

### MECHANICAL SYMBOLS LEGEND

<b>ABBREVIATIONS:</b>		<b>EQUIPMENT:</b>		<b>GENERAL REFERENCES/NOTATIONS:</b>	
AFF	ABOVE FINISHED FLOOR		ROOF MOUNTED EXHAUST FAN		EXHAUST DUCT ELBOW UP OR DOWN
BOD	BOTTOM OF DUCT		CEILING MOUNTED EXHAUST FAN		DUCT ELBOW WITH FIXED TURNING VANES
BTU	BRITISH THERMAL UNIT		ROOFTOP UNIT		DUCT BRANCH TAKE-OFF
CFM	CUBIC FEET PER MINUTE		MAKE-UP AIR UNIT		ROUND SPIN-IN WITH DAMPER
DB	DRY BULB		TEMPERATURE SENSOR - ELECTRIC		SQUARE TO ROUND TAP WITH DAMPER
EAT	ENTERING AIR TEMPERATURE		THERMOSTAT		FLEXIBLE DUCT CONNECTION
ESP	EXTERNAL STATIC PRESSURE		CARBON DIOXIDE SENSOR		VOLUME DAMPER
FOB	FLAT ON BOTTOM		DUCT SMOKE DETECTOR		BACKDRAFT DAMPER
HZ	FREQUENCY		HUMIDITY SENSOR		FLEXIBLE DUCTWORK
NC	NOISE CRITERIA		AUDIOVISUAL REMOTE SMOKE DETECTOR ANNUNCIATOR		
PSI	POUNDS PER SQUARE INCH				
RTU	ROOFTOP UNIT				
TYP	TYPICAL				
WC	WATER COLUMN				
WB	WET BULB				
<b>GRILLES/DIFFUSERS:</b>		<b>DOUBLE LINE DUCT SYMBOLS:</b>		<b>SYMBOLS LEGEND NOTES:</b>	
	SUPPLY DIFFUSER		NEW SHEET METAL DUCTWORK		CONNECT TO EXISTING
	SUPPLY DIFFUSER WITH 3-WAY THROW		SUPPLY OR OUTSIDE AIR DUCT	#	NOTE DESIGNATION
	SUPPLY DIFFUSER WITH 2-WAY THROW		RETURN AIR DUCT		REVISION DESIGNATION
	SIDEWALL MOUNTED SUPPLY REGISTER		EXHAUST AIR DUCT		MECHANICAL EQUIPMENT DESIGNATION
	RETURN GRILLE		DUCTWORK TRANSITION	TAG CFM	DIFFUSER DESIGNATION AND CFM
	EXHAUST GRILLE		DUCTWORK TRANSITION - RECTANGULAR TO ROUND		
	ROUND DIFFUSER		SUPPLY DUCT ELBOW UP OR DOWN		
	LINEAR DIFFUSER		RETURN DUCT ELBOW UP OR DOWN		

### SEQUENCE OF OPERATION

- A. PROVIDE STAND ALONE OR APPLICATION SPECIFIC CONTROLLERS AS REQUIRED TO PERFORM THE FOLLOWING SEQUENCES OF OPERATIONS.
- B. PACKAGED ROOFTOP UNITS
  1. UNIT SHALL CONSIST OF SUPPLY AIR FAN, FILTERS, DX COOLING COIL, GAS-FIRED HEAT SECTION, AND A 7-DAY PROGRAMMABLE THERMOSTAT.
  2. PROVIDE AN OVERRIDE SWITCH TO OPERATE THE UNIT DURING UNOCCUPIED HOURS. THIS SWITCH SHALL BE PART OF THE PROGRAMMABLE THERMOSTAT. OVERRIDE SWITCH ALLOWS THE UNIT TO OPERATE FOR TWO HOURS (ADJUSTABLE).
  3. OCCUPIED MODE: BASED ON THE ROOFTOP UNIT'S HOURS OF OCCUPANCY, START THE UNIT AT THE BEGINNING OF OCCUPANCY AND SHUT DOWN THE UNIT AT THE END OF OCCUPANCY (NOTE: OUTSIDE AIR DAMPER WITHIN THE RTU SHALL OPEN AND THEN THE RTU SHALL START). THE UNIT SHALL START EARLIER AS DETERMINED BY THE PROGRAM FOR EARLY WARM-UP OR COOL DOWN. ON A SYSTEM STARTUP, THE RTU FAN SHALL START AND RUN CONTINUOUSLY AND THE INTERNAL FACTORY CONTROLS SHALL BE ENABLED. BASED ON THE SPACE TEMPERATURE SENSOR, THE UNIT SHALL CYCLE THE HEATING/COOLING TO MAINTAIN THE SPACE TEMPERATURE SETPOINT (COOLING 75 DEGREE F, HEATING 70 DEGREE F)
    - 3.1 ECONOMIZER MODE: WHEN ENTHALPY OF OA IS BELOW 28 BTU/LB, ECONOMIZER MODE SHALL BE ENABLED. ECONOMIZER MODE SHALL LINEARLY MODULATE OUTDOOR AIR CFM FROM MINIMUM OA CFM TO 100% BASED ON ENTHALPY READINGS.
    - 3.2 HUMIDITY CONTROL (WHEN NEEDED BASED ON CLIMATE): UPON DETECTION OF RELATIVE HUMIDITY ABOVE 55%, THE UNIT SHALL CYCLE INTO DEHUMIDIFICATION MODE IF NOT ALREADY IN COOLING.
  4. UNOCCUPIED MODE: THE RTU INTERNAL OA DAMPERS SHALL REMAINED CLOSED WHEN THE BUILDING IS NOT OCCUPIED. THE RTU SHALL STOP HEATING/COOLING AND THE FAN SHALL STOP. IF THE SPACE TEMPERATURE FALLS BELOW 56 DEGREE F (ADJUSTABLE), THE UNIT SHALL START AND HEAT UNTIL THE SPACE TEMPERATURE IS 60 DEGREE F (ADJUSTABLE) AND THEN SHUTDOWN. IF THE SPACE TEMPERATURE RISES ABOVE 85 DEGREE F (ADJUSTABLE), THE UNIT SHALL START AND COOL UNTIL THE SPACE TEMPERATURE IS 80 DEGREE F (ADJUSTABLE) AND THEN SHUTDOWN.
  5. UPON DETECTION OF SMOKE BY UNIT SMOKE DETECTOR BOTH RTUS SHALL SHUT DOWN AND AN ALARM SHALL BE SENT TO THE FIRE ALARM CONTROL PANEL (WHERE APPLICABLE). LOCAL REMOTE ANNUNCIATORS SHALL ALSO BE ACTIVATED.
- C. KITCHEN HOOD EXHAUST FAN (KF-1)
  1. THE KITCHEN HOOD EXHAUST FAN SHALL BE ENABLED WHEN ANY COOKING APPLIANCE LOCATED UNDER ITS RESPECTIVE HOOD, IS IN USE.
- D. MAKE UP AIR UNIT
  1. THE MAKE UP AIR UNIT SHALL BE ENABLED WHEN THE KITCHEN HOOD EXHAUST FAN (KF-1) IS ENERGIZED. THE INTERNAL MOTORIZED DAMPER WITHIN MAU-1 SHALL OPEN AND THE FAN SHALL RUN. IF OA IS LESS THAN 65" (ADJ.), THE MAU-1 GAS-FIRED HEAT SECTION SHALL BE ENABLED TO MAINTAIN A MINIMUM OF 65".
  2. WHEN KF-1 IS OFF, MAU-1 SHALL BE DE-ENERGIZED AND THE INTERNAL MOTORIZED DAMPED SHALL CLOSE.
- E. ANSUL SYSTEM ACTIVATION
  1. UPON ACTIVATION OF ANSUL SYSTEM, SHUT DOWN MAU-1, AND RTUS. PROVIDE RELAYS CONTACTS, INTERLOCKS, TRANSFORMERS AND ALL ASSOCIATED WIRING TO ACCOMPLISH SEQUENCE. MAU-1 IS ALREADY PREWIRED TO SHUT DOWN IN HOOD CONTROL PANEL. MECHANICAL CONTRACTOR SHALL INTERLOCK RTUS TO ALSO SHUT DOWN.

### GENERAL NOTES

- A. CONTRACTORS AND SUB-CONTRACTORS SHALL CAREFULLY REVIEW THE CONSTRUCTION DOCUMENTS. INFORMATION REGARDING THE COMPLETE WORK IS DISPERSED THROUGHOUT THE DOCUMENT SET AND CANNOT BE ACCURATELY DETERMINED WITHOUT REFERENCE TO THE COMPLETE DOCUMENT SET.
- B. COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF THE OWNER, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE. PROVIDE DUCT RISES AND DROPS AS REQUIRED FOR FIELD INSTALLATION AND TRADE COORDINATION. NOTIFY ARCHITECT OF ANY DISCREPANCIES
- C. DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC, SHOWING THE GENERAL LOCATION, TYPE, LAYOUT, AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENT. REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONS. REFER TO MANUFACTURER'S STANDARD INSTALLATION DRAWINGS FOR EQUIPMENT CONNECTIONS AND INSTALLATION REQUIREMENTS. PROVIDE DUCTWORK, CONNECTIONS, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY FOR A COMPLETE SYSTEM.
- D. ALL WORK SHALL COMPLY WITH STATE AND LOCAL CODE REQUIREMENTS AS APPROVED AND AMENDED BY THE GOVERNING CITY. PURCHASE ALL PERMITS ASSOCIATED WITH THE WORK. OBTAIN ALL INSPECTIONS REQUIRED BY CODE.
- E. INSTALL EQUIPMENT PER MANUFACTURER'S INSTRUCTIONS AND MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCE.
- F. CONTACT LANDLORD APPROVED ROOFING CONTRACTOR TO FLASH AND SEAL RELATED ROOF PENETRATIONS TO MAINTAIN ROOFING WARRANTY.
- G. INSTALL EXHAUST FAN A MINIMUM OF 10 FT FROM INTAKE AIR OPENINGS.

### INSULATION SCHEDULE

ALL EXPOSED DUCTWORK IN CONDITIONED SPACES	1" DUCT LINER
ALL EXTERIOR DUCTWORK	MIN. R-12
ALL CONCEALED SUPPLY AND RETURN DUCT	MIN. R-6
ALL EXHAUST UP TO 10'-0" FROM DISCHARGE	MIN. R-8

NOTE:

ALL SUPPLY AND RETURN AIR DUCTS AND PLENUMS SHALL BE INSULATED WITH A MINIMUM OF R-6 INSULATION WHEN LOCATED IN UNCONDITIONED SPACES AND WITH A MINIMUM OF R-12 INSULATION WHEN LOCATED OUTSIDE THE BUILDING ENVELOPE. WHEN LOCATED WITHIN A BUILDING ENVELOPE ASSEMBLY, THE DUCT OR PLENUM SHALL BE SEPARATED FROM THE BUILDING EXTERIOR OR UNCONDITIONED OR EXEMPT SPACES BY A MINIMUM OF R-12 INSULATION. ALL JOINTS, LONGITUDINAL AND TRANSVERSE SEAMS, AND CONNECTIONS IN DUCTWORK SHALL BE SECURELY FASTENED AND SEALED WITH WELDS, GASKETS, MASTICS, MASTIC-PLUS-EMBEDDED-FABRIC SYSTEMS OR TAPES. TAPES AND MASTICS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181A OR UL 181B. DUCT CONNECTIONS TO FLANGES OF AIR DISTRIBUTION SYSTEM EQUIPMENT SHALL BE SEALED AND MECHANICALLY FASTENED. DUCT TAPE IS NOT PERMITTED AS A SEALANT ON ANY METAL DUCTS.

### ENERGY NOTES

1. MOTORIZED DAMPERS SHALL BE INSTALLED ON ALL INTAKES AND EXHAUST OPENINGS UNLESS NOTED OTHERWISE.
2. MAXIMUM FAN NAMEPLATE HORSEPOWER SHALL NOT EXCEED 1.1 HP/1000CFM.
3. LOAD CALCULATIONS WERE BASED ON ASHRAE 2021 FUNDAMENTALS
4. ALL PROGRAMMABLE THERMOSTATS SHALL HAVE 5 DEGREE DEADBAND AND SHALL HAVE 7-DAY CLOCK, 2-HOUR MANUAL OVERRIDE, 10 HOUR BACKUP AND SETBACK CAPABLE OF 56 DEGREES HEATING AND 85 DEGREES COOLING. (EXCEPT CONTINUOUS OPERATING ZONES)
5. DUCT INSULATION AS SPECIFIED WITH MINIMUM VALUES AS FOLLOWS:
  - a. R-6 SUPPLY AND RETURN DUCT INSULATION IN UNCONDITIONED SPACES.
  - b. R-12 SUPPLY AND RETURN DUCT INSULATION FOR EXTERIOR DUCTS.
  - c. R-3 SUPPLY AND RETURN DUCT INSULATION UNDERGROUND.
  - d. 1" INTERNAL LINER ON DUCTS WITHIN INDIRECTLY CONDITIONED PLENUM SPACES.
6. ALL DUCTWORK SHALL BE SEALED PRESSURE SENSITIVE TAPE IS NOT USED AS THE PRIMARY SEALANT. LONGITUDINAL AND TRANSVERSE SEAMS FOR DUCTS IN UNCONDITIONED SPACES AND WALL PENETRATIONS. TRANSVERSE SEAMS ON BURIED DUCTS.
7. ALL MOTORS SHALL MEET THE REQUIREMENTS OF IECC C405.8.
8. PROVIDE COMMISSIONING PER IECC C408.

### APPLICABLE CODES

AS ADOPTED BY THE CITY OF CHESTNUT HILLS, MASSACHUSETTS  
 2015 INTERNATIONAL MECHANICAL CODE  
 2015 INTERNATIONAL PLUMBING CODE  
 2015 INTERNATIONAL BUILDING CODE  
 2015 INTERNATIONAL FIRE CODE  
 2021 INTERNATIONAL ENERGY CONSERVATION CODE WITH STATE AMENDMENTS  
 MA BUILDING CODE 780 CMR

### DESIGN CRITERIA

BASED ON ASHRAE HANDBOOK - 2021 FUNDAMENTALS

CHESTNUT HILL, MA  
 OUTDOOR DESIGN CONDITION

1% COOLING: 90.8°/73.0°F DB/WB  
 99.6% HEATING: 7.7°F DB

INDOOR DESIGN CONDITION (ADJUSTABLE)

SUMMER: 75°F DB/50% RH  
 WINTER: 70°F DB

ADR PROJECT NUMBER:  
CAV048

ISSUE	DATE
SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION	10/25/24
SHEET	

MECHANICAL GENERAL NOTES, SYMBOLS & LEGEND

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### KEYED NOTES

- 1 DUCT MOUNTED SMOKE DETECTOR FURNISHED BY FIRE ALARM CONTRACTOR AND INSTALLED IN DUCT BY MECHANICAL CONTRACTOR. INTERLOCK WIRING BETWEEN FIRE ALARM SYSTEM RELAY AND ROOFTOP UNIT SHUTDOWN CONTACT SHALL BE PROVIDED BY MECHANICAL CONTRACTOR. ALL OTHER WIRING BY FIRE ALARM CONTRACTOR. UPON DETECTION OF SMOKE, ROOFTOP UNIT SHALL SHUT DOWN UPON SIGNAL FROM FIRE ALARM SYSTEM. COORDINATE INSTALLATION LOCATION WITH ARCHITECT AND MOUNT CABLE CONTROLLER IN CEILING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- 2 INSTALL OWNER FURNISHED TYPE I GREASE EXHAUST HOOD. SUPPORT HOOD PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE TRAPEZE HANGERS AND MOUNTING BRACKETS FOR ALL THREAD SUPPORT UNDER DUCTWORK AS REQUIRED. REFER TO HOOD DRAWINGS IN FOOD SERVICE SET FOR HOOD SPECIFICATION AND ADDITIONAL INFORMATION INCLUDING BALANCE OF MAKEUP AIR AND CONDITIONED SUPPLY AIR TO HOOD.
- 3 8"Ø EXHAUST DUCT VTR.
- 4 PROVIDE REMOTE TEMPERATURE SENSOR COMPATIBLE WITH THERMOSTAT. MOUNT SENSOR 48" ABOVE FINISHED FLOOR. COORDINATE EXACT LOCATION WITH OWNER.
- 5 CARRIER CONNECT Wi-Fi 7-DAY PROGRAMMABLE THERMOSTAT WITH AUTO-CHANGEOVER AND AUTOMATIC START CAPABILITY. MOUNT THERMOSTAT 48" ABOVE FINISHED FLOOR. COORDINATE FINAL INSTALLATION LOCATION OF THERMOSTAT WITH OWNER'S REPRESENTATIVE.
- 6 PROVIDE CEILING MOUNTED EXHAUST FAN. TRANSITION FROM FAN DISCHARGE TO DUCT SIZE SHOWN AND EXTEND UP THROUGH ROOF.
- 7 UNDERCUT RESTROOM DOOR 1" FOR TRANSFER AIR.
- 8 DUCT UP TO EQUIPMENT ON ROOF. REFER TO SHEET M201 FOR EQUIPMENT LOCATION.
- 9 MOUNT REGISTER AT 15° ANGLE ON SIDE OF DUCT. ADJUST DIFFUSER BLADES TO 45° PATTERN. BALANCE AIR SCOOOP TO CFM INDICATED.
- 10 PROVIDE UL 2221 LISTED DOUBLE-WALL GREASE DUCT EQUAL TO CAPTIVEAIRE SYSTEMS MODEL DW-3R OR 32 ROUND 20 GAUGE 430 STAINLESS INNER DUCT INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL. FROM HOOD COLLAR EXHAUST FAN ON ROOF. INSTALL EXHAUST DUCT PER MANUFACTURER'S INSTRUCTIONS. PROVIDE CLEANOUTS AT EVERY CHANGE OF DIRECTION IN THE DUCT AND/OR EVERY 10 FEET WITH A MINIMUM OF 3 FEET OF CLEARANCE IN FRONT OF CLEAN-OUT. COORDINATE ROUTING OF DUCTWORK WITH OWNER'S CAPTIVEAIRE REPRESENTATIVE.
- 11 REFER TO HOOD DRAWINGS FOR BALANCE OF MAKEUP AIR AND CONDITIONED SUPPLY AIR.
- 12 PROVIDE YOUNG REGULATOR MODEL 830ACC RECTANGULAR CABLE CONTROLLED OPPOSED BLADE BALANCING DAMPER, MODEL 270-301EZ BOWDEN CABLE CONTROL KIT, AND BCW CONTROL WIRE AND CASINGS. COORDINATE INSTALLATION LOCATION WITH ARCHITECT AND MOUNT CABLE CONTROLLER IN CEILING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- 13 REMOTE BALANCING DAMPER, TYPICAL FOR BALANCING DAMPERS IN HARD CEILING APPLICATIONS.
- 14 PROVIDE RETURN AIR BOOT WITH ACOUSTICAL DUCT LINER. LINER SHALL BE 1" THICK, LONG TEXTILE TYPE FIBER, WITH SURFACE CLEANABLE PER NAIMA DUCT CLEANING GUIDELINES. INSTALL LINER IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS. LAMINATE LINER TO INTERNAL SURFACES OF DUCT IN ACCORDANCE WITH LINER MANUFACTURER'S INSTRUCTIONS. AND FASTEN WITH MECHANICAL FASTENERS. ELBOW END OF RETURN DUCT UP 4".
- 15 EXTEND 3" COMBUSTION AIR AND FLUE IN CEILING SPACE. FIELD VERIFY EXACT ROUTING. EXTEND 3" COMBUSTION AIR AND FLUE UP TO CONCENTRIC VENT THROUGH ROOF ABOVE. COORDINATE FINAL LOCATIONS/SIZES WITH ACTUAL SITE CONDITIONS.
- 16 PROVIDE AIR CURTAIN ABOVE ENTRANCE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- 17 ROUTE SUPPLY AND RETURN AIR DUCT UP THRU ROOF ABOVE AND CONNECT TO ROOFTOP UNIT. REFER TO SHEET M201 FOR CONTINUATION. SEAL WEATHER TIGHT.
- 18 MOUNT SPIRAL DUCT TIGHT TO BOTTOM OF LOW ROOF STRUCTURE APPROXIMATELY 12'-2" AFF. COORDINATE FINAL MOUNTING HEIGHT WITH FIELD CONDITIONS & CLOUD CEILING. DUCTWORK NOT TO ROUTE BELOW 11'-0" AFF IN DINING AREA.
- 19 PROVIDE AUDIOVISUAL REMOTE SMOKE DETECTOR ANNUNCIATOR WITH REMOTE KEY OPERATED RESET FOR SMOKE DETECTOR MOUNTED AT 48" AFF. ALIGN ANNUNCIATOR WITH THERMOSTAT SENSOR WHERE APPLICABLE.
- 20 REMOTE TEMPERATURE AND HUMIDITY SENSORS MOUNTED WITHIN RETURN DUCT FOR RTU-1. WIRE BACK TO THERMOSTAT AT MANAGERS DESK.
- 21 PROVIDE CO2 MEASUREMENT SPECIALISTS RAD-0102-6 REMOTE CO2 STORAGE SAFETY ALARM (OR EQUAL). INSTALL PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE FINAL LOCATION WITH OWNER'S REPRESENTATIVE.
- 22 PROVIDE REMOTE HUMIDITY SENSOR COMPATIBLE WITH THERMOSTAT. MOUNT SENSOR 48" ABOVE FINISHED FLOOR.

### GENERAL NOTES

- 1 CONTRACTOR SHALL PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR AS REQUIRED TO INSTALL A COMPLETE AND OPERABLE HVAC SYSTEM PER THE NEW ARCHITECTURAL LAYOUT AND AS TO COMPLY WITH THE SPECIFICATION. DETAILS, THIS SCOPE OF WORK AND ALL APPLICABLE CODES.
- 2 ALL WORK PERFORMED SHALL CONFORM TO ALL APPLICABLE STATE AND LOCAL CODES.
- 3 IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY ALL EXISTING CONDITIONS AND COORDINATE ALL NEW WORK WITH ALL TRADES PRIOR TO ANY WORK BEING DONE TO ENSURE CONFLICTS DO NOT OCCUR.
- 4 DISRUPTION OF ANY EXISTING SERVICE SHALL BE CLEARED WITH THE OWNER AND SHALL BE PERFORMED AT A TIME AND IN A MANNER SO AS TO CAUSE THE OWNER A MINIMUM OF INCONVENIENCE.
- 5 ALL DUCT SIZES INDICATED ON PLANS AND RISERS ARE CLEAR INSIDE DIMENSIONS. DUCT SIZES NOT SHOWN SHALL BE SIZED TO VELOCITIES NO GREATER THAN UPSTREAM SECTION USING SIMILAR ASPECT RATIOS.
- 6 ALL SUPPLY AIR TAKEOFFS FROM MAIN TRUNK DUCTS ARE TO BE INSTALLED WITH BELL MOUTH FITTINGS OR 45 DEGREE ENTRY TO PROVIDE THE SMOOTHEST AIR FLOW POSSIBLE.
- 7 PROVIDE TURNING VANES IN ALL LOW-PRESSURE 90-DEGREE DUCT TURNS.
- 8 ALL THERMOSTAT LOCATIONS SHALL BE APPROVED BY THE ARCHITECT.
- 9 ALL DUCTS LOCATED ABOVE INACCESSIBLE CEILINGS ARE TO BE BALANCED PRIOR TO CEILING INSTALLATIONS.
- 10 CONTRACTOR SHALL PROVIDE ACCESS DOORS FOR SERVICE AND MAINTENANCE OF ALL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.
- 11 PROVIDE GUIDES, HANGERS, EXPANSION LOOPS AND SUPPLEMENTARY STEEL SUPPORT WHERE REQUIRED FOR ALL PIPING.
- 12 DO NOT PENETRATE KITCHEN EXHAUST HOODS OR DUCTWORK WITH ANY TYPE OF FASTENING ASSEMBLY (I.E. SCREWS, RIVETS).
- 13 IF NOT PAINTED, ALL DUCTWORK SHALL HAVE GASKET A SEAL.
- 14 EXPOSED DUCTWORK IN THE DINING AREA SHALL BE MADE OF ELECTRO-GALVANIZED STEEL (PAINT LOCK). SEE MECHANICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- 15 COORDINATE ACCESS PANEL LOCATIONS WITH ARCHITECTURAL SHEETS.
- 16 PROVIDE GUARDS FOR ANY MECHANICAL EQUIPMENT THAT REQUIRES SERVICE ON ROOF THAT IS LOCATED WITHIN 10'-0" OF A ROOF EDGE. THE TOP OF THE GUARD SHALL BE LOCATED NOT LESS THAN 42" ABOVE THE ELEVATED SURFACE ADJACENT TO THE GUARD.

### HVAC COMMISSIONING

GENERAL CONTRACTOR SHALL HIRE A THIRD PARTY REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY TO DEVELOP A COMMISSIONING PLAN THAT SHALL INCLUDE THE FOLLOWING ITEMS:

- 1 NARRATIVE DESCRIPTION OF ACTIVITIES THAT WILL BE ACCOMPLISHED DURING EACH PHASE OF COMMISSIONING, INCLUDING PERSONNEL INTENDED TO ACCOMPLISH EACH PHASE OF ACTIVITY.
- 2 LISTING OF SPECIFIC EQUIPMENT, APPLIANCES OR SYSTEMS TO BE TESTED AND DESCRIPTION OF TESTS TO BE PERFORMED.
- 3 FUNCTIONS TO BE TESTED, INCLUDING, BUT NOT LIMITED TO CALIBRATIONS AND ECONOMIZER CONTROLS.
- 4 CONDITIONS UNDER WHICH TEST WILL BE PERFORMED. AT MINIMUM, TESTING SHALL AFFIRM WINTER AND SUMMER DESIGN CONDITIONS AND FULL OUTSIDE AIR CONDITIONS.
- 5 MEASURABLE CRITERIA FOR PERFORMANCE.

A PRELIMINARY REPORT OF COMMISSIONING TEST PROCEDURES AND RESULTS SHALL BE COMPLETED AND CERTIFIED BY REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY IN ACCORDANCE WITH REQUIREMENTS OF SECTION C408.2 OF THE ENERGY CONSERVATION CODE AND PROVIDED TO PROJECT OWNER. A COPY OF THE REPORT SHALL BE MADE AVAILABLE TO CODE OFFICIAL IF REQUESTED.

FINAL COMMISSIONING REPORT SHALL BE DUE TO PROJECT OWNER WITHIN 90 DAYS OF RECEIPT OF CERTIFICATE OF OCCUPANCY.

### DEMOLITION NOTES

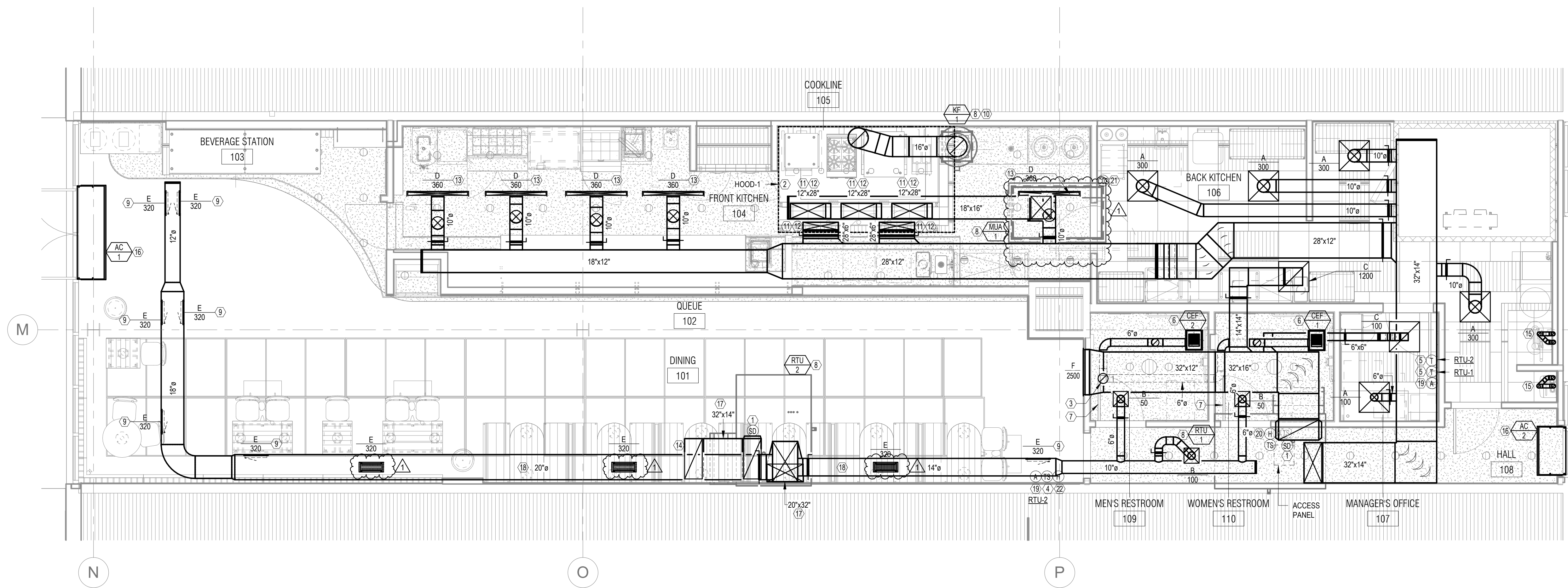
REMOVE ALL EXISTING MECHANICAL EQUIPMENT, DUCTWORK, HANGERS, SUPPORTS, PIPING, AND ACCESSORIES ONLY SERVING THIS SPACE AND NOT INDICATED TO REMAIN. CAP UNUSED ROOF CURBS WITH 18 GAUGE GALVANIZED SHEET METAL CAP. INSULATE CURB CAPS WITH 2" THICK 2 PCF DENSITY DUCT LINER. AND SEAL WATER TIGHT. FIELD VERIFY EXISTING CONDITIONS PRIOR TO BID.

### REMODEL NOTES

THIS DRAWING IS BASED ON BEST AVAILABLE INFORMATION AT TIME OF DESIGN AND MAY NOT REFLECT AS-BUILT CONDITIONS. ALL MECHANICAL INSTALLATIONS INDICATED ON THIS SHEET SHALL BE FIELD VERIFIED PRIOR TO BID AND DEMOLITION.

### EQUIPMENT CLEARANCE NOTES

VERIFY ALL EXISTING EXHAUST OUTLETS WITHIN 10'-0" OF OUTDOOR AIR INTAKES ARE MINIMUM 3'-0" HIGHER THAN OUTDOOR AIR INTAKES. CONTACT THE ARCHITECT AND ENGINEER IMMEDIATELY IF ANY EXISTING EXHAUST OUTLETS WITHIN 10'-0" OF OUTDOOR AIR INTAKES ARE OBSERVED TO BE LESS THAN 3'-0" HIGHER THAN OUTDOOR AIR INTAKES.



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



ferris+sloane  
100 N. Howard Street, Suite 4500, Spokane, WA 99201

CAVA #010514 CHESTNUT HILL, MA  
220 BOYLSTON STREET  
CHESTNUT HILL, MA 02467  
FOR CAVA

CAVA  
14 Ridge Square NW #500, WASHINGTON, DC 20016

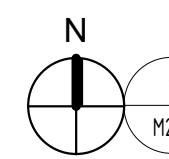
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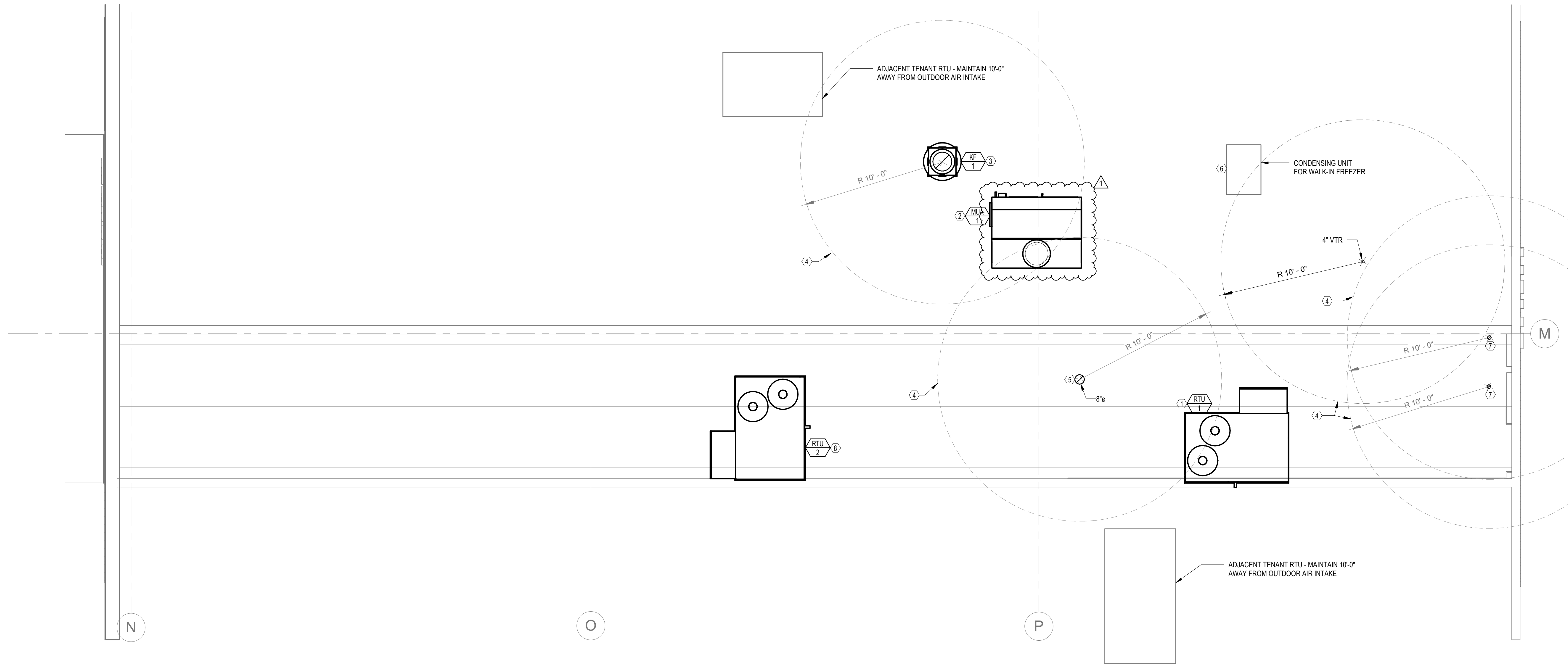
MECHANICAL PLAN

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**MECHANICAL ROOF PLAN**  
SCALE: 1/4" = 1'-0"



**GENERAL NOTES**

- ALL ROOFTOP EQUIPMENT LOCATIONS SHALL BE COORDINATED WITH ROOF DRAINS. REFER TO ARCHITECTURAL AND STRUCTURAL PLANS FOR EXACT LOCATIONS OF EQUIPMENT.
- THE INSTALLING CONTRACTOR SHALL PROVIDE ROOF CURBS AND LEVELING CURBS TO MATCH THE ROOF PITCH IF REQUIRED. THE ROOFING CONTRACTOR SHALL FLASH ALL CURBS INTO ROOF.
- ALL ROOFTOP EQUIPMENT SHALL BE SET ON CURBS OR RAILS. ALL PIPE AND DUCT PENETRATIONS THROUGH THE ROOF SHALL HAVE A WEATHER PROOF CURB OR FLASHING. ALL ROOF FLASHING SHALL BE PERFORMED BY THE ROOFING CONTRACTOR.
- ALL VENTS AND EXHAUSTS SHALL BE LOCATED A MINIMUM OF 10'-0" AWAY FROM FRESH AIR INTAKES PER LOCAL CODE.
- VENT TERMINATIONS PROVIDED BY THE PLUMBING CONTRACTOR SHALL BE 12'-0" MINIMUM FROM ANY AIR INTAKE. EXTEND TERMINATION HEIGHT TO PROVIDE 12'-0" CROSS SECTION CLEARANCE WHERE NEEDED.
- ANY PENETRATION THROUGH THE ROOF SHALL BE COORDINATED WITH THE ROOFING CONTRACTOR.
- ALL STRUCTURAL DUCT OPENINGS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER PRIOR TO CUTTING. INDICATE ON 1/8" SHOP DRAWINGS EXACT LOCATION OF OPENINGS COORDINATED WITH STRUCTURAL TRADES. PROVIDE DUCT ROOF CURBS AT ALL DUCT PENETRATIONS THRU THE ROOF.
- ALL EQUIPMENT SHALL BE A MINIMUM OF 10'-0" AWAY FROM ROOF EDGE IF PARAPET IS LOWER THAN 42" PER CODE.
- ACCESS TO MECHANICAL APPLIANCES INSTALLED IN UNDER-FLOOR AREAS, IN ATTIC SPACES, AND ON ROOFS OR ELEVATED STRUCTURES SHALL BE IN ACCORDANCE WITH THE INTERNATIONAL MECHANICAL CODE.
- EXHAUST TERMINATION OF ENVIRONMENTAL AIR DUCTS SHALL TERMINATE NOT LESS THAN 3'-0" FROM A PROPERTY LINE, 10'-0" FROM A FORCED AIR INLET, AND 3'-0" FROM OPENINGS INTO BUILDINGS.
- CONTRACTOR TO PROVIDE SIGNED AND SEALED WIND LOAD CALCULATIONS (AS APPLICABLE) PRIOR TO INSTALLATION OF ALL ROOF MOUNTED EQUIPMENT AND DUCTWORK.
- PROVIDE ENGINEERED ROOF CURBS AS NEEDED. PROVIDE MINIMUM WIND LOAD CALCULATIONS WITH P.E. CERTIFICATIONS (AS APPLICABLE).
- PROVIDE GUARDS FOR ANY MECHANICAL EQUIPMENT THAT REQUIRES SERVICE ON ROOF THAT IS LOCATED WITHIN 10'-0" OF A ROOF EDGE. THE TOP OF THE GUARD SHALL BE LOCATED NOT LESS THAN 42" ABOVE THE ELEVATED SURFACE ADJACENT TO THE GUARD.

