

MECHANICAL SHEET INDEX

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RESPONSIBILITY MATRIX							
DESCRIPTION	FURNISHED			INSTALLED			REMARKS
	GC	OWNER	LL	GC	OWNER	LL	
DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING							
23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION							
HVAC DUCTWORK SYSTEM IDENTIFICATION	•			•			
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GREASE DUCTWORK ON ROOF	•			•			
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OUTSIDE AIR DUCTWORK	•			•			
OUTSIDE AIR DUCTWORK ON ROOF	•			•			
SUPPLY AND RETURN AIR DUCTWORK	•			•			
RESTROOM EXHAUST AIR DUCTWORK	•			•			
GENERAL EXHAUST AIR LOUVER		•			•		
INSULATION AND FIRE WRAP	•			•			
DAMPERS	•			•			
SMOKE DETECTORS	•			•			
SUPPLY, RETURN, AND EXHAUST GRILLS AND REGISTERS	•			•			
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KITCHEN EXHAUST HOOD	•			•			
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TANK SYSTEM	•			•			B
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TEST AND BALANCE (TAB) REPORT	•			•			
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GENERAL NOTES:
 1. INFORMATION CONTAINED WITHIN IS BASED ON OUR INTERPRETATION OF THE FINAL EXECUTED WORK LETTER.
 2. CONTRACTOR TO CONFIRM ALL SCOPE WITH FINAL WORK LETTER PRIOR TO PROCUREMENT OF EQUIPMENT.

REMARKS:
 A. WALK-IN COOLER AND FREEZER CONDENSING UNITS FURNISHED AND INSTALLED BY OWNER VENDOR.
 B. GENERAL CONTRACTOR TO COORDINATE TANK INSTALLATION TIME WITH OWNER VENDOR AND FACILITATE SYSTEM SIGN-OFF.
 C. COMMISSIONING TO BE DONE BY NATIONAL TAB. REFER TO M-101 NOTE FOR ACCOUNT DETAILS.

SUBMITTAL MATRIX					
GENERAL CONTRACTORS TO ALSO REVIEW ARCHITECTURAL SPECIFICATIONS AS NOTED IN PLANS IN PLAN SECTION 700 OF THE ARCHITECTURAL PACKAGE FOR REQUIRED SUBMITTALS THAT MIGHT NOT BE LISTED BELOW.					
Submittal Description	Required Review Time (Business Days)	Architect of Record	Shake Shack	Physical Sample Required	Submittal for Record
Diffusers, Grills & Registers	5	X			X
Ductwork Layout (if there are significant changes in field)	5	X			X
HVAC Equipment (if Captive Aire - Submitted by Owner Vendor directly to Owner/AOR prior to construction)	5	X			X
MEP Tests, Start-Up, and Programming Reports	5	X			X

GENERAL NEW NOTES:

- PRIOR TO SUBMITTING BID, VISIT THE JOB SITE AND BECOME FULLY ACQUAINTED WITH THE EXISTING CONDITIONS OF THE PROJECT. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL REQUIREMENTS WHICH MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER AND/OR OWNER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
- EXISTING CONDITIONS WERE TAKEN FROM ORIGINAL DRAWINGS AND SITE VISITS AND MAY NOT REFLECT EXACT "AS-BUILT" CONDITIONS. FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING FINAL BIDS. COORDINATE NEW WORK AND DEMOLITION WITH OTHER DISCIPLINES AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
- COORDINATE THE INSTALLATION OF THE MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. ANY MODIFICATIONS REQUIRED DUE TO LACK OF COORDINATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO EXTRA COST TO THE OWNER.
- WHERE SHUTDOWN OF EXISTING SYSTEMS IS REQUIRED DURING NEW WORK, COORDINATE SHUTDOWN TIME AND DURATION WITH THE OWNER TO MINIMIZE DOWNTIME. NOTIFY OWNER SEVEN (7) DAYS PRIOR TO INTERRUPTION OF SERVICE.
- DURING INSTALLATION OF NEW WORK, AVOID DAMAGING EXISTING SURFACES AND EQUIPMENT TO REMAIN. REPAIR DAMAGE CAUSED DURING CONSTRUCTION AT NO EXTRA COST TO THE OWNER.
- PROVIDE TEMPORARY BARRIERS TO CONTAIN DUST AND DEBRIS RESULTING FROM THE PERFORMANCE OF THE WORK TO THE AREA WHERE WORK IS BEING PERFORMED.
- ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.
- NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
- REFER TO ARCHITECTURAL DRAWINGS FOR RELATED CONSTRUCTION DETAILS AS APPLICABLE TO THE HVAC SYSTEM. VERIFY CHASES AND PENETRATIONS SHOWN ON ARCHITECTURAL DRAWINGS THAT ARE INTENDED FOR DUCTWORK AND PIPING MEET REQUIREMENTS.
- COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.
- INDOOR AIR QUALITY MEASURES: PROTECT INSIDE OF (INSTALLED AND DELIVERED) DUCTWORK AND HVAC UNITS FROM EXPOSURE TO DUST, DIRT, PAINT AND MOISTURE. REPLACE INSULATION THAT HAS BECOME WET AT ANY TIME DURING CONSTRUCTION, DRYING THE INSULATION IS NOT ACCEPTABLE. SEAL ANY TEARS OR JOINTS OF INTERNAL FIBERGLASS INSULATION. REMOVE DEBRIS FROM CEILING/RETURN AIR PLENUM INCLUDING DUST. AN INDEPENDENT PROFESSIONAL DUCT CLEANING COMPANY SHALL VACUUM CLEAN ANY DUCTWORK CONNECTED TO HVAC UNITS THAT WERE OPERATED DURING THE CONSTRUCTION PERIOD AFTER NEW FILTERS ARE INSTALLED AND PRIOR TO TURNING SYSTEM OVER TO THE OWNER. THE INTERNAL SURFACES AND ASSOCIATED COILS OF ANY HVAC UNITS THAT WERE OPERATED SHALL ALSO BE CLEANED.
- INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING COLUMN LINES UNLESS OTHERWISE SHOWN OR NOTED.
- OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF EXCEPT WHERE CONCRETE INSERTS IN CONCRETE SLABS ARE ALLOWED BY THE SPECIFICATIONS.
- COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTER REPLACEMENT.
- SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH ILL. REQUIREMENTS.
- COORDINATE THE EXACT MOUNTING SIZE AND FRAME TYPE OF DIFFUSERS, REGISTERS AND GRILLES WITH THE SUPPLIER TO MEET THE CEILING, WALL AND DUCT INSTALLATION REQUIREMENTS.
- ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.
- PAINT PORTIONS OF DUCTWORK AND INSULATION THAT ARE EXPOSED TO VIEW BY THE INSTALLATION OF DIFFUSERS, REGISTERS, AND GRILLES IN CEILINGS OR WALLS FLAT BLACK. PORTIONS INCLUDE BOTH THE INTERIOR OF UNLINED DUCTWORK AND THE EXTERIOR OF DUCTWORK AND INSULATION.
- LOCATE AND SET THERMOSTATS AND HUMIDISTATS AT LOCATIONS SHOWN ON PLANS. VERIFY EXACT LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL DEVICES WITH TOP OF DEVICE AT MAXIMUM 48" AFF TO MEET ADA REQUIREMENTS UNLESS NOTED OTHERWISE ON PLANS. PROVIDE INSULATED BACKING FOR THERMOSTATS MOUNTED ON EXTERIOR BUILDING WALLS. INSTALL WIRING IN CONDUIT PROVIDED BY DIVISION 26. AT A MINIMUM, PROVIDE CONDUIT IN THE WALL FROM THE JUNCTION BOX TO 6" ABOVE THE CEILING.
- COORDINATE THE LOCATION AND ELEVATION OF WALL-MOUNTED DEVICES WITH PRESENTATION BOARDS, DISPLAY CABINETS, SHELVES OR OTHER COMPONENTS SHOWN ON THE ARCHITECTURAL DRAWINGS THAT ARE TO BE INSTALLED UNDER OTHER DIVISIONS. CONTRACTOR WILL NOT BE REIMBURSED FOR RELOCATION OF WALL-MOUNTED DEVICES CAUSED BY A LACK OF COORDINATION.
- PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.
- PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR/ROUND BRANCH DUCT TAKEOFF FITTING FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS, REGISTERS AND GRILLES. PROVIDE WITH INTEGRAL MANUAL BALANCING DAMPER AND LOCKING QUADRANT WHERE INDICATED ON PLANS.
- BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.
- REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL PLANS INDICATE CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.
- FLEXIBLE DUCTWORK SHALL NOT EXCEED 5'-0" IN LENGTH AND SHALL BE INSTALLED AND SUPPORTED TO AVOID SHARP BENDS AND SAGGING. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- PROVIDE EQUIPMENT VENTS AND FLUES PER EQUIPMENT MANUFACTURERS RECOMMENDATIONS AND EQUIPMENT SPECIFICATIONS. KEEP PENETRATIONS THROUGH ROOF A MINIMUM OF 10'-0" FROM HVAC EQUIPMENT FRESH AIR INLETS AND 2'-0" FROM ROOF PARAPETS.
- PROVIDE TYPE I GREASE HOOD EXHAUST DUCTWORK OF MINIMUM 16 GAUGE BLACK IRON WITH LIQUID TIGHT WELDS, WITH ACCESS PANELS FOR GREASE CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES. SLOPE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT MAINTAINING 18" CLEARANCE TO COMBUSTIBLE MATERIALS. INSTALL GREASE DUCTS IN AN APPROVED FIRE-RATED ENCLOSURE SEPARATED FROM THE EXHAUST DUCT BY A MINIMUM OF 6" AND MAXIMUM OF 12". VENTILATE ENCLOSURE TO THE OUTSIDE AIR IF REQUIRED BY CODE. AS AN OPTION, IF APPROVED BY LOCAL CODES, PROVIDE AN APPROVED WRAP SYSTEM IN LIEU OF THE RATED DUCT ENCLOSURE SYSTEM. DUCT WRAP SYSTEM SHALL MEET UL REQUIREMENTS FOR GREASE DUCT ENCLOSURES.
- PROVIDE A NEW SET OF AIR FILTERS IN UNITS PRIOR TO TESTING, ADJUSTING AND BALANCING AND BEFORE TURNING SYSTEM(S) OVER TO OWNER.
- FIELD VERIFY THAT THE EXISTING EQUIPMENT INCLUDING ACCESSORIES BEING REUSED FOR THIS PROJECT IS NOT DAMAGED AND IS IN GOOD WORKING ORDER. REPORT ANY DEFICIENCIES TO THE OWNER OR ARCHITECT. SUBMIT TO THE OWNER AND ARCHITECT A WRITTEN REPORT DESCRIBING TESTS PERFORMED TO VERIFY OPERATION AND RESULTS OF THE TESTS.
- CLEAN EXISTING EQUIPMENT AND EQUIPMENT COMPONENTS BEING REUSED FOR THIS PROJECT. PROVIDE NEW FILTERS FOR EXISTING AIR HANDLING EQUIPMENT PRIOR TO STARTUP OF EQUIPMENT. NEW FILTERS SHALL BE COMPATIBLE WITH THE EXISTING EQUIPMENT AND EQUAL IN PERFORMANCE TO THE EXISTING FILTERS AT NEW CONDITION UNLESS OTHERWISE NOTED. CLEAN STRAINERS IN PIPING SYSTEMS PRIOR TO STARTING PUMPS.
- TEMPORARY INSTALLATIONS OF INFECTION CONTROL MEASURES DURING CONSTRUCTION SHALL BE COORDINATED WITH THE FACILITY'S INFECTION CONTROL STAFF. PRIOR TO CONSTRUCTION PROVIDE ALL REQUIRED TEMPORARY INSTALLATIONS, INCLUDING DETAILS OF THE INFECTION CONTROL MEASURES SUCH AS TEMPORARY BARRIERS AND MEMBRANES, PORTABLE EXHAUST FANS AND TEMPORARY DUCTWORK. TEMPORARY INSTALLATIONS MUST NOT HAVE A NEGATIVE IMPACT ON EXISTING SYSTEMS NOR CAUSE UNSAFE CONDITIONS. TEMPORARY INSTALLATIONS SHALL MAINTAIN ADEQUATE EGRESS AND SHALL NOT OBSTRUCT EXISTING EXITS, CREATE A FIRE HAZARD OR REDUCE REQUIRED FIRE RESISTANCE. TEMPORARY VENTILATION SYSTEMS SHALL NOT CAUSE THE AIR BALANCE OF ADJACENT ROOMS OR SPACES TO BE IMPACTED OR ALTER THE PERFORMANCE OF PERMANENT BUILDING VENTILATION SYSTEMS. AIRFLOW MEASUREMENTS SHALL BE TAKEN TO VERIFY ADJACENT ROOMS OR SPACES ARE NOT IMPACTED.

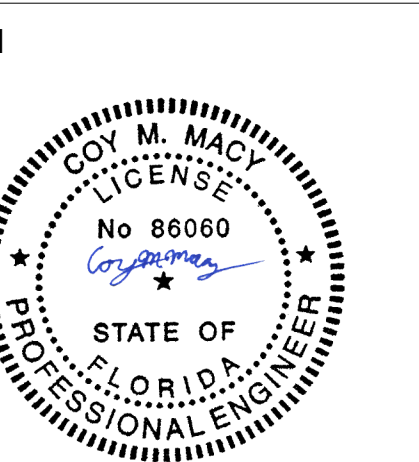
MECHANICAL SYMBOLS

THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED.

V2.06

STANDARD MOUNTING HEIGHT		HVAC DUCTWORK AND ACCESSORIES		PIPING SYMBOLS																																																																																																																																																																																																																																																																																		
<p>THERMOSTATS (USER ADJUSTABLE) (TOP OF DEVICE) 48"</p> <p>CONTROLS (TOP OF DEVICE) 48"</p> <p>INSTALL DEVICES AT THE MOUNTING HEIGHTS SHOWN ABOVE UNLESS OTHERWISE NOTED IN THE CONSTRUCTION DOCUMENTS. MOUNTING HEIGHTS LISTED ABOVE OR ELSEWHERE IN THE CONSTRUCTION DOCUMENTS ARE AFF OR AFF TO BOTTOM OF DEVICE UNLESS OTHERWISE NOTED. ALL DEVICES SHALL BE INSTALLED IN COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS.</p> <p>ANNOTATION</p> <p>① MECHANICAL PLAN NOTE CALLOUT</p> <p>② MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)</p> <p>③ CONNECTION POINT OF NEW WORK TO EXISTING</p> <p>④ DETAIL REFERENCE: UPPER NUMBER INDICATES DETAIL NUMBER LOWER NUMBER INDICATES SHEET NUMBER</p> <p>⑤ SECTION CUT DESIGNATION</p> <p>ABBREVIATIONS</p> <table border="0"> <tr><td>A/C</td><td>AIR CONDITIONING</td><td>HWP</td><td>HEATING WATER PUMP</td></tr> <tr><td>ACC</td><td>AIR COOLED CHILLER</td><td>IN WC</td><td>INCHES OF WATER COLUMN</td></tr> <tr><td>ACCU</td><td>AIR COOLED CONDENSING UNIT</td><td>L</td><td>LEAVING AIR TEMPERATURE</td></tr> <tr><td>AFC</td><td>ABOVE FINISHED CEILING</td><td>LAT</td><td>LEAVING AIR TEMPERATURE</td></tr> <tr><td>AFF</td><td>ABOVE FINISHED FLOOR</td><td>LDB</td><td>LEAVING DRY BULB</td></tr> <tr><td>AFG</td><td>ABOVE FINISHED GRADE</td><td>LP</td><td>LOW PRESSURE</td></tr> <tr><td>AHJ</td><td>AUTHORITY HAVING JURISDICTION</td><td>LWB</td><td>LEAVING WET BULB</td></tr> <tr><td>AHU</td><td>AIR HANDLING UNIT</td><td>LWT</td><td>LEAVING WATER TEMPERATURE</td></tr> <tr><td>AI</td><td>ANALOG INPUT</td><td>MAU</td><td>MAKE-UP AIR UNIT</td></tr> <tr><td>AO</td><td>ANALOG OUTPUT</td><td>MAX</td><td>MAXIMUM</td></tr> <tr><td>AP</td><td>ACCESS PANEL</td><td>MBH</td><td>1000 BTU PER HOUR</td></tr> <tr><td>APD</td><td>AIR PRESSURE DROP</td><td>MD</td><td>MOTORIZED DAMPER</td></tr> <tr><td>AWG</td><td>AMERICAN WIRE GAUGE</td><td>MFR</td><td>MANUFACTURER</td></tr> <tr><td>B</td><td>BOLTER</td><td>MIN</td><td>MINIMUM</td></tr> <tr><td>BAS</td><td>BUILDING AUTOMATION SYSTEM</td><td>N/A</td><td>NOT APPLICABLE</td></tr> <tr><td>BB</td><td>BACKDRAFT DAMPER</td><td>NB</td><td>NORMALLY CLOSED</td></tr> <tr><td>BD</td><td>BLOWDOWN</td><td>NOM</td><td>NOMINAL</td></tr> <tr><td>BFC</td><td>BELOW FINISHED CEILING</td><td>NOI</td><td>NOISE CRITERIA</td></tr> <tr><td>BFF</td><td>BELOW FINISHED FLOOR</td><td>NO</td><td>NON-FUSED</td></tr> <tr><td>BFG</td><td>BELOW FINISHED GRADE</td><td>NIC</td><td>NOT IN CONTRACT</td></tr> <tr><td>BHP</td><td>BRAKE HORSEPOWER</td><td>GA</td><td>GENERAL</td></tr> <tr><td>BI</td><td>BINARY INPUT</td><td>PCV</td><td>PRESSURE INDEP. 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REFER TO DUCTWORK SPECIFICATIONS FOR DUCTWORK INSULATION AND LINER INFORMATION.</p> <p>HVAC CONTROL DEVICES</p> <p>HUMIDISTAT</p> <p>THERMOSTAT</p> <p>CARBON MONOXIDE SENSOR</p> <p>CARBON DIOXIDE SENSOR</p> <p>DIFFERENTIAL PRESSURE SENSOR</p> <p>FLOW SWITCH</p> <p>HUMIDITY SENSOR</p> <p>PULL STATION</p> <p>REMOTE TESTING STATION WITH INDICATING LIGHT</p> <p>STATIC PRESSURE</p> <p>SWITCH</p> <p>TEMPERATURE SENSOR</p>	<p>DIRECTION OF FLOW</p> <p>CONTROL VALVE</p> <p>THREE-WAY CONTROL VALVE</p> <p>SHUTOFF VALVE</p> <p>CHECK VALVE</p> <p>BALANCING VALVE WITH PRESSURE PORTS</p> <p>TRIPLE DUTY VALVE WITH PRESSURE PORTS</p> <p>STRAINER</p> <p>STRAINER WITH BLOWDOWN VALVE</p> <p>RELIEF / SAFETY VALVE</p> <p>SOLENOID VALVE</p> <p>PRESSURE REDUCING VALVE</p> <p>GAS PRESSURE REGULATOR</p> <p>THERMOSTATIC MIXING VALVE</p> <p>PIPE ANCHOR</p> <p>EXPANSION JOINT</p> <p>PIPE GUIDE</p> <p>PIPING SUPPORT</p> <p>F & T TRAP</p> <p>BUCKET TRAP</p> <p>THERMOSTATIC TRAP</p> <p>BACKFLOW PREVENTER</p> <p>PRESSURE GAUGE</p> <p>THERMOMETER</p> <p>PRESSURE AND TEMPERATURE TEST PLUG</p> <p>UNION</p> <p>FLANGE CONNECTION</p> <p>VACUUM RELIEF VALVE</p> <p>AUTOMATIC AIR VENT</p> <p>MANUAL AIR VENT</p> <p>PRESSURE / VACUUM SWITCH</p> <p>CLEANOUT</p> <p>CAP</p> <p>ELBOW UP</p> <p>ELBOW DOWN</p> <p>TEE UP</p> <p>TEE DOWN</p> <p>ELBOW UP WITH SHUT-OFF VALVE (SOV)</p> <p>ELBOW DOWN WITH SHUT-OFF VALVE (SOV)</p> <p>TEE UP WITH SHUT-OFF VALVE (SOV)</p> <p>TEE DOWN WITH SHUT-OFF VALVE (SOV)</p> <p>REDUCER</p> <p>RECIRCULATION PUMP</p> <p>P-TRAP</p> <p>GAS COCK</p> <p>TOP BEAM CLAMP</p> <p>TRAPEZE HANGER</p> <p>FLEXIBLE CONNECTION</p>
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EA	EXHAUST AIR	TFA	TO FLOOR ABOVE																																																																																																																																																																																																																																																																																			
EAT	ENTERING AIR TEMPERATURE	TFB	TO FLOOR BELOW																																																																																																																																																																																																																																																																																			
ED	EXHAUST DUCT	TH	TOTAL HEAT CAPACITY																																																																																																																																																																																																																																																																																			
EDB	ENTERING DRY BULB	TSP	TOTAL STATIC PRESSURE																																																																																																																																																																																																																																																																																			
EF	EFFICIENCY	TT	TEMPERATURE TRANSMITTAL																																																																																																																																																																																																																																																																																			
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ESP	EXTERNAL STATIC PRESSURE	UG	UNDERGROUND																																																																																																																																																																																																																																																																																			
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EWT	ENTERING WATER TEMPERATURE	VAV	VARIABLE AIR VOLUME																																																																																																																																																																																																																																																																																			
FCU	FAN COIL UNIT	VEL	VELOCITY																																																																																																																																																																																																																																																																																			
FF	FROM FLOOR ABOVE	VFD	VARIABLE FREQUENCY DRIVE																																																																																																																																																																																																																																																																																			
FFB	FROM FLOOR BELOW	VRF	VARIABLE REFRIGERANT FLOW																																																																																																																																																																																																																																																																																			
FF	FINISHED FLOOR	VRV	VARIABLE REFRIGERANT VOLUME																																																																																																																																																																																																																																																																																			
FPI	FEET PER INCH	W/	WITHOUT																																																																																																																																																																																																																																																																																			
FPM	FEET PER MINUTE	W/O	WITHOUT																																																																																																																																																																																																																																																																																			
GC	GENERAL CONTRACTOR	WB	WET BULB																																																																																																																																																																																																																																																																																			
GEA	GREASE EXHAUST AIR	WC	WATER COLUMN																																																																																																																																																																																																																																																																																			
GPM	GALLONS PER MINUTE	WPD	WATER PRESSURE DROP																																																																																																																																																																																																																																																																																			
HDA	HAND-OFF-AUTOMATIC	XP	EXPLOSION PROOF																																																																																																																																																																																																																																																																																			
HP	HORSEPOWER																																																																																																																																																																																																																																																																																					
HTG	HEATING																																																																																																																																																																																																																																																																																					

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7/25/2025

COY M. MACY
 LICENSE # 86600

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Project

SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number 2450002080
 Drawn By DJ
 Checked By CM
 Date 2/12/2025

Revisions

1	11/12/2024	ISSUED FOR PERMIT
2	2/12/2025	ISSUED FOR BID
2	7/25/2025	ISSUED FOR CONSTRUCTION

Drawing

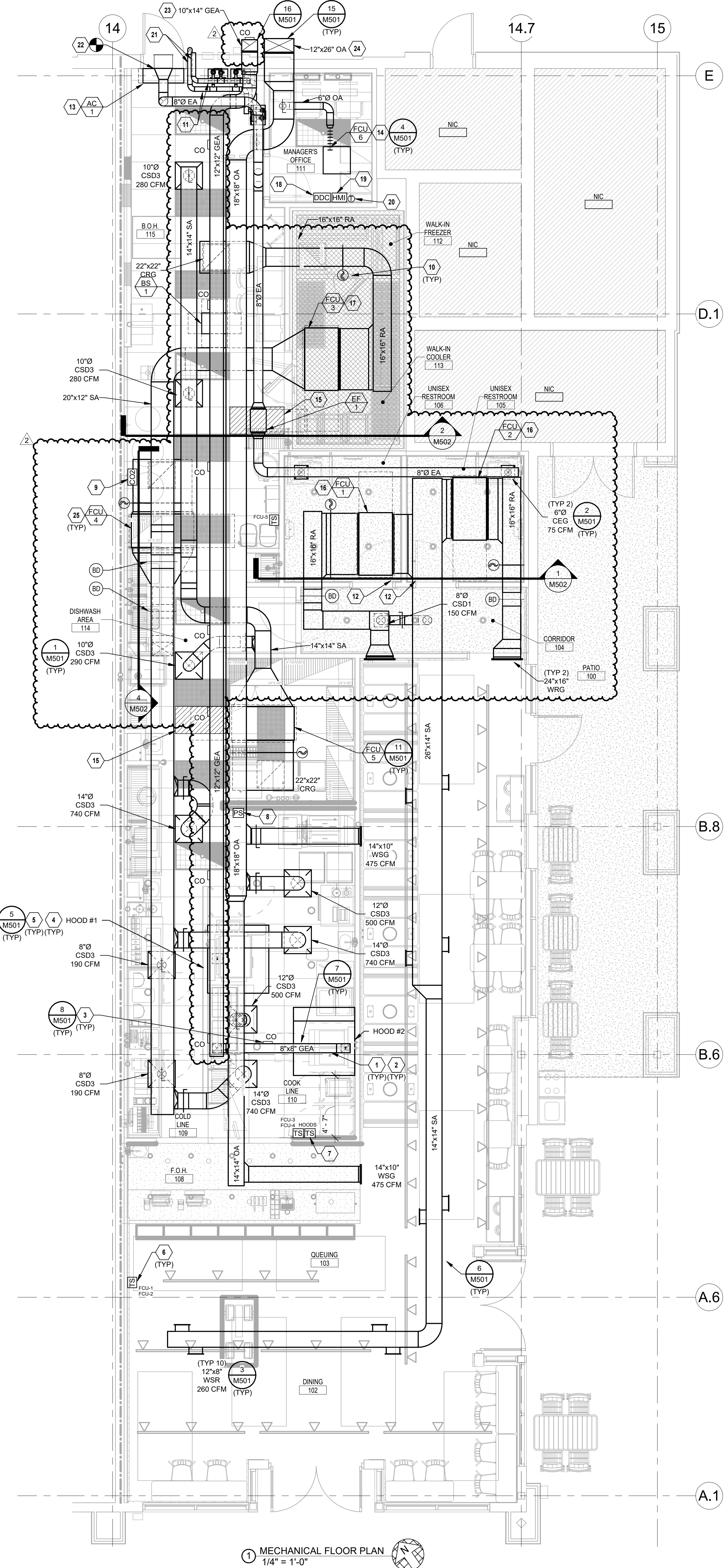
MECHANICAL GENERAL INFORMATION

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M001

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1 MECHANICAL FLOOR PLAN
1/4" = 1'-0"

MECHANICAL GENERAL NOTES:

- DO NOT ROUTE ANY DUCTWORK OR PIPING ABOVE ELECTRICAL PANELS. REFER TO SHEET M001 FOR ADDITIONAL GENERAL NOTES AND REQUIREMENTS.
- REFER TO DETAILS AND SCHEDULES SHEETS FOR FURTHER INFORMATION.
- MOUNT ALL THERMOSTATS AND SENSORS CONTROLLING HVAC EQUIPMENT AT 48" AFF UNLESS OTHERWISE NOTED.

MECHANICAL PLAN NOTES:

- TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 18 GAUGE STEEL OR MINIMUM 18 GAUGE STAINLESS STEEL WITH LIQUID TIGHT WELDS.
- INSTALL ACCESS PANELS FOR CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES. TRANSITION GREASE DUCTWORK AS REQUIRED TO HOOD AND FAN CONNECTIONS. PROVIDE 45° MAX OFFSETS AS REQUIRED TO COORDINATE WITH STRUCTURE. PROVIDE RADIUS ELBOWS WITHOUT TURNING VANES. SLOPE HORIZONTAL GREASE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT. GREASE DUCTS SHALL BE CONTAINED IN APPROVED GREASE DUCT WRAP SYSTEM.
- INSTALL "DUCTMATE ULTIMATE DOORS" ON GREASE DUCT FOR CLEANING IN LOCATION(S) SHOWN AT A MINIMUM AND AS REQUIRED BY NFPA 96 AND LOCAL CODES.
- TYPE I HOODS SHALL BE FURNISHED COMPLETE WITH INTERNALLY PIPED FIRE SUPPRESSION SYSTEM AND EXTERNAL FOAM SUPPLY BOTTLES WITH REMOTE PULL CONTROLS AND IN COMPLIANCE WITH NFPA 96. DIVISION 23 SHALL COORDINATE COMPLETE INSTALLATION WITH FIRE PROTECTION CONTRACTOR TO MEET APPROVAL OF LOCAL INSPECTOR AND CODE COMPLIANCE INCLUDING TESTING.
- HOOD SHALL OVERHANG THE COOKING SURFACE BY AT LEAST 6" ON BOTH SIDES.
- MOUNT THERMOSTATS, HUMIDITY SENSORS, AND TEMPERATURE SENSOR(S) ON WALL. THERMOSTATS AND SENSOR(S) SHALL BE LABELED TO MATCH THE UNIT TAG AND CORRESPOND TO THE ELECTRICAL LEGEND IN THE ELECTRICAL PANELBOARD SERVING THE EQUIPMENT. COORDINATE COLOR WITH ARCHITECT.
- MOUNT TEMPERATURE SENSOR PROVIDED WITH KITCHEN EXHAUST HOODS ON WALL.
- INSTALL HOOD FIRE SUPPRESSION MANUAL PULL STATION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FIRE SUPPRESSION SYSTEM INSTALLER AND THE AUTHORITY HAVING JURISDICTION.
- CARBON DIOXIDE SENSOR WITH REMOTE ALARM REPEATER FURNISHED BY OWNER'S CO2 VENDOR AND LOCATED AT 12" AFF. THE SENSOR SHALL BE EQUIPPED WITH A LOCAL AUDIBLE AND VISUAL ALARM. THE LOW-LEVEL ALARM SHALL ACTIVATE THE LOCAL ALARM IF THE BUILDING HAS A FIRE ALARM. PROVIDE THE APPROPRIATE FIRE ALARM INTERFACE MODULE TO INTERLOCK WITH THE BUILDING FIRE ALARM SYSTEM. THE HIGH-LEVEL CO2 ALARM SHALL SIGNAL BUILDING FIRE ALARM WHEN EQUIPPED. LOW LEVEL ALARM - 0.5% = 5,000 PPM. HIGH LEVEL ALARM - 3.0% = 30,000 PPM.
- INSTALL DUCT SMOKE DETECTOR IN RETURN AIR PLENUM.
- INSTALL COMBUSTION AIR AND EXHAUST SYSTEM PER MANUFACTURER'S REQUIREMENTS AND SPECIFICATIONS AND IN COMPLIANCE WITH LOCAL CODES. MAINTAIN A MINIMUM 10'-0" SEPARATION FROM ALL AIR INTAKES.
- CONTRACTOR TO COORDINATE 1" UNDERCUT ON DOOR FOR EXHAUST AIR PATH.
- AIR CURTAIN MOUNTED ABOVE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- TRANSITION 6" OUTDOOR AIR DUCT TO 4" FLEXIBLE DUCTWORK AND CONNECT TO UNIT.
- CEILING TILE DEDICATED TO ACCESS OF MECHANICAL EQUIPMENT. KEEP TILE AND AREA ABOVE CLEAR OF DEVICES AND MEP SYSTEMS PREVENTING THE ACCESS OF EQUIPMENT. COORDINATED WITH ALL DISCIPLINES.
- EQUIPMENT ACCESSIBLE FROM PLATFORM ABOVE RESTROOM CEILING. REFER TO ARCHITECTURAL DRAWINGS FOR DETAIL. PLATFORM TO BE ACCESSED FROM TOP OF WALK-IN COOLER.
- EQUIPMENT ACCESSIBLE FROM TOP OF WALK-IN COOLER. TOP OF WALK-IN TO BE ACCESSED FROM DEDICATED ACCESS TILE IN BOH.
- INSTALL VRF DDC CONTROLLER IN OFFICE.
- INSTALL REMOTE HMI CONTROLLER FOR DOAS IN OFFICE.
- INSTALL THERMOSTAT WITH INTEGRAL TEMPERATURE SENSOR FOR FCL-6 IN OFFICE.
- WATER HEATER INTAKE AND EXHAUST COMMON SYSTEM TO PENETRATE EXTERIOR WALL. INSTALL PER MANUFACTURER INSTALLATION INSTRUCTIONS AND SPECIFICATIONS.
- TOILET EXHAUST AIR DUCT TO TRANSITION AND CONNECT TO EXISTING EXHAUST LOUVER.
- EXHAUST AIR DUCT ROUTED UP TO ROOF ON EXTERIOR WALL.
- OUTDOOR AIR DUCT ROUTED DOWN FROM ROOF.
- CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-PH INDOOR AIR PURIFICATION SYSTEM MODEL PHI-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.

ALL GREASE DUCT TO BE WATER TESTED BY ENVIROMATIC AT MECHANICAL CONTRACTOR'S EXPENSE. CONTACT OWNER'S NATIONAL ACCOUNT VENDOR.

ENVIROMATIC
DON PFLEDERER
1.800.325.6476
inspections@enviromatic.com

THE BUILDINGS HVAC SYSTEMS SHALL BE BALANCED BY NATIONAL TAB (NO EXCEPTIONS) AND CONTRACTED BY THE GENERAL CONTRACTOR.

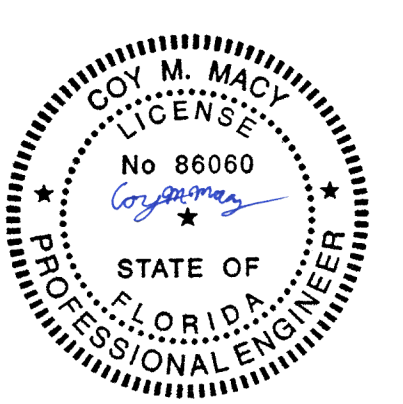
COMMISSIONING SHALL BE PERFORMED BY NATIONAL TAB FOR ALL TENANT PROVIDED UNITS.

CONTACT:
WILL TURNBOUGH
will@natontab.com
855-682-6822 ext1704

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LICENSE # 86600

Brian S. Thomas, Architect

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SHAKE SHACK
SHAKE SHACK #1612
(MERCATO) NAPLES, FL

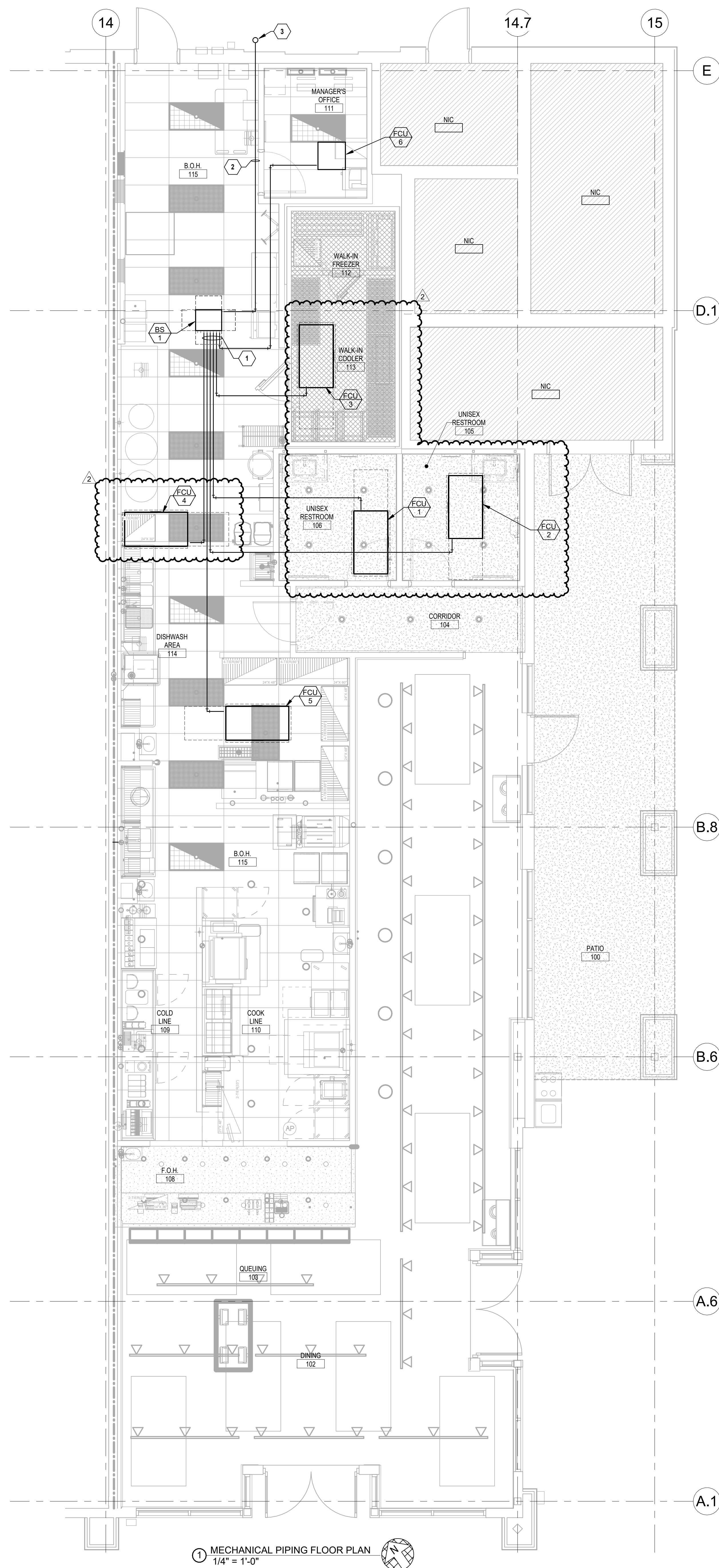
Project Number 2450002080
Drawn By DJ
Checked By CM
Date 2/12/2025

Revisions	
11/12/2024	ISSUED FOR PERMIT
2/12/2025	ISSUED FOR BID
2/7/2025	ISSUED FOR CONSTRUCTION

Drawing
MECHANICAL FLOOR PLAN

M101

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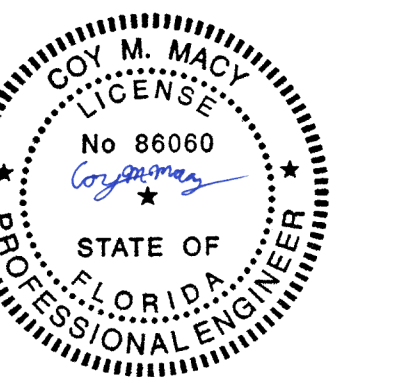


1 MECHANICAL PIPING FLOOR PLAN
1/4" = 1'-0"

- MECHANICAL PLAN NOTES:**
- 1 VRF REFRIGERANT PIPING IS 2 PIPE CONFIGURATION SHOWN AS SINGLE LINE FOR CLARITY.
 - 2 VRF REFRIGERANT PIPING IS 3 PIPE CONFIGURATION SHOWN AS SINGLE LINE FOR CLARITY.
 - 3 VRF REFRIGERANT PIPING UP TO CU-1 ROUTED THROUGH EXTERIOR SHAFT.

