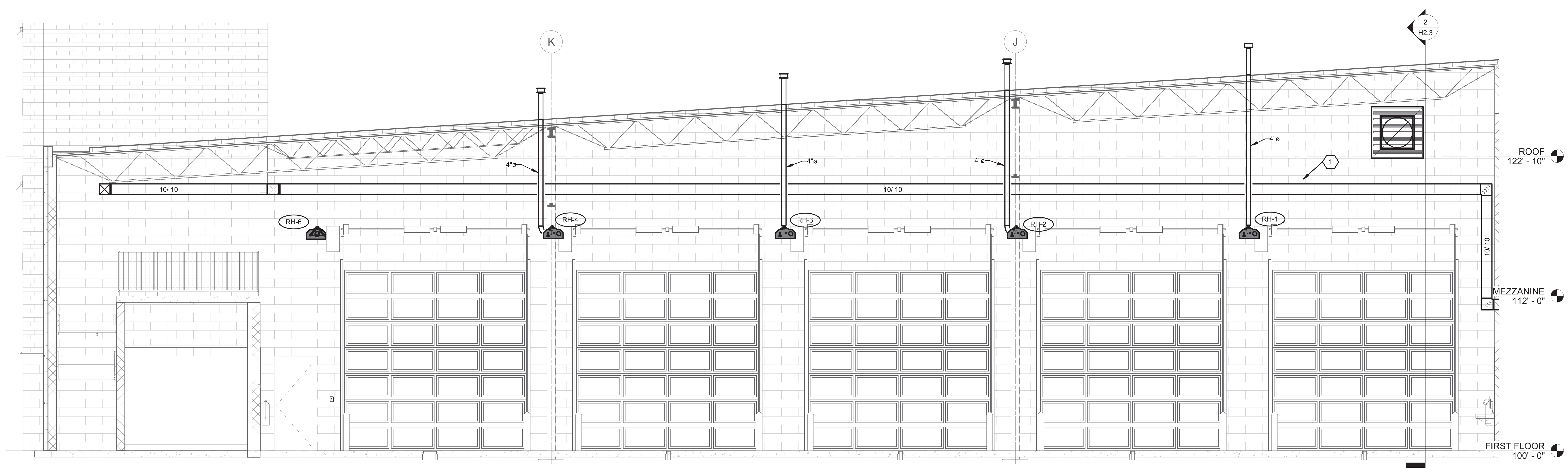
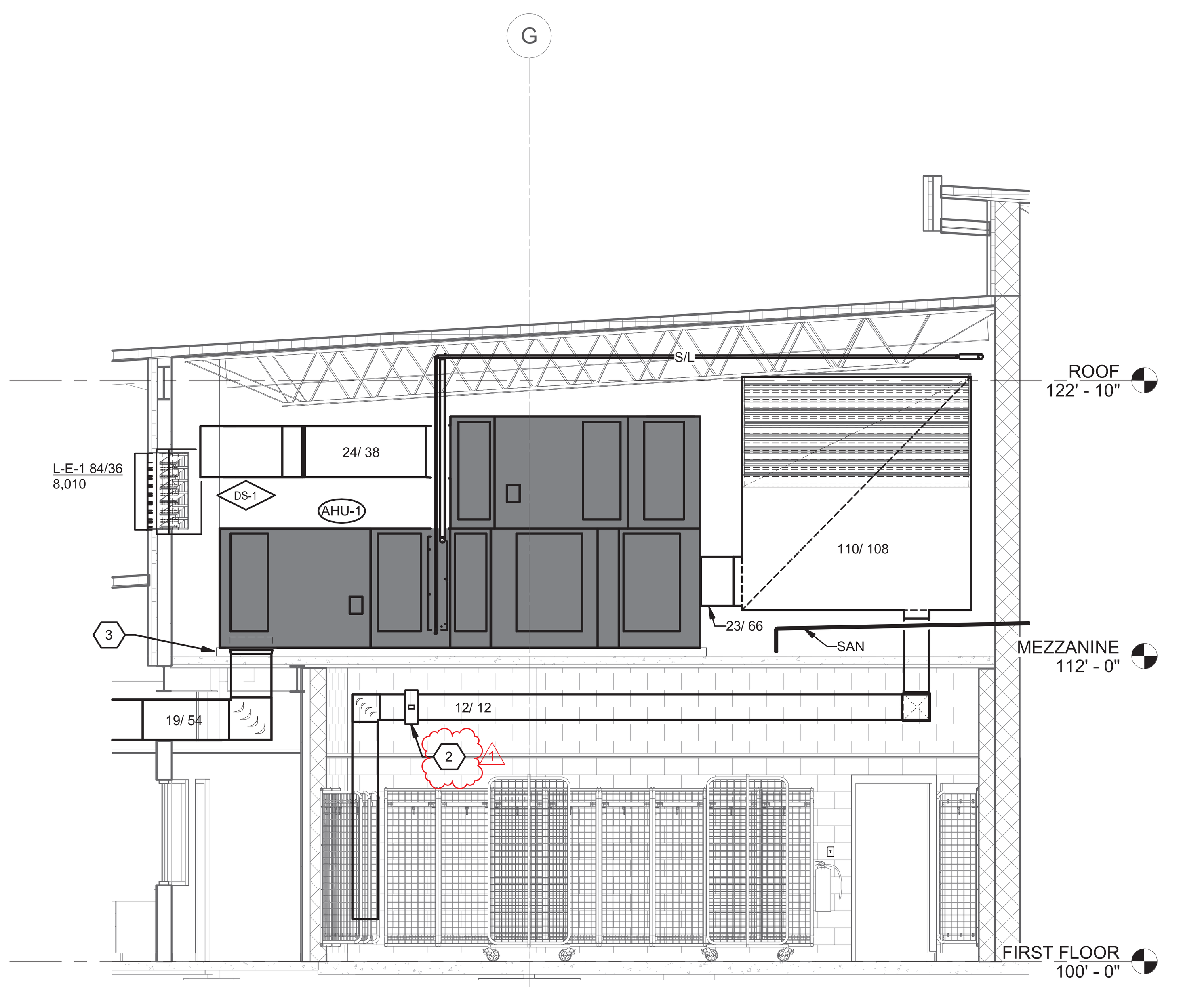
TITLE
SECTIONS

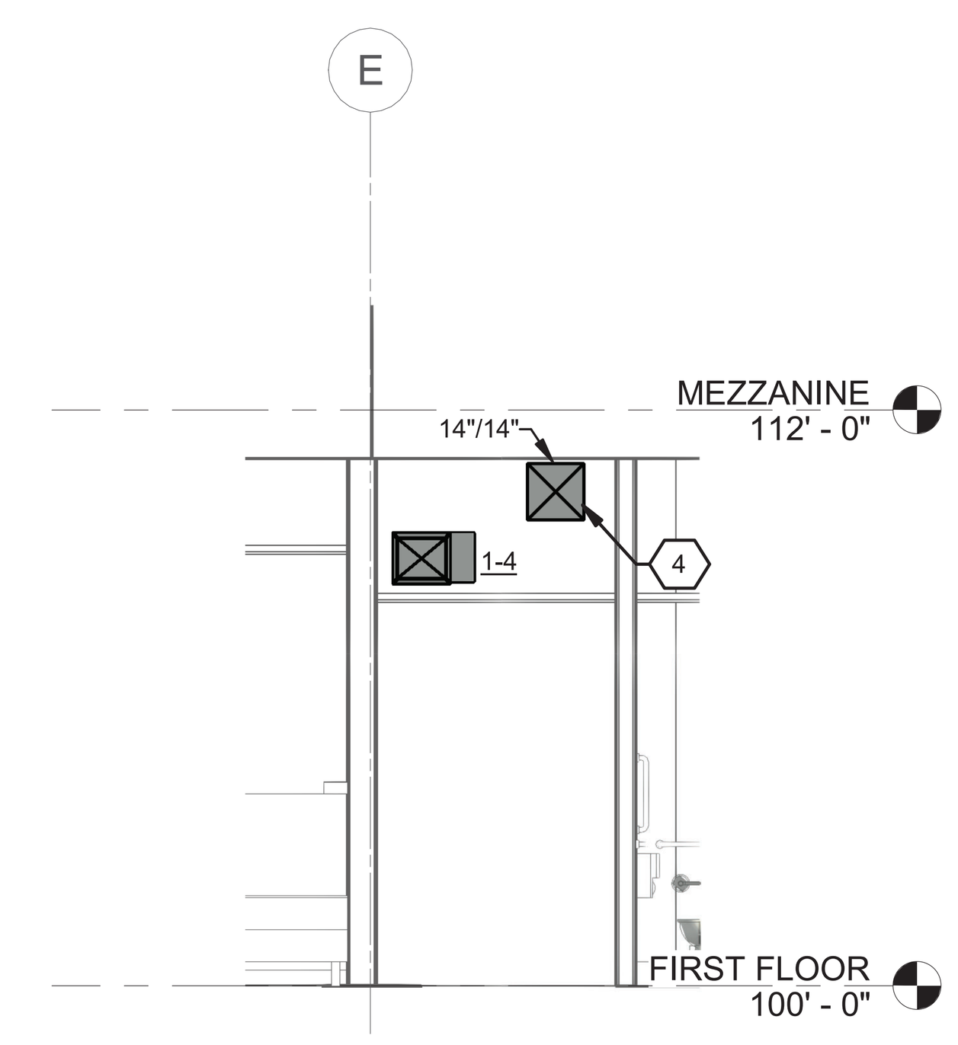
SHEET NO.
H2.3



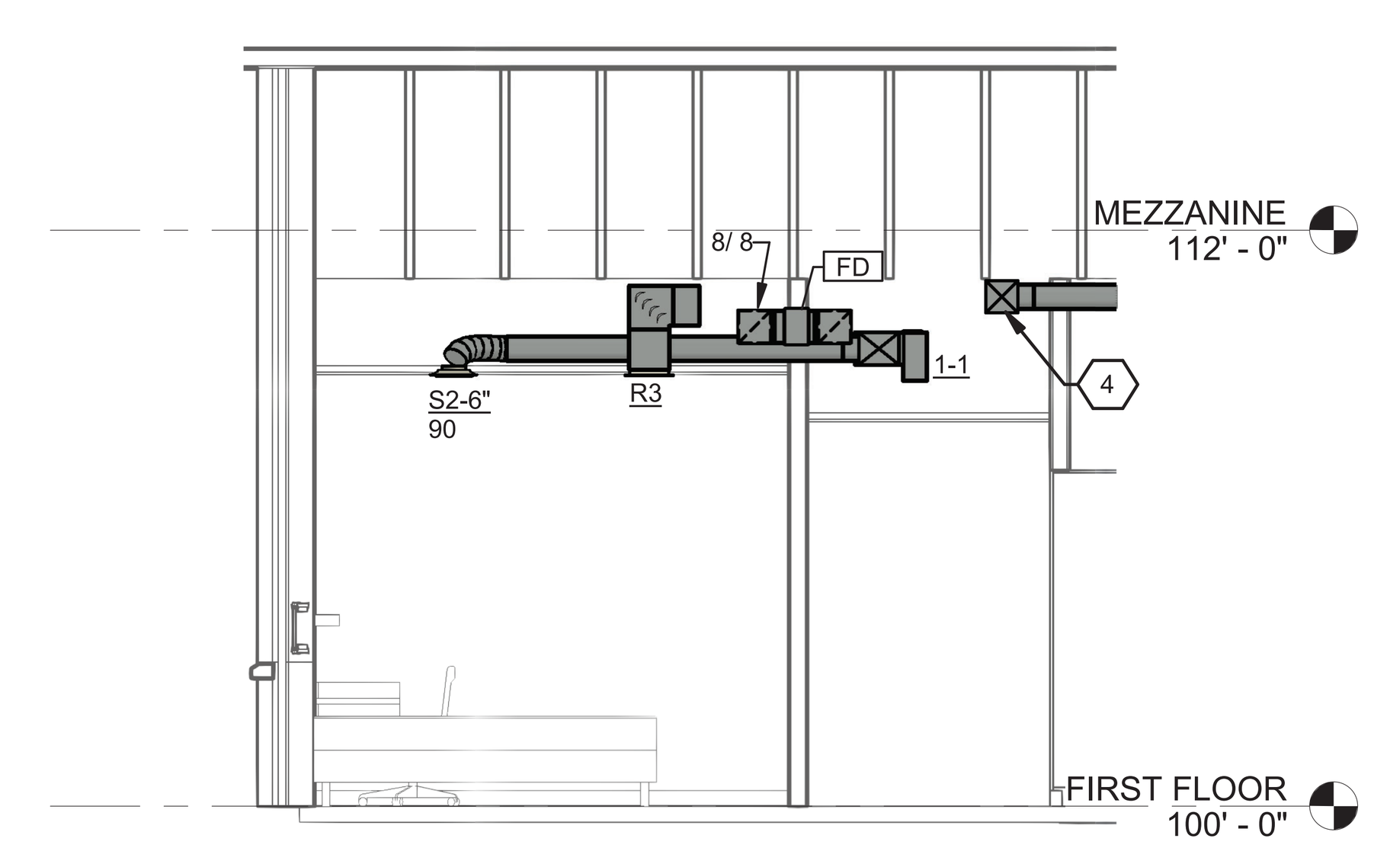
APPARATUS BAY SECTION C
SCALE: 1/4" = 1'-0"



LIVING QUARTERS SECTION 1
SCALE: 1/4" = 1'-0"



LIVING QUARTERS SECTION 2
SCALE: 1/4" = 1'-0"



LIVING QUARTERS SECTION 3
SCALE: 1/4" = 1'-0"

CONSTRUCTION NOTES

1. PAINT DUCT TO MATCH WALL BASE COLOR.
2. MOTORIZED CONTROL DAMPER IN STORM SHELTER OUTSIDE AIR DUCT. POWERED CLOSED, FAIL OPEN. 120V POWER SUPPLY BY E.C.
3. 4" CONCRETE EQUIPMENT PAD BY H.C.
4. DUCTWORK RUN HIGH IN ABOVE CEILING SPACE TO ALLOW FOR ACCESS TO VAV.

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NO.	DATE	DESCRIPTION
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1	11/10/23	BULLETIN 5

DATE	10/16/2023
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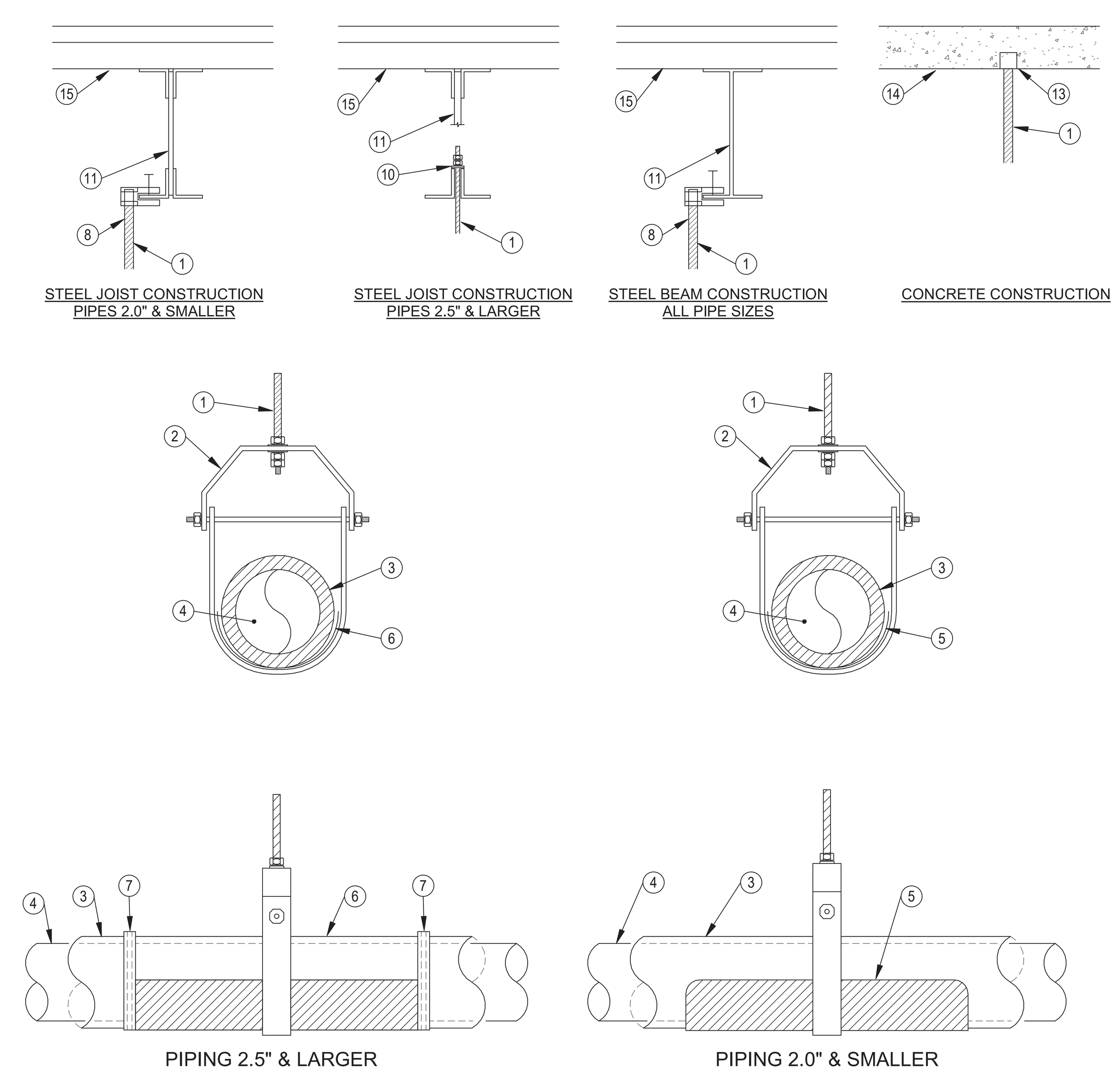
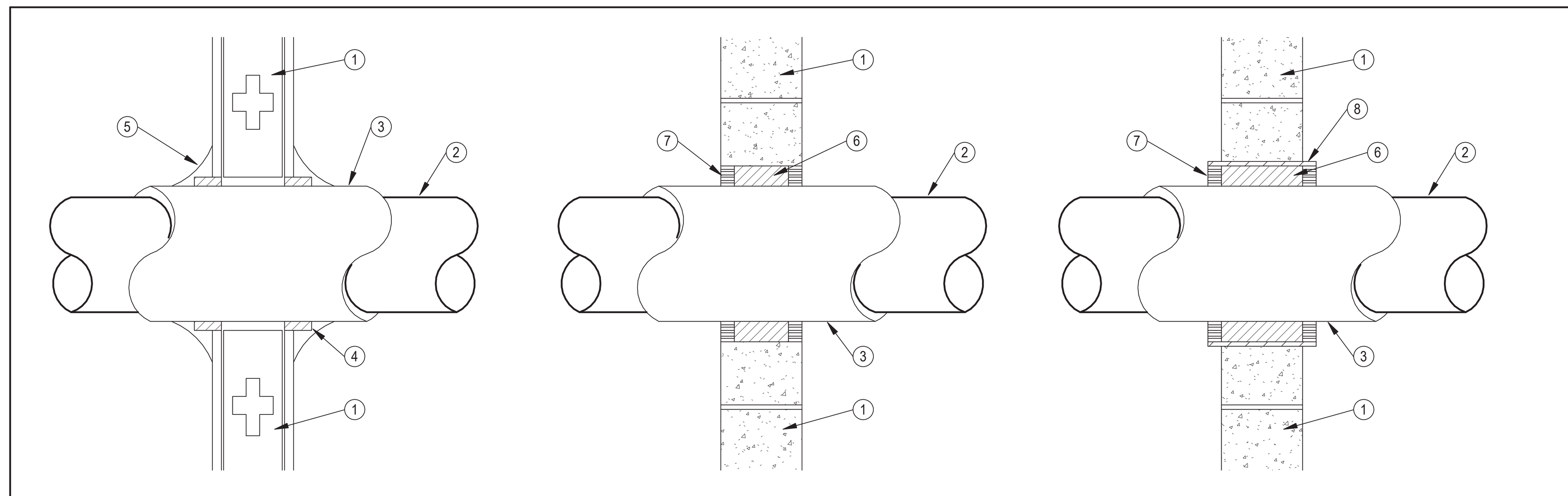
TITLE
SECTIONS

SHEET NO.
H2.4



1. GALVANIZED THREADED ROD. ADJUST NUTS & RODS FOR PROPER ELEVATION.
2. STEEL CLEVIS PIPE HANGER. EQUAL TO ANVIL FIG. 260.
3. PIPE INSULATION.
4. PIPE.
5. 12" LONG, 18 GA. GALVANIZED INSULATION SHIELD. EQUAL TO ANVIL FIG. 168. CONTINUOUS INSULATION.
6. 18" LONG INSULATED PIPE SADDLES. BUCKAROOS TRU-BALANCE 3300E OR EQUAL. PROVIDE WITH 3.75 LB. DENSITY PNENOLIC FOAM INSULATION WITH VAPOR RETARDER JACKET & BOTTOM GALVANIZED METAL INSULATION SHIELD. SADDLES TO MEET 25/50 FLAME/SMOKE RATING.
7. PIPE INSULATION AND SADDLE INSULATION SHALL BE TIGHTLY ABUTTED TOGETHER. SEAL WITH 4" WIDE VAPOR RETARDER TAPE WITH FACTORY APPLIED JACKET WITH ACRYLIC ADHESIVE TO ASSURE VAPORTIGHT SEAL.
8. THREADED ROD BEAM CLAMP.
9. WOOD DECK & BEAM.
10. RETAINING NUTE & WASHERS.
11. STEEL JOIST OR BEAM.
12. 90 DEGREE SIDE BEAM BRACKET WITH THREADED ROD INTO WOOD.
13. CONCRETE EXPANSION ANCHOR OR CONCRETE INSERT IN NEW CONSTRUCTION.
14. CONCRETE SLAB OR PLANK.
15. METAL DECKING. DIRECT ATTACHMENT TO DECKING IS PROHIBITED. PROVIDE SUPPLEMENTAL STEEL ANGLES OR UNISTRUT WHERE REQUIRED FOR PROPER HANGER SPACING OR IN LIEU OF ATTACHMENTS SHOWN.

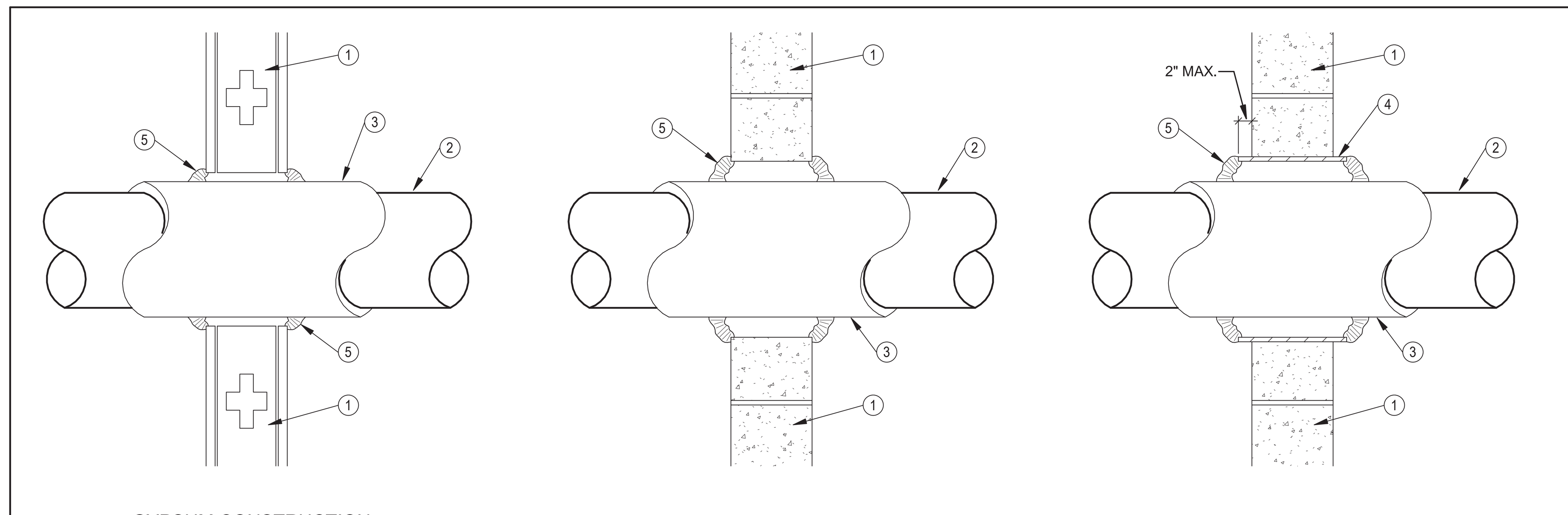
1 PIPE HANGERS
N.T.S.
CLEVIS HANGER, INSULATED PIPE



FIRESTOPPING MATERIALS/INSTALLATION
- MANUFACTURERS: 3M FIRE PROTECTION PRODUCTS OR HILTI FIRESTOP SYSTEMS
- FIRESTOPPING MATERIAL INSTALLATION SHALL BE PER THE MANUFACTURERS DETAILED INSTALLATION DIAGRAMS AND INSTRUCTIONS.
- F-RATING OF PENETRATION SHALL BE NO LESS THAN THE FIRE RATING OF THE WALL.
- SUBMITTAL SHALL INCLUDE PRODUCT DATA AND DETAILED INSTALLATION SYSTEM DIAGRAMS.

1. RATED WALL ASSEMBLY.
2. METALLIC PIPE OR TUBING.
3. PIPE INSULATION, CONTINUOUS THROUGH WALL OPENING, SEE SCHEDULE FOR THICKNESS.
4. APPROVED FIRESTOPPING VOID/CAVITY MATERIAL.
5. APPROVDED FIRESTOPPING CAULK OR SEALANT.
6. PACKING MATERIAL, MINERAL WOOL BATT INSULATION.
7. APPROVED FIRESTOPPING CAULK OR SEALANT FLUSH WITH SURFACE OF WALL OR EDGE OF SLEEVE.
8. SCHEDULE 40 STEEL PIPE SLEEVE CAST OR GROUTED INTO WALL ASSEMBLY. ENDS FLUSH OR MAX. 2" BEYOND WALL SURFACE.

2 PIPE PENETRATIONS THRU FIRE RATED WALL
N.T.S.



1. FULL HEIGHT INTERIOR WALL.
2. PIPE OR TUBING.
3. PIPE INSULATION, CONTINUOUS THROUGH WALL OPENING, SEE SCHEDULE FOR THICKNESS.
4. SCHEDULE 40 STEEL PIPE SLEEVE CAST OR GROUTED INTO WALL ASSEMBLY. ENDS FLUSH OR MAX. 2" BEYOND WALL SURFACE.
5. CAULK TO FILL VOID AT WALL/SLEEVE OPENING.

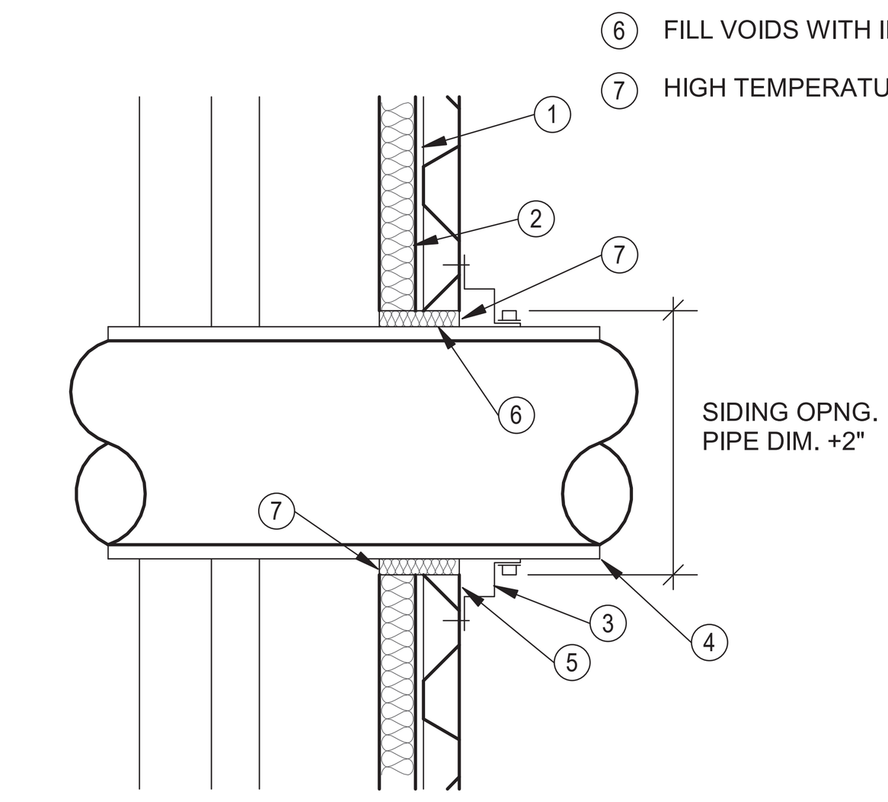
GENERAL NOTE:

A. SLEEVES ARE NOT REQUIRED IN THE FOLLOWING:
- IN FLOOR SLABS ON GRADE.
- IN STUD AND GYPSUM BOARD OR PLASTER WALLS AND PARTITIONS WHICH ARE NOT FIRE RATED.
- FOR UNINSULATED PIPE PASSING THRU MASONRY WALLS AND PARTITIONS AND STUD AND GYPSUM BOARD OR PLASTER WALLS AND PARTITIONS. SLEEVES ARE REQUIRED HOWEVER, FOR UNINSULATED CONDENSER WATER PIPING AND HYDRONIC HEAT PUMP PIPING FOR WHICH EXPANSION, CONTRACTION AND OTHER PIPE MOVEMENT CAN BE EXPECTED.
- IN CORE DRILLED OPENINGS IN SOLID CONCRETE NOT REQUIRING WATER PROTECTION. SLEEVES ARE REQUIRED, HOWEVER, AT CORE DRILLING THRU HOLLOW PRE-CAST SLABS AND CONCRETE BLOCK WALLS, TO FACILITATE CONTAINMENT OF REQUIRED FIRESTOPPING MATERIAL.
- IN LARGE FLOOR OPENINGS FOR MULTIPLE PIPE AND DUCT RISERS WHICH ARE WITHIN A FIRE RATED SHAFT, UNLESS THE OPENING IS TO BE CLOSED OFF WITH CONCRETE OR OTHER MATERIAL AFTER PIPE ARE SET.