**KEYED NOTES**

- INSTALL OWNER FURNISHED ROOFTOP UNIT ON ENGINEERED CURB. COORDINATE WITH STRUCTURE. SHIM UNIT AND CURB LEVEL FOR PROPER CONDENSATE DRAINAGE. PROVIDE FLEXIBLE CONNECTORS ON SUPPLY AND RETURN AIR DUCT CONNECTIONS.
- INSTALL OWNER FURNISHED MAKEUP AIR UNIT AND ROOF CURB. SHIM UNIT AND CURB LEVEL. PROVIDE FLEXIBLE CONNECTORS ON THE SUPPLY AIR DUCT CONNECTION. TRANSITION TO DUCT SIZE SHOWN ON M101.
- INSTALL OWNER FURNISHED ROOF MOUNTED EXHAUST FAN AND ROOF CURB.
- MAINTAIN A MINIMUM 10'-0" CLEARANCE FROM EXHAUST DISCHARGE TO OUTSIDE AIR INTAKES.
- EXTEND 8" Ø EXHAUST DUCT UP THROUGH ROOF. PROVIDE A ROOF JACK, STORM COLLAR, AND ALL-WEATHER CAP.
- PROVIDE ROOF MOUNTED EQUIPMENT SUPPORT RAILS AND INSTALL OWNER FURNISHED REMOTE CONDENSING UNIT FOR WALK-IN COOLER. INSTALL REFRIGERANT LINE SET, THERMOSTATIC EXPANSION VALVE, SOLENOID VALVE, TEMPERATURE CONTROL, SIGHT GLASS, FILTER DRIER, PRESSURE CONTROL, CRANKCASE HEATER, LOW AMBIENT CONTROLS, AND WEATHER PROOF HOUSING. PROVIDE ROOF RAILS TO SUPPORT CONDENSING UNIT ON ROOF. TRAP AND SLOPE REFRIGERANT LINES PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE PIPE CURB ASSEMBLY FOR ROOF PENETRATIONS. SEAL PIPING PENETRATIONS THROUGH COOLER ROOF.
- PROVIDE WITH NAVIAN GX0000057 CONCENTRIC VENT AT TERMINATION.
- INSTALL OWNER FURNISHED ROOFTOP UNIT ON ENGINEERED ADAPTIVE CURB. COORDINATE WITH STRUCTURE. SHIM UNIT AND CURB LEVEL FOR PROPER CONDENSATE DRAINAGE. PROVIDE FLEXIBLE CONNECTORS ON SUPPLY AND RETURN AIR DUCT CONNECTIONS.

**EQUIPMENT CLEARANCE NOTE**

VERIFY ALL EXISTING EXHAUST OUTLETS WITHIN 10'-0" OF OUTDOOR AIR INTAKES ARE MINIMUM 3'-0" HIGHER THAN OUTDOOR AIR INTAKES. CONTACT THE ARCHITECT AND ENGINEER IMMEDIATELY IF ANY EXISTING EXHAUST OUTLETS WITHIN 10'-0" OF OUTDOOR AIR INTAKES ARE OBSERVED TO BE LESS THAN 3'-0" HIGHER THAN OUTDOOR AIR INTAKES.

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AOR PROJECT NUMBER:  
CAV048

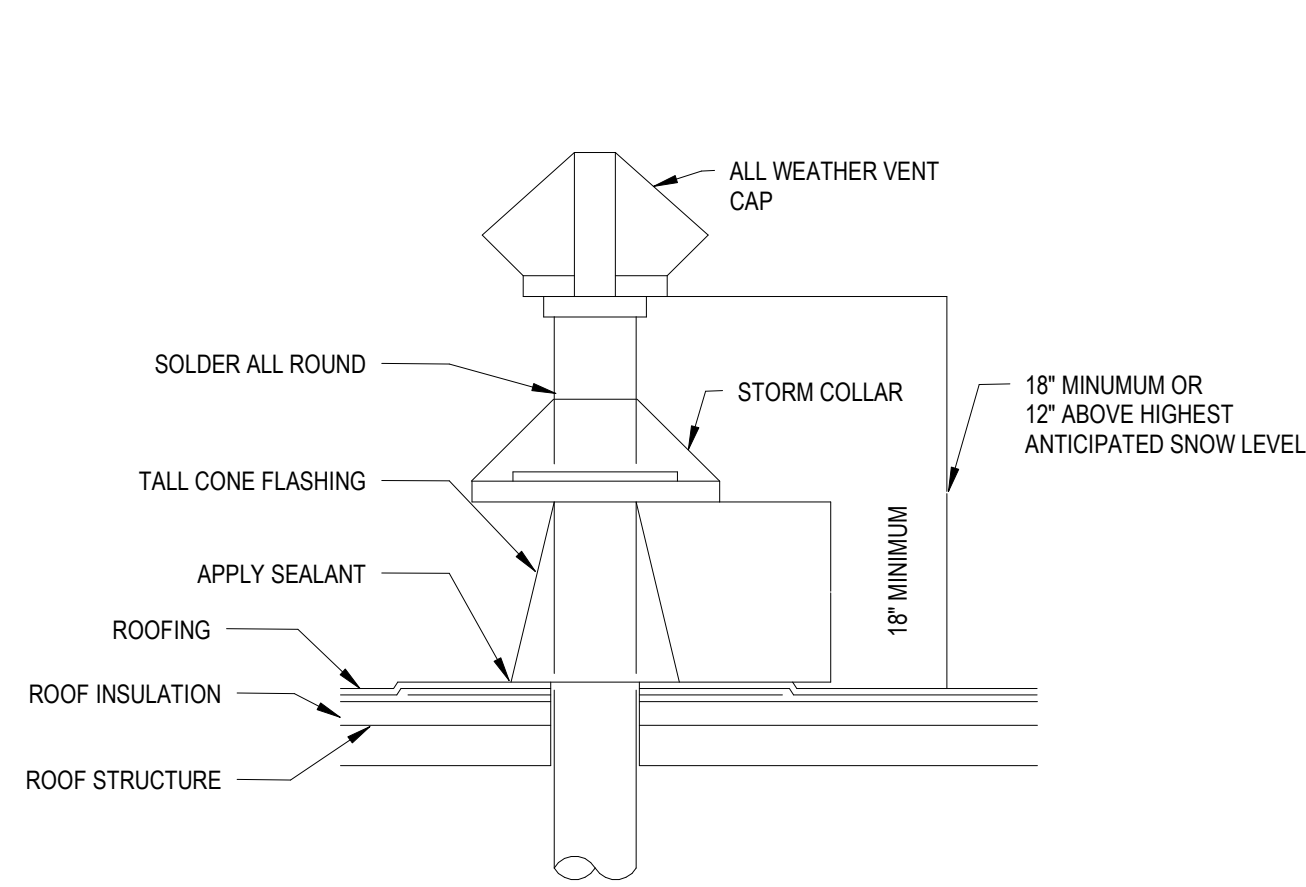
ISSUE	DATE
SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION SET	10/25/24

MECHANICAL ROOF PLAN

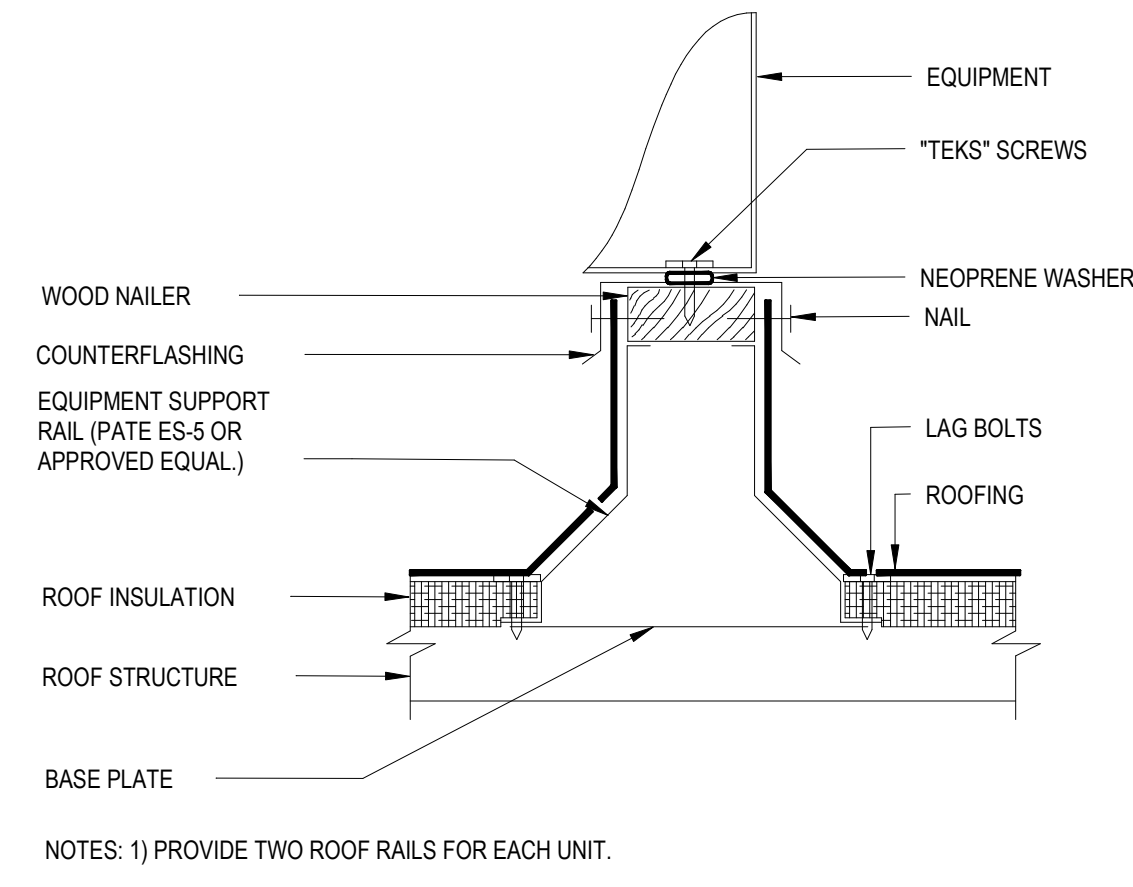
SHEET:

**M201**

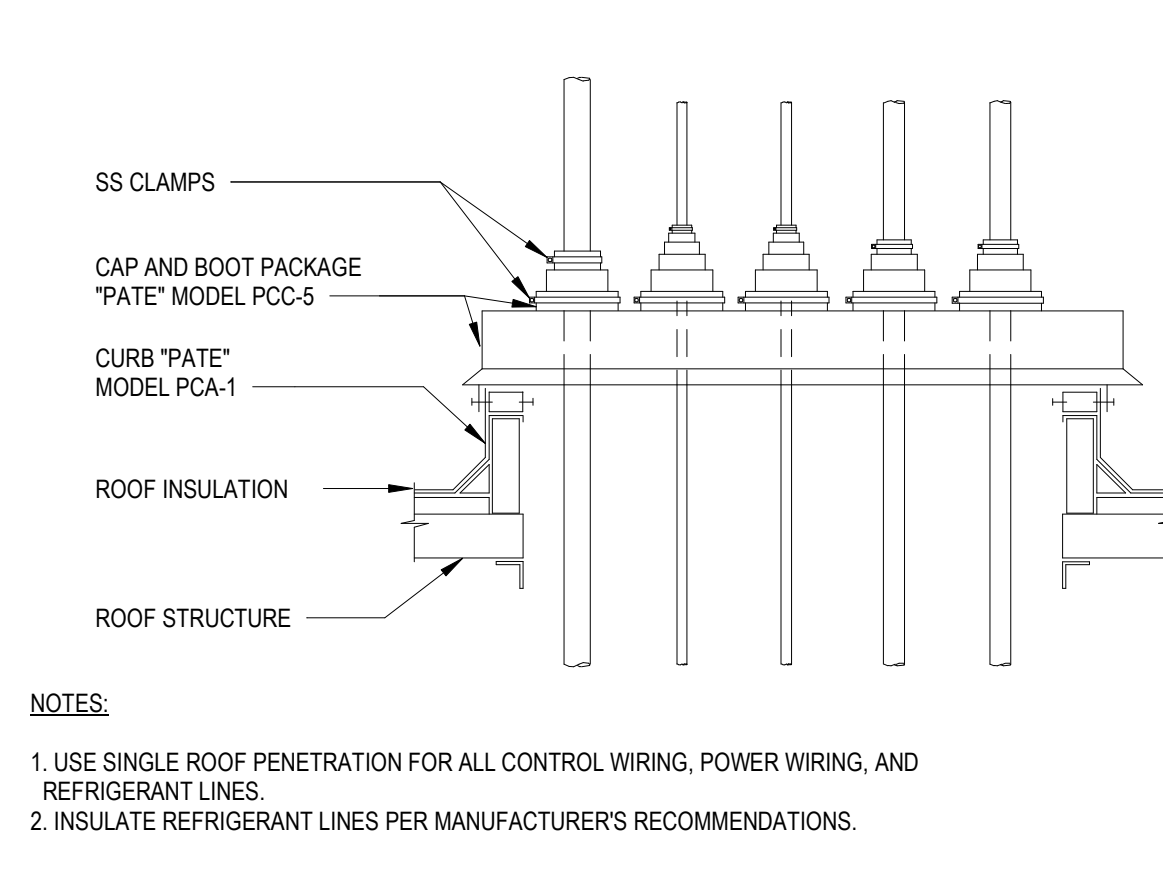




1 DUCT THRU ROOF DETAIL  
SCALE: N.T.S.

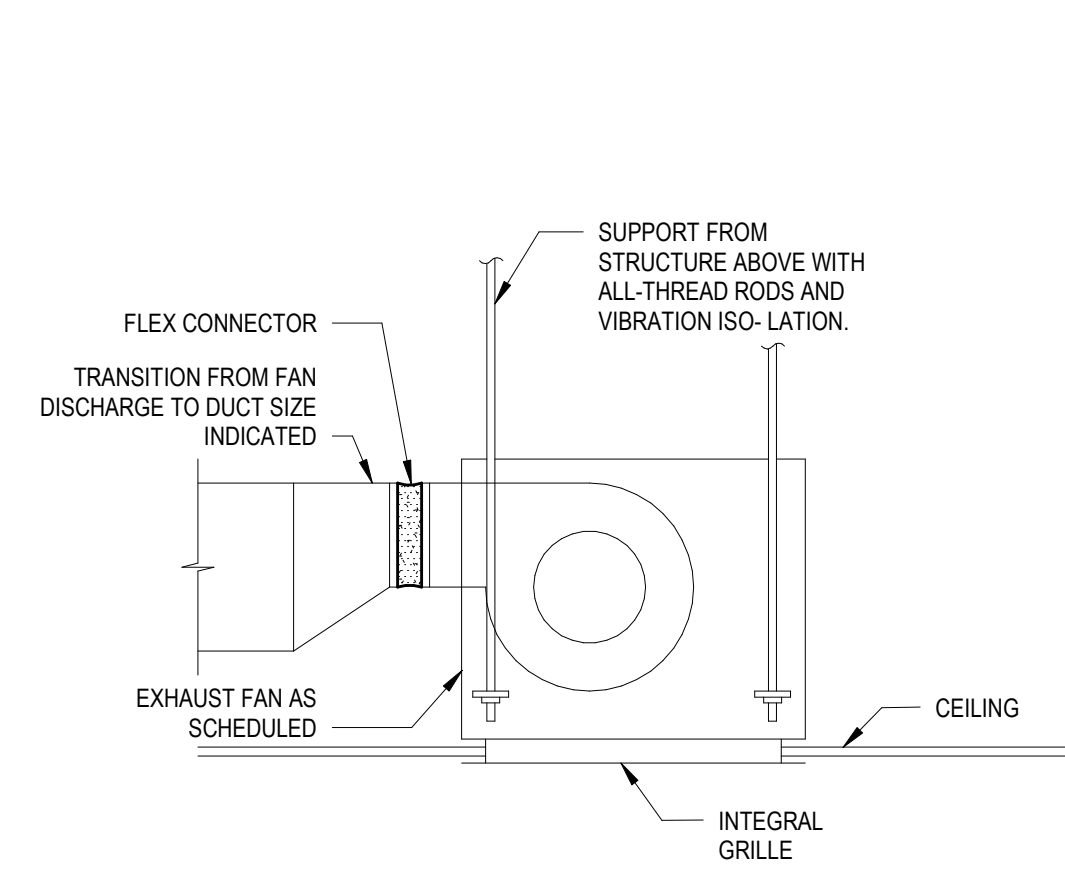


2 EQUIPMENT SUPPORT RAIL DETAIL  
SCALE: N.T.S.

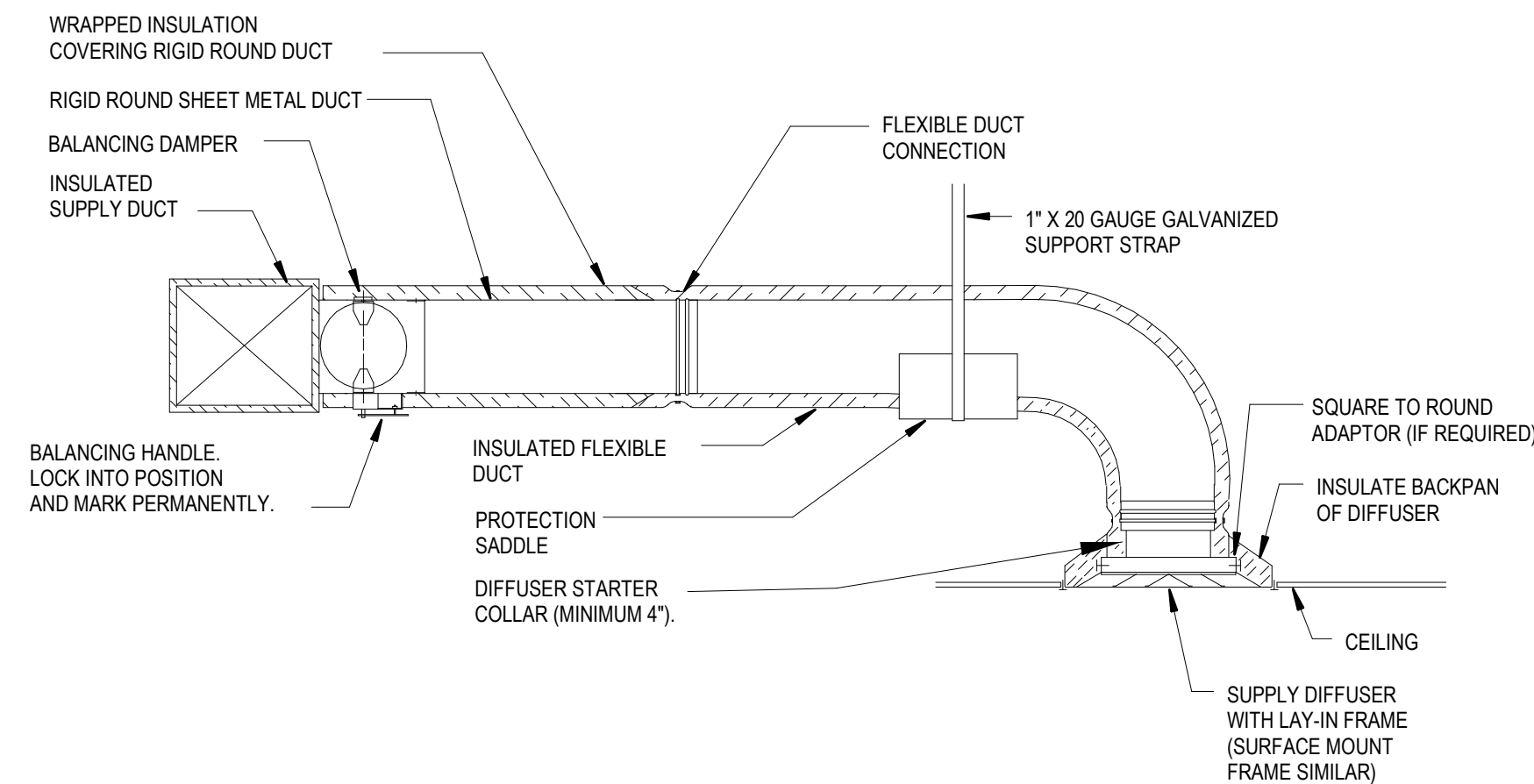


NOTES:  
1. USE SINGLE ROOF PENETRATION FOR ALL CONTROL WIRING, POWER WIRING, AND REFRIGERANT LINES.  
2. INSULATE REFRIGERANT LINES PER MANUFACTURER'S RECOMMENDATIONS.

3 PIPE ROOF PENETRATION DETAIL  
SCALE: N.T.S.

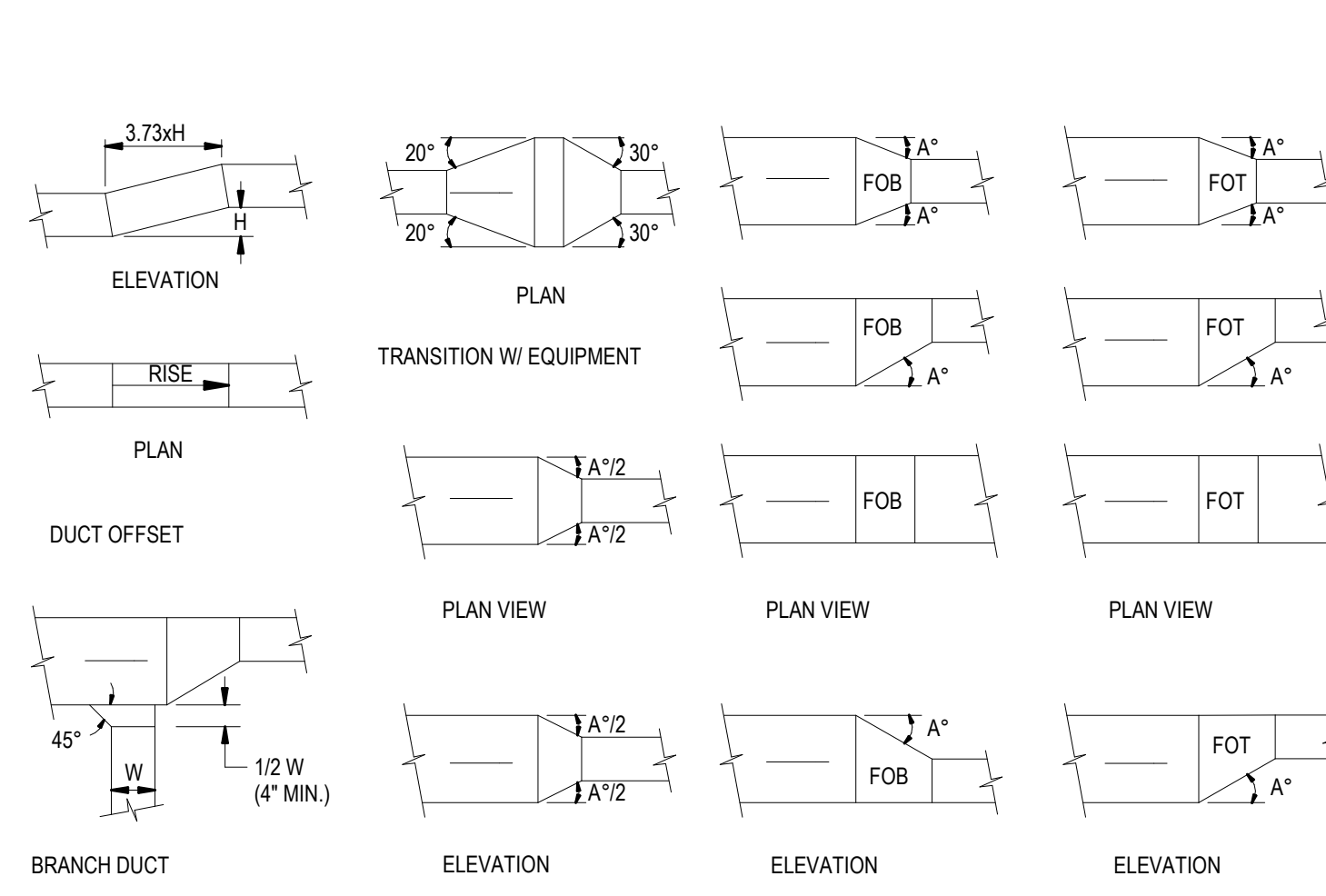


4 TYPICAL CABINET EXHAUST FAN DETAIL  
SCALE: N.T.S.



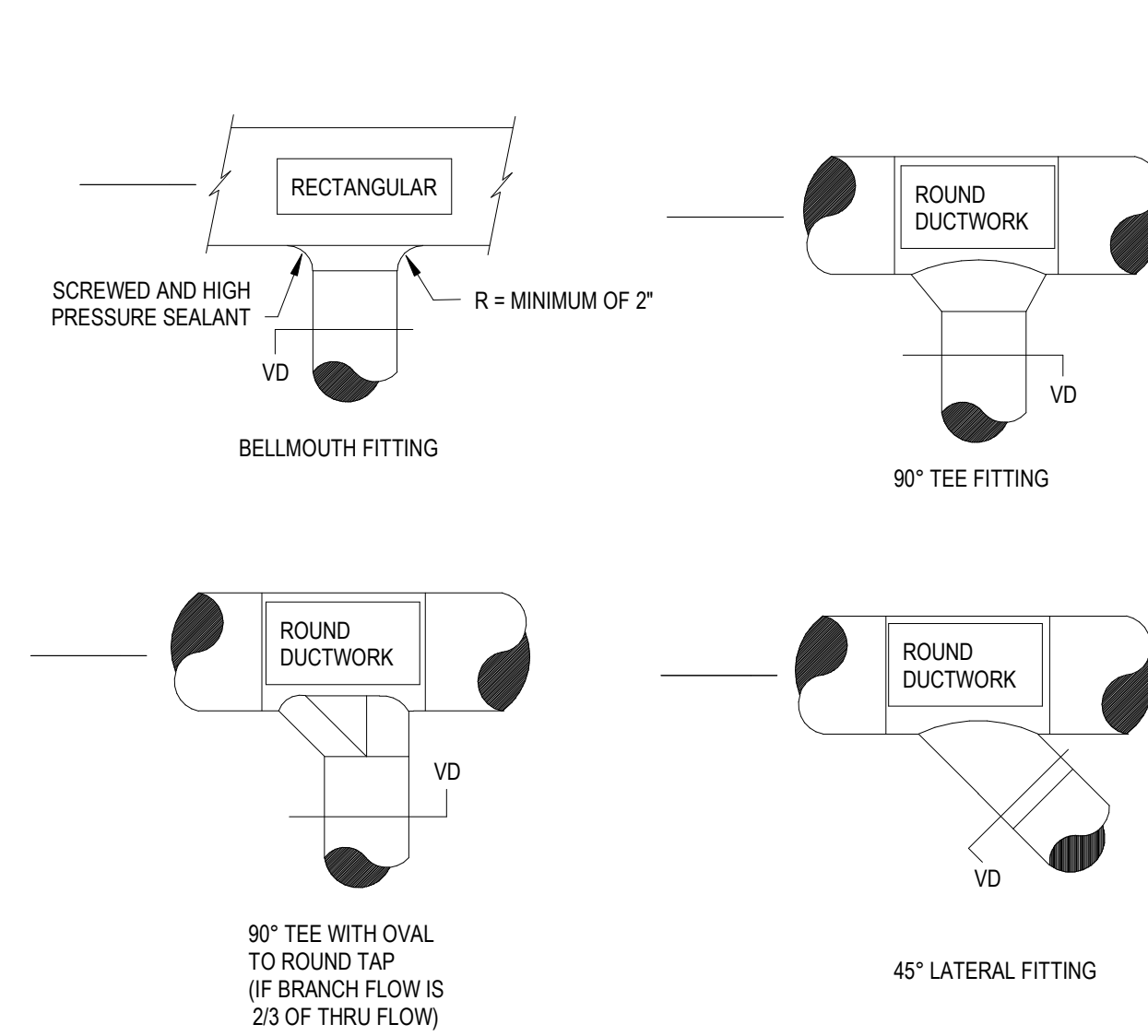
NOTES:  
1. PROVIDE AT FLEXIBLE DUCT CONNECTION METAL OR "PANDUIT" DRAWBAND ON THE INTERIOR FLEXIBLE DUCT HELIX. SECURE THE INSULATION OVER THE DRAW BAND WITH AN ADDITIONAL DRAWBAND.  
2. PROVIDE BEADING ON ROUND METAL DUCT 12" OR LARGER IN DIAMETER.  
3. PROVIDE MINIMUM 4" COLLARS FOR ATTACHMENT OF THE FLEXIBLE DUCT TO ROUND DUCT, DAMPERS AND DIFFUSERS.  
4. BAND RIGID ROUND DUCT INSULATION TO DUCT AND PROVIDE TAPE FOR INSULATION OVERLAP.

5 DIFFUSER CONNECTION DETAIL  
SCALE: N.T.S.

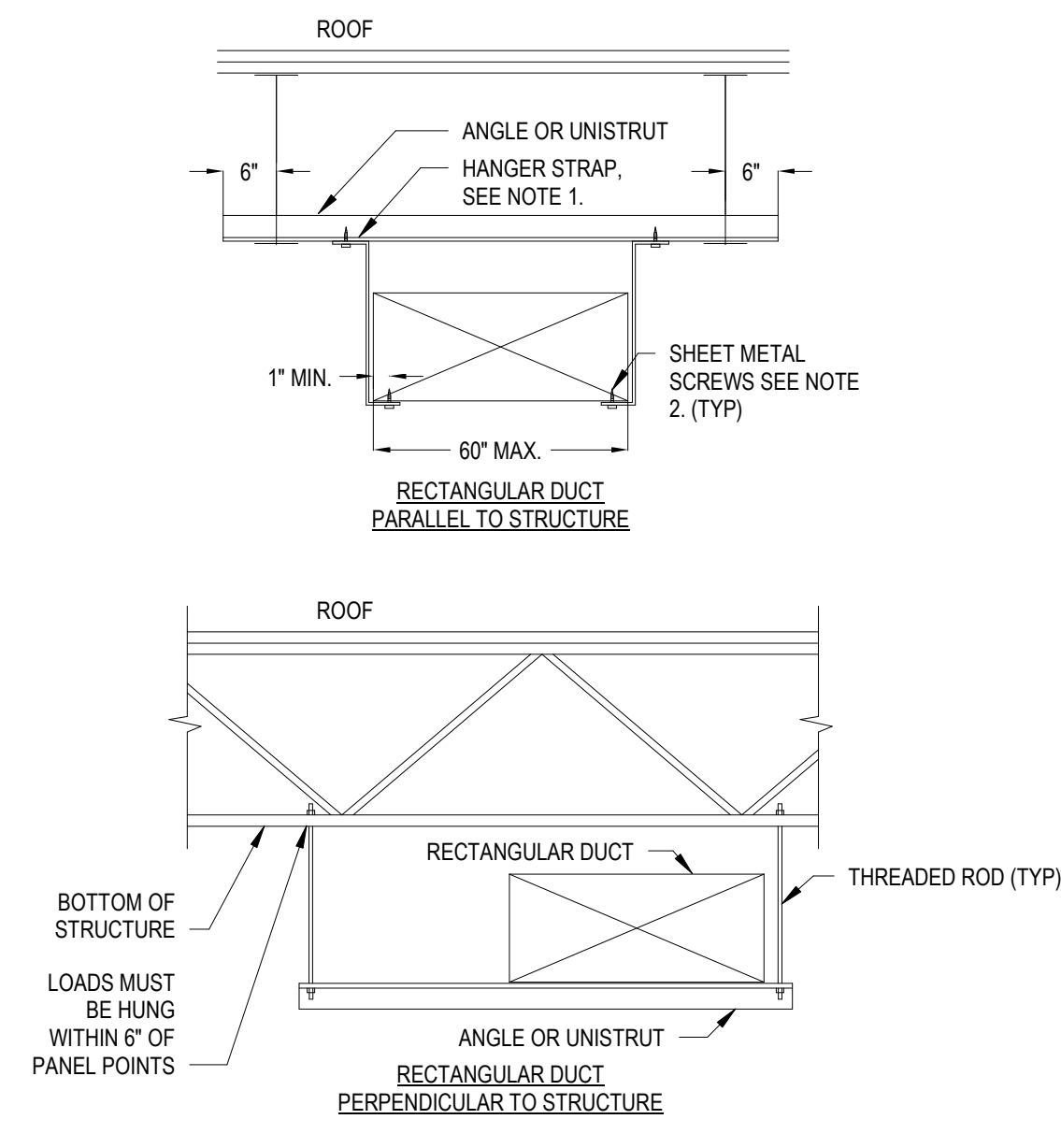


NOTES:  
1. ANGLE A = 30° WHEN AIR FLOWS IN DIRECTION OF ARROW (SUPPLY AIR).  
2. ANGLE A = 20° WHEN AIR FLOWS IN OPPOSITE DIRECTION OF ARROW (RETURN OR EXHAUST).