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 EXPIRES 2/28/2026

Seal



7/25/2025

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LICENSE # 86060

Brian S. Thomas,
Architect

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Project

SHAKE SHACK®
 SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

Project Number 2450002080
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Drawing

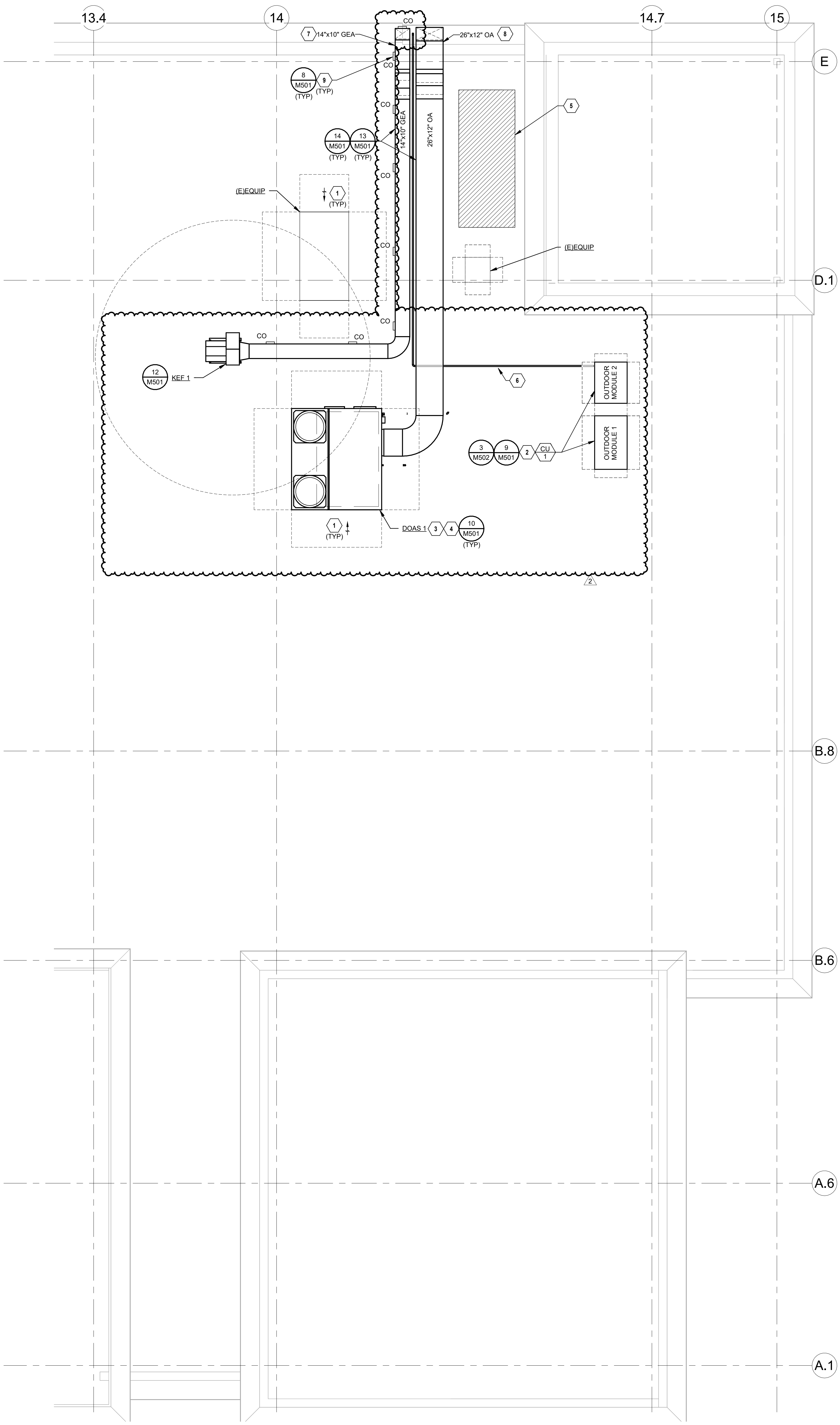
MECHANICAL PIPING FLOOR PLAN

M102

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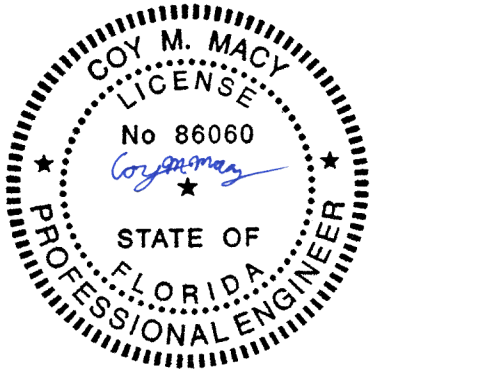
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- MECHANICAL PLAN NOTES:**
- 1 MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST, TYPICAL.
 - 2 CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. SINGLE LINES SET SHOWN FOR CLARITY. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
 - 3 CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-FBI INDOOR AIR PURIFICATION SYSTEM, MODEL PH1-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.
 - 4 REFERENCE PLUMBING DRAWINGS FOR CONDENSATE DRAIN ROUTING AND TERMINATION REQUIREMENTS.
 - 5 AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR. COORDINATE EQUIPMENT LOCATION AND CONDENSER INSTALLATION WITH KITCHEN EQUIPMENT CONTRACTOR.
 - 6 VRF REFRIGERANT PIPING IS 3 PIPE CONFIGURATION SHOWN AS SINGLE LINE FOR CLARITY.
 - 7 EXHAUST AIR DUCT ROUTED UP FROM TO TENANT SPACE.
 - 8 OUTDOOR AIR DUCT ROUTED DOWN TO TENANT SPACE ON EXTERIOR WALL.
 - 9 INSTALL "DUCTIMATE ULTIMATE LOGS" ON GREASE DUCT FOR CLEANING IN LOCATION(S) SHOWN AT A MINIMUM AND AS REQUIRED BY NFPA 96 AND LOCAL CODES.

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Seal



7/25/2025

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Project



SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

Project Number 2450002080
 Drawn By DJ
 Checked By CM
 Date 2/12/2025

Revisions

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Drawing

MECHANICAL ROOF PLAN

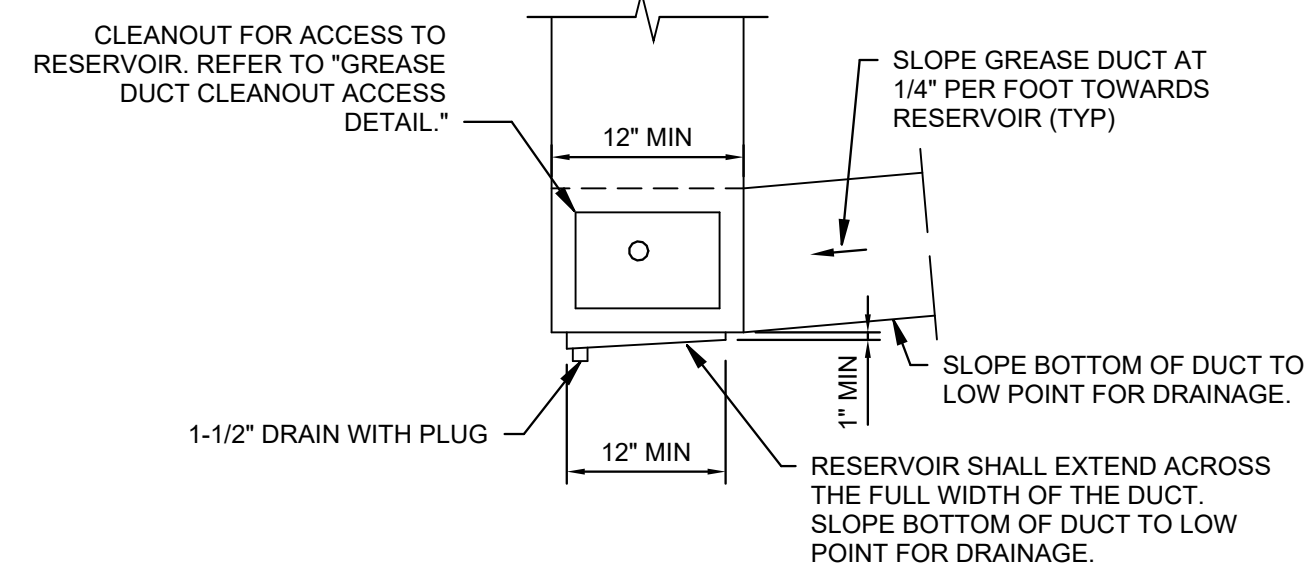
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1 MECHANICAL ROOF PLAN
 1/4" = 1'-0"

M150

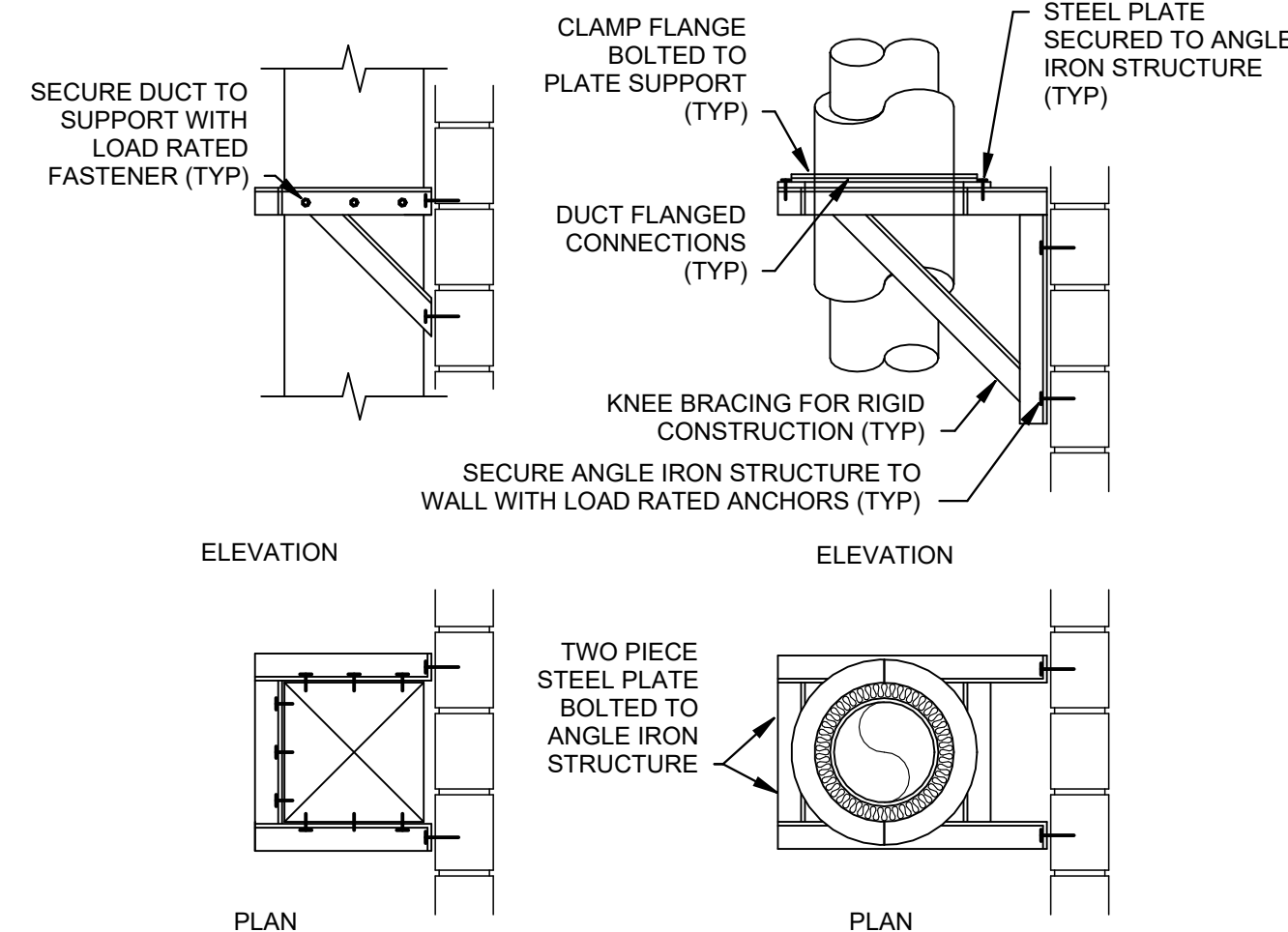
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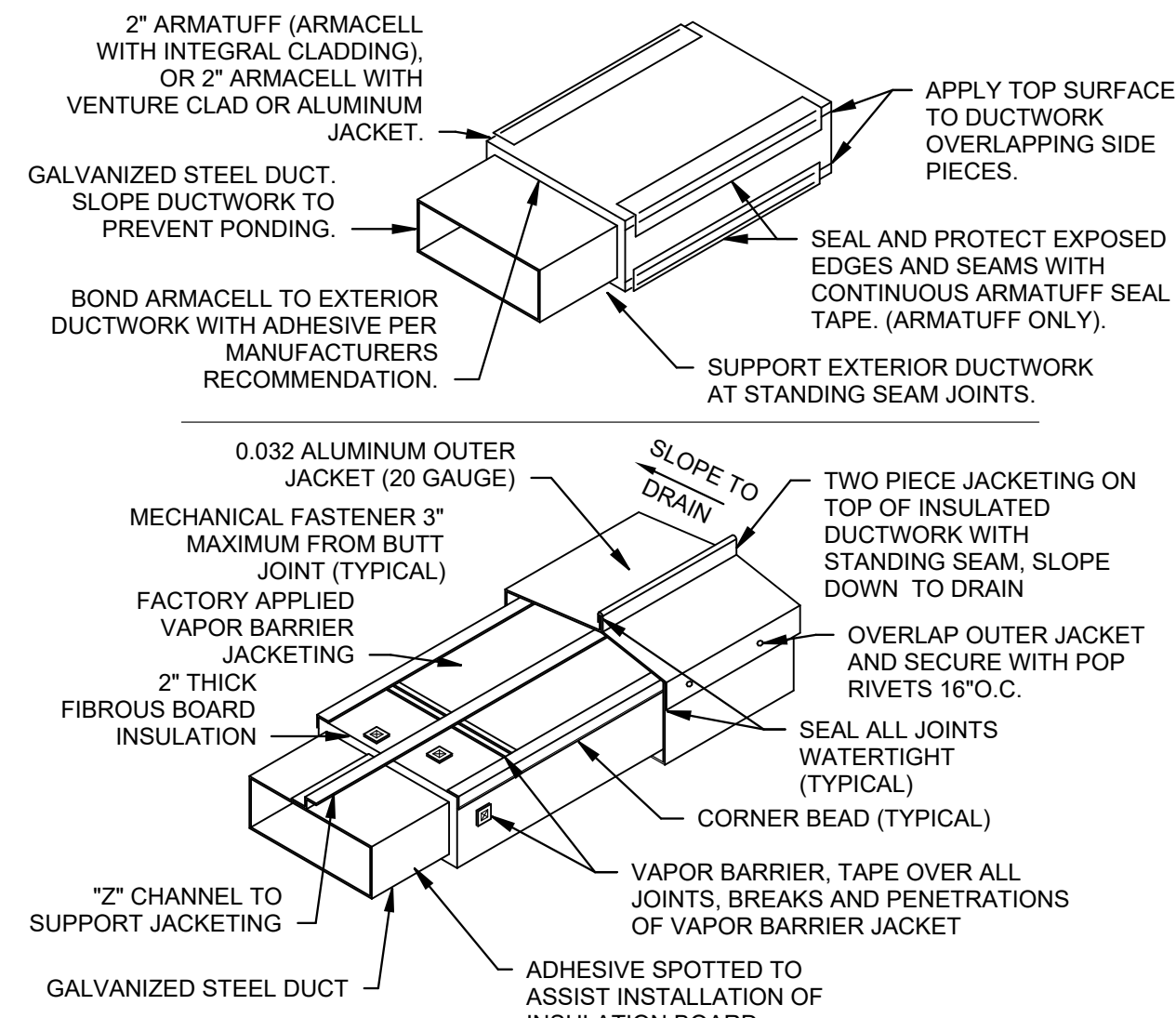
NOTES:
1. INSTALL GREASE DUCT RESERVOIR IN AN ACCESSIBLE LOCATION.

16 GREASE DUCT RESERVOIR DETAIL
NTS

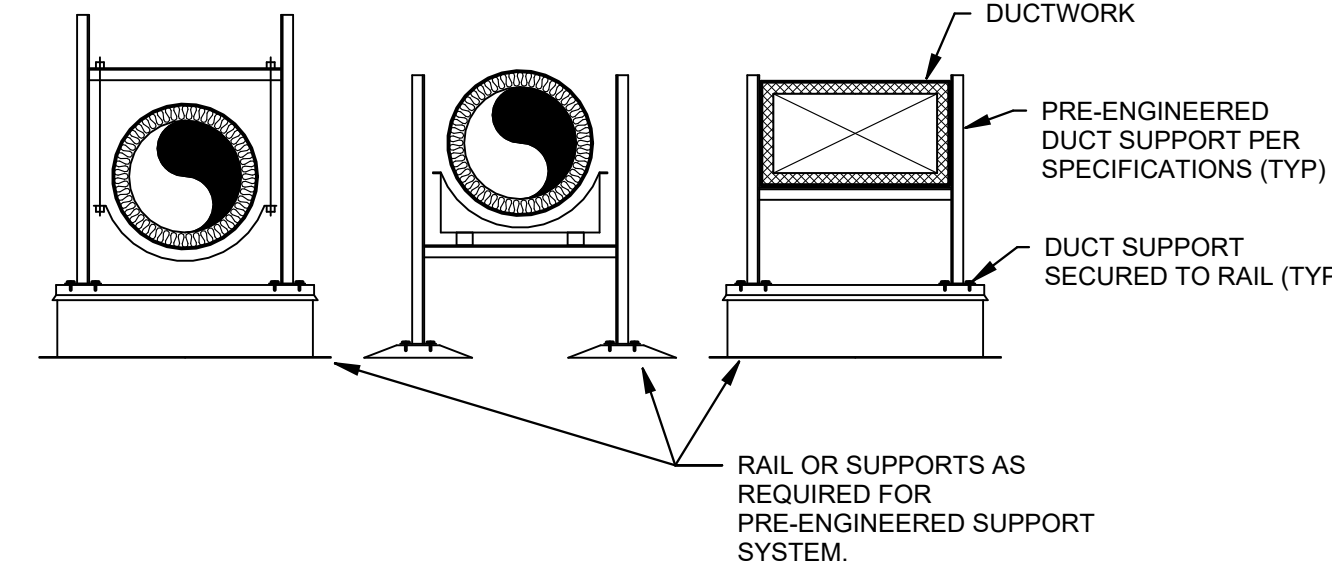


NOTES:
1. REFER TO SPECIFICATIONS AND SMACNA DUCT CONSTRUCTION STANDARDS FOR MORE INFORMATION. SUPPORTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA STANDARDS.
2. CONTRACTOR SHALL SELECT ANCHORS AS APPROPRIATE FOR LOAD AND ENVIRONMENT. REFER TO SPECIFICATIONS AND MANUFACTURER'S REQUIREMENTS.

15 DUCT WALL SUPPORT DETAIL
NTS

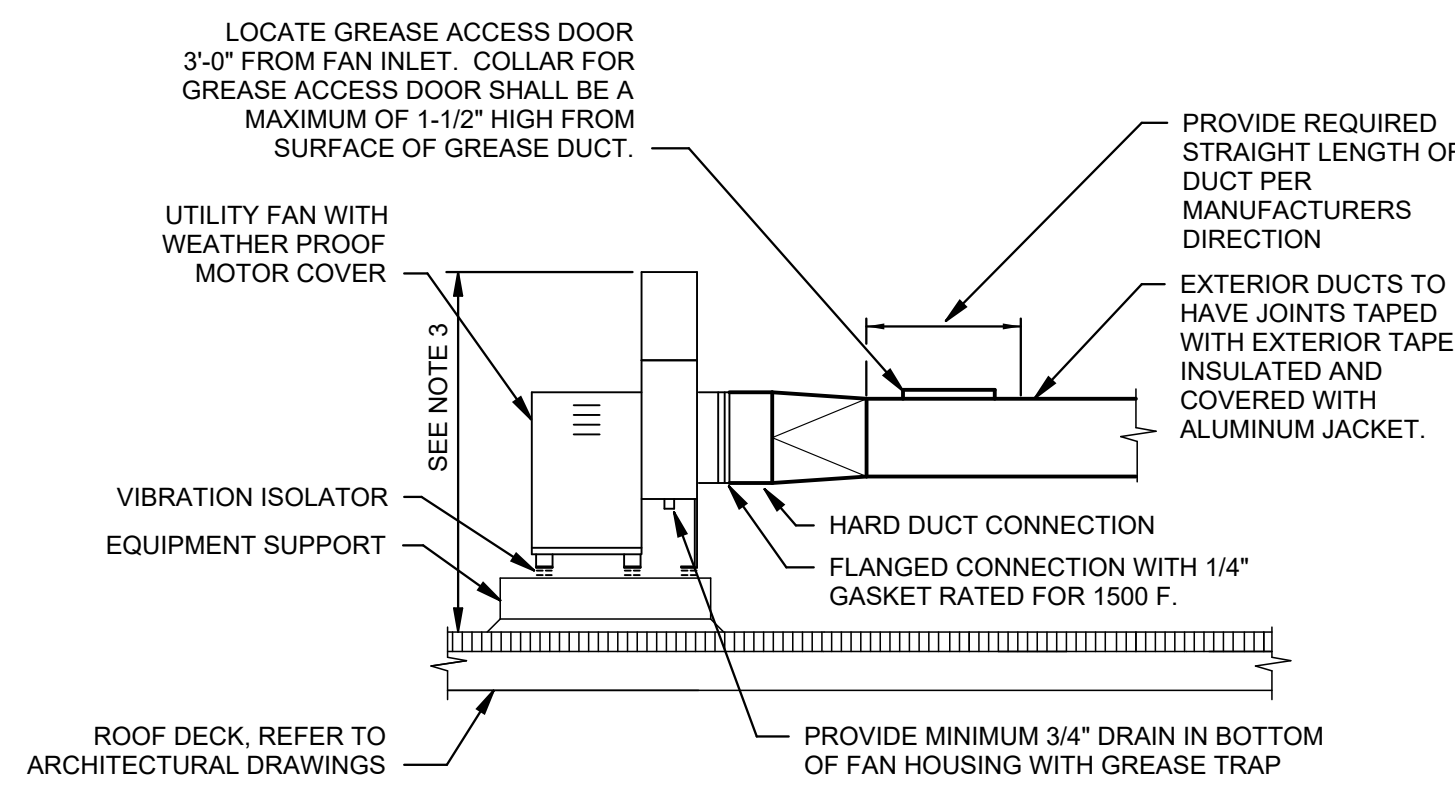


14 EXTERIOR DUCTWORK INSULATION DETAIL
NTS



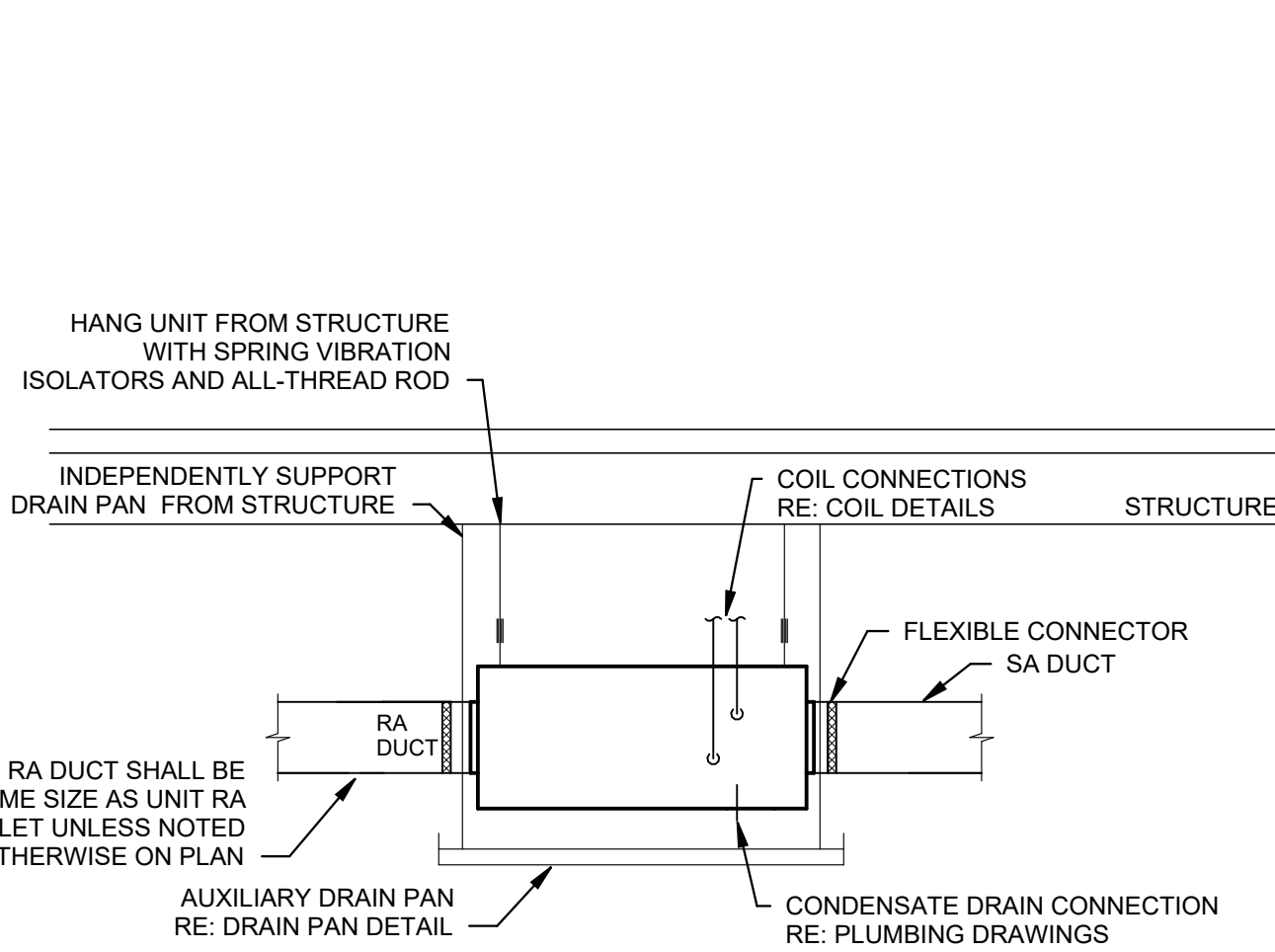
NOTES:
1. DUCT SUPPORTS SHALL BE PRE-ENGINEERED SUPPORT PRODUCT BY APPROVED MANUFACTURER. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR DUCT SUPPORTS, ANCHORING, AND SEISMIC/WIND RESISTANCE.
2. DUCTWORK SHALL REST ON OR BE ATTACHED TO SUPPORTS AS REQUIRED BY INSTALLATION REQUIREMENTS PER MANUFACTURER.

13 ROOF MOUNTED DUCT SUPPORT DETAIL
NTS



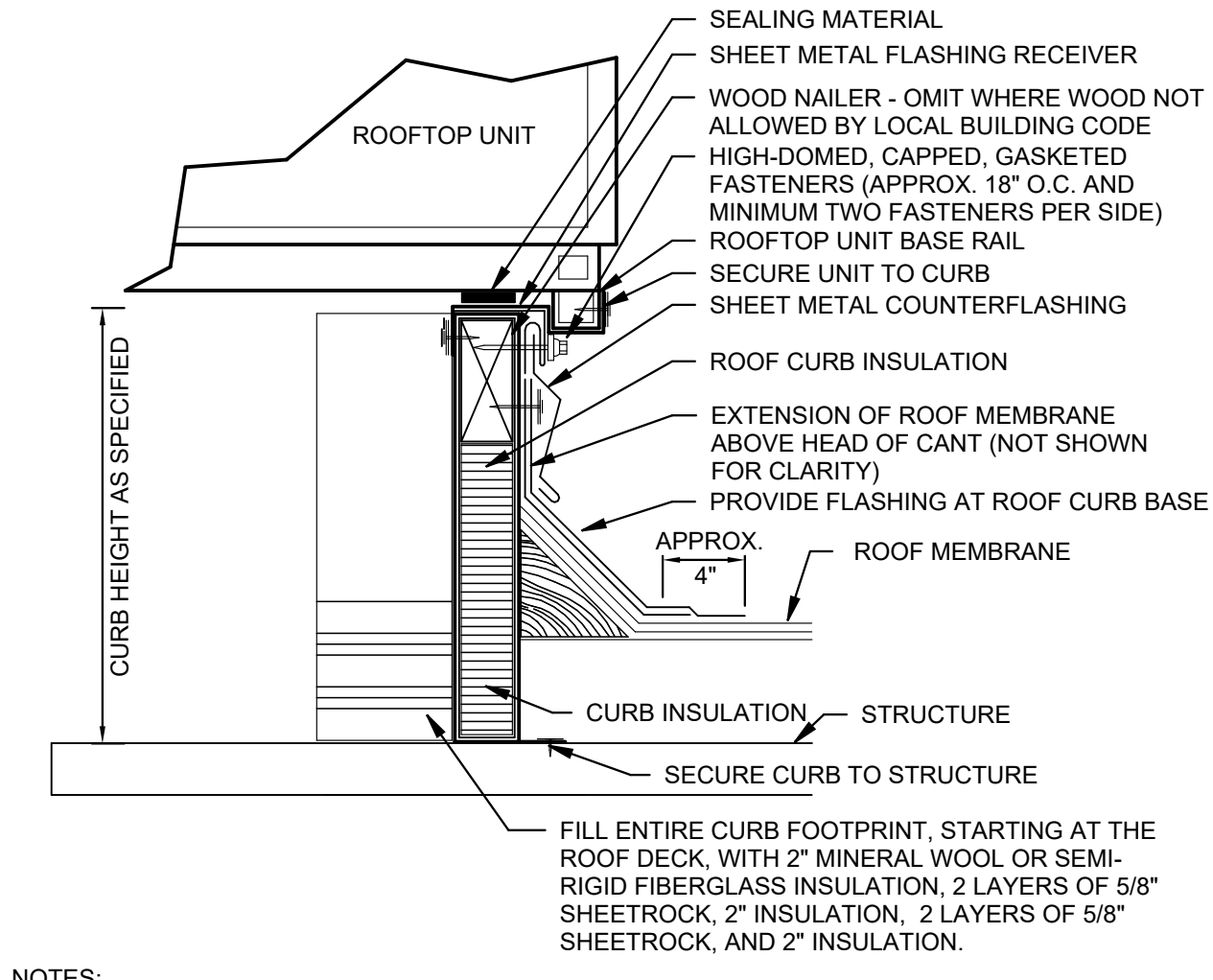
NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE.
2. IF DAMPER IS SPECIFIED IN EQUIPMENT SCHEDULE, INSTALL DAMPER AT BASE OF CURB WHERE DUCT PENETRATION OCCURS AND SECURE FROM ABOVE TO ALLOW SERVICE THROUGH TOP OF CURB.
3. PROVIDE CURB EXTENSION OF HEIGHT REQUIRED TO MOUNT FAN BASE A MINIMUM 18 INCHES ABOVE ROOF SURFACE AND DISCHARGE GREASE OUTLET A MINIMUM OF 40 INCHES ABOVE ROOF SURFACE OR ANY ADJACENT BUILDING STRUCTURE WITHIN 10 FEET OF OUTLET, WHICHEVER IS HIGHER. PROVIDE NON-VENTED CURB EXTENSION IF ZERO-CLEARANCE FIRE-RATED WRAP AROUND DUCT IS PROVIDED. PROVIDE VENTED CURB EXTENSION IF A FIRE-RATED NON-COMBUSTIBLE ENCLOSURE AROUND DUCT IS PROVIDED.

12 UTILITY VENT SET FAN INLET DETAIL
NTS



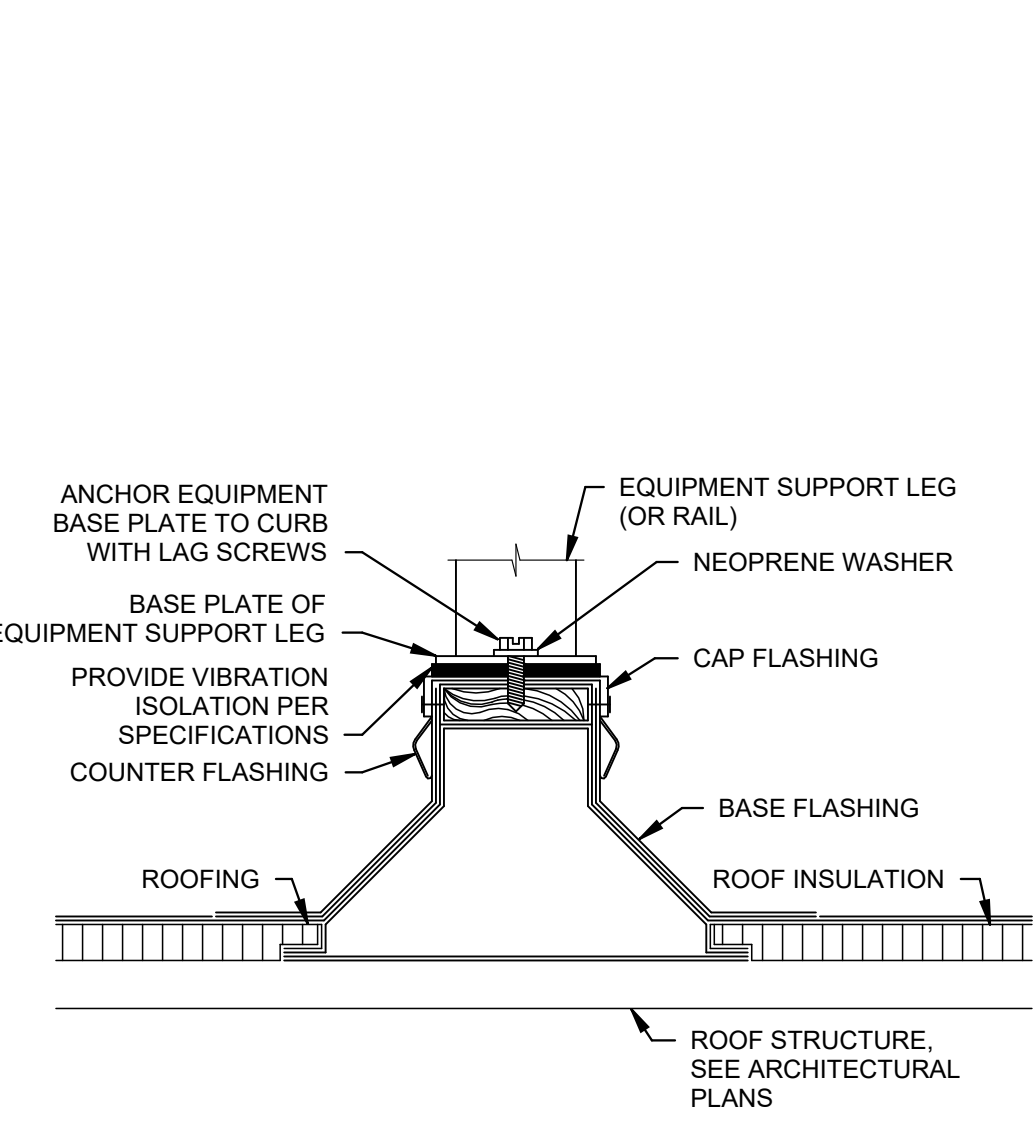
NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.