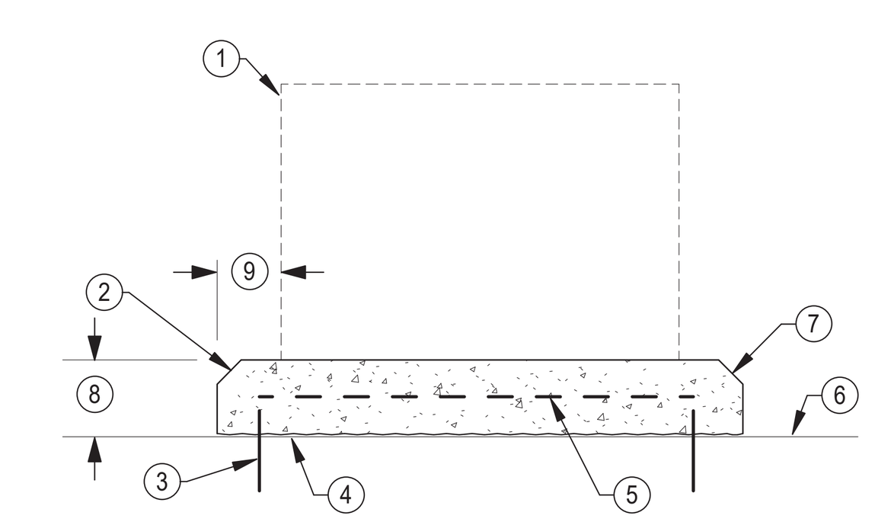
B. WHERE UNINSULATED PIPES REQUIRING NO PIPE SLEEVES PASS THRU NON-FIRE RATED FLOOR, WALL OR PARTITION, THE ANNULAR SPACE SHALL BE CLOSED WITH MATERIAL AND METHODS COMPATIBLE WITH THE WALL OR PARTITION MATERIAL (TYPE M MASONRY GROUT, DRYWALL JOINT COMPOUND, PLASTER, ETC.).

3 PIPE PENETRATIONS THRU NON-RATED WALL
N.T.S.

1. 1/2" SUB-GIRT.
2. LINER PANEL WITH INSULATION.
3. HIGH TEMPERATURE SILICONE WALL FLASHING. SET BASE FLANGE IN CAULK AND ANCHOR TO SIDING.
4. HOT PIPE THROUGH SIDING.
5. SHEETMETAL CLOSURE ANGLES. COLOR TO MATCH ADJACENT SIDING.
6. FILL VOIDS WITH INSULATION.
7. HIGH TEMPERATURE RATED CAULKING.



4 PIPE PENETRATIONS EXTERIOR WALL
N.T.S.



1. OUTLINE OF EQUIPMENT.
2. 4,000 PSI CONCRETE.
3. 1-#4 DOWEL, 6" LONG, EACH CORNER.
4. ROUGHEN SLAB & APPLY BONDING AGENT.
5. STEEL REINFORCING MESH.
6. FINISHED CONCRETE FLOOR.
7. 45 DEG. CHAMFER ALL AROUND.
8. 4" THICK CONCRETE SLAB.
9. MINIMUM 2" DISTANCE.

NOTE: OVERALL DIMENSION TO BE DETERMINED BY CONTRACTOR.

5 INTERIOR CONCRETE EQUIPMENT PAD
N.T.S.

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PROJECT # 23001

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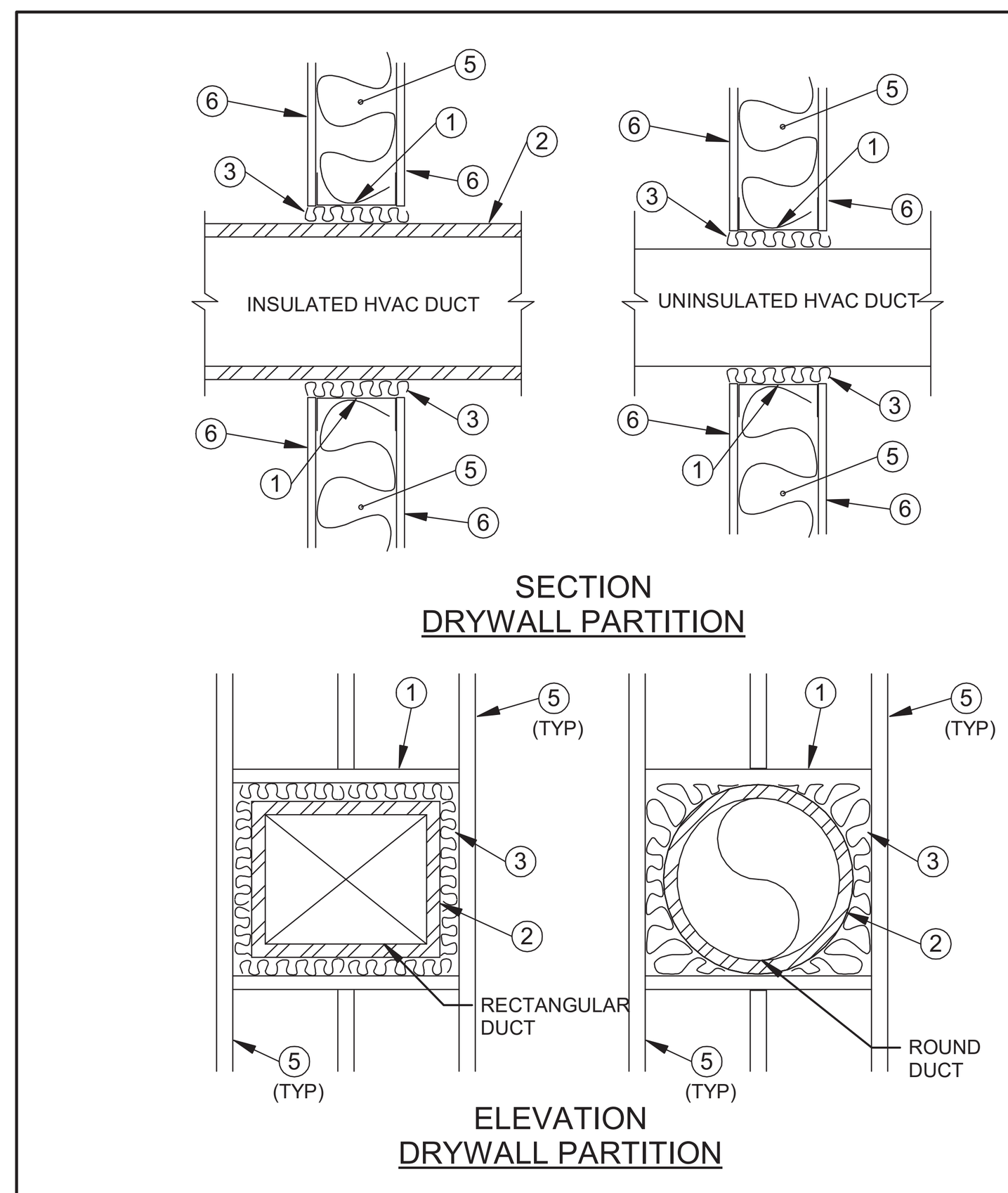
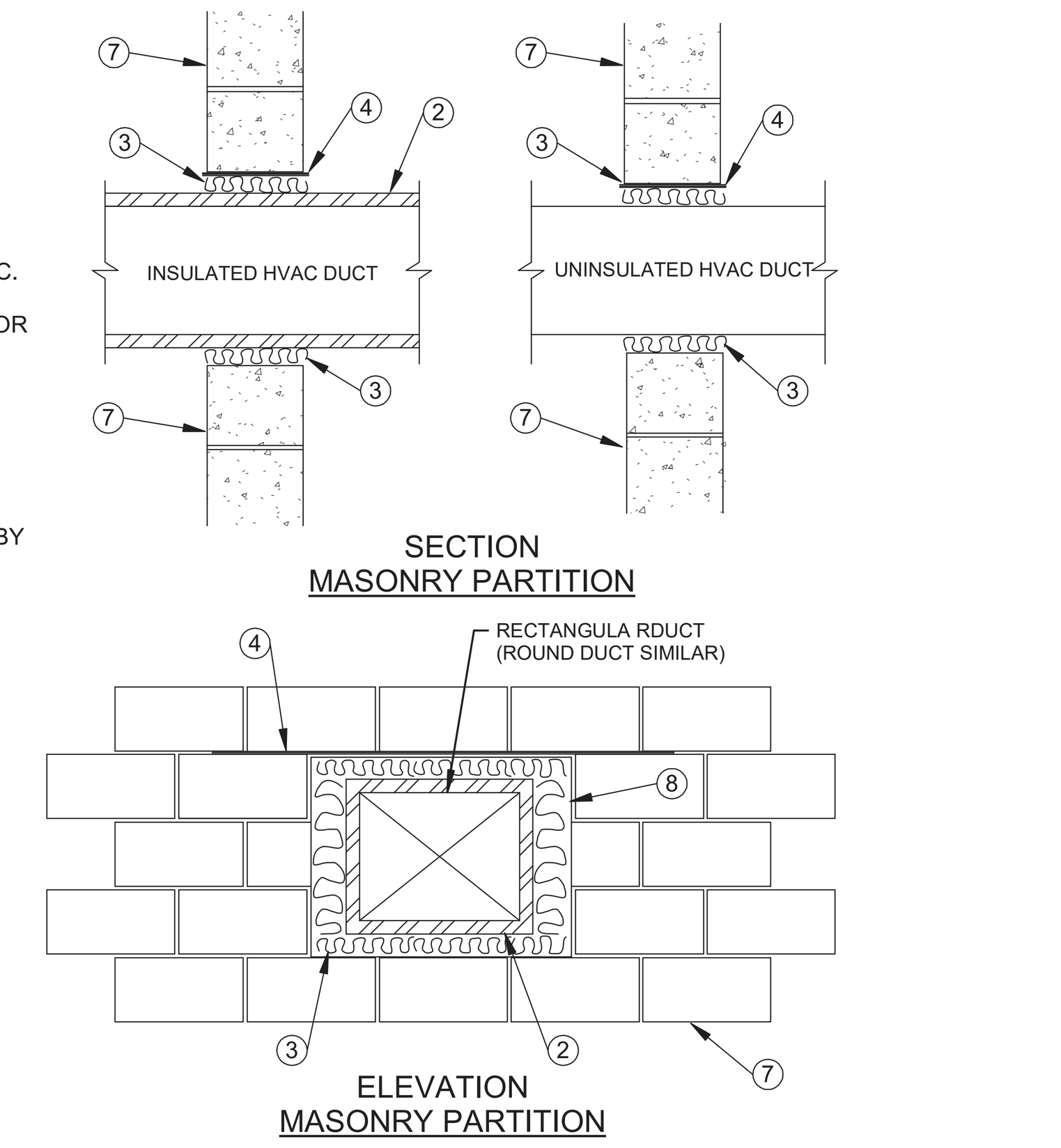
TITLE
DETAILS

SHEET NO.
H3.1

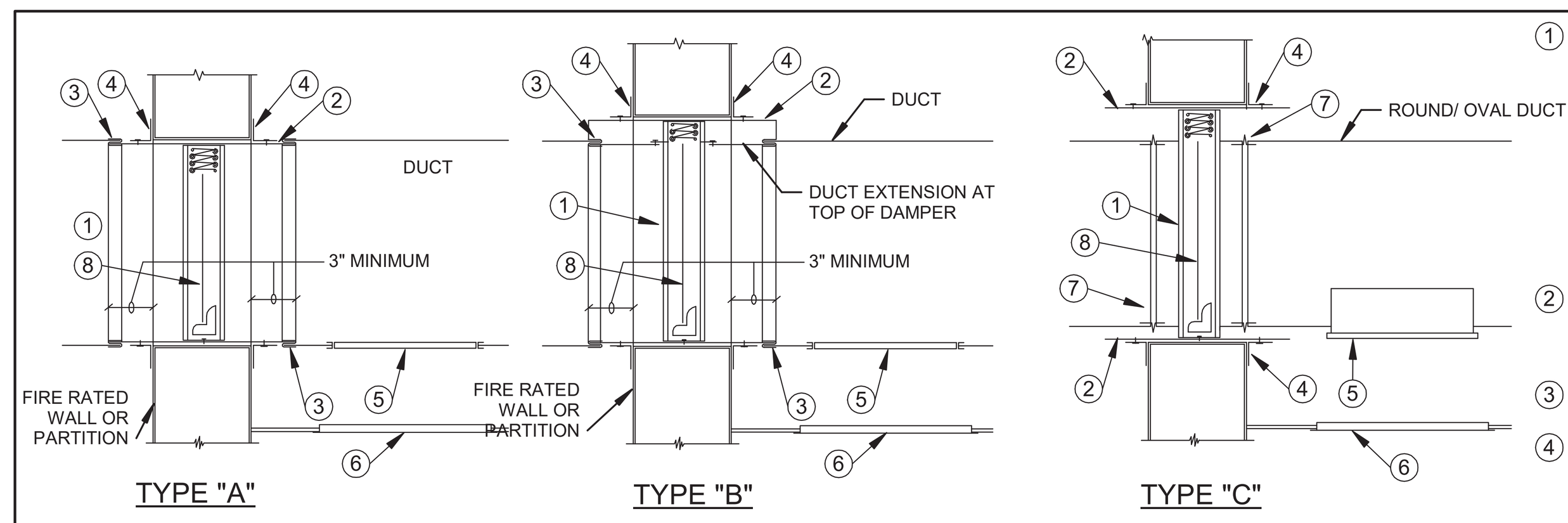


1. WALL OPENING WITH FRAMING BY G.C.
2. DUCT INSULATION, SEE SCHEDULE FOR THICKNESS.
3. FILL VOID WITH 1.5" THICK, 0.75 P FIBERGLASS BATT INSULATION.
4. LINTEL BY G.C.
5. WOOD OR METAL STUDS AT 16" O.C. BY G.C.
6. DRYWALL BY G.C.
7. MASONRY WALL BY G.C.
8. FRAMED MASONRY OPENING BY G.C.



1 DUCT SEALING THRU NON-FIRE RATED WALL
N.T.S.

* NEW CONSTRUCTION, FRAMED OPENING, DUCT SIDE OR DIA. ≥ 12"



1. FIRE DAMPER TYPES -
   TYPE "A" - BLADES STORED IN AIR STREAM. APPROVED FOR USE ONLY AT STORM SHELTER.
   TYPE "B" - BLADES STORED OUT OF AIR STREAM.
   TYPE "C" - ROUND/OVAL DUCT, BLADES STORED OUT OF AIR STREAM.
   ATTACH TO SLEEVE PER SMACNA, MINIMUM 4 CONNECTIONS (2 ON EACH SIDE OF BLADE CHANNEL) PER SIDE, MAX. 6" APART - TACK WELD, #10 SCREWS, 0.25" BOLTS/NUTS OR 3/16" STEEL POP RIVETS.
2. SHEETMETAL WALL SLEEVE, SAME MATERIAL AS DUCT. SHEETMETAL GAUGE PER SMACNA. MAINTAIN REQUIRED CLEARANCE TO WALL.
3. DUCT/SLEEVE CONNECTION, BREAKAWAY TYPE.
4. RETAINING ANGLE ALL FOUR SIDES, 1.5"x1.5" LEGS (MIN.), GAUGE PER SMACNA. 1" MINIMUM OVERLAP OF WALL BEYOND OPENING. EXTENDED LEG MAY BE REQUIRED. BOLT, SCREW, OR TACK WELD TO WALL SLEEVE. SPACING OF FASTENERS PER SMACNA.
5. DUCT ACCESS PANEL OR DOOR - 18"x16" EXCEPT SMALLER WHERE LIMITED BY DUCT SIZE.
6. CEILING ACCESS PANEL IF CEILING IS NOT ACCESSIBLE.
7. ROUND DUCT COUPLING.
8. STAINLESS STEEL CLOSURE SPRING.

GENERAL NOTES

-FIRE DAMPERS SHALL BE UL CLASSIFIED.

-FIRE DAMPERS SHALL BE 1.5 HOUR RATED FOR 2 HOUR RATED WALLS OR LESS; 3 HOUR FIRE RATED FOR 3 HOUR WALLS.

-FIRE DAMPERS SHALL BE DYNAMIC RATED, CURTAIN TYPE, SPRING OPERATED

-DIFFERENTIAL PRESSURE RATING OF 4" MINIMUM, HIGHER WHERE REQUIRED TO MATCH DUCT CONSTRUCTION.

-2000 FPM MAX. AIRFLOW RATING, EXCEPT 4000 FPM WHERE DESIGN DUCT VELOCITY IS OVER 2000 FPM.

-FIRE CLOSURE FUSIBLE LINK OF 165 DEG. F. EXCEPT WHERE REQUIRED TO BE HIGHER BY APPLICATION.

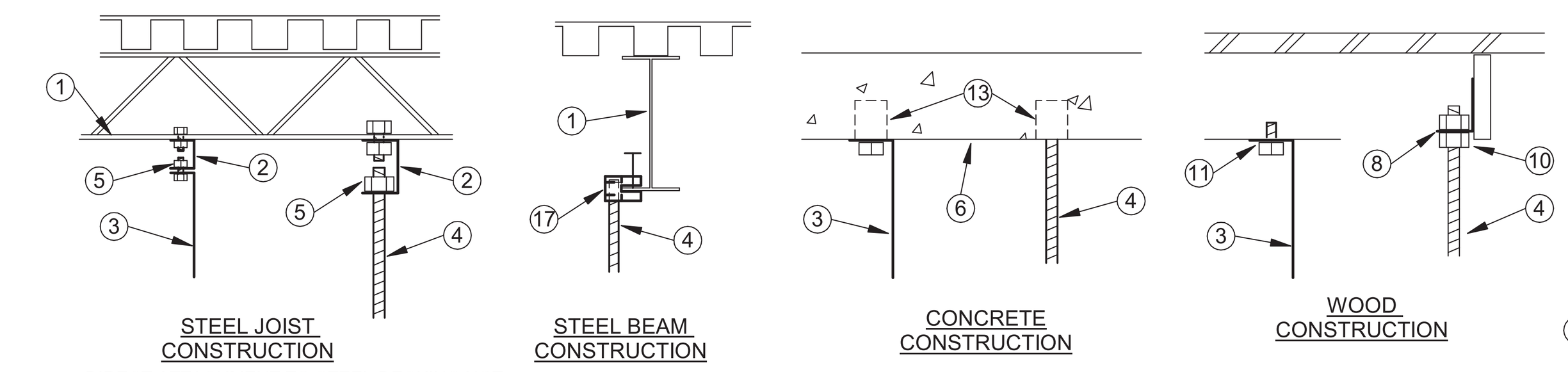
-GALVANIZED STEEL CONSTRUCTION IN GALVANIZED DUCT, STAINLESS STEEL IN OTHER APPLICATIONS.

-NOMINAL 4" STANDARD FRAME WIDTH.

-INSTALLATION OF FIRE DAMPERS AND ACCESSORIES INCLUDING INSULATION SHALL CONFORM TO NFPA 90A, SMACNA AND MANUFACTURER'S INSTRUCTIONS.

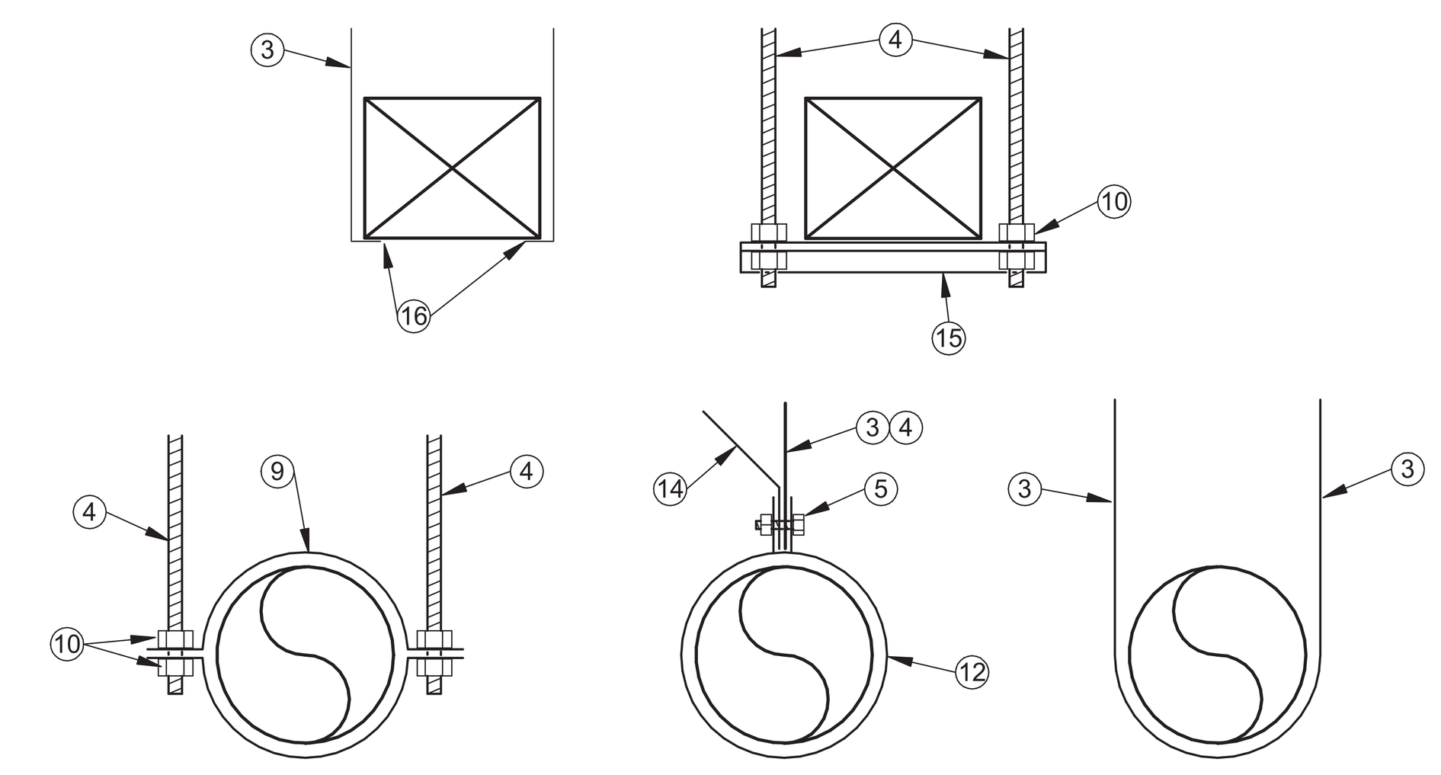
-DETAILS SHOW INSTALLATION OF FIRE DAMPER IN WALL. DAMPER INSTALLATION IN FLOOR SIMILAR. REFER TO PLANS FOR ACCESS LOCATION.

2 FIRE DAMPERS DETAIL
N.T.S.



DIRECT ATTACHMENT TO STEEL DECKING NOT ALLOWED. PROVIDE SUPPLEMENTAL STEEL BETWEEN STRUCTURAL MEMBERS WHERE NEEDED.

STRUCTURAL CONNECTIONS



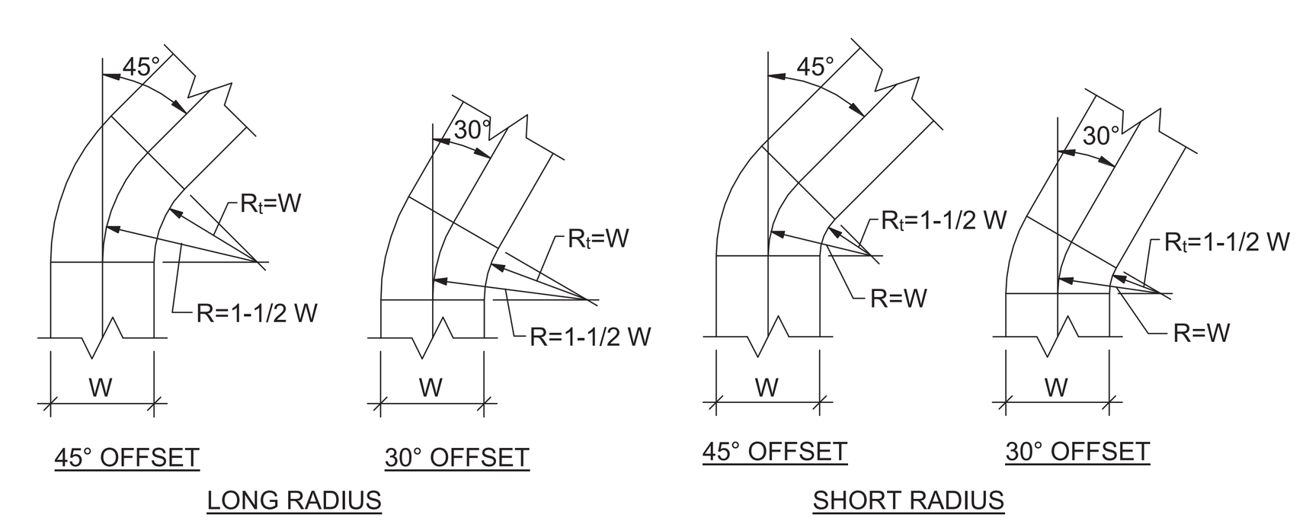
DUCT CONNECTIONS

1. STEEL JOIST OR BEAM.
2. UNISTRUT CHANNEL SPANNING TWO JOIST OR BEAMS. ATTACH TO BOTTOM CHORDS OF TWO BEAMS OR JOIST WITH "C" CLAMP.
3. GALVANIZED SHEETMETAL STRAP HANGER.
4. GALVANIZED THREADED ROD.
5. GALVANIZED BOLT & NUT.
6. CONCRETE SLAB.
7. WOOD DECK & BEAM.
8. STEEL ANGLE CLIP ENGINEERED FASTENER FOR THREADED ROD INTO WOOD.
9. TWO GALVANIZED BAND HANGERS.
10. RETAINING NUTS & WASHERS.
11. ATTACH TO BOTTOM OF WOOD BEAM OR JOIST WITH LAG BOLT.
12. ONE PIECE GALVANIZED STEEL BAND HANGER.
13. CONCRETE EXPANSION ANCHOR OR CONCRETE INSERT IN NEW CONSTRUCTION.
14. SEISMIC SWAY BRACE ATTACHED TO STRUCTURE.
15. PAINTED STEEL UNISTRUT CHANNEL.
16. GALVANIZED STEEL RESTRAINT PER SMACNA REQUIREMENTS.
17. THREADED ROD BEAM CLAMP.

NOTE:
ALL HANGERS & SUPPORT OF DUCT SHALL BE IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS SECOND ADDITION - 1995.

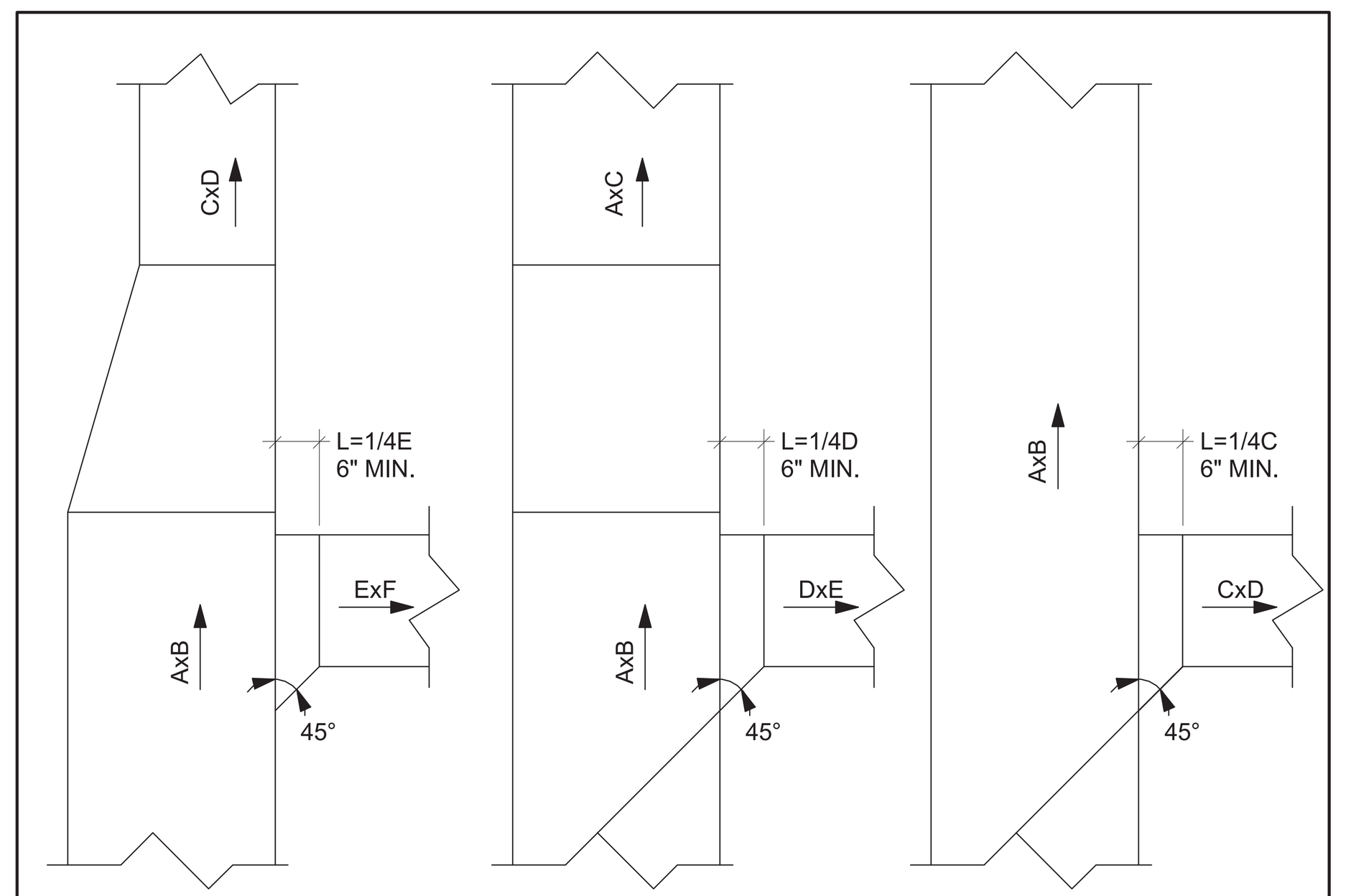
3 DUCT HANGERS & SUPPORTS
N.T.S.