6 LOW VELOCITY DUCT FITTINGS DETAIL  
SCALE: N.T.S.

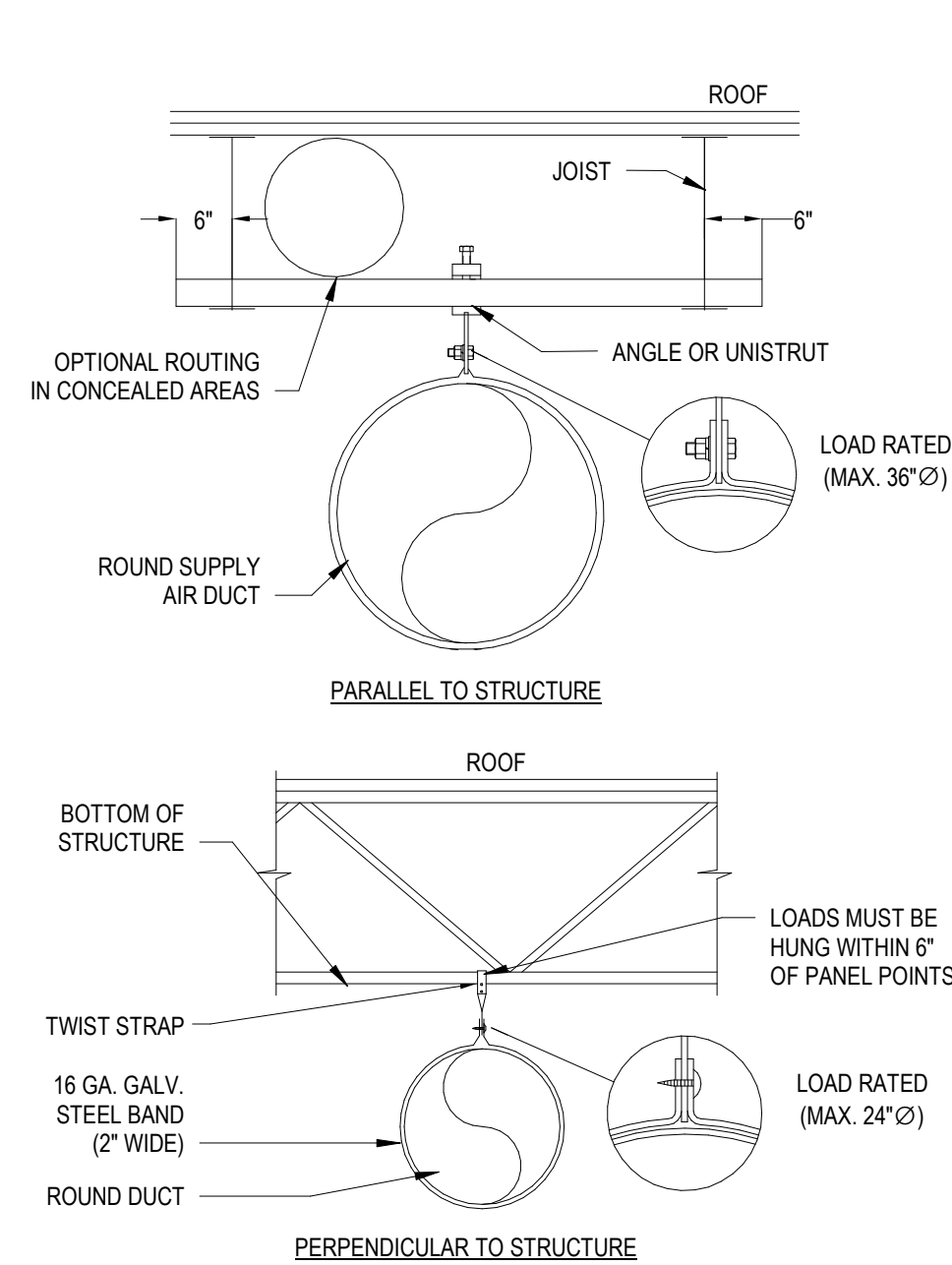


7 ROUND DUCTWORK FITTINGS  
SCALE: N.T.S.



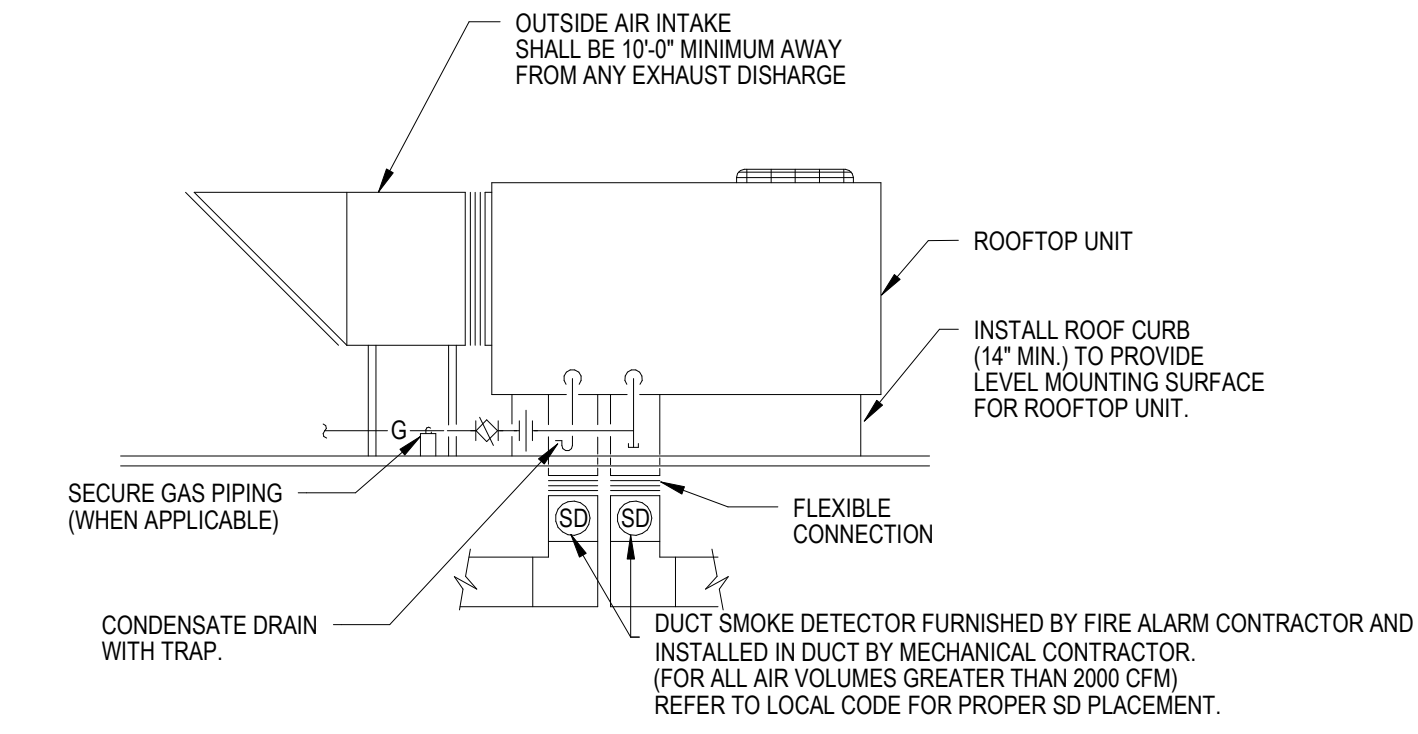
NOTE:  
1. USE THREADED ROD FOR ALL DUCTS LARGER THAN 60\"/>

9 RECTANGULAR DUCT SUPPORT FROM CEILING STRUCTURE/JOISTS DETAIL  
SCALE: N.T.S.

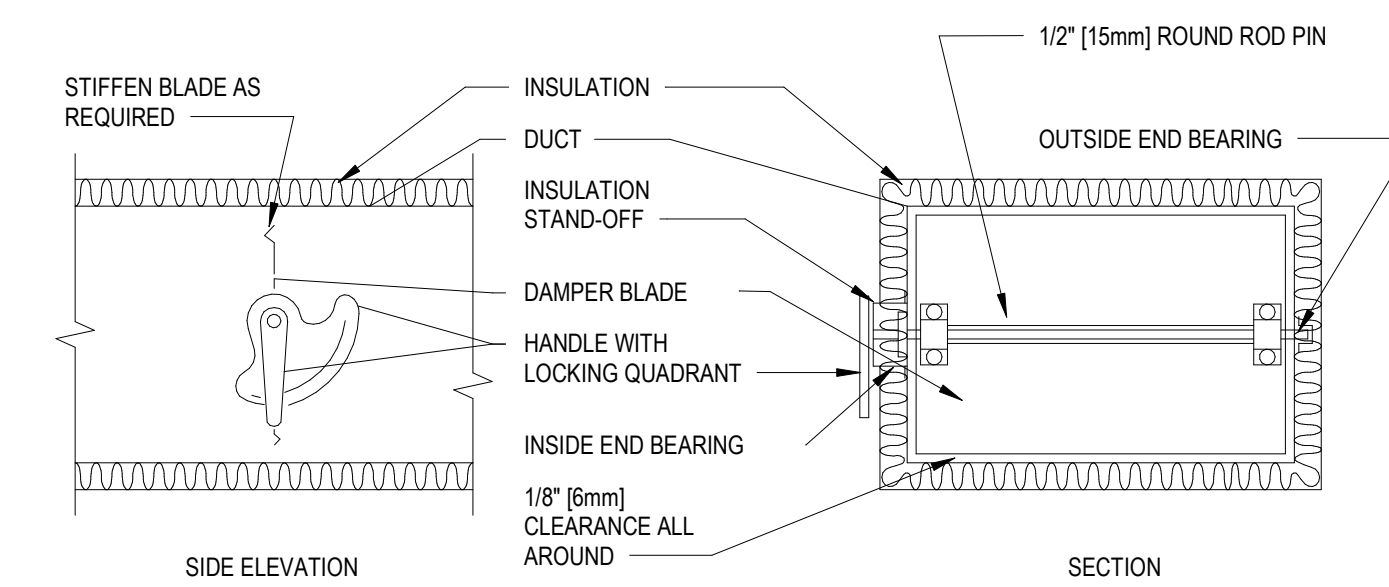


NOTE:  
1. FOR DUCTS LARGER THAN 36\"/>

10 ROUND DUCT SUPPORT DETAIL  
SCALE: N.T.S.

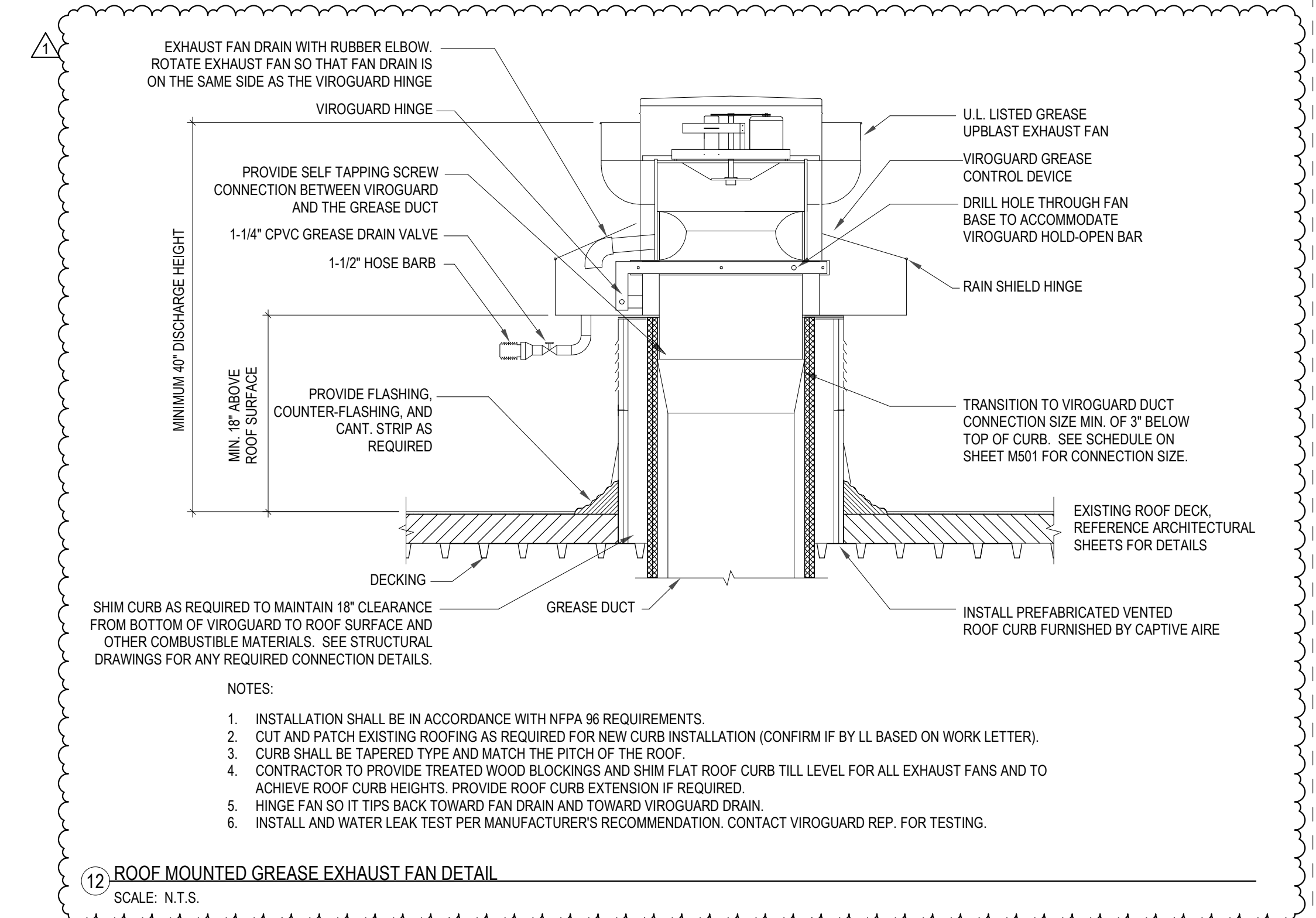


8 ROOF TOP UNIT DETAIL  
SCALE: N.T.S.



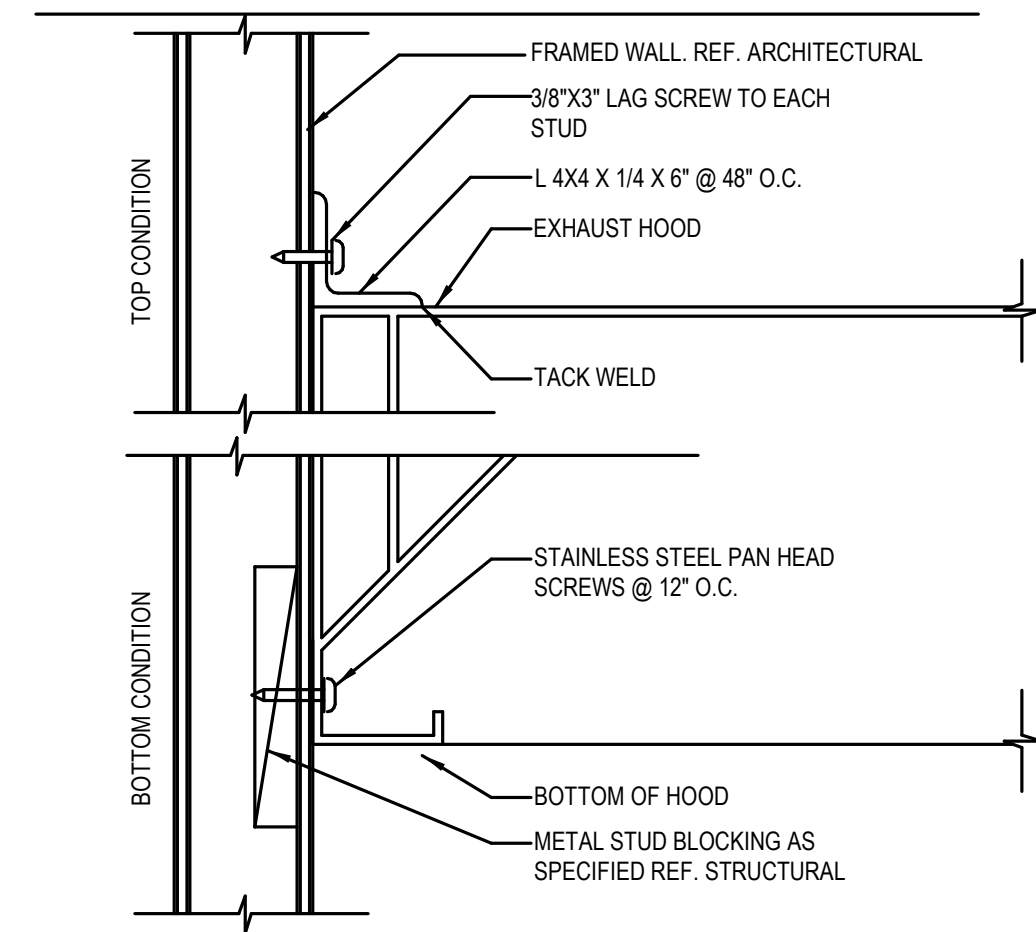
NOTE:  
1. DELETE INSULATION STAND-OFF ON DUCTWORK WITHOUT EXTERIOR INSULATION.  
2. DETAIL SHOWS SINGLE BLADE DAMPER. DAMPER INSTALLATION SHALL BE SIMILAR FOR MULTI-BLADE DAMPERS & ROUND DAMPERS.

11 VOLUME DAMPER DETAIL  
SCALE: N.T.S.

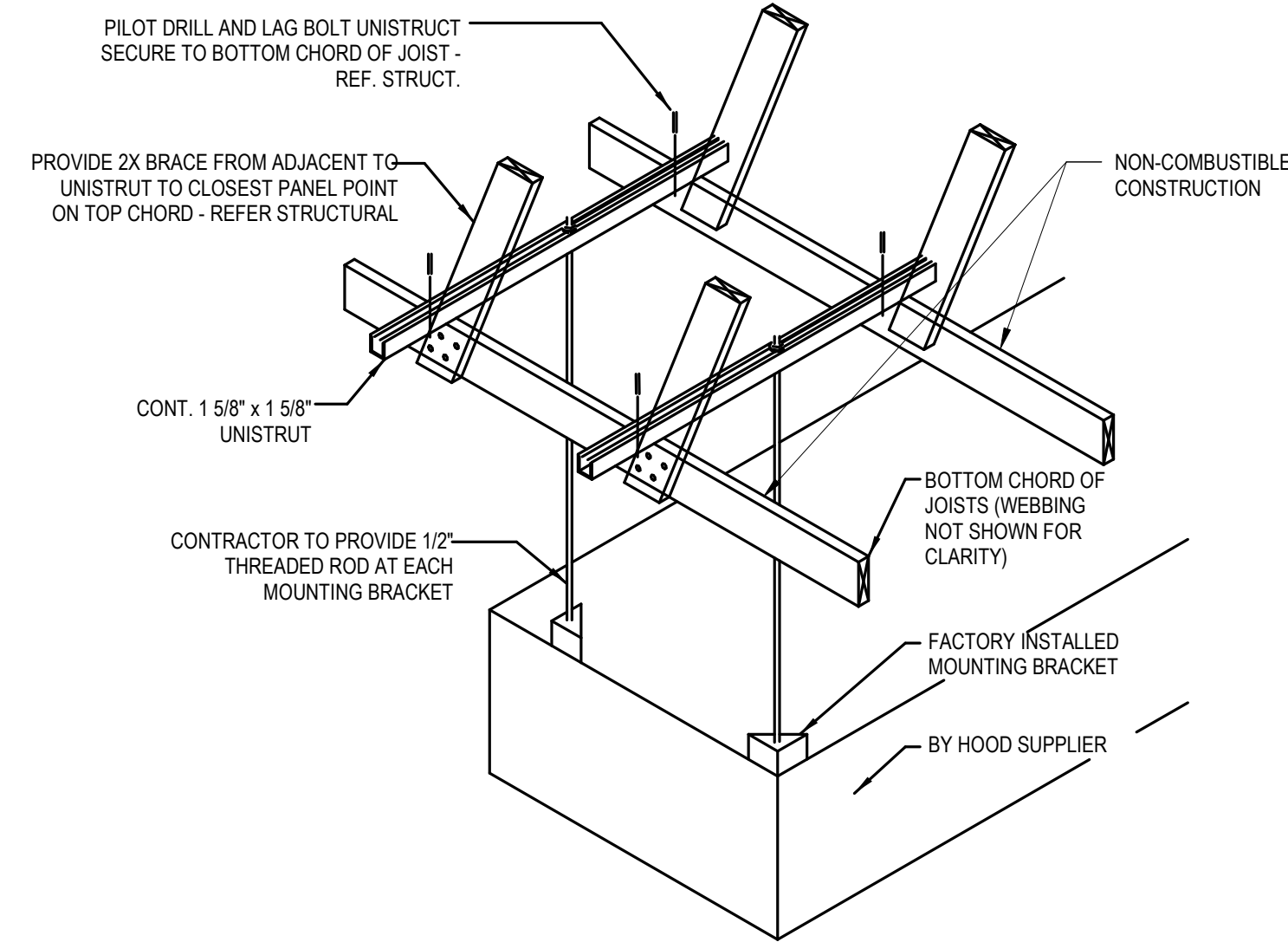


12 ROOF MOUNTED GREASE EXHAUST FAN DETAIL  
SCALE: N.T.S.

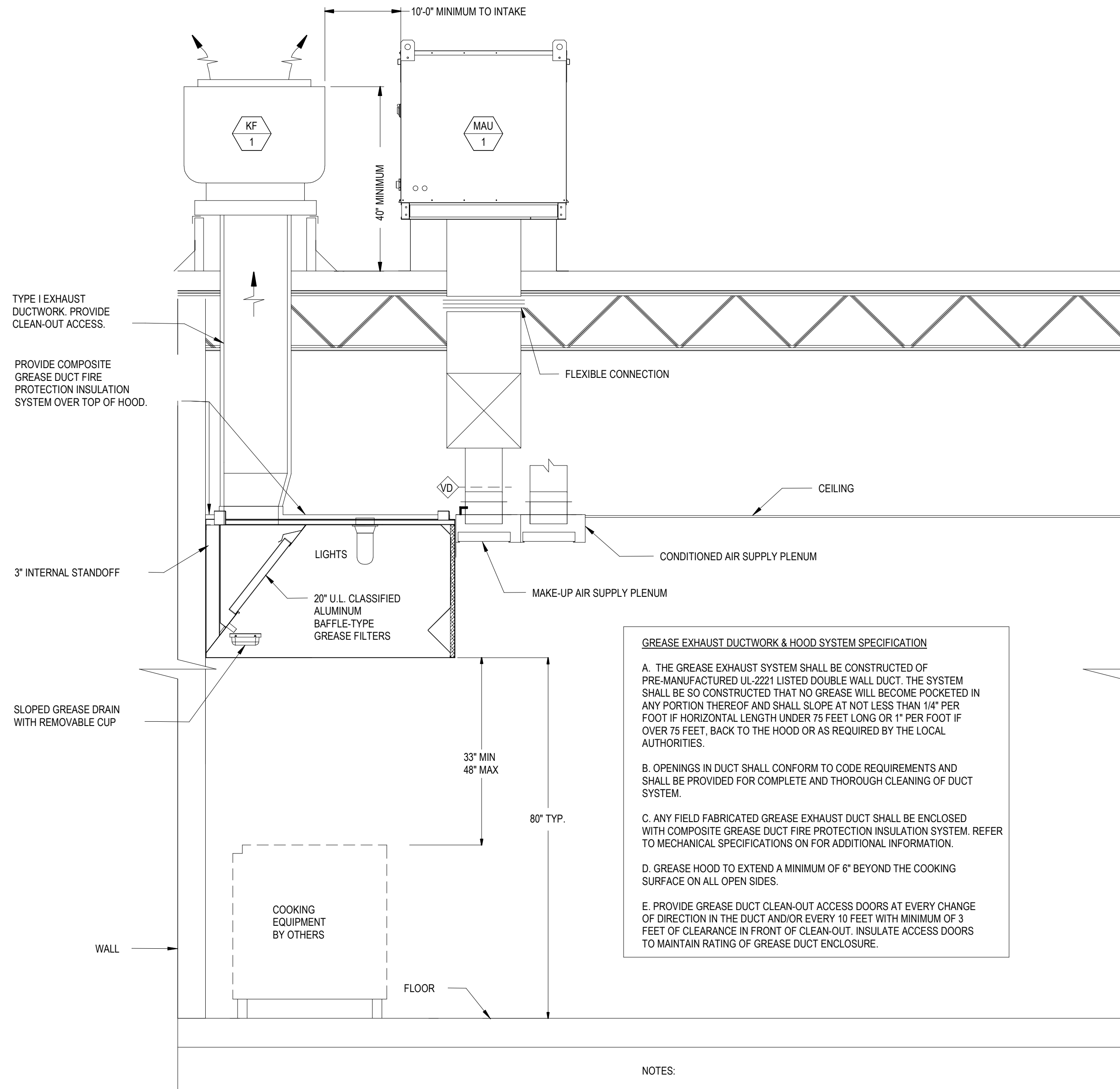
NOTES:  
1. INSTALLATION SHALL BE IN ACCORDANCE WITH NFPA 96 REQUIREMENTS.  
2. CUT AND PATCH EXISTING ROOFING AS REQUIRED FOR NEW CURB INSTALLATION (CONFIRM IF BY LL BASED ON WORK LETTER).  
3. CURB SHALL BE TAPERED TYPE AND MATCH THE PITCH OF THE ROOF.  
4. CONTRACTOR TO PROVIDE TREATED WOOD BLOCKINGS AND SHIM FLAT ROOF CURB TILL LEVEL FOR ALL EXHAUST FANS AND TO ACHIEVE ROOF CURB HEIGHTS. PROVIDE ROOF CURB EXTENSION IF REQUIRED.  
5. HINGE FAN SO IT TIPS BACK TOWARD FAN DRAIN AND TOWARD VIROGUARD DRAIN.  
6. INSTALL AND WATER LEAK TEST PER MANUFACTURER'S RECOMMENDATION. CONTACT VIROGUARD REP. FOR TESTING.



1 TYPICAL HOOD CLIP AT WALL  
SCALE: N.T.S.



2 TYPICAL HOOD SUPPORT AT TRUSS  
SCALE: N.T.S.



**GREASE EXHAUST DUCTWORK & HOOD SYSTEM SPECIFICATION**

A. THE GREASE EXHAUST SYSTEM SHALL BE CONSTRUCTED OF PRE-MANUFACTURED UL-2221 LISTED DOUBLE WALL DUCT. THE SYSTEM SHALL BE SO CONSTRUCTED THAT NO GREASE WILL BECOME POCKETED IN ANY PORTION THEREOF AND SHALL SLOPE AT NOT LESS THAN 1/4\"/>

B. OPENINGS IN DUCT SHALL CONFORM TO CODE REQUIREMENTS AND SHALL BE PROVIDED FOR COMPLETE AND THOROUGH CLEANING OF DUCT SYSTEM.

C. ANY FIELD FABRICATED GREASE EXHAUST DUCT SHALL BE ENCLOSED WITH COMPOSITE GREASE DUCT FIRE PROTECTION INSULATION SYSTEM. REFER TO MECHANICAL SPECIFICATIONS ON FOR ADDITIONAL INFORMATION.

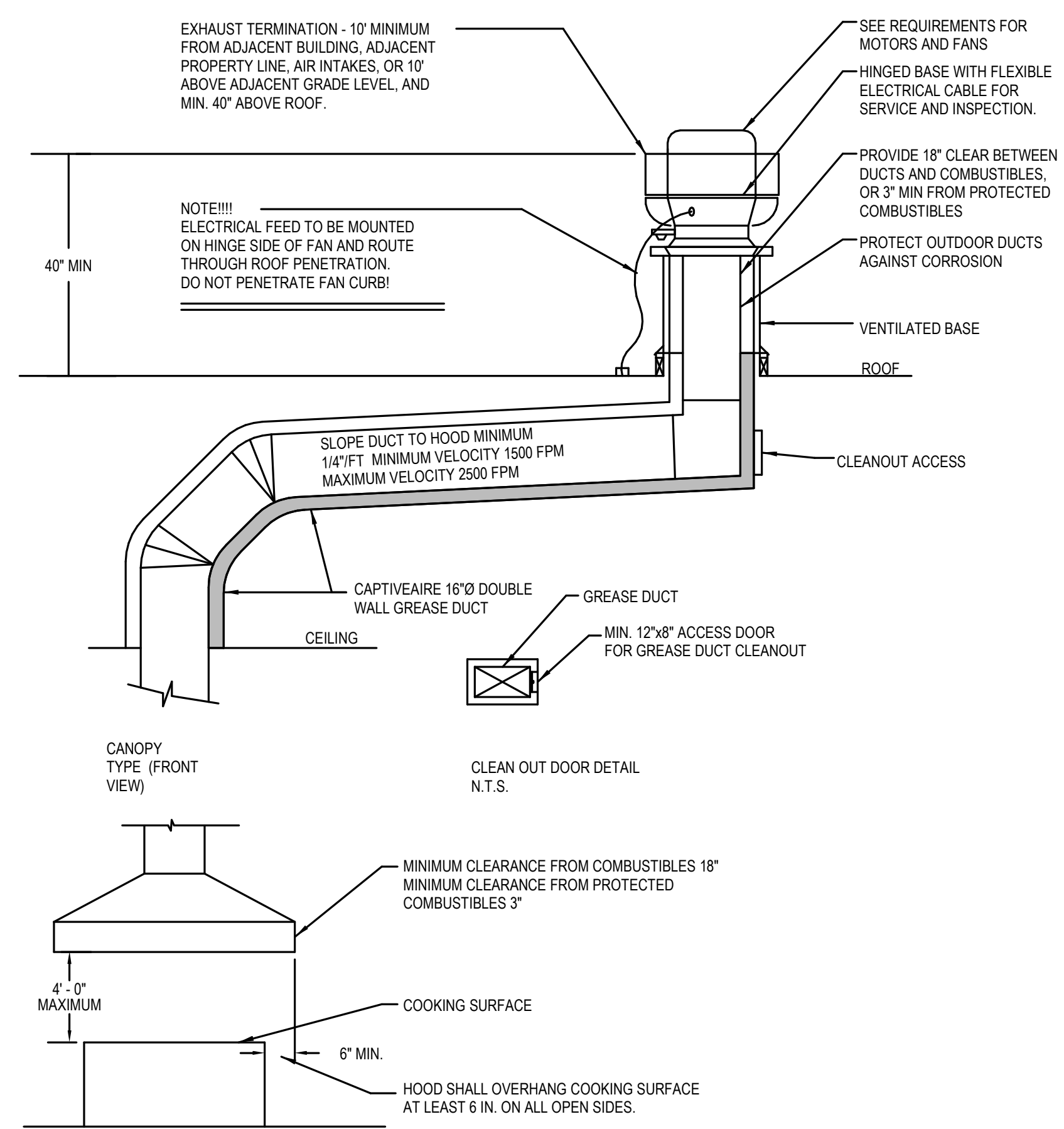
D. GREASE HOOD TO EXTEND A MINIMUM OF 6\"/>

E. PROVIDE GREASE DUCT CLEAN-OUT ACCESS DOORS AT EVERY CHANGE OF DIRECTION IN THE DUCT AND/OR EVERY 10 FEET WITH MINIMUM OF 3 FEET OF CLEARANCE IN FRONT OF CLEAN-OUT. INSULATE ACCESS DOORS TO MAINTAIN RATING OF GREASE DUCT ENCLOSURE.

- NOTES:
1. PROVIDE UL LISTED TYPE 1 EXHAUST HOOD.
  2. THE GREASE HOOD SHALL MEET THE REQUIREMENTS OF THE MECHANICAL CODE, NSF AND NFPA FOR A TYPE I HOOD.
  3. FIRE DEPARTMENT APPROVAL SHALL BE REQUIRED ON FIRE PROTECTION SYSTEM FOR GREASE HOODS AND DUCTS AS REQUIRED BY THE MECHANICAL CODE AND AS REQUIRED BY THE FIRE CODE.
  4. PROVIDE CHEMICAL FIRE SUPPRESSION SYSTEM AS REQUIRED BY NFPA 17A.
  5. PERFORM SMOKE TEST ON GREASE EXHAUST DUCTWORK AFTER DUCTWORK INSTALLATION IS COMPLETE BUT PRIOR TO DUCTWORK CONCEALMENT PER REQUIREMENTS OF LOCAL CODE AUTHORITIES.

3 KITCHEN HOOD SCHEMATIC  
SCALE: N.T.S.

- INFORMATIONAL GUIDE FOR COMMERCIAL COOKING HOODS
1. STAINLESS STEEL TO BE NO. 18 U.S. GAGE.
  2. WHEN GUTTERS ARE PROVIDED THEY SHALL DRAIN TO A COLLECTING PAN WHICH IS READILY ACCESSIBLE FOR CLEANING.
  3. SEE TABLE 507.2.8 FOR MINIMUM DISTANCE BETWEEN LOWER EDGE OF GREASE FILTER AND THE COOKING OR HEATING SURFACE.
  4. GREASE FILTERS SHALL BE OF STEEL CONSTRUCTION AND READILY ACCESSIBLE FOR CLEANING.
  5. ALL JOINTS AND SEAMS SHALL BE GREASE TIGHT.
  6. HOODS SHALL BE SECURELY FASTENED IN PLACE BY INCOMBUSTIBLE SUPPORTS.
- NOTES
1. PROVIDE ADEQUATE CLEANOUT OPENINGS FOR THOROUGH CLEANING OF DUCT SYSTEM.
  2. PROVIDE ADEQUATE MAKE-UP AIR FOR PROPER OPERATION.
  3. PROVIDE A SEPARATE DUCT SYSTEM FOR EACH HOOD.
  4. THICKNESS OF DUCTS SHALL BE:
- | DUCT AREA       | U.S. GAGE STEEL |
|-----------------|-----------------|
| UP TO 4 SQ. FT. | 16 GA           |
| OVER 4 SQ. FT.  | 14 GA           |
5. SUPPORT THE DUCTS AS REQUIRED. DO NOT PENETRATE DUCT WALLS WITH SCREWS, NAILS, ETC.
  6. SECTIONS OF DUCT SHALL NOT CONTAIN GREASE POCKETS.



4 TYPICAL HOOD VENTILATION AND SECTION  
SCALE: N.T.S.

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AOR PROJECT NUMBER:  
CAV048

ISSUE	DATE
SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION SET	10/25/24

MECHANICAL DETAILS

SHEET:

**M402**

**AIR DEVICE SCHEDULE**

TAG	TYPE	MAKE/MODEL	AIR STREAM	MOUNTING TYPE	NECK SIZE	SIZE	REMARKS
A	PERFORATED DIFFUSER	TITUS / PAS	SUPPLY	LAY IN	SEE PLAN	24"X24"	3-5
B	PLAQUE FACE DIFFUSER	TITUS / OMNI	SUPPLY	SURFACE	SEE PLAN	12"X12"	1-5
C	LOUVERED RETURN GRILLE	TITUS / 350RL	RETURN	SEE PLAN	SEE PLAN	24"X24"	1-4
D	LINEAR DIFFUSER	TITUS / FL-25	SUPPLY	SURFACE	10"	48"X5.75"	2,7,8
E	DOUBLE DEFLECTION SUPPLY GRILLE	TITUS / S300FS	SUPPLY	DUCT MOUNTED	SEE PLAN	20"X6"	3,6
F	LOUVERED RETURN GRILLE	TITUS / 350RL	RETURN	SEE PLAN	36"X18"	38"X20"	1-4

- REMARKS:  
 1. PROVIDE WITH INTEGRAL OPPOSED BLADE BALANCING DAMPER FOR DIFFUSERS MOUNTED IN HARD-INACCESSIBLE CEILINGS UNLESS NOTED OTHERWISE.  
 2. PROVIDE WITH SURFACE MOUNTING FRAME WHERE APPLICABLE.  
 3. COORDINATE FINISH AND LOCATION WITH ARCHITECT.  
 4. SEE PLAN FOR INLET SIZE.  
 5. SUPPLY DIFFUSERS TO BE INSULATED VIA FACTORY SYSTEM.  
 6. PROVIDE WITH DOUBLE DEFLECTION CORE AND AN AIR SCOOP DAMPER AT NECK.  
 7. PROVIDE WITH 2.5" SINGLE SLOT, 4'-0" FLOWBAR DIFFUSER WITH 10" INLET PLENUM.  
 8. PROVIDE DIFFUSER WITH REMOTE CABLE OPERATED BALANCING DAMPER.