11 HORIZONTAL HVAC UNIT DETAIL (FCU-1.5)
NTS



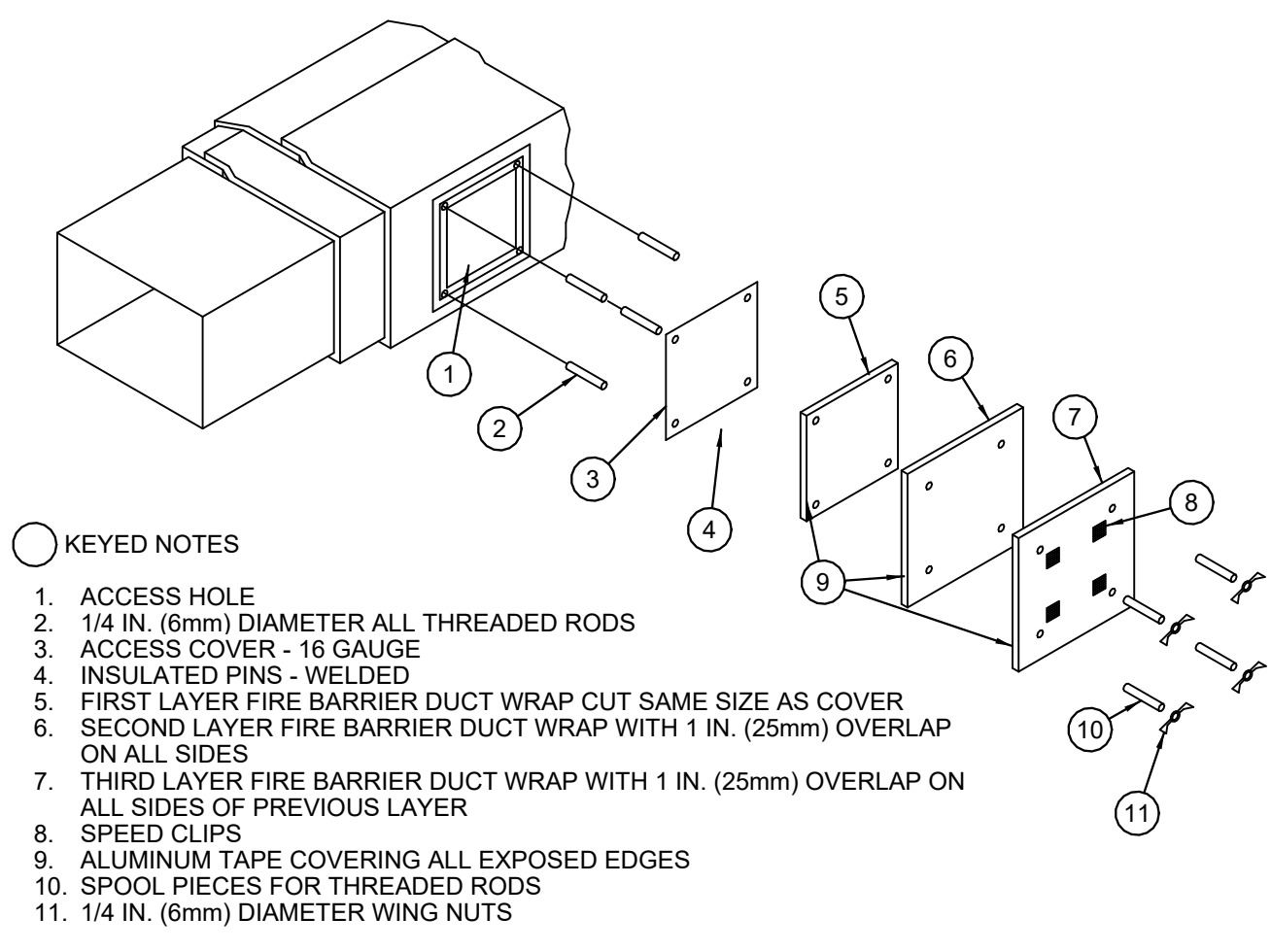
NOTES:
1. CUT METAL DECKING TO ALLOW CURB INSTALLATION ON STEEL FRAMING. AFTER CURB IS SET IN PLACE, TRIM REMAINING METAL DECKING AND INSTALL WITHIN CURB. TACK WELD DECKING TO SUPPORT STEEL. DO NOT WELD INTERIOR DECKING TO ROOF CURB. PROVIDE ADDITIONAL CROSS FRAMING TO SUPPORT INTERIOR DECKING AND FILL MATERIAL AS REQUIRED.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR ROOF CURBS, ANCHORING AND SEISMIC/WIND RESISTANCE.

10 ROOF CURB DETAIL
NTS



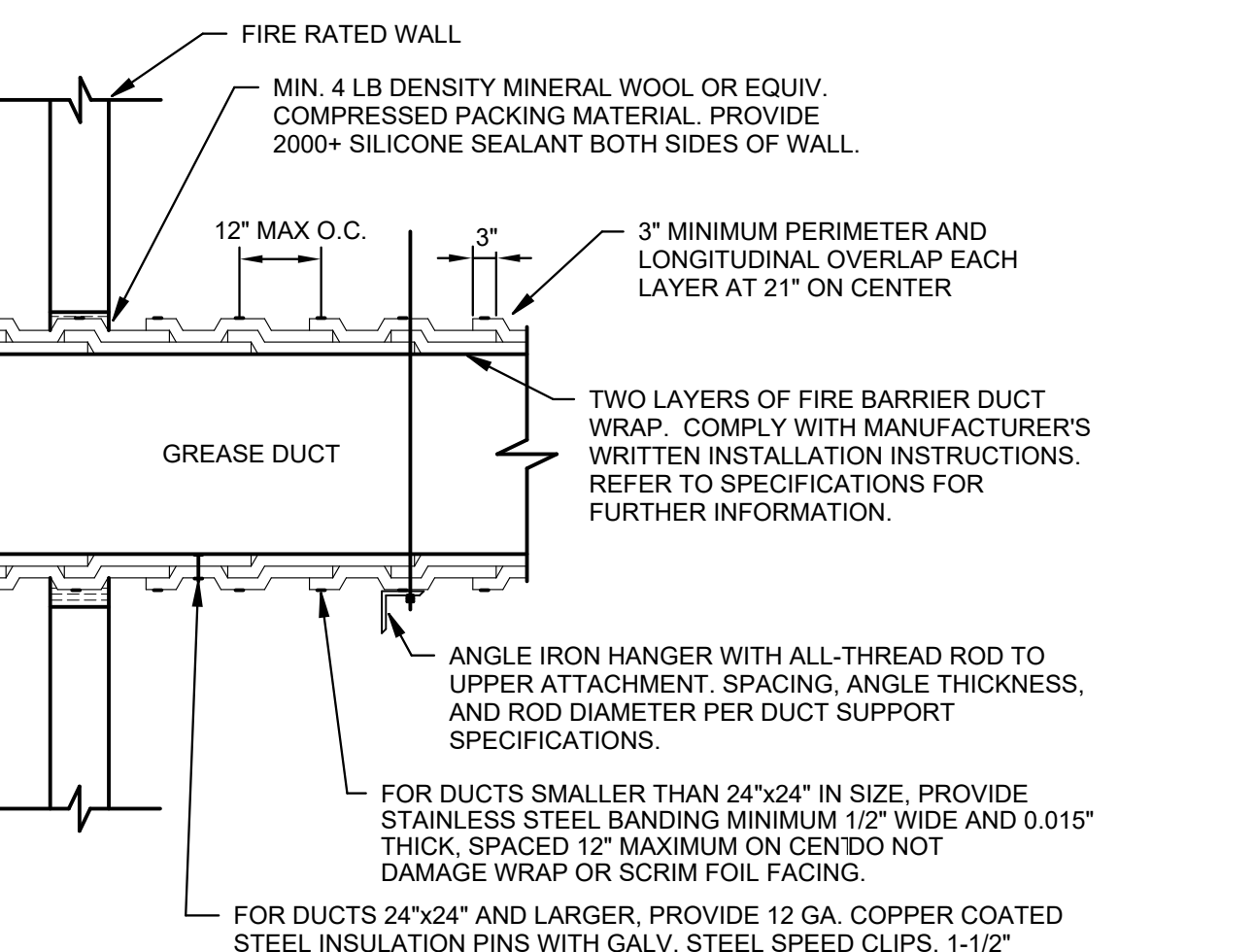
NOTES:
1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR EQUIPMENT SUPPORTS, ANCHORING AND SEISMIC/WIND RESISTANCE.

9 ROOF EQUIPMENT SUPPORT RAIL DETAIL
NTS



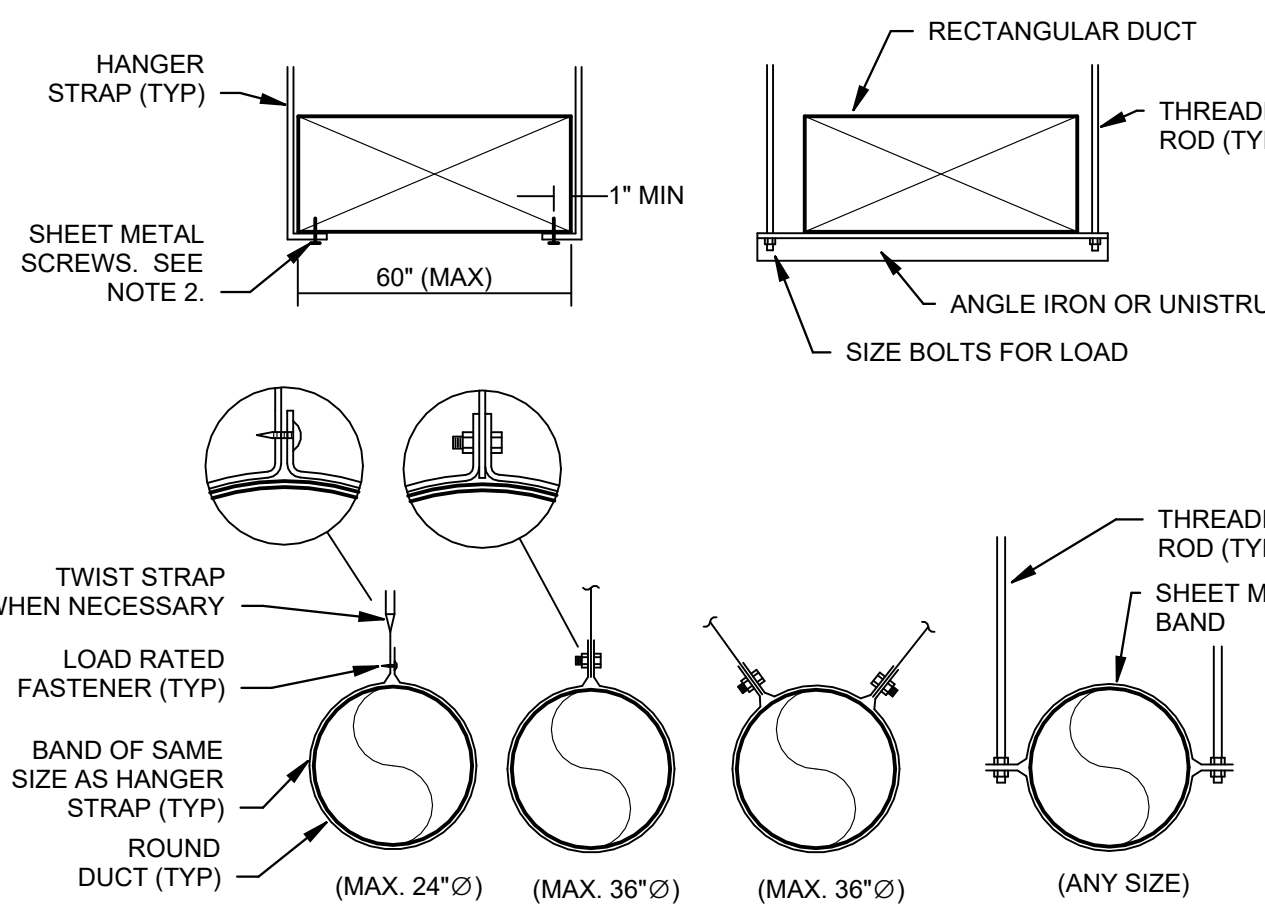
NOTES:
1. FOR REFERENCE ONLY. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
2. AT CONTRACTOR'S OPTION, A LISTED UL 1978 GREASE ACCESS DOOR PRODUCT MAY BE SUBSTITUTED FOR THE ACCESS DOOR PICTURED IN THIS DETAIL. DOOR SHALL BE RATED FOR UP TO 2,300F AND MEET NFPA88 STANDARDS. BOLTS SHALL BE LONG ENOUGH FOR DUCT WRAP SYSTEM (WHEN USED). INSTALL IN ACCORDANCE WITH MANUFACTURER'S LITERATURE.

8 GREASE DUCT CLEANOUT ACCESS DOOR DETAIL
NTS



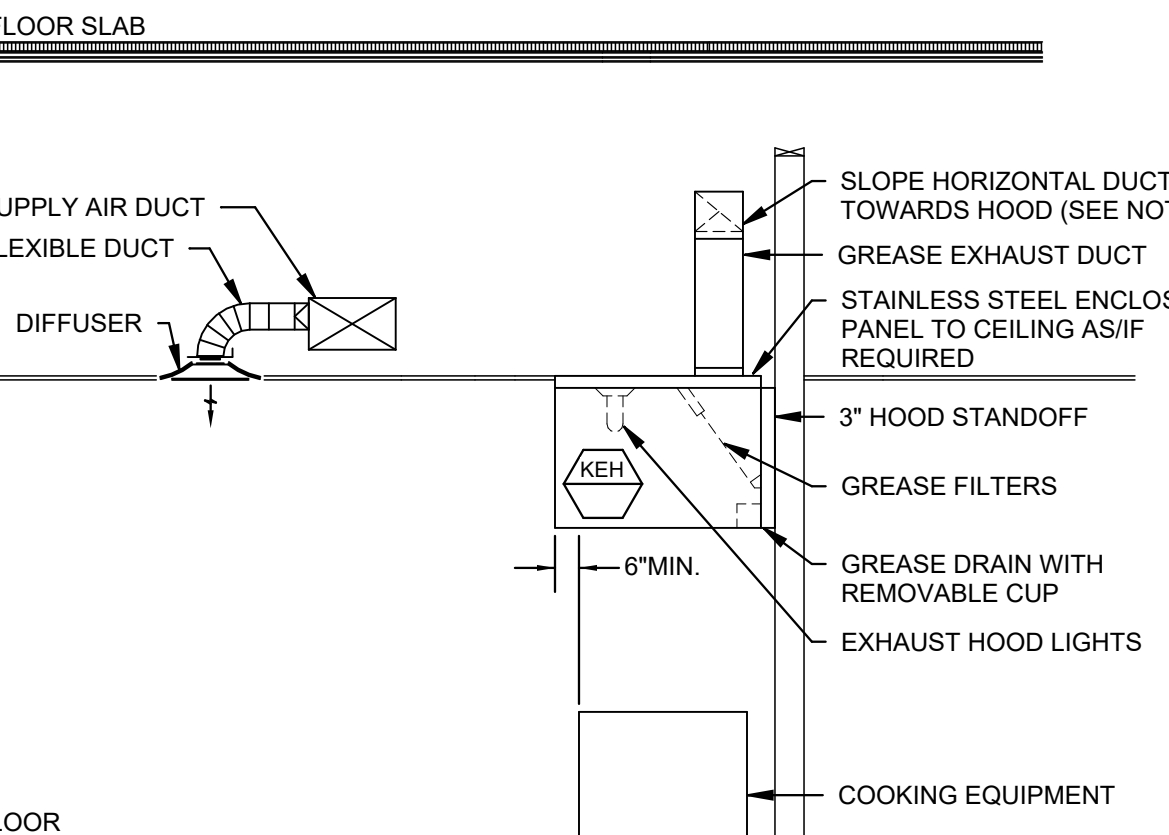
NOTES:
1. INSTALL GREASE EXHAUST AND FIRE RATED DUCT WRAP IN ACCORDANCE WITH THE MANUFACTURER'S APPROVED INSTRUCTIONS AND UL LISTED INSTALLATION DETAILS. TECHNIQUES THAT DIFFER FROM THE ABOVE METHOD ARE ACCEPTABLE IF THEY ARE UL TESTED AND APPROVED.

7 GREASE DUCT FIRE WRAP INSULATION INSTALLATION DETAIL
NTS



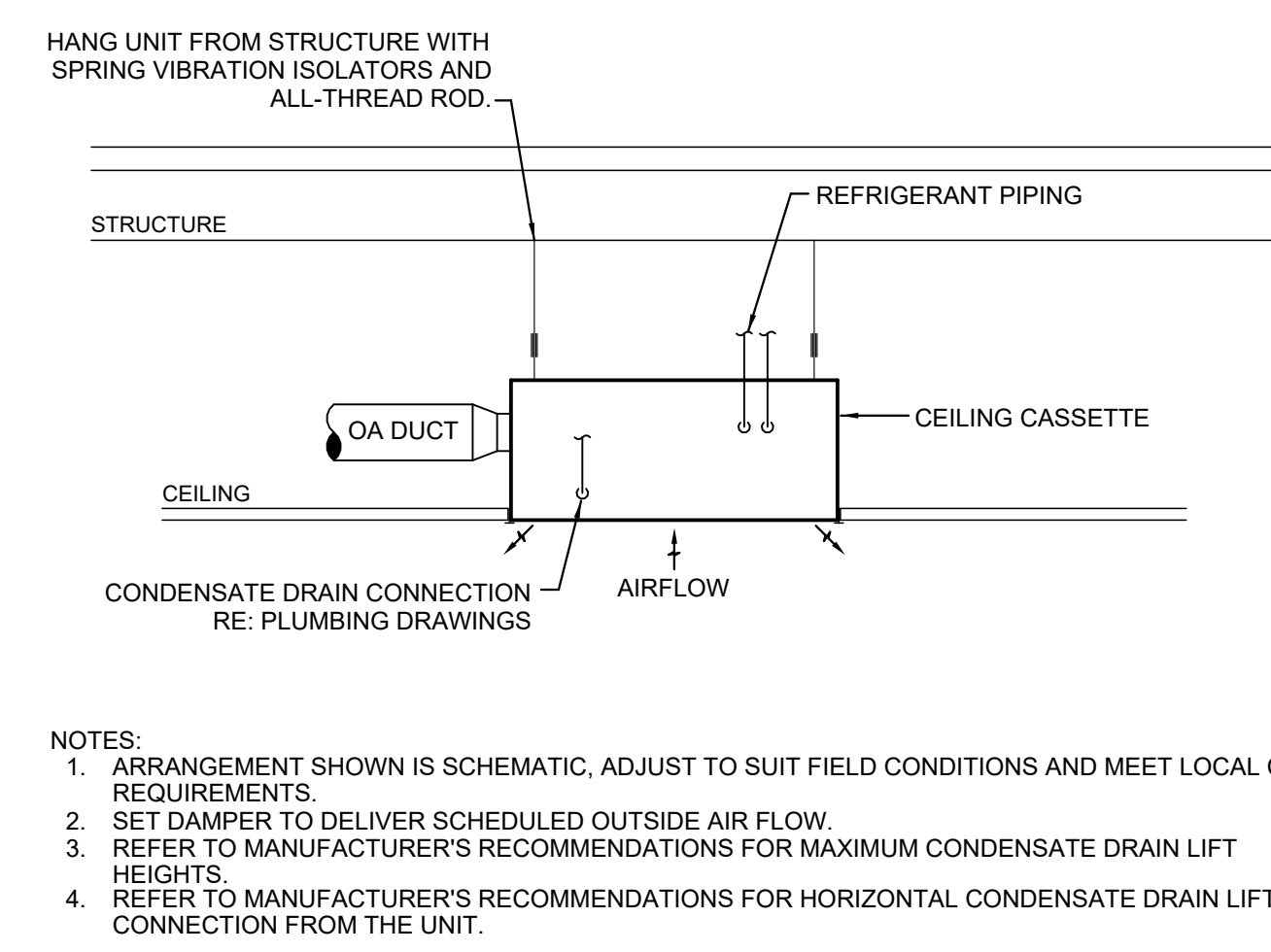
NOTES:
1. USE THREADED ROD FOR RECTANGULAR DUCTS LARGER THAN 60" WIDE.
2. OMIT SHEET METAL SCREWS IF HANGER STRAP IS CONTINUOUS AND LOOPS UNDER ENTIRE RECTANGULAR DUCT.
3. FOR ROUND DUCTS LARGER THAN 36" Ø, USE TWO HANGER RODS TO SUPPORT DUCT FROM EACH SIDE. HANGERS MUST NOT DEFORM DUCT SHAPE.

6 DUCT HANGER LOWER ATTACHMENT DETAILS
NTS



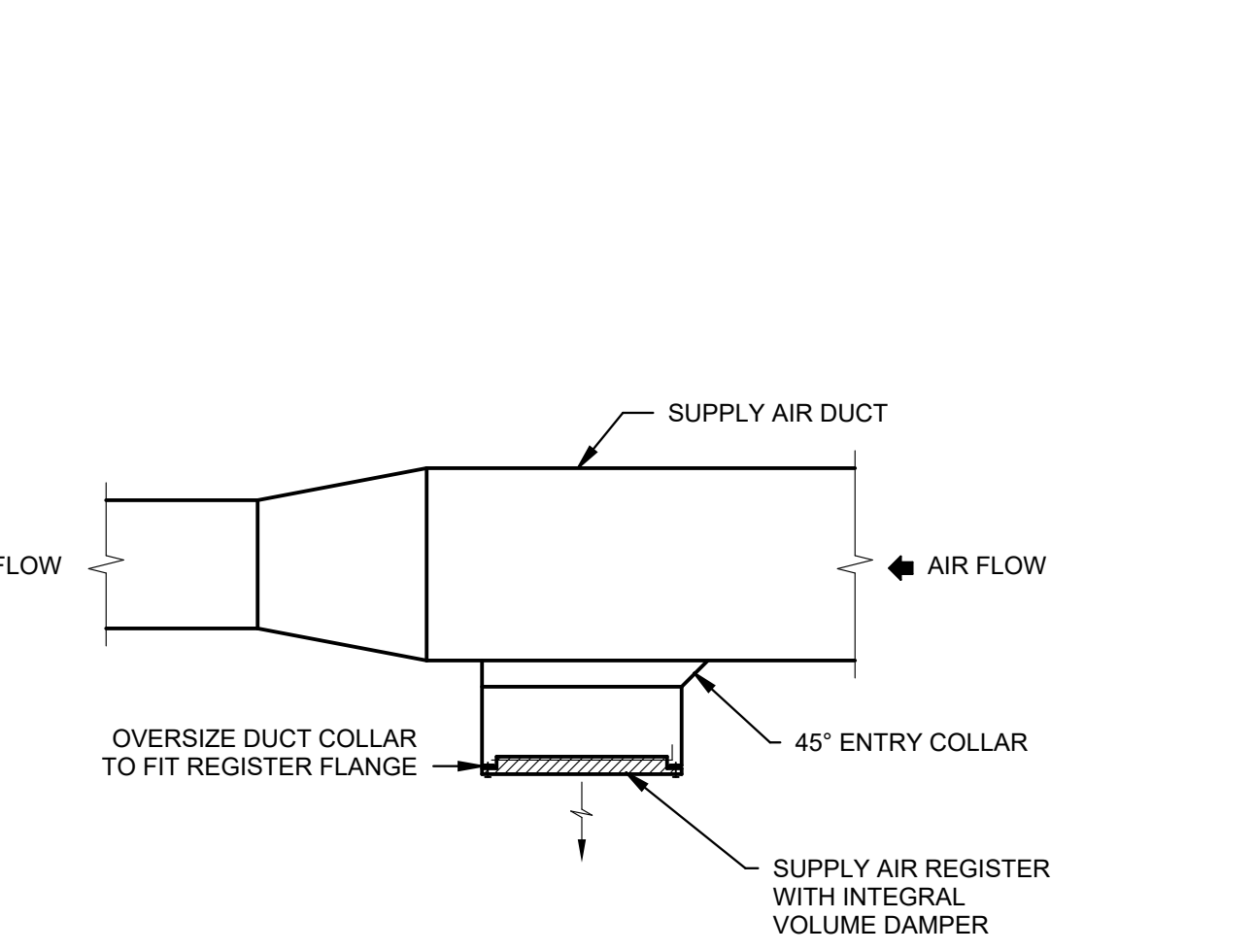
NOTES:
1. SUBMIT SHOP DRAWINGS OF ALL HOOD SYSTEMS TO CITY FOR APPROVAL PRIOR TO INSTALLATION.
2. TOTAL HOOD SYSTEM TO BE IN COMPLETE CONFORMANCE WITH NFPA, AND ALL LOCAL CODES AND REGULATIONS.
3. COORDINATE ALL FIRE PROTECTION SYSTEMS WITH FIRE PROTECTION CONTRACTOR WHO SHALL ALSO BE RESPONSIBLE FOR ALL PERMITS AND TESTING REQUIRED.
4. PROVIDE WRAP SYSTEM WHERE APPROVED BY LOCAL CODES IN LIEU OF RATED ENCLOSURE.
5. PROVIDE ACCESS PANELS AS REQUIRED BY LOCAL CODE AND PER PLAN.
6. HOODS SHALL EXTEND MINIMUM 6" BEYOND ALL OPEN SIDES AND FRONT EDGE OF FOOD COOKING EQUIPMENT BEING SERVED.

5 KITCHEN EXHAUST HOOD ELEVATION DETAIL
NTS

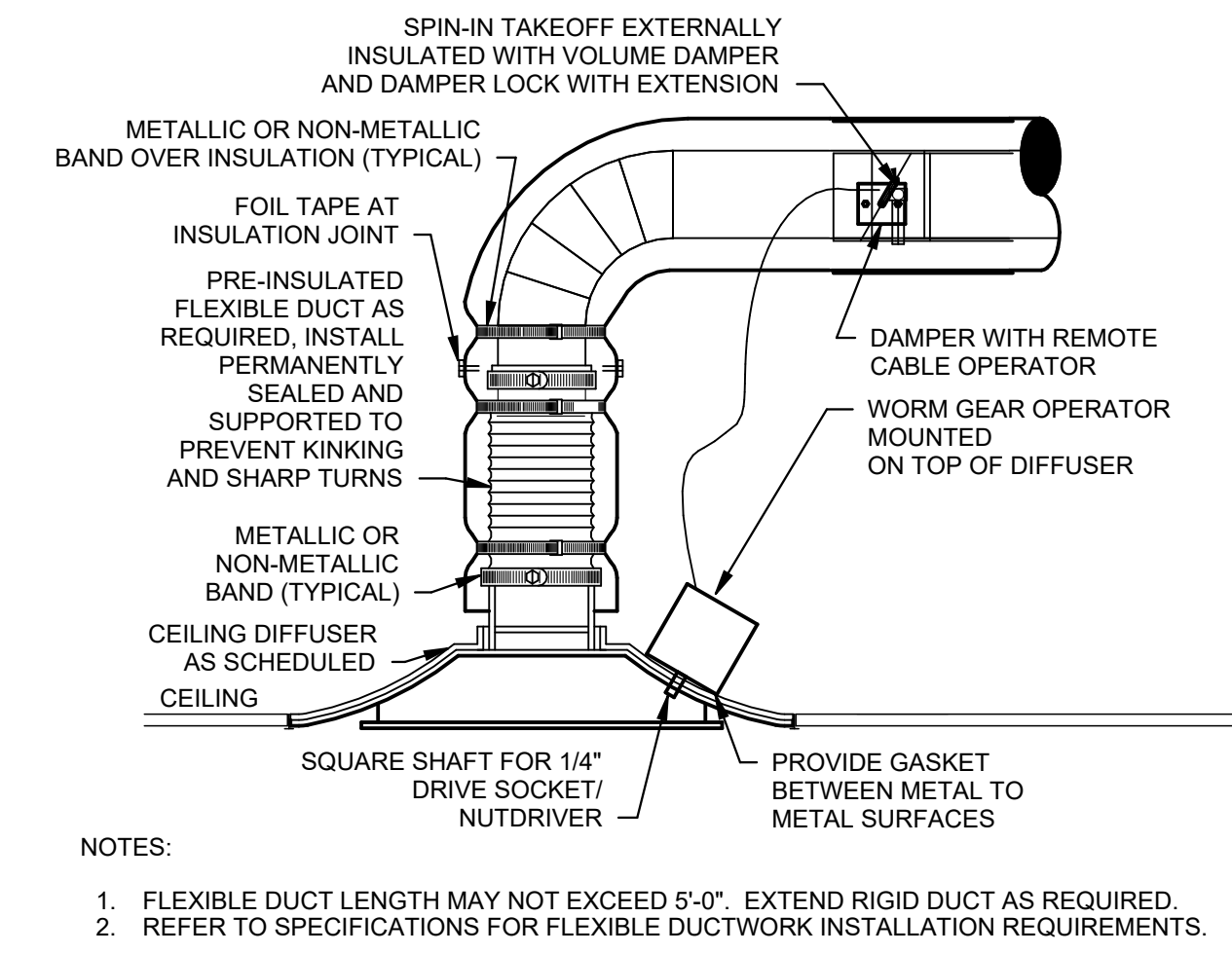


NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.
2. SET DAMPER TO DELIVER SCHEDULED OUTSIDE AIR FLOW.
3. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR MAXIMUM CONDENSATE DRAIN LIFT HEIGHT.
4. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR HORIZONTAL CONDENSATE DRAIN LIFT CONNECTION FROM THE UNIT.

4 CEILING CASSETTE DETAIL
NTS

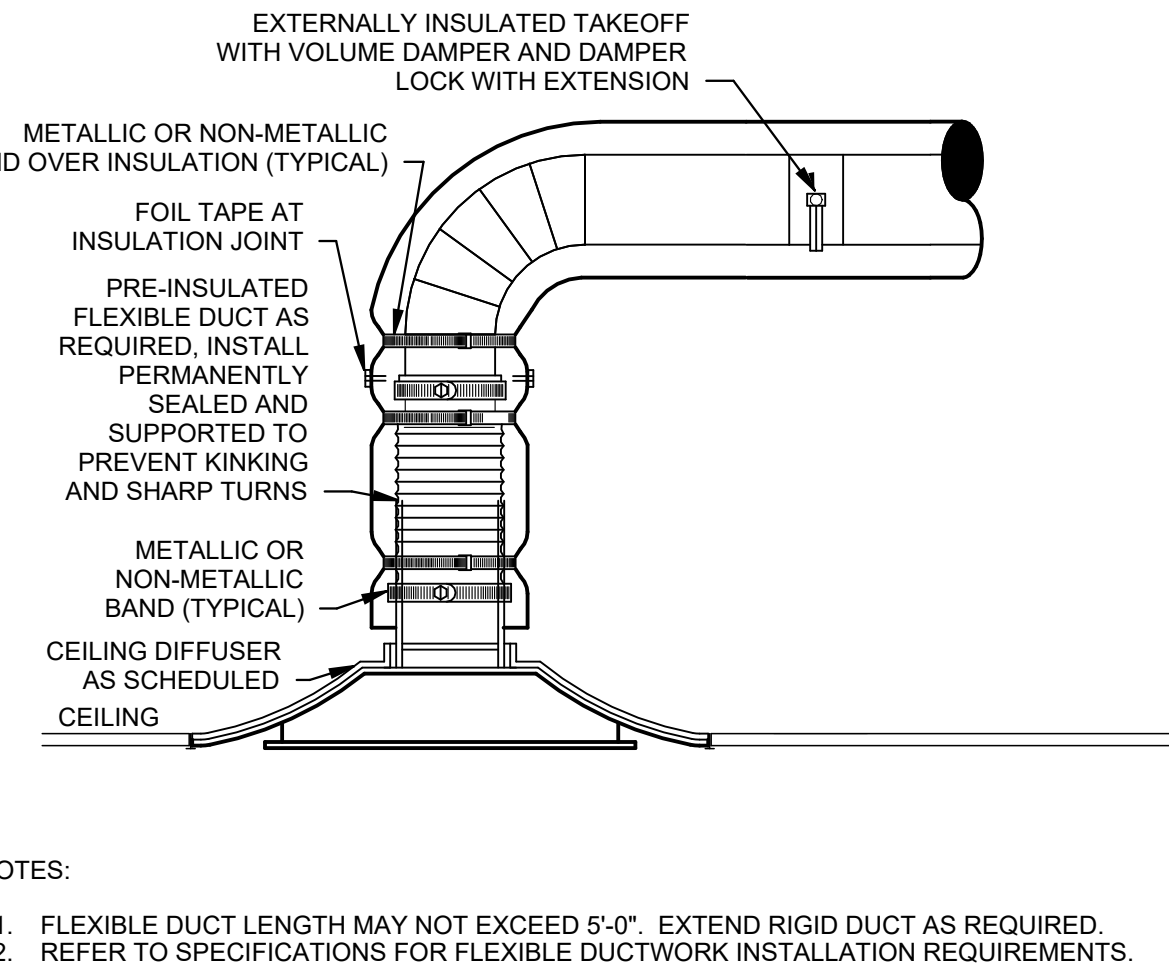


3 DUCT MOUNTED REGISTER DETAIL
NTS



NOTES:
1. FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
2. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCTWORK INSTALLATION REQUIREMENTS.

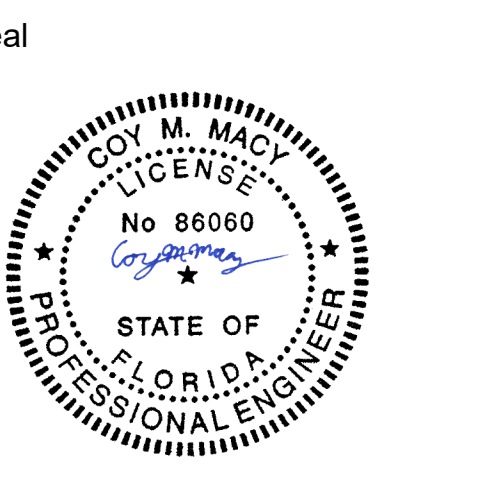
2 HARD CEILING DIFFUSER DETAIL
NTS



NOTES:
1. FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
2. REFER TO SPECIFICATIONS FOR FLEXIBLE DUCTWORK INSTALLATION REQUIREMENTS.