METAL STRAP & ROD HANGERS



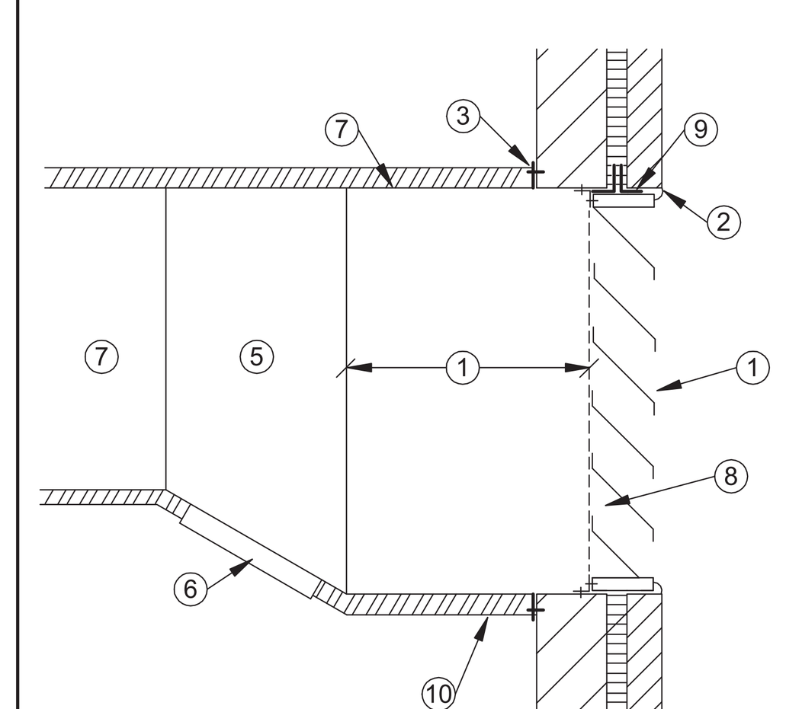
NOTES:
1. USE ONLY LONG RADIUS ELBOWS ON KITCHEN HOOD AND DISHWASHER HOOD EXHAUST DUCTWORK.
2. USE LONG RADIUS ELBOWS ON ALL DUCTWORK SYSTEMS WHERE POSSIBLE OR UNLESS OTHERWISE INDICATED.
3. ONLY WHEN IT IS IMPOSSIBLE TO USE LONG RADIUS ELBOWS, USE LARGEST POSSIBLE RADIUS WITH A MINIMUM RADIUS EQUAL TO THAT OF A SHORT RADIUS ELBOW.

4 RECTANGULAR 45° & 30° RADIUS ELBOW
N.T.S.



NOTES:
1. DIMENSIONS A, B, C, D, E, AND F AS INDICATED ON THE DRAWINGS.
2. TRANSITIONS MAY BE FLAT ON TOP, FLAT ON BOTTOM OR CONCENTRIC.
3. SAME FOR RETURN AND EXHAUST DUCTS EXCEPT AIRFLOW IS REVERSED.
4. TAP HEIGHT DIMENSION SHOULD BE 2" SMALLER THAN MAIN DUCT HEIGHT.

5 RECTANGULAR 90° SIDE TAP
N.T.S.



1. FRESH AIR, EXHAUST OR VENT AIR LOUVER. SEE AIR DEVICE SCHEDULE.
2. PLIABLE CAULK ALL FOUR SIDES.
3. FLANGE CONNECTION TO WALL.
4. 5' MIN. DISTANCE FOR INTAKE.
5. 30 DEG. DUCT TRANSITION.
6. ACCESS DOOR.
7. SHEET METAL DUCTWORK.
8. BIRDSCREEN.
9. STEEL LINTEL BY G.C.
10. INSULATION.

6 WALL LOUVER
N.T.S.

WHERE DUCTS PENETRATE FIRE RATED ASSEMBLIES AND FIRE DAMPERS ARE NOT INDICATED THE PENETRATION SHALL BE PROTECTED BY AN APPROVED PENETRATION FIRE STOP SYSTEM INSTALLED AS TESTED IN ACCORDANCE WITH ASTM E814 OR UL 1479

CONTRACTOR SHALL SUBMIT PENETRATION DETAIL FROM FIRE STOP SYSTEM MANUFACTURER.

7 DUCT PENETRATIONS - FIRE RATED WALLS
N.T.S.

-NEW AND EXISTING CONSTRUCTION

App Architecture
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615 Woodside Drive, Englewood, Ohio 45322
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JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402
Phone: (937) 223-3821 ~ Fax: (937) 223-3849
PROJECT # 23001

City of Middletown

Fire Station No. 83 & Headquarters

1830 Yankee Road, Middletown, Ohio 45044

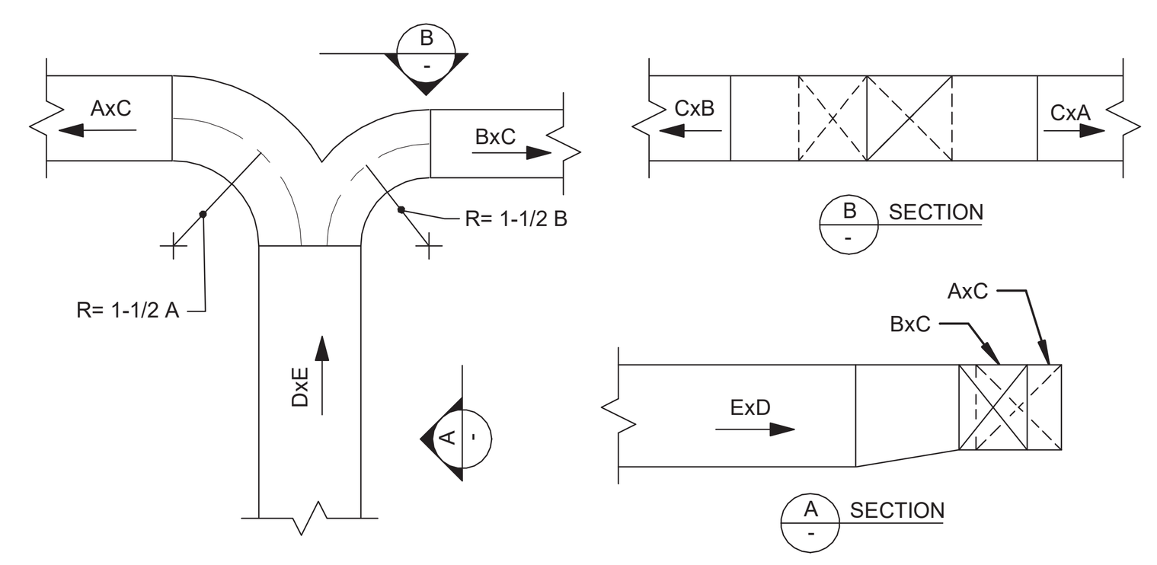
ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
DETAILS

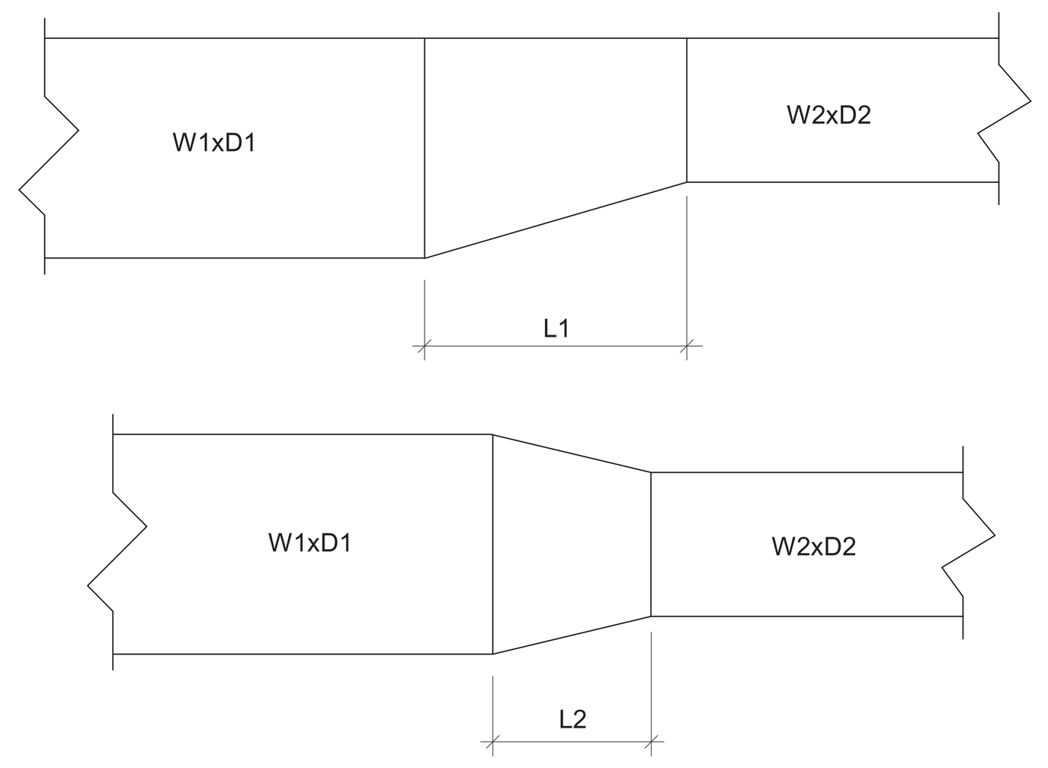
SHEET NO.
H3.2



NOTES:

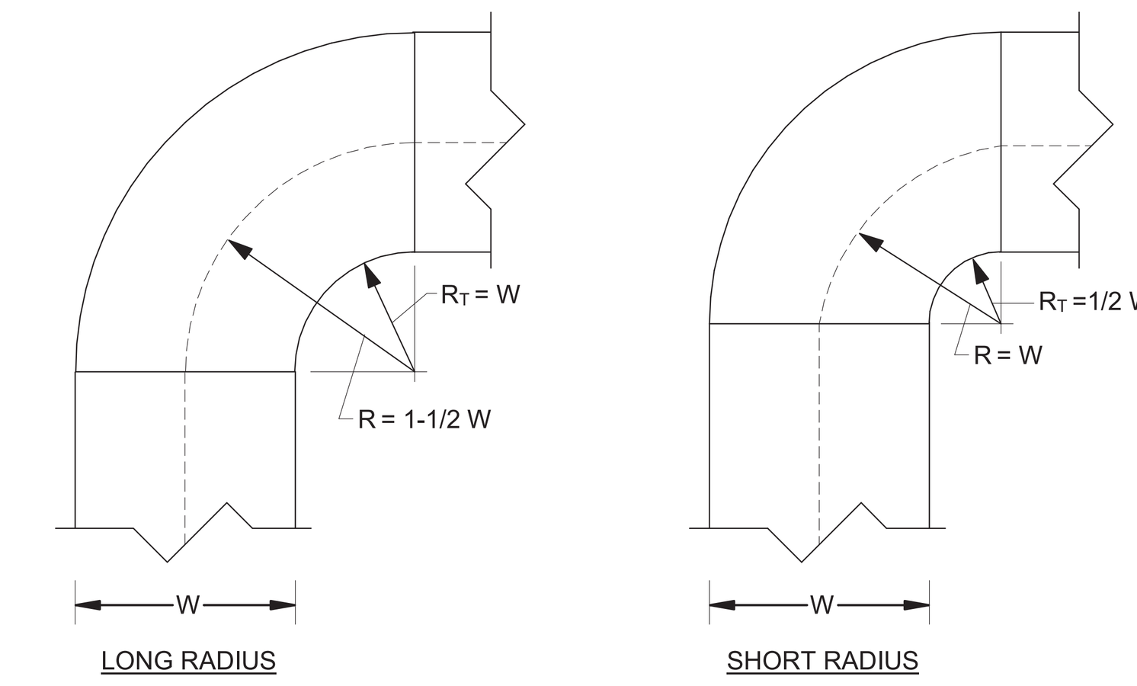
1. DIMENSIONS A, B, C, D, AND E AS INDICATED ON DRAWINGS.
2. TRANSITIONS SHOWN CONCENTRIC IN PLAN, MAY BE FLAT ON EITHER SIDE. TRANSITION SHOWN FLAT ON TOP IN SECTION, MAY BE FLAT ON BOTTOM OR CONCENTRIC. TRANSITION DUCT AS FIELD CONDITIONS DICTATE.
3. SAME FOR RETURN AND EXHAUST DUCTS EXCEPT AIRFLOW IS REVERSED.

1 RECTANGULAR REDUCING WYE BRANCH ELBOW
N.T.S.



NOTES:
1. DIMENSIONS W1, W2, D1, AND D2 AS INDICATED ON THE DRAWINGS.
2. FOR LOW VELOCITY DUCTWORK (1800 FPM OR LESS)
   L1 = 4 x (W1-W2) OR 4 x (D1-D2) WHICHEVER IS GREATER.
   L2 = 2 x (W1-W2) OR 2 x (D1-D2) WHICHEVER IS GREATER.
3. FOR MEDIUM AND HIGH VELOCITY DUCTWORK (OVER 1800 FPM)
   L1 = 7 x (W1-W2) OR 7 x (D1-D2) WHICHEVER IS GREATER.
   L2 = 3.5 x (W1-W2) OR 3.5 x (D1-D2) WHICHEVER IS GREATER.

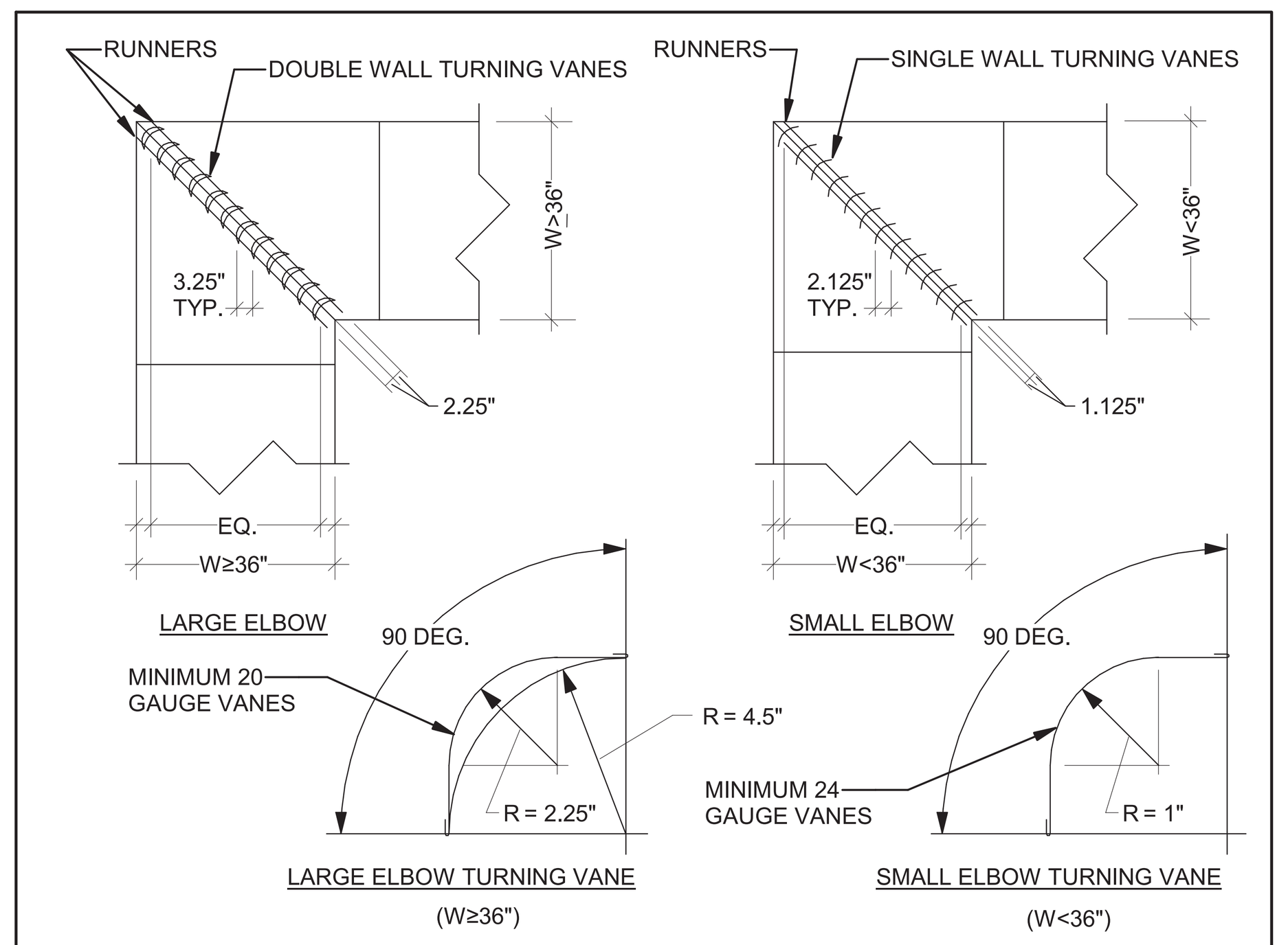
2 RECTANGULAR TRANSITION
N.T.S.



NOTES:
1. USE ONLY LONG RADIUS ELBOWS ON KITCHEN HOOD AND DISHWASHER HOOD EXHAUST DUCTWORK.
2. USE LONG RADIUS ELBOWS ON ALL DUCTWORK SYSTEMS WHERE POSSIBLE OR UNLESS OTHERWISE INDICATED.
3. ONLY WHEN IT IS IMPOSSIBLE TO USE LONG RADIUS ELBOWS, USE LARGEST POSSIBLE RADIUS WITH A MINIMUM RADIUS EQUAL TO THAT OF A SHORT RADIUS ELBOW.

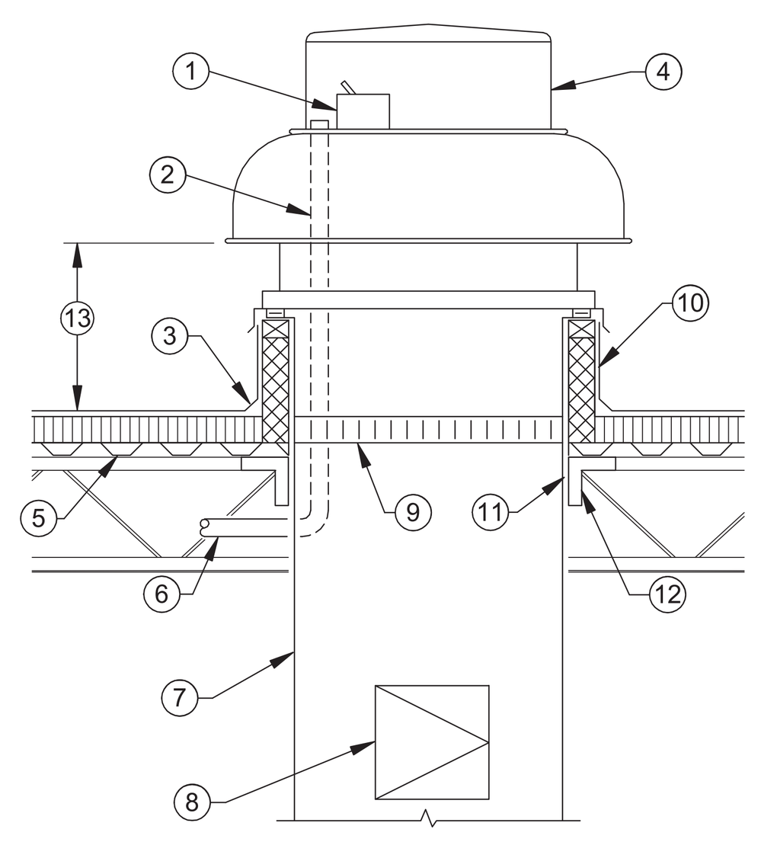
NOTE:
ELBOWS WITH 90 DEGREE SQUARE ON INSIDE RADIUS ARE NOT ACCEPTABLE.

3 RECTANGULAR 90° RADIUS ELBOW
N.T.S.



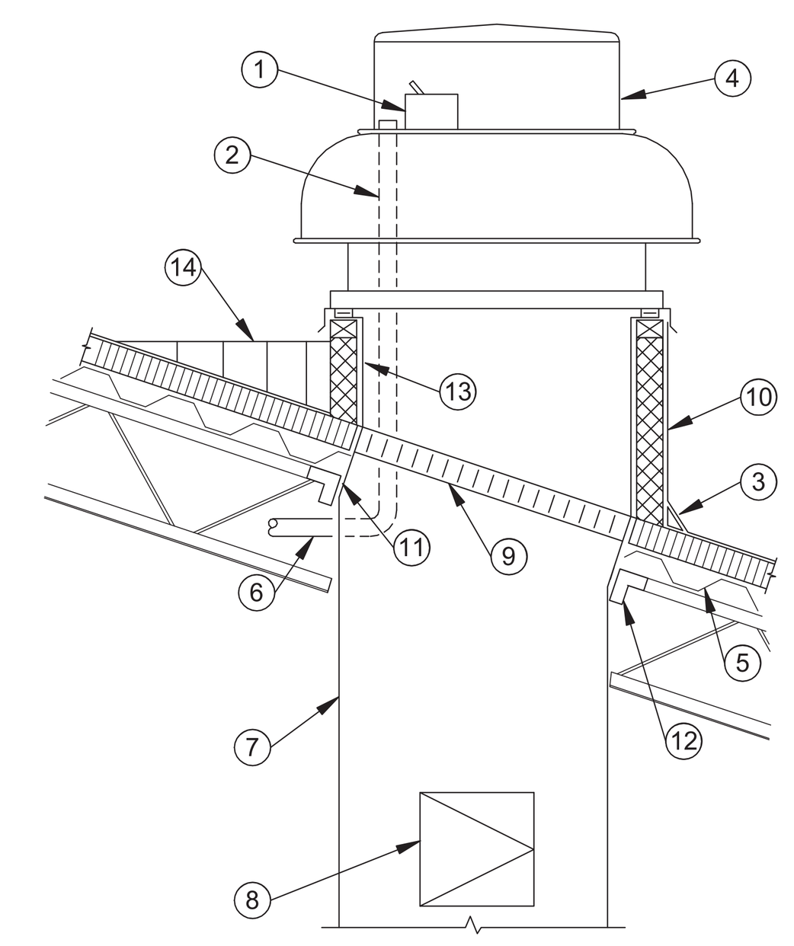
NOTES:
1. ALL VANES SHALL BE SECURE AND STABLE IN OPERATING POSITION.
2. VANES SHALL BE SECURELY FASTENED TO RUNNERS.
3. INSTALL VANES IN SECTIONS OR USE TIE RODS TO LIMIT THE UNBRACED LENGTH TO 60".
4. VANES ARE NOT TO HAVE TRAILING EDGES.

4 RECTANGULAR 90° MITERED ELBOW
N.T.S.



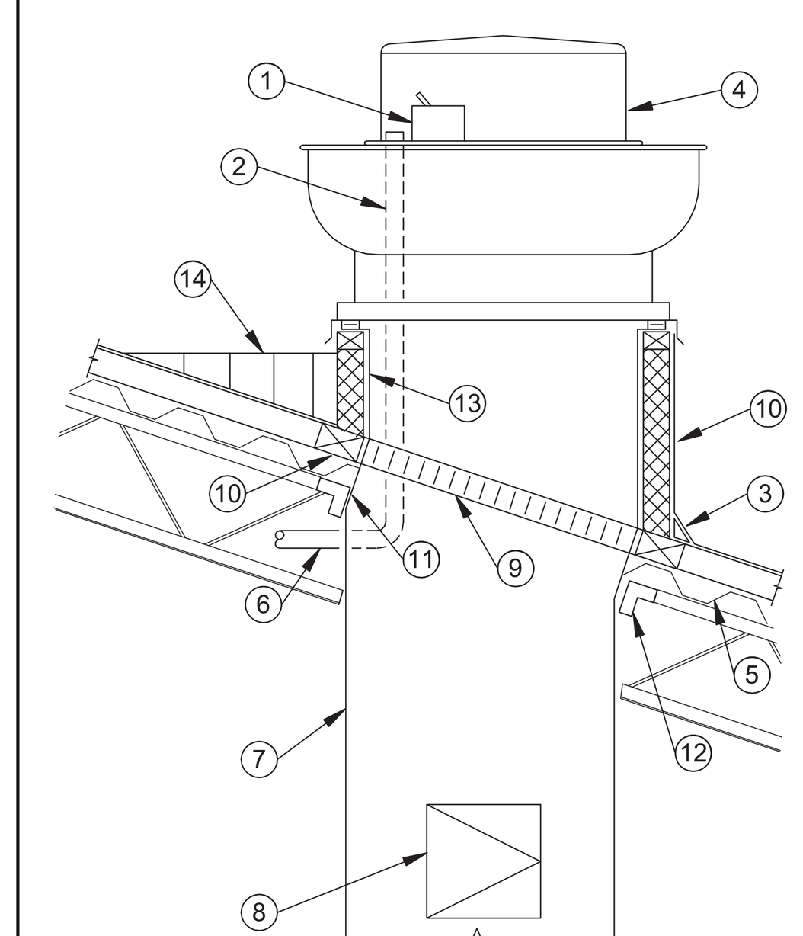
1. DISCONNECT SWITCH BY FAN MANUFACTURER.
2. WIRING CONDUIT CHASE BY FAN MANUFACTURER.
3. ROOFING & CURB FLASHING BY ROOFING CONTRACTOR.
4. EXHAUST FAN. INSTALL PER MANUFACTURERS RECOMMENDATION.
5. METAL ROOF DECK.
6. ELECTRIC CONDUIT BY E.C., SEAL DUCT PENETRATION.
7. EXHAUST DUCT-REFER TO PLANS/SCHEDULE FOR SIZE
8. ACCESS DOOR
9. 120V MOTORIZED DAMPER FROM MANUFACTURER.
10. 14" ROOF CURB WITH 1.5" INSULATION, INSTALL PER FAN AND ROOFING MANUFACTURERS INSTALLATION RECOMMENDATIONS.
11. FILL VOID BETWEEN DUCT AND STRUCTURE WITH FOAM INSULATION.
12. SUPPLEMENTAL STEEL FRAMING BY G.C.
13. MINIMUM 18" ABOVE ROOF DECK.

5 ROOF MOUNTED EXHAUST FAN DETAIL — DOWNBLAST, STEEL JOIST, METAL DECK
N.T.S.



1. DISCONNECT SWITCH BY FAN MANUFACTURER.
2. WIRING CONDUIT CHASE BY FAN MANUFACTURER.
3. ROOFING & CURB FLASHING BY ROOFING CONTRACTOR.
4. EXHAUST FAN. INSTALL PER MANUFACTURERS RECOMMENDATION.
5. METAL DECK.
6. ELECTRIC CONDUIT BY E.C., SEAL DUCT PENETRATION.
7. EXHAUST DUCT-REFER TO PLANS.SCHEDULE FOR SIZE.
8. ACCESS DOOR
9. 120V MOTORIZED DAMPER FROM MANUFACTURER.
10. SLOPED ROOF CURB WITH 1.5" INSULATION, INSTALL PER FAN AND ROOFING MANUFACTURERS INSTALLATION RECOMMENDATIONS.
11. FILL VOID BETWEEN DUCT AND STRUCTURE WITH FOAM INSULATION.
12. SUPPLEMENTAL STEEL FRAMING BY G.C.
13. CURB MINIMUM 14" TALL ON UPSLOPE SIDE.
14. ROOF CRICKET BY G.C.

6 ROOF MOUNTED EXHAUST FAN DETAIL — DOWNBLAST, STEEL JOIST, SLOPED ROOF
N.T.S.



1. DISCONNECT SWITCH BY FAN MANUFACTURER.
2. WIRING CONDUIT CHASE BY FAN MANUFACTURER.
3. ROOFING & CURB FLASHING BY ROOFING CONTRACTOR.
4. EXHAUST FAN. INSTALL PER MANUFACTURERS RECOMMENDATION.
5. METAL DECK.
6. ELECTRIC CONDUIT BY E.C., SEAL DUCT PENETRATION.
7. EXHAUST DUCT-REFER TO PLANS.SCHEDULE FOR SIZE.
8. ACCESS DOOR
9. 120V MOTORIZED DAMPER FROM MANUFACTURER.
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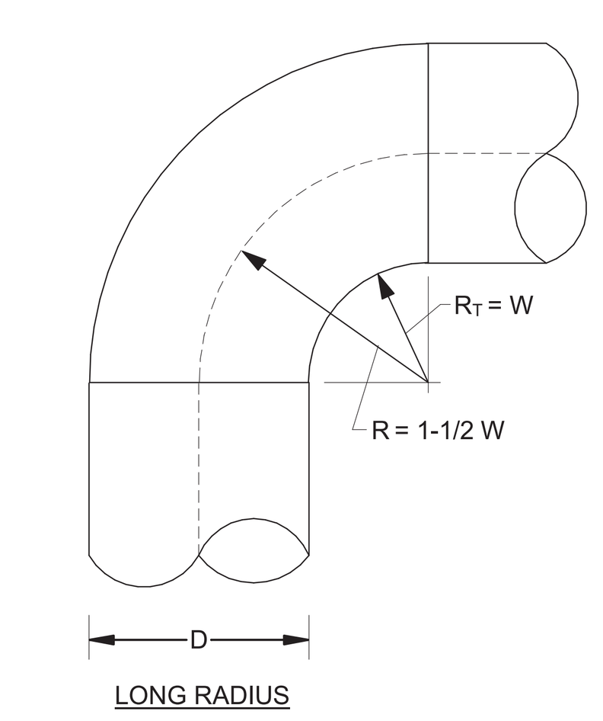
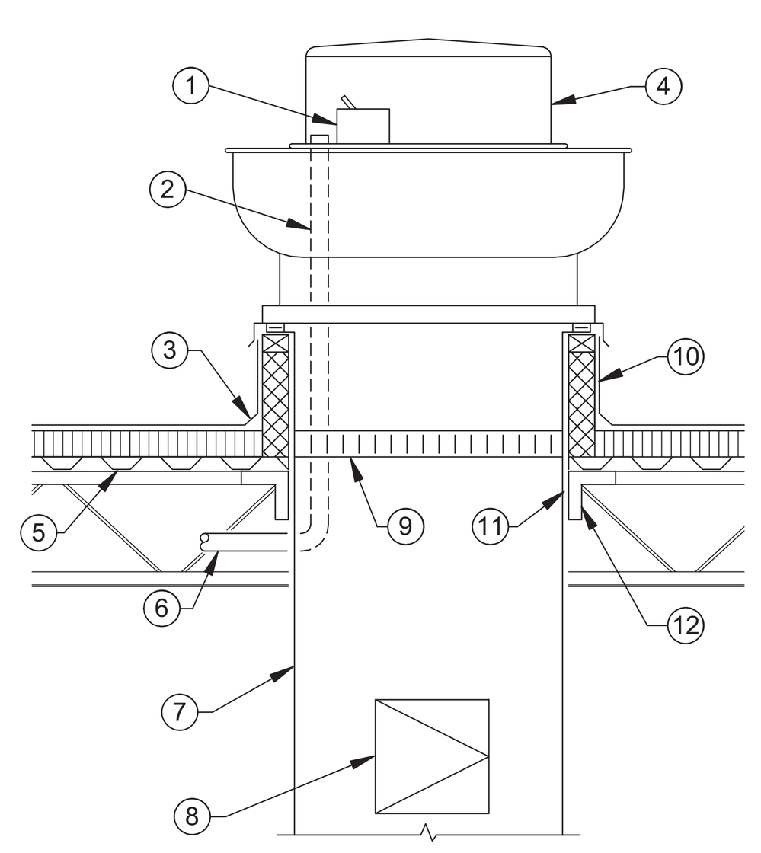
12. SUPPLEMENTAL STEEL FRAMING BY G.C.
13. CURB MINIMUM 14" TALL ON UPSLOPE SIDE.
14. ROOF CRICKET BY G.C.