**PACKAGED GAS HEATING / ELECTRIC COOLING ROOFTOP UNIT SCHEDULE - OWNER FURNISHED**

TAG	MANUFACTURER	MODEL #	AREA SERVED	TONS	EER/SEER/IEER	BLOWER SECTION				COOLING CAPACITY				HEATING CAPACITY				ELECTRICAL DATA				FILTERS	UNIT WEIGHT (LBS)	REMARKS
						CFM	OA CFM	ESP (IN. W.C.)	FAN BHP	REFRIG. TYPE	GROSS (MBH)	SENSIBLE (MBH)	INPUT (MBH)	OUTPUT (MBH)	AFUE (%)	VOLTAGE	MCA	MOCP						
RTU-1	CARRIER	48FCDN12	KITCHEN	10.0	11.0/-15	3,800	380	1.00	2.42	R-410A	118.0	96.2	120/180	98/148	82	480/360	27	30	MERV 8	1,300	1-14, 16			
RTU-2	CARRIER	48FCEN09	DINING	8.5	11.2/-15	3,400	680	1.00	1.75	R-410A	98.0	79.0	120/180	98/148	82	480/360	21	25	MERV 8	1,300	1-3, 5-16			

- REMARKS:  
 1. PROVIDE FACTORY MOUNTED AND WIRED DISCONNECT SWITCH, UN-POWERED CONVENIENCE OUTLET, AND THRU THE BASE ELECTRICAL/GAS.  
 2. PROVIDE 100% OUTSIDE AIR ECONOMIZER WITH ELECTROMECHANICAL CONTROLS. FURNISH WITH CONTROL SENSORS TO BE FIELD INSTALLED.  
 3. PROVIDE FACTORY MOUNTED POWER EXHAUST.  
 4. FURNISH WITH 14" HIGH FACTORY FABRICATED ROOF CURB.  
 5. FURNISH WITH HAIL GUARD TO BE FIELD INSTALLED.  
 6. PROVIDE 5 MINUTE TIME DELAY ON COMPRESSOR RESTART.  
 7. PROVIDE WITH MOTORIZED OA DAMPER SET TO MINIMUM POSITION DURING OPERATION HOURS AND SHUT-OFF DURING OFF HOURS.  
 8. FURNISH WITH MANUFACTURER RECOMMENDED TEMPERATURE AND HUMIDITY SENSOR PER PLANS.  
 9. PROVIDE WITH TWO STAGES OF HEATING.  
 10. PROVIDE WITH HIGH STATIC ECO BLUE FAN. FAN TO BE DIRECT DRIVE VANE AXIAL 2-SPEED FAN TO MEET IECC REQUIREMENTS.  
 11. PROVIDE WITH SINGLE CIRCUIT, 2-STAGE COOLING TO MEET IECC REQUIREMENTS.  
 12. PROVIDE STANDARD CARRIER WARRANTY: 1 YEAR PARTS, 5 YEAR COMPRESSOR PARTS, AND 10 YEAR HEAT EXCHANGER.  
 13. PROVIDE WITH CARRIER'S FACTORY-INSTALLED HUMIDIFIER ADAPTIVE DEHUMIDIFICATION SYSTEM.  
 14. PROVIDE HINGED ACCESS DOORS.  
 15. PROVIDE WITH ADAPTIVE CURB EXACT DIMENSIONS TO BE FIELD VERIFIED.  
 16. PROVIDE R-410A REFRIGERANT IF INSTALLED BEFORE JANUARY 1ST, 2025. PROVIDE A2L REFRIGERANT IF INSTALLED AFTER JANUARY 1ST, 2025.

**KITCHEN EXHAUST FAN SCHEDULE - OWNER FURNISHED**

ITEM TAG	MANUFACTURER	MODEL	TYPE	AIR FLOW (CFM)	EXTERNAL STATIC (IN W.C.)	ELECTRICAL		SERVICE	UNIT WEIGHT (LBS)	REMARKS
						V/PHHZ	FAN MOTOR HP			
KF-1	ECON-AIRE	EADU85H	UTILITY	2275	1.1	115/1/60	1	KITCHEN HOOD	94	1,2,3

- REMARKS:  
 1. PROVIDE WITH 26" HIGH MANUFACTURER RECOMMENDED ROOF CURB.  
 2. INTERLOCK MAU-1 AND RTU-1 TO OPERATE IN OCCUPIED MODE WHILE KITCHEN EXHAUST FANS ARE ENERGIZED.  
 3. PROVIDE FAN WITH ENVIRONMENTAL VIBROGUARD HOOD EXHAUST FAN ROOFTOP CONTAINMENT SYSTEM.

**KITCHEN HOOD SCHEDULE - OWNER FURNISHED**

ITEM TAG	MANUFACTURER	MODEL	HOOD LENGTH	MAX COOKING TEMP (°F)	TOTAL EXHAUST CFM	LIGHTS		MISC		REMARKS
						QTY.	TYPE	FIRE SUPP. SYSTEM	HANGING WEIGHT (LB)	
HOOD-1	CAPTIVEAIRE	6030 ND-2-ACPSF-F	10'-7"	600	2275	5	L55 SERIES E26	YES	1172	1

- REMARKS:  
 1. REFER TO KES AND CAPTIVEAIRE DRAWINGS FOR ACCESSORY INFORMATION.

**EXHAUST FAN SCHEDULE**

ITEM TAG	TYPE	DRIVE	PERFORMANCE			ELECTRICAL			APPROX WEIGHT (LBS)	SERVICE LOCATION	MANUFACTURER	OPERATION	MODEL	REMARKS
			AIR FLOW (CFM)	EXT. STATIC (IN W.C.)	V/PHHZ	FAN MOTOR HP	FAN MOTOR WATTS							
CEF-1	CEILING MOUNTED	DIRECT	125	0.3	120/1/60	-	83	30	WOMEN'S	GREENHECK	REMARK 1	SP-A250	2-5	
CEF-2	CEILING MOUNTED	DIRECT	125	0.3	120/1/60	-	83	30	MEN'S	GREENHECK	REMARK 1	SP-A250	2-5	

- REMARKS:  
 1. FAN SHALL OPERATE ON RESTROOM OCCUPANCY SENSOR. FAN SHOULD TURN OFF 1 MINUTE AFTER RESTROOM IS UNOCCUPIED. ELECTRICAL CONTRACTOR TO WIRE.  
 2. PROVIDE BACKDRAFT DAMPER ON EXHAUST FAN.  
 3. PROVIDE DISCONNECT SWITCH AND VIBRATION ISOLATION.  
 4. PROVIDE MANUFACTURER'S OPTIONAL SPEED CONTROLLER. SPEED CONTROLLER SHALL BE MOUNTED WITHIN FAN HOUSING.  
 5. EQUIPMENT PROVIDED BY MC.

**AIR CURTAIN SCHEDULE**

MARK	AREA SERVED	MANUFACTURER	MODEL	UNIT SPECS					ELECTRICAL			WEIGHT (LBS)	NOTES
				LENGTH (IN)	MAX AIRFLOW (CFM)	HEATING CAPACITY (KW)	FAN QUANTITY	MOTOR HP	V/PH	MCA	MOCP		
AC-1	ENTRY	BERNER	AE08-E-1072EB	76	1,978	8	1.0	0.2	208/1/60	41.0	60	60	ALL
AC-2	HALL 108	BERNER	AE08-E-1036EB	36	904	4	1.0	0.2	208/1/60	21.7	30	100	ALL

- REMARKS:  
 1. EQUIPMENT PROVIDED BY MC.  
 2. PROVIDE UNITS WITH WALL MOUNTING BRACKET, INTEGRAL STARTER AND DISCONNECT SWITCH.  
 3. MOUNT UNIT PER MANUFACTURER'S RECOMMENDATIONS.  
 4. INTERLOCK AIR CURTAIN WITH DOOR LIMIT SWITCH TO ENERGIZE WHEN THE DOOR OPENS.  
 5. PROVIDE AIR CURTAIN WITH MAGNETIC NORMALLY CLOSED DOOR LIMIT SWITCH FOR INSTALLATION ON DOOR.  
 6. PROVIDE WITH INTEGRAL THERMOSTAT AND CONTROLLER. ADJUST CONTROL SET-UP WITH AIR CURTAIN USER MANUAL.  
 7. PROVIDE WITH TIME DELAY MICROSWITCH WITH ADJUSTABLE DELAY TIMERS PRE MOUNTED IN THE AIR CURTAIN CONTROL PANEL.  
 8. PROVIDE WITH POWDER COATED FINISH COLOR AS SELECTED BY THE ARCHITECT.  
 9. C403.4.1.4 HEATED OR COOLED VESTIBULES (MANDATORY) - THE HEATING SYSTEM FOR AIR CURTAINS WITH INTEGRAL HEATING SHALL BE PROVIDED WITH CONTROLS CONFIGURED TO SHUT OFF THE SOURCE OF HEATING WHEN THE OUTDOOR AIR TEMPERATURE IS GREATER THAN 45F.

**AIR BALANCE SCHEDULE**

	RTU-1 (KITCHEN)	RTU-2 (DINING)	MAU-1	KF-1	CEF-1 (WOMEN'S)	CEF-2 (MEN'S)	TOTAL
OUTSIDE AIR FLOW (CFM)	380	680	1979	0	0	0	3039
RETURN AIR FLOW (CFM)	3420	2720	0	0	0	0	6140
SUPPLY AIR FLOW (CFM)	3800	3400	1979	0	0	0	9179
EXHAUST AIR FLOW (CFM)	0	0	0	2275	125.0	125.00	2525
BUILDING PRESSURE (CFM)	380	680	1979	-2275	-125	-125	514
RESULTING BUILDING PRESSURIZATION (CFM)							514

**VENTILATION SCHEDULE**

ROOM NUMBER	ROOM NAME	OCCUPANCY CLASSIFICATION	ZONE FLOOR AREA	ZONE POPULATION	2015 MASSACHUSETTS MECHANICAL CODE				ACTUAL				EQUIPMENT		
					PEOPLE OUTDOOR AIR RATE	AREA OUTDOOR AIR RATE	BREATHING ZONE OUTDOOR AIRFLOW	Ez	REQUIRED OUTDOOR AIRFLOW	E.A. CFM	MAX SUPPLY CFM	OA CFM	EXHAUST CFM	SUPPLY FAN	EXHAUST FAN
101	DINING	DINING	925	45	7.5	0.18	504	0.8	650	-	3100	-	RTU-2	-	
102	QUEUEING	CORRIDOR	135	0	0.0	0.06	8	0.8		-	100	660	-	RTU-2	-
108	HALL	CORRIDOR	125	0	0.0	0.06	8	0.8		-	100	-	-	RTU-2	-
110	WOMENS	PUBLIC BATHROOM	55	1	0.0	0.00	0	0.8		0	70	50	10	125.0	RTU-2 CEF-1
109	MENS	PUBLIC BATHROOM	55	1	0.0	0.00	0	0.8	0	70	50	10	125.0	RTU-2 CEF-2	
104	FRONT KITCHEN	KITCHEN (COOKING)	500	10	7.5	0.12	135	0.8	169	350	2500	250	RTU-1	KF-1	
106	BACK KITCHEN	KITCHEN (NO COOKING)	415	4	7.5	0.12	80	0.8	100	291	1200	120	RTU-1	KF-1	
107	MANAGER OFFICE	OFFICE SPACES	50	1	5.0	0.06	8	0.8	10	-	100	10	RTU-1	-	
TOTAL			2260	61	-	-	734	-	928	781	7200	1050	2525	-	-

**MAKE-UP AIR UNIT SCHEDULE - OWNER FURNISHED**

ITEM TAG	MANUFACTURER	MODEL	CONFIGURATION	DRIVE	AIR FLOW (CFM)	EXTERNAL STATIC (IN W.C.)	DX COOLING				GAS HEATING			ELECTRICAL			WEIGHT (LB)	REMARKS	
							TOTAL (MBH)	SENSIBLE (MBH)	IEER	ISMRE	INPUT (MBH)	OUTPUT (MBH)	BURNER EFF.	V/PHHZ	HP	MCA			MOCP
MUA-1	ECON-AIR	EARTU1-I.200-15-ST-MPU	ROOF MOUNTED	DIRECT	1979	0.75	66.0	42.9	17.9	6.1	184.9	149.7	81%	460/3/60	2	13.4	15	1182	ALL

- REMARKS:  
 1. INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL.  
 2. DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE.  
 3. INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER.  
 4. REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE.  
 5. EC MOTOR CONDENSING FANS.  
 6. ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE.  
 7. SUCTION LINE ACCUMULATOR.  
 8. FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER.  
 9. AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT).  
 10. 81% EFFICIENT FURNACE, WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 6:1 TURNDOWN WITH NG AND 5:1 TURNDOWN WITH LP.  
 11. SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE.  
 12. FULLY MODULATING HOT GAS REHEAT.  
 13. 1" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-4.3 INSULATION-MINIMUM 24GA EXTERIOR W/ 18GA BASE.  
 14. DOWN DISCHARGING RETURN.  
 15. PROVIDE 20" HIGH MANUFACTURER RECOMMENDED ROOF CURB.  
 16. REFER TO ECON-AIR DRAWINGS FOR ADDITIONAL INFORMATION.

10/28/2024 9:06:53 AM

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**CAVA**

CAVA #010514 CHESTNUT HILL, MA  
 220 BOYLSTON STREET  
 CHESTNUT HILL, MA 02467  
 FOR CAVA  
 14 Ridge Square NW #500, WASHINGTON, DC 20016

AOR PROJECT NUMBER:  
CAV048

ISSUE	DATE
SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION SET	10/25/24

MECHANICAL SCHEDULES

SHEET:

**M501**



2800 16th Ave SE | Suite 115 Bellevue, WA 98007  
 T: 847.756.4100 www.rtmec.com

FOR QUESTIONS, CALL THE  
Maryland Mechanical  
REGION 76  
PHONE: (800) 988 - 0881  
EMAIL: reg76@econair.com

**PATENT NUMBERS**

AC-PSP (UNITED STATES) - US PATENT 7963830 B2.  
AC-PSP WALL (CANADA) - CA PATENT 2820509.  
AC-PSP ISLAND (CANADA) - CA PATENT 2520330.

**HOOD INFORMATION - JOB#6994705**

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S)						MUA CFM	AC CFM	HOOD CONSTRUCTION	HOOD CONFIG		
										WIDTH	LENG	HEIGHT	DIA	CFM	VEL				SP	END TO END	ROW
1		6030 ND-2-ACSPSP-F	CAPTIVEAIRE	10' 7"	600 DEG	I	HEAVY	215	2275			4'	16'	2275	1629	-0.753'	1979	714	430 SS WHERE EXPOSED	ALONE	ALONE

**HOOD INFORMATION**

HOOD NO	TAG	FILTER(S)				LIGHT(S)			UTILITY CABINET(S)				FIRE SYSTEM PIPING	HOOD HANGING WEIGHT			
		TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	FIRE SYSTEM			SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY
1		CAPRATE SOLO FILTER	7	20"	16"	85% SEE FILTER SPEC	5	L55 SERIES E26	NO	RIGHT	12"x60"x30"	TANK FS	4.0/4.0	DCV-1111	1 LIGHT 1 FAN	YES	1172 LBS

**HOOD OPTIONS**

HOOD NO	TAG	OPTION
1		FIELD WRAPPER 10.00" HIGH FRONT, LEFT, RIGHT. LEFT END STANDOFF (FINISHED) 1" WIDE 60" LONG INSULATED. RIGHT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS. LEFT WALL AS END PANEL.

**PERFORATED SUPPLY PLENUM(S)**

HOOD NO	TAG	POS	LENGTH	WIDTH	HEIGHT	TYPE	RISER(S)				
							WIDTH	LENG	DIA	CFM	SP
1		Front	140'	24'	6'		MUA	12"	28"	659	0.165"
							MUA	12"	28"	659	0.165"
							MUA	12"	28"	659	0.165"
							AC	6"	28"	357	0.086"
							AC	6"	28"	357	0.086"

**GREASE DUCT & CHIMNEY SPECIFICATIONS:**  
PROVIDE GREASE DUCT EQUAL TO ECON-AIR MODEL "EDW" ROUND 20 GAUGE 430 STAINLESS STEEL DUCTWORK. MODEL "EDW" IS LISTED TO UL-1978 AND IS INSTALLED USING "V" CLAMP LOCKING CONNECTIONS SEALED WITH 3M FIRE BARRIER 2000 PLUS. MODEL "EDW" DOES NOT REQUIRE WELDING PROVIDING IT HAS BEEN INSTALLED PER THE MANUFACTURERS INSTALLATION GUIDE.  
PROVIDE RATED ACCESS DOORS AT EVERY CHANGE IN DIRECTION AND EVERY 12' ON CENTER. PER MANUFACTURERS LISTING MODEL "EDW" HORIZONTAL RUNS LESS THAN 75 FT. CAN BE SLOPED 1/16" PER 12", HORIZONTAL RUNS MORE THAN 75 FT. CAN BE SLOPED 3/16" PER 12". DUCT SHOULD BE SLOPED AS MUCH AS POSSIBLE TO REDUCE THE CHANCE OF GREASE ACCUMULATION IN HORIZONTAL RUNS.  
  
IF THE DUCT OR CHIMNEY IS WITHIN 18 INCHES OF COMBUSTIBLE MATERIAL, PROVIDE UL-2221 OR UL-103 HT LISTED DOUBLE WALL GREASE DUCT OR DOUBLE WALL CHIMNEY EQUAL TO ECON-AIR MODEL "EDW- 2R, 2R TYPE HT, 3R, OR 3Z" ROUND 20 GAUGE 430 STAINLESS INNER DUCT INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL.

ECON-AIR RECOMMENDS THE USE OF LISTED, PRE-FABRICATED ROUND GREASE EXHAUST DUCT TO REDUCE STATIC PRESSURE IN THE SYSTEM, MINIMIZE INSTALLATION AND INSPECTION TIMES, AND ENSURE DUCT IS LIQUID TIGHT

**HVAC DISTRIBUTION NOTE**  
HIGH VELOCITY DIFFUSERS OR HVAC RETURNS SHOULD NOT BE PLACED WITHIN TEN (10) FEET OF THE EXHAUST HOOD. PERFORATED DIFFUSERS ARE RECOMMENDED.

**VERIFY CEILING HEIGHT**  
\_\_\_\_' - \_\_\_\_"  
  
HEIGHT REQUIRED TO VERIFY THAT HOOD FITS SPACE AND TO SIZE THE ENCLOSURE PANELS

**CUSTOMER APPROVAL TO MANUFACTURE:**

APPROVED AS NOTED	<input type="checkbox"/>
APPROVED WITH NO EXCEPTION TAKEN	<input type="checkbox"/>
REVISE AND RESUBMIT	<input type="checkbox"/>
SIGNATURE _____	
YOUR TITLE _____	DATE _____

**SPECIFICATION: CAPRATE® GREASE-STOP® SOLO FILTER**

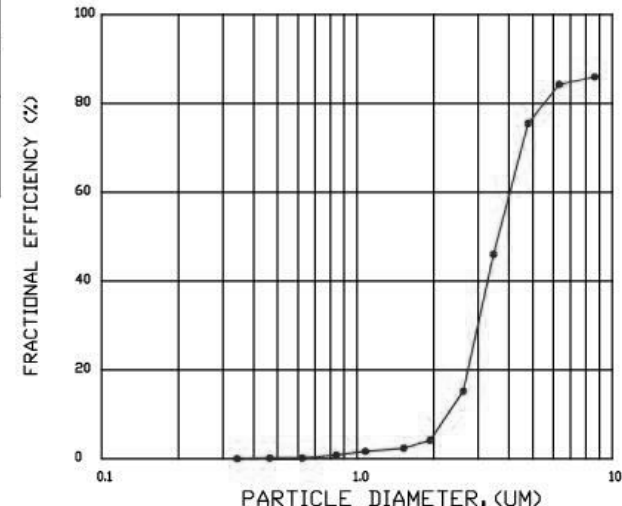
THE CAPRATE GREASE-STOP SOLO FILTER IS A SINGLE-STAGE FILTER FEATURING A UNIQUE S-BAFFLE DESIGN IN CONJUNCTION WITH A SLOTTED REAR BAFFLE DESIGN, TO DELIVER EXCEPTIONAL FILTRATION EFFICIENCY.

FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNEL(S).

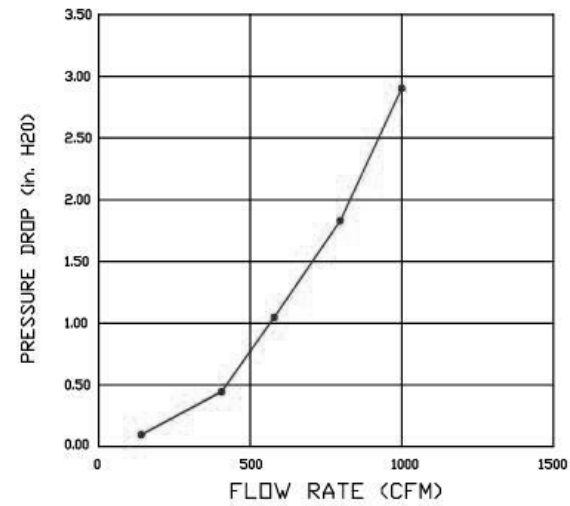
UNITS SHALL INCLUDE STAINLESS STEEL HANDLES AND A FASTENING DEVICE TO SECURE THE TWO COMPONENTS WHEN ASSEMBLED.

GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 85% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 1.0 INCHES OF WATER GAUGE. THE CAPRATE GREASE-STOP SOLO WAS TESTED TO ASTM STANDARD ASTM F2819-05. MANUFACTURER APPROVED FOR USE IN SOLID FUEL APPLICATIONS AS A SPARK ARRESTER.

**EFFICIENCY VS. PARTICLE DIAMETER**



**PRESSURE DROP VS. FLOW RATE**



CAPRATE FILTERS ARE BUILT IN COMPLIANCE WITH:  
NFPA #96.  
NSF STANDARD #2.  
UL STANDARD #1046.  
INT. MECH. CODE (IMC).  
ULC-S649.



REVISIONS	
DESCRIPTION	DATE

**econ·air**  
Maryland Mechanical  
8120 Woodmont Avenue, Suite 720, Bethesda, MD, 20814 PHONE: (800) 988 - 0881 FAX: 9192275831 EMAIL: reg76@econair.com

Cava - Chestnut Hill, MA\_R1  
220 Boylston Street,  
Newton, MA, 02467

**DATE:** 10/23/2024  
**DWG.#:** 6994705  
**DRAWN BY:** ABS-76  
**SCALE:** NTS  
**MASTER DRAWING**

**SHEET NO.**  
1

ferris+sloane  
100 N. Howard Street, Suite 4565 Spokane, WA 99201



**CAVA**

CAVA #010514 CHESTNUT HILL, MA  
220 BOYLSTON STREET  
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14 Ridge Square NW #500, WASHINGTON, DC 20016

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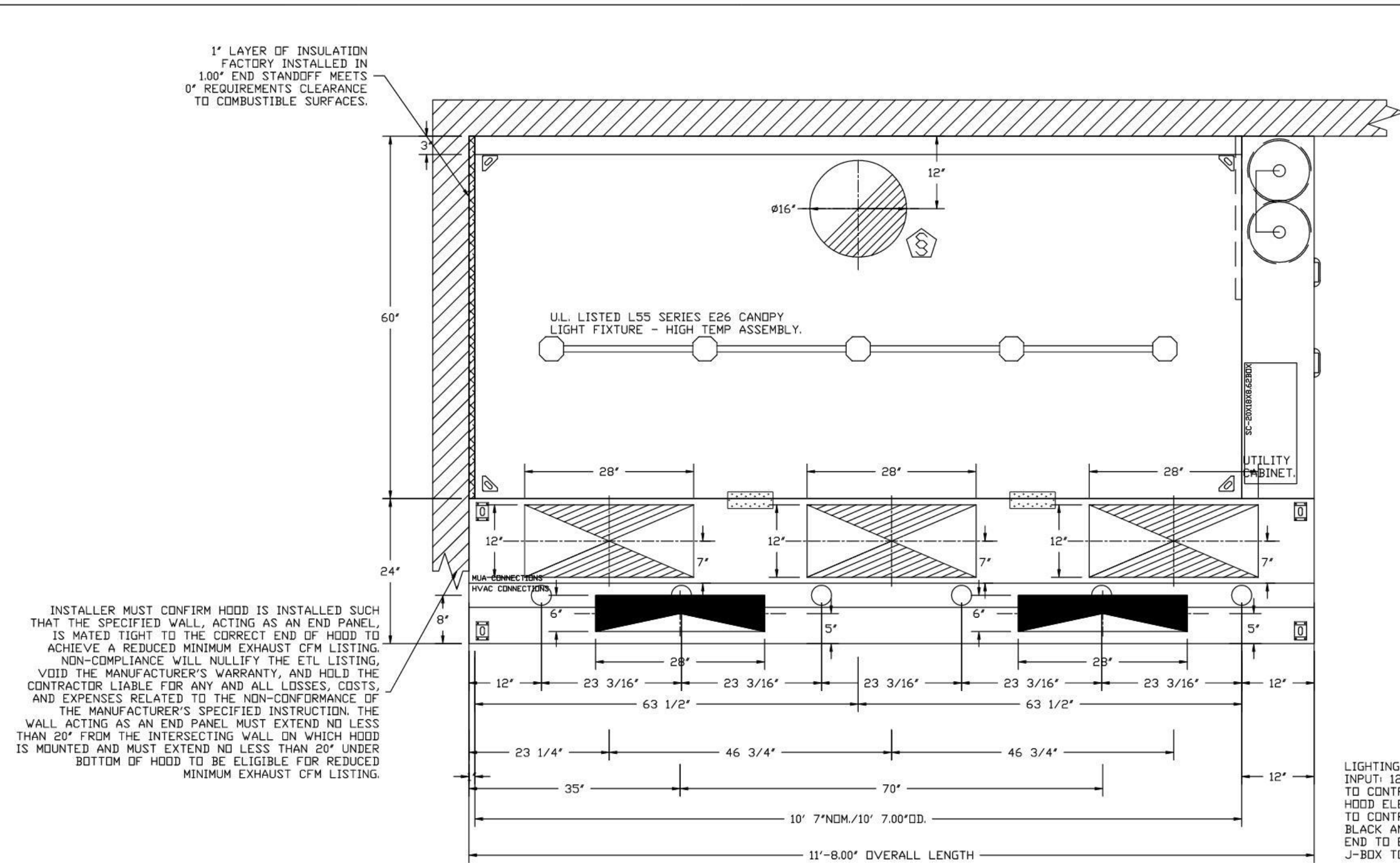
ISSUE	DATE
SD SET	03.08.2024
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CONSTRUCTION SET	10/25/24

MECHANICAL HOOD DETAIL PLAN

SHEET:  
**M601**

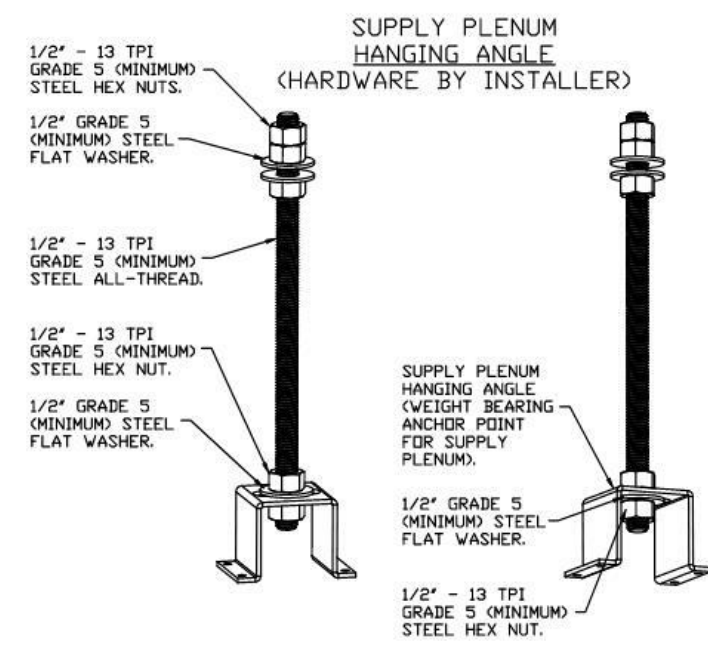


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PLAN VIEW - HOOD #1  
10' 7.00\"/>

ACPSP SHIPS LOOSE FOR FIELD INSTALLATION



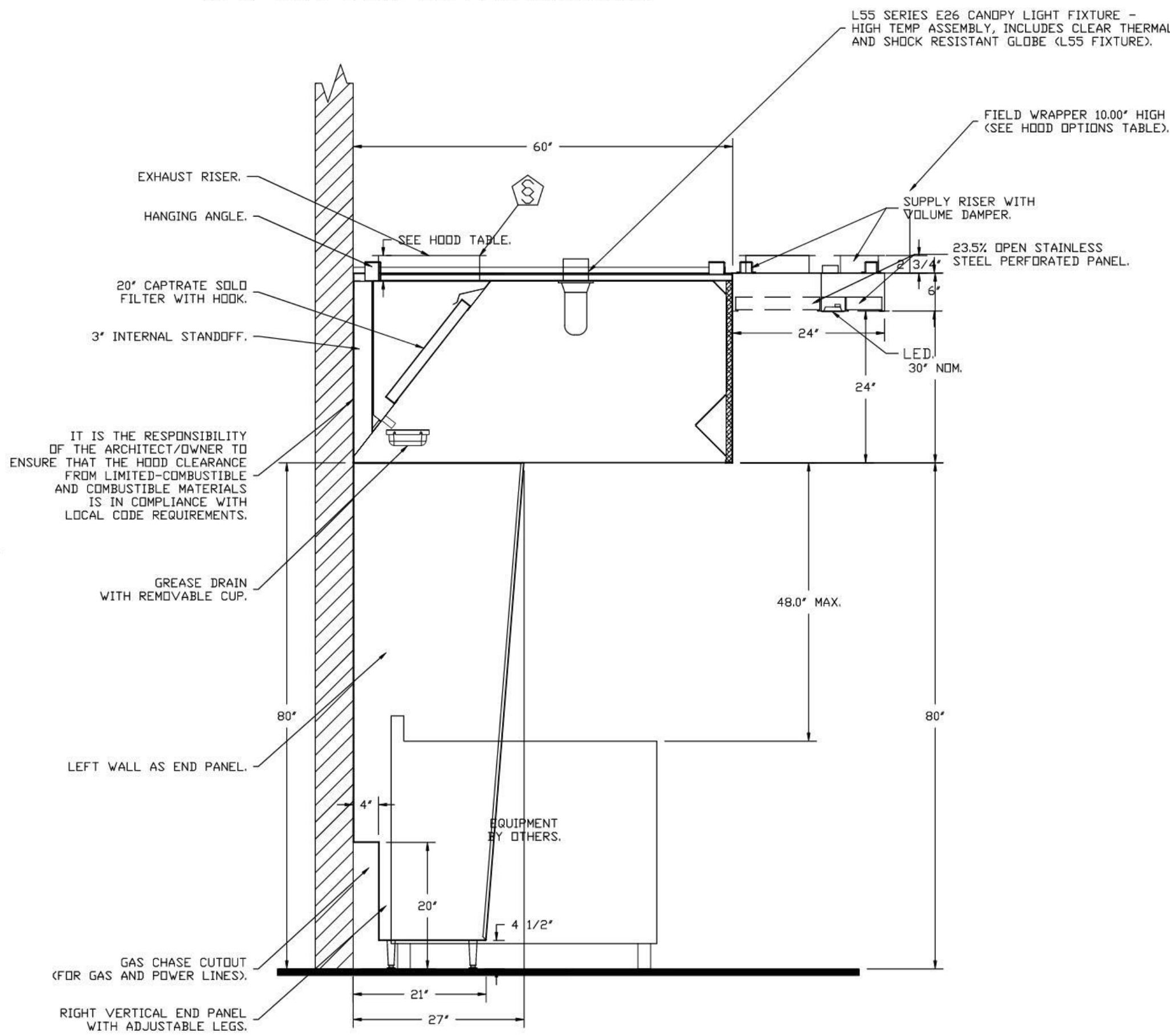
ASSEMBLY INSTRUCTIONS

HANGING ANGLE MUST BE SUPPORTED WITH 1/2\"/>

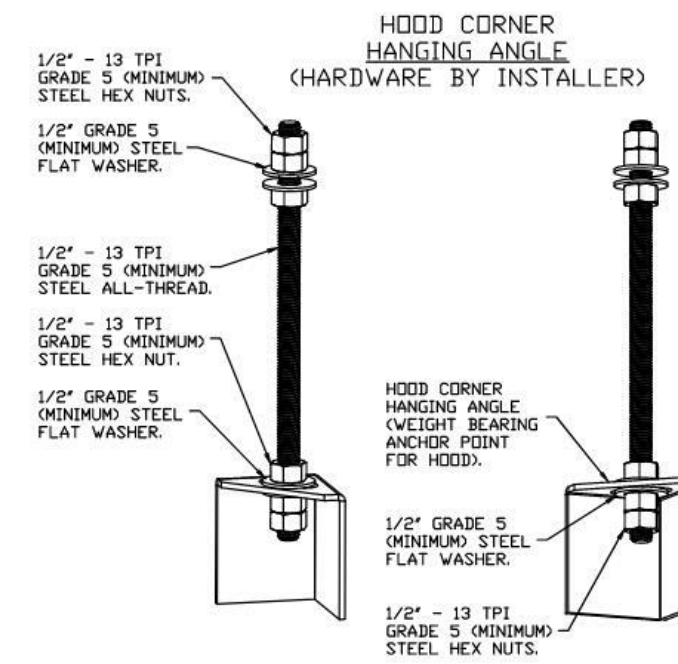
**CLEARANCE TO COMBUSTIBLES**

HOODS #	SURFACE	*CLEARANCE
1	TOP	18"
	FRONT	0"
	BACK	18"
	LEFT	0"
	RIGHT	0"

- \*0\"/>
- HOOD MOUNTED UTILITY CABINETS REQUIRE 36\"/>

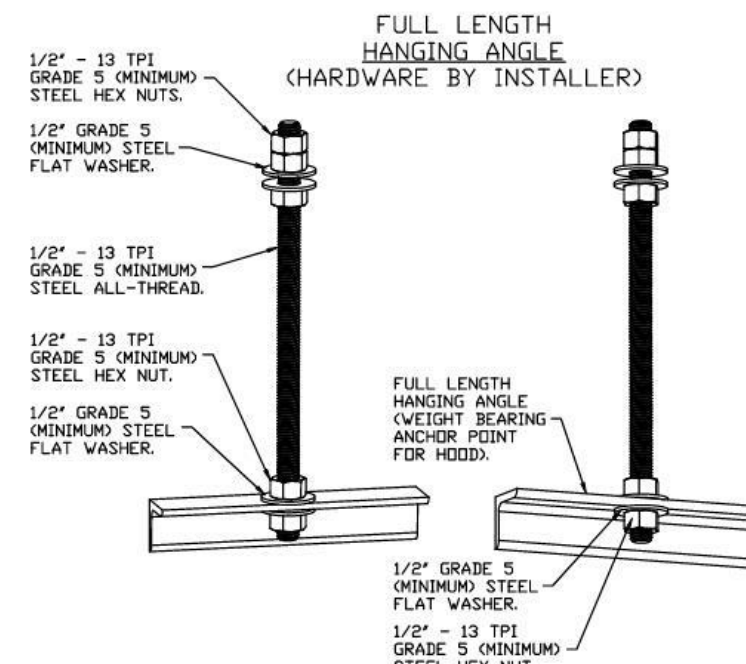


SECTION VIEW - MODEL 6030ND-2-ACPSP-F  
HOOD - #1



ASSEMBLY INSTRUCTIONS

HANGING ANGLE MUST BE SUPPORTED WITH 1/2\"/>



ASSEMBLY INSTRUCTIONS

HANGING ANGLE MUST BE SUPPORTED WITH 1/2\"/>

REVISIONS	
DESCRIPTION	DATE

**recon.air**  
www.reconair.com

Maryland Mechanical  
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Cava - Chestnut Hill, MA\_R1  
220 Boylston Street,  
Newton, MA, 02467

DATE: 10/23/2024

DWG.#:  
6994705

DRAWN BY: ABS-76

SCALE:  
NTS

MASTER DRAWING

SHEET NO.  
2

ferris+sloane  
100 N. Howard Street, Suite 4563 Spokane, WA 99201

**CAVA**

CAVA #010514 CHESTNUT HILL, MA  
220 BOYLSTON STREET  
CHESTNUT HILL, MA 02467  
FOR CAVA  
14 Ridge Square NW #500, WASHINGTON, DC 20016

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SHEET	

MECHANICAL HOOD DETAIL  
PLAN

SHEET:  
**M602**

**rtm**  
engineering consultants  
2001 156th Ave SE | Suite 115 Bellevue, WA 98007  
T: 847.756.4100 www.rtmec.com

**FIRE SYSTEM INFORMATION – JOB#6994705**

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0	40	37	FIRE CABINET RIGHT	RIGHT, HOOD 1

**FIRE SYSTEM PARTS LIST KEY**

FIRE SYSTEM NO	TAG	KEY NUMBER - PART DESCRIPTION	QTY BY FACTORY	QTY BY DIST
		0 - 0 - TANK FIRE SUPPRESSION POST-DISCHARGE PROCEDURE UTILITY CABINET LABEL SHEET.	1	0
		0 - 0 - TANK FIRE SUPPRESSION MAINTENANCE GUIDE UTILITY CABINET LABEL SHEET.	1	0
		0 - 0 - 12-F28021-32144-0T-360 DUCT FIRE THERMOSTAT WITH 12 FOOT WIRE LEADS. NO. CLDSE ON TEMP RISE AT 360°F. (A0034310).	1	0
		0 - 0 - 32-00002 QUIK SEAL - 1/2" (UL).	1	0
		0 - 0 - 4429K153 1/2" MALE NPT TO 1/2" FEMALE NPT ELBOW, BRASS.	2	0
		0 - 0 - 4429K422 1/2" X 1/4" BRASS REDUCING BUSHING.	1	0
		0 - 0 - 79525 1/2" 90 PRO-PRESS ELBOW WITH 1/2" NPT FEMALE CONNECTION, VIEGA.	1	0
		0 - 0 - 79580 1/2" X 1/2" PRO-PRESS TEE X 1/2" NPT FEMALE CONNECTION, VIEGA.	2	0
		0 - 0 - 87-120042-001 SECONDARY ACTUATOR VALVE (SVA) - SINGLE ACTUATOR, REQUIRES PRIMARY RELEASE ACTUATOR, TANK FIRE SUPPRESSION.	1	0
		0 - 0 - 87-120045-001 HOSE, SECONDARY ACTUATOR HOSE, 7.5' BRAIDED STAINLESS STEEL, TANK FIRE SUPPRESSION.	1	0
		0 - 0 - 87-300001-001 TANK - PRESSURIZED TANK USED FOR TANK FIRE SUPPRESSION.	2	0
		0 - 0 - 87-300030-001 PRIMARY ACTUATOR KIT (PAK) - ACTUATOR AND RELEASE SOLENOID ASSEMBLY, ONE NEEDED PER FIRE SYSTEM, SUPERVISED, TANK FIRE SUPPRESSION.	1	0
		0 - 0 - 87-300030-001 PRIMARY ACTUATOR KIT (PAK) - ACTUATOR AND RELEASE SOLENOID ASSEMBLY, ONE NEEDED PER FIRE SYSTEM, SUPERVISED, TANK FIRE SUPPRESSION.	1	0
		0 - 0 - 87-300152-001 HARDWARE, SVA BOLTS, TANK FIRE SUPPRESSION.	8	0
		0 - 0 - 9055455PC PRO PRESS 1/2 PRESS X PRESS 90 ELBOW L.D.	6	0
		0 - 0 - 9097200PC PRO PRESS PC611 1/2 PRESS TEE L.D.	7	0
		0 - 0 - 98694A115 HARDWARE, DATANKLOCK LOCKING BRACKET SQUARE NUTS 5/16" ZINC, TANK FIRE SUPPRESSION.	4	0
		0 - 0 - A0034332 JUNCTION BDX FOR MANUAL PULL STATION. 1.5" DEEP BACK BDX, RED COLOR.	1	0
		0 - 0 - A31484 1/4" NPT SCHRADER VALVE AND CAP, JB INDUSTRIES. 1/4" FLARE X 1/4" MPT HALF UNION. USED ON TANK SERVICE PORT.	1	0
		0 - 0 - B1145 3/8" BLACK IRON 90 ELL.	3	0
		0 - 0 - DATANKLOCK DISCHARGE ADAPTER TANK LOCKING PLATE FOR FIRE SYSTEM TANK INSTALLATION IN UTILITY CABINETS, TANK FIRE SUPPRESSION.	2	0
		0 - 0 - TANK STRAP TANK STRAP - USED FOR TANK FIRE SUPPRESSION.	6	0
		0 - 0 - TFS-UCTANKBRACKET TANK BRACKET FOR FIRE SYSTEM TANK INSTALLATION IN UTILITY CABINETS, TANK FIRE SUPPRESSION.	2	0
		0 - 0 - WK-283952-000 DISCHARGE ADAPTER, TANK FIRE SUPPRESSION.	2	0
		16 - 16 - 79210 1/2" X 3/8" NPT MALE ADAPTER, VIEGA.	8	0
		16 - 16 - DL-F NOZZLE - TANK PROTECTION APPLIANCE COVERAGE NOZZLE (INCLUDES METAL BLOW OFF CAP, LANYARD, USED WITH CHROME-PLATED PIPE).	8	0
		26 - 26 - QSA-3/8 QUIK SEAL - 3/8" (UL).	8	0
		34 - 34 - A0034331 24VDC SINGLE ACTION MANUAL ACTUATION DEVICE (PUSH/PULL STATION) WITH PROTECTIVE COVER, ONE (1) NORMALLY OPEN CONTACT. RED COLOR.	1	0

**NOTES**

- FIELD PIPE DROPS AS SHOWN PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- FIELD INSTALLED DROP: FACTORY WILL PROVIDE QTY 2 60IN LONG PIECES OF CHROME PLATED PIPING SHIPPED LOOSE TO BE FIELD-INSTALLED.
- SHIP LOOSE DROP: FACTORY WILL PROVIDE THE EXACT CHROME PIPE LENGTH NEEDED SHIPPED LOOSE TO BE FIELD-INSTALLED.
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELVEING, SALAMANDERS, ETC.
- OVERLAPPING COVERAGE SHALL NOT BE USED ON ANY APPLIANCE WITH AN OBSTRUCTION.
- IF APPLICABLE, EXTENDED PRE-PIPED DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6' ABOVE THE TOP OF THE HOOD.