1 LAY-IN CEILING DIFFUSER DETAIL
NTS

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.4001
WWW.HENDERSONENGINEERS.COM
2450002080
FL REGISTRY NO. EB 7606
EXPIRES 2/28/2026



7/25/2025
COY M. MACY
LICENSE # 86060

Brian S. Thomas, Architect

DP3 Architects, Ltd.
15 South Main Street, Suite 400
Greenville, SC 29601
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Project



SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number 2450002080
Drawn By DJ
Checked By CM
Date 2/12/2025

Revisions
1. 11/12/2024 ISSUED FOR PERMIT
2. 2/12/2025 AND SEALED BY
3. 7/25/2025 COY M. MACY
ISSUED FOR BID
ISSUED FOR CONSTRUCTION

Drawing

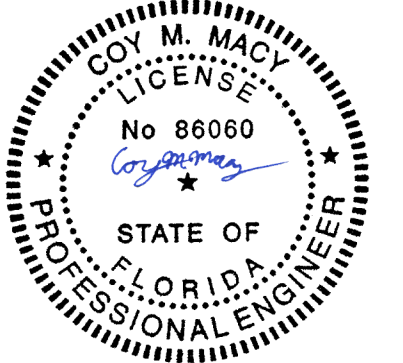
MECHANICAL DETAILS

M501

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Seal



7/25/2025

COY M. MACY
 LICENSE # 86060

Brian S. Thomas,
 Architect

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Project

SHAKE SHACK

SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

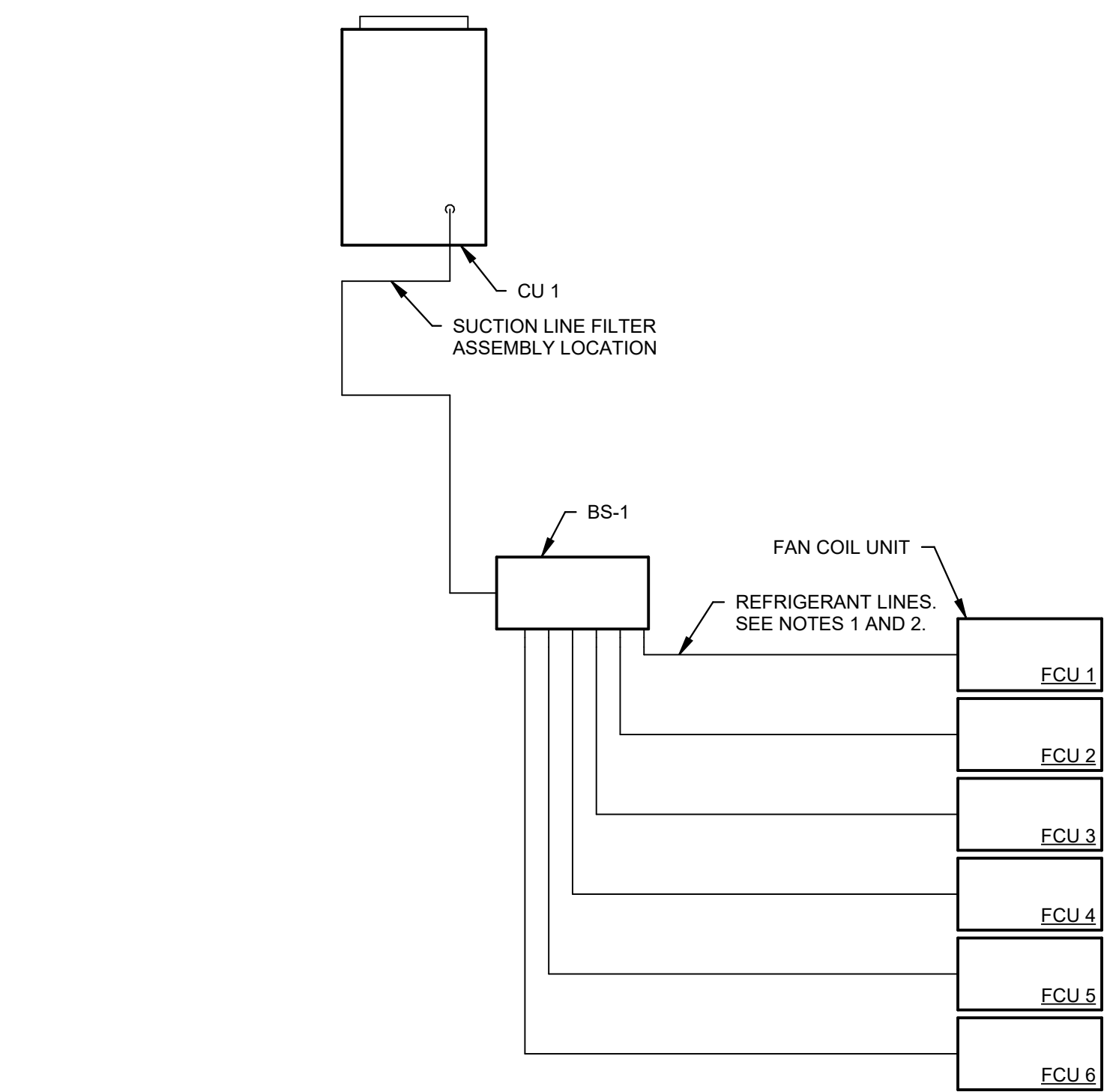
Project Number 2450002080
 Drawn By DJ
 Checked By CM
 Date 2/12/2025

Revisions	
1	11/12/2024 ISSUED FOR PERMIT
2	2/12/2025 ISSUED FOR BID
3	7/25/2025 ISSUED FOR CONSTRUCTION

Drawing

**MECHANICAL
 DETAILS**

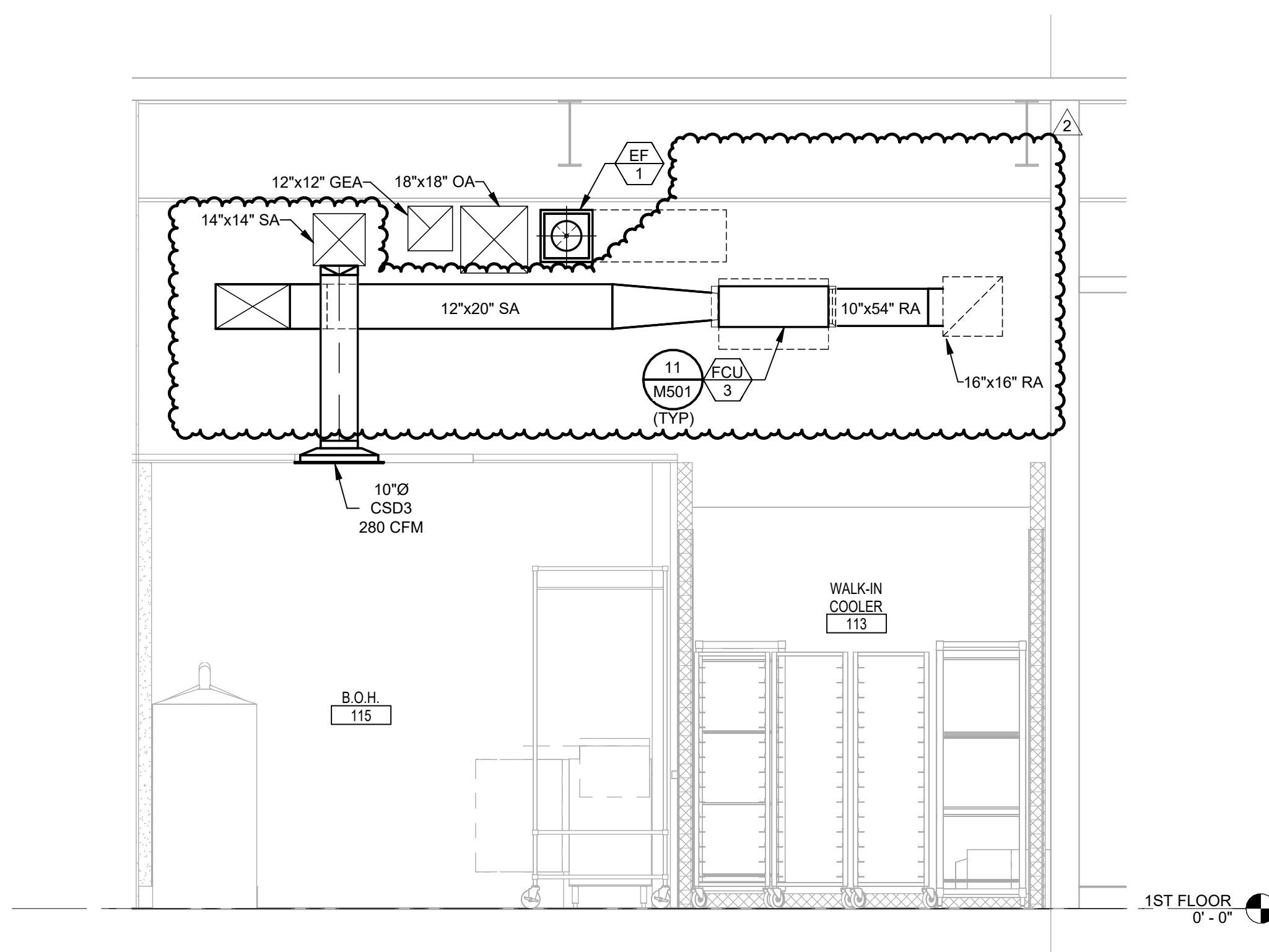
M502



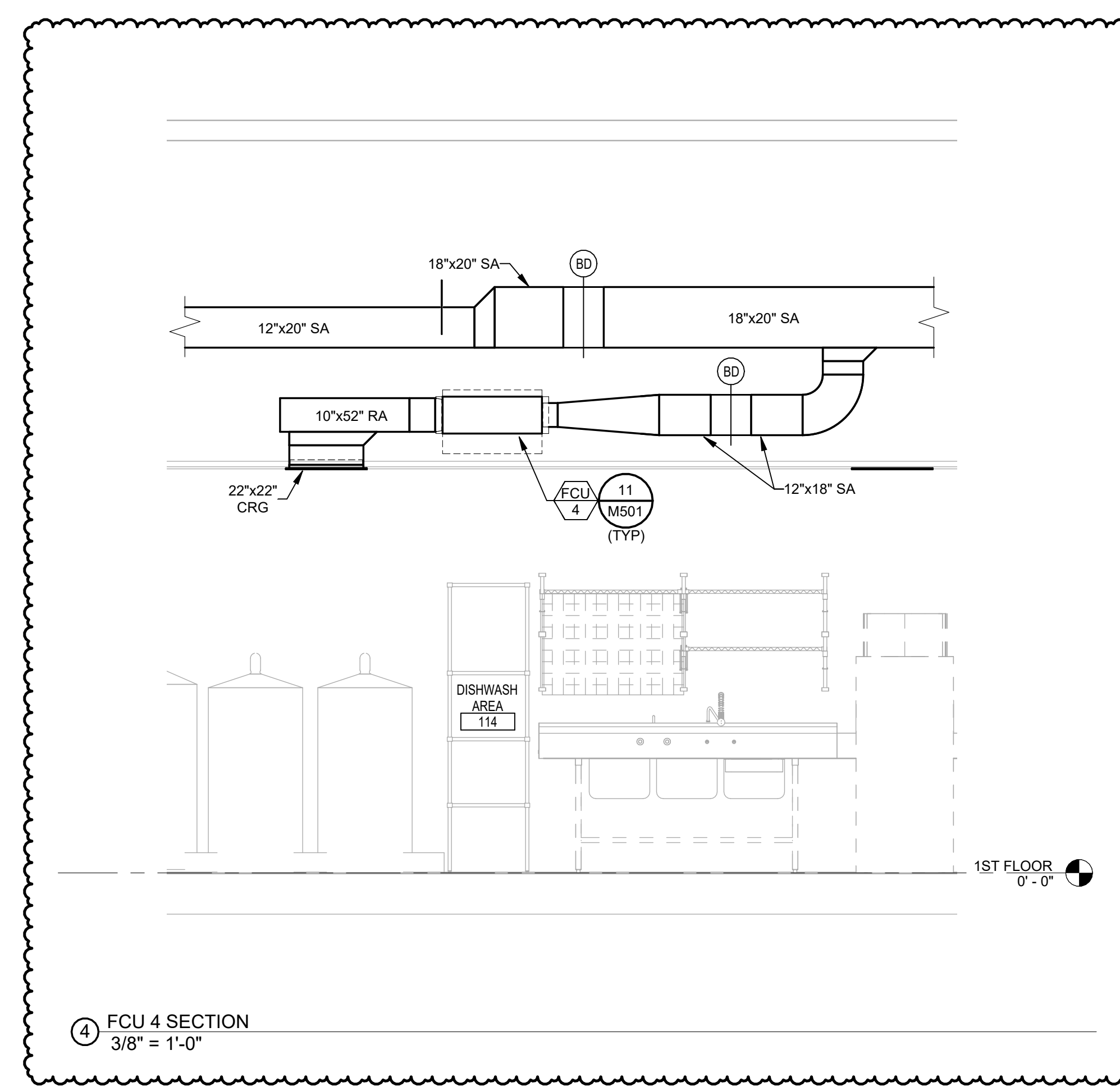
NOTES:

- ARRANGEMENT SHOWN IS SCHEMATIC. COORDINATE WITH THE MANUFACTURER THE FINAL HORIZONTAL AND VERTICAL REFRIGERANT PIPE ROUTING TO DETERMINE ACTUAL CIRCUITING, REFRIGERANT LINE QUANTITIES, LENGTHS, SIZES, FITTING TYPES, AND LOCATIONS.
- MANUFACTURER SHALL PROVIDE DETAILED REFRIGERANT PIPING DIAGRAMS AND SHOP DRAWINGS INCLUDING DIMENSIONAL DATA FOR ALL REFRIGERANT PIPING DEVICES. THE MANUFACTURER SHALL SIZE AND LOCATE THE ASSOCIATED REFRIGERANT TRAPS BASED ON THE ACTUAL ROUTING AND FURNISH OTHER APPURTENANCES TO PROVIDE A FULLY FUNCTIONAL AND OPERATIONAL SYSTEM. COORDINATE WITH THE MANUFACTURER SHOP DRAWINGS TO MAINTAIN SERVICEABILITY AND ACCESSIBILITY OF SYSTEM COMPONENTS.

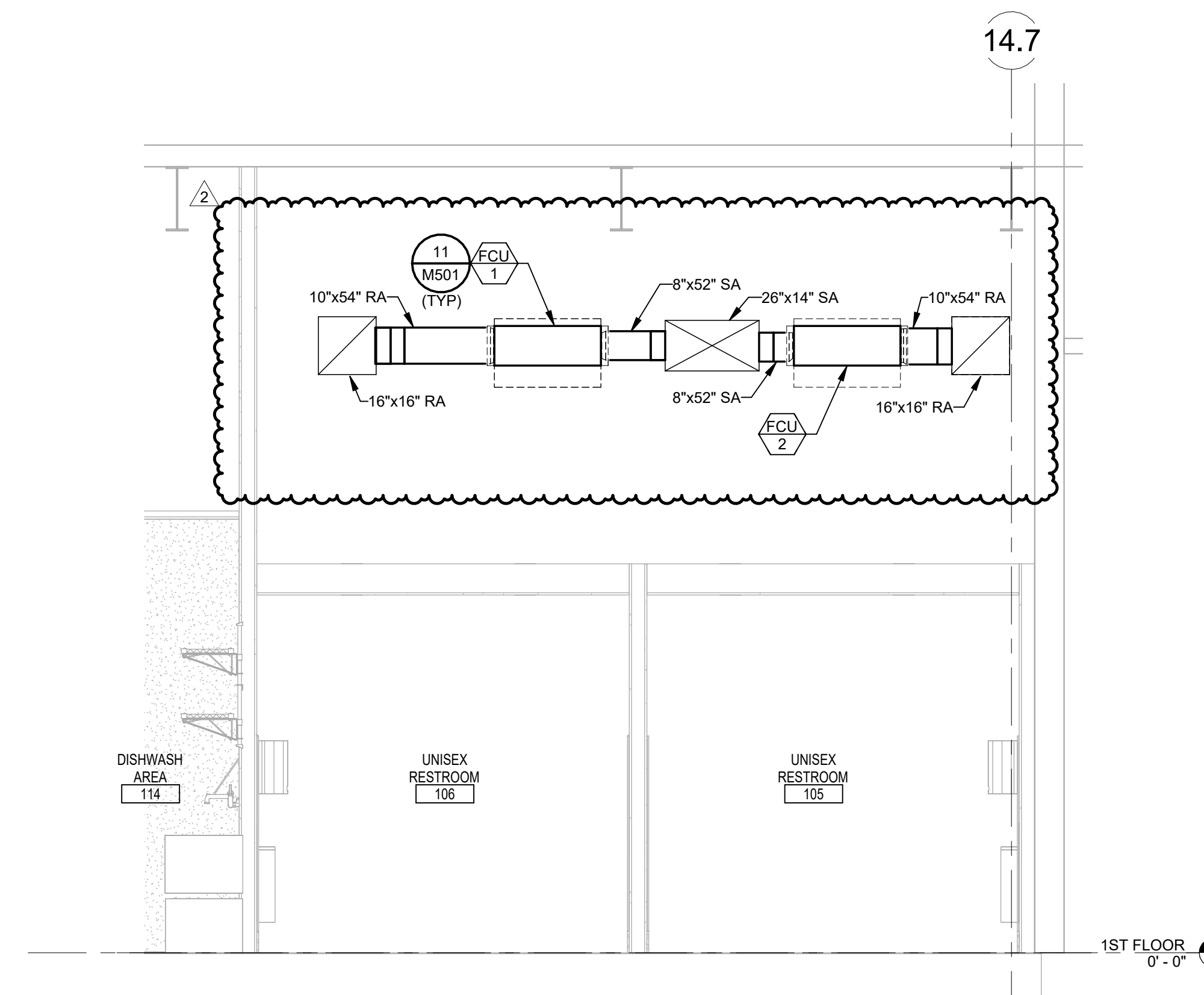
3 VRF PIPING DIAGRAM - CU-1
 NTS



2 FCU 3 SECTION
 3/8" = 1'-0"



4 FCU 4 SECTION
 3/8" = 1'-0"



1 FCU 1 & 2 SECTION
 3/8" = 1'-0"

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GENERAL MECHANICAL REQUIREMENTS

1. GENERAL INSTRUCTIONS

- A. GENERAL REQUIREMENTS
- B. DEFINITIONS
- C. PRE-BID SITE VISIT
- D. MATERIAL AND WORKMANSHIP
- E. MANUFACTURERS
- F. COORDINATION
- G. ORDINANCES AND CODES
- H. PROTECTION OF EQUIPMENT AND MATERIALS
- I. SUBSTITUTIONS
- J. SUBMITTALS
- K. ELECTRONIC DRAWINGS FILES
- L. RECORD DRAWINGS (AS-BUILT DRAWINGS)
- M. OPERATION AND MAINTENANCE INSTRUCTIONS
- N. SPARE PARTS
- O. TRAINING
- P. WARRANTIES

2. GENERAL MATERIALS AND INSTALLATION

- A. BUILDING OPERATION
- B. EXISTING EQUIPMENT REUSE AND REMOVAL
- C. EXCAVATION AND BACKFILLING
- D. COINCIDENTAL DAMAGE
- E. CUTTING AND PATCHING
- F. STRUCTURAL SUPPORT SYSTEMS
- G. PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS AND CURBS
- H. ACCESS PANELS AND DOORS
- I. PENETRATIONS
- J. FIRESTOPPING
- K. MOTORS AND STARTERS
- M. VARIABLE FREQUENCY DRIVES
- N. ELECTRICAL WIRING
- O. EQUIPMENT FURNISHED BY OTHERS
- P. SYSTEM TESTING, ADJUSTING, AND BALANCING
- Q. VIBRATION ISOLATION
- R. AIR FILTERS
- S. REFRIGERANT AND OIL
- T. IDENTIFICATION

3. DUCT INSULATION, DUCTWORK, ACCESSORIES, FLUES AND FANS

- A. DUCT INSULATION
- B. DUCTWORK
- C. FLEXIBLE DUCT
- D. PLASTIC FLUE GAS VENTS
- E. AIR DEVICES
- F. CONTROL DAMPERS
- G. EXHAUST AIR SYSTEMS
- H. KITCHEN EXHAUST AIR SYSTEMS

4. VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS

- A. SUBMITTALS
- B. SHOP DRAWINGS
- C. WARRANTY
- D. MANUFACTURERS
- E. VRF CONDENSING UNITS
- F. VRF BRANCH SELECTOR BOX FOR VRF HEAT G RECOVERY SYSTEM
- H. VRF CENTRAL CONTROLLER

5. VRF REFRIGERANT PIPING AND INSULATION

- A. QUALITY ASSURANCE
- B. SUBMITTALS
- C. DELIVERY, STORAGE, AND HANDLING
- D. MANUFACTURERS
- E. PIPE AND TUBING MATERIALS
- F. FITTINGS AND JOINING MATERIALS
- G. VALVES
- H. PIPE APPLICATIONS
- I. PIPING INSTALLATIONS
- J. FIELD QUALITY CONTROL
- K. CHARGING, CLEANING, AND STARTUP

6. HVAC EQUIPMENT

- A. ROOFTOP UNITS (HEAT PUMP) 3-25 TONS
- B. AIR CURTAINS

7. PIPING AND PIPING SPECIALTIES

- A. REFRIGERANT PIPING AND INSULATION
- B. SYSTEM EVACUATION AND CHARGING

8. TEMPERATURE CONTROLS

- A. GENERAL REQUIREMENTS
- B. WIRING
- C. THERMOSTAT CONTROL EQUIPMENT
- D. SENSORS AND RELAYS

9. ALTERNATIVES

- A. DESCRIPTION

10. COMMISSIONING OF MECHANICAL SYSTEM

- A. GENERAL
- B. EXECUTION

Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

1. GENERAL INSTRUCTIONS

A. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and Division 23. Where the requirements of this section and Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division includes all materials, equipment, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment specified.

The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the work involved.

Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without detailing all elements, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and which when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory, and properly operating system.

B. DEFINITIONS

Division: References contained in this specification follow the numbering system defined in the Construction Specifications Institute (CSI) MasterFormat 2004 Edition. Specification Divisions 01 through 13 provided with this project may reference the CSI MasterFormat 1995 Edition. The corresponding division references between the 2004 Edition and 1995 Edition are as follows:

2004 Edition	1995 Edition
1. Division 21 – Fire Suppression	Division 15
2. Division 22 – Plumbing	Division 15
3. Division 23 – HVAC	Division 15
4. Division 26 – Electrical	Division 16
5. Division 27 – Communications	Division 16
6. Division 28 – Electronic Safety and Security	Division 16

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations."

Install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, connecting, adjusting, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."

Provide: "to furnish and install."

Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete and ready for intended use, including all items and services incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division."

Engineer: Where referenced in this division, "Engineer" is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, "Engineer" means increased involvement by and obligations to the Engineer, in addition to involvement by and obligations to the Architect.

AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the work.

NRTL: Nationally recognized testing laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.

- 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
- 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

The terms "approved equal," "equivalent," or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified." The term "approve" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. PREBID SITE VISIT

Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain extra compensation over and above the contract price.

D. MATERIAL AND WORKMANSHIP

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Install material and equipment in accordance with the manufacturer's installation instructions. Model numbers listed in the specifications or shown on the drawings are not necessarily intended to designate the required trim, written descriptions of the trim govern model numbers.

Pipe, pipe fittings, pipe specialties and valves shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.

Work performed under this contract shall provide a neat and "workmanlike" appearance when completed, to the satisfaction of the Architect and Engineer. Workmanship shall be the finest possible by experienced mechanics. Installations shall comply with applicable codes and laws.

The complete installation shall function as designed and intended with respect to efficiency, capacity, noise level, etc. Abnormal noise caused by rattling equipment, piping, ducts, air devices, and squeaks in rotating components shall not be acceptable. Materials and equipment shall be of commercial specification grade in quality. Light duty and residential grade equipment shall not be accepted unless otherwise indicated.

Remove from the premises waste material present as a result of work, including cartons, crating, paper, stickers, and/or excavation material not used in backfilling, etc. Clean equipment installed under this contract to present a neat and clean installation at the termination of the work.

Repair or replace public and private property damaged as a result of work performed under this contract to the satisfaction of authorities and regulations having jurisdiction. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

E. MANUFACTURERS

In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.

Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.

Where manufacturers are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for no less than 5 years.

F. COORDINATION

Coordinate work with that of other trades so that the various components of the systems are installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. The General Contractor shall furnish and install all necessary equipment and materials. Equipment and materials are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner as to not interfere with or delay the work of other trades.

Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations may occur. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection. Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:

- 1. National Electrical Code (NEC)
- 2. National Fire Protection Association (NFPA)
- 3. Underwriters Laboratories (UL)
- 4. Occupational Safety and Health Administration (OSHA)
- 5. American Society of Mechanical Engineers (ASME)
- 6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- 7. American National Standards Institute (ANSI)
- 8. American Society of Testing and Materials (ASTM)
- 9. Other national standards and codes where applicable.

Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent.

Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and licenses required for the accomplishment of the work herein described. Where required, obtain, pay for, and furnish certificates of inspection to Owner.

H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For materials and equipment not susceptible to these conditions, cover with waterproof, tear-resistant, heavy tarp or polyethylene plastic as required to protect from plaster, dust, dirt, paint, water, or physical damage. Replace insulation that has become wet at any time during construction. Drying the insulation is not acceptable. Seal any tears or joints of internal fiberglass insulation. Equipment and material required by construction activities shall be protected and Contractor shall furnish new equipment and material of a like kind at his own expense.

Keep premises broom clean of foreign material created during work performed under this contract. Piping, equipment, etc. shall have a neat and clean appearance at the termination of the work. Remove debris from ceiling/return air plenum, including dust.

Plug, seal, or cap open ends of ductwork and piping systems while stored and installed during construction when not in use to prevent the entrance of debris into the systems. Remove temporary protection prior to starting equipment and turning the system over to the owner.

I. SUBSTITUTIONS

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. The base bid shall include only the products from manufacturers specifically named in the drawings and specifications. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and send the Substitution Request Form for each material, product, equipment, or system that is proposed to be substituted. The burden of proof of the merit of the proposed substitution is upon the proposer.

Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:

- 1. Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise in the substitution request.
- 2. Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of replacement parts.
- 3. Proposed substitution has received necessary approvals of all authorities having jurisdiction.
- 4. Same warranty will be furnished for proposed substitution as for specified Work.
- 5. If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
- 6. Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.

No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation. No substitution will be considered prior to receipt of bids unless written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date for receipt of bids.

If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless specifically provided in the contract documents.

J. SUBMITTALS

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contractors under this contract. Provide submittals in sufficient detail so as to demonstrate compliance with these contract documents and the design concept. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use, will fit the available space, and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.

Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus before mailing time via the Architect, plus a duplication of this time for resubmittal, if required. Only resubmit those sections requested for resubmittal.

Submittals shall contain the project name, applicable specification section, submittal date, equipment identification acronym as used on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are being proposed. General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such product, refer to paragraph "Electronic Drawing Files" for procedures to be used.

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly bound, identified, indexed and tabbed in a 3-ring binder. Each item or model number shall be clearly marked and accessories indicated. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical requirements and deviations from specified equipment or materials. For equipment with motor starters or VFDs, include short circuit current ratings. Mark out applicable items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of submittals required by Division 01. If not indicated and hard-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, user name, and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the electronic submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for deviations from the drawings and specifications, errors in dimensions, details, size of members, or quantities, omissions of components or fittings; coordination of electrical requirements; and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

See Division 01 and General Conditions for additional information.

K. ELECTRONIC DRAWING FILES

In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format on CD-ROM disk, DVD disk, flash drive or direct download, as desired. From the Engineer for a drawing and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet. Contact the Architect for written authorization and Engineer for the necessary release agreement form and to specify shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described above.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project. Include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment manufacturer. Contact the Architect for written authorization and Engineer for the necessary release agreement form and to specify shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

Submit three copies of literature bound in approved binders with index and tabs separating equipment types to the Architect, for Engineer's review, at the termination of the work. Paper clips, staples, rubber bands, loose-leaf binding, and mailing envelopes are not considered approved binders. Final approval of systems installed under this contract shall be withheld until this equipment brochure is received and deemed complete by the Architect and Engineer. Instruct workmen to save required literature shipped with the equipment itself for inclusion in this brochure.

Include Record Drawings as described above.

Refer to Division 01 for acceptance of electronic manuals for this project. For electronic manuals, refer to paragraph "Submittals" for requirements.

N. SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for the equipment furnished for this project:

- 1. One set of spare filters of each type required for each unit. In addition to the spare set of filters, install new filters prior to testing, adjusting, and balancing work and before turning system over to Owner.
- 2. Furnish one complete set of belts for each fan.
- 3. Furnish three operating keys for each type of air outlet and inlet that require them.

O. TRAINING

At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.

Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole; operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention; and review of data included in the operation and maintenance manuals.

Submit a certification letter to the Architect stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The Contractor and the Owner's representative shall sign the certification letter indicating agreement that the training has been provided.

Schedule training with Owner with at least 7 days advance notice.

P. WARRANTIES

Warrant each system and each element thereof against all defects due to faulty workmanship, design, or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the construction documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01.

Warranties shall include labor and material, including travel expenses. Make repairs or replacements without any additional costs to the Owner, and to the satisfaction of the Owner, Architect, and Engineer.

Perform the remedial work promptly, upon written notice from the Engineer or Owner.

At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status. Each warranty instrument shall be addressed to the Owner and state the commencement date and term.

2. GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

Comply with the schedule of operations as outlined in the architectural portions of this specification. Accomplish work requiring interruption of building operation at a time when the building is not in operation and only with written approval of building Owner and/or tenant. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance of work.

B. EXISTING EQUIPMENT REUSE AND REMOVAL

Remove all unused equipment, ductwork, piping, and associated supports. Cap ductwork and piping at mains and seal air and water tight.

Provide items of HVAC systems modification required because of building remodeling, as noted on the drawings or necessary for proper operation. Match existing materials and construction techniques when modifying existing systems unless specified otherwise. Coordinate additional requirements with General Contractor and Architect.

Seal airtight existing ductwork required to be abandoned in place or not in use at the termination of the work.

Cap and seal weathertight existing roof curbs and roof openings to be abandoned in place as a result of equipment removal.

Clean and rebalance existing ductwork, diffusers, registers, and grilles intended for reuse as required or as indicated on drawings.

Clean and refurbish existing HVAC equipment intended for reuse as required for proper operation including replacement of filters, belts, motors, remote controls, and safety interlocks.

C. EXCAVATION AND BACKFILLING

Perform excavation and backfill required for installation of underground work under this contract. Trenches shall be of sufficient width. Crib or braced trenches to prevent cave-in or settlement. Do not excavate trenches close to columns and walls of new building without prior consultation with the Architect. Use pumping equipment if required to keep trenches free of water. Backfill trenches in maximum 6 inch layers of well-tempered dry earth in a manner to prevent future settlement.

Excavation as specified herein shall be classified as common excavation. Common excavation shall comprise the satisfactory removal and disposition of material of whatever substances and of every description encountered, including rock, if any, within the limits of the work as specified and shown on the drawings. Excavation shall be performed to the lines and grades indicated on the drawings. Dispose of excavated materials that are considered unsuitable for backfill and surplus of excavated material which is not required for backfill to the satisfaction of the Architect.

D. COINCIDENTAL DAMAGE

Repair streets, sidewalks, drives, paving, walls, finishes, and other facilities damaged in the course of the work. Repair materials shall match existing construction. Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the satisfaction of the Architect.

E. CUTTING AND PATCHING

Conform to the requirements in Division 01. Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission from the Architect prior to cutting. Do not cut or disturb structural members without prior approval from the Architect and Structural Engineer. For post-tension slabs, x-ray slab and closely coordinate all core drill locations with Architect and Structural Engineer prior to performing any work. Obtain approval from Architect and Structural Engineer for all core drills and penetrations at least four days prior to performing work. Penetrations shall be made as small as possible while maintaining required clearances between the building element penetrated and the system component. Patch around openings to match the adjacent construction including fire ratings, if applicable. Repair and refinish areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

F. ROUGH-IN

Coordinate without delay all roughing-in with other divisions. Conceal piping, conduit, and rough-in except in unfinished areas and where otherwise shown.

G. STRUCTURALSUPPORT SYSTEMS

Structural steel used for support of equipment, ductwork and piping shall be new, clean, and conform to ASTM Designation A-36.

Support mechanical components from the building structure. Do not support mechanical components from ceilings, other mechanical or electrical components, and other non-structural elements.

H. PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS AND CURBS

Provide prefabricated equipment support rails and roof curbs manufactured by AES Industries, Custom CURB, Inc., Pate Company, Thybur or approved equal. Provide with fully mitered raised cant and step to match roof insulation thickness, welded, minimum 18 gauge galvanized steel shell, internally reinforced to load bearing factors of equipment being supported, minimum 1-1/2 inch thick, 3 pound rigid insulation internal to shell to maintain continuous roof insulation where required, factory installed wood nailer, and minimum 18 gauge jacket with counterflashing where equipment does not fully cover the equipment support. Provide sloped roof equipment supports to enable level installation. Provide rigid backing material behind cant to maintain cant slope. Provide multiple support rails to uniformly support the equipment. Attach to roof structure according to manufacturer's installation instructions.

Attach equipment directly to pre-engineered roof equipment support using one of the following methods:

- 1. Hold-Down Brackets: Coordinate with the curb manufacturer to determine the quantity and size of hold-down brackets and fasteners, with installation instructions for each unit to meet a Building Design Risk Category II and a Design Wind Speed of 132 mph.
- 2. Submit signed and sealed drawings that indicate the design and installation requirements of pre-engineered roof supports can withstand the design criteria listed. Include installation requirements for anchoring to the roof structure. The Engineer is not responsible and will not provide the seal and signature. Deliver submittal to the local AHJ for approval prior to installation of the contractor provided, pre-engineered roof supports.

I. ACCESS PANELS AND DOORS

Refer to Architectural documents for specification of access panels and doors.

Provide access doors for all concealed equipment and duct and piping accessories that require service where indicated or as required, except where above lay-in ceilings. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches. Access doors must be of the proper construction for type of construction in which it is installed. Obtain Architect's approval of type, size, location and color before ordering. Provide factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation, concealed hinges, flush screwdriver-operated cam lock, and anchor straps. Provide access doors manufactured by Greenheck, Milor, Titec, Zum, or equal.

Provide the quantity of submittals required by Division 01. If not indicated and hard-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, user name, and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer.

Provide power and communication wiring with transient protection in accordance with IEEE C62.41.2. All control and interlock wiring shall comply with the NEC. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller. Control wiring not installed in conduit shall be UL rated for plenum installation. All NEC Class 1 (line voltage) wiring shall be UL listed in approved wiring according to the NEC and Division 26 requirements. Maximum allowable voltage drop for control wiring shall be 120 V. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be sub-fused when required to meet Class 2 current limit.

Conduit for Control Wiring: EMT with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connections.

Pull and Junction Boxes: Size according to number, size, and position of entering raceways as required by National Electrical Codes. Enclosure type shall be suited to location.

Install wiring parallel to building lines wherever possible. Conceal all control wiring in finished rooms. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two wires (e.g., relays and transformers). All wire-to-device and wire-to-wire connections shall be made at a terminal block or terminal strip. All runs of communication wiring shall be unspliced length when that length is commercially available. Verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable. Label all wiring and cabling at each end within 2 inches of termination with the controller termination number. Label control devices used in the system with permanent labels using the identifiers that match the record documents.

O. EQUIPMENT FURNISHED BY OTHERS

Provide necessary equipment and accessories that are not provided by the equipment supplier or Owner to complete installation of equipment furnished by others in locations as indicated on the drawings, specified herein, or both. Equipment and accessories not provided by the equipment supplier may include, but not be limited to flues, vents, intakes, associated roof jacks and caps to outdoors, dampers, in-line fans, roof fans, and control interlocks, etc. as required for proper operation of the complete system in accordance with the manufacturer's instructions.

Contractor shall be responsible for correct rough-in dimensions and shall verify them with Architect and/or equipment supplier prior to device installations.

P. SYSTEM TESTING, ADJUSTING, AND BALANCING

Upon completion of each phase of the installation, test each system in conformance with local code requirements and as noted below. Furnish labor and equipment required to test each system installed under this contract. Assume all costs involved in making the tests and repairing and/or replacing any damaged resulting therefrom.

The final test and balance of the building HVAC systems shall be completed by National TAB (no exceptions) and contracted by the General Contractor. The representative from National TAB shall be certified by the National Environmental Balancing Bureau (NEBB), Associated Air Balance Council (AABC), or Testing, Adjusting and Balancing Bureau (TABB). TAB shall be performed in accordance with the most current edition of the certified agencies procedural standard for testing, adjusting and balancing and shall comply with the strictest interpretation of all applicable codes and regulations of all TAB work.

Work shall include but not be limited to: Perform test readings on fans, units, coils, pumps, etc. and adjust equipment to deliver specified amounts of air. Prepare testing and balancing report showing air supply quantities, air entering and leaving temperatures and pressures at design flow, fan and unit test readings, motor voltage and amp draws, etc., and submit six copies of the final compilation of data to the Architect for evaluation and approval before final inspection of the project. Balance air systems to within plus or minus 10 percent for terminal devices and branch lines and plus or minus 5 percent for main ducts and air handling equipment of the amount of air shown on the drawings. TAB Contractor shall record space temperatures and make adjustments in airflow to each diffuser to obtain uniform temperature (no greater than +/- 3 F) in spaces. Document temperatures and adjustments in lab report. Adjust equipment to operate as intended by the specification. TAB report shall include a "report summary/remarks" section in accordance with the procedural standard that provides both system set up and a summary of deficiencies as defined by the procedural standard.

TAB Contractor shall be responsible to calibrate, set, and adjust automatic temperature control sensors, actuators and control devices. Check proper sequencing of interlock systems, and operation of safety controls, adjust thermostats, and control setpoints, limits and time based adjustment to operate in accordance with the performance requirements of the Construction Documents. Adjust pumps, fans, etc. for proper and efficient operation. Certify to Architect that adjustments have been made and that system is operating safely/control. Calibrate, set, and adjust automatic temperature controls. Check proper sequencing of interlock systems, and operation of safety controls.

Division 23 contractor shall align bearings and replace bearings that have dirt or foreign material in them with new bearings without additional cost to the Owner.

Q. VIBRATION ISOLATION

Provide vibration isolation equipment and materials by a single manufacturer. If type and deflection for specific equipment is not specified within the contract documents, reference ASHRAE Handbook Applications or provide per manufacturer's recommendations. Approved manufacturers include Caldyn, Kinetics Noise Control, Mason Industries, Inc., Vibration Eliminator Co., Inc., Vibration Mounting and Controls, or Vibro-Acoustics, provided their systems are in compliance with the specified design and performance requirements.

General Requirements: Select vibration isolators by the weight distribution to produce uniform deflection. Vibration isolators shall have either known un-deflected heights or calibration markings so that, after adjustment, the static deflection can be verified, thus determining that the load is within the proper range of the isolator. Isolators shall operate in the linear portion of their load versus deflection curves. Spring deflection shall show 50 percent excess capacity without coil bound. Coat vibration isolators with factory-applied paint. Coat vibration isolators exposed to weather and other corrosive environments with factory-applied corrosion resistance protection. Install and adjust vibration isolators in accordance with manufacturers written instructions.

Pipe connections. Provide flexible connectors for piping system connections on equipment side of shutoff valves for all pumps, mechanical equipment supported or suspended by spring isolators, and where indicated on drawings. Fabricate flexible piping connectors from stainless steel or rubber materials as suitable for system fluid. Flexible piping connectors shall be belows, spherical or braided hose type as recommended by the manufacturer for the application.

Isolator Types:

1. Type WP (Waffle Pads): Provide 5/16 inch thick neoprene pads ribbed or waffled on both sides. Manufacture pads with bridge quality neoprene and select for a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.05 inches. Incorporate steel load-spreading plates where required between the equipment and the neoprene pad to provide selected deflection. If the isolator is bolted to the structure, install a neoprene mounting sleeve under the bolt head between the steel washer and the base plate to prevent metal to metal contact. Provide Mason Industries Type W or equal.

2. Type SPNH (Spring and Neoprene Hangers): Provide a steel hanger box containing a laterally stable, double-deflecting neoprene isolator in series with a steel spring. Design springs so the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80 percent of the compressed height of the spring at rated load. Loaded springs shall operate within the linear portion of their load versus deflection curve over a deflection range of not less than 50 percent above design deflection. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 90 degree arc. Include a neoprene bushing to prevent contact between the lower hanger rod and hanger box and short-circuiting the isolating function. The neoprene element shall have a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of not less than 0.4 inches. Unless otherwise specified, the static deflection of SPNH hangers shall be 2 inches. Provide SPNH hangers with 1 inch static deflection for water source heat pumps and fan-powered VAV terminal units. When installed, do not lock the spring element and do not allow the hanger box to rotate through a full 360 degree arc without encountering obstructions. Provide Mason Industries Type SON or equal.

3. Type NR (Neoprene Bushing): Provide neoprene, rubber-in-shear bushings for lightweight (less than 100 pounds), suspended equipment supported from structure with all thread rod and angle iron or Unistrut. Select for a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.15 inches. Provide Mason Industries Type HMBB or equal.

R. AIR FILTERS

Provide AAF/Fluents Perfect Flat HC M8, Camfil FX 3030, pleated, throwaway type filters, minimum MERV 8, or similar as manufactured by Air Filter, Inc., Biodynamic, Columbus, Koch, or approved equal, unless otherwise indicated.

Temporary filters used to protect openings in ductwork and inside equipment when permanent HVAC equipment is used during the construction period shall be pleated, throwaway type filters, minimum MERV 6.

S. REFRIGERANT AND OIL

Provide full refrigerant and oil charge in new air conditioning refrigeration systems, and maintain it for full term of the guarantee.

T. IDENTIFICATION

Provide pipe markers to standard pre-printed, semi-rigid snap-on or permanent adhesive, pressure-sensitive vinyl pipe markers. Color code pipe markers to comply with ANSI A13.1.

Install pipe markers on each HVAC piping system and include arrows to show normal direction of flow.

Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

Provide plastic laminate or brass valve tag on every valve, coil and control device in each HVAC piping system; exclude check valves, valves within factory-fabricated equipment units, and shut-off valves at HVAC terminal devices and similar rough-in connections of end-use and unit connections.

Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code: Green for Cooling, Yellow/Green for Heating/Cooling and Heating; Brown for Energy Reclamation; Blue for other equipment types. Conform to ANSI A13.1 for Hazardous Equipment.

Provide stenciled signs for equipment identification at Contractor's option or where distance of required identification requires lettering larger than 1 inch height. Stencil paint shall be exterior type, oil-based, alkyl enamel, minimum 1-1/4 inch height or greater as required for long distance identification, white or black color for best contrast.