7 ROOF MOUNTED EXHAUST FAN DETAIL — UPBLAST, STEEL JOIST, SLOPED ROOF
N.T.S.



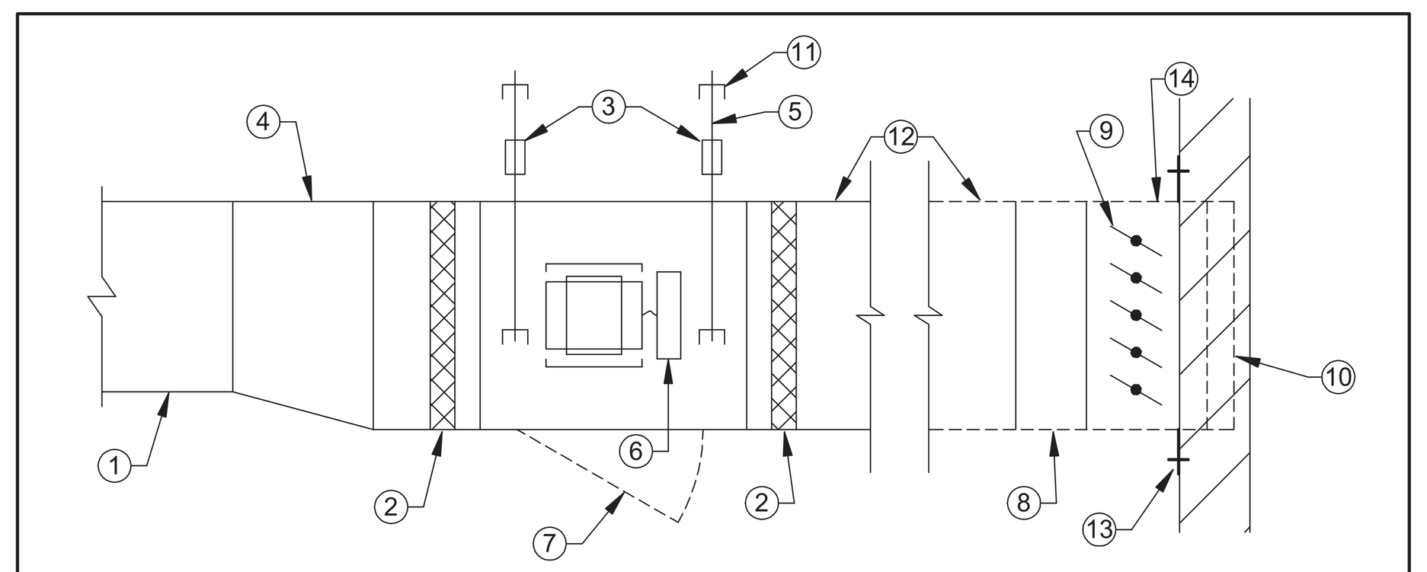
NOTES:
1. DIMENSION D AS SHOWN ON THE DRAWINGS.
2. USE LONG RADIUS ELBOWS ON ALL DUCTWORK SYSTEMS WHERE POSSIBLE OR UNLESS OTHERWISE INDICATED.
3. ONLY WHEN IT IS IMPOSSIBLE TO USE LONG RADIUS ELBOWS, USE LARGEST POSSIBLE RADIUS WITH A MINIMUM RADIUS EQUAL TO THAT OF A SHORT RADIUS ELBOW.

8 ROUND 90° RADIUS ELBOW
N.T.S.



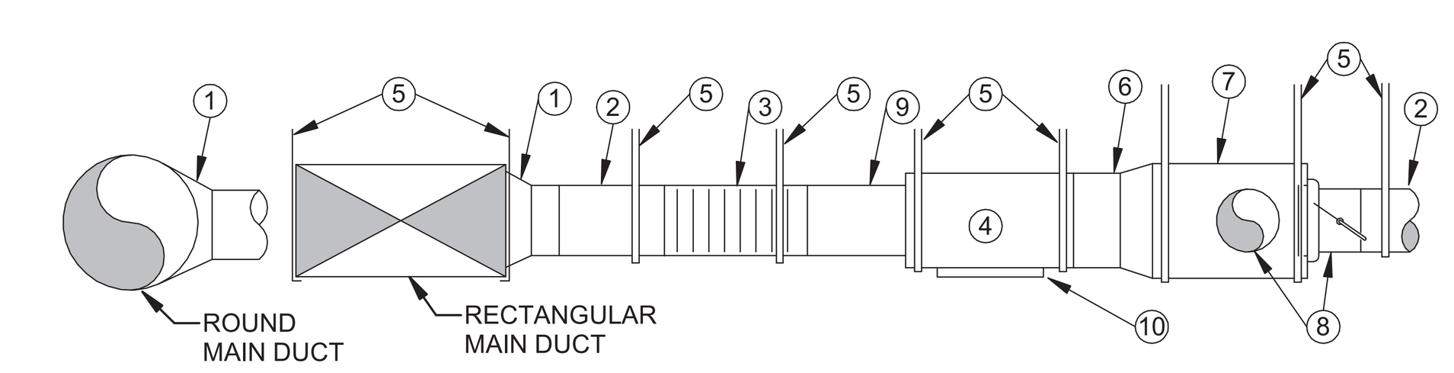
1. DISCONNECT SWITCH BY FAN MANUFACTURER.
2. WIRING CONDUIT CHASE BY FAN MANUFACTURER.
3. ROOFING & CURB FLASHING BY ROOFING CONTRACTOR.
4. EXHAUST FAN. INSTALL PER MANUFACTURERS RECOMMENDATION.
5. METAL ROOF DECK.
6. ELECTRIC CONDUIT BY E.C., SEAL DUCT PENETRATION.
7. EXHAUST DUCT-REFER TO PLANS/SCHEDULE FOR SIZE
8. ACCESS DOOR
9. 120V MOTORIZED DAMPER FROM MANUFACTURER.
10. 14" ROOF CURB WITH 1.5" INSULATION, INSTALL PER FAN AND ROOFING MANUFACTURERS INSTALLATION RECOMMENDATIONS.
11. FILL VOID BETWEEN DUCT AND STRUCTURE WITH FOAM INSULATION.
12. SUPPLEMENTAL STEEL FRAMING BY G.C.

9 ROOF MOUNTED EXHAUST FAN DETAIL — UPBLAST, STEEL JOIST, METAL DECK
N.T.S.



1. EXHAUST DUCT
2. FLEXIBLE DUCT CONNECTION VIBRATION ISOLATORS
3. VIBRATION ISOLATORS
4. TRANSITION TO EXHAUST FAN INLET SIZE
5. THREADED ROD
6. BELT GUARD
7. ACCESS DOOR
8. TRANSITION TO LOUVER SIZE
9. MOTORIZED BACK DAMPER PROVIDED WITH EXHAUST FAN
10. LOUVER BY H.C. SEE DETAIL.
11. STEEL CHANNEL. ATTACH TO STRUCTURE
12. DISCHARGE DUCT IS SAME SIZE AS FAN OUTLET
13. FASTEN DUCT TO WALL ON ALL FOUR SIDES. CAULK TO SEAL AIRTIGHT
14. INSULATE EXTERIOR OF DUCT TO PREVENT COLD DUCT SURFACES INSIDE OF BLDG.

10 INLINE EXHAUST FAN — **EXTERIOR WALL OUTLET**
N.T.S.



1. CONICAL TEE BRANCH FITTING.
2. ROUND SHEET METAL BRANCH DUCT. LENGTH AS REQUIRED. INSULATED.
3. INSULATED FLEXIBLE DUCT, 4' MAXIMUM LENGTH. STRETCH TO MINIMUM 90% OF FULLY EXTENDED LENGTH. DUCT SHALL BE FLEXMASTER TL-M ALUMINUM SPIRAL LINER WITH 1.5" INSULATION.
4. VAV REHEAT AIRFLOW CONTROL UNIT.
5. DUCT STRAP HANGER. ATTACH TO STRUCTURAL ELEMENTS.
6. ELECTRIC REHEAT COIL.
7. LOW PRESSURE RECTANGULAR SUPPLY DUCT. WHERE NOT SIZED ON THE DRAWINGS, SIZE TO MATCH COIL DIMENSIONS EXCEPT TRANSITION DUCT HEIGHT TO BE 2" HIGHER THAN LARGEST SPIN-IN BRANCH TAP FITTING.
8. SPIN-IN BRANCH TAP FITTING, STRAIGHT SIDE WITH MANUAL DAMPER AND INTEGRAL INSULATION GUARD SLEEVE.
9. 24" LONG SHEETMETAL AT BOX INLET - REDUCE LENGTH ONLY WHERE REQUIRED BY FIELD CONDITIONS.
10. ACCESS DOOR. LOCATE ON UNITS WITH REHEAT COILS ONLY.

NOTE:
COORDINATE WITH OTHER TRADES AND INSTALL VAV BOXES TO PROVIDE 18" SIDE AND UNOBSTRUCTED BOTTOM CLEARANCE TO CONTROLLER, ACTUATORS AND VALVES FOR MAINTENANCE. COORDINATE TO INSURE ACCESS IS PROVIDED BY SIMPLE REMOVAL OF ADJACENT UNRESTRICTED CEILING TILES (FREE OF CEILING MOUNTED DEVICES) WITHOUT NEED TO REMOVE LIGHTS OR CEILING GRID. ACCESS DOOR ON BOX IS FOR INSPECTION AND UPSTREAM COIL CLEANING. ACCESS DOOR USE IS RARE AND REMOVAL OF LIGHTS OR CEILING GRID TO GAIN ACCESS IS ACCEPTABLE.

MARK DESIGNATIONS AS SHOWN ON DRAWINGS ON ALL VAV BOXES WITH 2" HIGH PAINTED STENCIL LETTERING.

11 VARIABLE AIR VOLUME UNIT W/ REHEAT COIL
N.T.S.

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STATE OF OHIO — JEFFREY D. ZELINSKI 63822 — REGISTERED PROFESSIONAL ENGINEER
JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
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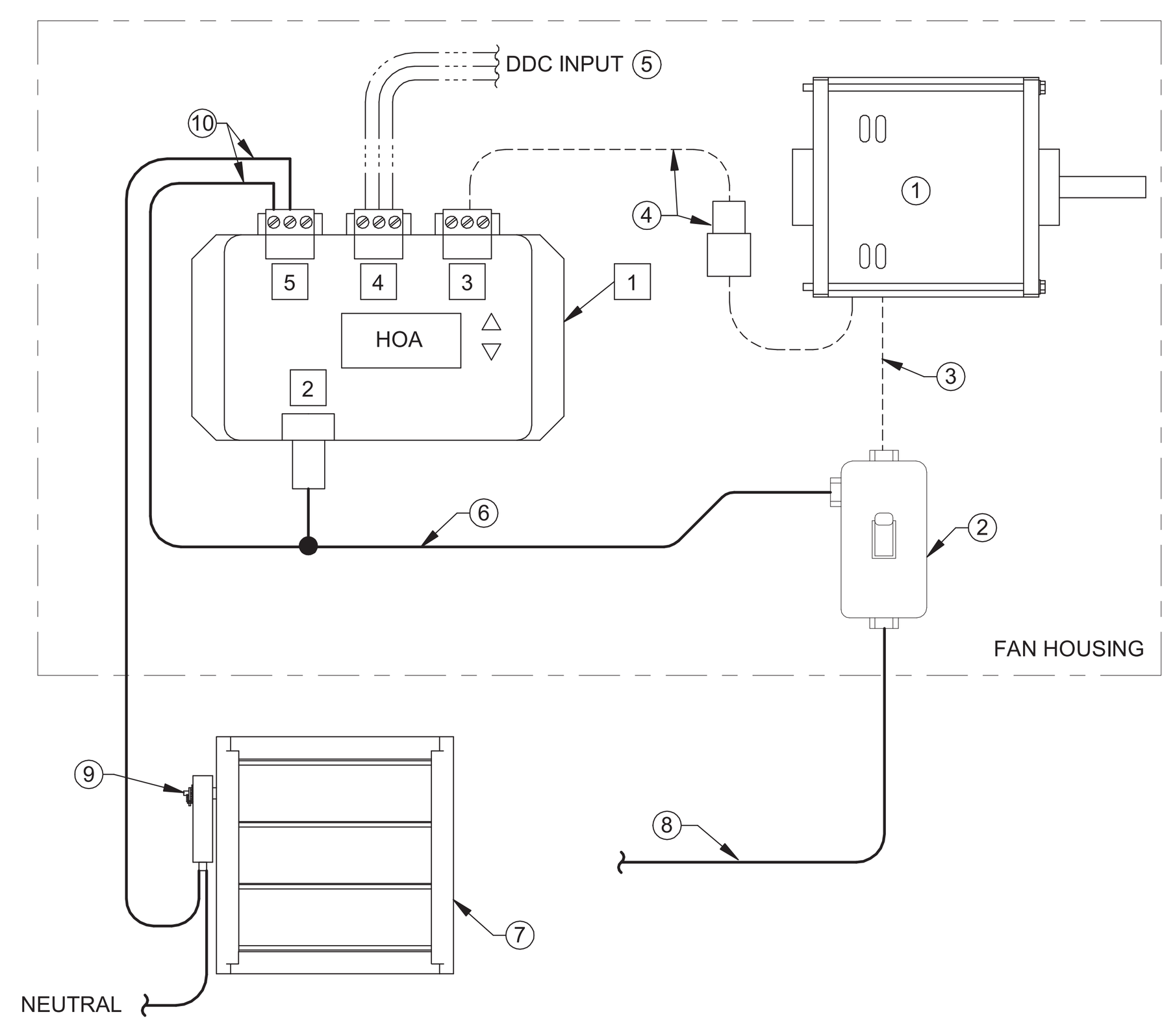
TITLE
DETAILS

SHEET NO.
H3.3

1 HOA CONTROLLER - SINGLE PHASE ECM FAN WIRING DIAGRAM
N.T.S.



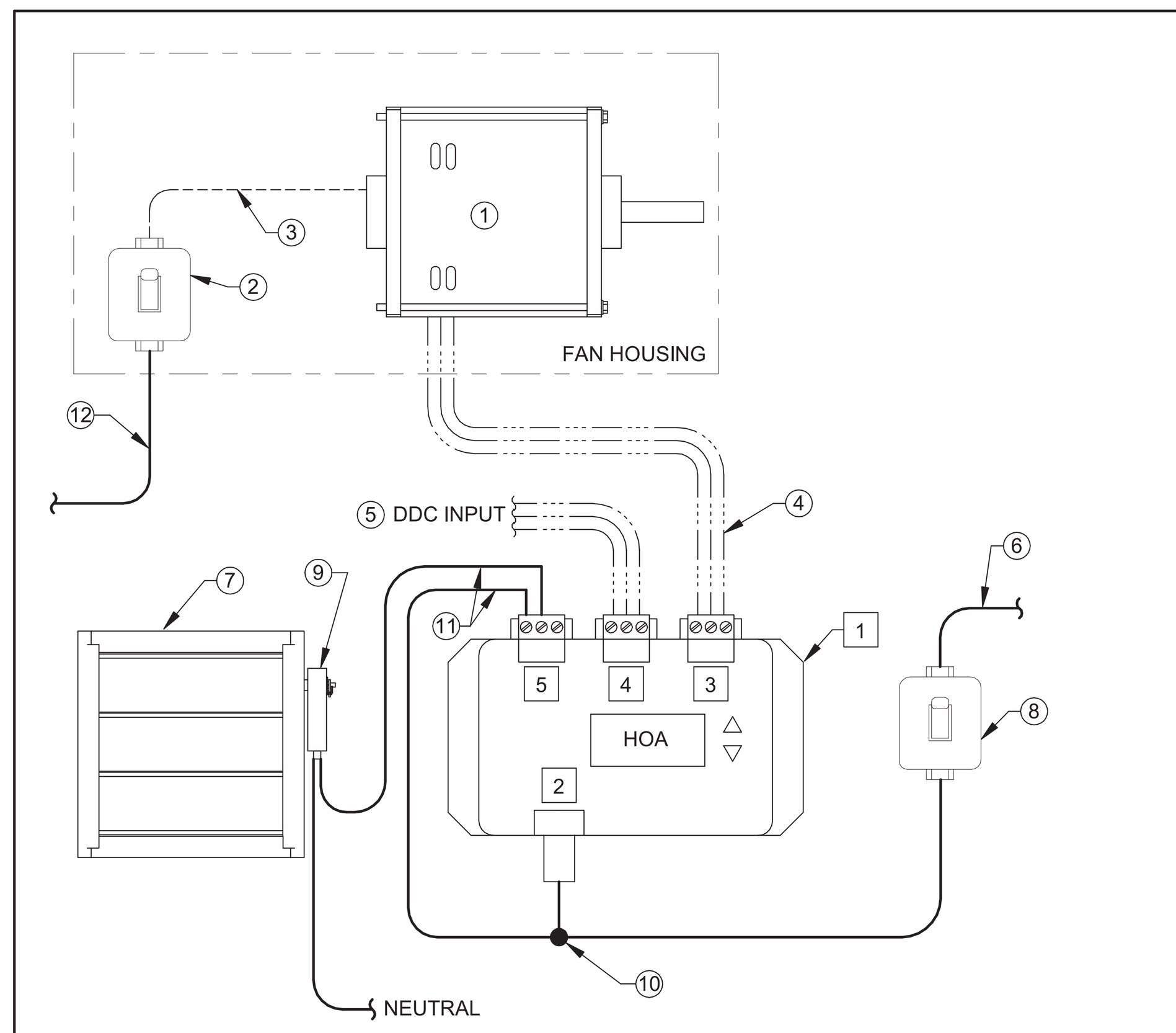
CONTROLLER NOTES

1. HAND/OFF/AUTO ECM FAN CONTROLLER BY FAN MANUFACTURER. MOUNTED IN FAN HOUSING OR IN BUILDING ADJACENT TO FAN.
2. 100 - 277V / 1 PHASE POWER TO CONTROLLER.
3. MOTOR CONTROL: 0-10 VDC, 24V, & COM.
4. DDC CONTROL SIGNAL: 0-10 VDC, 24V, & COM.
5. AUX. CONTACT, LINE OR LOW VOLTAGE. RATED FOR 10A @ 24-250V. N.O., N.C., & COM.

DETAIL NOTES

1. ECM FAN MOTOR.
2. TOGGLE DISCONNECT MOUNTED IN FAN HOUSING BY FAN MANUFACTURER.
3. SINGLE PHASE WIRING BY MANUFACTURER.
4. CONTROL WIRING BY MANUFACTURER.
5. DDC INPUT CONTROL WIRING BY H.C.
6. LINE VOLTAGE TO POWER MOTORIZED DAMPER BY E.C. TAP ON LOAD SIDE OF TOGGLE SWITCH. PROVIDES POWER TO HOA CONTROLLER AND DAMPER ACTUATOR.
7. DUCT MOUNTED MOTORIZED DAMPER BY FAN MANUFACTURER.
8. SUPPLY CIRCUIT POWER TO DISCONNECT BY E.C.
9. 120V MOTORIZED DAMPER ACTUATOR PROVIDED BY H.C.
10. WIRE 120V DAMPER POWER THROUGH AUXILARY CONTACT.

2 HOA CONTROLLER - THREE PHASE ECM FAN WIRING DIAGRAM
N.T.S.



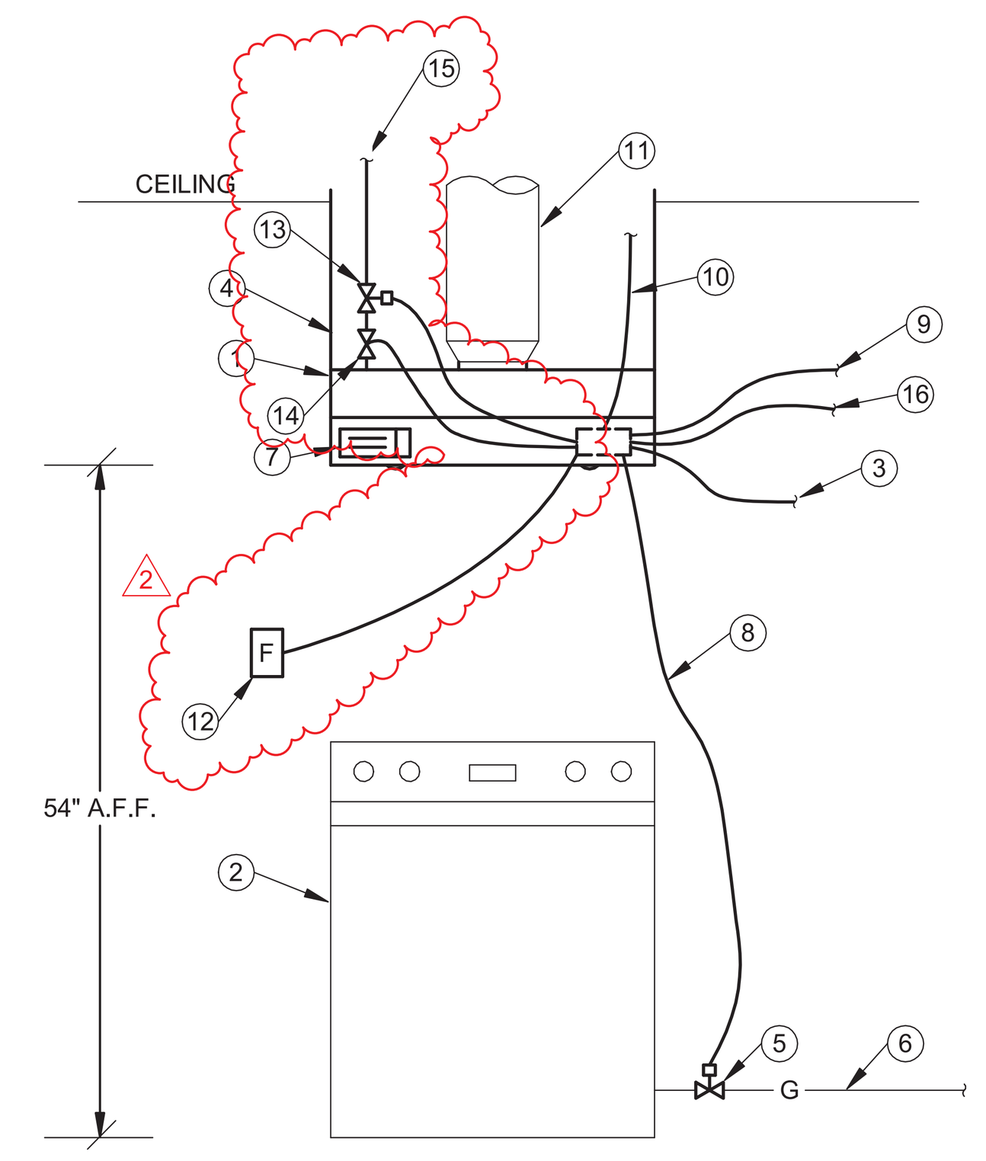
CONTROLLER NOTES

1. HAND/OFF/AUTO ECM FAN CONTROLLER BY FAN MANUFACTURER. MOUNTED IN FAN HOUSING OR IN BUILDING ADJACENT TO FAN.
2. 100 - 277V / 1 PHASE POWER TO CONTROLLER.
3. MOTOR CONTROL: 0-10 VDC, 24V, & COM.
4. DDC CONTROL SIGNAL: 0-10 VDC, 24V, & COM.
5. AUX. CONTACT, LINE OR LOW VOLTAGE. RATED FOR 10A @ 24-250V. N.O., N.C., & COM.

DETAIL NOTES

1. ECM FAN MOTOR
2. TOGGLE DISCONNECT MOUNTED IN FAN HOUSING BY FAN MANUFACTURER.
3. THREE PHASE POWER SUPPLY WIRING BY MANUFACTURER.
4. DDC CONTROL WIRING TO FAN BY H.C.
5. DDC INPUT CONTROL WIRING BY H.C.
6. 120V POWER BY E.C.
7. DUCT MOUNTED MOTORIZED DAMPER BY FAN MANUFACTURER.
8. TOGGLE DISCONNECT SWITCH BY E.C.
9. 120V MOTORIZED DAMPER ACTUATOR PROVIDED BY H.C.
10. TAP 120V TO PROVIDE POWER TO BOTH HOA CONTROLLER AND DAMPER ACTUATOR.
11. WIRE 120V DAMPER POWER THROUGH AUXILARY CONTACT.
12. FAN SUPPLY CIRCUIT BY E.C.

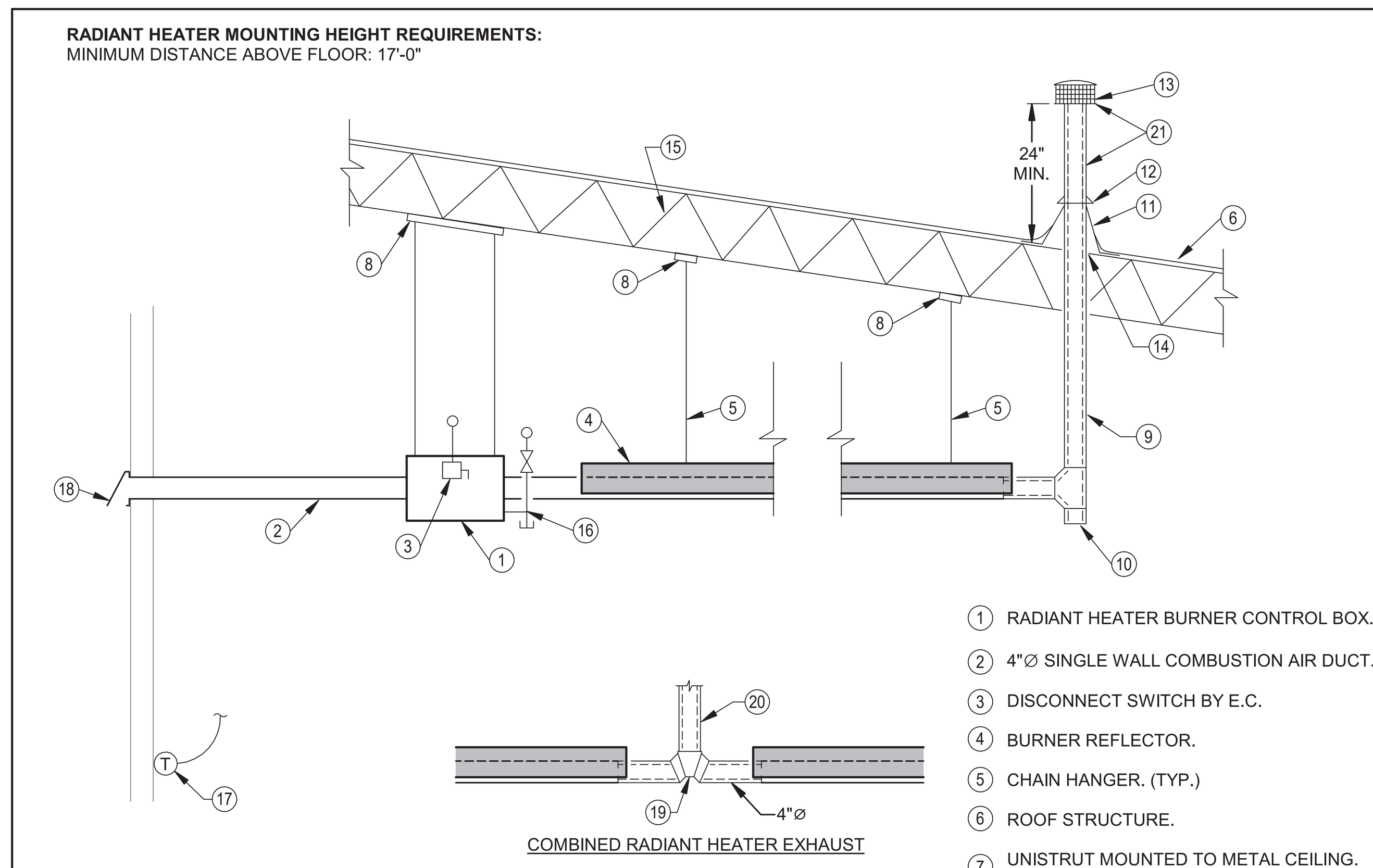
3 KITCHEN HOOD
N.T.S.