- APPLIANCE DIMENSIONS LISTED REPRESENT THE COOKING SURFACE SIZE, NOT THE OVERALL APPLIANCE SIZE.
- THIS FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.
- DL-F NOZZLE PART NUMBER REPLACES 3070-3/8H-10-SS

JOB #: 6994705.  
JOB NAME: CAVA - CHESTNUT HILL, MA.

SYSTEM SIZE: TANK-SP-2 DESIGN FP: 37. MAXIMUM FP: 40.  
HOOD # 1 10' 7.00' LONG X 60' WIDE X 30" HIGH.  
RISER # 1 SIZE: 16" DIA.  
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.

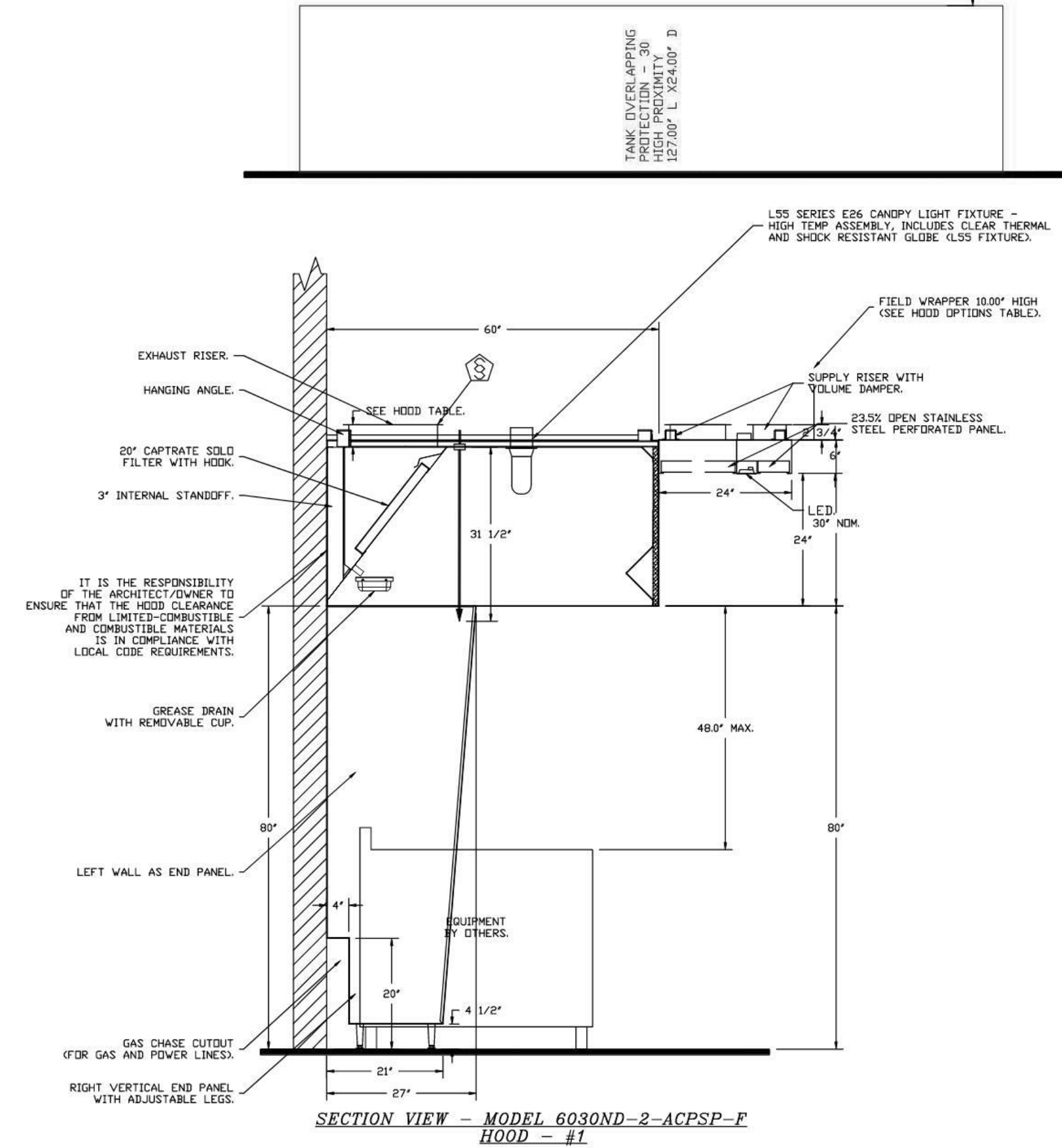
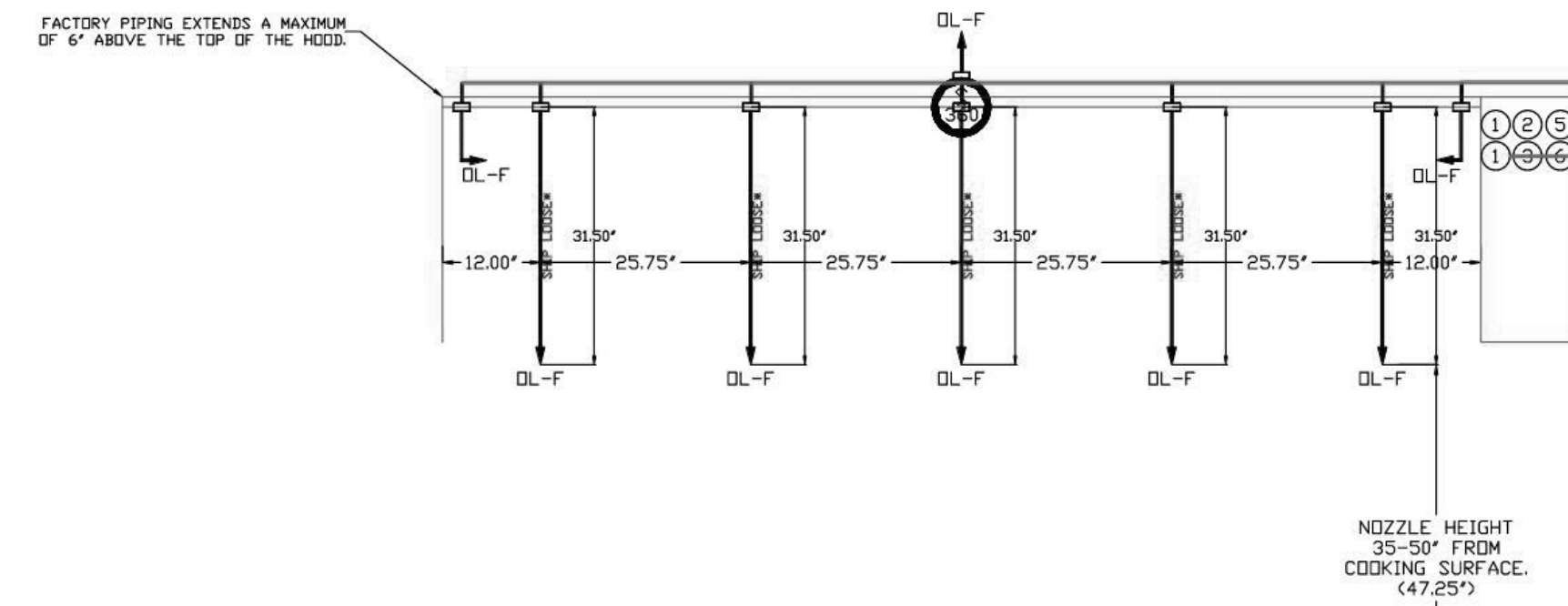
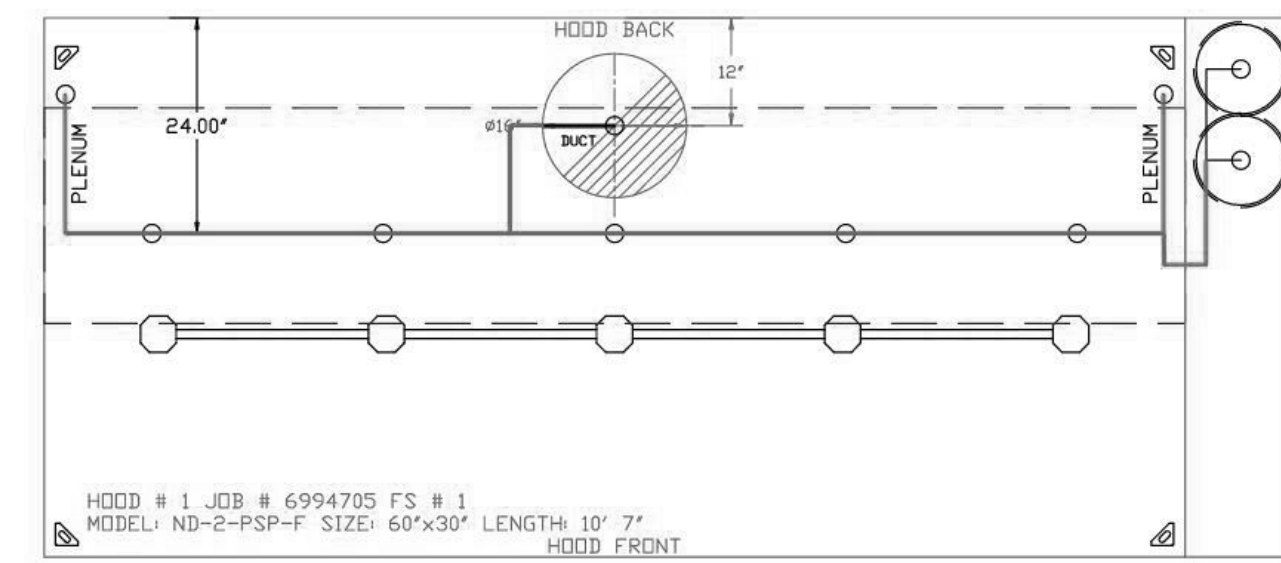
- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

AGENT DISTRIBUTION PIPING LIMITATIONS	
PIPE SECTION	MAX PIPE LENGTH (FT)
MAX SUPPLY LINE TO FIRST OVERLAPPING NOZZLE	42
OVERLAPPING NOZZLE APPLIANCE BRANCH	10
DEDICATED NOZZLE APPLIANCE BRANCH	10

**LEGEND – FIRE CABINET TANK SYSTEM**

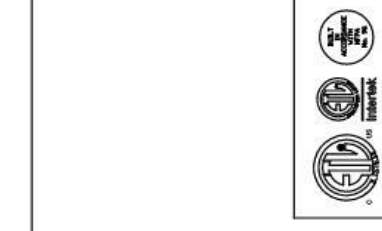
- 4 GALLON TANK.
- PRIMARY ACTUATOR RELEASE.
- SECONDARY ACTUATOR RELEASE.
- PRESSURE SUPERVISION SWITCH.
- PRIMARY HOSE ASSEMBLY.
- SECONDARY HOSE ASSEMBLY.
- REMOTE MANUAL ACTUATION DEVICE.

INCLUDES: FIELD INSTALLATION AND HOOKUP DURING NORMAL BUSINESS HOURS BY CERTIFIED INSTALLERS ONLY IN THE LOCATION NOTED ABOVE, TWO SITE VISITS ONLY (ONE VISIT TO SET PULL STATION & SYSTEM HOOKUP AND ONE VISIT FOR ONE TEST); ADDITIONAL VISITS WILL RESULT IN ADDITIONAL CHARGES), ONE MECHANICAL OR ELECTRICAL GAS VALVE PER SYSTEM AT A MAXIMUM SIZE OF 2", PERMIT, AND SYSTEM TEST.  
EXCLUDES: UNION LABOR & PREVAILING WAGE (LABOR & WAGES WILL BE ADDED IF APPLICABLE), GAS VALVE INSTALLATION, ELECTRICAL HOOKUP AND CONNECTIONS, HANGING OF FIRE CABINET, SHUNT TRIP, HANDHELD EXTINGUISHER(S), ON-SITE RE-PIPING DUE TO EQUIPMENT LAYOUT CHANGES.



SYSTEM REQUIRES A MINIMUM OF 7 FT. OF EQUIVALENT PIPE LENGTH BETWEEN TANK AND NEAREST APPLIANCE NOZZLE FOR MOST APPLIANCES. EACH 90 DEGREE ELBOW ADDS 1.3 FT OF EQUIVALENT LENGTH. SEE MANUAL FOR DETAILS.

REVISIONS	
DESCRIPTION	DATE



**econ·air**  
Maryland Mechanical  
8120 Woodmont Avenue, Suite 720, Bethesda, MD, 20814  
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DATE: 10/23/2024  
DWG.#: 6994705  
DRAWN BY: ABS-76  
SCALE: NTS  
MASTER DRAWING  
SHEET NO. 3

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100 N. Howard Street, Suite 4565, Spokane, WA 99201



CAVA #010514 CHESTNUT HILL, MA  
220 BOYLSTON STREET  
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SET	

MECHANICAL HOOD DETAIL PLAN

SHEET:  
**M603**



**EXHAUST FAN INFORMATION – JOB#6994705**

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SDNES
1	KEF	1	EADU5H	ECDN-AIR	2275	1.100	1567	TEAD-ECM	1.000	0.6930	1	115	11.6	720 FPM	94	16.8

**DOAS/RTU FAN SCHEDULE – JOB#6994705**

FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	FAN INFORMATION										ELECTRICAL INFORMATION						COOLING INFORMATION						REHEAT INFORMATION				GAS HEAT INFORMATION				NOTES		
					BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLT	MCA	MDCP	OUTSIDE AIR DB	OUTSIDE AIR WB	MIXED AIR DB	MIXED AIR WB	LEAVING AIR DB	LEAVING AIR WB	DP	TOTAL CAPACITY	SENS.	IEER	ISMRE	DISCHARGE DB	DISCHARGE WB	CAPACITY DESIRED	CAPACITY MAX	MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUS	OUTPUT BTUS		TEMP RISE	REQUIRED INPUT GAS PRESSURE
2	MAU	1	EARTU1-I.200-15-ST-MPU	ECDN-AIR	15P-1	0	1979	1979	1182	0.750	2.00	3	460	13.4A	15A	88.0°F	72.0°F	88.0°F	72.0°F	67.0°F	62.1°F	59.5°F	66.0 MBH	42.9 MBH	17.9	6.1	90.0°F	69.4°F	48.6 MBH	0.2 MBH	21.0 LBS/HR	NATURAL	184862	149738	65°F	7 IN. W.C. - 14 IN. W.C.	1,2,3,4,5,6,7,8,9,10,11,12,13,14

**NOTES:**

1. INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL
2. DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE
3. INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER
4. REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE
5. ECM MOTOR CONDENSING FANS
6. ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE
7. SUCTION LINE ACCUMULATOR
8. FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER
9. AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT)
10. 81% EFFICIENT FURNACE, WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 6:1 TURNDOWN WITH NG AND 5:1 TURNDOWN WITH LP
11. SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE
12. FULLY MODULATING HOT GAS REHEAT
13. 1" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-4.3 INSULATION-MINIMUM 24GA EXTERIOR W/ 18GA BASE
14. DOWN DISCHARGE/NO RETURN

**FAN OPTIONS**

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	KEF	1	GREASE BOX
		1	ECM WIRING PACKAGE – PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
		1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	TOTAL CFM MONITORING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	SHIP LOOSE GAS STRAINER 3/4"
		1	CASLINK BUILDING MONITORING SYSTEM – INTERNET OR CELLULAR CONNECTION REQUIRED
		1	2" MERV 13 FILTERS FOR RTU1 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU1 (QTY. 4)
		1	RTU1 DOWN DISCHARGE
2	MAU	1	RTU1 CURB DUCT HANGER
		1	120V FIRE INPUT
		1	RTU1 NO RETURN – 100% OA – MPU
		1	RTU1 FIXED 100% OA INTAKE CONTROL
		1	5 TON MODULATING COOLING OPTION, 460/480V. R410A REFRIGERANT, VARIABLE SPEED COMPRESSOR, DL ECM CONDENSING FAN
		1	UNIT MOUNTED VFD CONFIGURED FOR DCV
		1	LOAD REACTOR MOUNTED IN FAN
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU, 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #28, #47, #48, OR #52 PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE
		1	REHEAT – IBT ONLY REHEAT
		1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVE SERVICE CONTRACT, 25 YEAR STAINLESS STEEL FURNACE PARTS WARRANTY (SEE ADDITIONAL DETAILS)
		1	EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET

**FAN ACCESSORIES**

FAN UNIT NO	TAG	EXHAUST				SUPPLY		
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	KEF	YES						

**CURB ASSEMBLIES**

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF	44 LBS	CURB	23.000"W X 23.000"L X 26.000"H VENTED HINGED.
2	# 2	MAU	103 LBS	CURB	41.000"W X 71.000"L X 20.000"H INSULATED.


**HMI SCHEDULE**

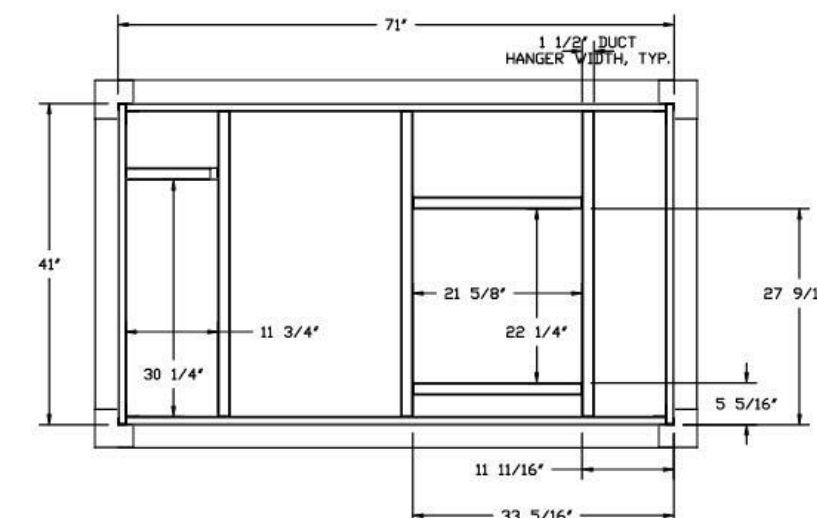
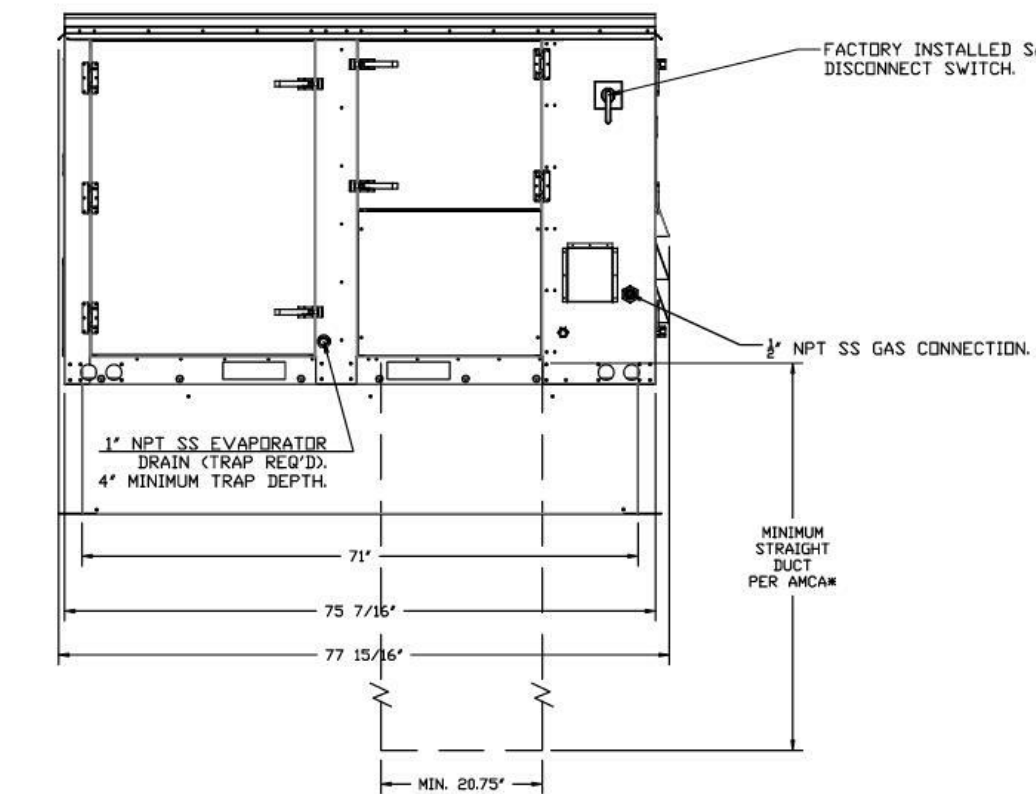
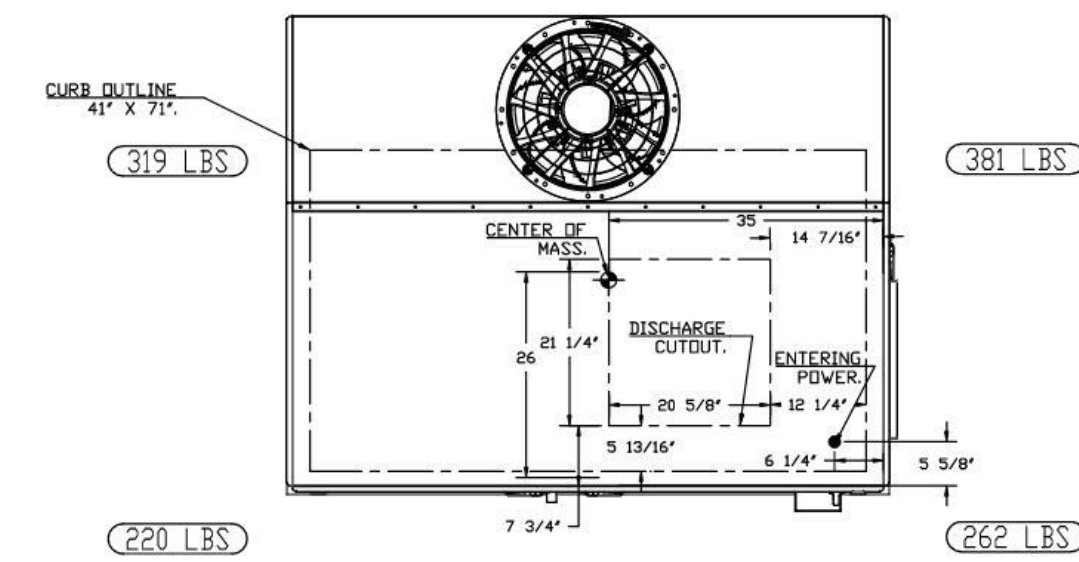
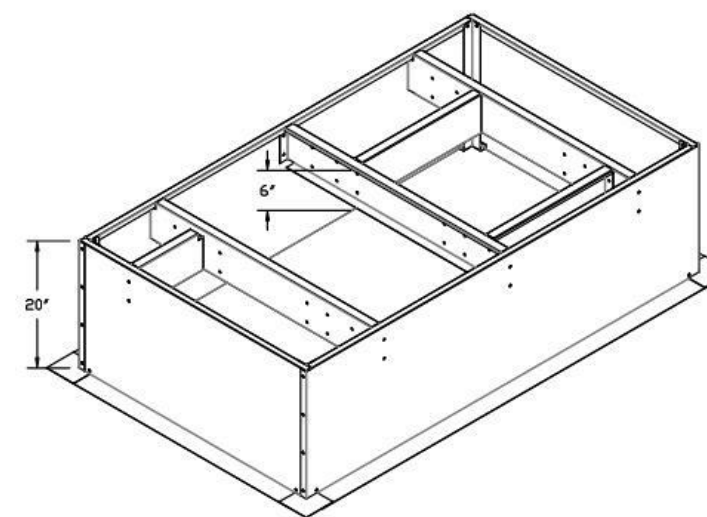
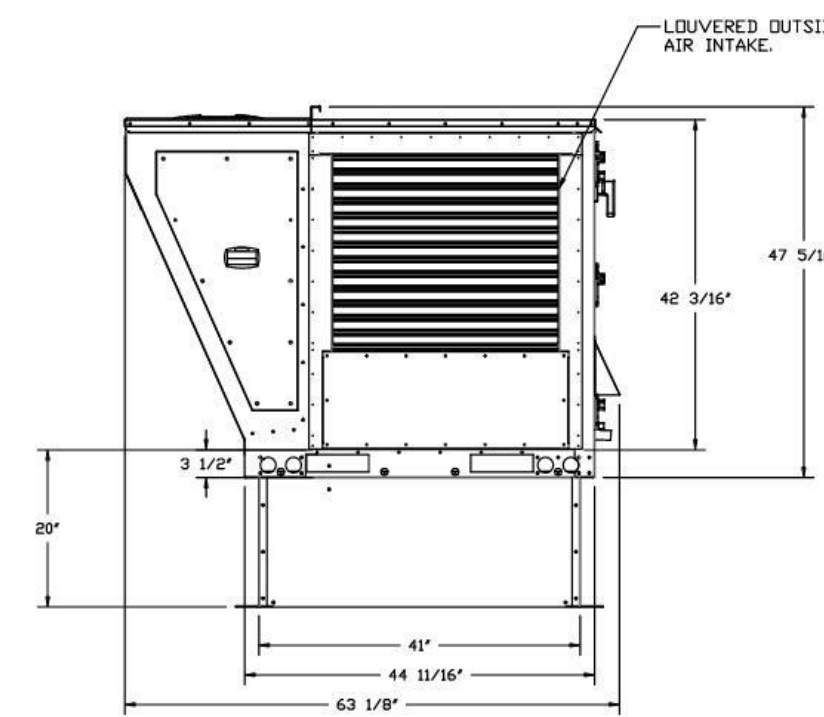
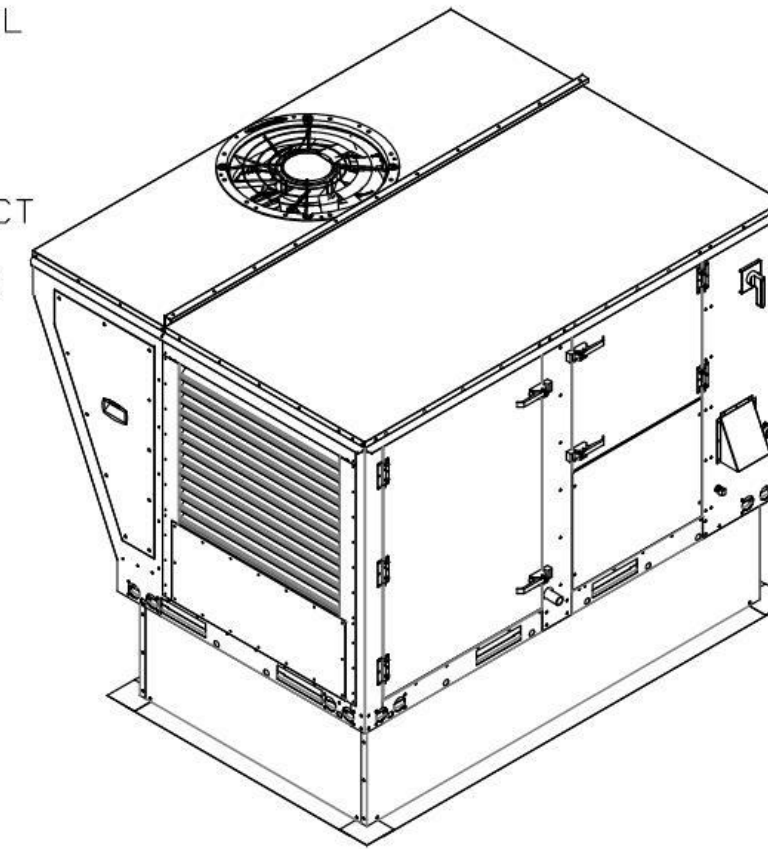
UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #2	HMI #1 – UNIT	IN UNIT	NOT AVERAGED	55

\*NOTE: SUPPLY DUCT MUST BE INSTALLED TO MEET SMACNA STANDARDS. A MINIMUM STRAIGHT DUCT LENGTH MUST BE MAINTAINED DOWNSTREAM OF UNIT DISCHARGE AS OUTLINED IN AMCA PUBLICATION 201. WHEN USING RECTANGULAR DUCTWORK, ELBOWS MUST BE RADIUS THROAT, RADIUS BACK WITH TURNING VANES. FLEXIBLE DUCTWORK AND SQUARE THROAT/SQUARE BACK ELBOWS SHOULD NOT BE USED. ANY TRANSITION AND/OR TURNS IN THE DUCTWORK WILL CAUSE SYSTEM EFFECT. SYSTEM EFFECT WILL DRASTICALLY INCREASE STATIC PRESSURE AND REDUCE AIRFLOW. DO NOT RELY ON UNIT TO SUPPORT DUCT IN ANY WAY. FAILURE TO PROPERLY SIZE DUCTWORK MAY CAUSE SYSTEM EFFECTS AND REDUCE PERFORMANCE OF THE EQUIPMENT. SUGGESTED STRAIGHT DUCT SIZE IS 20.75" x 21.5".

**FAN #2 EARTU1-I.200-15-ST-MPU – HEATER (MAU)**

**NOTES:**

1. DO NOT OBSTRUCT OUTSIDE AIR INLET, OUTSIDE AIR COIL OR OUTSIDE AIR FAN.
2.  DENOTES CORNER WEIGHT.
3. ROOF OPENING MUST BE 2" SMALLER THAN CURB DIMENSIONS IN BOTH DIRECTIONS.
4. CONNECTION FROM BREAKER TO UNITS SAFETY DISCONNECT SWITCH TO BE COPPER WIRE ONLY.
5. EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET.