Provide duct markers or provide stenciled signs and arrows indicating ductwork service and flow direction in black or white lettering for test contrast with duct field markers. Provide pipe markers maximum 50 feet apart along each duct shaft and within 5 feet of all control and balancing dampers or branch ducts more than 25 feet length and within 5 feet on each side of wall, floor, and ceiling penetrations. Provide additional markers in congested areas or at multiple duct runs as required for clarity.

3. DUCT INSULATION, DUCTWORK, ACCESSORIES, FLUES AND FANS

A. DUCT INSULATION

Provide fiberglass duct liner with fibers firmly bonded together with a thermosetting resin. Linear surface shall serve as a barrier against infiltration of dust and dirt, shall meet ASTM C1338 for fungi resistance, and shall be cleanable using duct cleaning methods and equipment outlined by North American Insulation Manufacturers Association (NAIMA) duct cleaning guide. Install with linear adhesive in accordance with manufacturer's instructions and recommendations. Ductwork sizes shown on drawings are inside clear dimensions. Increase sheet metal by liner thickness in both directions where liner is installed.

Provide rectangular liner conforming to ASTM C1071, Type I or II that is 1-1/2 inch thick, 1-1/2 pound density, minimum R-6.0 Certaintec Corp. "Toughguard" or equivalent, Johns Manville, Owens-Corning, or Knaf.

Provide round liner that is 1-1/2 inch thick, 4 pound density, minimum R-6.0 Johns Manville "Spiracoustic Plus" or equivalent, Certaintec or Owens-Corning.

Provide liner on the following interior air ducts and where specified on the drawings:

- Exposed round and rectangular supply ductwork.
- Exposed round and rectangular return ductwork.

All exposure of lined and wrapped ductwork, overlap lined ductwork at least 2 feet beyond wrapped insulation.

Cover concealed, rigid ductwork with ASTM C553, Type II flexible fiberglass insulation. Installed insulation shall be 2 inch thick, 3/4 pound density, minimum R-6.0 duct wrap, Certaintec or equivalent Johns Manville, Owens-Corning, or Knaf with heavy-duty foil-scrim-kraft facing, and with joints taped with 3 inch wide foil tape as follows:

- Round and rectangular supply and return air ductwork.
- Unlined Round and rectangular outdoor air ductwork.
- Round and rectangular exhaust and relief air ductwork within 10 feet of exterior discharge.

Cover Outdoor air, Exhaust air and Relief air plenums connected to exterior louvers with 1-1/2 inch thick, 1.5 pound density, rigid fiberglass insulation conforming to ASTM C612, Class 2.

Insulating materials, adhesives, coatings, etc., shall not exceed flame spread rating of 25 and smoke developed rating of 50 per ASTM E84. Containers for mastics and adhesives shall have UL Label.

For supply and return ductwork located exterior to the building, insulation shall be minimum R-8.0. Provide Insulation and jacket in accordance with one of the following three options:

- Exterior insulation and jacket consisting of 2 inch thickness of Armaulfil flexible elastomeric insulation or equivalent meeting ASTM C534 with integral 1/2 mils thick UV resistant cladding laminated at factory. Cover all seams with Armaulfil seal tape.
- Exterior insulation consisting of 2 inch thickness of flexible elastomeric insulation meeting ASTM C534 or 3 inch density rigid fiberglass meeting ASTM C612, and jacket consisting of 20 gauge corrugated aluminum jacket with aluminum fitting covers and minimum three aluminum attachment bands per section.
- Exterior insulation consisting of 2 inch thickness of flexible elastomeric insulation meeting ASTM C534 or 3 inch density rigid fiberglass meeting ASTM C612, and jacket consisting of 15.5 mils thick Ventulocor Plus UV resistant cladding.

Install exterior ductwork with sufficient slope to ensure that water cannot pond anywhere on the duct. Drainage must be achieved by sloping ductwork - not by increasing the insulation thickness. Locate longitudinal seams of outer shell (aluminum, flexible elastomeric, or cladding as applicable) at bottom of duct. Install cladding in strict conformance with cladding manufacturer's instructions.

B. DUCTWORK

Provide galvanized steel ductwork and housings as shown on drawings. Construct ductwork including fittings and transitions in conformance with current SMACNA standards relative to gauge, bracing, joints, etc. Minimum thickness of duct shall be 26-gauge sheet metal. Reinforce housings and ductwork over 30 inches with 1-1/4 inch angles not less than 5'-6" on centers, and closed if required for sufficient rigidity to prevent vibration. Support horizontal runs of duct from strap iron hangers on centers not to exceed 8'-0". Do not support ceiling grid, conduits, pipes, equipment, etc. from ductwork. Coordinate routing of duct with other contractors such that piping, electrical conduit, and associated supports are not routed through the ductwork.

Provide pre-engineered roof duct supports supports by Cooper B-Line, Elite Components, ERICO, FNV, Miro, PHD Manufacturing, PHP Systems, Roof Top Box, Unistrut (Alkore), Zai Foster, or approved equal. Support ductwork on the roof with pre-engineered roof duct supports that rest on top of the roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with embedded support fixtures as required to support the duct. Provide steel pedestal type supports with minimum 18x18 inch thermoplastic or rubber base or 4 inch wide closed-cell polyethylene block with length as required. Maintain minimum 6 inches clearance under duct to finished roof surface.

Coordinate with the pre-engineered roof duct support manufacturer to anchor the duct supports directly to the roof structure in accordance with the manufacturer's installation instructions or provide intermediate duct supports engineered to meet the wind resistance and seismic design criteria. Refer to Section, "PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS". Construct non-VAV supply ducts to meet SMACNA positive pressure of 2 inches w.g. Construct Return, Outdoor and Exhaust ductwork systems of fans to meet SMACNA negative pressure of 1 inch w.g. Construct exhaust ductwork downstream of fans to meet SMACNA positive pressure of 1 inch w.g.

Provide mill phosphatized or galvanized finish for exposed ductwork to be field painted. Shop treated steel metal shall have galvanized metal primer applied in the shop after fabrication and prior to shipping.

Seal ductwork with heavy liquid sealant, Hardcast Irongrip 801, Design Polymer DP 1010, United McGill duct sealer or approved equal, applied according to sealant manufacturer's instructions. Seal all longitudinal and transverse ductwork joints airtight to meet SMACNA Seal Class A. Tapes and mastics shall be listed and labeled in accordance with UL 181A.

Provide radius elbows, turns, and offsets with a minimum centerline radius of 1-1/2 times the duct width. Where space does not permit full radius elbows, provide short radius elbows with a minimum of two continuous spitzer vanes. Vanes shall be the entire length of the bend. Provide mitered elbows where space does not permit radius elbows, where shown on the drawings, or at the option of the contractor with the engineer's approval. Mitered elbows less than 45 degrees shall not require turning vanes. Mitered elbows 45 degrees and greater shall have single thickness turning vanes of same gauge as ductwork, rigidly fastened with guide strips in place. Vanes for mitered elbows shall be provided at all supply and exhaust ductwork and in return and outside air ductwork that has an air velocity exceeding 1000 fpm. Do not install vanes in grease ductwork. The use of square throat, radius heel elbows is prohibited. Remove and replace all installed elbows of this type with an approved elbow or no additional cost to the owner.

Connect ducts to vibrating equipment and when transitioning between two different material duct materials (e.g., aluminum to galvanized steel) by means of flexible connectors. Flexible connectors shall be neoprene coated glass cloth canvas connections. Duro-Dyne, Elgen, Vexor or equal. Flexible connectors shall have a flame spread of 25 or less and smoke developed rating of 50.

Provide balancing dampers, manufactured by Cosco, Greenheck, Louvers & Dampers, Nalor Industries, Potoff, Ruskin, Tamco, or approved equal, where shown on drawings and wherever necessary for complete control of air flow. Splitter dampers shall be controllable in both directions. Provide Yoking and Ventlok or similar dampers and bearings for the damper rod. Rectangular volume dampers shall be opposed blade interlocking type. Round volume dampers shall be single blade interlocking type consisting of circular blade mounted to a shaft. Provide Flexmaster model STO or equal 45 degree rectangular/round side takeoff fitting with model B03 damper with locking quadrant and installation kit out for round ductwork branch takeoffs to individual air devices. Omit damper at takeoff fitting when damper is located downstream of takeoff.

Where access to dampers through a hard ceiling is required, provide a concealed, remote cable controlled, butterfly-type volume damper assembly with external worm gear operator. Damper assembly shall include casing with rolled bead stiffeners, reinforced blade, self-lubricating bearing, and remote operator mounting plate. External operator shall attach to damper as a single piece with no linkage adjustment required. Damper shall be adjustable through the diffuser frame with standard 1/4 inch nutdriver or flat screwdriver. Provide positive, direct, two-way damper control with no sleeves, springs or screw adjustments to come loose after installation. Provide cable length to span the distance from the damper to the remote operator location. Install damper in branch duct. Do not install in diffuser neck. Install diffuser frame with standard 1/4 inch nutdriver or flat screwdriver. 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Arrange piping to allow normal inspection and servicing of compressor and other equipment. Locate groups of pipes parallel to each other. Install valves and specialties in accessible locations to allow for servicing and inspection. Install piping with sufficient space above removable ceiling panels to allow for panel removal.

Install piping with adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floor and ceilings, sized to fit thickness of insulation.

Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury. Slope refrigerant piping as recommended by the manufacturer's installation instructions. Install piping as high as necessary to allow for the required slope and in coordination with other components.

Use fittings for all changes in direction and all branch connections for hard-drawn tubing.

For bendable copper tubing system, bend tubing in accordance with manufacturer's instructions using tools that are acceptable to the manufacturer.

Install piping free of sags and bends. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated. Install vertical piping tight to columns or walls. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, unless indicated to be exposed to view.

Install and support piping to keep noise and vibration to a minimum. Support and secure piping to unistrut type supports so that no vibration passes to the building structure. Pipe attachments shall be copper-plated or have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing. Install a support within one foot of each change of direction. Mount pipe hangers around the outside of the insulation with saddles to prevent hangers from rupturing the insulation. Replace insulation that is cut or broken by the hangers.

Insulate refrigerant lines with flexible elastomeric insulation, Armeflex or equal. Insulate suction and liquid lines between the expansion valve, evaporator, and compressor with 1/2 inch thick insulation on pipes less than 1 inch in size and 1 inch thick for pipes 1 inch and larger. Insulate hot gas and liquid lines between the compressor condenser, and expansion valve with 1 inch thick insulation on pipes less than 1-1/2 inch and 1-1/2 inch thick for pipes 1-1/2 inch and larger. Piping insulation shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Coat insulation that is exposed to the elements with a protective sealer. Do not install insulation until system testing has been completed and all leaks have been eliminated.

Piping Joints: Provide brazed joints at all piping joints. Mechanical flare fittings are not permitted except at the indoor unit connection. Continuously purge the

Piping Joints: Provide brazed joints at all piping joints. Mechanical flare fittings are not permitted except at the indoor unit connection. Continuously purge the pipe until fittings during brazing with an inert gas per manufacturer's recommendation (e.g., dry nitrogen) to prevent formation of scale. Maintain purge until the joint is cool to the touch. Provide temporary cap or cover on completed joints with open ends to prevent entry of contaminating materials.

Press-Fit and Mechanically Attached Fittings: Install fittings in accordance with manufacturer's written instructions. Installers of these fittings shall be trained using manufacturer's training tools prior to installing any fittings. Provide sufficient length of copper piping at connections to equipment to facilitate the installation of these fittings using the manufacturer's recommendations. Prepare the copper tube in accordance with manufacturer's instructions. Install fittings to minimum depth required by the fitting manufacturer. Crimp or mechanically attach the fittings only using the crimping or press clamp tools allowed by the manufacturer using the jaw size appropriate for the tube diameter. Verify the fittings are properly installed using crimp gauges or manufacturer's approved verification methods.

Install suction line filter assembly upstream of the condensing unit.

J. FIELD QUALITY CONTROL

Leak test all refrigerant containing components of each system after installation. Pressurize with manufacturer recommended gas to manufacturer recommended pressure and hold for 24 hours minimum. Submit test report with date/time stamped photos of the pressure gauges at both the beginning and ending of a successful pressure test or documented observation by a third party. Repair leaking joints using new materials, and retest for leaks.

Triple evacuate all refrigerant containing components of each system after installation according to the manufacturer's recommended procedures. Submit test report.

K. CHARGING, CLEANING, AND STARTUP

Clean and inspect refrigerant piping systems prior to charging. Charge system using the following procedure:

1. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
2. During evacuation, apply heat to pockets, elbows, and low spots in piping.
3. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
4. Break vacuum with refrigerant gas, allow system to stabilize at all normal operating pressures.
5. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

After charging, close the bypass isolation valve and open isolation valves around the bypass suction filter. Place all units in cooling mode. Use the manufacturer's maintenance tools and modes to partition the indoor unit connected capacity into thirds. For each partitioned zone, flow refrigerant through the bypass suction filter for 20 minutes in accordance to the manufacturer's instructions. Repeat for each partitioned zone. Provide additional refrigerant for replacement of any refrigerant lost during leak testing, repair, or charging.

Provide VRF factory trained representative for charging and system startup. Train Owner's maintenance personnel on procedures and schedules related to system startup, shutdown, troubleshooting, servicing, and preventive maintenance.

6. HVAC EQUIPMENT

A. ROOFTOP UNITS (HEAT PUMP) 3-20 TONS

Install package rooftop heat pump units as scheduled on the drawings furnished by owner, manufactured by Captive Aire with features as noted in the RTU schedule and in the RTU Control Matrix, and complete with factory installed direct-drive hermetic compressors and fan motor thermal overload protection, crankcase heater, and low pressure switches; direct expansion evaporating and condensing coils with 1 inch factory installed flexible elastomeric insulation around the suction and liquid lines not directly located above a condensate drain pan and protective UV coating on any insulation exposed to sunlight, minimum 1/2 inch (1/2" or more) HSPF or COP rating (heating) as required by the applicable energy code or greater if scheduled on the drawings; centrifugal evaporator blower; air filter rack; propeller type condenser fan; electric supplemental heat modules constructed of heavy-duty nickel chromium elements (UL listed) with code required integral safety features and controls including automatic reset high limit; complete factory installed micro-processor controls including anti-short cycle timers, time delay relays and minimum "on" time controls; built-in thermal overload protection on motors and compressors; reversing valve, suction line accumulator, flow control check valve, and solid state defrost control utilizing thermostats; outdoor air damper; relief, weathertight housing constructed of galvanized steel with weather-resistant baked enamel finish; pre-engineered roof curb with minimum height as scheduled on the drawings if unit is equipped with internal vibration isolators; Type CMB if unit is not equipped with internal vibration isolators; single point electrical power connection. Provide guards or louvered panels to protect the condenser coils from hail or other damage. Provide 120 VAC, 20 amp duplex convenience receptacle mounted on unit ready for field wiring with a cover UL listed for wet and damp locations when in use. Provide electronic programmable type thermostat. Provide unit complete with manufacturer's one year guarantee on components plus an additional four year guarantee on the compressors. For units equipped with an economizer, unit shall have an adjustable integral discharge nozzle. Units shall have statically and dynamically balanced fans with direct drive fan drives. Motors shall be single speed/inverter controlled, continuous duty, with permanently sealed pre-lubricated ball bearings, and internal disconnect.

Furnish unit with washable panel filters with welded galvanized steel mounting frames, gasketed, with fasteners for bolting together built-up filter banks. Furnish unit with built-in line voltage thermostat wired to air curtain junction box. Furnish with plunger-type automatic differential start/stop pushbutton switch, factory-installed time-delay relay, and mounting brackets and accessories. Furnish unit with motor control panel complete with motor starter, 115V transformer with primary and secondary fuses, terminal strip, and NEMA 250 enclosure.

7. PIPING AND PIPING SPECIALTIES

A. REFRIGERANT PIPING AND INSULATION

Copper Tubing: ASTM B280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

Refrigerant Line Kits: Soft-annealed copper tubing with pipe diameters as recommended by the manufacturer and of length as required for the installation. Tubing shall be factory finished with flexible unicellular insulation with thickness as specified below.

Fittings: wrought-copper fittings; ANSI B16.22, streamlined pattern.

Solder filler metals: ASTM B32, 95-S Tin-Antimony.

Brazing filler metals:

1. AWS A5.8, Classification BAg-5: Silver (Ag) 44.0-46.0 percent, Zinc (Z) 23.0-27.0 percent, and Copper (Cu) 29.0-31.0 percent.
2. AWS A5.8, Classification BCU-P-5; Phosphorus (P) 4.8-5.2 percent, Silver (Ag) 14.5-15.5 percent, and Copper (Cu) remainder.

Braze mechanical joints. Solder joints connecting to refrigerant valves and specialties. Continuously purge the pipe and fittings during brazing with an inert gas per manufacturer's recommendation (e.g., dry nitrogen) to prevent formation of scale. Maintain purge until the joint is cool to the touch. Provide temporary cap or cover on completed joints with open ends to prevent entry of contaminating materials.

Insulate refrigerant lines with flexible elastomeric insulation, Armeflex or equal. Insulate suction and liquid lines between the expansion valve, evaporator, and compressor with 1/2 inch thick insulation on pipes less than 1 inch in size and 1 inch thick for pipes 1 inch and larger. Insulate hot gas and liquid lines between the compressor condenser, and expansion valve with 1 inch thick insulation on pipes less than 1-1/2 inch and 1-1/2 inch thick for pipes 1-1/2 inch and larger. Piping insulation shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Coat insulation that is exposed to the elements with a protective sealer. Install and support piping to keep noise and vibration to a minimum. Support and secure piping to unistrut type supports so that no vibration passes to the building structure. Pipe attachments shall be copper-plated or have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing. Install a support within one foot of each change of direction. Mount pipe hangers around the outside of the insulation with saddles to prevent hangers from rupturing the insulation. Replace insulation that is cut or broken by the hangers.

Run refrigerant lines parallel and perpendicular to wall and floor lines and to appear straight and in good order. Pitch suction lines down slightly (1 inch in 20 feet) towards the compressor. Provide oil traps at the base of vertical suction risers over 6 feet high. Install liquid line sight glasses in liquid lines nearest the expansion valve. Factory mount expansion valves with the sensing bulbs shipped loose. Field mount expansion valve bulb after refrigerant piping is complete (damage may occur if bulbs come in contact with heat).

For systems of 5 ton capacity and smaller, the contractor shall have the option to provide copper refrigerant tubing line set sized as recommended by equipment manufacturer and of length as required for the installation. Provide quick-connect flare tubing compression fittings, solder connections, or brazed connections as recommended by the manufacturer to match the connections of the condensing unit and evaporator coil.

B. SYSTEM EVACUATION AND CHARGING

Blow out refrigeration lines with dry nitrogen at a suitable pressure before making final connection at the condensing unit or coil to ensure against dirt, scale, or other foreign material being in the lines. Draw a vacuum to 29 inches of mercury. Break this vacuum by charging dry refrigerant gas into the system, raising the pressure to 0 PSIG. Repeat the latter two steps for a triple evacuation before the final evacuation is started. Make final evacuation by reducing the system absolute pressure to a maximum of 0.5 millimeters (500 microns) and allowing the pump to run at this pressure for a minimum of two hours.

Repeat the proper amount of refrigerant charge per the manufacturer's recommendations. Record the amount of refrigerant by weight charged into the system for each circuit recorded to the nearest 1/4 pound on tags and attach tags to the liquid line near the condensing unit. Refrigerant shall be supplied by the HVAC Contractor.

8. TEMPERATURE CONTROLS

A. GENERAL REQUIREMENTS

Provide a complete system of temperature controls including controllers, control panels, thermostats, sensors, time switches, override timers, actuators, relays, and wiring required to provide the desired control systems specified on the drawings.

Submit shop drawings of equipment provided for temperature control. Submit operation and maintenance data, including trouble-shooting maintenance guide, step-by-step procedures indexed for each controller and thermostat function, inspection period, cleaning methods and materials, and calibration tolerances.

Provide integrated wiring diagrams showing interconnections between field installed equipment and package wiring furnished with the HVAC equipment. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller.

Provide supervision and on-job checkout service as required to ensure that installation and operation of the temperature control system meets requirements of the drawings, specifications, and sequences of operation. The system shall be guaranteed for a period of one year following the acceptance of the system by the Architect/Engineer. Correct defects occurring during this period at no additional cost to the Owner.

Install control devices with top of device at 48 inches AFF to meet ADA requirements unless otherwise noted on the plans.

B. WIRING

Provide electrical and control wiring as specified under the section "Electrical Wiring."

C. THERMOSTAT CONTROL EQUIPMENT

Provide thermostat control equipment with sufficient communication, programming, input and output connections, and modulating or staging capability to meet the sequence of operations. Provide thermostats with the features as indicated:

1. LCD or LED display screen.
2. Button or touchscreen interface.
3. Display temperature setpoint.
4. Display temperature setpoint.
5. Adjust temperature setpoint.
6. Limit temperature setpoint adjustment within plus or minus 3 degrees F.
7. Display relative humidity.
8. Adjust relative humidity.
9. Display operating mode.
10. Adjust operating mode.
11. Adjust schedule, minimum seven day occupied/unoccupied.
12. Security lockout.
13. At contractor's option where multiple sensors are shown, the sensors may be provided with the thermostat in a single device.

Seven day programmable, occupied/unoccupied thermostats for on/off or multiple stages of heating and cooling systems shall be used. Override thermostat with multi-stage capability as required to match scheduled unit cooling/heating stages.

Remote sensors integrated with the seven day programmable thermostat shall be Honeywell TR21/TR21-H remote sensor or equal.

D. SENSORS AND RELAYS

Provide general-purpose type elements for use in input and output sensors. Provide transmitters or transducers with sensor as required, compatible with the controllers used, with range suitable for the systems encountered. Transmitters and transducers shall have offset and span adjustments, temperature compensation, shock and vibration immunity, and zeroing capability. Accuracy requirements shall include the combined effects of linearity, hysteresis, repeatability, and the transmitter.

Provide sensors that meet the following minimum performance:

1. Dry-bulb temperature sensors at a minimum shall be accurate to +/- 2 degrees Fahrenheit over the range of 40 to 80 degrees Fahrenheit.
2. Wet-bulb temperature shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 2 degrees Fahrenheit.
3. Enthalpy shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 3 BTU/lb over the range of 20 to 36 BTU/lb.
4. Humidity sensors at a minimum shall be accurate within +/- 3 percent full range between 20 and 95 percent, with drift less than 1 percent full scale per year.
5. Pressure transmitters at a minimum shall be accurate to +/- 1 percent full scale with drift less than 1 percent full scale per year.

Provide remote sensors where indicated on the drawings and integrate them with the thermostat control equipment. Remote sensors shall have the following features:

1. Wired connection.
2. Temperature sensor.
3. Humidity sensor.
4. Blank faceplate.
5. Where multiple remote sensors are shown for a single unit, the sensors shall be provided in a single device.

Dry-bulb temperature sensors at a minimum shall be accurate to +/- 2 degrees Fahrenheit over the range of 40 to 80 degrees Fahrenheit. Wet-bulb temperature shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 2 degrees Fahrenheit. Enthalpy shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 3 BTU/lb over the range of 20 to 36 BTU/lb. Humidity sensors at a minimum shall be accurate within +/- 3 percent full range between 20 and 95 percent, with drift less than 1 percent full scale per year. Pressure transmitters at a minimum shall be accurate to +/- 1 percent full scale with drift less than 1 percent full scale per year.

Smoke detectors furnished and installed as indicated in this section or as scheduled on the plans (or heat detectors, if permitted by code) shall shut down each associated unit supply fan upon activation where required by code. Provide remote visual and audible alarm device in an approved location if smoke detectors are not connected to a fire alarm panel and label device as "Air Duct Detector Trouble".

Provide 24 Volt or 120 Volt timeswitches Intermatic Series FMD20 or equal programmable type with 7-day programming with up to two "on" and "off" per day. Battery backup shall provide 48 hours of memory retention. Override timer switches shall be spring wound, 6-hour, normally open type. Coordinate 120 V wiring of timeswitch with electrical contractor if 120 V model is provided.

Provide relays with contact rating, configuration, and coil voltage that is suitable for the application. Relay shall be general purpose, enclosed plug-in type and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required. Transient suppression shall be provided as an integral part of the relay. Contactors shall be single coil, electrically operated, mechanically held, double-break, silver-to-silver type protected by arcing contacts. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Operating and release times shall be 100 milliseconds or less.

9. ALTERNATES

A. DESCRIPTION

Refer to the architectural portion of the specification for list of alternates. Applicable sections of the base specifications shall apply to all work required by the alternate unless otherwise specified. Determine whether or not each alternate affects work. Include labor, materials, equipment, and transportation services necessary for and incidental to the completion of work under each particular alternate. Furnish separate bid for each alternate applicable to work, stating the amount to be added or deducted from the base bid.

10. COMMISSIONING OF MECHANICAL SYSTEMS

Commissioning of HVAC System

A. PART 1 GENERAL

1.1 SUMMARY

a. Section includes Cx process requirements for the following HVAC systems, assemblies, and equipment:

1. Air handling units (Supply fans, return fan, packaged units, roof top units, specialized fans)
2. Exhaust fans
3. Fan coil units and terminal units
4. Condensing units
5. Make-Up air units
6. Ductwork and piping

b. Related Requirements:

1. Section 019113 "General Commissioning Requirements" for general Cx process requirement and CxA responsibilities.

1.2 INFORMATIONAL SUBMITTALS

a. Construction Checklists: Draft construction checklists will be created by CxA for Contractor review.

b. Construction Checklists: Installation and Performance test checklists for systems, assemblies, subsystems, equipment, and components to be part of the Cx process and according to requirement in Section 019113 "General Commissioning Requirement."

1. Refrigerant piping, including the following:

- a. Refrigerant piping, fittings, and specialties.
- b. Refrigerant charge.
- c. General duty and specialty valves.
- d. Meters and gages.

2. Air distribution systems, including the following:

- a. Supply, return, and exhaust systems.
- b. Metal ducts, liners, and fittings.
- c. Nonmetal ducts and fittings.
- d. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.
- e. Duct-mounted access doors and panels.

3. Kitchen exhaust system, including the following:

- a. Exhaust and makeup air system.
- b. Metal ducts, liners, and fittings.
- c. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.
- d. Duct-mounted access doors and panels.

4. Make-Up air unit

4. Air-handling equipment, including the following:

- a. Fans and motors.
- b. Indoor air-handling units with and without coils, dampers, and filters.
- c. Outdoor air-handling units with and without coils, dampers, and filters.

B. PART 3 EXECUTION

3.1 CONSTRUCTION CHECKLISTS

a. Complete detailed construction checklists (prefunctional checklists) prepared by the CxA for HVAC systems, assemblies, subsystems, equipment, and components.

1. Air and hydronic distribution systems, including the following:
 - a. Supply, return, outdoor-air, and exhaust-air distribution systems.
 - b. Automatic dampers.
 - c. Control valves.
2. Heating and cooling terminal and unitary equipment, including the following:
 - a. Unit heaters.
 - b. Fan coil units.
 - c. Electric heating.
3. TAB verification.

3.2 CONSTRUCTION CHECKLIST REVIEW

a. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide item to Contractor.

b. Return draft construction checklist review comments within 5 days of receipt.

c. When review comments have been resolved, the CxA will provide final construction checklists marked "Approved for Use, (date)."

d. Use only construction checklists marked "Approved for Use, (date)."

3.3 Cx TESTING PREPARATION

a. Certify that HVAC systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved submittals.

b. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, and alarm conditions).

3.4 Cx TESTS COMMON TO HVAC SYSTEMS

a. Comply with construction checklist requirements, including installation checks, startup, and performance tests requirements for HVAC systems and equipment.

b. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment and components, including operational and control functions, to verify compliance with acceptance criteria.

c. Coordinate schedule with, and perform Cx activities at the direction of CxA.

d. Provide technicians, instrumentation, tools, and equipment to perform and document the following:

1. Construction checklist verification tests.
2. Construction checklist verification tests demonstrations
3. Cx test demonstrations.

3.5 START-UP DOCUMENTATION COMMON TO ALL SYSTEMS

a. The following Start-Up Documentation (Checklists and Tests) shall be considered common to all systems:

1. Checklist shall proceed from lower level devices to larger components to the entire system operation.
2. Verify labeling is affixed per specification and visible.
3. Verify prerequisite procedures are done.
4. Inspect for damage and ensure none is present.
5. Verify system is installed per the manufacturer's recommendations.
6. Verify system has undergone Start-Up per the manufacturer's recommendations.
7. Verify that access is provided for inspection, operation and repair.
8. Verify that access is provided for eventual replacement of the equipment.
9. Verify that record drawings, submittal data and O&M documentation accurately reflect the installed systems.
10. Verify all gauges and test ports are provided as required by contract documents and manufacturer's recommendations.
11. Verify all recorded nameplate data is accurate.
12. Verify that the installation ensures safe operation and maintenance.
13. Verify all rotating and moving parts are properly lubricated.
14. Verify all specified replacement material/stock has been provided as required by the Contract Documents.
15. Verify all monitoring and ensure all alarms are active and set per requirements.

3.6 MECHANICAL IDENTIFICATION

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: Perform the following checks:

1. Verify all valve labels and identification labeling corresponds with drawings and indexes and meets requirements specified. Correct any deficiencies for all piping and duct system.
2. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
3. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.7 MECHANICAL INSULATION

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: Examine all piping, systems and equipment specified to be insulated.

1. Ensure quality of insulation. Patch and repair all insulation damaged after installation.
2. Ensure the integrity of vapor barrier around all cold surfaces.

3.8 PIPING GENERAL

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: These procedures apply to all installed piping systems, including underground site utilities.

1. Inspect all piping for proper installation, adequate support (with appropriate vibration isolation where applicable) and adequate isolation valves for required service.
2. Provide notifications of pipe cleaning and flushing activities.
3. Flush and clean all piping and clean all strainers. Provide documentation of all related procedures.
4. Ensure adequate drainage is provided at low points and venting is provided at high points.
5. Ensure facilities to effectively drain and fill the system are in place.
6. Ensure air is thoroughly removed from the system as applicable.
7. Provide notification of pressure testing.
8. Pressure and/or leak test all applicable systems in accordance with the requirements in the applicable Division 23 specification.
9. Size/size applicable piping systems as specified in the individual sections and as required by regulatory authorities.
10. Submit pressure test reports that document the pressure testing results with certification of the results. Include drawings/diagrams indicating the locations of piping systems that are tested with the corresponding report.
11. Set and adjust fill, pressure, or level controls to the required setting.

3.9 AC MOTORS

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: Perform the following checks during start-up and as specified in manufacturer's instructions.

- a. Verify proper alignment, installation, and rotation.
- b. Verify properly sized overloads are in place.

c. Start-Up Tests: Perform the following tests, measurements, or procedures during start-up and as specified in the manufacturer's instruction:

1. Measure voltage available to all phases. Measure amps and RPM after motor has been placed in operation and is under load.
2. Record all motor nameplate data.

3.10 PACKAGED HEATING AND COOLING UNITS

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Refer to AC Motors in this section.

c. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide startup service, and to demonstrate and train Owner's maintenance personnel is required by the Owner.

b. Start-Up Checks: Perform the following inspections/checks during start-up:

1. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
2. Install new filters after start-up.

3.11 TERMINAL UNITS

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: Perform the following inspections/checks during start-up:

1. After construction is completed, including painting if applicable, clean unit exposed surfaces.
2. Clean factory-finished surfaces. Repair any marred or scratches surfaces with manufacturer's touch-up paint.
3. Verify adequate access for maintenance.
4. Check power and control voltage.
5. Check rotation of fan where applicable.
6. Check operation of water leak sensors.
7. Check calibration and operation of the controlling elements.
8. Check control valves for required close-off and fail position.
9. Install new filter units for terminals requiring same.

3.12 FANS

a. Include all applicable "Start-Up Checks Common to All Systems".

b. General: Provide the services of a factory-authorized service representative to test and inspect exhaust fan installation, provide startup service, and to demonstrate and train Owner's maintenance personnel is required by the Owner.

c. Start-Up Checks: Perform the following inspections/checks during start-up:

1. Inspect the field assembly of components and installation of the units, piping, ductwork, and electrical connections.
2. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, coils entering air face. Ensure volatile irritants are contained and kept out of occupied spaces.
3. Adjust and lubricate dampers and linkages for proper damper operation.
4. Verify the unit is secure on mountings and supporting devices and connections for ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
5. Ensure vibration isolation integrity is maintained with the fan installation and associated connectors.
6. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
7. Stroke all dampers to ensure free and full travel.

3.13 DUCTWORK ACCESSORIES

a. Include all applicable "Start-Up Checks Common to All Systems".

b. Start-Up Checks: Perform the following checks during start-up and as specified:

1. Cleaning: Clean factory-finished surfaces. Repair any marred or scratches surfaces with manufacturer's touch-up paint.

c. Start-Up Tests: In addition to specifications, perform the following as a minimum:

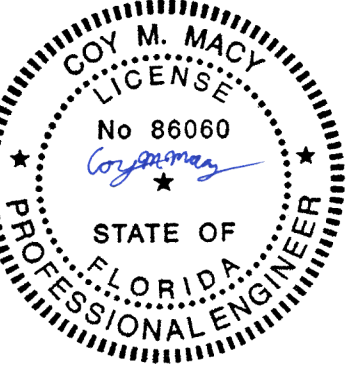
1. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.
2. Label access doors in accordance with Division 21 Section "Mechanical Identification"
3. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in-fire dampers and adjust for proper action.

END OF SECTION 23

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY COY M. MACY ON THE DATE LISTED BELOW USING A DIGITAL SIGNATURE. PREPARED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.



Seal



7/25/2025

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Project



SHAKE SHACK #1612
(MERCATO) NAPLES, FL

Project Number 245000280
Drawn By DJ
Checked By CM
Date 2/12/2025

Revisions

1	11/12/2024	ISSUED FOR PERMIT
2	2/12/2025	ISSUED FOR BID
2	7/25/2025	ISSUED FOR CONSTRUCTION

Drawing

MECHANICAL SPECIFICATIONS

M592

DOAS UNIT CONTROL MATRIX			
CONTROL FEATURE	UNITS	DOAS-1 SETPOINT OR Y/N	NOTES
CONTROL STRATEGY			
DOAS SUPPLY AIR TEMPERATURE CONTROL			Y
HEATING AND COOLING SET POINTS			
COOLING MODE ENABLE - OUTSIDE AIR TEMPERATURE	'F DB	75 x X	
COOLING - SUPPLY AIR TEMPERATURE SETPOINT	'F DB	75	
HEATING MODE ENABLE - OUTSIDE AIR TEMPERATURE	'F DB	X < 70	
HEATING - SUPPLY AIR TEMPERATURE SETPOINT	'F DB	70	
DEHUMIDIFICATION MODE ENABLE - OUTSIDE AIR DEW POINT	'F DP	55 F	F
DEHUMIDIFICATION - REHEAT CONTROL - SUPPLY AIR TEMPERATURE SETPOINT	'F DB	75 F	F
PROGRAMMED CONTROL FEATURES			
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT		Y	B
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - SCHEDULED AT DOAS INTERNAL UNIT CONTROLLER		Y	B
OPTIMUM START SEQUENCE		Y	
EQUIPMENT COMPONENTS, ACCESSORIES AND CONTROL FEATURES			
COOLING COIL (DX - MODULATING CAPACITY)		Y	K
DEHUMIDIFICATION - MODULATING HOT GAS REHEAT		Y	K
HEATING - NATURAL GAS - MODULATING		Y	K
OUTSIDE AIR DAMPER - MOTOR OPERATED		Y	J, T
OUTSIDE/SUPPLY AIR AIRFLOW MONITORING		Y	F
SUPPLY FAN CONTROL METHODS			
ON DURING OCCUPIED MODE		Y	
CONSTANT SPEED SUPPLY FAN OPERATION		YN	K
SAFETIES, INTERLOCKS, AND ALARMS			
GAS VALVE SAFETY		Y	F
LOW LIMIT FREEZE/STAT - FREEZE PROTECTION SAFETY SHUTDOWN		Y	F
DIFFERENTIAL PRESSURE SWITCH - FILTER CHANGE ALARM		Y	F
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK		Y	F
OUTSIDE AIR DAMPER END SWITCH - SAFETY SHUTDOWN		Y	S
KITCHEN EXHAUST SYSTEM INTERLOCK		Y	L

DIV. 23 CONTRACTOR SHALL PROVIDE CONTROL PANEL(S), WIRING, THERMOSTAT(S), TEMPERATURE SENSOR(S), HUMIDISTAT(S), AND/OR CO2 SENSOR(S) WHERE SHOWN ON THE DRAWINGS AND AS REQUIRED TO FACILITATE THE SCHEDULED CONTROL MODULES AND SEQUENCES OF OPERATION. EACH UNIT SHALL CONTROL BASED ON ITS OWN INTERNAL SAFETIES, TIME DELAYS, AND SEQUENCES UNLESS NOTED OTHERWISE. COORDINATE WITH OWNER FINAL BUILDING AND EQUIPMENT SCHEDULES DURING STARTUP. REFERENCE DIVISION SPECIFICATIONS FOR INDIVIDUAL DEVICE REQUIREMENTS.

- NOTES:
- DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.
 - DEVICE SHALL BE FACTORY MOUNTED AND PRE-WIRED FOR OPERATION SUBJECT TO THE ONBOARD CONTROLLER.
 - DAMPER SHALL BE CLOSED DURING UNOCCUPIED MODE.
 - UNITARY CONTROLLER SHALL MODULATE AND/OR CYCLE SUPPLY FAN SPEED AND COIL CAPACITY SUBJECT TO THE INTERNAL SAFETIES AND SEQUENCES TO MAINTAIN SCHEDULED SETPOINTS.
 - INTERLOCK RTU WITH KITCHEN EXHAUST HOOD SYSTEM(S) TO SHUT DOWN UPON SIGNAL FROM HOOD FIRE EXTINGUISHING SYSTEM. INTERLOCK RTU WITH KITCHEN EXHAUST FAN TO ENERGIZE WHEN HOOD SYSTEM IS ENERGIZED FOR PRESSURIZATION.
 - PROVIDE END SWITCH ON THE OUTSIDE AIR DAMPER AND INTERLOCK THE SWITCH WITH THE SUPPLY FAN TO KEEP IT FROM STARTING IF END SWITCH IS NOT MADE.
 - DURING UNOCCUPIED OPERATION, OUTSIDE AIR DAMPERS SHALL CLOSE AND RETURN AIR DAMPER SHALL MODULATE TO FULL OPEN.