1. KITCHEN HOOD BY H.C. HOOD INSTALLED BY H.C.
2. RANGE FURNISHED BY OTHERS.
3. LOW VOLTAGE CONTROL WIRING TO INTERCONNECT HOOD WITH VAV-20. REFER TO CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION.
4. WRAPPER PROVIDED WITH HOOD. COORDINATE REQUIRED HEIGHT WITH CEILING.
5. NATURAL GAS SOLENOID VALVE PROVIDED WITH KITCHEN HOOD. VALVE INSTALLED BY P.C.
6. NATURAL GAS PIPING BY P.C.
7. KITCHEN HOOD USER INTERFACE SCREEN.
8. 120V WIRING BY E.C. REFER TO MANUFACTURERS INSTALLATION FIELD DIAGRAM FOR ADDITIONAL INFORMATION.
9. 120V KITCHEN HOOD POWER CONNECTION BY E.C. NEMA 5-15P TO HARDWIRE CONNECTION AT HOOD.
10. LINE VOLTAGE WIRING TO ROOF MOUNTED EXHAUST FAN BY E.C. LOW VOLTAGE (0-10V) TO ROOF MOUNTED EXHAUST FAN BY T.C.
11. STAINLESS STEEL EXHAUST DUCT BY H.C.
12. WALL MOUNTED, 24VDC, MANUAL PULL STATION FOR RANGE HOOD. COORDINATE INSTALLATION HEIGHT WITH COUNTERTOP. 24VDC WIRING TO RANGE HOOD BY H.C.
13. WATER SOLENOID VALVE FURNISHED AND INSTALLED BY HOOD MANUFACTURER.
14. SUPERVISED VALVE FURNISHED AND INSTALLED BY HOOD MANUFACTURER.
15. FIRE SUPPRESSION PIPING CONNECTION TO RANGE HOOD BY F.C. COORDINATE PIPE SIZE REQUIREMENT WITH H.C. (2)
16. RANGE HOOD CONNECTION TO FIRE ALARM SYSTEM. E.C. SHALL PROVIDE WIRE TO FIRE ALARM RELAY ON HOOD CONTROLLER. (2)

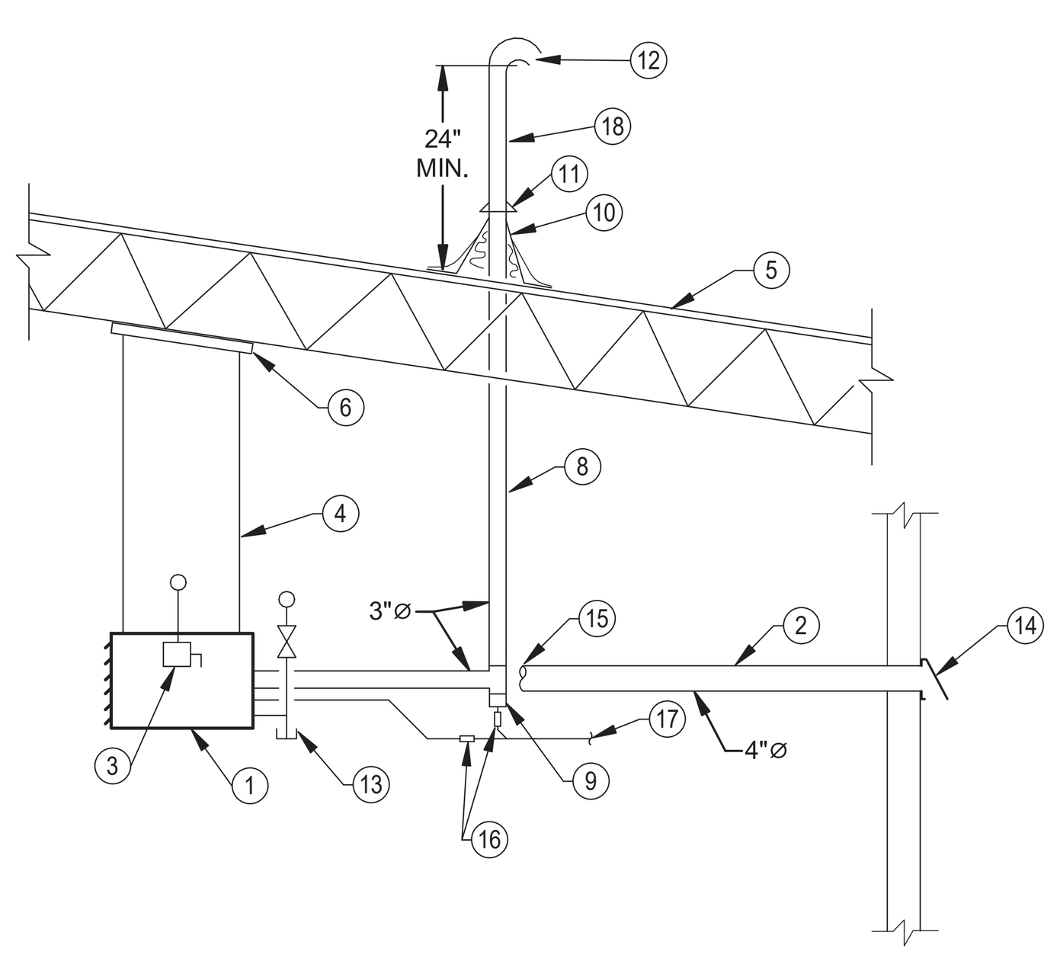
4 RADIANT HEATER
N.T.S.

RADIANT HEATER MOUNTING HEIGHT REQUIREMENTS:
MINIMUM DISTANCE ABOVE FLOOR: 17'-0"



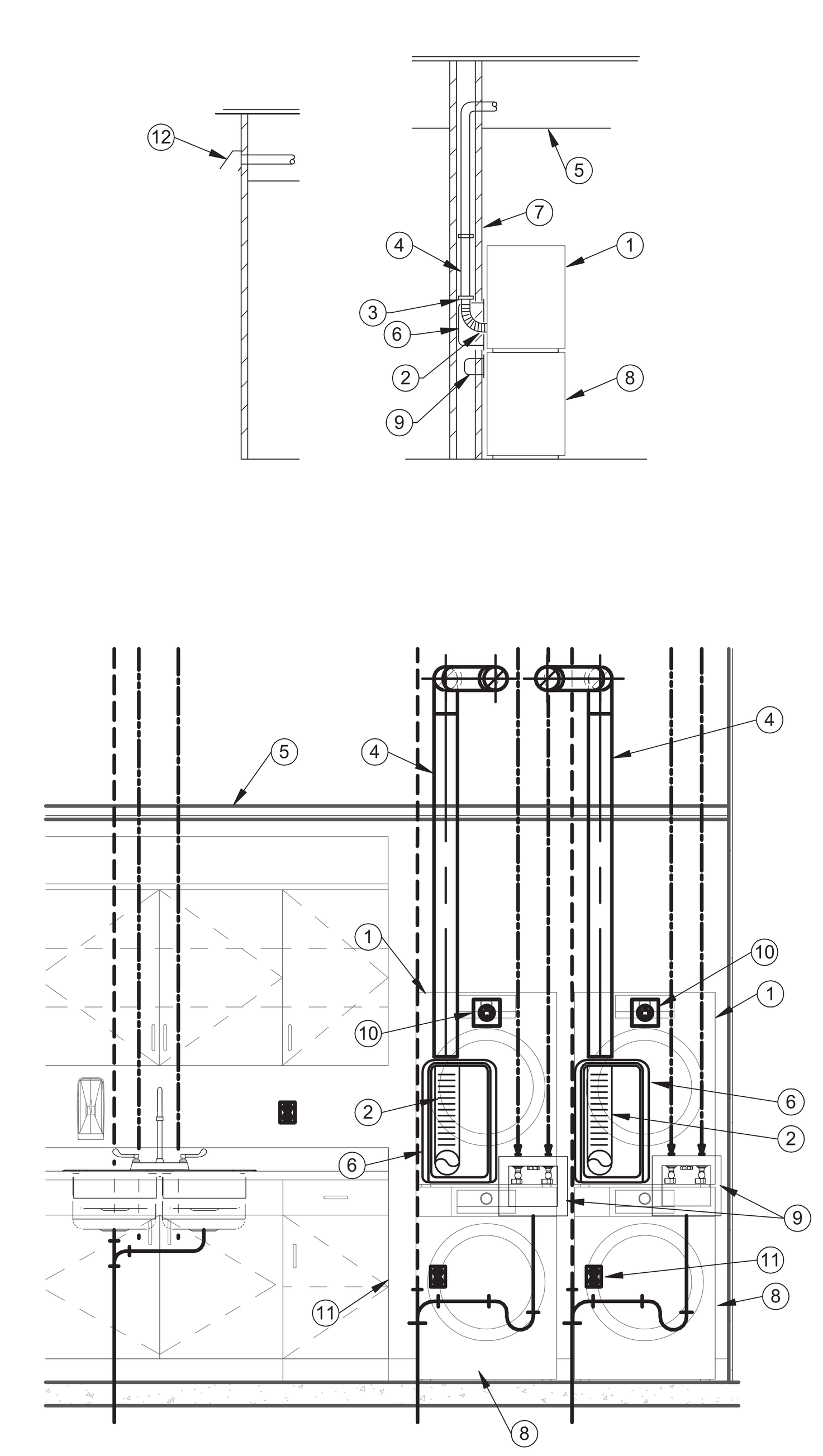
1. RADIANT HEATER BURNER CONTROL BOX.
2. 4"Ø SINGLE WALL COMBUSTION AIR DUCT.
3. DISCONNECT SWITCH BY E.C.
4. BURNER REFLECTOR.
5. CHAIN HANGER. (TYP.)
6. ROOF STRUCTURE.
7. UNISTRUT MOUNTED TO METAL CEILING. CONNECT CHAIN HANGERS TO UNISTRUT.
8. SUSPEND CHAIN HANGERS FROM TRUSS BOTTOM WITH CLAMP.
9. 4"Ø TYPE B DOUBLE WALL GAS VENT.
10. CLEAN OUT CAP.
11. S.S. FLASHING CONE. SEAL PENETRATION THROUGH ROOF WATERTIGHT.
12. STORM COLLAR.
13. FLUE VENT CAP. BOTTOM OF CAP MINIMUM 24" ABOVE ROOF ON UPSLOPE SIDE.
14. SEAL PENETRATION WATER TIGHT.
15. ROOF TRUSS.
16. NATURAL GAS CONNECTION, SHUTOFF VALVE, AND DIRT LEG BY P.C.
17. WALL MOUNTED THERMOSTAT.
18. 4"Ø INTAKE CAP WITH BIRD SCREEN. FINAL CUSTOM COLOR SELECTED BY ARCHITECT, FINAL PAITING BY G.C.
19. DUAL EXHAUST WYE.
20. 6"Ø TYPE B DOUBLE WALL GAS VENT. 6"Ø FLUE AND VENT CAP.
21. CUSTOM PAINT COLOR SELECTED BY ARCHITECT, FINAL PAINTING BY G.C.

5 GAS FIRED UNIT HEATER
N.T.S.



1. GAS FIRED UNIT HEATER.
2. 4"Ø COMBUSTION INTAKE DUCT.
3. DISCONNECT SWITCH WITH UNIT.
4. THREADED ROD HANGER.
5. ROOF STRUCTURE.
6. SECURE THREADED ROD HANGER TO BAR JOIST.
7. NOT USED.
8. 3"Ø VENT DUCT.
9. CLEAN OUT CAP WITH STANDARD VENT DRIP LEG.
10. S.S. FLASHING CONE. SEAL PENETRATION THROUGH ROOF WATERTIGHT.
11. STORM COLLAR.
12. GOOSENECK AND BIRD SCREEN ON FLUE VENT.
13. NATURAL GAS CONNECTION, SHUTOFF VALVE, AND DIRT LEG BY P.C.
14. 4"Ø INTAKE CAP WITH BIRD SCREEN. COLOR BY ARCHITECT, PAINTING BY G.C.
15. EXTEND COMBUSTION AIR DUCT TO UNIT HEATER.
16. WATERLESS CONDENSATE TRAPS PROVIDED WITH UNIT. INSTALL PER MANUFACTURER'S RECOMMENDATION.
17. EXTEND CONDENSATE DRAIN TO FLOOR DRAIN. REFER TO H1.2 FOR LOCATION.
18. CUSTOM PAINT COLOR SELECTED BY ARCHITECT, FINAL PAINTING BY G.C.

6 DRYER VENT
N.T.S.



1. DRYER.
2. FLEXIBLE ALUMINUM DUCT WITH METAL DRAWBAND CONNECTORS.
3. STAINLESS STEEL DUCT SUPPORT. SUPPORT AT 4' INTERVALS.
4. 4"Ø ALUMINUM SPIRAL DUCT. DUCT SHALL NOT BE JOINED WITH SCREWS OF FASTENERS THAT PROTRUDE MORE THAN 1/8" INTO THE INSIDE OF THE DUCT.
5. LAY-IN CEILING.
6. RECESSED DRYER VENT BOX. FLUSH MTD. IN 6" STUD WALL. 22 GA. ALUMINIZED STEEL WITH FLANGE, 4" DIA. TOP OUTLET. 9"Wx18"Hx5.5"DP. INSIDE DIMENSION. FASTEN TO WALL AT FLANGE TO CONNECT TO STUDS. AMERICAN ALDES #99-061 OR OR EQUAL. MOUNT BOTTOM AT BASE OF STACKED DRYER.
7. DRYWALL OR MASONRY ENCLOSURE BY G.C.
8. WASHER.
9. WASHER UTILITY BOX BY P.C.
10. 220/208 VOLT OUTLET BY E.C.
11. DOUBLE DUPLEX OUTLET BY E.C.
12. SIDWALL DRYER VENT HOOD WITH DAMPER, AMERICAN ALDES #22-404 OR EQUAL. HOOD IS GALVANIZED, PAINTING BY G.C., FINAL CUSTOM COLOR SELECTION BY ARCHITECT.

NOTE:
1. COORDINATE LOCATION OF VENT BOX WITH WASHER & DRYER PROVIDED AND WITH ELEC. & PLBG. CONTRACTORS ON LOCATION OF RECEPTACLES & WASHER BOX.

4"Ø DUCT SIZE EXCEPT LARGER IF RECOMMENDED BY DRYER MANUFACTURER.

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STATE OF OHIO
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REGISTERED PROFESSIONAL ENGINEER
JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402
PROJECT # 23001

City of Middletown
Fire Station No. 83 & Headquarters
1830 Yankee Road, Middletown, Ohio 45044

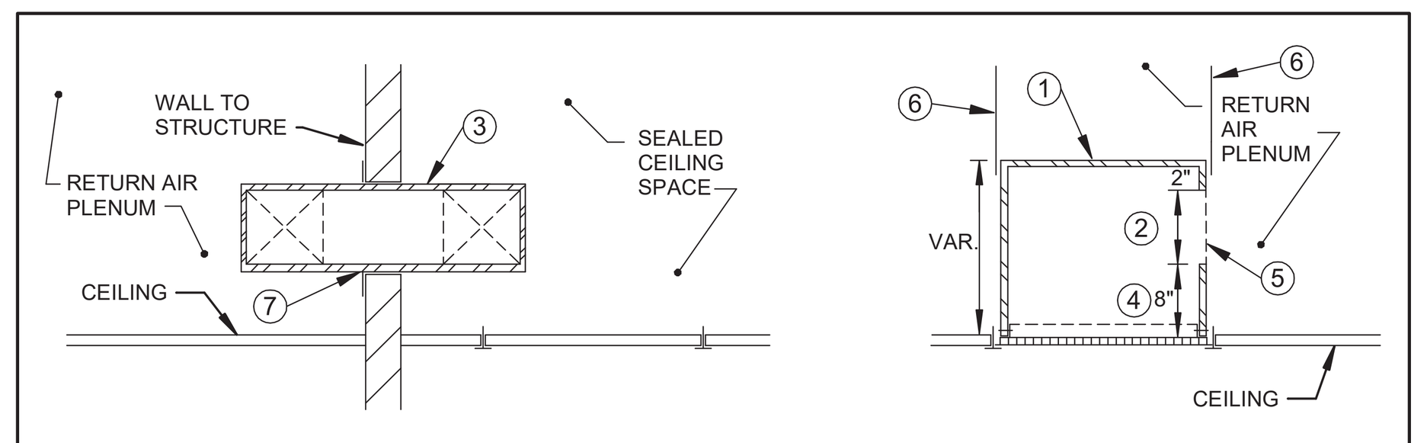
ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION
2	03/08/24	BULLETIN 10

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

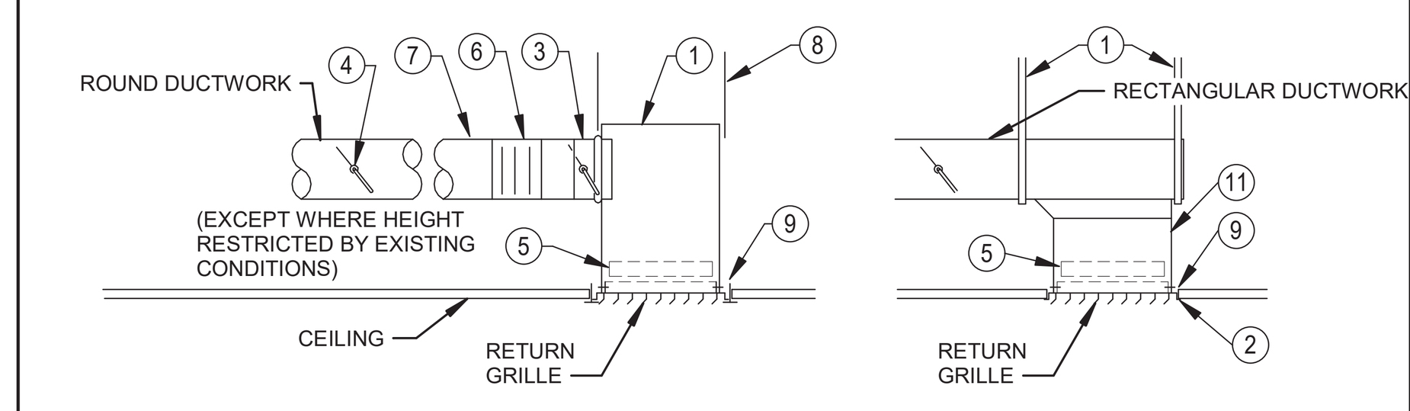
TITLE
DETAILS

SHEET NO.
H3.4



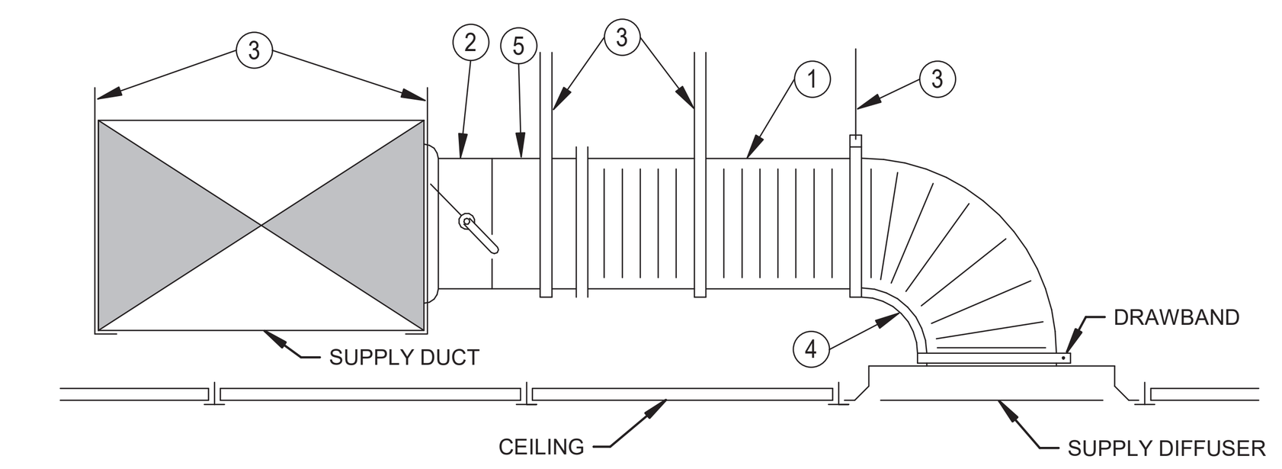
1. 24"x24" OR 24"x12" NOMINAL SHEET METAL PLENUM LINED WITH 1/2" BLACK FIBERGLASS DUCT LINER.
2. 24"x12" GRILLE SIZE - 6" HIGH x FULL WIDTH
   24"x24" GRILLE SIZE - 12" HIGH x FULL WIDTH
3. TRANSFER AIR DUCT THROUGH FULL HEIGHT WALL. PROVIDE 1/2" INTERNAL DUCT LINER. REFER TO FLOOR PLAN FOR DUCT SIZE.
4. MINIMUM HEIGHT, EXCEPT WHERE HEIGHT IS RESTRICTED BY EXISTING CONDITIONS.
5. OPEN TO PLENUM ABOVE CEILING.
6. SUPPORT PLENUM FROM STRUCTURE WITH DUCT STRAP HANGERS.
7. FRAME OPENING THROUGH WALL AS REQUIRED AND SEAL WALL PENETRATION SMOKE TIGHT.
8. 24"x12" GRILLE SIZE - 10" HIGH x 14" WIDTH
   24"x24" GRILLE SIZE - 20" HIGH x 14" WIDTH

1 TRANSFER AIR GRILLE/PLENUM
N.T.S.



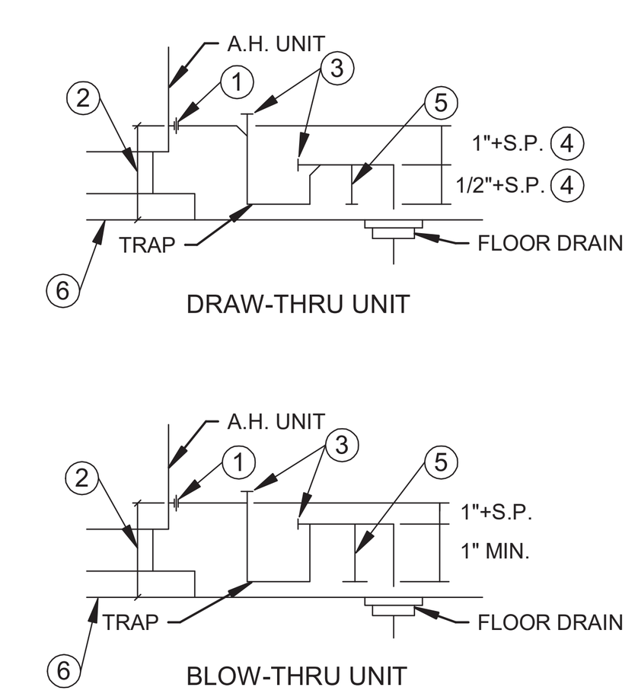
1. PLENUM - SIZE TO MATCH GRILLE. PAINT INTERIOR OF PLENUM FLAT BLACK.
2. EXHAUST/RETURN GRILLE FRAME TO MATCH CEILING CONDITION.
3. SPIN-IN FITTING WITH BALANCING DAMPER, USE FOR ALL ACCESSIBLE CEILINGS.
4. PROVIDE REMOTE BALANCING DAMPER IN BRANCH DUCT ABOVE ACCESSIBLE CEILING FOR EACH GRILLE WHERE GRILLE IS INSTALLED ABOVE INACCESSIBLE CEILING.
5. PROVIDE BALANCING DAMPER AT DEVICE ONLY WHERE DUCT MOUNTED DAMPER CANNOT BE PROVIDED DUE TO INACCESSIBLE CEILING.
6. FLEXIBLE DUCT ACCEPTABLE ABOVE ACCESSIBLE CEILING ONLY. MAX. 1 FT., REFER TO CEILING DIFFUSER DETAIL FOR INSTALLATION REQUIREMENTS.
7. SHEETMETAL DUCT.
8. SUPPORT PLENUM FROM STRUCTURE WITH DUCT STRAP HANGERS.
9. FASTEN SHEETMETAL PLENUM OR DUCT TO AIR DEVICE, EACH SIDE.
10. DUCT STRAP HANGER.
11. VIEWABLE PORTION OF DUCT INTERIOR TO BE PAINTED FLAT BLACK.

2 EXHAUST/RETURN GRILLE - DUCTED
N.T.S.



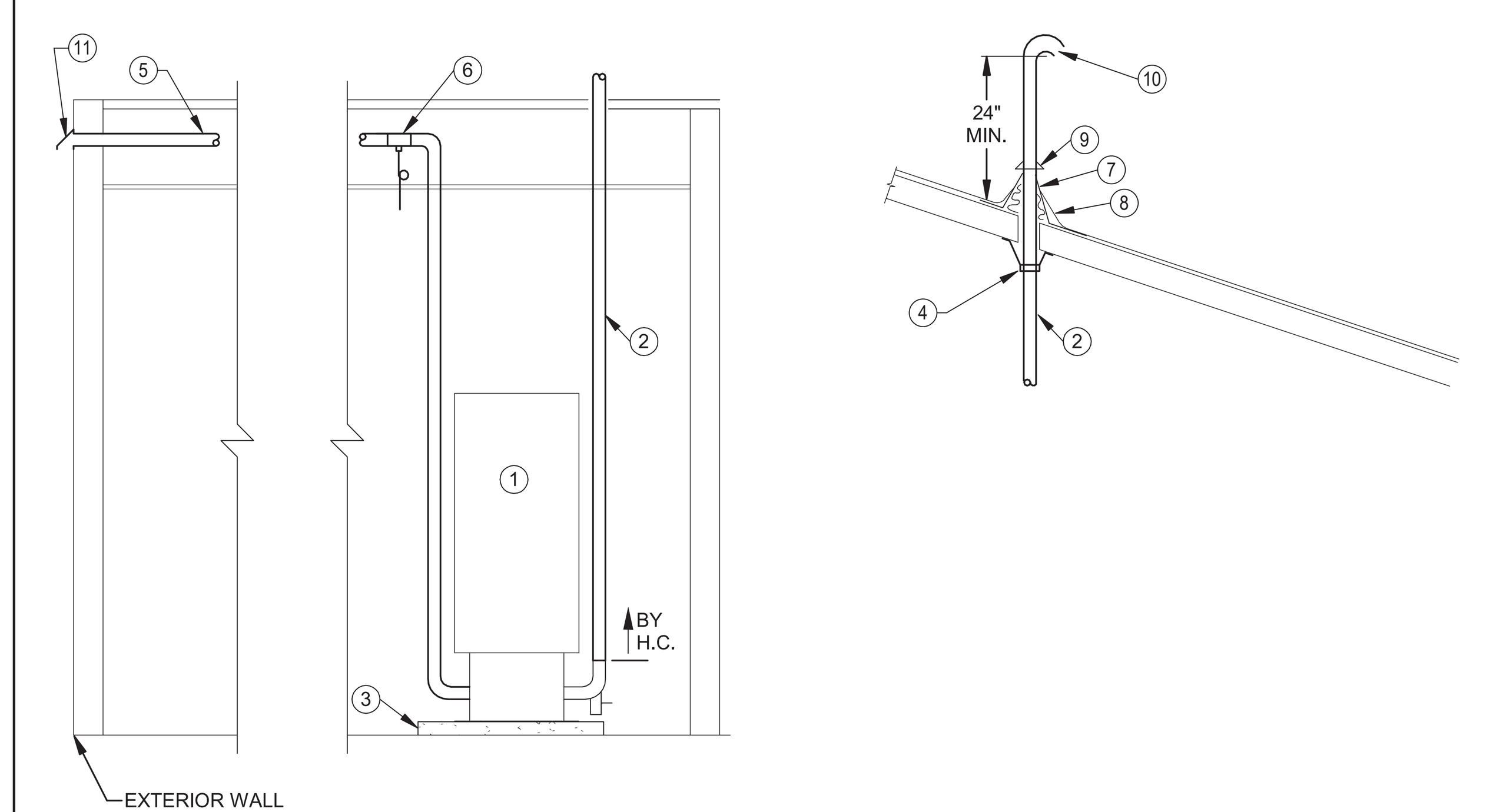
1. FLEXIBLE DUCT SAME DIAMETER AS DIFFUSER INLET (ABOVE ACCESSIBLE CEILING ONLY USE SHEETMETAL ONLY ABOVE INACCESSIBLE CEILING). 5 FT. MAXIMUM LENGTH. STRETCH TO MINIMUM 90% OF FULLY EXTENDED LENGTH. ADDITIONAL HANGER REQUIRED IF DUCT LENGTH EXCEEDS 4 FT.
2. SPIN-IN BRANCH TAP FITTING, STRAIGHT SIDE, WITH MANUAL DAMPER. DAMPER SHAFT IN HORIZONTAL. INTEGRAL INSULATION GUARD SLEEVE REQUIRED FOR TAP FITTING TO MAIN DUCT WITH INTERNAL INSULATION.
3. DUCT STRAP HANGER. ATTACH TO STRUCTURE. PER SMACNA.
4. 90 DEGREE FLEXIBLE ELBOW SUPPORT BY FLEXRIGHT, FLEXFLOW OR SMARTFLOW. PROVIDE WITH DRAWBANDS, UL-2043 RATING.
5. SHEETMETAL DUCT, SAME DIAMETER AS DIFFUSER INLET. LONGITUDINAL OR SPIRAL LOCK SEAM, 0.50" S.P. CONSTRUCTION. PROVIDE EXTERIOR INSULATION, 1.5" THICKNESS, 0.75" DENSITY FIBERGLASS WITH FOIL/KRAFT PAPER JACKET.

3 CEILING DIFFUSER
N.T.S.



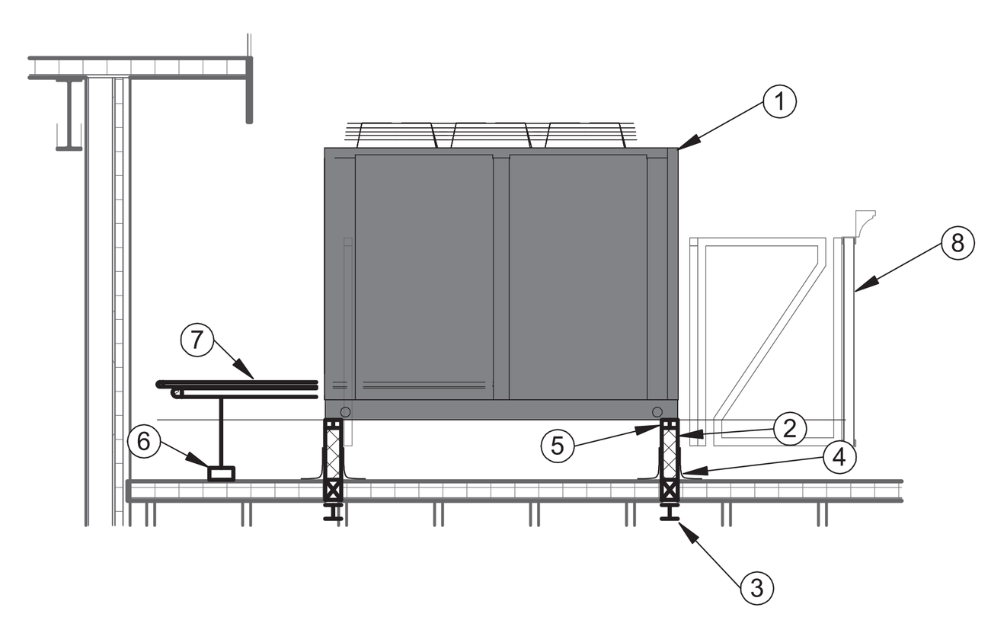
1. DRAIN PIPE SAME SIZE AS UNIT DRAIN PAN CONNECTION.
2. VERIFY REQUIRED HEIGHT FOR DRAIN PIPE AND TRAP INSTALLATION. PROVIDE ADDITIONAL BEAMS OR BACK-TO-BACK CHANNELS UNDER UNIT. IF REQUIRED, TO ATTAIN REQUIRED DIMENSION.
3. TEE WITH CLEANOUT PLUG.
4. 4" MINIMUM CENTERLINE TO CENTERLINE.
5. DRAIN CENTERLINE DIMENSION NOT LESS THAN SUPPLY FAN T.S.P. (INCH W.G.) + 2".
6. CONCRETE PAD OR STEEL BASE. SEE FLOOR PLANS.