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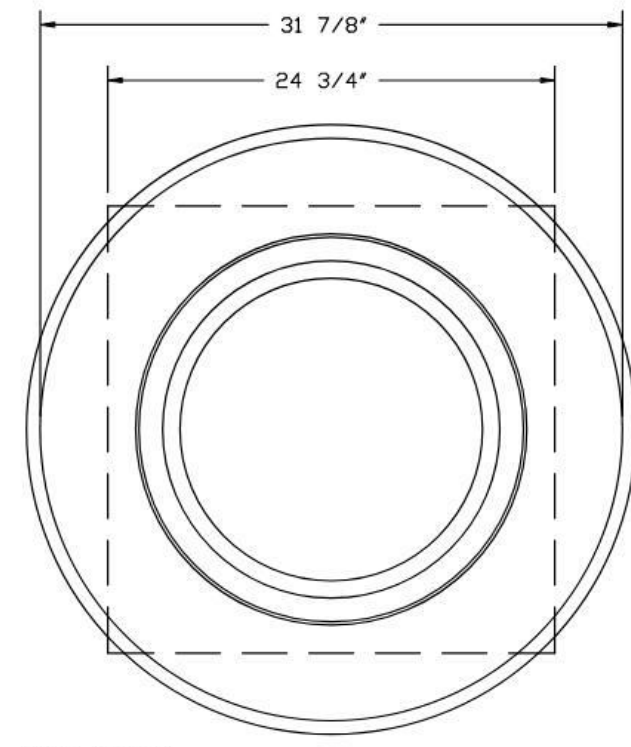
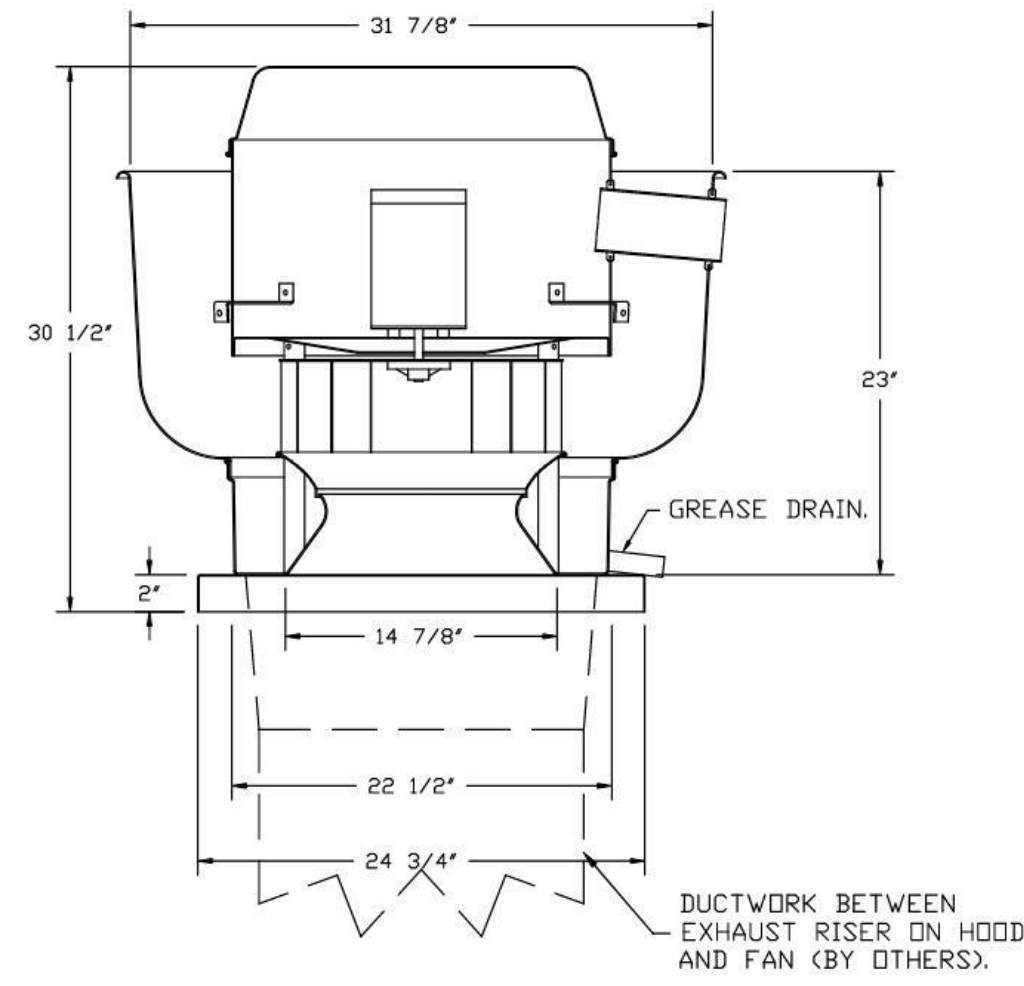
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MECHANICAL HOOD DETAIL PLAN

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**rtm**  
engineering consultants  
2001 15th Ave SE | Suite 115 Bellevue, WA 98007  
T: 847.756.4100 | www.rtmec.com

FAN #1 EADUBSH - EXHAUST FAN (KEF)



TOP VIEW

**FEATURES:**

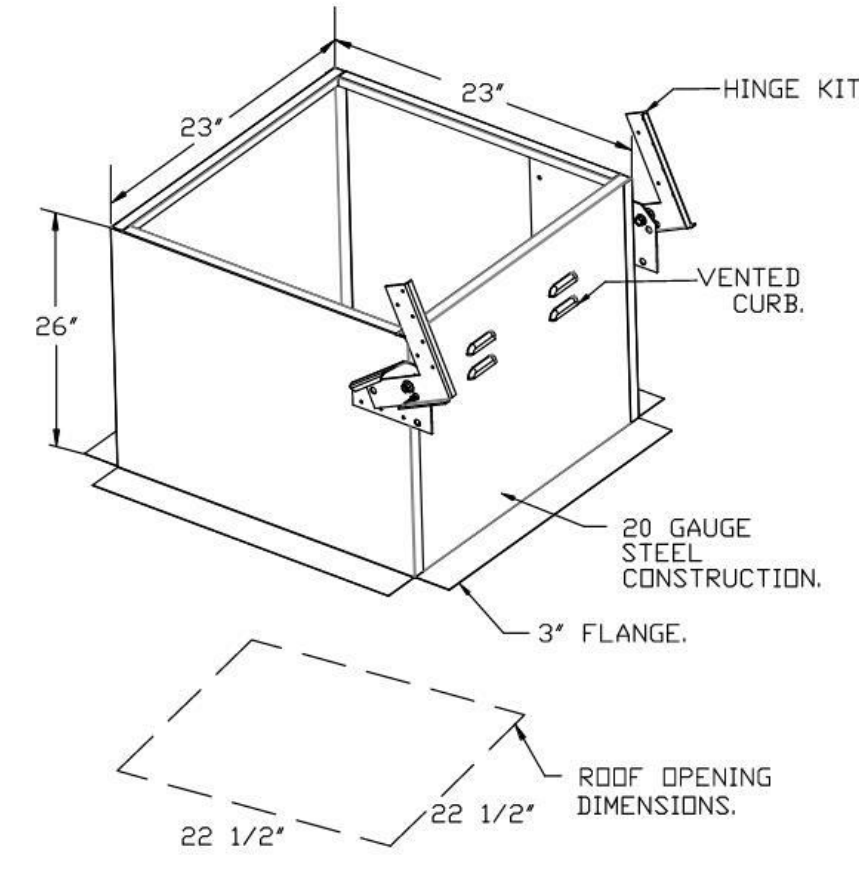
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

**NORMAL TEMPERATURE TEST**  
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

**ABNORMAL FLARE-UP TEST**  
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

**OPTIONS:**

- GREASE BOX.
- ECM WIRING PACKAGE - PWM SIGNAL FROM ECM03 PREWIRE (TELCD MOTOR), CCM ROTATION.
- 2 YEAR PARTS WARRANTY.



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MECHANICAL HOOD DETAIL  
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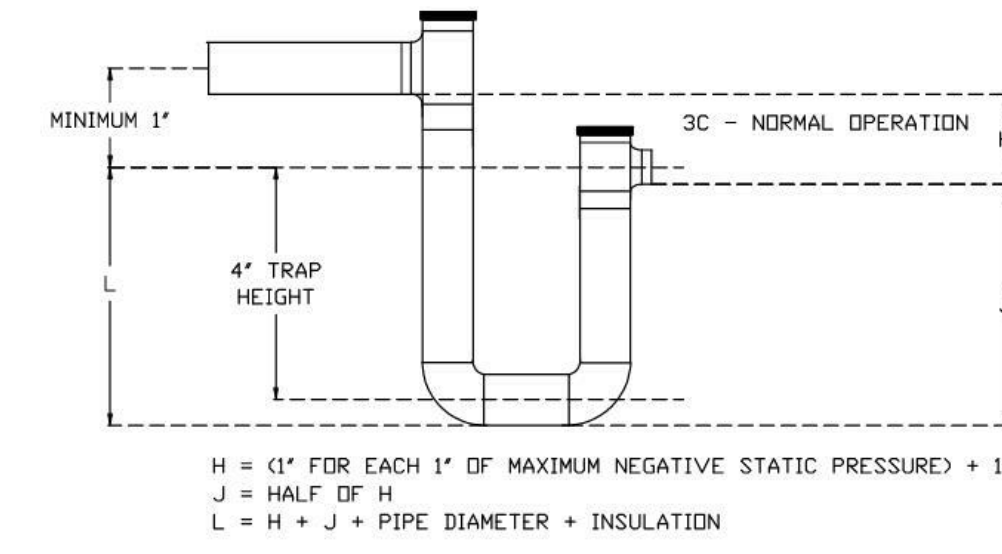
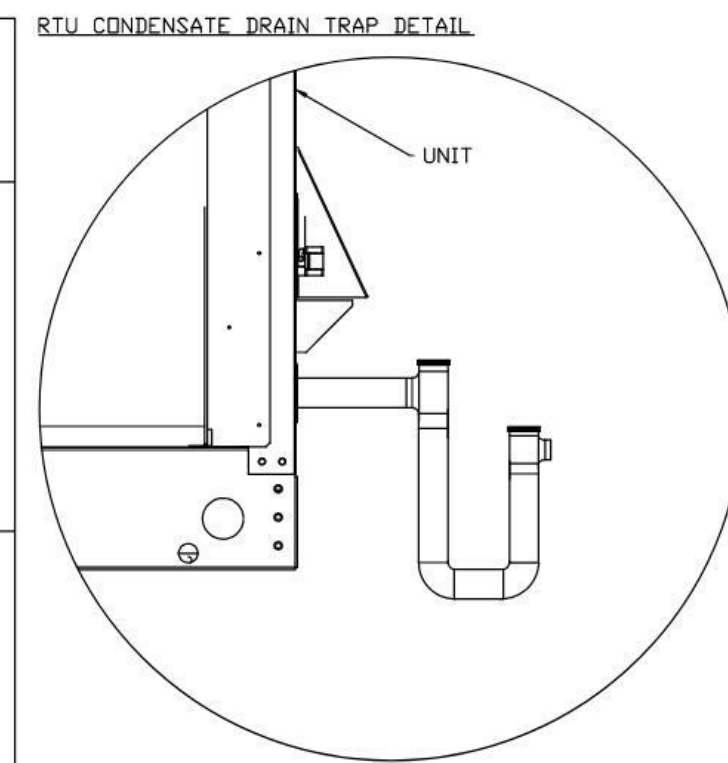
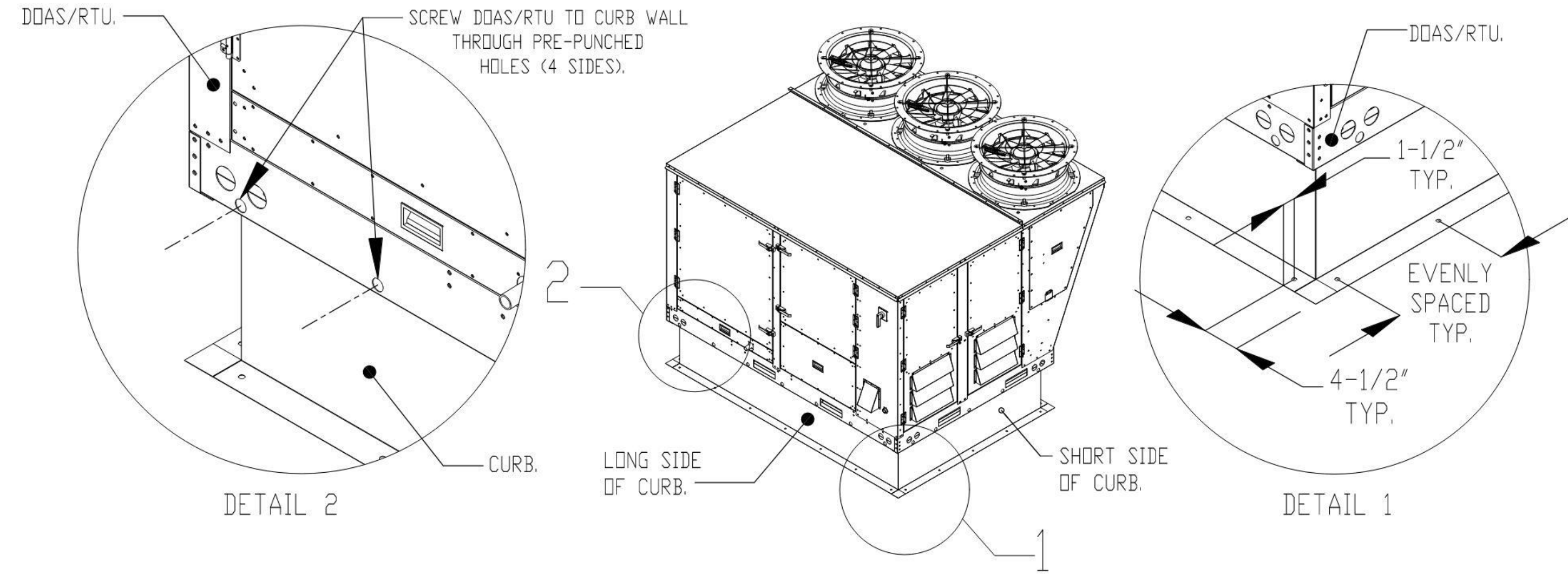
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**ferris+sloane**  
 100 N. Howard Street, Suite 4503 Spokane, WA 99201

# TYPICAL DOAS/RTU ROOF MOUNTING INSTALLATION INSTRUCTIONS

1. SECURE THE CURB TO THE ROOF FRAMING MEMBERS BY DRILLING 1/4" PILOT HOLES IN THE CURB FLANGES AT LOCATIONS SHOWN IN THE DIAGRAM BELOW. USING 3/8" X 2" ZINC PLATED STEEL LAG BOLTS, AND ZINC PLATED WASHERS, SCREW THROUGH THE CURB FLANGES AND INTO THE ROOF FRAMING MEMBERS. A MINIMUM OF (5) LAG BOLTS ON EACH SHORT SIDE, AND (7) LAG BOLTS ON EACH LONG SIDE IS REQUIRED.
2. SECURE THE UNIT BASE TO THE SIDE WALLS OF THE CURB USING (24) 1/4"-14 X 2" SELF-DRILLING, STEEL ZINC PLATED SCREWS. PRE-PUNCHED HOLES HAVE BEEN PROVIDED FOR EACH SCREW LOCATION.



**GREASE DUCT & CHIMNEY SPECIFICATIONS:**  
 PROVIDE GREASE DUCT EQUAL TO ECON-AIR MODEL "EDW" ROUND 20 GAUGE 430 STAINLESS STEEL DUCTWORK. MODEL "EDW" IS LISTED TO UL-1978 AND IS INSTALLED USING "V" CLAMP LOCKING CONNECTIONS SEALED WITH 3M FIRE BARRIER 2000 PLUS. MODEL "EDW" DOES NOT REQUIRE WELDING PROVIDING IT HAS BEEN INSTALLED PER THE MANUFACTURES INSTALLATION GUIDE.  
 PROVIDE RATED ACCESS DOORS AT EVERY CHANGE IN DIRECTION AND EVERY 12' ON CENTER. PER MANUFACTURES LISTING MODEL "EDW" HORIZONTAL RUNS LESS THAN 75 FT. CAN BE SLOPED 1/16" PER 12", HORIZONTAL RUNS MORE THAN 75 FT. CAN BE SLOPED 3/16" PER 12". DUCT SHOULD BE SLOPED AS MUCH AS POSSIBLE TO REDUCE THE CHANCE OF GREASE ACCUMULATION IN HORIZONTAL RUNS.  
 IF THE DUCT OR CHIMNEY IS WITHIN 18 INCHES OF COMBUSTIBLE MATERIAL, PROVIDE UL-2221 OR UL-103 HT LISTED DOUBLE WALL GREASE DUCT OR DOUBLE WALL CHIMNEY EQUAL TO ECON-AIR MODEL "EDW- 2R, 2R TYPE HT, 3R, OR 3Z" ROUND 20 GAUGE 430 STAINLESS INNER DUCT INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL.

**CUSTOMER APPROVAL TO MANUFACTURE:**

APPROVED AS NOTED	<input type="checkbox"/>
APPROVED WITH NO EXCEPTION TAKEN	<input type="checkbox"/>
REVISE AND RESUBMIT	<input type="checkbox"/>
SIGNATURE _____	
YOUR TITLE _____ DATE _____	

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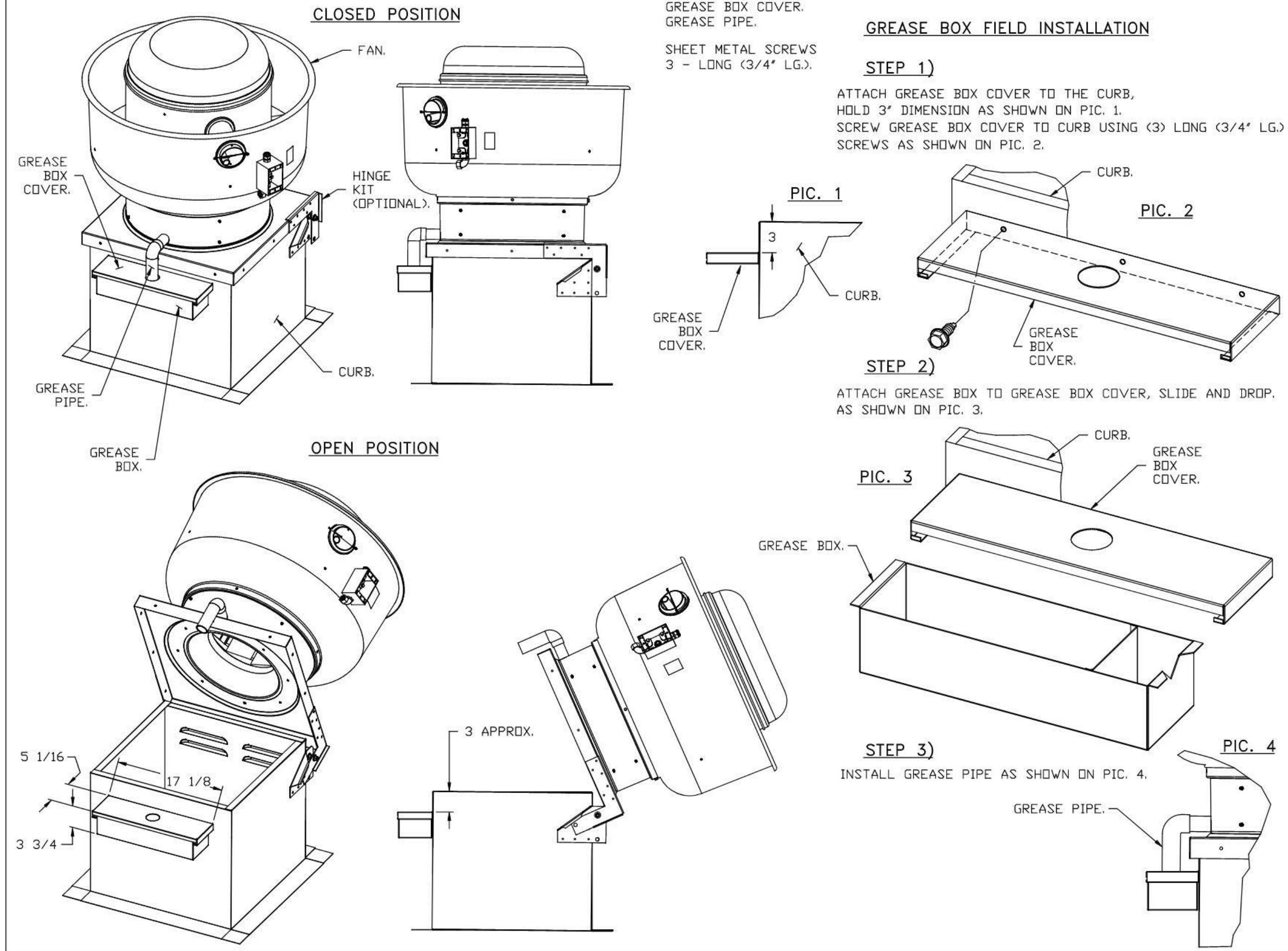
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MECHANICAL HOOD DETAIL PLAN

SHEET: **M606**



**GREASE BOX INSTALLATION**



\*NOTE: UL 705 INSTALL.

**3** AIR DIFFUSION SUPPLY DUCT SPECIFICATIONS:  
 PROVIDE AIR DIFFUSION SUPPLY DUCT EQUAL TO CAPTIVEAIRE SYSTEMS MODEL DW-S0(HC), DW-S90(HC), & DW-S180(HC).  
 THREE DISTINCT HOLE PATTERN OPTIONS TO COVER A VARIETY OF CEILING HEIGHTS.  
 NO ADDITIONAL DIFFUSERS REQUIRED, AS THE DUCT ITSELF PROVIDES AIR DIFFUSION.  
 MADE OF HIGH QUALITY STAINLESS STEEL DESIGNED TO LAST 20+ YEARS.  
 HIGH INDUCTION SUPPLY DUCT IS CONSTRUCTED USING 24 GAUGE, 430 SS - 5" THRU 24".  
 HIGH INDUCTION SUPPLY DUCT IS CONSTRUCTED USING 20 GAUGE, 430 SS - 26" THRU 36".  
 QUICK ONSITE ASSEMBLY USING EPDM GASKETS & UNIVERSAL V-BANDS.  
 DOUBLE WALL SUPPLY DUCT AVAILABLE FOR INTERIOR AND EXTERIOR SPACES, EITHER CONDITIONED OR UNCONDITIONED.  
 DOUBLE WALL SUPPLY DUCT AVAILABLE IN DW-1S, DW-2S, & DW-3S TO MEET SPECIFIC REGIONAL "R" VALUE REQUIREMENTS.

Insulation R-Value Recommendations

Supply Duct Type	Minimum R-value	Space Type
Single Wall - S & -HC	N/A	Conditioned Space Only
Double Wall - 1S	R-4	Unconditioned Interior Space Only
Double Wall - 2S	R-8	Unconditioned Space Climate Zones 1-4
Double Wall - 3S	R-12	Unconditioned Space Climate Zones 5-8

DOUBLE WALL SUPPLY DUCT IS INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL.  
 AIR DIFFUSION SUPPLY DUCT COMPLIES WITH SMACNA (SHEET METAL AND AIR CONDITIONING CONTRACTORS) BEST PRACTICES.  
 POSITIONING OF SPRINKLERS TO AVOID OBSTRUCTION TO DISCHARGE, SEE NFPA 13, TABLE 8.12.5.1.1.

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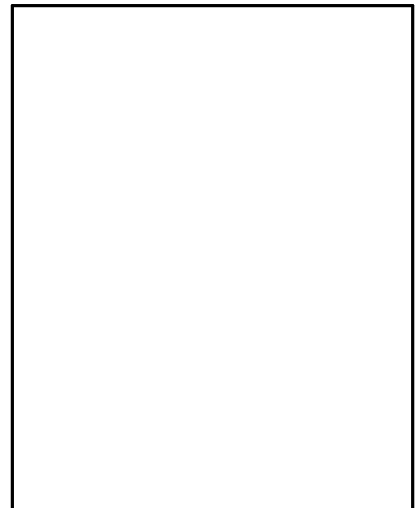
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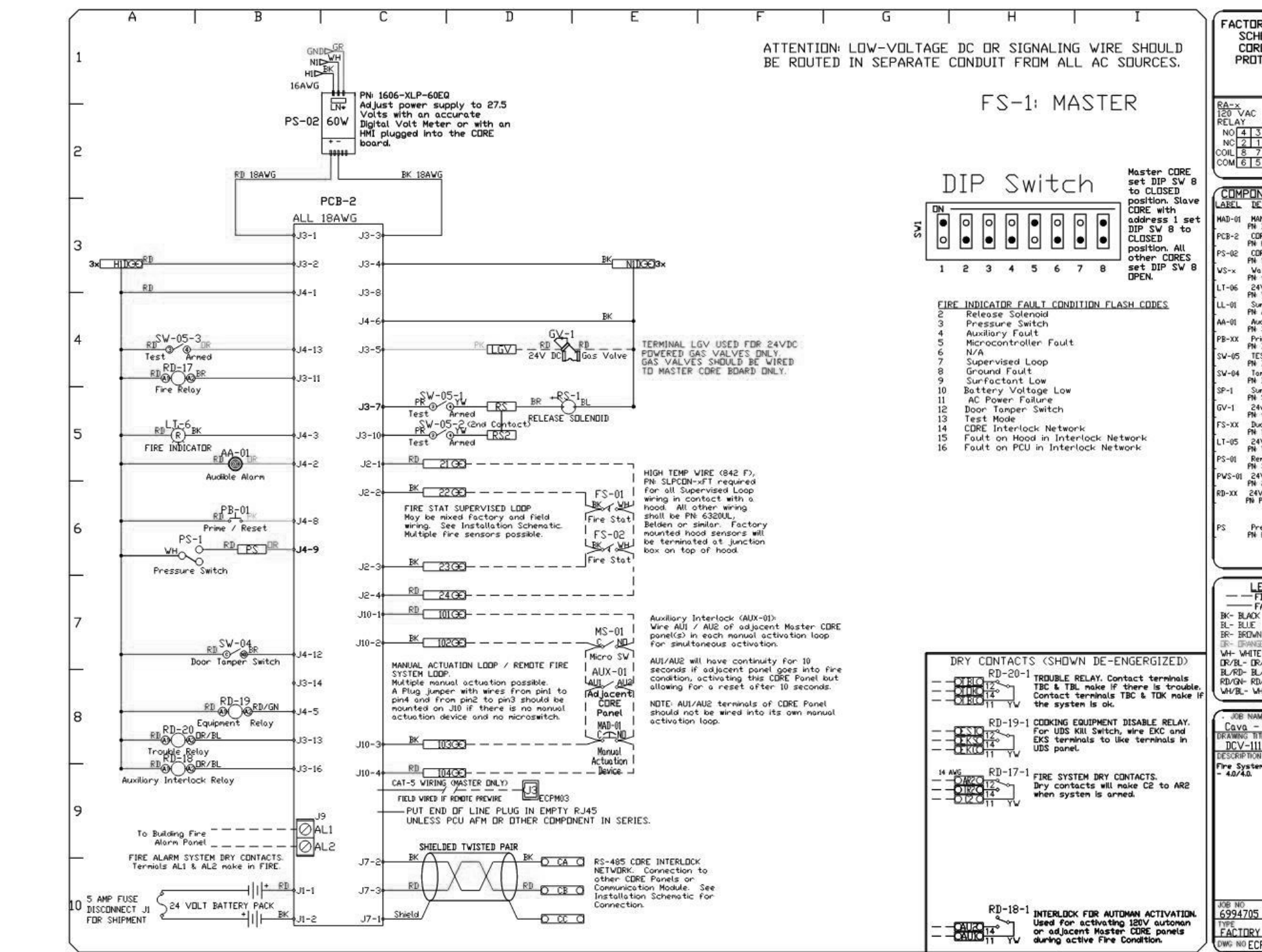
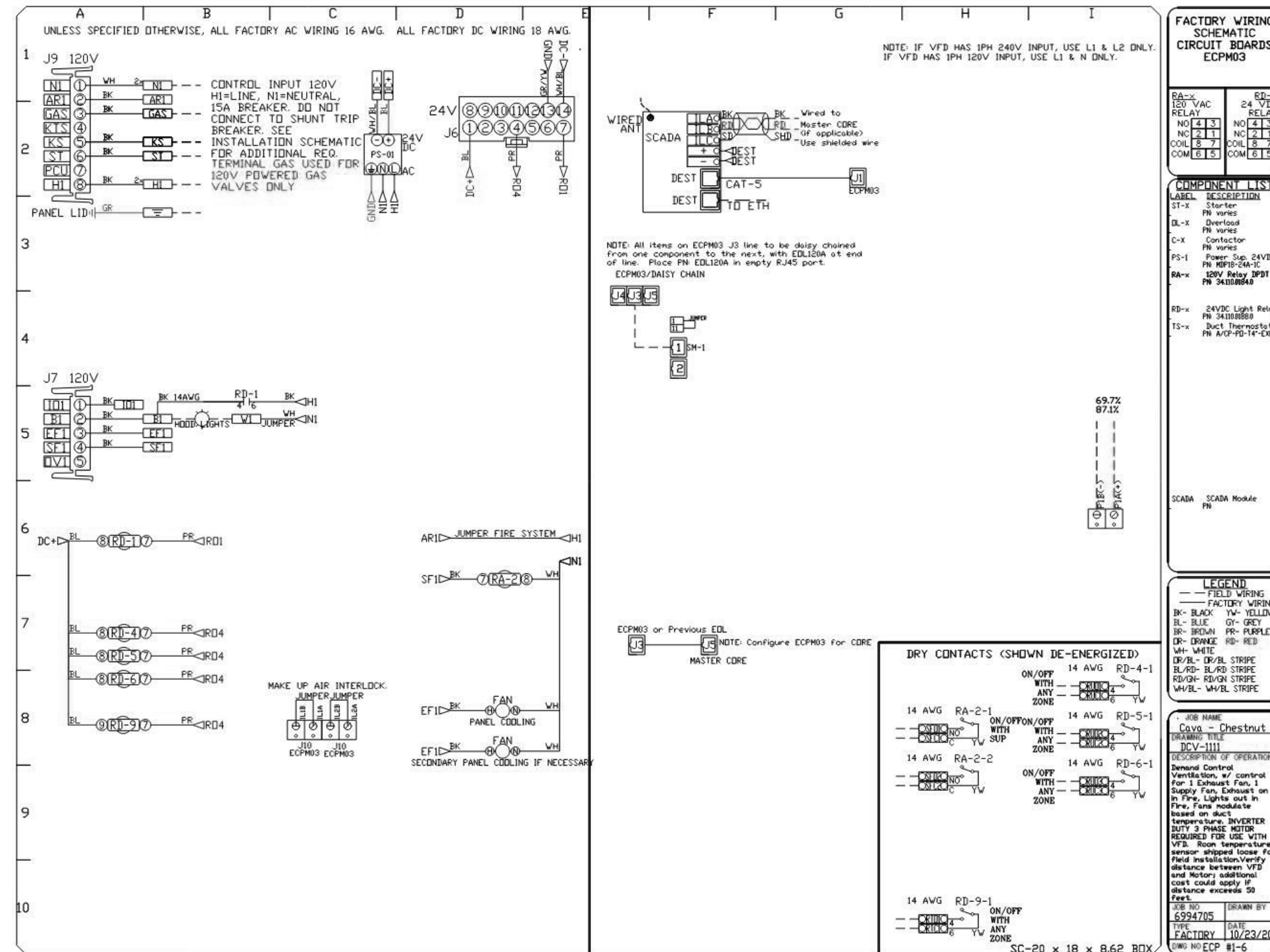
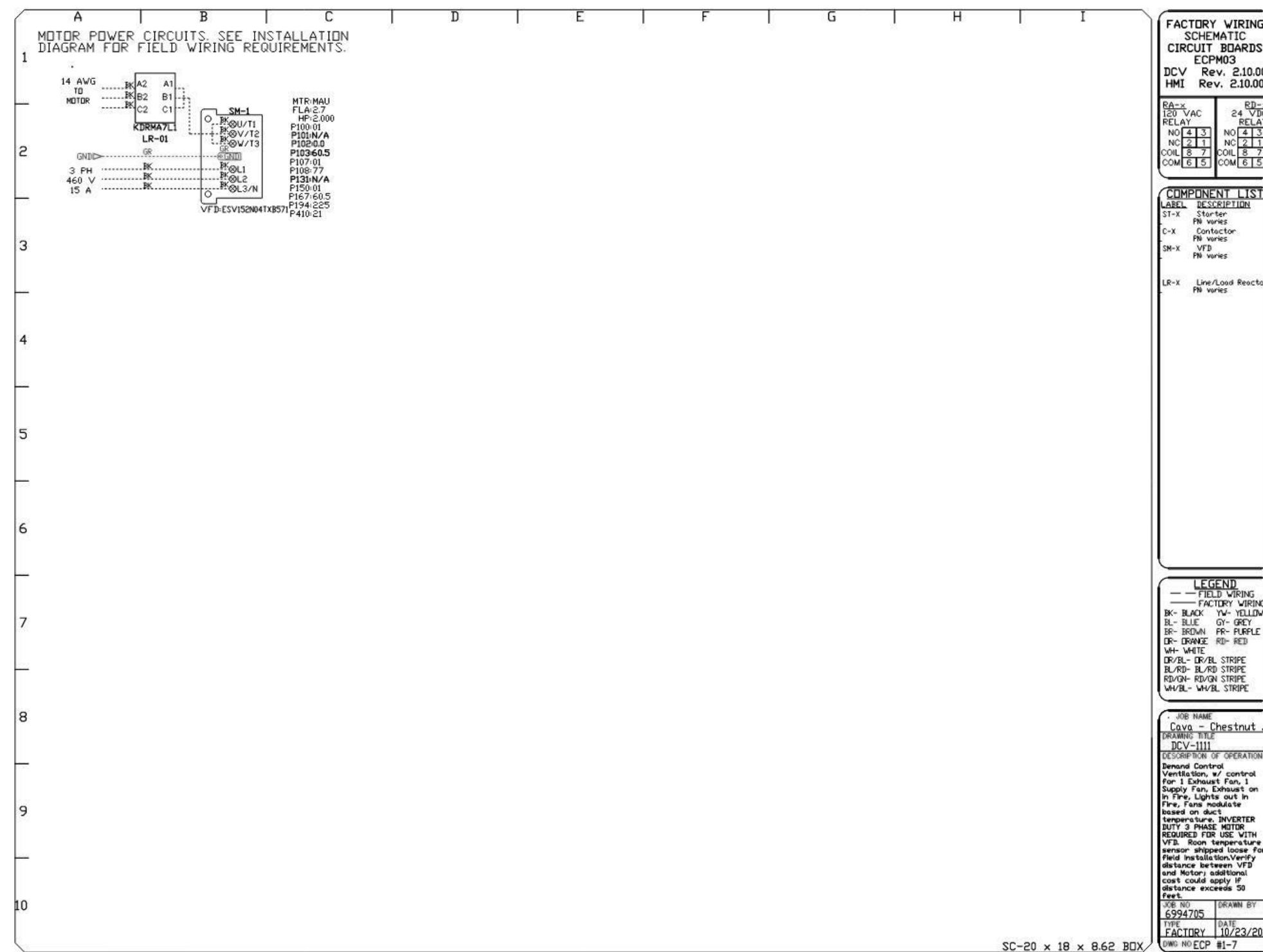
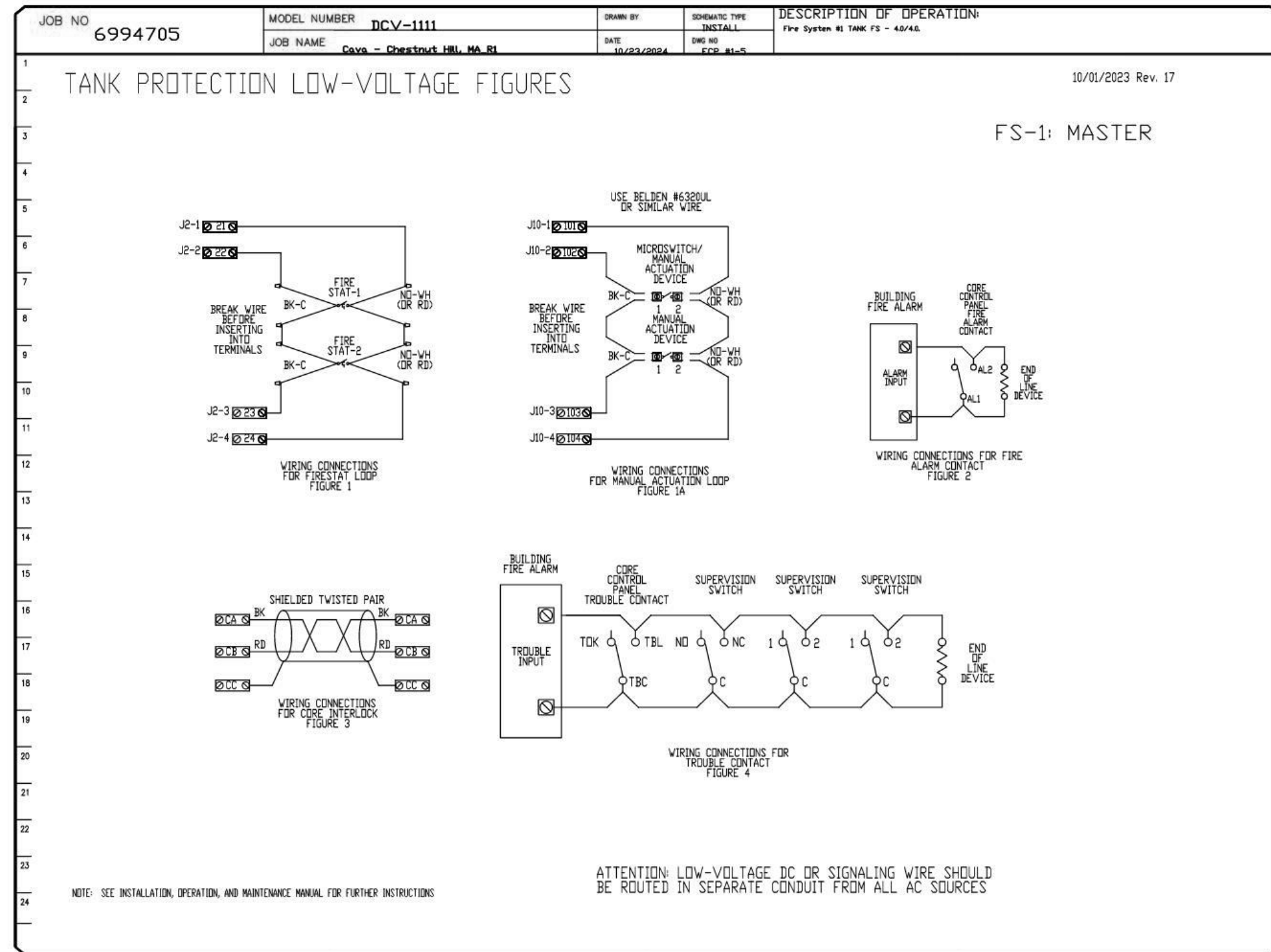
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**MECHANICAL HOOD DETAIL PLAN**