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

MARK	MANUFACTURER	SERVICE	MODEL	CONSTRUCTION MATERIAL	FACE TYPE	MOUNTING LOCATION	FACE SIZE (IN)	MAX. NC	NOTES
CEG	E.H. PRICE	EXHAUST GRILLE W/ DAMPER	80D	STEEL	EGGCRATE	SURFACE	12x12	30	A B C F G H
CRG	E.H. PRICE	RETURN GRILLE	80	STEEL	EGGCRATE	LAY-IN	24x24	30	A B C F H
CS01	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	SURFACE	12x12	30	A B C F H J K L
CS02	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	LAY-IN	24x24	30	A B C F H K
CS03	E.H. PRICE	SUPPLY DIFFUSER	PDR	STEEL	PERFORATED	LAY-IN	24x24	30	A B C F H
WRG	E.H. PRICE	RETURN GRILLE W/DAMPER	530D	STEEL	LOUVERED FACE	WALL OR DUCT	(SEE PLANS)	30	A B C D F H
WSR	E.H. PRICE	SUPPLY REGISTER W/ DAMPER	520D	STEEL	LOUVERED FACE	WALL OR DUCT	(SEE PLANS)	30	A B C D E F G H

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

- NOTES:
- EQUIPMENT FURNISHED AND INSTALLED PER THE EQUIPMENT RESPONSIBILITY SCHEDULE.
 - NECK SIZE SHOWN ON DRAWINGS. PROVIDE BRANCH DUCT TO MATCH NECK SIZE UNLESS OTHERWISE SHOWN ON DRAWINGS.
 - DIFFUSERS SHALL BE PREFINISHED TO MATCH CEILING/WALL/EXPOSED DUCT COLOR (COORDINATE WITH ARCHITECT).
 - FRONT BLADES PARALLEL TO LONG DIMENSION.
 - DOUBLE DEFLECTION BARS SHALL BE ADJUSTABLE.
 - FRAME TYPE TO MATCH CEILING/WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING/WALL PLAN.
 - PROVIDE OPPOSED BLADE DAMPER ADJUSTABLE FROM FACE OF DUCT.
 - GRILLES WITH NO EXPOSED MOVING SCREENS.
 - CONTRACTOR SHALL PROVIDE REMOTE CABLE-OPERATED VOLUME DAMPER BY METROPOLITAN AIR TECHNOLOGIES MODEL RT-250 WITH EXTERNAL WORM GEAR OPERATOR OR EQUIVALENT YOUNG REGULATOR BUTTERFLY DAMPER WITH 270-275 CONTROLLER. OPERATOR SHALL HAVE A SQUARE DRIVE FOR 1/4" NUT DRIVER. DAMPER ASSEMBLY SHALL INCLUDE GALVANIZED STEEL DUCT WITH ROLLED BEAD STIFFENERS, REINFORCED. BLD. SELF LUBRICATING BEARING AND WORM GEAR MOUNTING PLATE. DAMPER SHALL BE INSTALLED IN BRANCH DUCT NOT INLET OF PLenum DIFFUSER. (REF. 2M601)
 - 4-WAY THROW PATTERN UNLESS OTHERWISE INDICATED BY FLOW ARROWS ON DRAWINGS.
 - PROVIDE RAPID MOUNT FRAME FOR INSTALLATION IN HARD CEILING.

PROJECT DESIGN CONDITIONS

CLIMATE CONDITIONS		WEATHER STATION:		NAPLES, FL, USA	
CLIMATE ZONE		2A			
HEATING (DB)	99.6%	44.5	'F		
COOLING (DB/MCWB)	0.4%	92	'F/	78.0	'F/

BUILDING OPERATING HOURS:	
MONDAY - FRIDAY	TBD BY OWNER
SATURDAY	TBD BY OWNER
SUNDAY	TBD BY OWNER
HOLIDAY	TBD BY OWNER

SPACE / UNIT DESCRIPTION	COOLING / DEHUMIDIFICATION				SET POINTS				HUMIDIFICATION				ZONE VENTILATION RESET				SPACE OPERATING HOURS OCCUPIED / UNOCCUPIED	NOTES
	UNOCC	MAX	MIN	RH %	OCC	UNOCC	MIN	MAX	CONTROL METHOD	BASE PPM	MAXIMUM PPM	M-F	SAT	SUN				
DINING AREAS	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C			
OFFICES	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C			
MECHANICAL ROOM	NA	NA	NA	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C			
KITCHEN/BOH	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C			

- NOTES:
- ZONE LEVEL SET POINT CONDITIONS SHALL BE AS SCHEDULED UNLESS OTHERWISE SCHEDULED OR NOTED ON THE DRAWINGS FOR ROOM SPECIFIC SPACE CONDITIONS.
 - ZONE LEVEL OCCUPANCY HOUR SCHEDULE SHALL BE PER BUILDING OPERATING HOURS UNLESS OTHERWISE SCHEDULED.
 - ZONE LEVEL CONTROLS SHALL BE CAPABLE OF OPERATING WITH INDEPENDENT OCCUPANCY SCHEDULES.

SEQUENCE OF OPERATIONS

- VARIABLE REFRIGERANT FLOW SYSTEM (VRF)**

The sequence of operations is organized into the following main categories: operating modes; control setpoint resets; safeties, overrides and interlocks; and component control loops. The operating modes describe the criteria that either enable or disable the various modes of operation. If a mode of operation is not listed within a component control loop section then that mode of operation has no direct influence on the operation of the component. The control setpoint reset section describes the logic and reference variables that will be used to reset control setpoints to a new value within its reset range. The safeties, overrides, and interlocks section outlines the hardware interlocks that are required to meet life safety requirements. Safeties and interlocks take precedence over all other control strategies outlined in this document. The control responses of each component for the various modes of operation are described in the component control loop sections. Setpoints shall be adjustable (adj.) as noted.

The sequence of operations, the points list and control diagrams shall be used to provide a detailed description of the control philosophy for the controlled equipment. Individual setpoint values, reset ranges, and alarm action levels are listed in the points list. Components and control sensor locations are graphically depicted on the control diagram. The contractor shall be responsible for coordinating any necessary time delay setpoints to establish stable system operation.

The VRF system described by this sequence of operations consists of condensing unit(s), branch selector boxes, fan coil unit(s), and a central controller that operate together to provide space conditioning as shown on the drawings. The VRF system shall be furnished with factory digital controls (DDC).

Ventilation air is provided via a dedicated outside air unit as shown on the drawings. The ventilation air is distributed directly to the space.

Heat Recovery System Control:
Each condensing unit shall be capable of serving multiple fan coil units. Each fan coil unit or bank of fan coil units associated with an individual branch selector box shall be capable of independent heating or cooling operation and independent temperature control.

Manufacturer Central Controller:
The VRF manufacturer shall furnish a central controller that shall provide centralized management of system scheduling, temperature setpoints, mode, alarms, fan speed, unoccupied space temperature limits, remote controller restrictions, and mode changeover.

Operating Modes
The unit shall go into cooling or heating modes based on setpoints in project design conditions. Unit shall be in occupied or unoccupied modes based on building schedule.
- KITCHEN EXHAUST FAN CONTROL**

Kitchen exhaust fan shall be energized through on-off switches at the associated exhaust hoods or cooking equipment or through a master kitchen ventilation control panel as indicated on the drawings.

Kitchen fans shall be interlocked to operate with cooking appliances, make-up air and other air-handling equipment providing fresh air to the kitchen area as noted or scheduled on the drawings and per operations requirements of the local mechanical code.
- DOAS UNIT CONTROL**

Refer to DOAS CONTROL MATRIX on Sheet M601 for required rooftop unit control options.
- RESTROOM EXHAUST FAN (EF-1) CONTROL**

Operate exhaust fans continuously during occupied hours and shut down during unoccupied hours. Provide a 7-day timeclock to switch each system between occupied and unoccupied operation.

DEDICATED OUTDOOR AIR SYSTEM - ROOFTOP UNIT (DX COOLING, NATURAL GAS HEATING)

MARK	MANUFACTURER	MODEL	NOMINAL TONS	UNIT TYPE	SUPPLY FAN				COOLING COIL				GAS FIRED HEAT EXCHANGER				ELECTRICAL	WEIGHT (LBS)	NOTES											
					FAN TYPE	CFM	ESP (IN)	NOM HP (Y/N)	VFD	REFR TYPE	TH (MBH)	SH (MBH)	EAT (°F DB)	LAT (°F WB)	MIN EFF (%)	MIN NO STAGES				MIN OUT (MBH)	NOM INPUT (MBH)	EAT (°F DB)	LAT (°F DB)	MIN NO STAGES	VIPH	MCA	MOCP	DISC TYPE		
DOAS-1	CAPTIVE AIRE	CAS-HVAC3-1150-18-1ST-DOAS	15	DOAS	DIRECT	2,000	1.0	3.0	Y	R-410A	173.8	82.4	82.0	78.0	55.0	53.3	5.7	3.0	55.1	66.0	81.0	44.5	70.0	2	4803	30.2	35	NF	2472	A-U

MODEL NUMBERS AND NOMINAL TONS LISTED SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER, MODEL NUMBERS, OR NOMINAL TONS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

- NOTES:
- REFER TO ROOFTOP UNIT CONTROL MATRIX FOR ADDITIONAL UNIT FEATURES, COMPONENTS, MODULES, ACCESSORIES, AND CONTROLS THAT SHALL BE PROVIDED WITH THE EQUIPMENT.
 - EQUIPMENT SIZED FOR 97°F AMBIENT TEMPERATURE.
 - PROVIDE 2" MERV 13, EFFICIENT PLEATED THROWAWAY AIR FILTERS.
 - PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
 - STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.
 - PROVIDE FACTORY MOUNTED VARIABLE FREQUENCY DRIVE TO FACILITATE MODULATING FAN SPEED CONTROL.
 - PROVIDE SINGLE POINT POWER CONNECTION.
 - COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
 - PROVIDE 1/8" VAC. 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMPER LOCATIONS WHEN IN USE.
 - SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
 - PROVIDE MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE REQUIRED BHP.
 - PROVIDE INSULATED ROOF CURB WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 8 INCHES ABOVE FINISHED ROOF SURFACE. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE.
 - COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDINATE CURB TYPE WITH DRAWINGS.
 - PROVIDE FLORIDA APPROVED NOA CURBS DESIGNED TO WITHSTAND HURRICANE WIND FORCES IN COMPLIANCE WITH MIAMI-DADE PRODUCT CONTROL SECTION.
 - SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT AND CURB.
 - COOLING COIL LAT IS LEAVING AIR TEMPERATURE OF COIL.
 - COOLING COIL SHALL BE CAPABLE OF MODULATING CAPACITY WITHOUT THE USE OF HOT GAS BYPASS. PROVIDE VARIABLE SPEED OR DIGITAL SCROLL LEAD COMPRESSOR FOR CAPACITY CONTROL.
 - PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED. MEET MINIMUM EFFICIENCY SCHEDULED.
 - PROVIDE GUARDS TO PROTECT CONDENSING COIL FROM HAIL OR ICE DAMAGE.
 - PROVIDE A FACTORY APPLIED COIL CORROSION COATING TO HOT GAS REHEAT, EVAPORATOR, AND CONDENSER COIL WHICH IS CAPABLE OF WITHSTANDING GREATER THAN 6,000 HOURS OF THE ASTM B117 SALT SPRAY TEST.
 - PROVIDE HOT GAS REHEAT COIL CAPABLE OF PROVIDING LEAVING AIR TEMPERATURE OF 75°F AT DESIGN AIRFLOW.
 - PROVIDE EQUIPMENT WITH MINIMUM SCRR RATING OF 10 KAIC. SCRR SHALL BE MARKED ON THE NAMEPLATE IN ACCORDANCE WITH NEC.

VARIABLE REFRIGERANT FLOW FAN COIL UNIT SCHEDULE

MARK	SERVICE	MANUFACTURER	MODEL	TYPE	MOUNTING	COOLING COIL				HEAT PUMP HEATING COIL				MIN OA (CFM)	ELECTRICAL	WEIGHT (LBS)	CONTROL METHOD	NOTES											
						DESIGN CFM	ESP (IN)	MOTOR OUTPUT (MBH)	TH (MBH)	SH (MBH)	EAT (°F DB)	LAT (°F WB)	REFR TYPE						MIN EFF (%)	MIN OUT (MBH)	NOM INPUT (MBH)	EAT (°F DB)	LAT (°F DB)	MIN NO STAGES	VIPH	MCA	MOCP	DISC TYPE	
FCU 1-2	DINING	CARRIER	MMD-UP054	FCU	SUSPENDED	1,300	0.8	350	47.9	31.9	75.0	63.9	52.7	51.3	R410A	10.7	21.8	21.1	70.0	85.0	3.3	0	208/1	4.33	15	NF	93	2	ALL
FCU 3-4	KITCHEN	CARRIER	MMD-UP048	FCU	SUSPENDED	1,300	0.8	350	36.7	32.1	75.0	61.1	52.4	51.0	R410A	10.7	21.8	21.1	70.0	85.0	3.3	0	208/1	3.88	15	NF	93	2	ALL
FCU 5	BOH	CARRIER	MMD-UP036	FCU	SUSPENDED	850	0.8	350	30.7	28.5	75.0	63.9	53.1	51.5	R410A	10.7	21.8	13.8	70.0	85.0	3.3	0	208/1	3.44	15	NF	93	2	ALL
FCU 6	OFFICE	CARRIER	MMU-UP015	CASSETTE	CEILING	400	0.8	60	9.5	9.0	75.0	61.4	54.5	53.1	R410A	11.7	22.9	6.5	70.0	85.0	3.9	0	208/1	0.65	15	NF	42	1	ALL

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

- NOTES:
- ASSOCIATED CONDENSING UNIT SHALL BE BY THE SAME MANUFACTURER.
 - FOR COOLING, EQUIPMENT SIZED FOR 97°F AMBIENT TEMPERATURE. FOR HEATING, EQUIPMENT SIZED FOR 40°F AMBIENT TEMPERATURE.
 - PROVIDE PRE-MANUFACTURED OR FIELD FABRICATED FILTER RACK ON UNIT RETURN AIR INLET WITH 2" MERV 13, PLEATED THROWAWAY FILTERS. FILTERS SHALL BE ACCESSIBLE FROM SERVICE SIDE OF UNIT. BOTTOM ACCESS FILTER RACK IS NOT PERMITTED.
 - PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
 - STARTER PROVIDED BY DIVISION 26 CONTRACTOR.
 - SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
 - SPECIFIED MOTOR OUTPUT SHALL BE DEFINED IN WATTS IF THE VALUE IS GREATER THAN 5 AND HORSEPOWER IF THE VALUE IS 5 OR LESS.
 - SUSPEND UNIT FROM STRUCTURE IN HORIZONTAL POSITION WITH ALL -THREAD ROD AND SPRING VIBRATION ISOLATION (2" MINIMUM DEFLECTION).
 - INSTALL UNIT IN CEILING WITH FRAMING TO MATCH CEILING CONSTRUCTION. SUPPORT UNIT WITH ALL-THREAD ROD AND SPRING VIBRATION ISOLATION (2" MINIMUM DEFLECTION).
 - EQUIPMENT SHALL BE SIZED FOR WORST CASE OF HEATING OR COOLING CAPACITY NEEDS FOR ALL ASSOCIATED VRF SYSTEMS WITHOUT DIVERSITY FACTORS APPLIED.
 - EQUIPMENT MUST MEET DESIGN LEAVING AIR TEMPERATURE IN HEATING MODE AT RATED AIRFLOW. HEATING CAPACITY SHALL INCLUDE ALL APPLICABLE DERATES FOR PIPING, AMBIENT TEMPERATURE, CONNECTED LOAD AND DEFROST.
 - TOTAL HEATING CAPACITY INCLUDES THE HEAT PUMP HEATING COIL CAPACITY AT THE AMBIENT DRY BULB TEMPERATURE LISTED PLUS THE AUXILIARY HEATING COIL OUTPUT LISTED.
 - PROVIDE AUXILIARY DRAIN PAN WITH FLOOD DETECTOR SWITCH TO SHUT OFF UNIT WHEN WATER IS PRESENT IN DRAIN PAN.
 - PROVIDE UNIT WITH INTEGRAL CONDENSATE PUMP.
 - PROVIDE UNIT WITH SPACE TEMPERATURE CONTROL DEVICES CONSISTENT WITH THE FOLLOWING CONTROL METHODS:
 - THERMOSTAT OR ROOM CONTROLLER FOR LOCAL OVERRIDE OF CENTRALIZED CONTROLLER WITH INTEGRAL TEMPERATURE SENSOR.
 - TEMPERATURE SENSOR WITH LOCAL OVERRIDE.
 - THERMOSTAT OR ROOM CONTROLLER FOR LOCAL OVERRIDE OF CENTRALIZED CONTROLLER WITH REMOTE TEMPERATURE SENSOR.
 - FAN COIL UNIT WITH INTEGRAL TEMPERATURE SENSOR IN RETURN AIRSTREAM WITHOUT LOCAL OVERRIDE (FACTORY DEFAULT SETTING).

VARIABLE REFRIGERANT FLOW CONDENSING UNIT SCHEDULE

MARK	SERVICE	MANUFACTURER	MODEL	REFR TYPE	COOLING CAPACITY		HEATING CAPACITY		OUTDOOR MODULE 1		OUTDOOR MODULE 2		WEIGHT (LBS)	NOTES					
					TOTAL (MBH)	MIN EFF (EER)	HEAT PUMP (MBH)	AMBIENT (°F DB)	MIN EFF COP 47°F	VIPH	MCA	MOCP			TYPE				
CU-1	FCU 1-6	CARRIER	MMY-UP284	R-410A	209.4	10.7	21.8	104.7	40	3.3	208/3	57.4	80	208/3	36.6	45	NF	1315	ALL

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

- NOTES:
- PROVIDE LOW AMBIENT KIT FOR COOLING OPERATION DOWN TO 25°F.
 - EQUIPMENT SIZED FOR 97°F AMBIENT TEMPERATURE.
 - APPROXIMATE LOCATION OF REFRIGERANT COMPONENTS AND CONTROL DEVICES AND GENERAL PIPE ROUTING ARE SHOWN ON THE DRAWINGS ONLY TO CONVEY GENERAL DESIGN INTENT. COORDINATE WITH THE MANUFACTURER THE FINAL HORIZONTAL AND VERTICAL REFRIGERANT PIPE ROUTING TO DETERMINE PIPE SIZES FOR THE REFRIGERANT PIPING. MANUFACTURER SHALL PROVIDE DETAILED REFRIGERANT PIPING DIAGRAMS INCLUDING DIMENSIONAL DATA FOR ALL REFRIGERANT PIPING DEVICES.
 - THE MANUFACTURER SHALL SIZE AND LOCATE THE ASSOCIATED REFRIGERANT TRAPS BASED ON THE ACTUAL ROLLOFF AND PROVIDE OTHER APPURTENANCES TO PROVIDE A FULLY FUNCTIONAL AND OPERATIONAL SYSTEM. COORDINATE WITH THE MANUFACTURER LOCATIONS FOR ALL REFRIGERANT PIPING AND CONTROL DEVICES TO MAINTAIN SERVICEABILITY AND ACCESSIBILITY.
 - PROVIDE CONDENSER HAIL GUARDS.
 - PROVIDE PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 8 INCHES ABOVE FINISHED ROOF SURFACE.
 - COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION.
 - PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
 - STARTERS FOR ALL MOTORS SHALL BE PROVIDED INTEGRAL WITH UNIT.
 - COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
 - PROVIDE MANUFACTURER'S VRF SYSTEM CONTROLLER FOR CONTROL OF VRF SYSTEMS AND INTERFACE TO BUILDING CONTROL SYSTEM. GATEWAY SHALL BE PROVIDED BY CONTROLS CONTRACTOR (IF REQUIRED).
 - EQUIPMENT SHALL BE SIZED FOR WORST CASE OF HEATING OR COOLING CAPACITY NEEDS FOR ALL ASSOCIATED VRF SYSTEMS WITHOUT DIVERSITY FACTORS APPLIED.
 - HEATING CAPACITY SHALL INCLUDE ALL APPLICABLE DERATES FOR PIPING, AMBIENT TEMPERATURE, CONNECTED LOAD AND DEFROST.
 - PROVIDE A FACTORY APPLIED COIL CORROSION COATING TO CONDENSER COIL WHICH IS CAPABLE OF WITHSTANDING GREATER THAN 6,000 HOURS OF THE ASTM B117 SALT SPRAY TEST.

RESTAURANT AIR BALANCE SCHEDULE

KITCHEN				DINING					
OUTDOOR AIR SOURCE EQUIPMENT	AREA/EQUIPMENT SERVED	SUPPLY AIR (CFM)	DESIGN OA (CFM)	PERCENT OAS/A	OUTDOOR AIR EQUIPMENT SERVED	SUPPLY AIR (CFM)	DESIGN OA (CFM)	PERCENT OAS/A	
DOAS-1 (BOH)	ROOF	1000	1000	100.0%	DOAS-1 (FOH)	950	950	100.0%	
FCU-3	KITCHEN	1300	0	0.0%	FCU-1	DINING	1300	0	0.0%
FCU-4	KITCHEN	1300	0	0.0%	FCU-2	KITCHEN	1300	0	0.0%
FCU-5	BOH	850	0	0.0%	FCU-6	OFFICE	400	50	12.5%
TOTAL AIRFLOW		4,450	1,000	22.5%	TOTAL AIRFLOW		3,950	1,000	25.3%
EXHAUST EQUIPMENT KEF-1	AREA/EQUIPMENT SERVED KITCHEN	EXHAUST (CFM)	EXHAUST EQUIPMENT	AREA DESCRIPTION	EXHAUST EQUIPMENT SERVED DINING	EXHAUST (CFM)	EXHAUST EQUIPMENT	AREA DESCRIPTION	
		750	KEF-1	KITCHEN		150	KEF-2	KITCHEN	
		700	KEF-2	KITCHEN		150			
TOTAL EXHAUST		1,450	TOTAL EXHAUST		150				
TOTAL KITCHEN POSITIVE/NEGATIVE AIR FLOW		-450	TOTAL DINING POSITIVE/NEGATIVE AIR FLOW		850				
PERCENT POSITIVE/NEGATIVE AIR FLOW		-45.0%	PERCENT POSITIVE/NEGATIVE AIR FLOW		85.0%				
TOTAL BUILDING POSITIVE AIR FLOW				400					
PERCENT BUILDING POSITIVE AIR FLOW				20.0%					

COMcheck Software Version COMcheckWeb Mechanical Compliance Certificate

Project Information

Energy Code: 2021 IECC
 Project Title: Shake Shack - Mercato
 Location: Naples, Florida
 Climate Zone: 2a
 Project Type: New Construction

Construction Site: Owner/Agent: Designer/Contractor:

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Mechanical Systems List

Quantity System Type & Description

- CU-1 (Unknown):
 VRF Condensing Unit, Air Cooled w/ Heat Recovery Heat Pump
 Heating Mode Capacity = 297 kBtu/h
 Proposed Efficiency = 3.28 COP, Required Efficiency = 3.20 COP
 Cooling Mode Capacity = 264 kBtu/h
 Proposed Efficiency = 10.70 EER, Required Efficiency = 9.30 EER
 Proposed Part Load Efficiency = 21.80 IEEER, Required Part Load Efficiency = 12.50 IEEER
 Fan System: None
- FCU 1-2 (Single Zone):
 Cooling: 1 each - VRF Zone Fan Unit, Capacity = 53 kBtu/h, No Economizer, Economizer exception: None
 No minimum efficiency requirement applies
 Fan System: FCU 1-2 - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 FCU 1-2 Supply, Constant Volume, 1300 CFM, 0.5 motor nameplate hp, 0.00 fan energy index , fan exception: Single fan < 1 HP or < 0.89 kW
- FCU 3-4 (Single Zone):
 Cooling: 1 each - VRF Zone Fan Unit, Capacity = 48 kBtu/h, Unknown Economizer
 No minimum efficiency requirement applies
 Fan System: FCU 3-4 - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 FCU 3-4 Supply, Constant Volume, 1300 CFM, 0.5 motor nameplate hp, 0.00 fan energy index , fan exception: Single fan < 1 HP or < 0.89 kW
- FCU 5 (Single Zone):
 Cooling: 1 each - VRF Zone Fan Unit, Capacity = 36 kBtu/h, Unknown Economizer
 No minimum efficiency requirement applies
 Fan System: FCU-5 - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 FCU-5 Supply, Constant Volume, 850 CFM, 0.5 motor nameplate hp, 0.00 fan energy index , fan exception: Single fan < 1 HP or < 0.89 kW
- FCU 6 (Single Zone):
 Cooling: 1 each - VRF Zone Fan Unit, Capacity = 15 kBtu/h, Unknown Economizer
 No minimum efficiency requirement applies
 Fan System: FCU-6 - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 FCU-6 Supply, Constant Volume, 400 CFM, 0.1 motor nameplate hp, 0.00 fan energy index , fan exception: Single fan < 1 HP or < 0.89 kW

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Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6]†	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

Quantity System Type & Description

- fan < 1 HP or < 0.89 kW
 DOAS-1 (Single Zone):
 Cooling: 1 each - DX DOAS (Dehumidification), Capacity = 201 kBtu/h, Air-Cooled Condenser, Air Economizer
 Proposed Efficiency = 5.70 ISMRE, Required Efficiency = 4.00 ISMRE
 Proposed Part Load Efficiency = 0.00, Required Part Load Efficiency = 0.00
 Fan System: DOAS-1 - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 DOAS-1 Supply, Constant Volume, 2000 CFM, 3.0 motor nameplate hp, 0.00 fan energy index , fan exception: Part of code listed equipment

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed mechanical systems have been designed to meet the 2021 IECC requirements in COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

DALTON JUENEMANN - DESIGNER
 Name - Title Signature Date 08/23/2024

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Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41]†	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.8.1 [ME65]†	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. See the Mechanical Systems list for values.
C403.8.3 [ME11]†	Fans have a fan energy index (FEI) >= 1.00. Variable volume fans will have an FEI >= 0.95.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Embedded fans with motor nameplate horsepower 5 hp or 4.1 kW.
C403.8.4 [ME14]†	Motors for fans that are not less than 1/2 hp and less than 1 hp are electronically commutated motors or have a minimum motor efficiency of 70 percent. These motors have the means to adjust motor speed.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.8.6 [ME14]†	Each DX cooling system > 65 kBtu and chiller water/evaporative cooling system with fans > 1/4 hp are designed to vary the indoor fan airflow as a function of load and comply with detailed requirements of this section.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.9 [ME14]†	Large diameter fans where installed shall be tested and labeled in accordance with AMCA 230.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.3 [ME55]†	HVAC equipment efficiency verified.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Mechanical Systems list for values.
C403.5.5 [ME11]†	Fault detection and diagnostics installed with air-cooled unitary DX units or VRF units having economizers.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.2.2 [ME19]†	Natural or mechanical ventilation is provided in accordance with International Mechanical Code Chapter 4. Mechanical ventilation has capability to reduce outdoor air supply to minimum per IMC Chapter 4.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.7.1 [ME59]†	Demand control ventilation provided for spaces >500 ft2 and >15 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Spaces where >75% required for makeup air.
C403.7.2 [ME115]†	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

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COMcheck Software Version COMcheckWeb Inspection Checklist

Energy Code: 2021 IECC
 Requirements: 100.0% were addressed directly in the COMcheck software
 Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2]†	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical and service water heating systems and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks. Hot water system sized per manufacturer's sizing guide.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C406 [PR9]†	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

Additional Comments/Assumptions:

Project Title: Shake Shack - Mercato Report date: 08/23/24
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Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.7.6 [ME14]†	HVAC systems serving guestrooms in Group R-1 buildings with > 50 guestrooms. Each guestroom is provided with controls that automatically manage temperature setpoint and ventilation (see sections C403.7.6.1 and C403.7.6.2).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.7.4 [ME5]†	Exhaust air energy recovery on systems meeting Table C403.7.4(1) and C403.7.4(2).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Where prohibited by the International Mechanical Code.
C403.7.5 [ME16]†	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.5.1, C403.5.2 [ME6]†	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.5.3 [ME12]†	Air economizers automatically reduce outdoor air intake to the design minimum outdoor air quantity when outdoor air intake will not reduce cooling energy usage. See Table C403.5.3.2 for applicable device types and climate zones.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.5.3 [ME12]†	System capable of relieving excess outdoor air during air economizer operation to prevent over pressurizing the building. The relief air outlet located to avoid recirculation into the building.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.5.3 [ME12]†	Returns, exhaust/relief and outdoor air dampers used in economizers have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Reference section C403.7.7 for details.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.1 [ME6]†	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 80F.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.2 [ME5]†	Air outlets and zone terminal devices have means for air balancing.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

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Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.1.3 [FO7]†	Snow/ice melting system and freeze protection systems have sensors and controls configured to limit service for pavement temperature above 50F and outdoor temperature above 40F.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.

Additional Comments/Assumptions:

Project Title: Shake Shack - Mercato Report date: 08/23/24
 Data filename: Shake Shack - Mercato Page 4 of 11

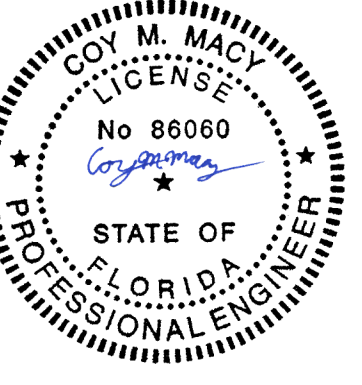
Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.11.3 [ME12]†	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.11.3.1 and refrigeration compressor systems that comply with C403.11.3.2.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

Project Title: Shake Shack - Mercato Report date: 08/23/24
 Data filename: Shake Shack - Mercato Page 8 of 11

HENDERSON ENGINEERS
 8345 LENEXA DRIVE, SUITE 300
 LENEXA, KS 66214
 TEL 913.742.5000 FAX 913.742.5001
 WWW.HENDERSONENGINEERS.COM
 2450002080
 FL REGISTRY NO. EB 7606
 EXPIRES 2/28/2026

Seal



7/25/2025

COY M. MACY
 LICENSE # 86060

Brian S. Thomas,
 Architect

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 864.232.8200
 www.DP3architects.com

Project

SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

Project Number 2450002080
 Drawn By DJ
 Checked By CM
 Date 2/12/2025

Revisions

11/12/2024 ISSUED FOR PERMIT
 2/12/2025 ISSUED FOR BID
 2 7/25/2025 ISSUED FOR CONSTRUCTION

Drawing

MECHANICAL
 ENERGY CODE
 COMPLIANCE

M630

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Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.7 [EL26]²	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.8 [EL27]²	Electric motors meet the minimum efficiency requirements of Tables C405.711 through C405.714. Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.9.1 [EL28]²	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.10 [EL29]¹	Total voltage drop across the combination of feeders and branch circuits <= 5%.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.1.1 [EL30]²	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy >= 65 lm/W or luminaires with efficacy >= 45 lm/W or comply with C405.2.4 or C405.3.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.1.1.1 [EL31]²	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and > 25% of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.1.1.1.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Project Title: Shake Shack - Mercato Report date: 08/23/24
Data filename: Page 9 of 11

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C403.3 C408.2.5 3 [F18]²	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.3.1 [F127]²	HVAC systems and equipment capacity does not exceed calculated loads.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.1 [F147]²	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.1 1 [F142]²	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.1 2 [F138]²	Thermostatic controls have a 5 °F deadband.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.1 3 [F120]²	Temperature controls have setpoint overlap restrictions.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.2 [F139]²	Each zone equipped with setback controls using automatic time clock or programmable control system.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.2 1. C403.4.2 2. [F140]²	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.2 3 [F141]²	Systems include optimum start controls.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.1.1 [F157]²	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C408.2.1 [F128]²	Commissioning plan developed by registered design professional or approved agency.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Project Title: Shake Shack - Mercato Report date: 08/23/24
Data filename: Page 10 of 11

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.2.3. 1 [F131]¹	HVAC equipment, systems and system-to-system relationships have been tested to ensure proper operation.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.3. 2 [F110]¹	HVAC and service water heating control systems have been tested to ensure proper operation, calibration and adjustment of controls.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.3. 3 [F132]¹	Economizers have been tested to ensure proper operation.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.4 [F129]¹	Preliminary commissioning report completed and certified by registered design professional or approved agency.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.5 [F17]²	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.5. 1 [F143]¹	An air and/or hydronic system balancing report is provided for HVAC systems.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.5. 2 [F130]¹	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

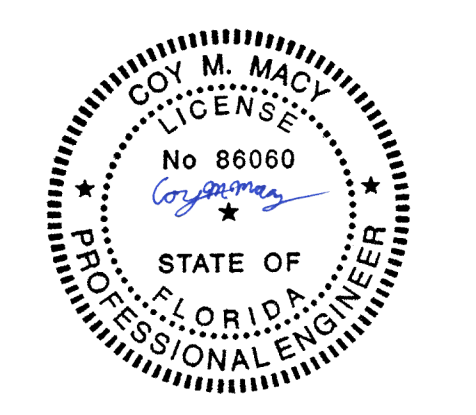
Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Project Title: Shake Shack - Mercato Report date: 08/23/24
Data filename: Page 11 of 11

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Seal



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LICENSE # 86060

Brian S. Thomas,
Architect

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Project

SHAKE SHACK®
SHAKE SHACK #1612
(MERCATO) NAPLES, FL

Project Number 2450002080
Drawn By DJ
Checked By CM
Date 2/12/2025

Revisions
11/12/2024 ISSUED FOR PERMIT
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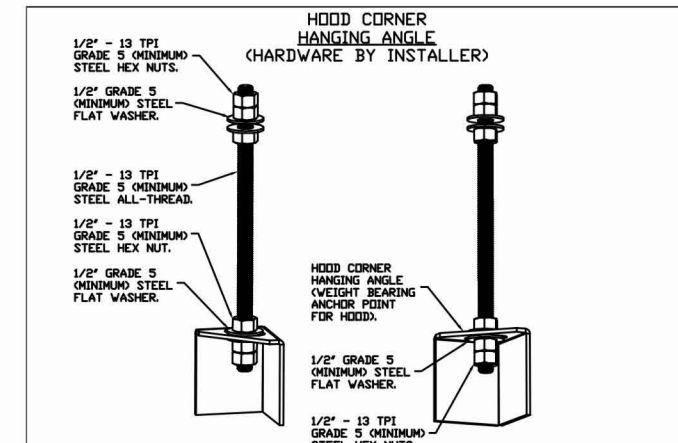
Drawing

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MECHANICAL ENERGY CODE COMPLIANCE

M631

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HOOD STYLE / MODEL	450 DEGREES cfm/ft.	600 DEGREES cfm/ft.	700 DEGREES cfm/ft.
CANOPY ND-2	150	200	250
CANOPY ND-2 W/ END PANELS	105	140	175
SLOPED SND-2	228	294	-
ISLAND ND-2MI	269	300	350
ISLAND ND-2I	346	422	475

ETL HOOD LISTING DETAIL
 EXHAUST CFM = LENGTH OF HOOD X CFM/IN.FT. (LOAD)
 SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED
 TOTAL DUCT AREA (sq. in.) = 144 X (FRM)²
 DUCT LENGTH = TOTAL DUCT AREA / DUCT WIDTH

CALCULATIONS UTILIZED
 CAPTIVE-AIRE HOODS BUILT IN COMPLIANCE WITH:
 ETL LISTED UNDER ETL File number 3054804-001/002

BUILDING CODES

MATERIAL	CLEARANCE REDUCTION SYSTEM
NON-COMBUSTIBLE	NONE REQUIRED
LIMITED-COMBUSTIBLE	3" UNINSULATED STANDOFF
COMBUSTIBLE	1" INSULATED STANDOFF

CLEARANCE TO COMBUSTIBLES

INSTALLATION

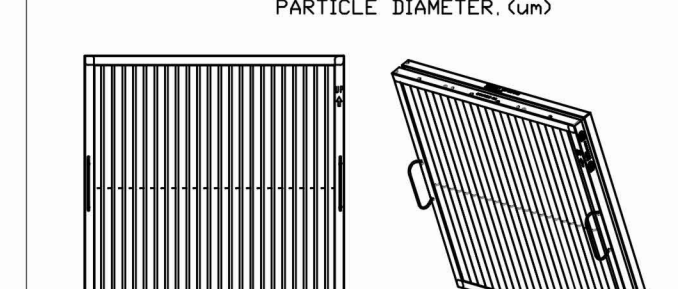
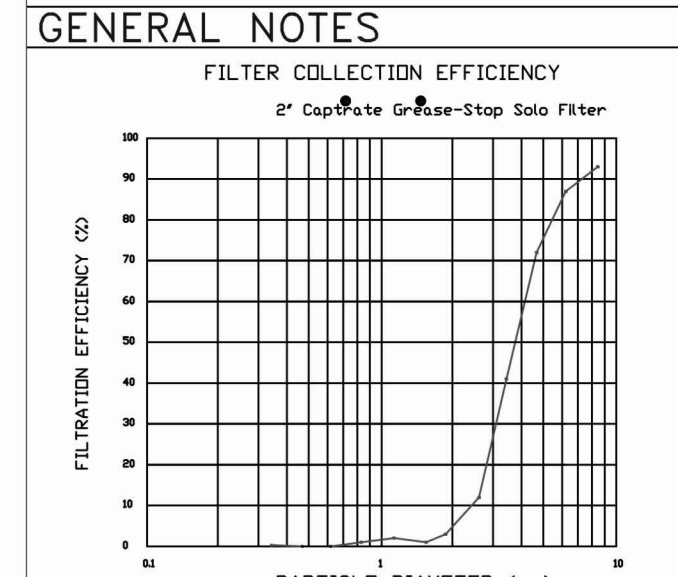
- ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.
- ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
- HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGING MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
- ALL CONNECTIONS FROM CAPTIVEAIRE HOOD PER MECHANICAL CONTRACTOR'S PLANS.
- COOKING EQUIPMENT TO SHUT OFF IN EVENT OF FIRE.
- EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
- ALL LIGHT FIXTURES SHOW INSTALLED BY CAPTIVEAIRE ARE FACTORY PROVIDED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES ARE BY ELECTRICAL CONTRACTOR.
- LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
- SEISMIC RESTRAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
- INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTERPRETATION AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

ADDITIONAL

- WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
- FIELD AND "IMPROVED" CORNERS OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO INSTALLATION.