4 COOLING COIL CONDENSATE PIPING
N.T.S.



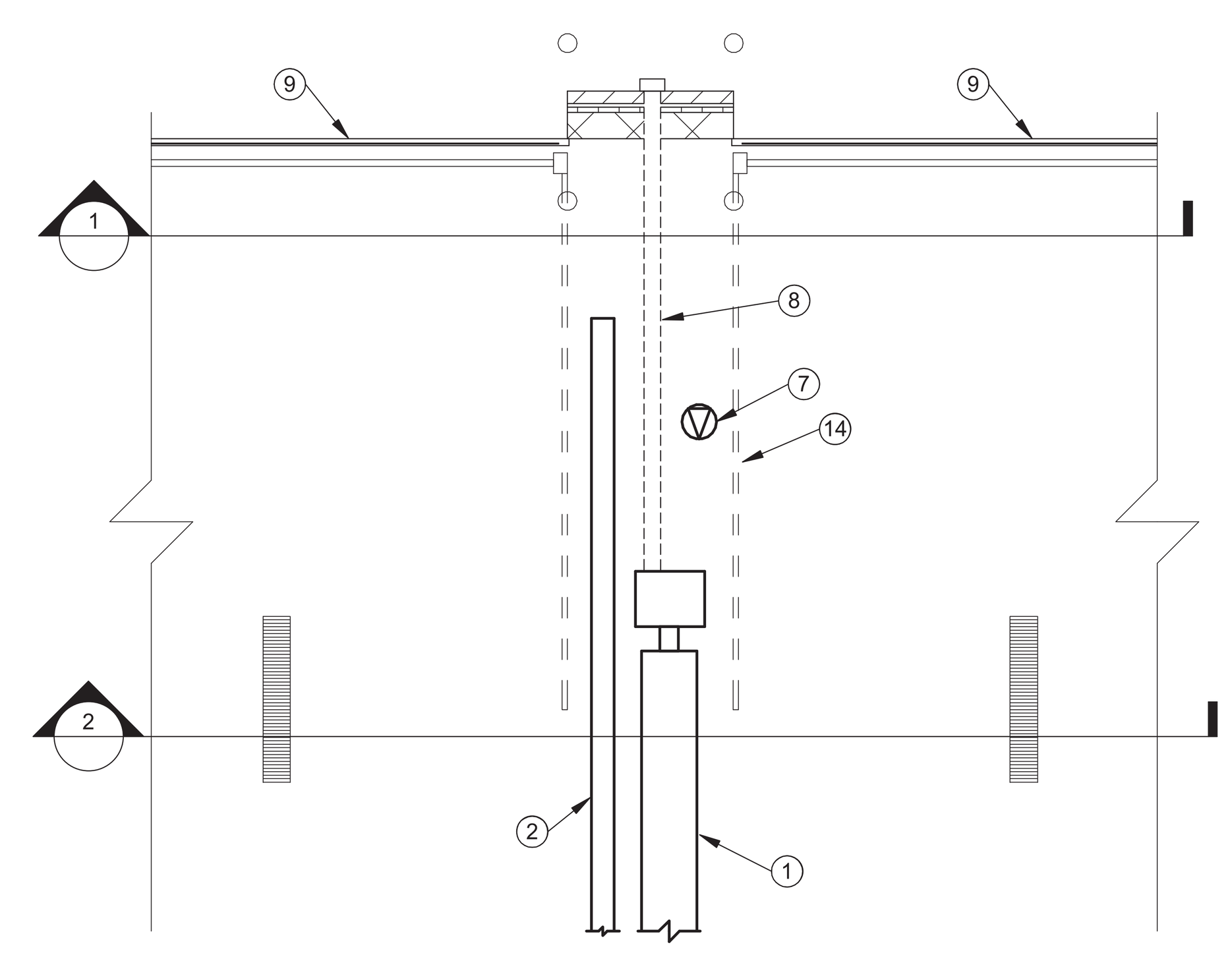
1. DOMESTIC WATER HEATER BY P.C.
2. 3"ø FLUE. REFER TO DUCT CONSTRUCTION SCHEDULE FOR PIPE MATIERAL. SLOPE HORIZONTAL PIPING AT 1/8" PER 1' TOWARD WATER HEATER. CONNECT TO ELBOW EXHAUST ASSEMBLY.
3. HOUSEKEEPING PAD BY OTHERS.
4. SUPPORT RING, SECURE TO STRUCTURE.
5. 4" ø INTAKE. REFER TO DUCT CONSTRUCTION SCHEDULE FOR PIPE MATIERAL. SLOPE HORIZONTAL PIPING AT 1/8" PER 1' TOWARD WATER HEATER.
6. PROVIDE TEE WITH DRAIN TUBING. ROUTE TUBING TO FLOOR DRAIN. INSTALL PER MANUFACTURER'S RECOMMENDATION.
7. S.S. FLASHING CONE.
8. ROOF FLASHING BY ROOFING CONTRACTOR.
9. STORM COLAR.
10. GOOSENECK AND BIRD SCREEN.
11. 4"Ø INTAKE CAP WITH BIRD SCREEN. FINAL CUSTOM COLOR SELECTED BY ARCHITECT, FINAL PAITING BY G.C.

5 CONDENSING HOT WATER HEATER — COMBUSTION AIR AND FLUE
N.T.S.

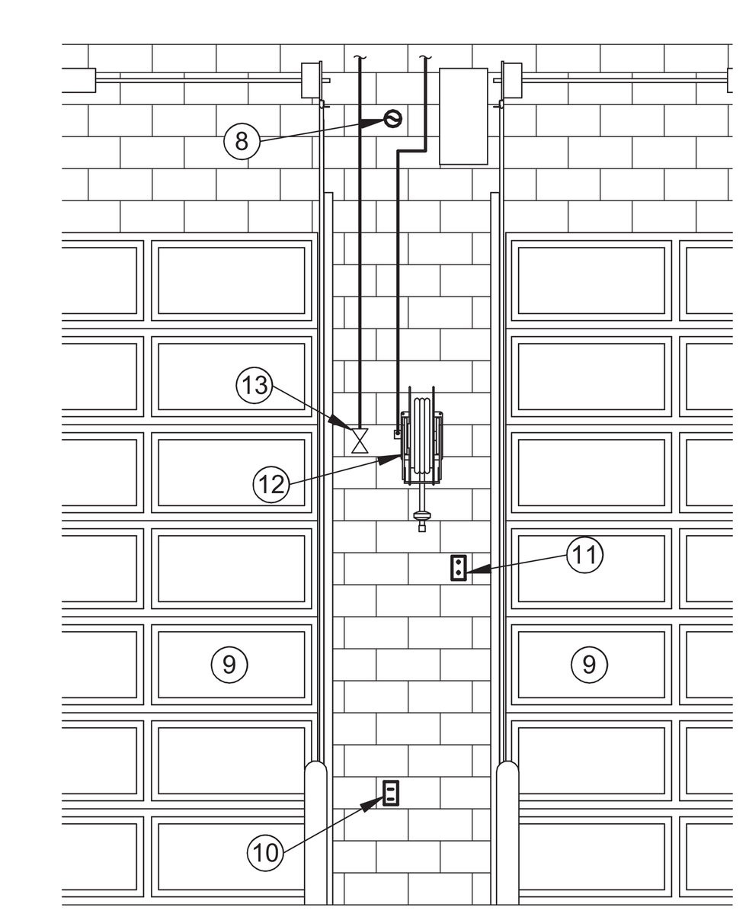


1. CONDENSING UNIT CD-1.
2. 14" ROOF RAIL CURB.
3. STRUCTURAL FRAMING BY G.C.
4. RAIL CURB FLASHING BY G.C.
5. PROVIDE SEISMIC ISOLATION PER SEISMIC SPECIFICATION.
6. REFRIGERANT PIPING.
7. PROVIDE ROOF PIPING SUPPORT AS REQUIRED FOR REFRIGERANT PIPING ON ROOF.
8. VISUAL SCREEN BY G.C.

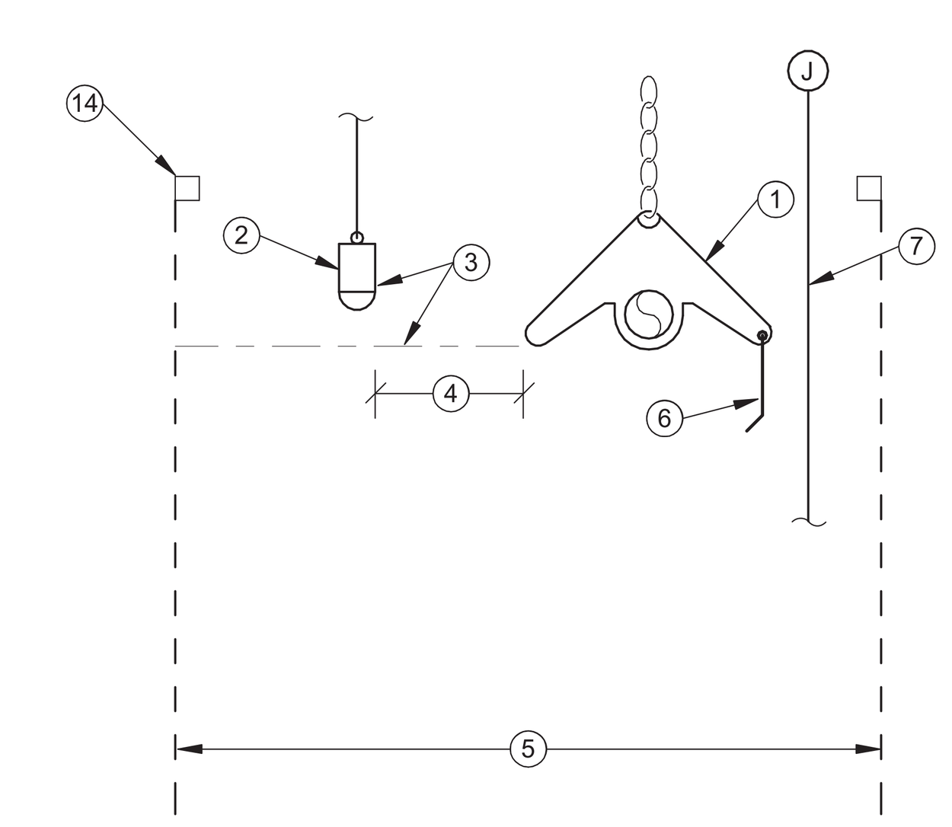
7 PACKAGED ROOFTOP UNIT CURB INSTALLATION
N.T.S.



BAY PLAN VIEW



SECTION 1



SECTION 2

1. RADIANT HEATER.
2. LIGHT FIXTURE.
3. MOUNT LIGHT FIXTURES WITH LENS ABOVE HORIZONTAL PLANE OF BOTTOM OF DEFLECTOR.
4. 12" MINIMUM.
5. AISLE BETWEEN VEHICLE BAYS.
6. SIDE DEFLECTOR.
7. POWER CORD DROP FROM CEILING. COORDINATE LOCATION WITH E.C.
8. INTAKE DUCT.
9. GARAGE DOOR.
10. DUPLEX RECEPTACLE. MOUNT 18" A.F.F.
11. DOOR CONTROL STATION. MOUNT 46" A.F.F.
12. AIR OR WATER CORD REEL. MOUNT 60" A.F.F. REFER TO PLUMBING PLANS FOR ADDITIONAL INFORMATION.
13. 2" TRUCK FILL VALVE. VALVE LOCATED 60" A.F.F.
14. GARAGE DOOR TRACK.

6 FIRE STATION APPARATUS BAY EQUIPMENT COORDINATION
N.T.S.

App Architecture
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615 Woodside Drive, Englewood, Ohio 45322
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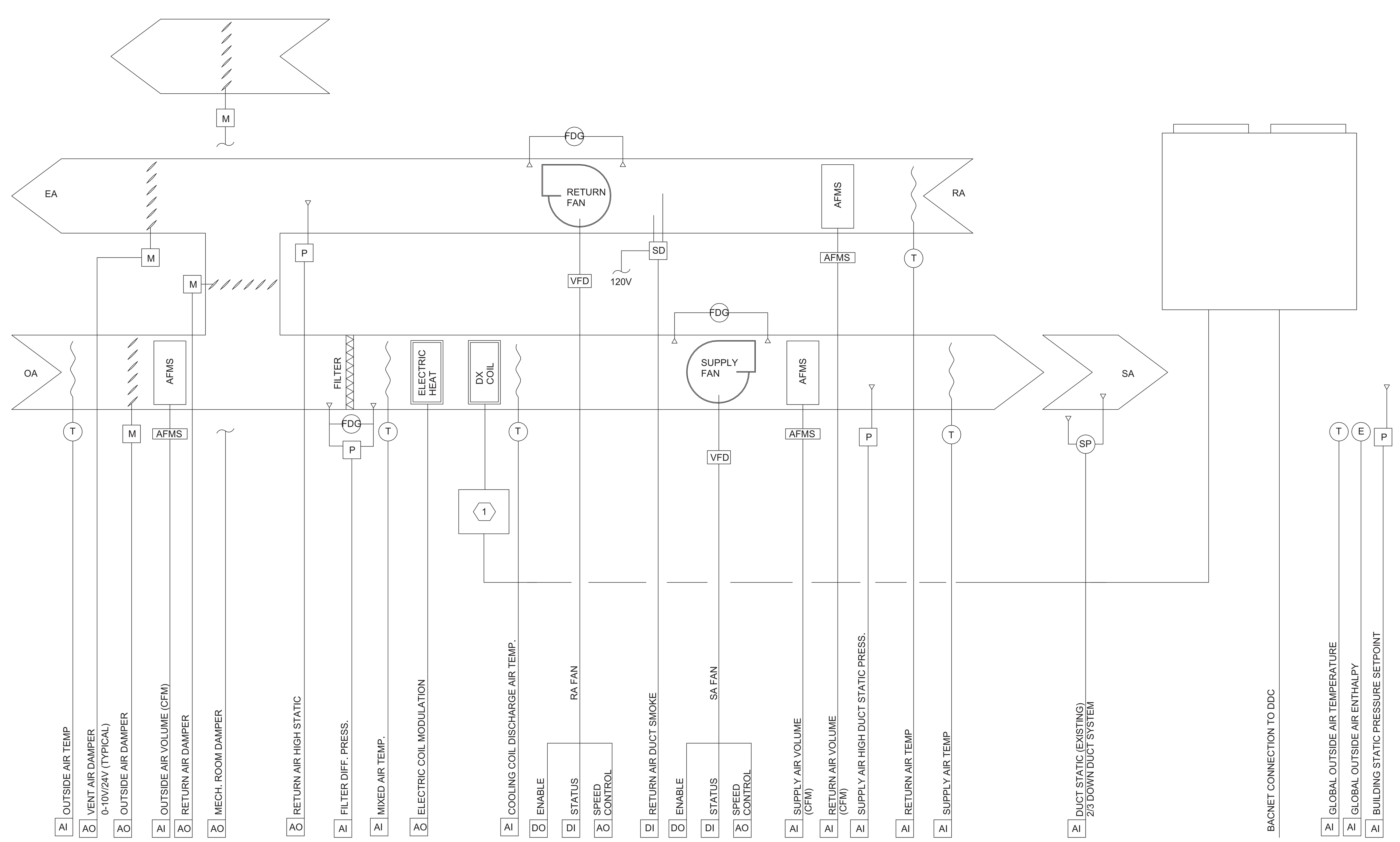


SEQUENCE OF OPERATION

OPERATION

THE AIR HANDLING SYSTEM SHALL OPERATE IN OCCUPIED MODE OF OPERATION, AT ALL TIMES, 24/7/365.

OCCUPIED MODE

WHEN INDEXED TO THE OCCUPIED MODE THE OUTSIDE AND RETURN AIR DAMPERS SHALL MODULATE TO THEIR OCCUPIED POSITION. THE OUTSIDE AIR DAMPERS SHALL BE SET TO PROVIED THE MINIMUM OUTDOOR VENTILATION AS PER THE AIR HANDLING UNIT SCHEDULE AND AS BALANCED BY THE BALANCING CONTRACTOR.

THE OUTSIDE AIR DAMPER AND DX COOLING COIL SHALL MODULATE IN SEQUENCE, WITHOUT OVERLAP, TO MAINTAIN THE SUPPLY AIR TEMPERATURE (SAT) SET POINT. THE SUPPLY TEMPERATURE SHALL BE RESET ACCORDING TO THE FOLLOWING SCHEDULE:

OAT = 20 DEG F	SAT SET POINT = 62 DEG F
OAT = 72 DEG F	SAT SET POINT = 55 DEG F

OUTSIDE AIR CONTROL & ECONOMIZER

THE OUTSIDE AIR, RETURN AIR, AND RELIEF AIR DAMPERS SHALL MODULATE TO MAINTAIN THE OUTSIDE AIR FLOW VOLUME SET POINT. REFER TO SHEET H5.1 FOR OUTSIDE AIR BALANCING SETPOINTS.

UPON ACTIVATION OF THE KITCHEN HOOD, THE OUTSIDE AIR DAMPER SHALL MODULATE OPEN TO PROVIDE THE REQUIRED MAKE-UP AIR (+750 CFM) FOR THE KITCHEN HOOD.

THE ECONOMIZER SHALL BE ENABLED/ DISABLED FROM THE GLOBAL OUTSIDE AIR TEMPERATURE SENSOR AND ENTHALPY SENSOR. WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 70 DEG F. AND THE ENTHALPY IS BELOW 28 BTU/LB, THE ECONOMIZER SHALL BE ENABLED. ABOVE EITHER VALUE AND THE ECONOMIZER SHALL BE DISABLED.

DURING ECONOMIZER CYCLE THE OUTSIDE AIR DAMPER SHALL SHALL MODULATE OPEN AS REQUIRED TO MAINTAIN THE UNIT DISCHARGE AIR SET POINT. THE RETURN DAMPERS SHALL INVERSELY TRACK THE OUTSIDE AIR DAMPERS.

PROVIDE A MIXED AIR TEMPERATURE SENSOR FOR LOW LIMIT CONTROL SET AT 50 DEG. F. TO PREVENT OVER - OPENING THE OUTSIDE AIR DAMPER.

RELIEF AIR DAMPER

THE RELIEF AIR AND MECH. ROOM DAMPER SHALL BE CLOSED UNTIL THE UNIT ENTERS THE ECONOMIZER MODE, AT WHICH TIME THE DAMPERS SHALL MODULATE TO MAINTAIN A BUILDING POSITIVE PRESSURE SETPOINT, STARTING AT 0.05" W.C. (ADJ).

FAN VOLUME CONTROL

SUPPLY FANS

THE FAN SPEED SHALL BE MODULATED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT (LOCATION SHOWN ON THE DRAWINGS). INITIAL SET POINT SHALL BE 1.5 INCH STATIC BUT SHALL BE ADJUSTED TO THE LOWEST POSSIBLE READING BY THE BALANCING CONTRACTOR.

THE DUCT STATIC PRESSURE SHALL BE RESET BASED VAV TERMINAL UNIT DAMPER POSITIONS. IF ANY ONE VAV TERMINAL DAMPER EXCEEDS 95%, OPEN THE STATIC PRESSURE SETPOINT SHALL INCREASE BY 0.1" W.C. IF ALL DAMPER POSITIONS ARE LESS THAN 90% OPEN THEN THE SETPOINT SHALL BE REDUCED BY 0.1". DAMPER POSITIONS SHALL BE POLLED AND SETPOINT RESET SHALL OCCUR EVERY 5 MINUTES. STATIC PRESSURE SETPOINT RESET SHALL HAVE A MINIMUM AND MAXIMUM RESET RANGE INITIALLY SET AT 0.5" MINIMUM AND 1.75" MAXIMUM. THE RESET RANGE LIMITS SHALL BE DISPLAYED ON THE DDC AHU GRAPHIC AND ADJUSTABLE BY THE SYSTEM OPERATOR. THE SYSTEM OPERATION SHALL ALSO BE ABLE TO REMOVE SPECIFIC VAV UNITS FROM THE RESET SEQUENCE VIA THE SYSTEM GRAPHICS.

RETURN FANS

THE FAN SPEED SHALL BE MODULATED TO MAINTAIN THE BUILDING STATIC PRESSURE SETPOINT, INITIALLY SET AT 0.1" W.C. (ADJ.).

SEQUENCE OF OPERATION CONT'D.

SAFETIES

THE FOLLOWING SAFETIES SHALL BE PROVIDED TO STOP THE AIR HANDLING UNIT SUPPLY AND RETURN FANS AND POSITION CONTROL DEVICES TO THEIR "FAIL SAFE" POSITION, I.E. OUTSIDE AND RELIEF DAMPERS CLOSED, RETURN DAMPERS OPEN.

SUPPLY DUCT AIR HIGH DUCT STATIC - SETPOINT 4" (ADJ) RETURN AIR SMOKE DETECTOR.

CONTROLS GENERAL NOTES

MONITORING AND ALARMS

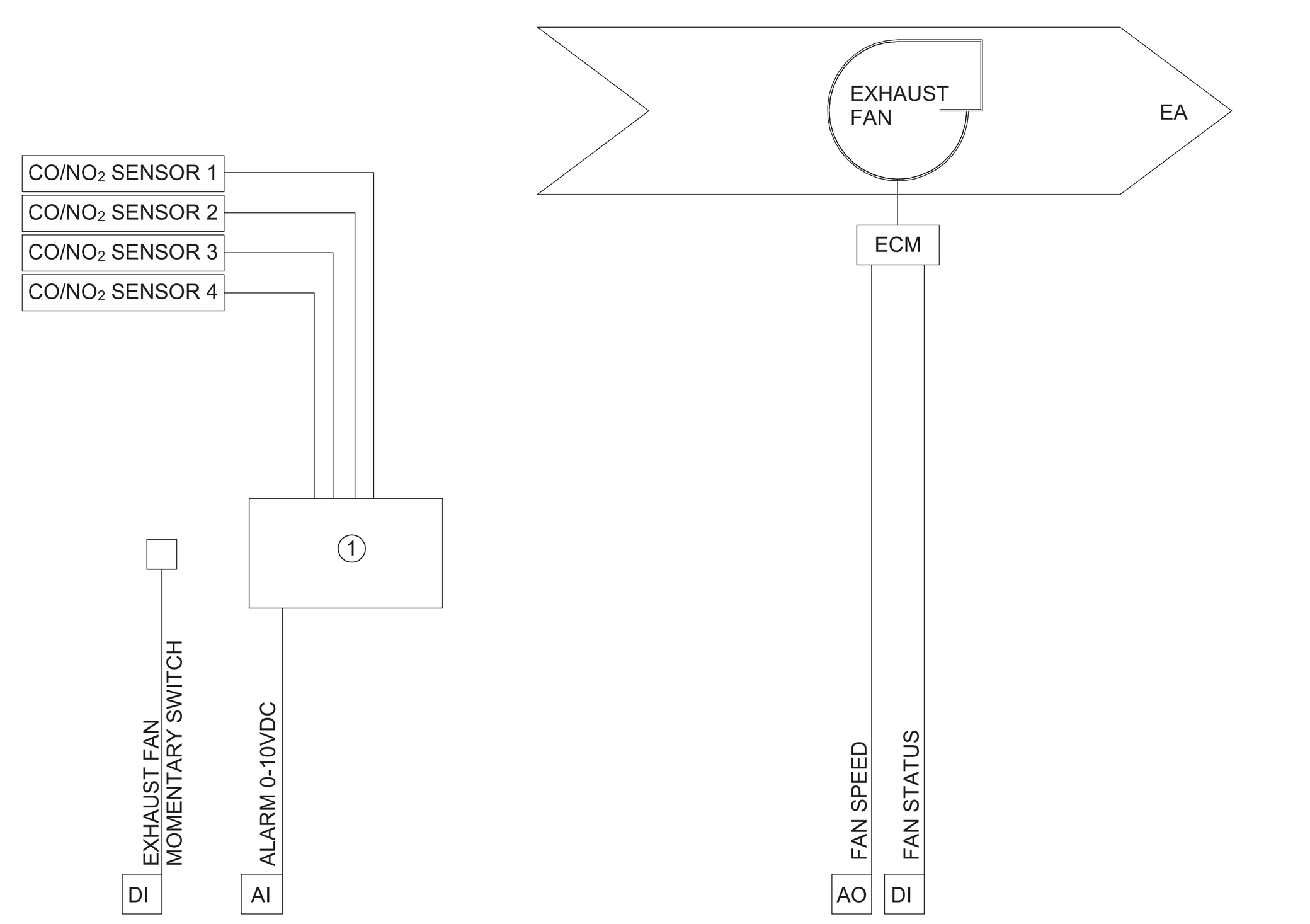
A. THE FOLLOWING POINTS SHALL BE MONITORED AND ALARMED AT THE MONITORING CONSOLE AND AS OTHERWISE SPECIFIED HEREINAFTER. THESE ARE IN ADDITION TO POINTS REQUIRED FOR OPERATIONAL CONTROL.
   a. CURRENT SENSING RELAYS - PROVIDE FOR:
      - AHU-1 SUPPLY AND RETURN AIR FANS
      - CD-1 CONDENSING UNIT
      - EXHAUST FANS
   b. HIGH/LOW TEMPERATURE ALARMS ON ALL DDC TEMPERATUR SENSORS WITH OFF-NORMAL MESSAGES.
   c. GENERATOR TROUBLE.
   d. TECHNOLOGY COMPUTER ROOM TEMPERATURE SENSOR, ALARM AT 80 DEG. F. (ADJ).
   e. OUTSIDE AIR HUMIDITY (ANALOG, NO ALARM).

B. WHEN INTERFACING WITH EQUIPMENT PROVIDING REMOTE ANALOG INPUT OR RECEIVING ANALOG OUTPUTS TO THE DDC SYSTEM OR WHEN MONITORING REQUIRES THE INSTALLATION OF EXTERNAL RELAYS AT THE EQUIPMENT BEING MONITORED, COORDINATE ALL REQUIREMENTS SUCH AS RANGE, SIGNAL CONDITION, GROUNDING, WIRING AND INPUT IMPEDANCE WITH THE SUPPLIER OF THE EQUIPMENT BEING MONITORED.

C. DIAL OUT ALARMS - DDC SYSTEM SHALL BE CAPABLE OF INITIATING DIAL OUT ALARM MESSAGE TO PAGERS, TELEPHONE OR INTERNET WHENEVER THE SYSTEM DETECTS AN ALARM. COORDINATE LIST OF DESIRED ALARMS AND INTERFACE WITH OWNERS' NOTIFICATION EQUIPMENT WITH THE SCHOOL DISTRICT.

D. PROVIDE ALL REQUIRED CONTROL WIRING TO CONNECT CD-1 TO AHU-1.

1 AHU-1 CONTROL DIAGRAM
N.T.S.



SEQUENCE OF OPERATION

FAN OPERATION

THE FAN SHALL BE NORMALLY OFF.

THE DDC SYSTEM SHALL MODULATE THE FAN SPEED UPON RECEIVING AN ALARM FROM THE CO/NO_2 MONITORING SYSTEM OR A LOCAL MANUAL, MOMENTARY, OVER-RIDE WALL PUSH BUTTON.

EF-1: 6,650 CFM

WHEN THE FAN IS INDEXED TO EITHER THE 50% OR MAXIMUM AIRFLOW, THE FAN SHALL RUN FOR A MINIMUM OF 30 MINUTES AT THE RESPECTIVE AIRFLOW.

CO/NO2 SENSOR CONTROL

THE APPARATUS BAY'S CO/NO_2 SHALL BE PROGRAMMED TO THE FOLLOWING ALARM LEVELS.

ALARM LEVELS:
- NO ALARM: CO (<34 PPM) AND NO2 (<2.5 PPM)
- ALARM LEVEL 1: CO (35 - 50 PPM) OR NO2 (2.5 - 2.8 PPM)
- ALARM LEVEL 2: CO (>50 PPM) OR NO2 (>2.8 PPM)

FAN AIRFLOW:
- NO ALARM: OFF.
- ALARM LEVEL 1: 50% OF MAXIMUM AIRFLOW
- ALARM LEVEL 2: MAXIMUM AIRFLOW

MANUAL MOMENTARY WALL SWITCH

THE MANUAL MOMENTARY OVER-RIDE SWITCH SHALL COMMAND THE FAN TO 50% OF MAXIMUM AIRFLOW FOR 30 MINUTES (ADJ).

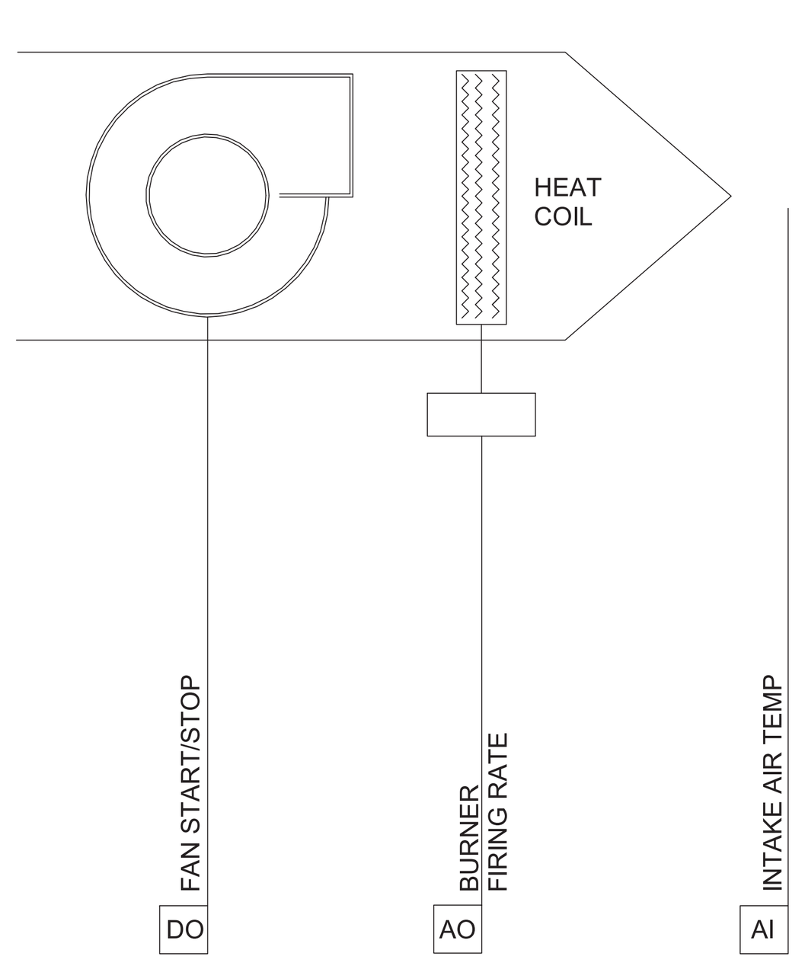
FAN SPEED CONTROL PRIORITY

THE CO/NO_2 SENSOR SHALL HAVE PRIORITY TO CHANGE THE FAN SPEED AT ANY TIME. IF THE MOMENTARY WALL SWITCH IS ACTIVATED TO RAISE THE FAN TO 50% AIRFLOW AND THE CO/NO_2 SENSOR ALARMS, THE FAN SHALL BE INDEXED TO RUN AT THE RESPECTIVE ALARM LEVEL AND RESET ITS RUN TIMER.