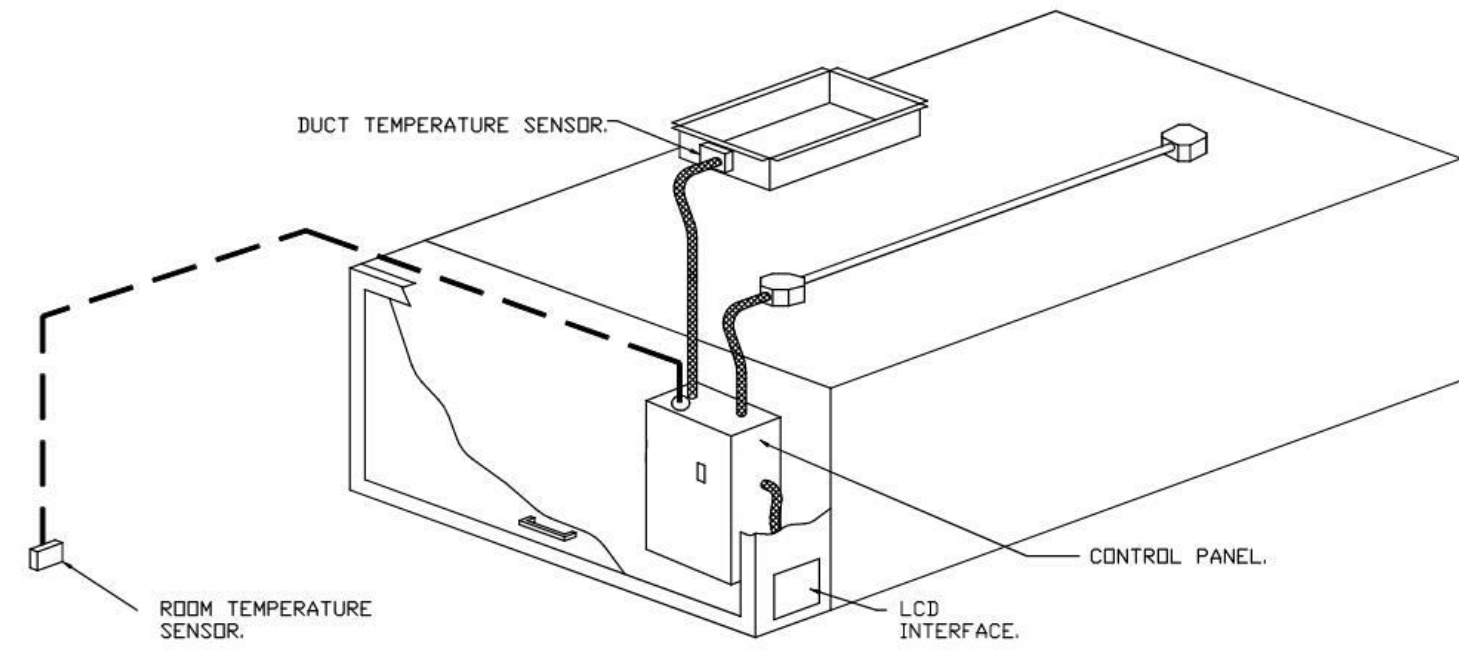
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**DEMAND CONTROL VENTILATION HOOD CONTROL PANEL SPECIFICATIONS:**

- CONTROLS SHALL BE LISTED BY ETL (UL 508A) AND SHALL COMPLY WITH DEMAND VENTILATION SYSTEM TURNDOWN REQUIREMENTS OUTLINED IN IECC 403.7.5 (2021).
- THE CONTROL ENCLOSURE SHALL BE NEMA 1 RATED AND LISTED FOR INSTALLATION INSIDE OF THE EXHAUST HOOD UTILITY CABINET. THE CONTROL ENCLOSURE MAY BE CONSTRUCTED OF STAINLESS STEEL OR PAINTED STEEL.
- TEMPERATURE PROBE(S) LOCATED IN THE EXHAUST DUCT RISER(S) SHALL BE CONSTRUCTED OF STAINLESS STEEL.
- A DIGITAL CONTROLLER SHALL BE PROVIDED TO ACTIVATE THE HOOD EXHAUST FANS DYNAMICALLY BASED ON A FIXED DIFFERENTIAL BETWEEN THE AMBIENT AND DUCT TEMPERATURES SENSORS. THIS FUNCTION SHALL MEET THE REQUIREMENTS OF IMC 507.1.1.
- A DIGITAL CONTROLLER SHALL PROVIDE ADJUSTABLE HYSTERESIS SETTINGS TO PREVENT CYCLING OF THE FANS AFTER THE COOKING APPLIANCES HAVE BEEN TURNED OFF AND/OR THE HEAT IN THE EXHAUST SYSTEM IS REDUCED.
- A DIGITAL CONTROLLER SHALL PROVIDE AN ADJUSTABLE MINIMUM FAN RUN-TIME SETTING TO PREVENT FAN CYCLING.
- VARIABLE FREQUENCY DRIVES (VFDs) SHALL BE PROVIDED FOR FANS AS REQUIRED. THE DIGITAL CONTROLLER SHALL MODULATE THE VFDs BETWEEN A MINIMUM SETPOINT AND A MAXIMUM SETPOINT ON DEMAND. THE DUCT TEMPERATURE SENSOR INPUT(S) TO THE DIGITAL CONTROLLER SHALL BE USED TO CALCULATE THE SPEED REFERENCE SIGNAL.
- THE VFD SPEED RANGE OF OPERATION SHALL BE FROM 0% TO 100% FOR THE SYSTEM, WITH THE ACTUAL MINIMUM SPEED SET AS REQUIRED TO MEET MINIMUM VENTILATION REQUIREMENTS.
- AN INTERNAL ALGORITHM TO THE DIGITAL CONTROLLER SHALL MODULATE SUPPLY FAN VFD SPEED PROPORTIONAL TO ALL EXHAUST FANS THAT ARE LOCATED IN THE SAME FAN GROUP AS THE SUPPLY FAN.
- THE SYSTEM SHALL OPERATE IN PREP MODE DURING LIGHT COOKING LOAD OR COOL DOWN MODE WHEN SUFFICIENT HEAT REMAINS UNDERNEATH THE HOOD SYSTEM AFTER COOKING OPERATIONS HAVE COMPLETED. OPERATION DURING EITHER OF THESE PERIODS WILL DISABLE THE SUPPLY FANS AND PROVIDE AN EXHAUST FAN SPEED THAT IS EQUAL TO THE MINIMUM VENTILATION REQUIREMENT.
- A DIGITAL CONTROLLER SHALL DISABLE THE SUPPLY FAN(S), ACTIVATE THE EXHAUST FAN(S), ACTIVATE THE APPLIANCE SHUNT TRIP, AND DISABLE AN ELECTRIC GAS VALVE AUTOMATICALLY WHEN FIRE CONDITION IS DETECTED ON A COVERED HOOD.
- A DIGITAL CONTROLLER SHALL ALLOW FOR EXTERNAL BMS FAN CONTROL VIA DRY CONTACT (EXTERNAL CONTROL SHALL NOT OVERRIDE FAN OPERATION LOGIC AS REQUIRED BY CODE).
- AN LCD INTERFACE SHALL BE PROVIDED WITH THE FOLLOWING FEATURES:
  - ON/OFF PUSH BUTTON FAN & LIGHT SWITCH ACTIVATION.
  - INTEGRATED GAS VALVE RESET FOR ELECTRONIC GAS VALVES (NO RESET RELAY REQUIRED).
  - VFD FAULT DISPLAY WITH AUDIBLE & VISUAL ALARM NOTIFICATION.
  - DUCT TEMPERATURE SENSOR FAILURE DETECTION WITH AUDIBLE & VISUAL ALARM NOTIFICATION.
  - MIS-WIRED DUCT TEMPERATURE SENSOR DETECTION WITH AUDIBLE & VISUAL ALARM NOTIFICATION.
  - A SINGLE LOW VOLTAGE CAT-5 RJ45 WIRING CONNECTION.
  - AN ENERGY SAVINGS INDICATOR THAT UTILIZES MEASURED KWH FROM THE VFDs.



TYPICAL HOOD CONTROL PANEL INSTALLATION

**SEQUENCE OF OPERATIONS:**

- THE HOOD CONTROL PANEL IS CAPABLE OF OPERATING IN ONE OR MORE OF THE FOLLOWING STATES AT ANY GIVEN TIME:
- **AUTOMATIC:** THE SYSTEM OPERATES BASED ON THE DIFFERENTIAL BETWEEN ROOM TEMPERATURE AND THE TEMPERATURE AT THE HOOD CAVITY OR EXHAUST DUCT COLLAR. FANS ACTIVATE AT A CONFIGURABLE TEMPERATURE DIFFERENTIAL THRESHOLD. DEPENDING ON THE JOB CONFIGURATION EACH FAN ZONE CAN BE CONFIGURED AS STATIC OR DYNAMIC. THESE TERMS REFER TO WHETHER A VARIABLE MOTOR (SUCH AS EC MOTORS OR VFD DRIVEN MOTORS) MODULATE WITH TEMPERATURE. IF THE PANEL IS EQUIPPED WITH VARIABLE SPEED FANS AND THE ZONE IS DEFINED AS "DYNAMIC", THESE WILL MODULATE WITHIN A USER-DEFINED RANGE BASED ON THE TEMPERATURE DIFFERENTIAL. PANELS EQUIPPED WITH VARIABLE SPEED FANS AND A FAN ZONE DEFINED AS "STATIC", FANS WILL RUN AT A SET SPEED CALCULATED FOR THE DRIVE. DEMAND CONTROL VENTILATION SYSTEMS ARE CAPABLE OF MODULATING EXHAUST AND MAKE UP AIR FAN SPEEDS PER THE REQUIREMENTS OUTLINED IN IECC 403.7.5 (2021).
  - **MANUAL:** THE SYSTEM OPERATES BASED ON HUMAN INPUT FROM AN HMI.
  - **SCHEDULE:** A WEEKLY SCHEDULE CAN BE SET TO RUN FANS FOR A SPECIFIED PERIOD THROUGHOUT THE DAY. THERE ARE THREE OCCUPIED TIMES PER DAY TO ALLOW FOR THE USER TO SET UP A TIME THAT IS SUITABLE TO THEIR NEEDS. ANY TIME THAT IS WITHIN THE DEFINED OCCUPIED TIME, THE SYSTEM WILL RUN AT MODULATION MODE AND FOLLOW THE FAN PROCEDURE ALGORITHM BASED ON TEMPERATURE DURING THIS TIME. DURING UNOCCUPIED TIME, THE SYSTEM WILL HAVE AN EXTRA OFFSET TO PREVENT UNINTENDED ACTIVATION OF THE SYSTEM DURING A TIME WHERE THE SYSTEM IS NOT BEING OCCUPIED.
  - **OTHER:** THE SYSTEM OPERATES BASED ON THE INPUT FROM AN EXTERNAL SOURCE (DDC, BMS OR HARD-WIRED INTERLOCK).
  - **FIRE:** UPON ACTIVATION OF THE HOOD FIRE SUPPRESSION SYSTEM, THE EXHAUST FAN WILL COME ON OR CONTINUE TO RUN, THE HOOD MAKEUP AIR WILL SHUTDOWN, AND A SIGNAL WILL BE SENT FOR ACTIVATING THE SHUNT TRIP BREAKER PROVIDED BY THE ELECTRICIAN. FUEL GAS WILL SHUT OFF VIA A MECHANICAL/ELECTRICAL GAS VALVE ACTUATED BY THE HOOD FIRE SUPPRESSION SYSTEM.

**SYSTEM DESIGN VERIFICATION (SDV)**

IF ORDERED, CAS SERVICE WILL PERFORM A SYSTEM DESIGN VERIFICATION (SDV) ONCE ALL EQUIPMENT HAS HAD A COMPLETE START UP PER THE OPERATION AND INSTALLATION MANUAL. TYPICALLY, THE SDV WILL BE PERFORMED AFTER ALL INSPECTIONS ARE COMPLETE.

ANY FIELD RELATED DISCREPANCIES THAT ARE DISCOVERED DURING THE SDV WILL BE BROUGHT TO THE ATTENTION OF THE GENERAL CONTRACTOR AND CORRESPONDING TRADES ON SITE. THESE ISSUES WILL BE DOCUMENTED AND FORWARDED TO THE APPROPRIATE SALES OFFICE. IF CAS SERVICE HAS TO RESOLVE A DISCREPANCY THAT IS A FIELD ISSUE, THE GENERAL CONTRACTOR WILL BE NOTIFIED AND BILLED FOR THE WORK. SHOULD A RETURN TRIP BE REQUIRED DUE TO ANY FIELD RELATED DISCREPANCY THAT CANNOT BE RESOLVED DURING THE SDV, THERE WILL BE ADDITIONAL TRIP CHARGES.

DURING THE SDV, CAS SERVICE WILL ADDRESS ANY DISCREPANCY THAT IS THE FAULT OF THE MANUFACTURER. SHOULD A RETURN TRIP BE REQUIRED, THE GENERAL CONTRACTOR AND APPROPRIATE SALES OFFICE WILL BE NOTIFIED. THERE WILL BE NO ADDITIONAL CHARGES FOR MANUFACTURER DISCREPANCIES.

REVISIONS	
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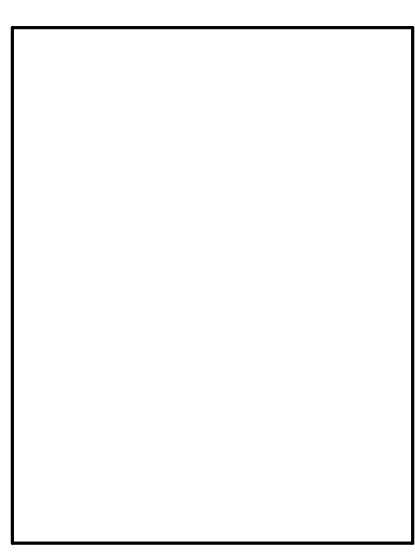
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AOR PROJECT NUMBER:  
CAV048

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SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION	10/25/24
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MECHANICAL HOOD DETAIL  
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# SPECIFICATIONS - DIVISION 23 - HVAC

## SECTION 230500 - GENERAL MECHANICAL REQUIREMENTS:

HVAC SUBCONTRACTOR SHALL PROVIDE A BID OF PREVENTATIVE MAINTENANCE SERVICES FOR ONE YEAR AT TIME OF BID.

FURNISH TO THE OWNER ALL OPERATING & MAINTENANCE MANUALS, RECORD DRAWINGS, TEST & BALANCE REPORT. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER REPRESENTATIVES FOR EMPLOYEE TRAINING REQUIREMENTS FOR ALL EQUIPMENT.

MECHANICAL CONTRACTOR SHALL SUBMIT COMPLIANCE CHECKLIST TO BUILDING OFFICIAL UPON SUBSTANTIAL COMPLETION OF PROJECT. PROVIDE EQUIPMENT INDICATED ON THE DRAWINGS, AND AS REQUIRED FOR A COMPLETE FUNCTIONING SYSTEM.

DEFINITIONS:  
**FURNISH** MEANS TO SUPPLY AND DELIVER TO PROJECT SITE, READY FOR INSTALLATION.  
**INSTALL** MEANS TO PLACE IN POSITION AND MAKE CONNECTIONS FOR SERVICE OR USE.  
**PROVIDE** MEANS TO FURNISH AND INSTALL, COMPLETE AND READY FOR INTENDED USE.

WARRANTY:  
PROVIDE LABOR AND MATERIALS TO REPAIR OR REPLACE DEFECTIVE PARTS AND MATERIALS AS REQUIRED FOR ONE YEAR AFTER SUBSTANTIAL COMPLETION OR OWNER ACCEPTANCE OF THE COMPLETED PROJECT. PROVIDE A SEPARATE LINE ITEM DEDUCT AMOUNT ON THE PROPOSAL FORM TO DELETE WARRANTY SERVICE, AT THE OWNER'S OPTION. CONTRACTOR SHALL INCLUDE ONE YEAR WARRANTY ON OWNER FURNISHED EQUIPMENT. CONTRACTOR SHALL INCLUDE COSTS FOR RECEIVING, HANDLING, STORAGE, AND HOISTING OF OWNER FURNISHED EQUIPMENT.

COORDINATION:  
COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF THE OWNER, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

DUCT DIMENSIONS:  
UNLESS OTHERWISE NOTED, DUCT DIMENSIONS ON THE DRAWINGS ARE INSIDE CLEAR DIMENSIONS.

MAKE-UP AIR UNIT:  
UNIT SHALL HAVE AN INTEGRAL DISCHARGE THERMOSTAT LINKED TO THE INTERNAL CONTROLS. THE HEATER SHALL BE SET TO MAINTAIN DUCT SUPPLY TEMPERATURE AT NO LESS THAN 65 DEG. F. (ADJ.). HIGH LIMIT SWITCH SET TO 180 DEG. F. INTAKE AIR SENSOR SET TO 10 DEG. F. (ADJ.) LOWER THAN DISCHARGE AIR SENSOR.

TEMPERATURE CONTROLS:  
PROVIDE PROGRAMMABLE THERMOSTATS WITH REMOTE TEMPERATURE SENSORS AND REMOTE HUMIDISTATS COMPATIBLE WITH ROOFTOP UNIT. CONTROL WIRING SHALL BE INSTALLED IN CONDUIT. THERMOSTAT SHALL MEET SETPOINT ADJUSTMENT FOR UNOCCUPIED MODE: HEATING DOWN TO 55 DEGREES AND COOLING UP TO 85 DEGREES. PROVIDE INTERLOCK CONTROL WIRING BETWEEN HOOD EXHAUST FANS AND ROOFTOP UNITS.

## END OF SECTION

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 SECTION REQUIREMENTS

##### A. SUBMITTALS:

- CERTIFIED TAB REPORTS.
- TAB FIRM QUALIFICATIONS: NBC CERTIFIED.
- TAB REPORT FORMS: STANDARD TAB CONTRACTOR'S FORMS APPROVED BY ARCHITECT.

##### PART 2 - PRODUCTS (NOT USED)

##### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- EXAMINE THE CONTRACT DOCUMENTS TO BECOME FAMILIAR WITH PROJECT REQUIREMENTS AND TO DISCOVER CONDITIONS IN SYSTEMS' DESIGNS THAT MAY PRECLUDE PROPER TAB OF SYSTEMS AND EQUIPMENT.
- EXAMINE THE APPROVED SUBMITTALS FOR HVAC SYSTEMS AND EQUIPMENT.
- EXAMINE SYSTEMS FOR INSTALLED BALANCING DEVICES, SUCH AS TEST PORTS, GAGE COCKS, THERMOMETER WELLS, FLOW CONTROL DEVICES, BALANCING VALVES AND FITTINGS, AND MANUAL VOLUME DAMPERS. VERIFY THAT LOCATIONS OF THESE BALANCING DEVICES ARE ACCESSIBLE.
- EXAMINE SYSTEM AND EQUIPMENT INSTALLATIONS AND VERIFY THAT FIELD QUALITY-CONTROL TESTING, CLEANING, AND ADJUSTING SPECIFIED IN INDIVIDUAL SECTIONS HAVE BEEN PERFORMED.
- EXAMINE HVAC EQUIPMENT AND FILTERS AND VERIFY THAT BEARINGS ARE GREASED, BELTS ARE ALIGNED AND TIGHT, AND EQUIPMENT WITH FUNCTIONING CONTROLS IS READY FOR OPERATION.
- EXAMINE TERMINAL UNITS, SUCH AS VARIABLE-AIR-VOLUME BOXES, AND VERIFY THAT THEY ARE ACCESSIBLE AND THEIR CONTROLS ARE CONNECTED AND FUNCTIONING.
- EXAMINE AUTOMATIC TEMPERATURE SYSTEM COMPONENTS TO VERIFY THE FOLLOWING:
  - DAMPERS, VALVES, AND OTHER CONTROLLED DEVICES ARE OPERATED BY THE INTENDED CONTROLLER.
  - DAMPERS AND VALVES ARE IN THE POSITION INDICATED BY THE CONTROLLER.
  - INTEGRITY OF DAMPERS AND VALVES FOR FREE AND FULL OPERATION AND FOR TIGHTNESS OF FULLY CLOSED AND FULLY OPEN POSITIONS. THIS INCLUDES DAMPERS IN MULTIZONE UNITS, MIXING BOXES, AND VARIABLE-AIR-VOLUME TERMINALS.
  - AUTOMATIC MODULATING AND SHUTOFF VALVES, INCLUDING TWO-WAY VALVES AND THREE-WAY MIXING AND DIVERTING VALVES, ARE PROPERLY CONNECTED.
  - THERMOSTATS AND HUMIDISTATS ARE LOCATED TO AVOID ADVERSE EFFECTS OF SUNLIGHT, DRAFTS, AND COLD WALLS.
  - SENSORS ARE LOCATED TO SENSE ONLY THE INTENDED CONDITIONS.
  - SEQUENCE OF OPERATION FOR CONTROL MODES IS ACCORDING TO THE CONTRACT DOCUMENTS.
  - CONTROLLER SET POINTS ARE SET AT INDICATED VALUES.
  - INTERLOCKED SYSTEMS ARE OPERATING.
  - CHANGEOVER FROM HEATING TO COOLING MODE OCCURS ACCORDING TO INDICATED VALUES.

- REPORT DEFICIENCIES DISCOVERED BEFORE AND DURING PERFORMANCE OF TEST AND BALANCE PROCEDURES.

#### 3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

- PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE", NBC, ASHRAE 111, NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS" OR SMACNA'S "HVAC SYSTEMS - TESTING, ADJUSTING, AND BALANCING" AND IN THIS SECTION.

- CUT INSULATION, DUCTS, PIPES, AND EQUIPMENT CABINETS FOR INSTALLATION OF TEST PROBES TO THE MINIMUM EXTENT NECESSARY FOR TAB PROCEDURES. AFTER TESTING AND BALANCING, PATCH PROBE HOLES IN DUCTS WITH SAME MATERIAL AND THICKNESS AS USED TO CONSTRUCT DUCTS. INSTALL AND JOIN NEW INSULATION THAT MATCHES REMOVED MATERIALS. RESTORE INSULATION, COVERINGS, VAPOR BARRIER, AND FINISH.

- MARK EQUIPMENT AND BALANCING DEVICES, INCLUDING DAMPER-CONTROL POSITIONS, VALVE POSITION INDICATORS, FAN-SPEED-CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, WITH PAINT OR OTHER SUITABLE, PERMANENT IDENTIFICATION MATERIAL TO SHOW FINAL SETTINGS.

#### 3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- PREPARE SCHEMATIC DIAGRAMS OF SYSTEMS "AS-BUILT" DUCT LAYOUTS.
- FOR VARIABLE-AIR-VOLUME SYSTEMS, DEVELOP A PLAN TO SIMULATE DIVERSITY.
- DETERMINE THE BEST LOCATIONS IN MAIN AND BRANCH DUCTS FOR ACCURATE DUCT AIRFLOW MEASUREMENTS.
- VERIFY THAT MOTOR STARTERS ARE EQUIPPED WITH PROPERLY SIZED THERMAL PROTECTION.
- CHECK FOR AIRFLOW BLOCKAGES.

- CHECK CONDENSATE DRAINS FOR PROPER CONNECTIONS AND FUNCTIONING.

- CHECK FOR PROPER SEALING OF AIR-HANDLING UNIT COMPONENTS.

- CHECK FOR PROPER SEALING OF AIR DUCT SYSTEM.

#### 3.4 TOLERANCES

- SET HVAC SYSTEM AIRFLOW AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES:

- SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS OR MINUS 5 PERCENT.
- AIR OUTLETS AND INLETS: PLUS OR MINUS 10 PERCENT.

## END OF SECTION

## SECTION 230700 - HVAC INSULATION

### PART 1 - GENERAL

#### 1.1 SECTION REQUIREMENTS

- QUALITY ASSURANCE: LABELED WITH MAXIMUM FLAME-SPREAD INDEX OF 25 AND MAXIMUM SMOKE-DEVELOPED INDEX OF 50 ACCORDING TO ASTM E 84.

##### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

##### A. SURFACE-BURNING CHARACTERISTICS:

- INDOOR INSULATION AND RELATED MATERIALS: TO BE FACTORY LABELED DESIGNATING MAXIMUM FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS ACCORDING TO ASTM E 84.

#### 2.2 INSULATION MATERIALS

- FLEXIBLE ELASTOMERIC: CLOSED-CELL, SPONGE- OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS AND TYPE II FOR SHEET MATERIALS.
- MINERAL-FIBER BLANKET INSULATION: COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE I.

- FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II.

- FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C 1136.

- MINERAL-FIBER, PIPE AND TANK INSULATION: COMPLYING WITH ASTM C 1393, TYPE II OR TYPE IIIA CATEGORY 2, OR WITH PROPERTIES SIMILAR TO ASTM C 612, TYPE IB; AND HAVING FACTORY-APPLIED ASJ JACKET. NOMINAL DENSITY IS 2.5 LB./CU. FT. OR MORE. THERMAL CONDUCTIVITY (K-VALUE) AT 100 DEG F IS 0.29 BTU X IN./H X SQ. FT. X DEG F OR LESS.

- ASJ: WHITE, KRAFT-PAPER, FIBERGLASS-REINFORCED SCRIM WITH ALUMINUM-FOIL BACKING; COMPLYING WITH ASTM C 1136, TYPE I.

- ASJ TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE, COMPLYING WITH ASTM C 1136.

- FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I.

- MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.

- VAPOR-BARRIER MASTIC: WATER BASED; SUITABLE FOR INDOOR AND OUTDOOR USE ON BELOW AMBIENT SERVICES; COMPLY WITH MIL-PRF-15665C, TYPE II.

### PART 3 - EXECUTION

#### 3.1 INSULATION INSTALLATION

- COMPLY WITH REQUIREMENTS OF THE MIDWEST INSULATION CONTRACTORS ASSOCIATION'S "NATIONAL COMMERCIAL & INDUSTRIAL INSULATION STANDARDS" FOR INSULATION INSTALLATION ON PIPES AND EQUIPMENT.

- INSULATION INSTALLATION AT INTERIOR WALLS AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.

- INSULATION INSTALLATION AT FIRE-RATED WALL, PARTITION, AND FLOOR PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH PENETRATIONS. SEAL PENETRATIONS, COMPLY WITH REQUIREMENTS IN SECTION 078400.

#### D. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION:

- SEAL LONGITUDINAL SEAMS AND END JOINTS WITH ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.
- INSULATION INSTALLATION ON PIPE FITTINGS AND ELBOWS: INSTALL MITERED SECTIONS OF PIPE INSULATION. SECURE INSULATION MATERIALS AND SEAL SEAMS WITH ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.

#### E. MINERAL-FIBER INSULATION INSTALLATION:

- INSULATION INSTALLATION ON STRAIGHT PIPES AND TUBES: WHERE VAPOR BARRIERS ARE INDICATED, SEAL LONGITUDINAL SEAMS, END JOINTS, AND PROTRUSIONS WITH VAPOR-BARRIER MASTIC AND JOINT SEALANT.
- FOR INSULATION WITH FACTORY-APPLIED JACKETS ON ABOVE AMBIENT SURFACES, SECURE LAPS WITH OUTWARD CLINCHED STAPLES AT 6 INCHES O.C.
- FOR INSULATION WITH FACTORY-APPLIED JACKETS ON BELOW AMBIENT SURFACES, DO NOT STAPLE LONGITUDINAL TABS BUT SECURE TABS WITH ADDITIONAL ADHESIVE AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER AND SEAL WITH VAPOR-BARRIER MASTIC AND FLASHING SEALANT.
- BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH ADHESIVE AND INSULATION PINS.
- FOR DUCTS AND PLENUMS WITH SURFACE TEMPERATURES BELOW AMBIENT, INSTALL A CONTINUOUS UNBROKEN VAPOR BARRIER.

#### F. PLENUMS AND DUCTS REQUIRING INSULATION:

- CONCEALED SUPPLY AIR.
- CONCEALED AND EXPOSED OUTDOOR AIR.
- CONCEALED AND EXPOSED RETURN AIR LOCATED IN NONCONDITIONED SPACE.

#### 3.2 DUCT AND PLENUM INSULATION SCHEDULE

- CONCEALED DUCT INSULATION SHALL BE 1-1/2" THICK MINERAL-FIBER BLANKET WITH A 1.5-LB/CU. FT. NOMINAL DENSITY.

#### 3.3 HVAC PIPING INSULATION SCHEDULE

- CONDENSATE PIPING: INSULATION SHALL BE 1" THICK FLEXIBLE ELASTOMERIC.

- REFRIGERANT PIPING: INSULATION SHALL BE 1" THICK FLEXIBLE ELASTOMERIC.

## END OF SECTION

## SECTION 232300 - REFRIGERANT PIPING

### PART 2 - PRODUCTS

#### 2.1 TUBES AND FITTINGS

- COPPER TUBE: ASTM B 88, TYPE K OR TYPE L, ANNEALED OR DRAWN-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED OR SOLDERED JOINTS.
- WROUGHT-COPPER FITTINGS AND UNIONS: ASME B16.22.
- SOLDER FILLER METALS: ASTM B 32. USE 95-5 TIN ANTIMONY OR ALLOY HB SOLDER TO JOIN COPPER SOCKET FITTINGS ON COPPER PIPE.
- BRAZING FILLER METALS: AWS A5.8.

#### 2.2 VALVES AND SPECIALTIES

- AS REQUIRED BY THE KITCHEN EQUIPMENT MANUFACTURER.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- INSTALL REFRIGERANT PIPING AND CHARGE WITH REFRIGERANT ACCORDING TO ASHRAE 15.
- INSTALL REFRIGERANT PIPING AS REQUIRED BY THE KITCHEN EQUIPMENT MANUFACTURER.

## END OF SECTION

## SECTION 233100 - HVAC DUCTS AND CASINGS

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."
- STRUCTURAL PERFORMANCE: DUCT HANGERS AND SUPPORTS SHALL WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."
- COMPLY WITH NFPA 96 FOR DUCTS CONNECTED TO COMMERCIAL KITCHEN HOODS.

#### 2.2 DUCTS

- ELECTROGALVANIZED-STEEL SHEET: ASTM A 879

- PAINT/LOK/PAINT/LOCK OR EQUAL.

- GENERAL DUCTWORK SHALL BE GALVANIZED STEEL, ASTM A653/A653M, CONSTRUCTED TO THE GAUGE AND CORRESPONDING REINFORCING SCHEDULE AS INDICATED IN THE LATEST EDITION OF SMACNA.

##### C. TYPE 1 KITCHEN EXHAUST DUCTWORK

- FACTORY-BUILT COMMERCIAL KITCHEN GREASE DUCT:
  - INSTALL REDUCED CLEARANCE, ROUND, DOUBLE-WALL GREASE DUCT AS SPECIFIED MEETING UL 978 REQUIREMENTS. REFER TO KITCHEN EQUIPMENT SUPPLIER DRAWINGS FOR REQUIREMENTS.
  - DUCTWORK AND FITTINGS FURNISHED BY OWNER FOR INSTALLATION BY THIS CONTRACTOR.
- ALTERNATIVE:
  - PROVIDE GREASE DUCT WITH 2-HOUR FIREWRAP FOR ZERO CLEARANCE TO COMBUSTIBLES.

- TYPE 2 KITCHEN EXHAUST DUCTWORK: 18 GAUGE ALUMINUM OR STAINLESS STEEL. SEAMS SHALL BE CONTINUOUSLY WELDED LIQUID TIGHT.

- JOINT AND SEAM TAPE, AND SEALANT: COMPLY WITH UL 181A. PROVIDE POLYMERIC RUBBER TYPE SEALANT FOR USE ON BOTH INTERIOR LOCATED DUCTWORK AND DUCTWORK EXPOSED TO OUTDOOR CONDITIONS. SEALER SHALL HAVE HIGH BONDING STRENGTH FOR SURE, FIRST TIME SEALING OF JOINTS IN LOW, MEDIUM, AND HIGH PRESSURE DUCT SYSTEMS. SEALER SHALL BE HIGH IN SOLID CONTENT. PROVIDE A TWO PART TAPE SEALING SYSTEM, CONSISTING OF WOVEN FIBER TAPE IMPREGNATED WITH A GYPSUM MINERAL COMPOUND, AND A MODIFIED ACRYLIC/SILICONE ACTIVATOR THAT REACTS EXOTHERMICALLY WITH THE TAPE. TWO PART TAPE SEALING SYSTEM MUST BE RATED FOR BOTH INDOOR AND OUTDOOR APPLICATION. TAPE SHALL NOT CONTAIN ASBESTOS.

- METAL DUCT FABRICATION: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."

#### 2.3 ACCESSORIES

- VOLUME DAMPERS AND CONTROL DAMPERS: SINGLE-BLADE AND MULTIPLE OPPOSED-BLADE DAMPERS, STANDARD LEAKAGE RATING, HEAVY DUTY, AND SUITABLE FOR HORIZONTAL OR VERTICAL APPLICATIONS; FACTORY FABRICATED AND COMPLETE WITH REQUIRED HARDWARE AND ACCESSORIES.

- ROUND VOLUME DAMPERS: PROVIDE MINIMUM 20 GAUGE GALVANIZED STEEL FRAME AND BLADES; MINIMUM 3/8" SQUARE STEEL AXLE; MOLDED SYNTHETIC BEARINGS, WITH LOCKING POSITION REGULATOR. REGULATOR SHALL BE POSITIONED WITH SHEET METAL BRACKET. SECOND DUCT COVERING, WHERE POSITIONING REGULATOR IS NOT ACCESSIBLE, PROVIDE COUPLING AND EXTENSION ROD WITH REGULATOR FOR CEILING OR WALL INSTALLATION, AS REQUIRED.

- RECTANGULAR VOLUME DAMPERS: PROVIDE MINIMUM 16 GAUGE GALVANIZED STEEL CHANNEL FRAME, 16 GAUGE GALVANIZED STEEL BLADES, MINIMUM 1/2" HEXAGONAL AXLE, BOLDED SYNTHETIC BEARINGS, WITH 3/8" SQUARE PLATED STEEL CONTROL SHAFT. LINKAGES SHALL BE CONCEALED IN THE FRAME. OPERATING SHAFT SHALL EXTEND BEYOND FRAME AND DUCT TO A LOCKING QUADRANT WITH ADJUSTABLE LEVER. MAXIMUM BLADE WIDTH SHALL NOT EXCEED 6".

- FLEXIBLE DUCT CONNECTORS: FLAME-RETARDED OR NONCOMBUSTIBLE FABRICS, COATINGS, AND ADHESIVES COMPLYING WITH UL 181, CLASS 1. CONNECTOR TO BE 30 UNCE, NEOPRENE COATED, FIBERGLASS FABRIC.