GENERAL NOTES

2" CapRate Grease-Stop Solo Filter



CaptiveAire Captrate Solo Filter
 ETL Listed Grease Extracting Filters
 Made From 430 Stainless Steel

FILTER DETAIL

FOR QUESTIONS, CALL THE
 Eastern PA Mechanical
 REGION 108
 PHONE: (267) 504 - 4126
 EMAIL: reg108@captiveaire.com

HOOD INFORMATION - JOB#6980804

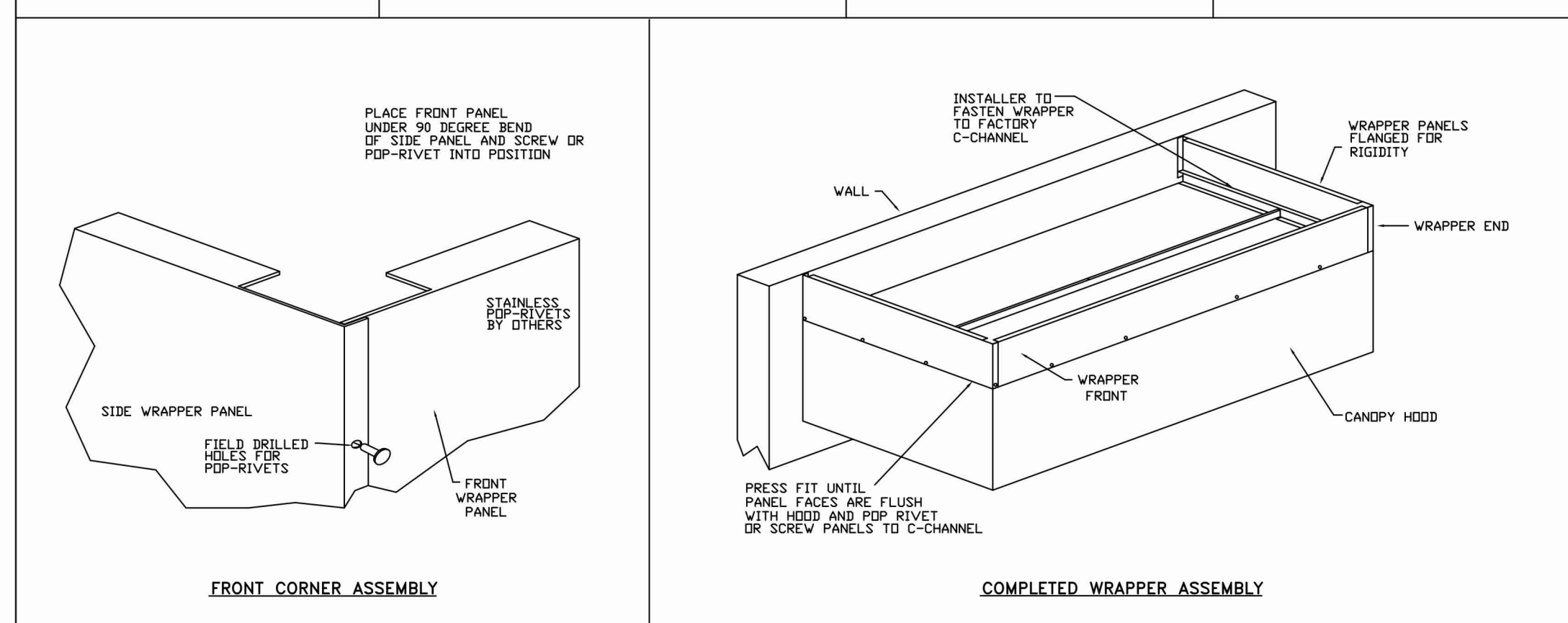
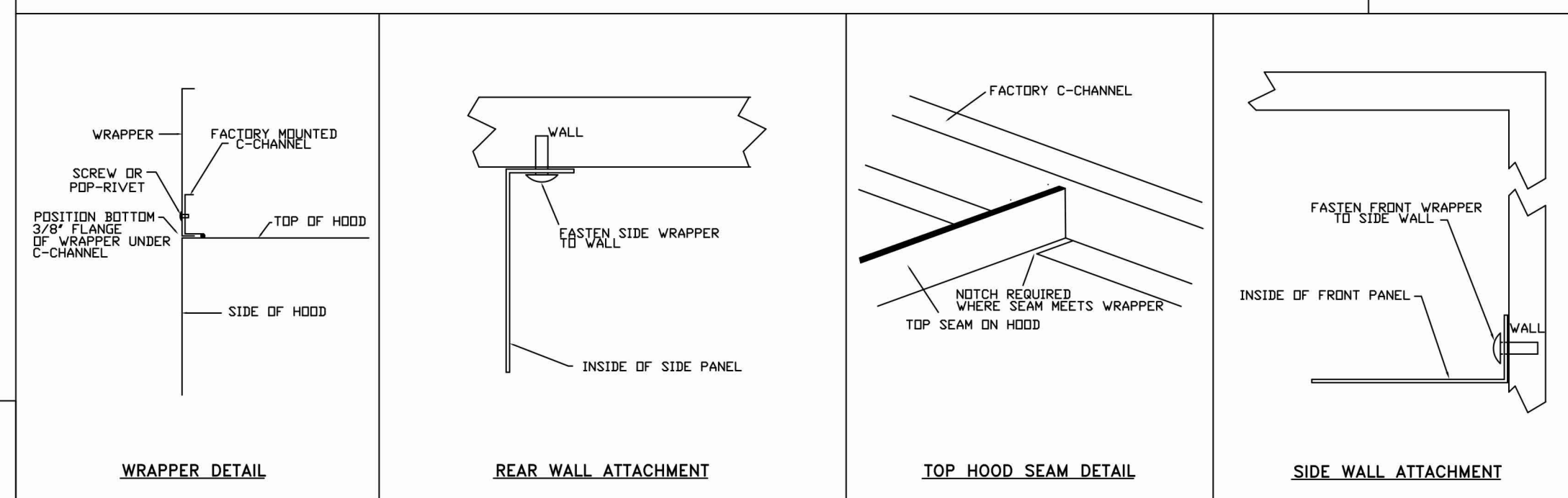
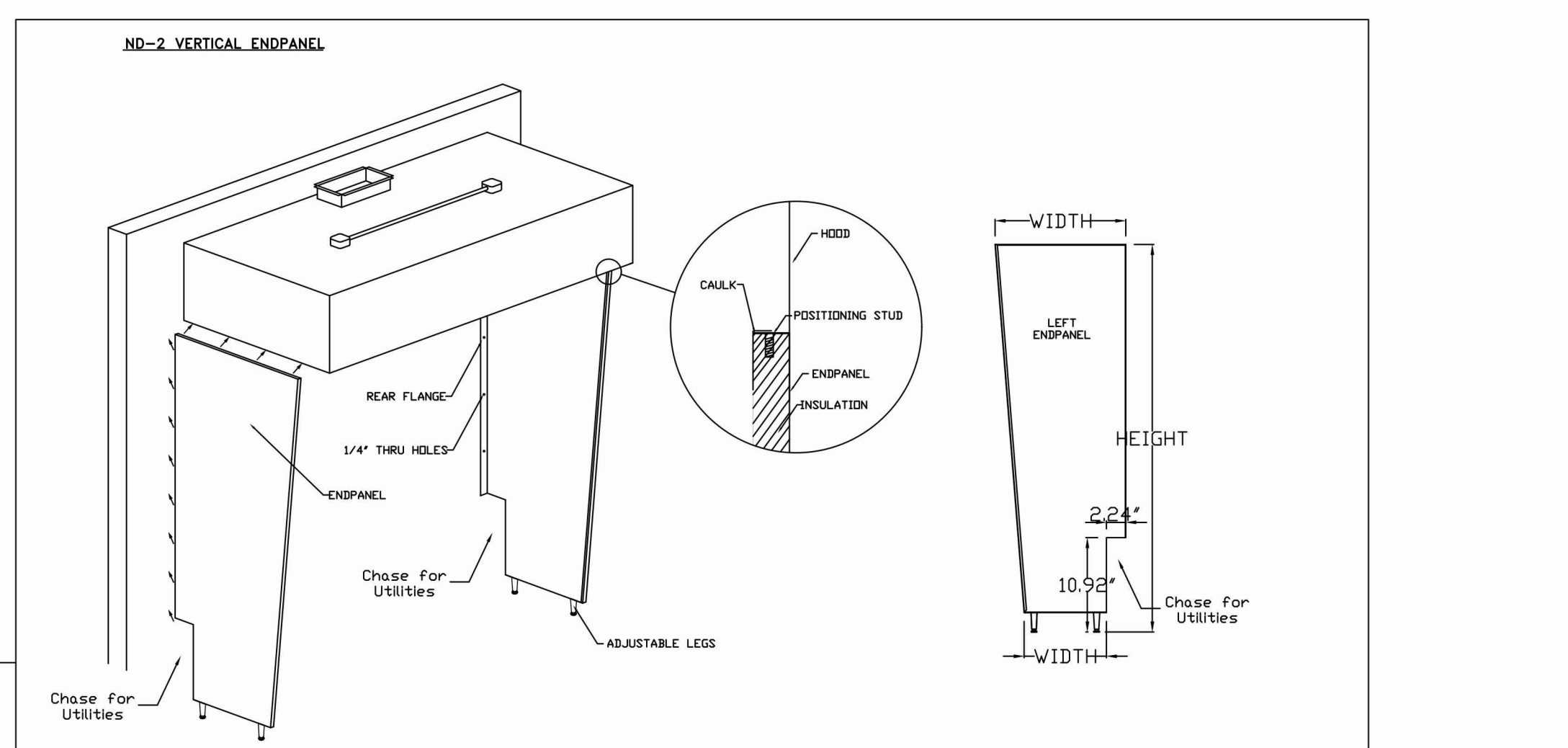
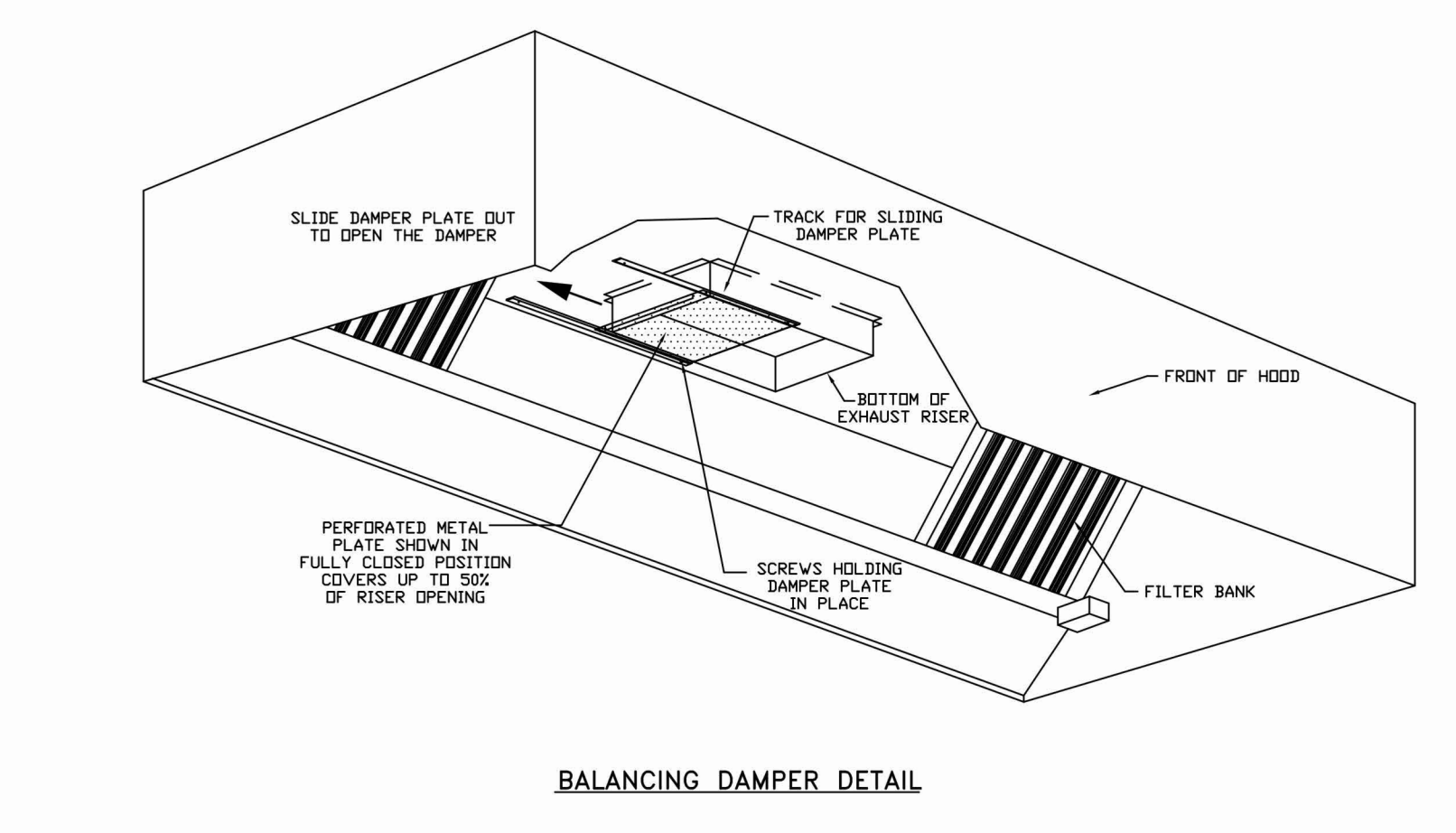
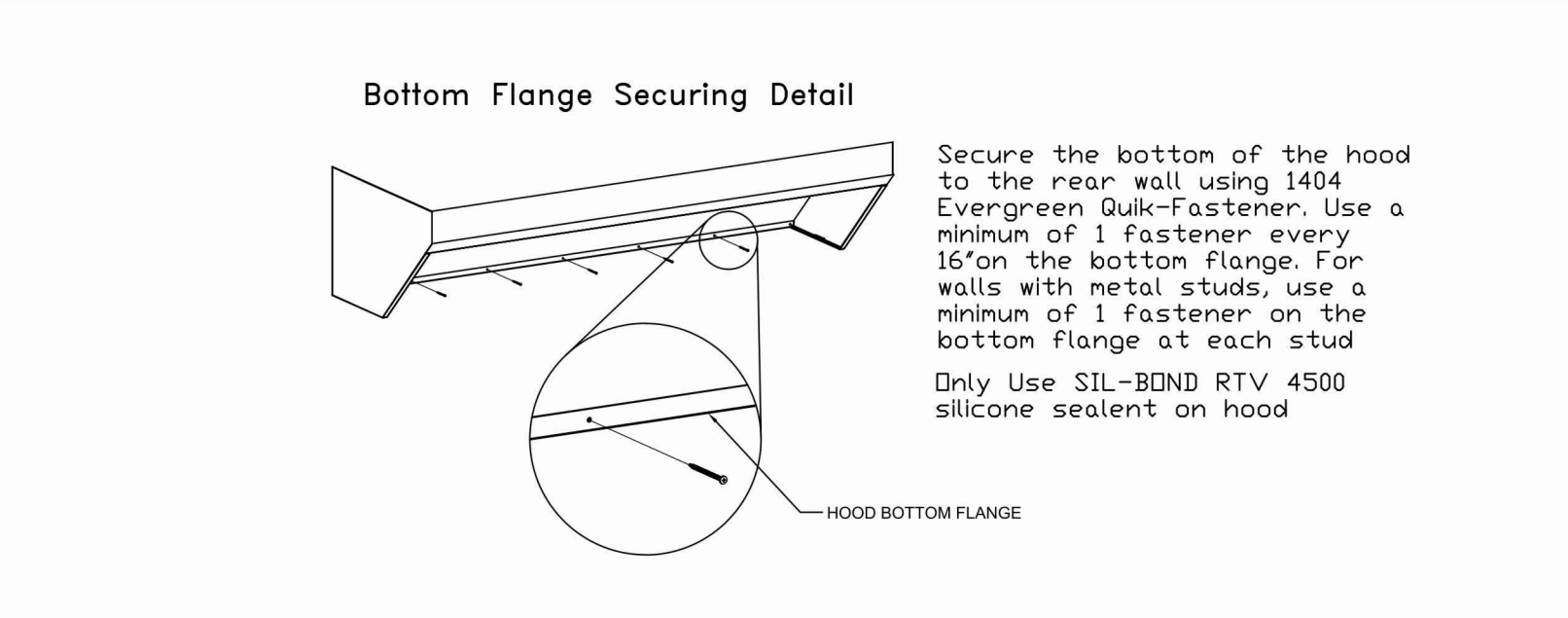
HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISE(S)				HOOD CONSTRUCTION	HOOD CONFIG			
										WIDTH	LENG	HEIGHT	DIA		CFM	VEL	SP	END TO END
1	Hood (Grill)	5430 ND-2	CAPTIVEAIRE	5' 0"	450 DEG	I	MEDIUM	150	750	9'	8'	4'	750	1500	-0.330'	430 SS WHERE EXPOSED	ALONE	ALONE
2	Hood (Fryer)	5430 ND-2	CAPTIVEAIRE	4' 0"	600 DEG	I	HEAVY	175	700	8'	8'	4'	700	1575	-0.375'	430 SS WHERE EXPOSED	ALONE	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S)				LIGHT(S)				UTILITY CABINET(S)				FIRE SYSTEM	HOOD PIPING	WEIGHT	
		TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	TYPE	SIZE				MODEL #
1	Hood (Grill)	CAPRATE SOLID FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO						YES	444 LBS	
2	Hood (Fryer)	CAPRATE SOLID FILTER	2	20"	20"	85% SEE FILTER SPEC	1	RECESSED ROUND	NO	LEFT	12"x54"x30"	TANK FS	4.0/4.0	SC-310110MA	1 LIGHT 1 FAN	YES	625 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	Hood (Grill)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT. BALANCE DAMPERS. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN. LEFT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS. GFCI DUPLEX OUTLET, 20A 125V - HOOD FRONT LEFT - HORIZONTAL - DIST FROM END: 3.50 DIST FROM BOTTOM: 4.00. RIGHT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
2	Hood (Fryer)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT. RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. BALANCE DAMPERS. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN.



REVISIONS

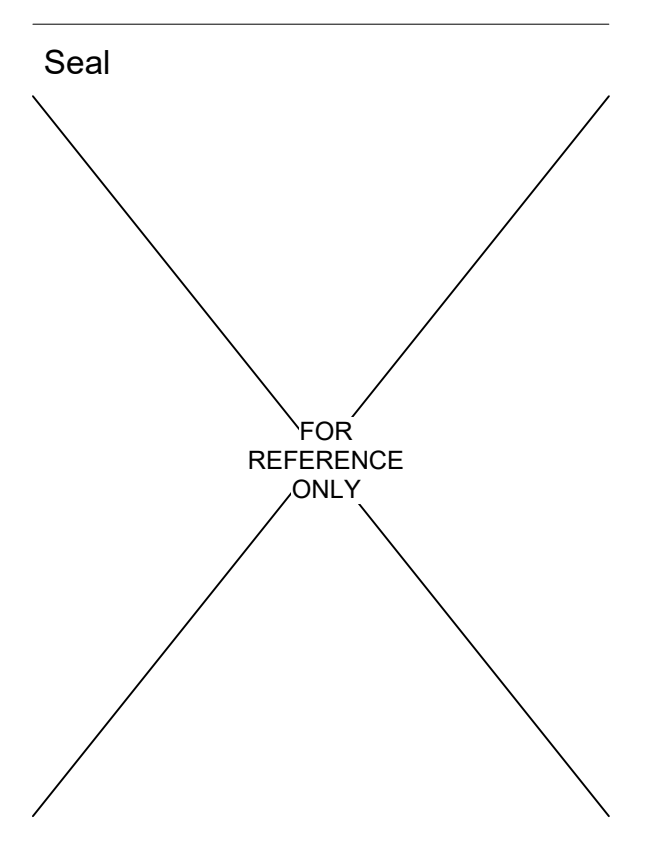
NO.	DESCRIPTION	DATE
1		
2		

DATE: 8/14/2024
DWG.#: 6980804
DRAWN BY: Joe.shilba
SCALE: 3/4" = 1'-0"
MASTER DRAWING

SHEET NO.
1

CAPTIVEAIRE
 Eastern PA Mechanical
 225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004
 PHONE: (267) 504 - 4126
 EMAIL: reg108@captiveaire.com

Shake Shack-1612-Mercato, FL (Kitchen)



Brian S. Thomas, Architect

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SHAKE SHACK
 SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number: 2450002080
 Drawn By: JS
 Checked By: N/A
 Date: 2/12/2025

Revisions

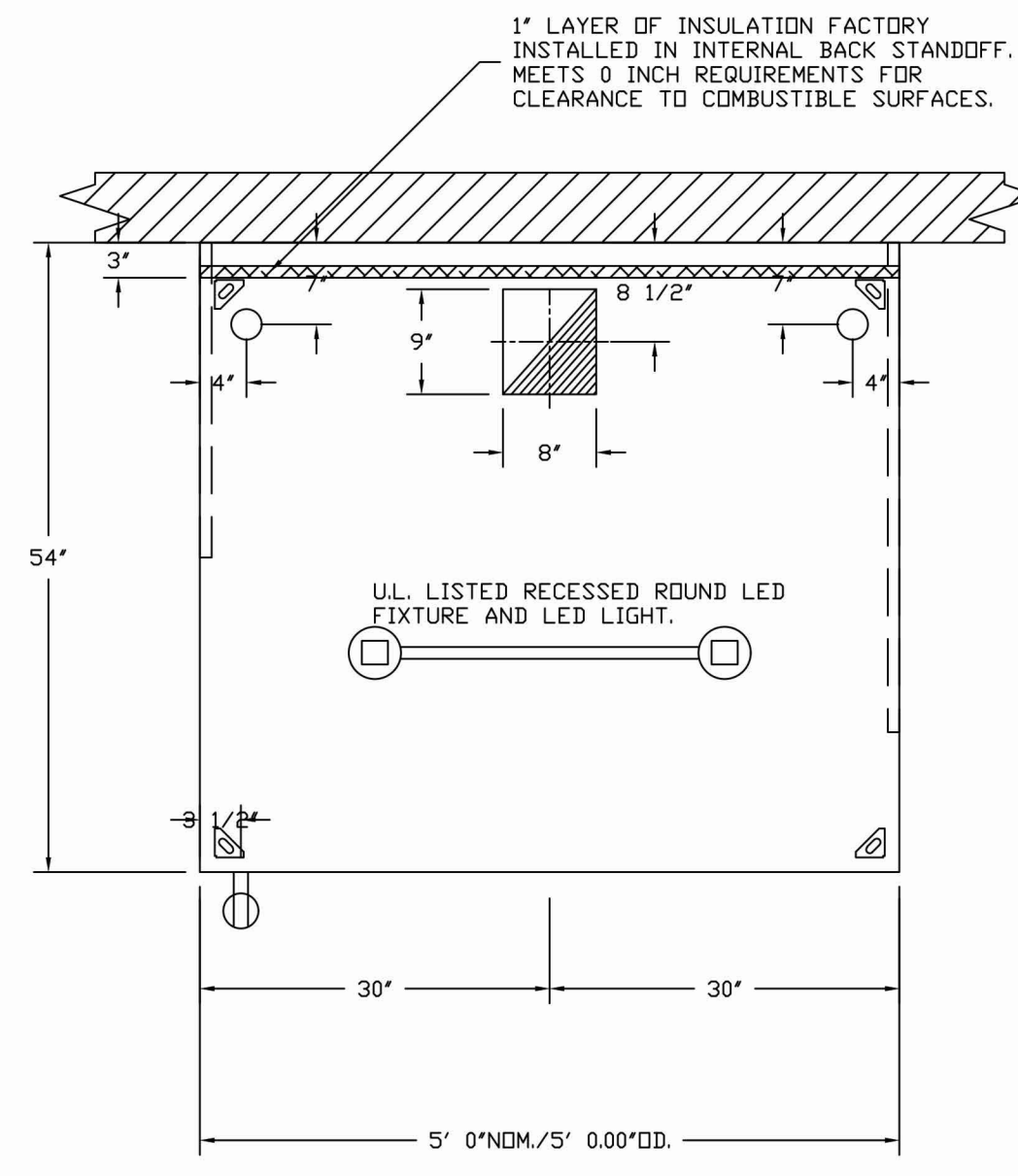
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2	2/12/2025	ISSUED FOR BID
2	7/25/2025	ISSUED FOR CONSTRUCTION

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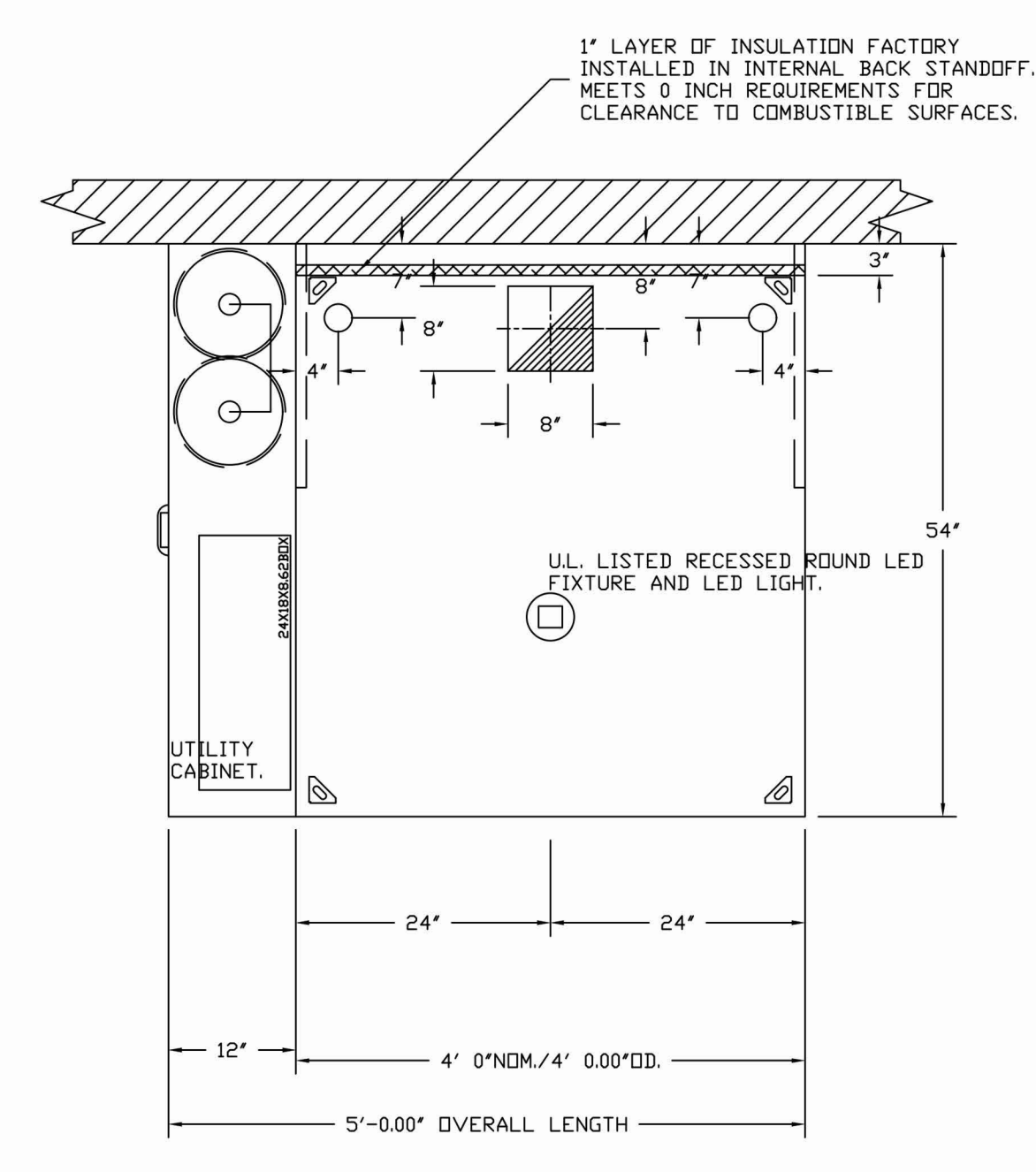
Drawing
CAPTIVEAIRE
 DRAWINGS

M701

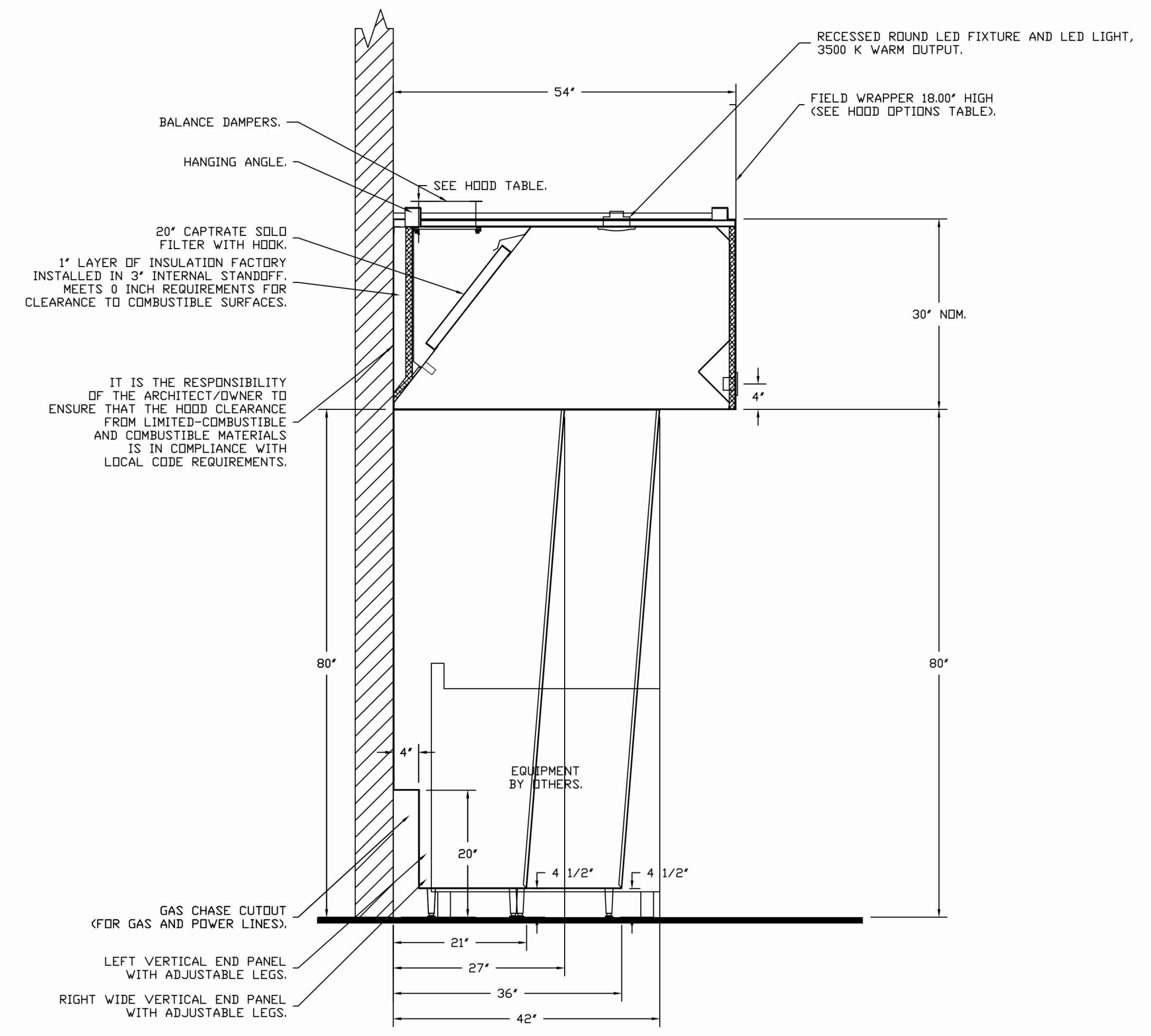
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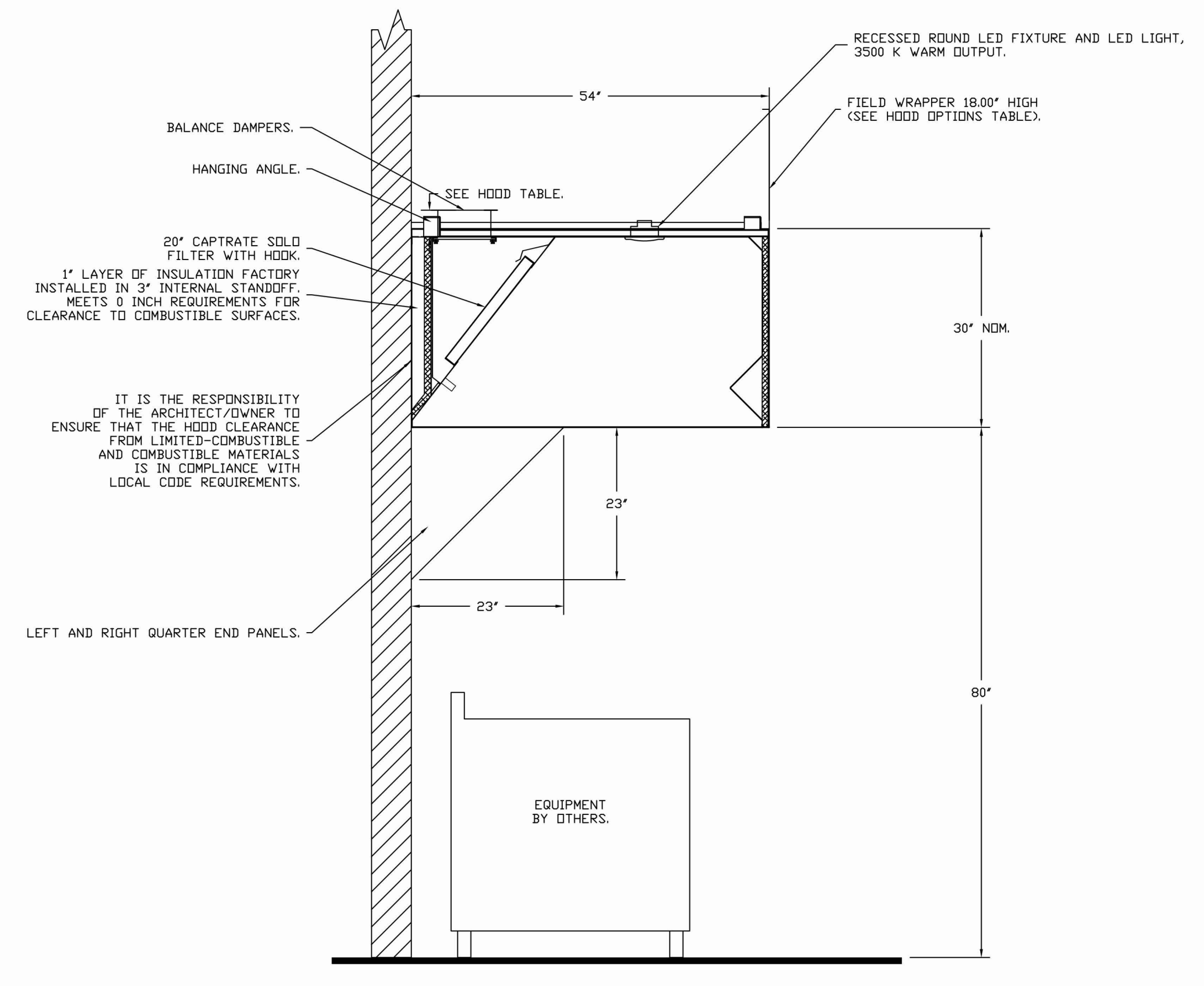
PLAN VIEW - HOOD #1 (Hood (Grill))
5'-0.00\"/>



PLAN VIEW - HOOD #2 (Hood (Fryer))
4'-0.00\"/>



SECTION VIEW - MODEL 5430ND-2
HOOD - #1 (Hood (Grill))



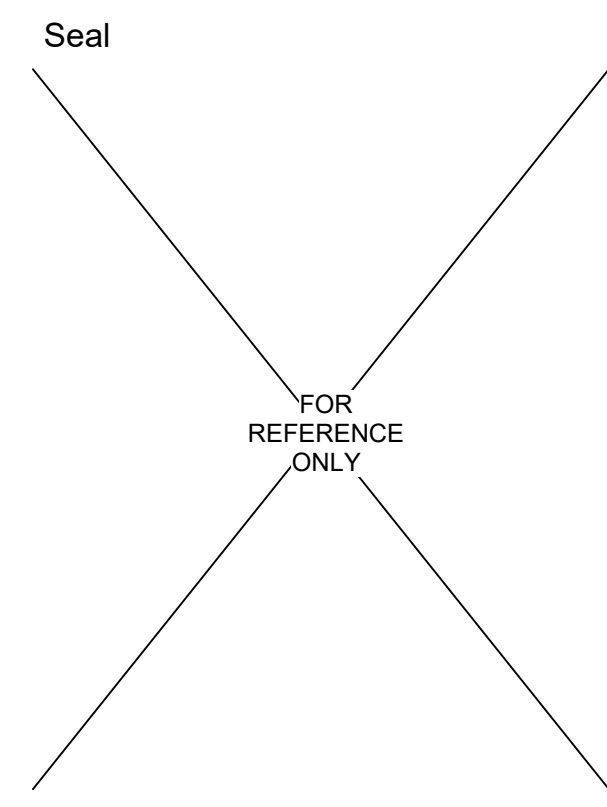
SECTION VIEW - MODEL 5430ND-2
HOOD - #2 (Hood (Fryer))

REVISIONS	
DESCRIPTION	DATE

CAPTIVEAIRE
 Eastern PA Mechanical
 225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4128 EMAIL: reg.108@captiveaire.com
 www.captiveaire.com

Shake Shack-1612-Mercato, FL (Kitchen)

DATE: 8/14/2024
DWG.#: 6980804
DRAWN BY: Joe.shilba
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 2



Brian S. Thomas,
Architect

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www.DP3architects.com

Project

SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number 2450002080
 Drawn By JS
 Checked By N/A
 Date 2/12/2025

Revisions
 1 11/12/2024 ISSUED FOR PERMIT
 2 2/12/2025 ISSUED FOR BID
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Drawing
CAPTIVEAIRE DRAWINGS

M702

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FIRE SYSTEM INFORMATION - JOB#6980804

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0	40	36	FIRE CABINET LEFT	LEFT, HOOD 2

GAS VALVE(S)

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1		SC ELECTRICAL	1.000	CAPTIVEAIRE SYSTEMS

NOTES

- FIELD PIPE DROPS AS SHOWN
- PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY GAS.
- 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 SHELVING, 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 #: 6980804
 JOB NAME: SHAKE SHACK-1612-MERCATO,FL(KITCHEN).