THE MOMENTARY FAN SWITCH SHALL ONLY START THE FAN SPEED IF THERE IS NO ALARM LEVEL FROM THE CO/NO_2 SENSOR AND THE FAN IS OFF. THE MOMENTARY WALL SWITCH SHALL NOT OVERRIDE THE CO/NO2 CONTROLLER.

(1) CO/NO_2 CONTROL PANEL BY T.C. REFER TO H1.1 FOR MOUNTING LOCATION AND REFER TO SPECIFICATIONS FOR EQUIPMENT INFORMATION

2 EF-1 - APPARATUS BAY CONTROL DIAGRAM



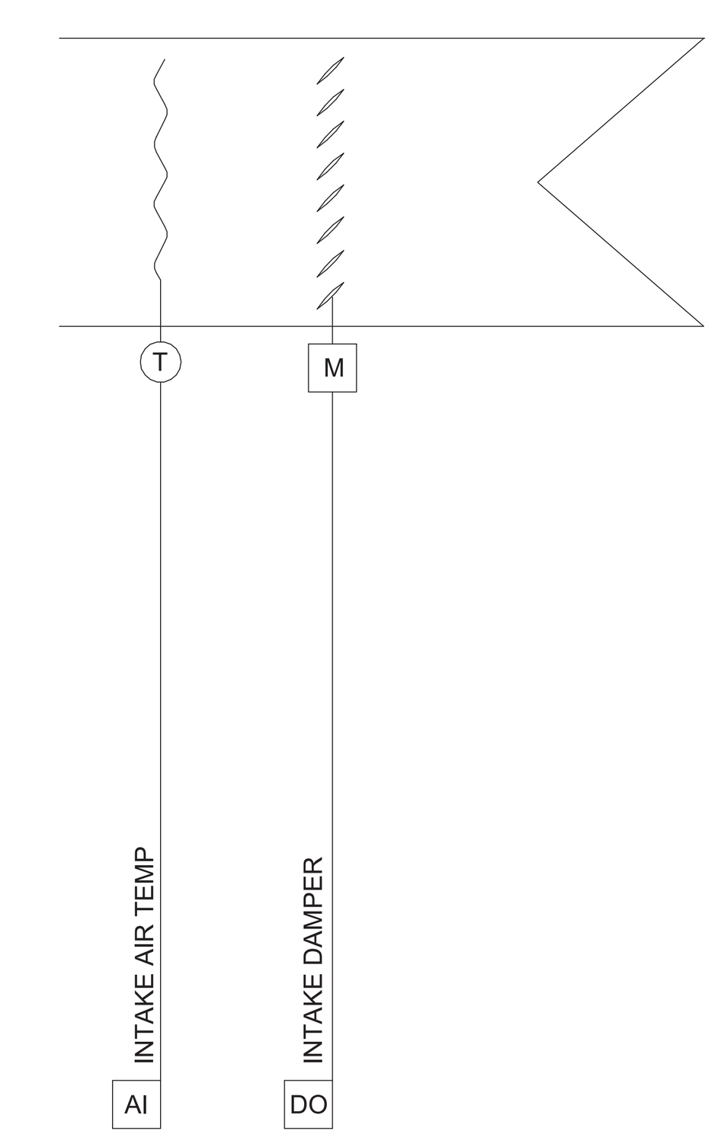
SEQUENCE OF OPERATION

A. THE GAS-FIRED MODULATING UNIT HEATER SHALL OPERATE IN CONJUNCTION WITH THE INTAKE DAMPER TO PREHEAT INDUCED MAKE-UP AIR.

B. THE GAS FIRED UNIT HEATER SHALL BE OFF WHEN THE INTAKE DAMPER IS CLOSED.

C. WHEN THE INTAKE DAMPER IS OPEN, THE MODULATING GAS BURNER SHALL FIRE INVERSELY BASED ON AN INTAKE AIR TEMPERATURE AT OR BELOW 40 DEG. F. (ADJ).
   a. INTAKE AIR TEMP. = 0 DEG. F. FIRING RATE = 100%
   b. INTAKE AIR TEMP. = 40 DEG. F. FIRING RATE = MIN.TURNDOWN

3 GAS-FIRED UNIT HEATERS CONTROL DIAGRAM



SEQUENCE OF OPERATION

A. THE INTAKE DAMPER SHALL OPEN TO 100% WHEN EF-1 IS OPERATING ABOVE THE MINIMUM AIRFLOW LEVEL. (CO/NO_2 OR MANUAL OVER-RIDE MODES)

B. THE INTAKE AIR TEMPERATURE SENSOR SHALL CONTROL THE GAS-FIRED UNIT HEATER GUH-1.

4 INTAKE DAMPER CONTROL DIAGRAM

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STATE OF OHIO
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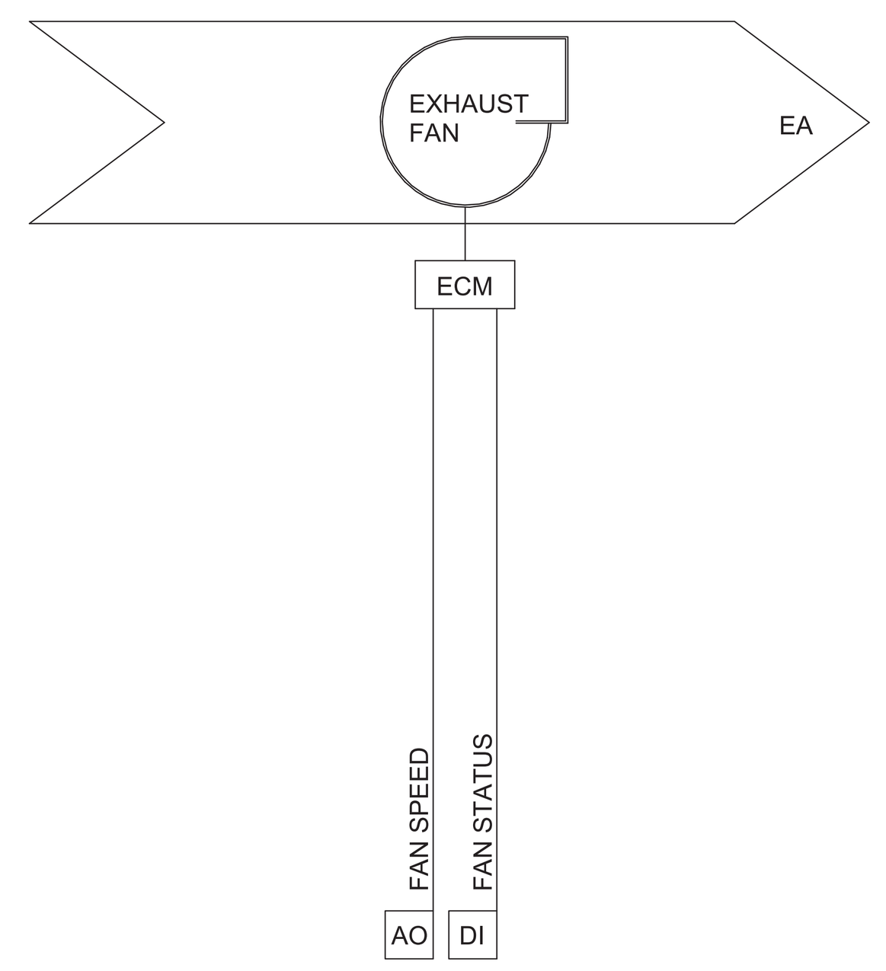
CONTROLS

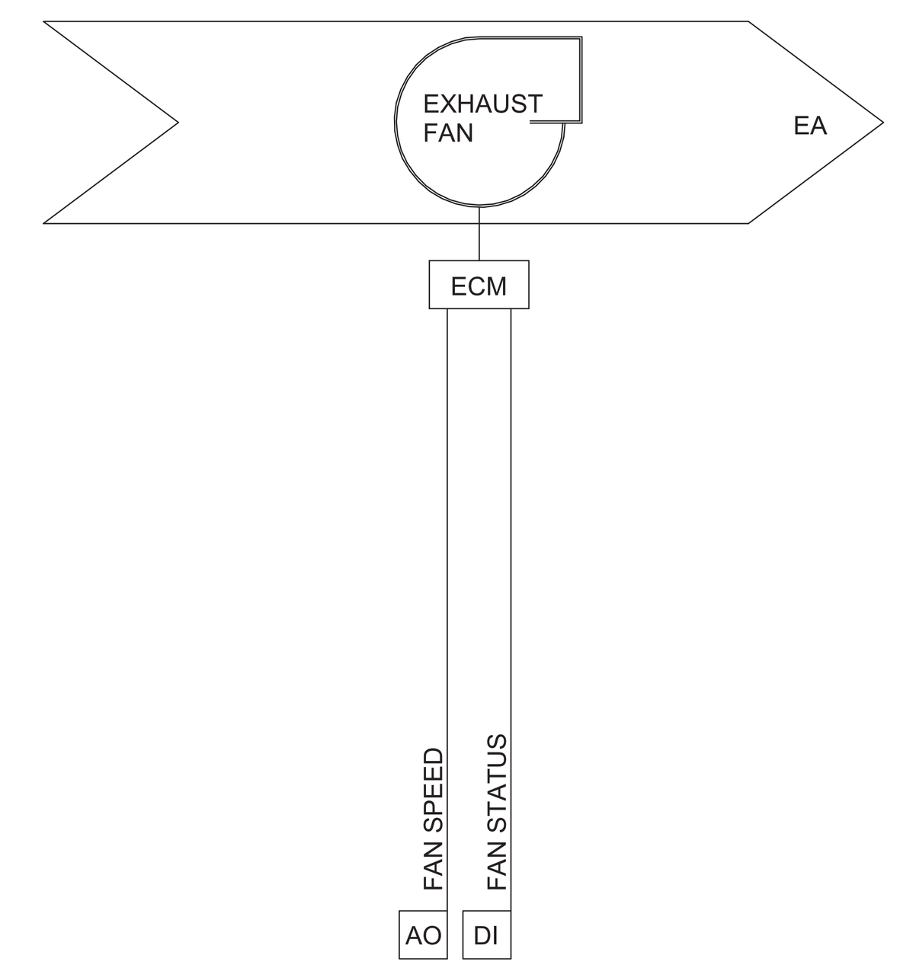


SEQUENCE OF OPERATION

A. FAN OPERATION

THE EXHAUST FAN SHALL RUN CONTINUOUSLY.

1 EF-2 CONTROLS

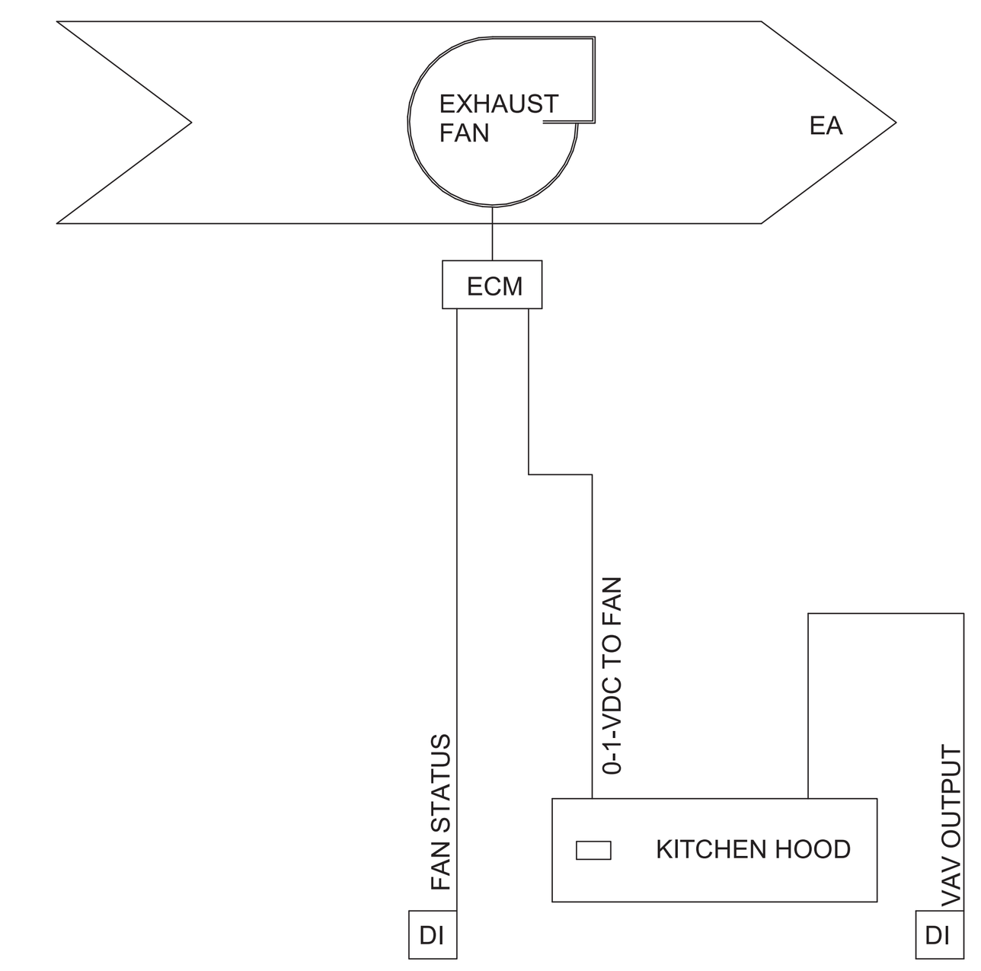


SEQUENCE OF OPERATION

A. FAN OPERATION

THE EXHAUST FAN SHALL RUN CONTINUOUSLY.

2 EF-3 CONTROLS



SEQUENCE OF OPERATION

A. FAN OPERATION

THE KITCHEN HOOD CONTROLS THE ASSOCIATED FAN. THE HOOD PROVIDES ALL SPEED CONTROL TO START/STOP THE EXHAUST FAN.

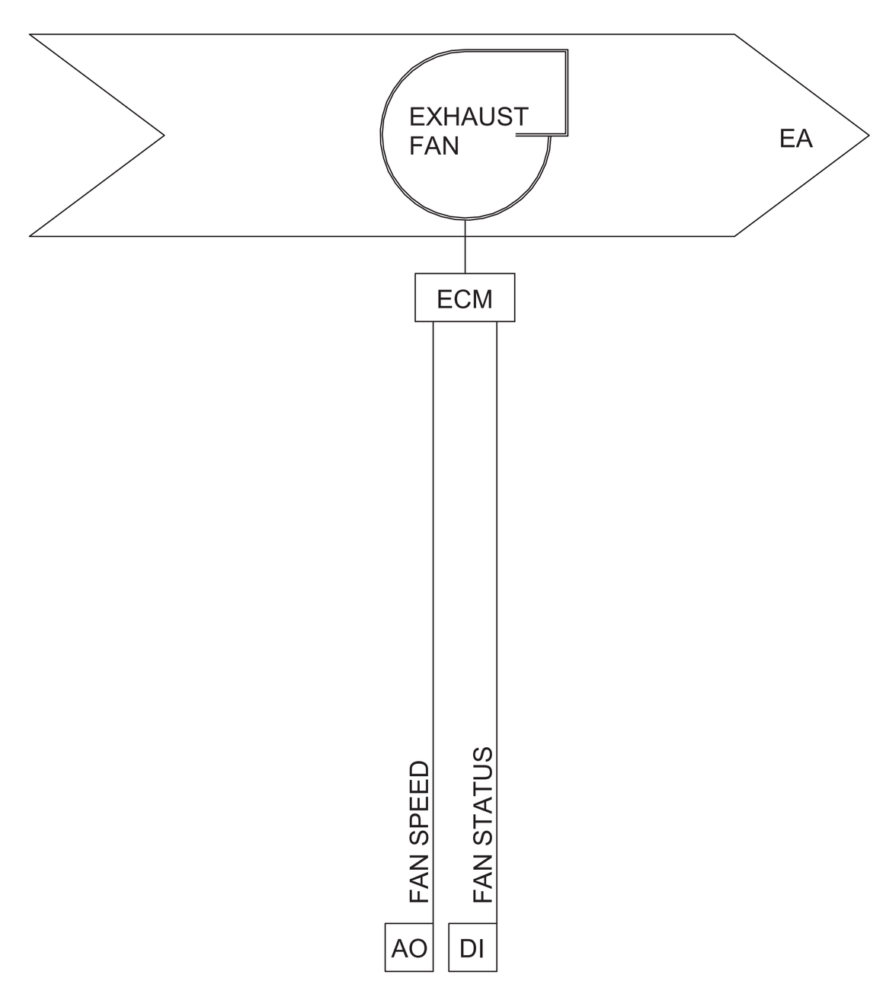
DURING NORMAL OPERATION, UPON A RISE IN TEMPERATURE AT THE HOOD >125°F, THE HOOD SHALL START THE FAN AND MODULATE THE FAN TO ITS SETPOINT. THE FAN SHALL TURN OFF UPON A FALL IN TEMPERATURE TO 100°F. THE MINIMUM RUNTIME SHALL BE 30 MIN. (ADJ.)

CONTROL WIRING BETWEEN THE HOOD AND FAN BY THE T.C.

B. VAV OPERATION:

UPON ACTIVATION OF THE EXHAUST FAN, VAV TERMINAL UNIT 1-20 SHALL OPERATE TO PROVIDE MAKE-UP AIR TO THE KITCHEN HOOD.

3 EF-4 CONTROLS

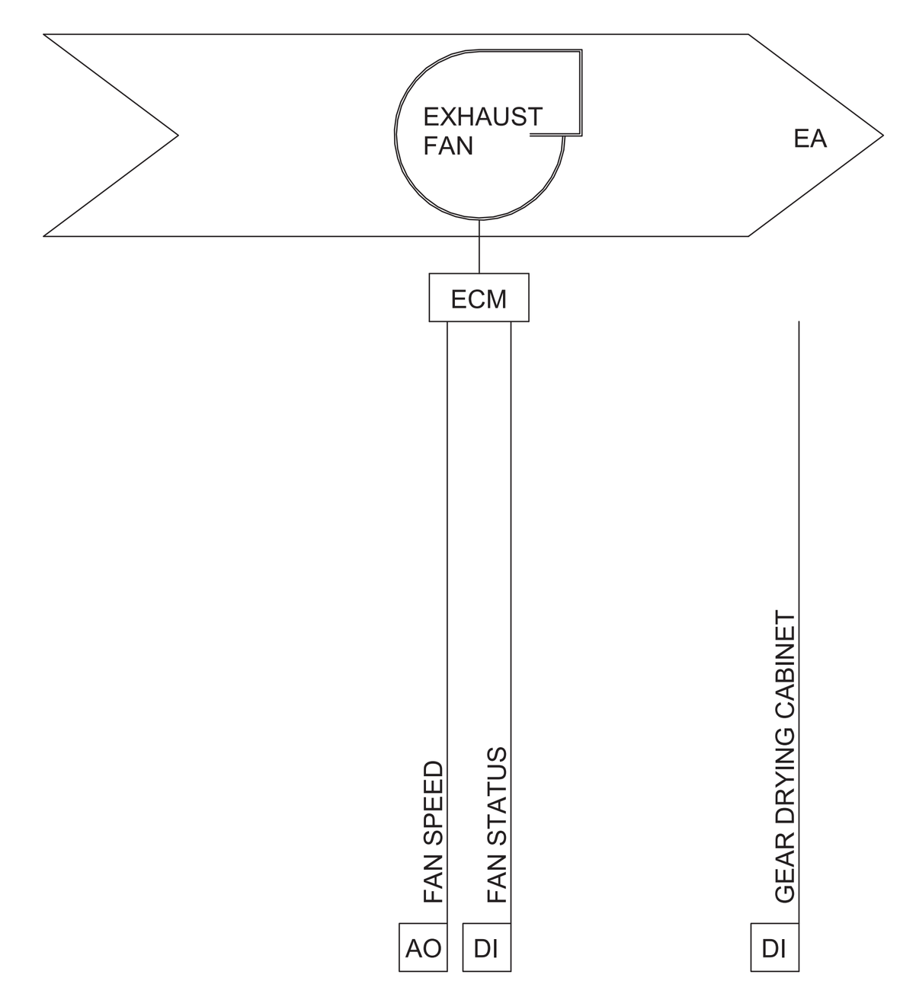


SEQUENCE OF OPERATION

A. FAN OPERATION

THE EXHAUST FAN SHALL RUN CONTINUOUSLY.

5 EF-5 CONTROLS

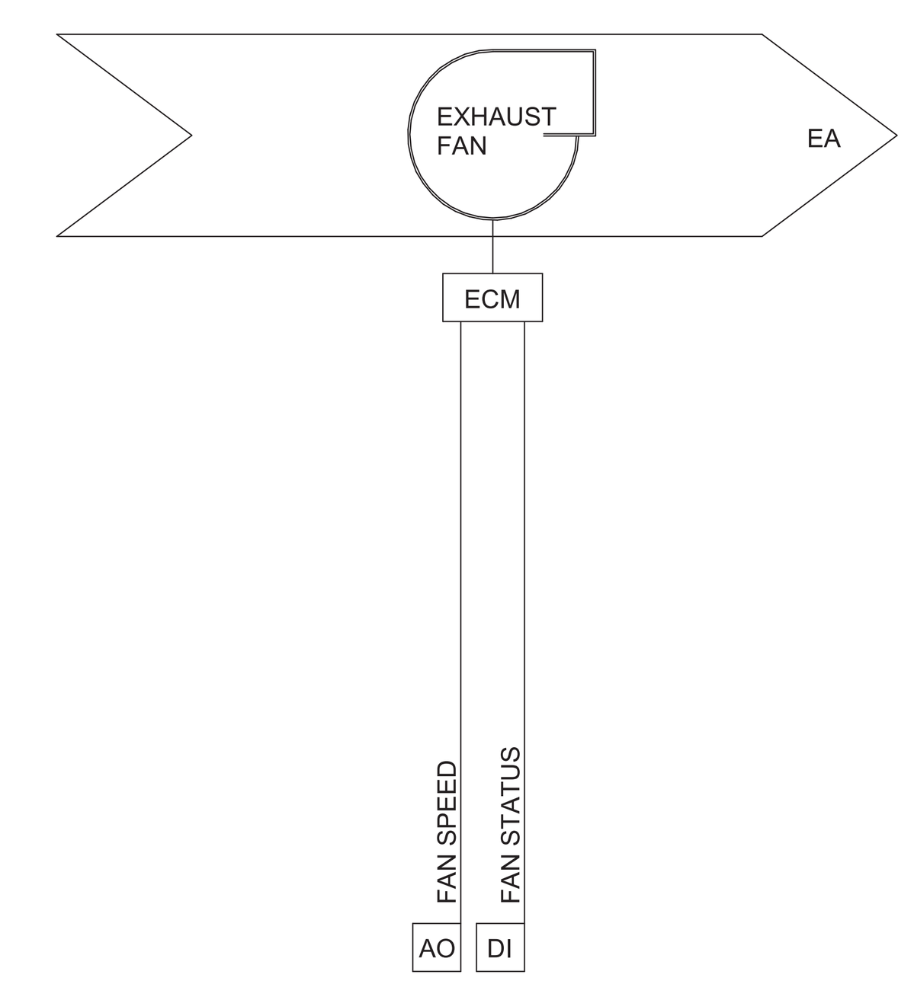


SEQUENCE OF OPERATION

A. FAN OPERATION

THE EXHAUST FAN SHALL OPERATE AT CONSTANT VOLUME WHEN THE GEAR DRYER IN OFF. UPON START OF THE GEAR DRYER, THE EXHAUST FAN SHALL STOP AND NOT RESTART OPERATING UNTIL THE GEAR DRYING CYCLE IS COMPLETE.

6 EF-6 CONTROLS

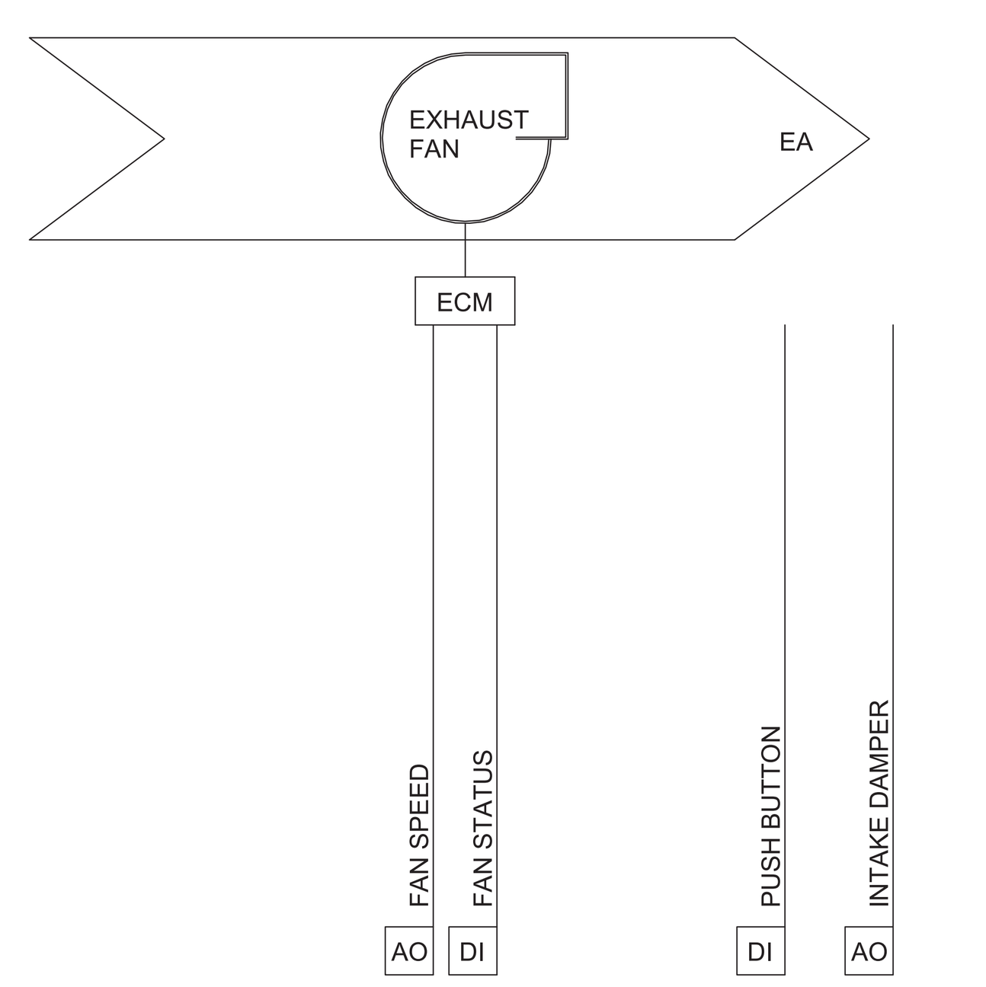


SEQUENCE OF OPERATION

A. FAN OPERATION

THE EXHAUST FAN SHALL RUN CONTINUOUSLY. EXHAUST FAN PROVIDES THE CODE REQUIRED MINIMUM EXHAUST AIRFLOW TO THE APPARATUS BAY.

7 EF-7 CONTROLS



SEQUENCE OF OPERATION

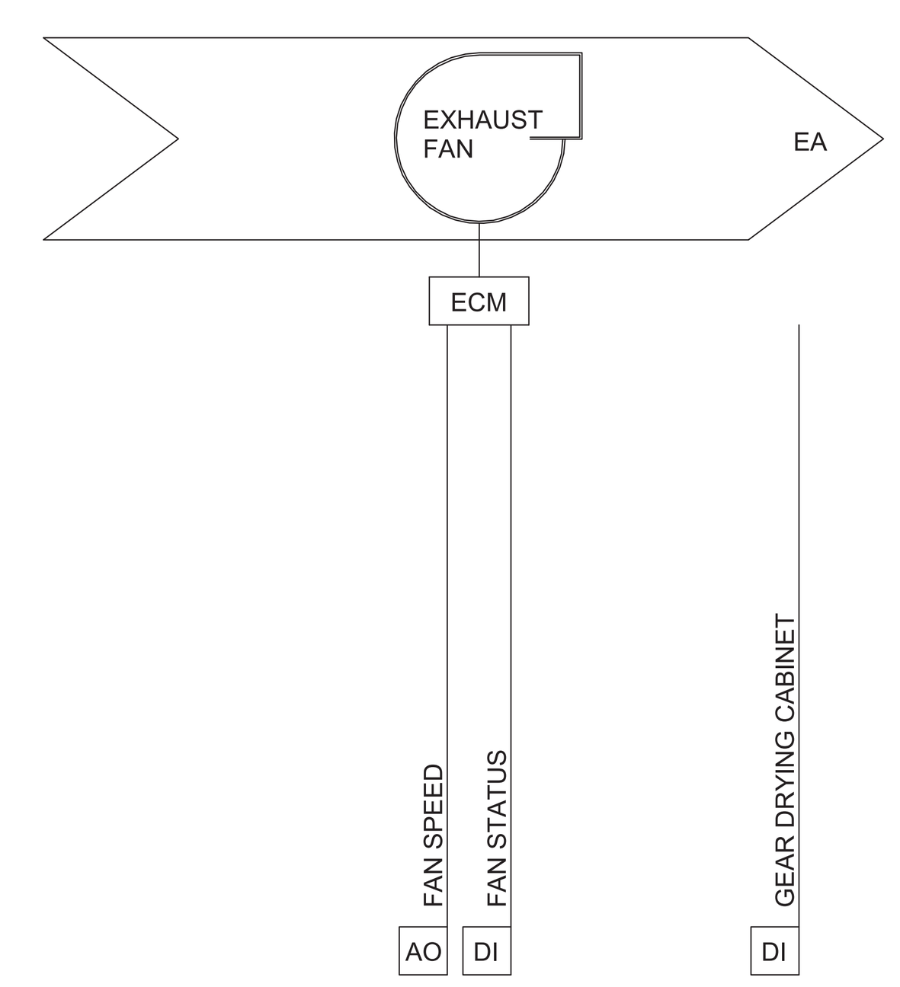
A. FAN OPERATION

THE EXHAUST FAN SHALL BE NORMALLY OFF.

THE EXHAUST FAN SHALL OPERATE UPON ACTIVATION FROM THE MOMENTARY WALL PUSHBUTTON. FAN SHALL OPERATE FOR 10 MIN (ADJ.) AND THEN SHUT OFF.

THE INTAKE DAMPER SHALL OPEN UPON ACTIVATION OF EF-8. DAMPER SHALL CLOSE WHEN FAN IS OFF.