- FLEXIBLE DUCTS: FACTORY ASSEMBLED, UL 181, CLASS 1, WITH 1-1/2-INCH THICK (R-4.2 MIN.), 1 PCF FIBERGLASS INSULATION AND REINFORCED OUTER PROTECTIVE COVER/VAPOR BARRIER. FLEXIBLE DUCT SHALL MEET NFPA 90A WITH FLAME SPREAD UNDER 25, SMOKE DEVELOPED UNDER 50, AND SHALL BE RATED FOR MINIMUM 2-INCH WG PRESSURE AND 0 TO 250°F TEMPERATURE. PROVIDE SCREW-OPERATED METAL ADJUSTABLE CLAMPING DEVICES. USE TWIST-LOCK CONICAL TAP COLLARS AT CONNECTIONS INTO SHEET METAL DUCTWORK. MAXIMUM EXTENDED LENGTH OF FLEXIBLE DUCT SHALL NOT EXCEED 5 FEET.

- TURNING VANES: PROVIDE FABRICATED TURNING VANES AND VANE RUNNERS, CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS": PROVIDE TURNING VANES CONSTRUCTED OF CURVED BLADES, SUPPORTED BY BARS PERPENDICULAR TO BLADES, AND SET INTO SIDE STRIPS SUITABLE FOR MOUNTING IN DUCTWORK. FOLLOW SMACNA GUIDELINES FOR SPACING SUPPORT, AND CONSTRUCTION. ALL BLADES SHALL BE DOUBLE THICKNESS AIRFLOW TYPE.

- BIRD SCREENS AND FRAMES: PROVIDE BIRD SCREENS THAT CONFORM TO ASTM E 2016, NO. 2 MESH, ALUMINUM OR STAINLESS STEEL. PROVIDE "MEDIUM-LIGHT" RATED ALUMINUM SCREENS. PROVIDE "LIGHT" RATED STAINLESS STEEL SCREENS.

- DUCT-MOUNTED ACCESS DOORS: FABRICATE ACCESS PANELS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE", FIGURES 2-10, "DUCT ACCESS DOORS AND PANELS," AND 2-11, "ACCESS PANELS - ROUND DUCT."

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- INSTALL DUCTWORK, ACCESSORIES, AND SUPPORTS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" UNLESS OTHERWISE INDICATED.

- SEAL DUCTS TO THE FOLLOWING SEAL CLASSES ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE": 1-INCH WG, SEAL CLASS A.

- AVOID PASSING THROUGH OR ABOVE ELECTRICAL EQUIPMENT SPACES AND ENCLOSURES.

- CLEAN DUCT SYSTEMS BEFORE TESTING, ADJUSTING, AND BALANCING.

#### 3.2 DUCTWORK SCHEDULE

- EXPOSED DUCTWORK IN ARCHITECTURALLY FINISHED SPACES: ELECTRO-GALVANIZED STEEL SHEET.
- CONCEALED DUCTWORK AND DUCTWORK IN UNFINISHED ARCHITECTURAL SPACES: GALVANIZED STEEL.

## END OF SECTION

## SECTION 233423 - HVAC EXHAUST FANS

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- PRODUCTS SHALL BE LICENSED TO USE THE AMCA-CERTIFIED RATINGS SEAL.
- EXHAUST FANS SHALL COMPLY WITH UL 705. TYPE 1 FANS SHALL ALSO COMPLY WITH UL 762.
- TYPE 1 FANS TO BE DESIGNED FOR HIGH HEAT OPERATION AT 300°F.
- ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.

#### 2.2 CENTRIFUGAL VENTILATORS

- HOUSING: REMOVABLE, SPUN-ALUMINUM, DOME TOP AND OUTLET BAFFLE; SQUARE, ONE-PIECE, ALUMINUM BASE WITH VENTURI INLET CONE.

- UPBLAST UNITS: ALUMINUM DISCHARGE BAFFLE TO DIRECT DISCHARGE AIR UPWARD, WITH RAIN AND SNOW DRAINS.

- FAN WHEELS: ALUMINUM HUB AND WHEEL WITH BACKWARD-INCLINED BLADES.

- BELT-DRIVEN DRIVE ASSEMBLY: RESILIENTLY MOUNTED TO HOUSING.

- FAN SHAFT: TURNED, GROUND, AND POLISHED STEEL; KEYS TO WHEEL HUB.

- SHAFT BEARINGS: PERMANENTLY LUBRICATED, PERMANENTLY SEALED, SELF-ALIGNING BALL BEARINGS.

- PULLEYS: CAST-IRON, ADJUSTABLE-PITCH MOTOR PULLEY.

- FAN AND MOTOR ISOLATED FROM EXHAUST AIRSTREAM.

##### D. ACCESSORIES:

- DISCONNECT SWITCH: NON-FUSIBLE TYPE, WITH THERMAL-OVERLOAD PROTECTION, FACTORY WIRED THROUGH AN INTERNAL ALUMINUM CONDUIT.

- BIRD SCREENS: REMOVABLE, 1/2-INCH MESH, ALUMINUM OR BRASS WIRE.

- DAMPERS: COUNTERBALANCED, PARALLEL-BLADE, BACKDRAFT DAMPERS MOUNTED IN CURB BASE; FACTORY SET TO CLOSE WHEN FAN STOPS.

- MOTORIZED DAMPERS: PARALLEL-BLADE DAMPERS MOUNTED IN CURB BASE WITH ELECTRIC ACTUATOR, WIRED TO CLOSE WHEN FAN STOPS.

- ROOF CURBS: 20 GAUGE GALVANIZED STEEL; MITERED AND WELDED CORNERS; 1-1/2-INCH THICK, RIGID, FIBERGLASS INSULATION ADHERED TO INSIDE WALLS; AND 1-1/2-INCH WOOD NAILER. SIZE AS REQUIRED TO SUIT ROOF OPENING AND FAN BASE.

- CONFIGURATION: SELF-FLASHING WITHOUT A CANT STRIP, WITH MOUNTING FLANGE.

- OVERALL HEIGHT: 14 INCHES FOR GENERAL EXHAUST FANS; 20 INCHES FOR KITCHEN EXHAUST FANS.

- PITCH MOUNTING: MANUFACTURER CURB FOR ROOF SLOPE.

- MOUNTING PEDESTAL: GALVANIZED STEEL WITH REMOVABLE ACCESS PANEL.

- TYPE 1 ROOF CURBS TO BE VENTED TYPE.

- TYPE 1 AND TYPE 2 ROOF CURBS TO BE HINGED TYPE.

##### F. CAPACITIES AND CHARACTERISTICS:

- SEE SCHEDULE.

##### G. MOTORS

- COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, ENCLOSURE TYPE, AND EFFICIENCY REQUIREMENTS FOR MOTORS.

- MOTOR SIZES: MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.

- ENCLOSURE TYPE: TOTALLY ENCLOSED, FAN COOLED.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- INSTALL UNITS WITH CLEARANCES FOR SERVICE AND MAINTENANCE

- ROOF-MOUNTED UNITS: INSTALL ROOF CURB ON ROOF STRUCTURE, ACCORDING TO ARI GUIDELINE B. INSTALL AND SECURE ROOF-MOUNTED FANS ON CURBS, AND COORDINATE ROOF PENETRATIONS AND FLASHING WITH ROOF CONSTRUCTION.

## END OF SECTION

## SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

### PART 1 - GENERAL

##### PART 2 - PRODUCTS

#### 2.1 DIFFUSERS, REGISTERS, AND GRILLES:

- REFER TO SCHEDULES FOR FINISH TYPE, COLOR, MATERIAL, AND MOUNTING.

##### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- INSTALL DIFFUSERS, REGISTERS, AND GRILLES LEVEL AND PLUMB.

- CEILING-MOUNTED OUTLETS AND INLETS: DRAWINGS INDICATE GENERAL ARRANGEMENT OF DUCTS, FITTINGS, AND ACCESSORIES. MAKE FINAL LOCATIONS WHERE INDICATED, AS MUCH AS PRACTICAL. FOR UNITS INSTALLED IN LAY-IN CEILING PANELS, LOCATE UNITS IN THE CENTER OF PANEL, UNLESS OTHERWISE INDICATED. WHERE ARCHITECTURAL FEATURES OR OTHER ITEMS CONFLICT WITH INSTALLATION, NOTIFY ARCHITECT FOR A DETERMINATION OF FINAL LOCATION.

- AFTER INSTALLATION, ADJUST DIFFUSERS, REGISTERS, AND GRILLES TO AIR PATTERNS INDICATED, OR AS DIRECTED, BEFORE STARTING AIR BALANCING.

#### 2. END OF SECTION

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# SPECIFICATIONS - DIVISION 23 - HVAC (CONTINUED)

## SECTION 237339 - DIRECT-FIRED MAKE-UP AIR UNIT

### PART 2 - PRODUCTS

#### 2.1 PACKAGED UNITS

- A. FACTORY-ASSEMBLED, PREWIRED, SELF-CONTAINED UNIT CONSISTING OF CABINET, SUPPLY FAN, CONTROLS, FILTERS, AND DIRECT-FIRED GAS FURNACE TO BE INSTALLED OUTSIDE THE BUILDING.

#### 2.2 CABINET

- A. CABINET: GALVANIZED-STEEL PANELS WITH LIFTING LUGS. CABINET SHALL BE FULLY WEATHERIZED FOR OUTDOOR INSTALLATION. HEAT-RESISTANT, BAKED-ENAMEL FINISH, VERTICAL-PATTERN, GALVANIZED-STEEL DISCHARGE PLENUM WITH DIFFUSERS INCORPORATING INDIVIDUALLY ADJUSTABLE VANES.

- B. ROOF CURB: FULL-PERIMETER CURB OF SHEET METAL, MINIMUM 20 INCHES HIGH, WITH WOOD NAILER, NEOPRENE SEALING STRIP, AND WELDED Z-BAR FLASHING.

- C. OUTDOOR-AIR INTAKE: GALVANIZED-STEEL HOOD WITH RAIN BAFFLES, BIRD SCREEN, AND FINISH TO MATCH CABINET; AND SIZED TO SUPPLY 100 PERCENT OUTDOOR AIR. GALVANIZED-STEEL, OPPOSED-BLADE MOTORIZED DAMPERS WITH VINYL BLADE SEALS AND STAINLESS-STEEL JAMB SEAL.

- D. FILTERS: COMPLY WITH NFPA 90A, 1 INCH THICK.

#### 2.3 SUPPLY-AIR FAN

- A. FAN: CENTRIFUGAL, RATED ACCORDING TO AMCA 210; STATICALLY AND DYNAMICALLY BALANCED, GALVANIZED STEEL; MOUNTED ON SOLID-STEEL SHAFT.

- B. MOTOR: TOTALLY ENCLOSED, SINGLE SPEED MOTOR.

- C. DRIVE: V-BELT DRIVE WITH MATCHING FAN PULLEY AND ADJUSTABLE MOTOR SHEAVES AND BELT ASSEMBLY.

- D. GAS PRESSURE GAUGE: 2-1/2 INCH DIAMETER AND 1/4 INCH THREAD SIZE.

#### 2.4 DIRECT-FIRED GAS FURNACE

- A. DESCRIPTION: FACTORY ASSEMBLED, PIPED, AND WIRED; AND COMPLYING WITH ANSI Z83.4, ANSI Z83.18, AND NFPA 94, CAST-IRON BURNER WITH STAINLESS-STEEL MIXING PLATES, SINGLE-STAGE CONTROL VALVE, FUEL-NATURAL GAS.

- B. SAFETY CONTROLS: AIRFLOW PROVING SWITCH; HIGH-TEMPERATURE LIMIT; SAFETY LOCKOUT; REDUNDANT, AUTOMATIC, MAIN GAS VALVES; ELECTRIC PILOT VALVE; MODULATING TEMPERATURE CONTROL VALVE; MAIN AND PILOT GAS REGULATORS; MAIN AND PILOT MANUAL SHUTOFF VALVES; MAIN AND PILOT PRESSURE TAPS; AND HIGH-LOW GAS PRESSURE SWITCHES TO COMPLY WITH ANSI STANDARDS.

#### 2.5 CONTROLS

- A. FACTORY-WIRED, FUSE-PROTECTED CONTROL TRANSFORMER, CONNECTION FOR POWER SUPPLY AND FIELD-WIRED UNIT TO REMOTE CONTROL PANEL.

1. FAN CONTROL: INTERLOCK FAN TO START WITH EXHAUST FAN(S) AND WITH RTU COOLING CYCLE.
2. OUTDOOR-AIR DAMPER CONTROL: OUTDOOR-AIR DAMPER OPENS WHEN SUPPLY FAN STARTS, AND CLOSES WHEN FAN STOPS.
3. TEMPERATURE CONTROL: OPERATES GAS VALVE TO MAINTAIN SUPPLY-AIR TEMPERATURE.

#### 2.6 INSTALLATION

- A. INSTALL GAS-FIRED UNITS ACCORDING TO NFPA 54.

- B. INSTALL ROOF CURB ON ROOF STRUCTURE, ACCORDING TO ARI GUIDELINE B OR NRCA'S "LOW-SLOPE MEMBRANE ROOFING CONSTRUCTION DETAILS" MANUAL.

- C. CONNECT GAS PIPING WITH SHUTOFF VALVE AND UNION AND WITH SUFFICIENT CLEARANCE FOR BURNER REMOVAL AND SERVICE.

- D. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF DUCTS. CONNECT SUPPLY DUCTS TO DIRECT-FIRED MAU WITH FLEXIBLE DUCT CONNECTORS; FLEXIBLE DUCT CONNECTORS ARE SPECIFIED IN SECTION 233100 "HVAC DUCTS AND CASINGS."

#### END OF SECTION

## SECTION 237413 - PACKAGED ROOFTOP UNITS

### 1.1 SUMMARY

- A. THIS SECTION INCLUDES PACKAGED, ROOFTOP UNITS WITH THE FOLLOWING COMPONENTS AND ACCESSORIES:

1. DIRECT-EXPANSION COOLING.
2. HUMIDITY CONTROL WITH HOT-GAS REHEAT (OPTIONAL)
3. GAS FURNACE.
4. ECONOMIZER OUTDOOR-AND RETURN-AIR DAMPER SECTION.
5. INTEGRAL, SPACE TEMPERATURE CONTROLS.
6. ROOF CURBS.

### 1.2 SECTION REQUIREMENTS

#### A. SUBMITTALS:

1. PRODUCT DATA: INCLUDE MANUFACTURER'S TECHNICAL DATA FOR EACH RTU, INCLUDING RATED CAPACITIES, DIMENSIONS, REQUIRED CLEARANCES, CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.

### PART 2 - PRODUCTS

#### 2.1 CASING

- A. GENERAL FABRICATION REQUIREMENTS FOR CASINGS: FORMED AND REINFORCED INSULATED PANELS, FABRICATED TO ALLOW REMOVAL FOR ACCESS TO INTERNAL PARTS AND COMPONENTS, WITH JOINTS BETWEEN SECTIONS SEALED.

- B. EXTERIOR CASING MATERIAL: GALVANIZED STEEL WITH FACTORY-PAINTED FINISH, WITH PITCHED ROOF PANELS AND KNOCKOUTS WITH GROMMET SEALS FOR ELECTRICAL AND PIPING CONNECTIONS AND LIFTING LUGS.

1. CASING THICKNESS: 16 GAUGE THICK.
2. CASING INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A.

1. MATERIALS: ASTM C 1071, TYPE I.
2. THICKNESS: 1/2 INCH
3. LINER MATERIALS SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.
4. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.

- D. UNIT SHALL HAVE A THRU-THE-BASE GAS AND ELECTRICAL CONNECTIONS.

#### 2.2 FANS

#### OPTION A OR B:

- A. DIRECT-DRIVEN SUPPLY-AIR FANS: DOUBLE WIDTH, BACKWARD INCLINED, CENTRIFUGAL; WITH PERMANENTLY LUBRICATED, MOTOR RESILIENTLY MOUNTED IN THE FAN INLET. ALUMINUM OR PAINTED-STEEL WHEELS, AND GALVANIZED- OR PAINTED-STEEL FAN SCROLLS.

- B. BELT-DRIVEN SUPPLY-AIR FANS: DOUBLE WIDTH, FORWARD CURVED, CENTRIFUGAL; WITH PERMANENTLY LUBRICATED, SINGLE-SPEED MOTOR INSTALLED ON AN ADJUSTABLE FAN BASE RESILIENTLY MOUNTED IN THE CASING. ALUMINUM OR PAINTED-STEEL WHEELS, AND GALVANIZED- OR PAINTED-STEEL FAN SCROLLS.

- C. CONDENSER-COIL FAN: DIRECT DRIVE, PROPELLER, MOUNTED ON SHAFT OF PERMANENTLY LUBRICATED MOTOR WITH THERMAL OVERLOAD PROTECTION.

- D. POWER EXHAUST: FORWARD CURVED, SHAFT MOUNTED ON PERMANENTLY LUBRICATED MOTOR.

#### 2.3 COILS

#### A. SUPPLY-AIR REFRIGERANT COIL:

1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
3. CATHODIC EPOXY COATING.
4. CONDENSATE DRAIN PAN: GALVANIZED STEEL WITH CORROSION-RESISTANT COATING FORMED WITH PITCH AND DRAIN CONNECTIONS.

#### B. OUTDOOR-AIR REFRIGERANT COIL:

1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
  2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
  3. CATHODIC EPOXY COATING.
- C. HOT-GAS REHEAT REFRIGERANT COIL (OPTIONAL):
    1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED COPPER TUBE IN STEEL CASING WITH EQUALIZING-TYPE VERTICAL DISTRIBUTOR.
    2. POLYMER STRIP SHALL PREVENT ALL COPPER COIL FROM CONTACTING STEEL COIL FRAME OR CONDENSATE PAN.
    3. CATHODIC EPOXY COATING.

#### 2.4 REFRIGERANT CIRCUIT COMPONENTS

- A. NUMBER OF REFRIGERANT CIRCUITS: TWO

- B. COMPRESSOR: HERMETIC, SCROLL, MOUNTED ON VIBRATION ISOLATORS; WITH INTERNAL OVERCURRENT AND HIGH-TEMPERATURE PROTECTION, INTERNAL PRESSURE RELIEF AND CRANKCASE HEATER.

#### C. REFRIGERATION SPECIALTIES:

1. REFRIGERANT: R-410A
2. EXPANSION VALVE WITH REPLACEABLE THERMOSTATIC ELEMENT.
3. REFRIGERANT FILTER/DRYER.
4. MANUAL-RESET HIGH-PRESSURE SAFETY SWITCH.
5. AUTOMATIC-RESET LOW-PRESSURE SAFETY SWITCH.
6. MINIMUM OFF-TIME RELAY.
7. AUTOMATIC-RESET COMPRESSOR MOTOR THERMAL OVERLOAD.
8. BRASS SERVICE VALVES INSTALLED IN COMPRESSOR SUCTION AND LIQUID LINES.
9. LOW-AMBIENT KIT HIGH-PRESSURE SENSOR.
10. HOT-GAS REHEAT SOLENOID VALVE WITH A REPLACEABLE MAGNETIC COIL.

#### 2.5 AIR FILTRATION

- A. PROVIDE 2" THROW-AWAY FIBERGLASS FILTERS.

#### 2.6 GAS FURNACE

- A. BURNERS: IN-SHOT TYPE CONSTRUCTED OF ALUMINUM-COATED STEEL.

1. FUEL: NATURAL GAS.
2. IGNITION: DIRECT SPARK IGNITION (DSI). VERIFY AVAILABILITY OF HIGH-ALTITUDE FEATURE WITH MANUFACTURERS.
3. HIGH-ALTITUDE KIT: FOR PROJECT ELEVATIONS MORE THAN 2,000 FEET ABOVE SEA LEVEL.

- B. HEAT-EXCHANGER AND DRAIN PAN: STAINLESS STEEL.

- C. INDUCED DRAFT COMBUSTION BLOWER.

#### D. SAFETY CONTROLS:

1. GAS CONTROL VALVE: TWO STAGE.
2. GAS TRAIN: SINGLE-BODY, REGULATED, REDUNDANT, 24-V AC GAS VALVE ASSEMBLY CONTAINING PILOT SOLENOID VALVE, PILOT FILTER, PRESSURE REGULATOR, PILOT SHUTOFF, AND MANUAL SHUTOFF.

#### 2.7 DAMPERS

- A. OUTDOOR AND RETURN AIR MIXING DAMPERS: PARALLEL OR OPPOSED-BLADE GALVANIZED-STEEL DAMPERS MECHANICALLY FASTENED TO CADMIUM PLATED FOR GALVANIZED-STEEL OPERATING ROD IN REINFORCED CABINET. CONNECT OPERATING RODS WITH COMMON LINKAGE AND INTERCONNECT LINKAGES SO DAMPERS OPERATE SIMULTANEOUSLY.

1. DAMPER MOTOR: MODULATING WITH ADJUSTABLE MINIMUM POSITION.
2. RELIEF AIR DAMPER: GRAVITY ACTUATED, WITH BIRD SCREEN AND HOOD.

#### 2.8 ELECTRICAL POWER CONNECTION

- A. PROVIDE FOR SINGLE CONNECTION OF POWER TO UNIT WITH UNIT-MOUNTED DISCONNECT SWITCH ACCESSIBLE FROM OUTSIDE UNIT AND CONTROL-CIRCUIT TRANSFORMER WITH BUILT-IN OVERCURRENT PROTECTION.

#### 2.9 CONTROLS

#### A. BASIC UNIT CONTROLS:

1. CONTROL-VOLTAGE TRANSFORMER.
2. WALL-MOUNTED THERMOSTAT OR SENSOR WITH THE FOLLOWING FEATURES:
  - a. HEAT-COOL-OFF SWITCH.
  - b. FAN ON-AUTO SWITCH.
  - c. FAN-SPEED SWITCH.
  - d. AUTOMATIC CHANGEOVER.
  - e. ADJUSTABLE DEADBAND.
  - f. EXPOSED SET POINT.
  - g. EXPOSED INDICATION.
  - h. DEGREE F INDICATION.
  - i. UNOCCUPIED-PERIOD-OVERRIDE PUSH BUTTON.
  - j. DATA ENTRY AND ACCESS PORT TO INPUT TEMPERATURE AND HUMIDITY SET POINTS, OCCUPIED AND UNOCCUPIED PERIODS, AND OUTPUT ROOM TEMPERATURE AND HUMIDITY, SUPPLY-AIR TEMPERATURE, OPERATING MODE, AND STATUS.
3. WALL-MOUNTED HUMIDISTAT OR SENSOR WITH THE FOLLOWING FEATURES:
  - a. EXPOSED SET POINT.
  - b. EXPOSED INDICATION.
4. REMOTE WALL-MOUNTED ANNUNCIATOR PANEL WITH KEYED ACCESS FOR EACH UNIT:
  - a. LIGHTS TO INDICATE POWER ON, UNIT ALARM OR FAILURE, SMOKE DETECTION.

#### B. DDC CONTROLLER:

1. CONTROLLER SHALL HAVE VOLATILE-MEMORY BACKUP.
2. SAFETY CONTROL OPERATION:

- a. SMOKE DETECTORS: STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SMOKE IS DETECTED. PROVIDE ADDITIONAL CONTACTS FOR ALARM INTERFACE TO FIRE ALARM CONTROL PANEL.
- b. FIRE ALARM CONTROL PANEL INTERFACE WHERE APPLICABLE.
- c. LOW-DISCHARGE TEMPERATURE: STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SUPPLY AIR TEMPERATURE IS LESS THAN 40°F.
- d. RETAIN FIRST SUBPARAGRAPH BELOW FOR AIR-TO-AIR HEAT-PUMP FEATURE.
- d. DEFROST CONTROL FOR CONDENSER COIL: PRESSURE DIFFERENTIAL SWITCH TO INITIATE DEFROST SEQUENCE.

3. UNIT SHALL BE CAPABLE OF DIRECT COMMUNICATION WITH GENERIC OPEN PROTOCOL SUCH AS BACNET MS/TP, LONTALK, OR MODBUS. THIS WILL ALLOW THE UNIT TO INTEGRATE WITH A FACILITY ENERGY MANAGEMENT SYSTEM.

4. SCHEDULED OPERATION: OCCUPIED AND UNOCCUPIED PERIODS ON SEVEN-DAY CLOCK WITH A MINIMUM OF FOUR PROGRAMMABLE PERIODS PER DAY.

5. UNOCCUPIED PERIOD:
  - a. HEATING SETBACK: 10°F.
  - b. COOLING SETBACK: SYSTEM OFF.
  - c. OVERRIDE OPERATION: TWO HOURS.

6. SUPPLY FAN OPERATION:
  - a. OCCUPIED PERIODS: RUN FAN CONTINUOUSLY.
  - b. UNOCCUPIED PERIODS: CYCLE FAN TO MAINTAIN SETBACK TEMPERATURE.

7. REFRIGERANT CIRCUIT OPERATION:
  - a. OCCUPIED PERIODS: CYCLE OR STAGE COMPRESSORS, AND OPERATE HOT-GAS BYPASS TO MATCH COMPRESSOR OUTPUT TO COOLING LOAD TO MAINTAIN ROOM TEMPERATURE AND HUMIDITY. CYCLE CONDENSER FANS TO MAINTAIN MAXIMUM HOT-GAS PRESSURE. OPERATE LOW-AMBIENT CONTROL KIT TO MAINTAIN MINIMUM HOT-GAS PRESSURE.
  - b. UNOCCUPIED PERIODS: CYCLE COMPRESSORS AND CONDENSER FANS FOR HEATING TO MAINTAIN SETBACK TEMPERATURE.

8. HOT-GAS REHEAT-COIL OPERATION (OPTIONAL):
  - a. OCCUPIED PERIODS: HUMIDISTAT OPENS HOT-GAS VALVE TO PROVIDE HOT-GAS REHEAT, AND CYCLES COMPRESSOR.
  - b. UNOCCUPIED PERIODS: REHEAT NOT REQUIRED.

9. GAS FURNACE OPERATION:
  - a. OCCUPIED PERIODS: STAGE BURNER TO MAINTAIN ROOM TEMPERATURE.
  - b. UNOCCUPIED PERIODS: CYCLE BURNER TO MAINTAIN SETBACK TEMPERATURE.

10. FIXED MINIMUM OUTDOOR-AIR DAMPER OPERATION:
  - a. OCCUPIED PERIODS: OPEN TO 25 PERCENT.
  - b. UNOCCUPIED PERIODS: CLOSE THE OUTDOOR-AIR DAMPER.

11. ECONOMIZER OUTDOOR-AIR DAMPER OPERATION:
  - a. OCCUPIED PERIODS: OPEN TO 25 PERCENT FIXED MINIMUM INTAKE, AND MAXIMUM 100 PERCENT OF THE FAN CAPACITY TO COMPLY WITH ASHRAE CYCLE II. CONTROLLER SHALL PERMIT AIR-SIDE ECONOMIZER OPERATION WHEN OUTDOOR AIR IS LESS THAN 60 ° F. USE MIXED-AIR TEMPERATURE AND SELECT BETWEEN OUTDOOR-AIR AND RETURN-AIR ENTHALPY TO ADJUST MIXING DAMPERS DURING ECONOMIZER CYCLE OPERATION. LOCK OUT COOLING.
  - b. UNOCCUPIED PERIODS: CLOSE OUTDOOR-AIR DAMPER AND OPEN RETURN-AIR DAMPER.

#### 2.10 ACCESSORIES

- A. DUPLEX, 115-V, GROUND-FAULT-INTERRUPTER OUTLET WITH 15-A OVERCURRENT PROTECTION. INCLUDE TRANSFORMER IF REQUIRED.

- B. LOW-AMBIENT KIT STAGED DOWN TO 0°F.

- C. FILTER DIFFERENTIAL PRESSURE SWITCH WITH SENSOR TUBING ON EITHER SIDE OF FILTER. SET FOR FINAL FILTER PRESSURE LOSS.

- D. HAIL GUARDS OF GALVANIZED STEEL, PAINTED TO MATCH CASING.

- E. DUCT MOUNTED SMOKE DETECTOR IN RETURN AND/OR SUPPLY AIR STREAM CAPABLE OF SHUTTING DOWN THE UNIT IN THE PRESENCE OF SMOKE DETECTION PER AUTHORITY HAVING JURISDICTION.

#### 2.11 ROOF CURBS

- A. MATERIALS: GALVANIZED STEEL WITH CORROSION-PROTECTION COATING, WATERTIGHT GASKETS, AND FACTORY-INSTALLED WOOD NAILER, COMPLYING WITH NRCA STANDARDS.

1. CURB INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A OR NFPA 90B.
  - a. MATERIALS: ASTM C 1071, TYPE I OR II.
  - b. THICKNESS: 1-1/2 INCHES.

2. APPLICATION: FACTORY APPLIED WITH ADHESIVE AND MECHANICAL FASTENERS TO THE INTERNAL SURFACE OF CURB.
  - a. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.
  - b. MECHANICAL FASTENERS: GALVANIZED STEEL, SUITABLE FOR ADHESIVE ATTACHMENT, MECHANICAL ATTACHMENT, OR WELDING ATTACHMENT TO DUCT WITHOUT DAMAGING LINER WHEN APPLIED AS RECOMMENDED BY MANUFACTURER AND WITHOUT CAUSING LEAKAGE IN CABINET.
  - c. LINER MATERIALS SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.
  - d. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.

- B. CURB HEIGHT: 14 INCHES ABOVE ROOF SURFACE LEVEL TYPICAL UNO.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF RTUS.

- B. EXAMINE ROUGHING-IN FOR RTUS TO VERIFY ACTUAL LOCATIONS OF PIPING AND DUCT CONNECTIONS BEFORE EQUIPMENT INSTALLATION.

- C. EXAMINE ROOFS FOR SUITABLE CONDITIONS WHERE RTUS WILL BE INSTALLED.

- D. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

#### 3.2 INSTALLATION

- A. ROOF CURB: INSTALL ON ROOF STRUCTURE, LEVEL AND SECURE. INSTALL RTUS ON CURBS AND COORDINATE ROOF PENETRATIONS AND FLASHING WITH ROOF CONSTRUCTION. RTUS TO UPPER CURB RAIL, AND SECURE CURB BASE TO ROOF FRAMING OR CONCRETE BASE WITH ANCHOR BOLTS.

#### 3.3 CONNECTIONS

- A. THE FOLLOWING ARE SPECIFIC CONNECTION REQUIREMENTS:

1. INSTALL DUCTS TO TERMINATION AT TOP OF ROOF CURB.
2. REMOVE ROOF DECKING ONLY AS REQUIRED FOR PASSAGE OF DUCTS. DO NOT CUT OUT DECKING UNDER ENTIRE ROOF CURB.

#### 3.4 COORDINATION

- A. CONTRACTOR TO COORDINATE WITH KITCHEN EQUIPMENT SUPPLIER TO ENSURE THAT THE RTUS ARE COORDINATED WITH THE KITCHEN EQUIPMENT, PARTICULARLY THE EXHAUST HOODS AND THE MAKE-UP AIR UNIT, TO PROPERLY PRESSURIZE THE BUILDING/SPACE.

- B. CONTRACTOR TO ENSURE THAT ALL THERMOSTATS AND SENSORS ARE COMPATIBLE WITH THE RTU CONTROLS.

#### 3.5 FIELD QUALITY CONTROL

- A. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT, TEST, AND ADJUST COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS. REPORT RESULTS IN WRITING.

- B. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.

1. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATIONS, INCLUDING CONNECTIONS, AND TO ASSIST IN TESTING. REPORT RESULTS IN WRITING.

#### C. TESTS AND INSPECTIONS:

1. AFTER INSTALLING RTUS AND AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, TEST UNITS FOR COMPLIANCE WITH REQUIREMENTS.

2. OPERATIONAL TEST: AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, START UNITS TO CONFIRM PROPER MOTOR ROTATION AND UNIT OPERATION.

3. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.

- D. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.

#### 3.6 STARTUP SERVICE

- A. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM STARTUP SERVICE.

- B. COMPLETE INSTALLATION AND STARTUP CHECKS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND DO THE FOLLOWING:

1. INSPECT FOR VISIBLE DAMAGE TO UNIT CASING, FURNACE COMBUSTION CHAMBER, COMPRESSOR, COILS, AND FANS.

2. VERIFY THAT LABELS ARE CLEARLY VISIBLE. CLEARANCES HAVE BEEN PROVIDED FOR SERVICING, CONTROLS ARE CONNECTED AND OPERABLE, AND FILTERS ARE INSTALLED.

3. CLEAN CONDENSER COIL AND FURNACE AND INSPECT FOR CONSTRUCTION DEBRIS.

4. REMOVE PACKING FROM VIBRATION ISOLATORS.

5. VERIFY LUBRICATION ON FAN AND MOTOR BEARINGS.

6. INSPECT FAN-WHEEL ROTATION FOR MOVEMENT IN CORRECT DIRECTION WITHOUT VIBRATION AND BINDING.

7. ADJUST FAN BELTS TO PROPER ALIGNMENT AND TENSION.

8. START UNIT ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

- a. INSPECT AND RECORD PERFORMANCE OF INTERLOCKS AND PROTECTIVE DEVICES. VERIFY SEQUENCES.

10. OPERATE UNIT FOR AN INITIAL PERIOD AS RECOMMENDED OR REQUIRED BY MANUFACTURER.

11. PERFORM THE FOLLOWING OPERATIONS FOR BOTH MINIMUM AND MAXIMUM FIRING. ADJUST BURNER FOR PEAK EFFICIENCY.
  - a. MEASURE GAS PRESSURE ON MANIFOLD.
  - b. INSPECT OPERATION OF POWER VENTS.
  - c. MEASURE SUPPLY-AIR TEMPERATURE AND VOLUME WHEN BURNER IS AT MAXIMUM FIRING RATE AND WHEN BURNER IS OFF. CALCULATE USEFUL HEAT TO SUPPLY AIR.

20. ADJUST AND INSPECT HIGH-TEMPERATURE LIMITS.

21. INSPECT OUTDOOR-AIR DAMPERS FOR PROPER STROKE AND INTERLOCK WITH RETURN-AIR DAMPERS.

22. INSPECT CONTROLS FOR CORRECT SEQUENCING OF HEATING, MIXING DAMPERS, REFRIGERATION, AND NORMAL AND EMERGENCY SHUTDOWN.

23. SIMULATE MAXIMUM COOLING DEMAND AND INSPECT THE FOLLOWING:
  - a. COMPRESSOR REFRIGERANT SUCTION AND HOT-GAS PRESSURES.
  - b. SHORT CIRCUITING OF AIR THROUGH CONDENSER COIL OR FROM CONDENSER FANS TO OUTDOOR-AIR INTAKE.

27. VERIFY OPERATION OF REMOTE PANEL INCLUDING PILOT-LIGHT OPERATION AND FAILURE MODES. INSPECT THE FOLLOWING:
  - a. HIGH-TEMPERATURE LIMIT ON GAS-FIRED HEAT EXCHANGER.
  - b. LOW-TEMPERATURE SAFETY OPERATION.
  - c. FILTER HIGH-PRESSURE DIFFERENTIAL ALARM.
  - d. ECONOMIZER TO MINIMUM OUTDOOR-AIR CHANGEOVER.
  - e. RELIEF-AIR FAN OPERATION.
  - f. SMOKE ALARMS.

28. AFTER STARTUP AND PERFORMANCE TESTING AND PRIOR TO SUBSTANTIAL COMPLETION, REPLACE EXISTING FILTERS WITH NEW FILTERS.

#### 3.7 CLEANING AND ADJUSTING

- A. OCCUPANCY ADJUSTMENTS: WHEN REQUESTED WITHIN 12 MONTHS OF DATE OF SUBSTANTIAL COMPLETION, PROVIDE ON-SITE ASSISTANCE IN ADJUSTING SYSTEM TO SUIT ACTUAL OCCUPIED CONDITIONS. PROVIDE UP TO TWO VISITS TO SITE DURING OTHER-THAN-NORMAL OCCUPANCY HOURS FOR THIS PURPOSE.

- B. AFTER COMPLETING SYSTEM INSTALLATION AND TESTING, ADJUSTING, AND BALANCING RTU AND AIR-DISTRIBUTION SYSTEMS, CLEAN FILTER HOUSINGS AND INSTALL NEW FILTERS.

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ADR PROJECT NUMBER:  
CAV048

ISSUE	DATE
SD SET	03.08.2024
PERMIT	04/12/24
CONSTRUCTION	10/25/24
SET	

MECHANICAL SPECIFICATIONS

SHEET:  
**M702**



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