8 EF-8 CONTROLS



SEQUENCE OF OPERATION

A. FAN OPERATION

THE INTAKE FAN SHALL OPERATE WHEN THE GEAR DRYING CABINET IS ACTIVE IN A DRYING CYCLE. PROVIDE A DRY CONTACT ON THE GEAR DRYER FAN CABINET TO SIGNAL THE DDC WHEN A DRYING CYCLE STARTS/STOPS.

9 IF-1 CONTROLS

App Architecture
creative focused design
615 Woodside Drive, Englewood, Ohio 45322
www.app-arch.com

STATE OF OHIO
JEFFREY D. ZELINSKI
63822

JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402

City of Middletown

Fire Station No. 83 & Headquarters

1830 Yankee Road, Middletown, Ohio 45044

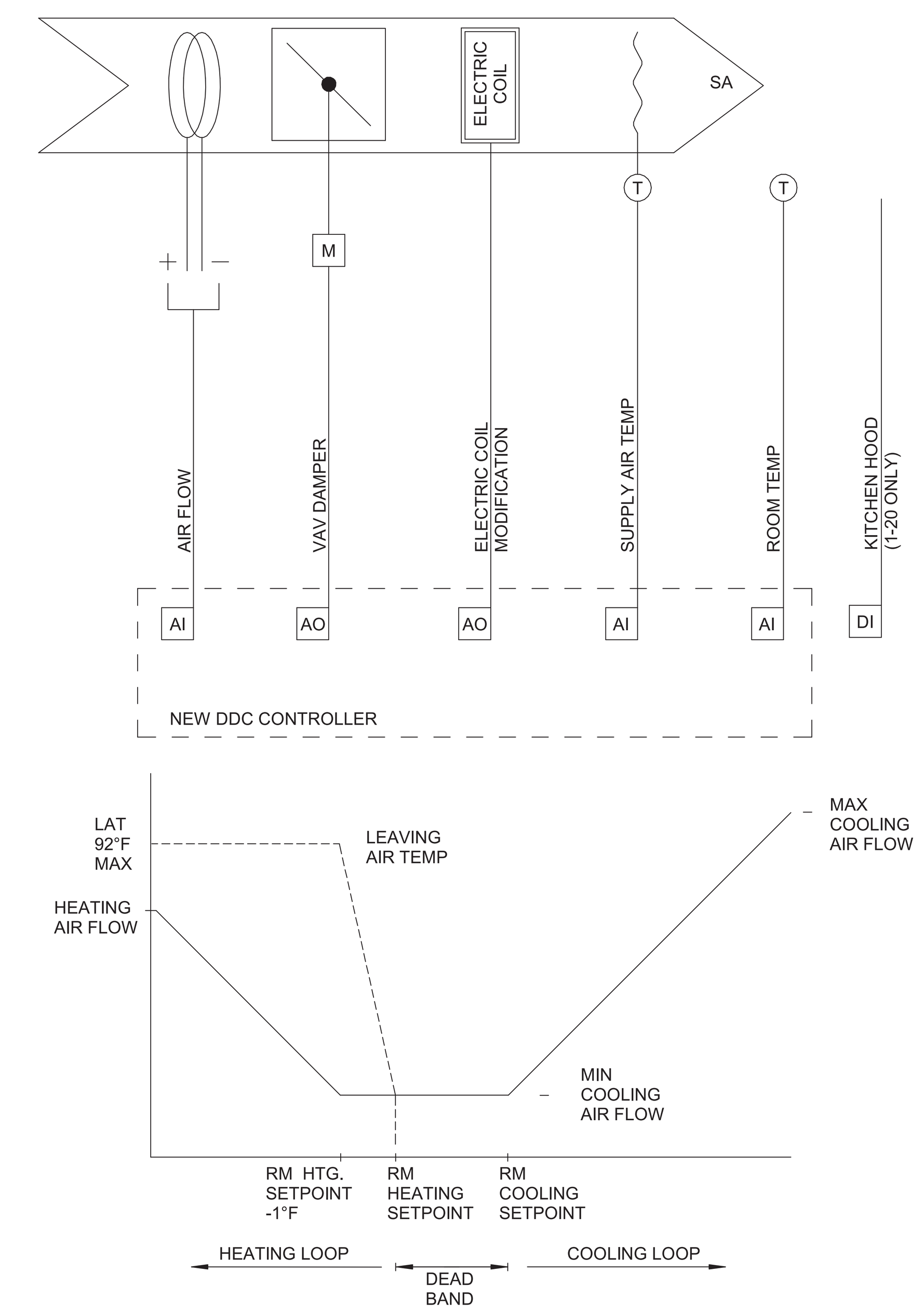
ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
CONTROLS

SHEET NO.
H4.2



SEQUENCE OF OPERATION

A. THE VAV BOX MANUFACTURER SHALL INCLUDE PNEUMATIC FLOW TAPS FROM THE AIR FLOW SENSOR ON THE BOX INLET AND AN INTEGRAL DAMPER WITH PROTRUDING SHAFT. ALL OTHER CONTROL COMPONENTS SHALL BE FURNISHED BY THE T.C.

B. CONSTANT VOLUME CONTROL - TERMINAL UNIT SHALL MAINTAIN A CONSTANT AIR FLOW VOLUME. ELECTRIC HEATING COIL SHALL MODULATE TO MAINTAIN ROOM TEMPERATURE AT SETPOINT. PROVIDE A 2 DEG. F DEADBAND. WHEN THE ROOM TEMPERATURE IS BELOW SETPOINT THE ELECTRIC COIL SHALL MODULATE ON. AS THE SPACE TEMPERATURE RISES TO SETPOINT THE ELECTRIC COIL SHALL MODULATE DOWN. WHEN THE ROOM TEMPERATURE RISES ABOVE THE HEATING SETPOINT THE ELECTRIC COIL SHALL SHUT OFF.

C. VARIABLE AIR VOLUME CONTROL - AS THE SPACE TEMPERATURE RISES ABOVE THE COOLING SET POINT THE AIR FLOW DAMPER SHALL MODULATE FROM THE MINIMUM TO THE MAXIMUM COOLING AIRFLOW. THE REHEAT COIL VALVE SHALL BE FULLY CLOSED.

AS THE SPACE TEMPERATURE DROPS TOWARDS THE COOLING SET POINT THE AIR FLOW DAMPER SHALL MODULATE FROM THE MAXIMUM TO THE MINIMUM FLOW RATE.

UPON AN CONTINUED DROP IN SPACE TEMPERATURE, THROUGH A DEADBAND THE TERMINAL UNIT SHALL THEN ENTER THE HEATING MODE. THE AIR FLOW SHALL BE SET AT THE MINIMUM FLOW AND THE ELECTRIC REHEAT COIL SHALL MODULATE ON. THE UNIT DISCHARGE AIR TEMPERATURE SHALL BE RESET VIA A PID LOOP FROM 55 DEG. F UP TO 95 DEG F BASED ON ROOM TEMPERATURE BELOW THE HEATING SET POINT.

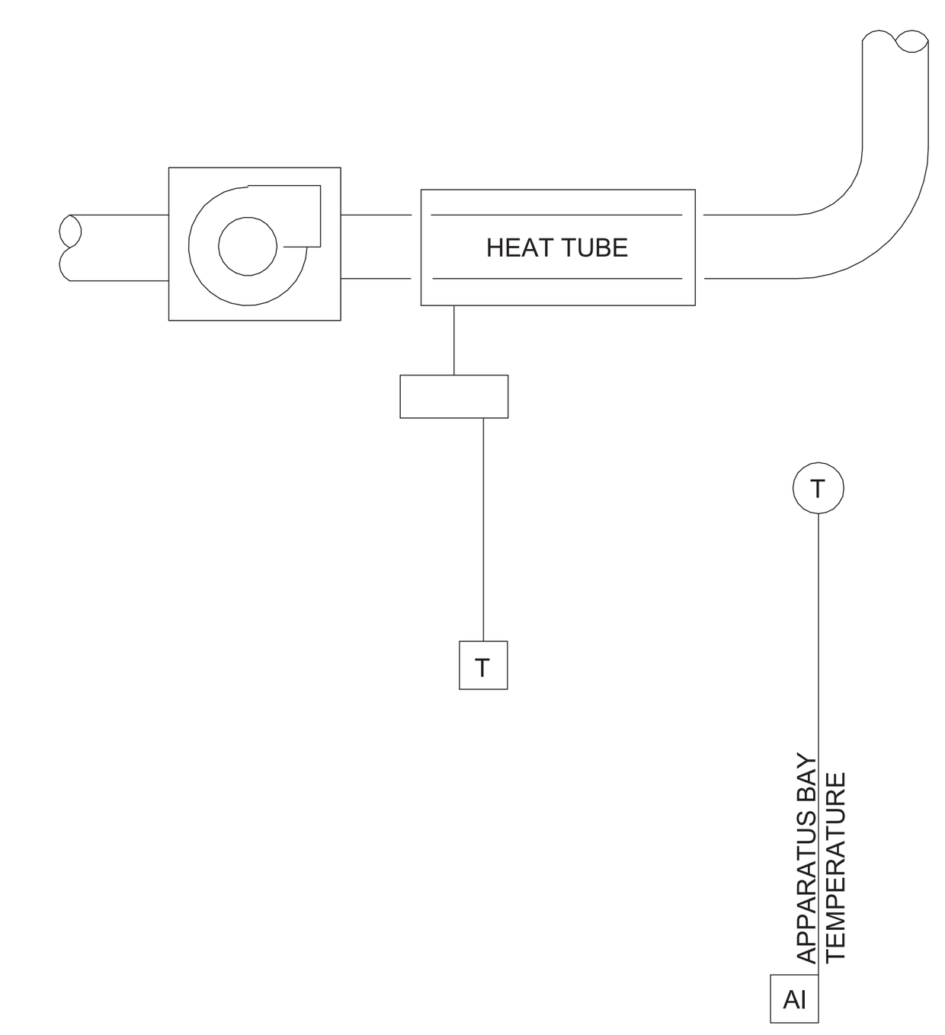
D. AS THE SPACE TEMPERATURE CONTINUES TO DROP THE AIR FLOW SET POINT SHALL BE INCREASED TOWARD THE HEATING AIR FLOW SET POINT. THE MAXIMUM DISCHARGE AIR TEMPERATURE SHALL REMAIN LIMITED TO 95° F.

E. DISCHARGE AIR TEMPERATURE SENSOR - PROVIDE A DISCHARGE AIR TEMPERATURE SENSOR IN THE SUPPLY DUCT (FIELD INSTALLED BY THE TEMPERATURE CONTROL SUBCONTRACTOR) FOR EACH REHEAT BOX FOR CONTROL, MONITORING AND TROUBLE SHOOTING PURPOSES. THE SENSOR SHALL BE A PRECISION THERMISTOR TYPE, WITH ACCURACY OF + OR - 0.5 DEG. F., MAXIMUM.

TERMINAL UNITS THAT SHARE A ROOM TEMP. SENSOR SHALL CONTROL IN UNISON PER THE ABOVE SEQUENCE.

F. VAV 1-20 SHALL BE NORMALLY OFF. UPON ACTIVATION OF EF-4, THE VAV SHALL OPERATE AT ITS AIRFLOW SETPOINT.

1 **VARIABLE AIR VOLUME UNIT CONTROL DIAGRAM**
N.T.S.

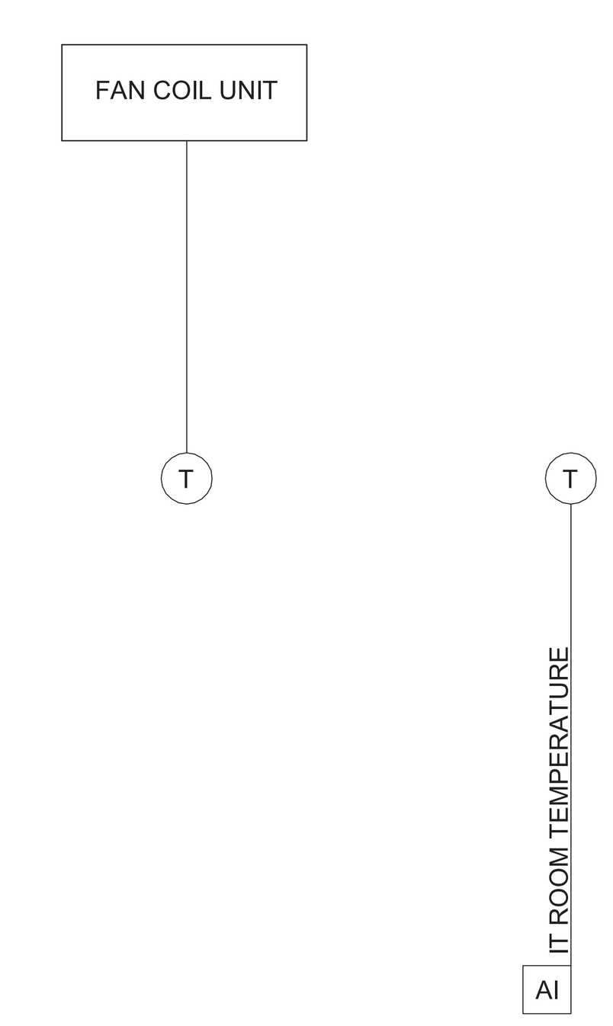


SEQUENCE OF OPERATION

A. THE GAS-FIRED RADIANT HEATER SHALL OPERATE TO MAINTIAN THEIR RESPECTIVE THERMOSTAT (NON-DDC)

B. PROVIDE DDC TEMPERATURE SENSORS PER SHEET H1.2 TO MONITOR APPARATUS BAY TEMPERATURE. IF THE APPARATUS BAY TEMPERATURE DROPS BELOW 50°F (ADJ.) FOR 5 MIN (ADJ.) AN ALARM SHALL BE SENT TO THE CONSOLE.

2 GAS-FIRED RADIANT HEATERS CONTROL DIAGRAM



SEQUENCE OF OPERATION

A. THE DEDICATED SPLIT SYSTEM SHALL PROVIDE COOLING TO THE IT ROOM. INITIAL SETPOINT SHALL BE 70°F (ADJ.). THE T.C. SHALL PROVIDE ALL LOW VOLTAGE WIRING FOR THE SPLIT SYSTEM CONTROLS.

B. PROVIDE A DDC TEMPERATURE SENSOR IN THE ROOM TO MONITOR THE ROOM TEMPERATURE. UPON EXCEEDING 80°F (ADJ.), SEND AN ALERT TO THE CONSOLE.

3 IT ROOM SPLIT SYSTEM CONTROLS

App Architecture
creative focused design
615 Woodside Drive, Englewood, Ohio 45322
T 937.836.8898 F 937.832.3696
www.app-arch.com

STATE OF OHIO
JEFFREY D. ZELINSKI
63822
REGISTERED PROFESSIONAL ENGINEER
JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

NAUMAN & ZELINSKI LLC.
204 S. Ludlow Street Suite 400 Dayton, Ohio 45402
PROJECT # 23001

City of Middletown

Fire Station No. 83 & Headquarters

1830 Yankee Road, Middletown, Ohio 45044

ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE
CONTROLS

SHEET NO.
H4.3

Building:	Middletown FS 83 - HQ
System Tag/Name:	AHU-1
Operating Condition Description:	
Units (select from pull-down list)	IP

Inputs for System

	Name	Units	System (w/o diversity)	Diversity	System (w/ diversity)
Floor area served by system	As	sf	10,437		
Population of area served by system	Ps	P	107	D 50%	54
Design primary supply fan airflow rate	Vpsd	cfm	10,775	100%	10,775
OA req'd per unit area for system (Weighted average)	Ras	cfm/sf	0.06		
OA req'd per person for system area (Weighted average)	Rps	cfm/p	8.2		
Percent increase in Vbz over minimum required			0%		

Inputs for Potentially Critical zones

Zone Name — *Zone title turns purple italic for critical zone(s)*

Occupancy Category — Select from pull-down list:

Floor Area of zone (Az, sf); Design population of zone (Pz, P) (default value listed; may be overridden); Design total supply to zone (primary plus local recirculated) (Vdzd, cfm); Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan? Select from pull-down list or leave blank if N/A; Frac. of local recirc. air that is representative of system RA (Er)

Inputs for Operating Condition Analyzed

Percent of total design airflow rate at conditioned analyzed (Ds, %): 100%; Air distribution type at conditioned analyzed (Select from pull-down list); Zone air distribution effectiveness at conditioned analyzed (Ez); Primary air fraction of supply air at conditioned analyzed (Ep)

Potentially Critical Zones

	DECON	SCBA	SCBA REPAIR	WAITING	TRIAGE	TRAINING ROOM	JAN.	STORAGE	MENS	WOMENS	CONFERENCE ROOM	ADMIN/ COPY	F. PREVENTION
Zone Tag	57	58	59	101	102	119	117	115	104	103	105	106	107
Occupancy Category	Lockeroom	Storage Room	Storage Room	Reception areas	Office space	Classrooms (age 9 plus)	Janitor	Storage Room	Restroom	Restroom	Conference/meeting	Office space	Office space
Floor Area of zone (Az, sf)	305	87	76	112	121	1,219	77	135	144	134	289	238	151
Design population of zone (Pz, P)	0	0	0	1	0.605	48	0	0	0	0	12	1	1
Design total supply to zone (Vdzd, cfm)	900	90	75	100	130	1,600	0	75	100	100	350	300	140
Ds (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Air distribution type	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH
Ez	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

	ASSIST. CHIEF	FIRE CHIEF	EMS CAPTAIN & LT.	FIRE CAPTAIN & LT.	SHIFT COMMANDER OFFICE	SHIFT COMMANDER DORM	SHIFT COMMANDER RR	STATION OFFICER	EMS STORAGE	FIRE INSPECTION	TOG	SHOP	ICE ALCOVE
Zone Tag	108	109	110	111	112	114	113	118	148	150	147	146	122
Occupancy Category	Office space	Office space	Office space	Office space	Office space	Dwelling unit	Restroom	Office space	Storage Room	Office space	Lockeroom	Occupiable storage rooms for dry materials	Corridors
Floor Area of zone (Az, sf)	161	222	144	141	171	128	70	100	99	103	470	133	31
Design population of zone (Pz, P)	1	1	1	1	1	1	0	1	0	0.515	0	0.266	0
Design total supply to zone (Vdzd, cfm)	175	260	175	175	175	120	75	80	75	100	550	100	100
Ds (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Air distribution type	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH
Ez	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

	RR	LOCKERS	SHOWER	SHOWER	SHOWER	SHOWER	LAUNDRY	DORM	DORM	DORM	DORM	DORM	DORM
Zone Tag	145	144	140	141	142	143	138	127	128	129	130	131	132
Occupancy Category	Restroom	Lockeroom	Restroom	Restroom	Restroom	Restroom	Laundry rooms within dwelling units	Dwelling unit	Dwelling unit	Dwelling unit	Dwelling unit	Dwelling unit	Dwelling unit
Floor Area of zone (Az, sf)	51	638	103	70	70	70	78	71	71	71	71	71	71
Design population of zone (Pz, P)	0	0	0	0	0	0	0.78	0.142	0.142	0.142	0.142	0.142	0.142
Design total supply to zone (Vdzd, cfm)	50	600	75	75	75	75	75	80	80	80	80	80	80
Ds (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Air distribution type	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH
Ez	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

	DORM	DORM	DORM	DORM	KITCHEN	*DINING*	DAYROOM	FITNESS	PUBLIC CORR.	ADMIN. CORR.	CORR.	CORR.	CORR.	REPORT	ADA DORM	ADA DORM	JAN.
Zone Tag	133	134	135	136	125	124	123	120	C-01	C-02	C-04	C-05	C-03	121	126	137	138
Occupancy Category	Dwelling unit	Dwelling unit	Dwelling unit	Dwelling unit	Kitchen (cooking)	Kitchen (cooking)	Dayroom	Health club/weight rooms	Corridors	Corridors	Corridors	Corridors	Corridors	Office space	Dwelling unit	Dwelling unit	Janitor
Floor Area of zone (Az, sf)	71	71	71	70	294	272	397	409	272	501	154	548	463	53	94	87	43
Design population of zone (Pz, P)	0.142	0.142	0.142	0.14	5	12	12	4.09	0	0	0	0	0	0.265	0.188	0.174	0
Design total supply to zone (Vdzd, cfm)	80	80	80	80	500	300	400	600	100	200	75	225	200	50	100	80	0
Ds (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Air distribution type	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH
Ez	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

Results

System Ventilation Efficiency	Ev		0.59
Outdoor air intake required for system	Vot	cfm	1815
Outdoor air per unit floor area	Vot /As	cfm/sf	0.17
Outdoor air per person served by system (including diversity)	Vot /Ps	cfm/p	33.8
Outdoor air as a % of design primary supply air	Ypd	%	17%

Detailed Calculations

Initial Calculations for the System as a whole

System primary supply air flow at conditioned analyzed	Vps	cfm	= Vpsd Ds	= 10775
Uncorrected OA intake flow req'd for system	Vou	cfm	= Rps *Ps* + Ras As	= 1067
Uncorrected OA req'd as a fraction of primary SA	Xs		= Vou / Vps	= 0.10

Initial Calculations for individual zones

	DECON	SCBA	SCBA REPAIR	WAITING	TRIAGE	TRAINING ROOM	JAN.	STORAGE	MENS	WOMENS	CONFERENCE ROOM	ADMIN/ COPY	F. PREVENTION
Area outdoor air rate (Ra, cfm/sf)	0.00	0.12	0.12	0.06	0.06	0.12	0.00	0.12	0.00	0.00	0.06	0.06	0.06
People outdoor air rate (Rp, cfm/p)	0.00	0.00	0.00	5.00	5.00	10.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00
Total supply air to zone (at condition being analyzed) (Vdz, cfm, Vdzd Ds)	900	90	75	100	130	1600	0	75	100	100	350	300	140
Primary airflow to zone (at condition being analyzed) (Vpz, cfm, = Vdz Ep)	900	90	75	100	130	1600	0	75	100	100	350	300	140
Breathing zone outdoor airflow (Vbz, cfm, = Rp Pz + Ra Az)	0	10	9	12	10	626	0	16	0	0	77	19	14
Zone outdoor airflow (Voz, cfm, = Vbz / Ez)	0	13	11	15	13	783	0	20	0	0	97	24	18
Fraction of zone supply not directly recirc. from zone (Fa, = Ep + (1-Ep) Er)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air (Fb, = Ep)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone (Fc, = 1-(1-Ez)(1-Ep)(1-Er))	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
OA fraction required in the supply air to the zone (Zd, = Voz / Vdz)	0.00	0.15	0.15	0.15	0.10	0.49	0.00	0.27	0.00	0.00	0.28	0.08	0.13
OA fraction required in the primary air to the zone (Zpz, = Voz / Vpz)	0.00	0.15	0.15	0.15	0.10	0.49	0.00	0.27	0.00	0.00	0.28	0.08	0.13
Zone Ventilation Efficiency (App A Method) (Evz, = (Fa+FbXs-FcZpzEp)/Fa)	1.10	0.95	0.95	0.95	1.00	0.61	1.10	0.83	1.10	1.10	0.82	1.02	0.97

	ASSIST. CHIEF	FIRE CHIEF	EMS CAPTAIN & LT.	FIRE CAPTAIN & LT.	SHIFT COMMANDER OFFICE	SHIFT COMMANDER DORM	SHIFT COMMANDER RR	STATION OFFICER	EMS STORAGE	FIRE INSPECTION	TOG	SHOP	ICE ALCOVE
Area outdoor air rate (Ra, cfm/sf)	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.06	0.12	0.06	0.00	0.06	0.06
People outdoor air rate (Rp, cfm/p)	5.00	5.00	5.00	5.00	5.00	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00
Total supply air to zone (at condition being analyzed) (Vdz, cfm, Vdzd Ds)	175	260	175	175	175	120	75	80	75	100	550	100	100
Primary airflow to zone (at condition being analyzed) (Vpz, cfm, = Vdz Ep)	175	260	175	175	175	120	75	80	75	100	550	100	100
Breathing zone outdoor airflow (Vbz, cfm, = Rp Pz + Ra Az)	15	18	14	13	15	13	0	11	12	9	0	9	2
Zone outdoor airflow (Voz, cfm, = Vbz / Ez)	18	23	17	17	19	16	0	14	15	11	0	12	2
Fraction of zone supply not directly recirc. from zone (Fa, = Ep + (1-Ep) Er)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air (Fb, = Ep)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone (Fc, = 1-(1-Ez)(1-Ep)(1-Er))	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
OA fraction required in the supply air to the zone (Zd, = Voz / Vdz)	0.10	0.09	0.10	0.10	0.11	0.13	0.00	0.17	0.20	0.11	0.00	0.12	0.02
OA fraction required in the primary air to the zone (Zpz, = Voz / Vpz)	0.10	0.09	0.10	0.10	0.11	0.13	0.00	0.17	0.20	0.11	0.00	0.12	0.02
Zone Ventilation Efficiency (App A Method) (Evz, = (Fa+FbXs-FcZpzEp)/Fa)	0.99	1.01	1.00	1.00	0.99	0.97	1.10	0.93	0.90	0.99	1.10	0.98	1.08

	RR	LOCKERS	SHOWER	SHOWER	SHOWER	SHOWER	LAUNDRY	DORM	DORM	DORM	DORM	DORM	DORM
Area outdoor air rate (Ra, cfm/sf)	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.06	0.06	0.06	0.06	0.06	0.06
People outdoor air rate (Rp, cfm/p)	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Total supply air to zone (at condition being analyzed) (Vdz, cfm, Vdzd Ds)	50	600	75	75	75	75	75	80	80	80	80	80	80
Primary airflow to zone (at condition being analyzed) (Vpz, cfm, = Vdz Ep)	50	600	75	75	75	75	75	80	80	80	80	80	80
Breathing zone outdoor airflow (Vbz, cfm, = Rp Pz + Ra Az)	0	0	0	0	0	0	13	5	5	5	5	5	5
Zone outdoor airflow (Voz, cfm, = Vbz / Ez)	0	0	0	0	0	0	17	6	6	6	6	6	6
Fraction of zone supply not directly recirc. from zone (Fa, = Ep + (1-Ep) Er)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air (Fb, = Ep)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone (Fc, = 1-(1-Ez)(1-Ep)(1-Er))	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
OA fraction required in the supply air to the zone (Zd, = Voz / Vdz)	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.08	0.08	0.08	0.08	0.08	0.08
OA fraction required in the primary air to the zone (Zpz, = Voz / Vpz)	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.08	0.08	0.08	0.08	0.08	0.08
Zone Ventilation Efficiency (App A Method) (Evz, = (Fa+FbXs-FcZpzEp)/Fa)	1.10	1.10	1.10	1.10	1.10	1.10	0.88	1.02	1.02	1.02	1.02	1.02	1.02

	DORM	DORM	DORM	DORM	KITCHEN	*DINING*	DAYROOM	FITNESS	PUBLIC CORR.	ADMIN. CORR.	CORR.	CORR.	CORR.	REPORT	ADA DORM	ADA DORM	JAN.
Area outdoor air rate (Ra, cfm/sf)	0.06	0.06	0.06	0.06	0.12	0.12	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00
People outdoor air rate (Rp, cfm/p)	5.00	5.00	5.00	5.00	7.50	7.50	5.00	20.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00	0.00
Total supply air to zone (at condition being analyzed) (Vdz, cfm, Vdzd Ds)	80	80	80	80	500	300	400	600	100	200	75	225	200	50	100	80	0
Primary airflow to zone (at condition being analyzed) (Vpz, cfm, = Vdz Ep)	80	80	80	80	500	300	400	600	100	200	75	225	200	50	100	80	0
Breathing zone outdoor airflow (Vbz, cfm, = Rp Pz + Ra Az)	5	5	5	5	73	123	84	106	16	30	9	33	28	5	7	6	0
Zone outdoor airflow (Voz, cfm, = Vbz / Ez)	6	6	6	6	91	153	105	133	20	38	12	41	35	6	8	8	0
Fraction of zone supply not directly recirc. from zone (Fa, = Ep + (1-Ep) Er)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone supply from fully mixed primary air (Fb, = Ep)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fraction of zone OA not directly recirc. from zone (Fc, = 1-(1-Ez)(1-Ep)(1-Er))	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
OA fraction required in the supply air to the zone (Zd, = Voz / Vdz)	0.08	0.08	0.08	0.08	0.18	0.51	0.26	0.22	0.20	0.19	0.15	0.18	0.17	0.11	0.08	0.10	0.00
OA fraction required in the primary air to the zone (Zpz, = Voz / Vpz)	0.08	0.08	0.08	0.08	0.18	0.51	0.26	0.22	0.20	0.19	0.15	0.18	0.17	0.11	0.08	0.10	0.00
Zone Ventilation Efficiency (App A Method) (Evz, = (Fa+FbXs-FcZpzEp)/Fa)	1.02	1.02	1.02	1.02	0.92	0.59	0.84	0.88	0.90	0.91	0.95	0.92	0.93	0.99	1.02	1.00	1.10

System Ventilation Efficiency

System Ventilation Efficiency (App A Method)	Ev		= min (*Evz*)	= 0.59
System Ventilation Efficiency (Table 6.3 Method)	Ev		= Value from Table 6.3	= 0.64

Minimum outdoor air intake airflow

Outdoor Air Intake Flow required to System	Vot	cfm	= Vou / Ev	= 1815	
OA intake req'd as a fraction of primary SA	Y		= Vot / Vps	= 0.17	
Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	= Vou / Ev	= 1670	144.71
OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		= Vot / Vps	= 0.16	0.08

OA Temp at which Min OA provides all cooling

OAT below which OA Intake flow is @ minimum		Deg F	= {(Tp-dTsf)-(1-Y)*(Tr+dTrf)}/Y	= -29

OMC CODE REQUIRED VENTILATION: 1,815 CFM
LIVING QUARTERS NORMAL BUILDING EXHAUST AIRFLOW: 1,750 CFM

THE MINIMUM OUTSIDE AIRFLOW TO AHU-1 SHALL BE 2,115 CFM. A +300 CFM OFFSET SHALL BE PROVIDED TO ENSURE THE LIVING QUARTERS STAYS POSITIVE RELATIVE TO THE APPARATUS BAY.

UPON ACTIVATION OF THE KITCHEN HOOD, THE MINIMUM OUTSIDE AIR VALUE SHALL INCREASE TO 2,865 CFM (+750) TO PROVIDE MAKE-UP AIR TO THE KITCHEN HOOD.

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JEFFERY D. ZELINSKI, LICENSE #63822
EXPIRATION DATE 12/21/2023

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PROJECT # 23001

City of Middletown

Fire Station No. 83 & Headquarters

1830 Yankee Road, Middletown, Ohio 45044

ISSUE

NO.	DATE	DESCRIPTION
	10/16/23	FOR CONSTRUCTION

DATE	10/16/2023
JOB NO.	4069.00
DRAWN	DJZ
CHECKED	JDZ

TITLE **VENTILATION**

SHEET NO. **H5.1**