SYSTEM SIZE: TANK-SP-2 DESIGN FP: 36, MAXIMUM FP: 40.
 HOOD # 1 5' 0.00" LONG x 54" WIDE x 30" HIGH.
 RISER # 1 SIZE: 9" x 8".
 HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.
 HOOD # 2 4' 0.00" LONG x 54" WIDE x 30" HIGH.
 RISER # 1 SIZE: 8" x 8".
 HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.

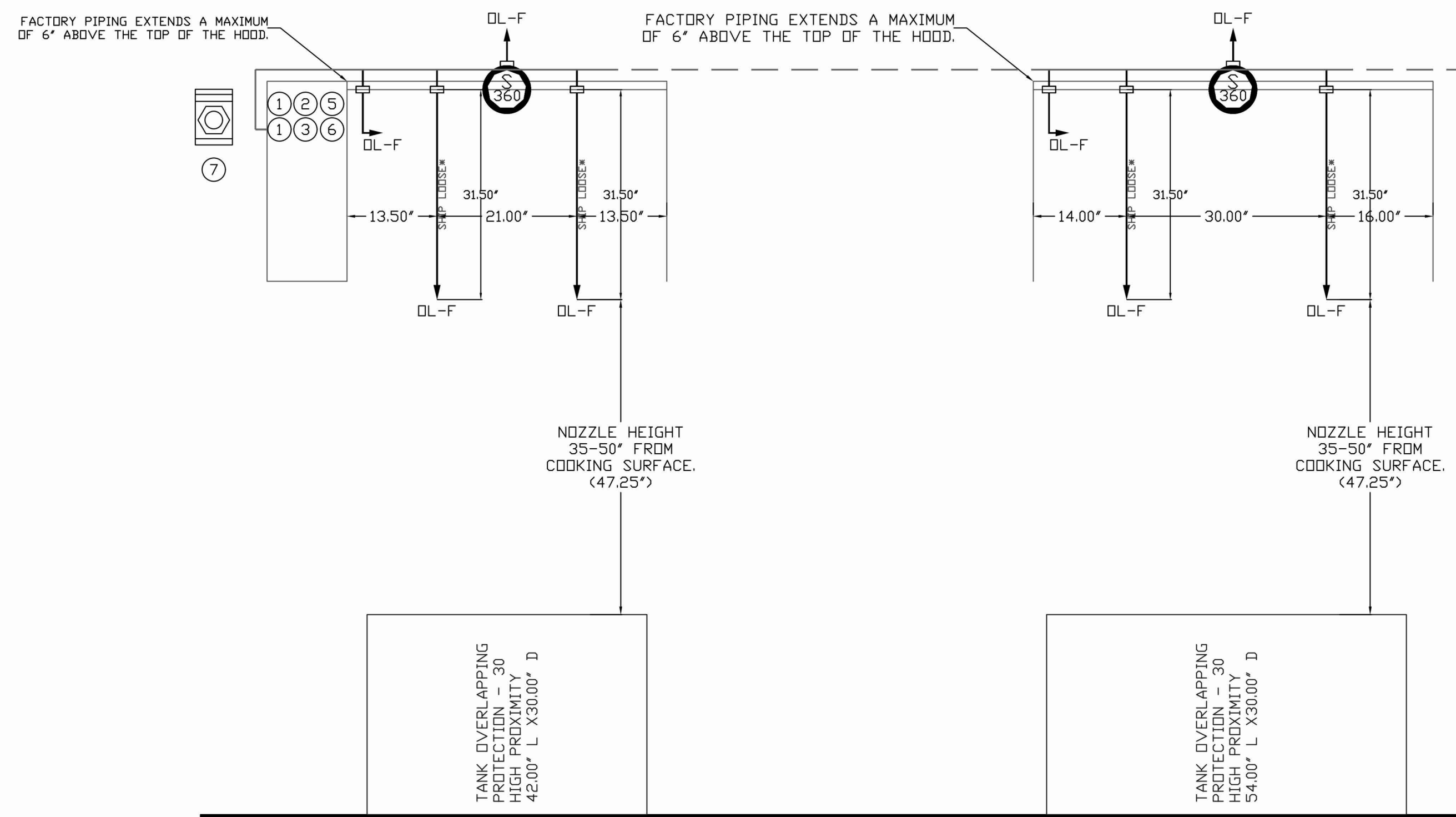
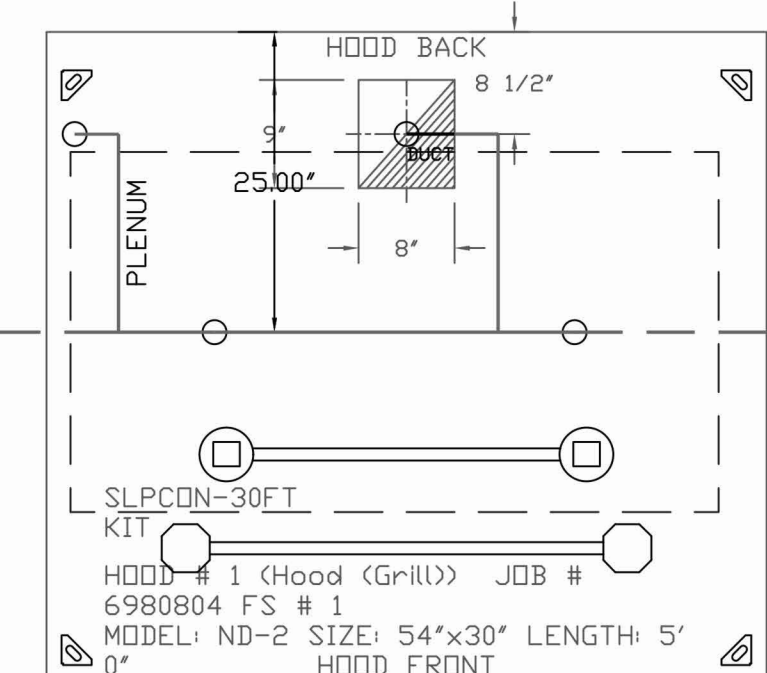
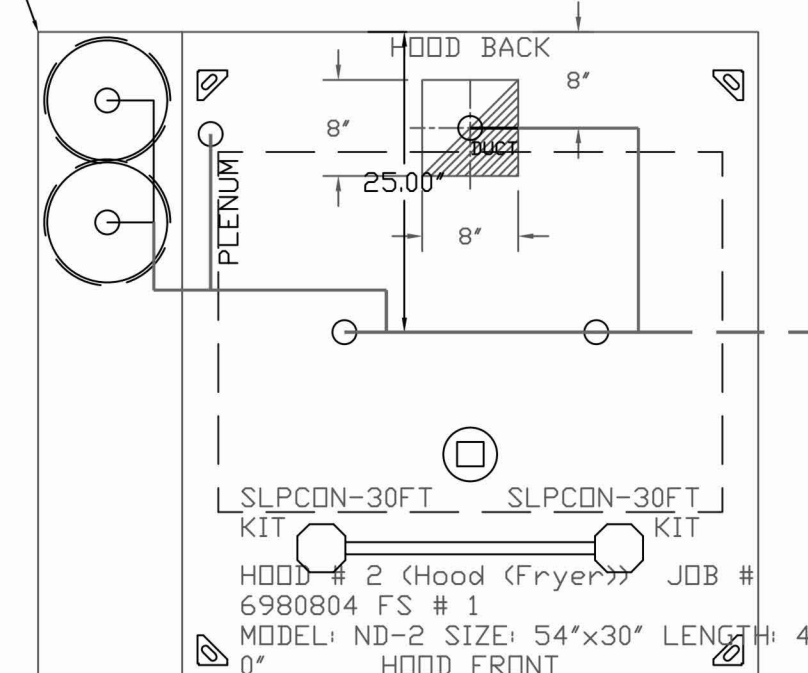
- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

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

- 1 4 GALLON TANK.
- 2 PRIMARY ACTUATOR RELEASE.
- 3 SECONDARY ACTUATOR RELEASE.
- 4 PRESSURE SUPERVISION SWITCH.
- 5 PRIMARY HOSE ASSEMBLY.
- 6 SECONDARY HOSE ASSEMBLY.
- 7 REMOTE MANUAL ACTUATION DEVICE.

- 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

CAPTIVEAIRE

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Shake Shack-1612-Mercato, FL(Kitchen)

DATE: 8/14/2024

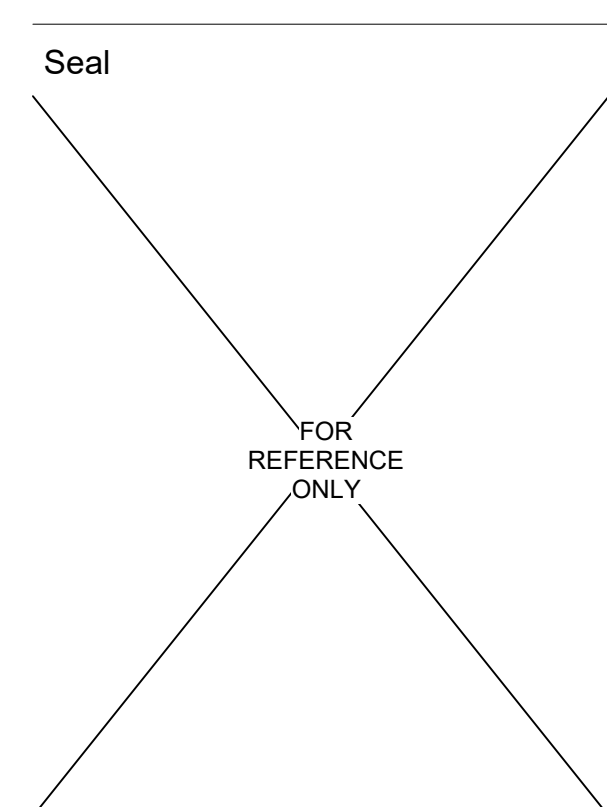
DWG.#: 6980804

DRAWN BY: Joe.shilba

SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 3



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 Architect

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Project

SHAKE SHACK
 SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

Project Number 2450002080
 Drawn By JS
 Checked By N/A
 Date 2/12/2025

Revisions
 1 11/12/2024 ISSUED FOR PERMIT
 2 2/12/2025 ISSUED FOR BID
 2 7/25/2025 ISSUED FOR CONSTRUCTION

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EXHAUST FAN INFORMATION – JOB#6980804

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SONES
1	KEF-1	1	USB115DD-RM	CAPTIVEAIRE	1450	1.500	1417	DDP,PREMIUM	1.000	0.6230	3	460	1.4	1008 FPM	274	14

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	KEF-1	1	B115 - INLET SERVICE DUCT CONNECTION, USED TO CONNECT TO STANDARD 16" GREASE DUCT OR FIELD WELDED DUCT. INCLUDES (2) 7" RISERS BOLTED TO STANDARD INLET RISER
		1	UTILITY SET GREASE CUP
		1	B115 - 24" DISCHARGE EXTENSION
		1	B1 - DISCHARGE ORIENTATION VERTICAL UPPER LEFT - CW INLET SIDE
		1	B115 - INLET CONNECTION STANDARD 16" FLANGED GREASE DUCT
		1	LOAD REACTOR MOUNTED IN FAN
		1	2 YEAR PARTS WARRANTY

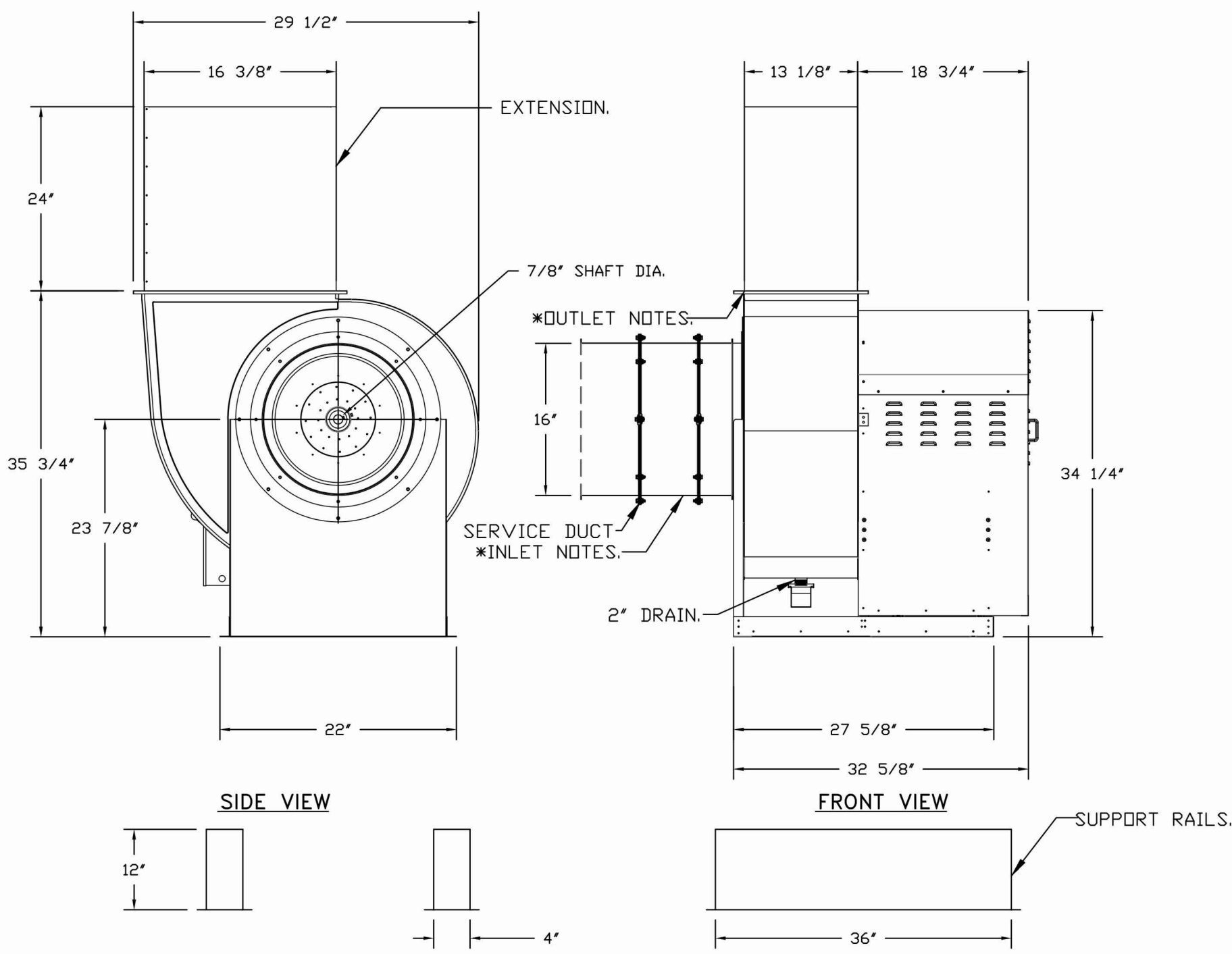
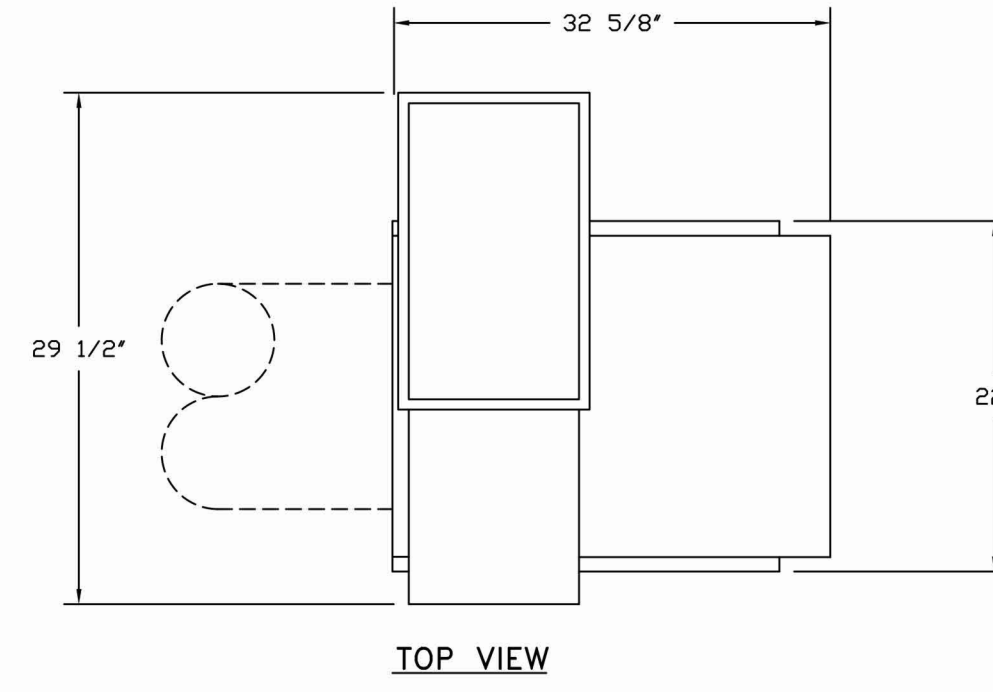
FAN ACCESSORIES

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

CURB ASSEMBLIES

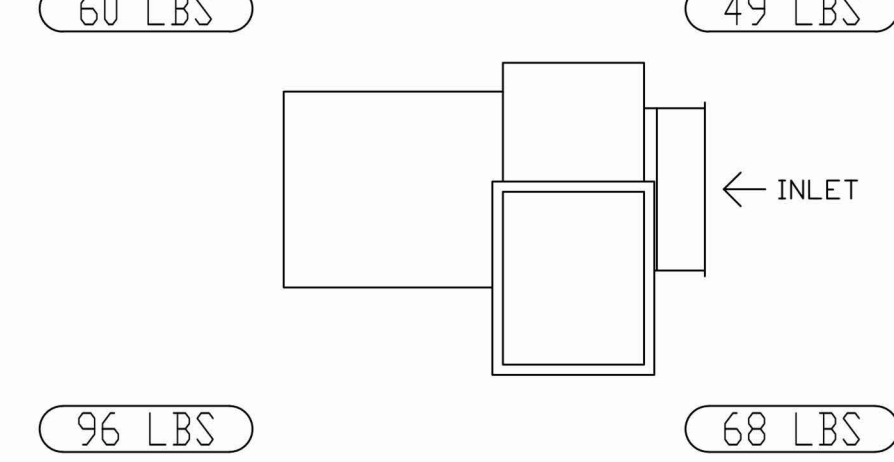
NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF-1	36 LBS	RAIL	4,000"W X 36,000"L X 12,000"H COMES AS A SET OF 2.

FAN #1 USB115DD-RM - EXHAUST_FAN (KEF-1)



* INLET/OUTLET NOTES:
LENGTH OF THE STRAIGHT DUCT ON THE INLET AND OUTLET TO BE 3 TIMES THE EQUIVALENT DUCT DIAMETER BEFORE CONNECTING TO ANY FITTINGS SUCH AS ELBOWS TO AVOID SYSTEM EFFECT.

UNIT PLAN VIEW CORNER WEIGHTS:



CORNER WEIGHTS ARE CALCULATED BASED ON VERTICAL DISCHARGE. SUPPORT DUCT PROPERLY BEFORE FAN TO ENSURE CORNER WEIGHTS ARE NOT AFFECTED.

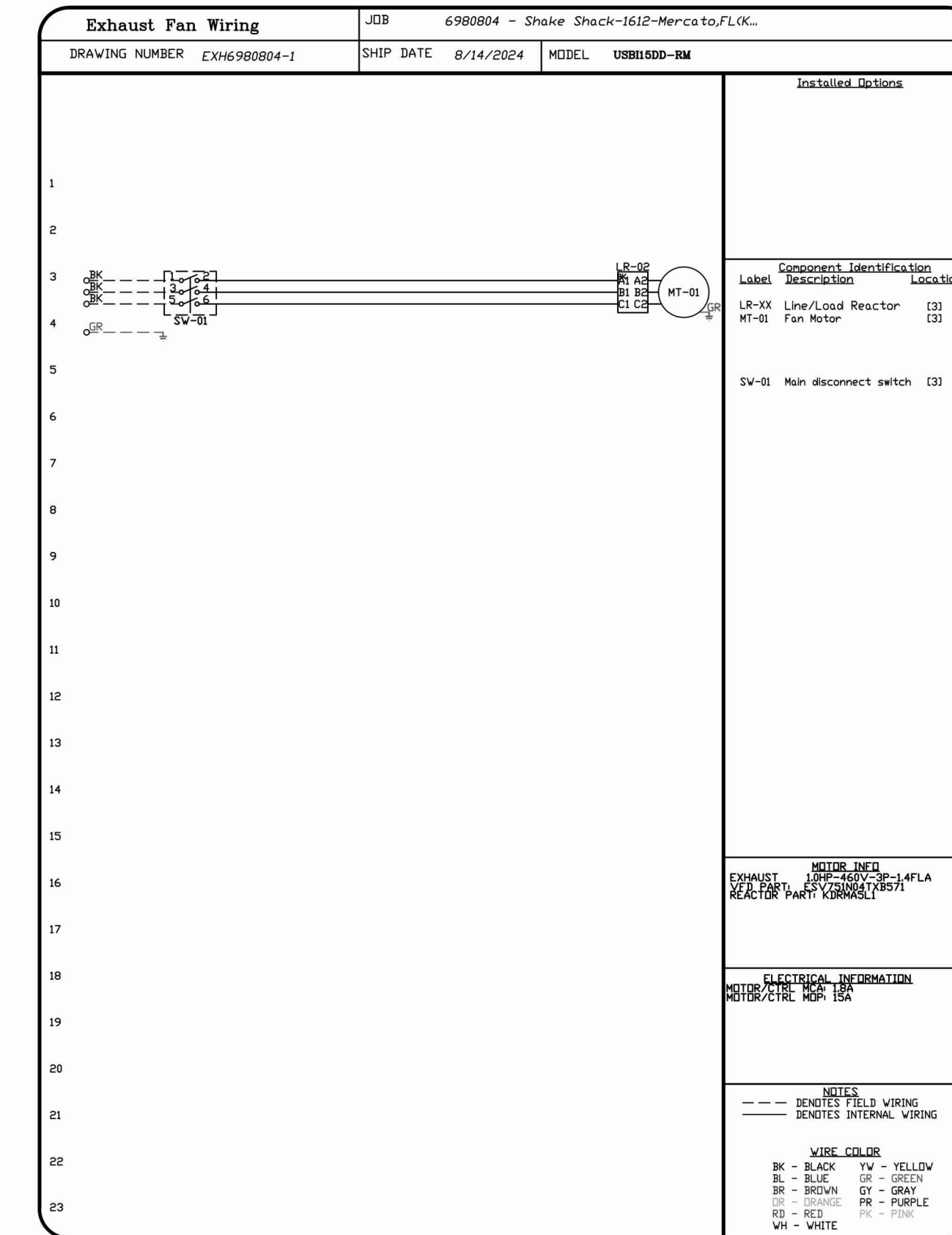
NORMAL TEMPERATURE TEST DIRECT DRIVE EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 350°F (176°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

FEATURES:

- ROOF MOUNTED FANS.
- UL705.
- UL752 AND ULC-3645 (RESTAURANT MODEL).
- HIGH HEAT OPERATION DIRECT DRIVE 350°F (176°C).
- HEAT SLINGER.
- NEMA 3R SAFETY DISCONNECT SWITCH.
- GREASE CLASSIFICATION TESTING.
- 2" DRAIN.
- MOTOR WEATHER COVER.
- FULLY SEALED SCROLL HOUSING.
- SCROLL ACCESS DOOR.
- FLANGE 1 1/4".

OPTIONS

- B115 - INLET SERVICE DUCT CONNECTION, USED TO CONNECT TO STANDARD 16" GREASE DUCT OR FIELD WELDED DUCT. INCLUDES (2) 7" RISERS BOLTED TO STANDARD INLET RISER.
- UTILITY SET GREASE CUP.
- B115 - 24" DISCHARGE EXTENSION.
- B1 - DISCHARGE ORIENTATION VERTICAL UPPER LEFT - CW INLET SIDE.
- B115 - INLET CONNECTION STANDARD 16" FLANGED GREASE DUCT.
- LOAD REACTOR MOUNTED IN FAN.
- 2 YEAR PARTS WARRANTY.



REVISIONS	
DESCRIPTION	DATE

CAPTIVEAIRE

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Shake Shack-1612-Mercato, FL (Kitchen)

DATE: 8/14/2024

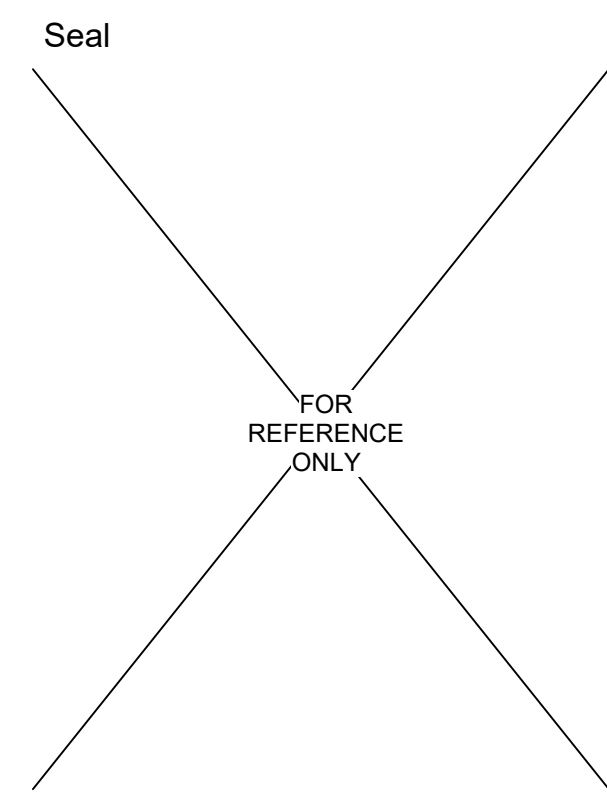
DWG.#: 6980804

DRAWN BY: Joe.shilba

SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 4



Brian S. Thomas, Architect

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Project

SHAKE SHACK
SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number 2450002080
Drawn By JS
Checked By N/A
Date 2/12/2025

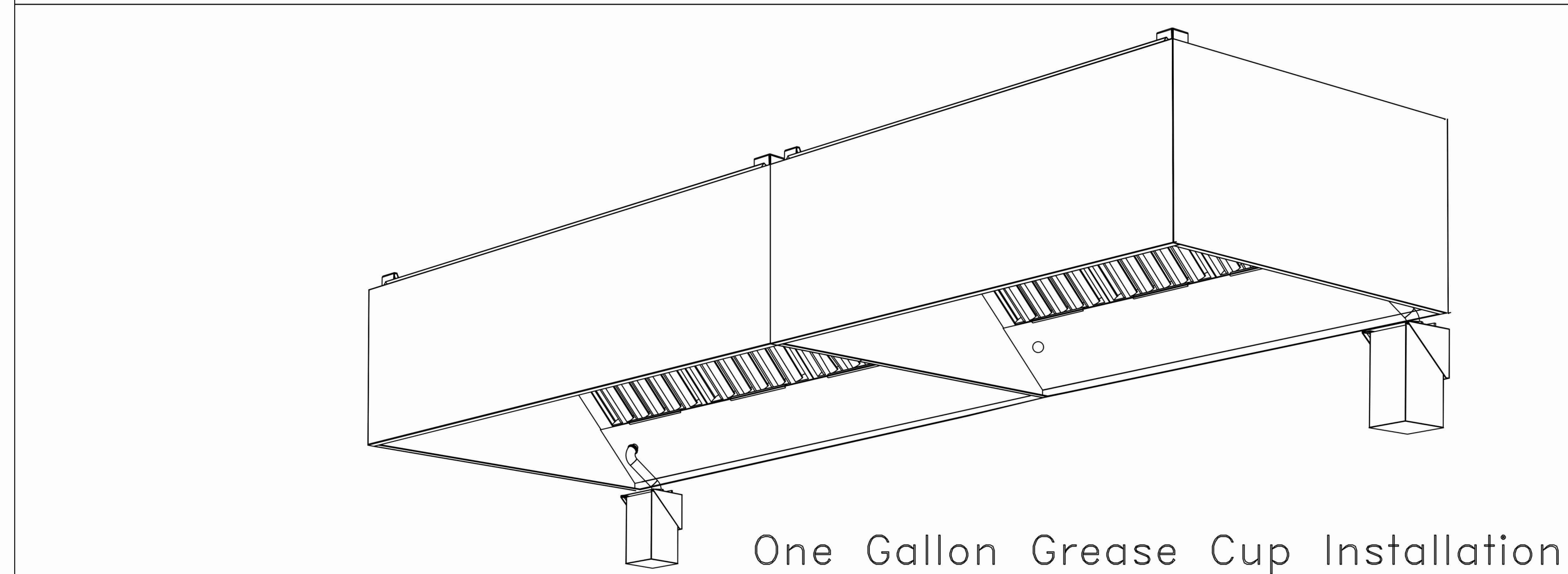
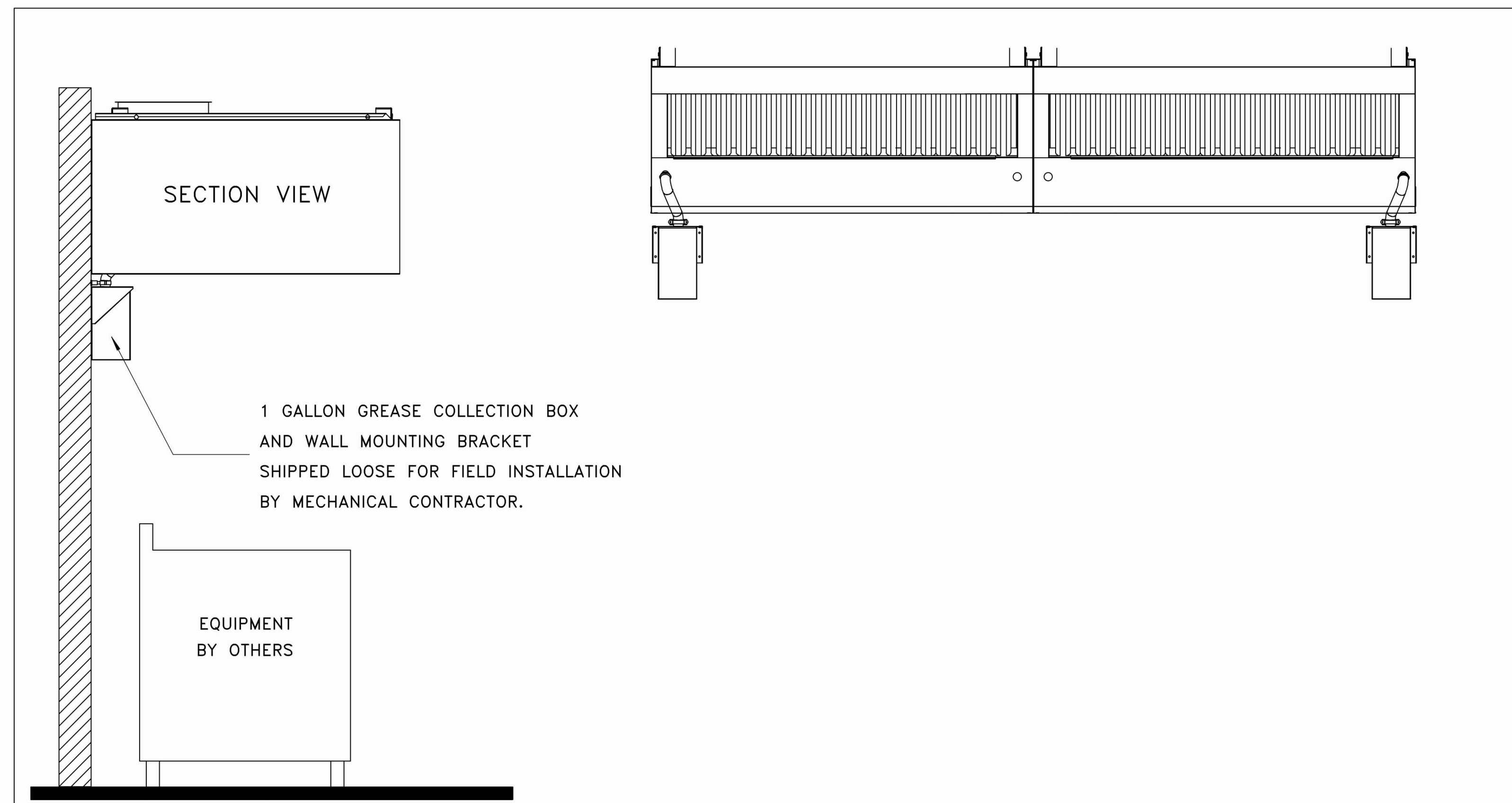
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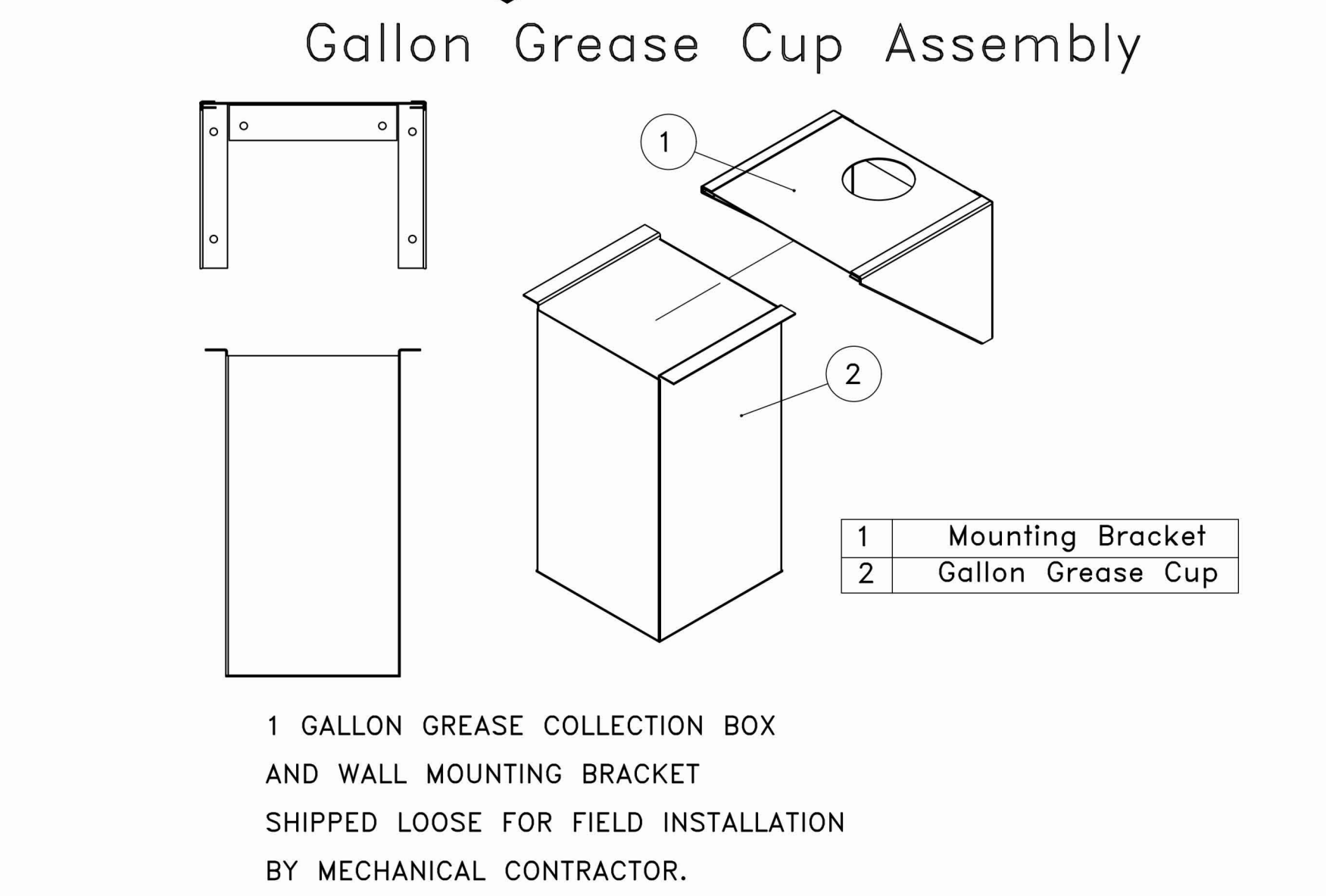
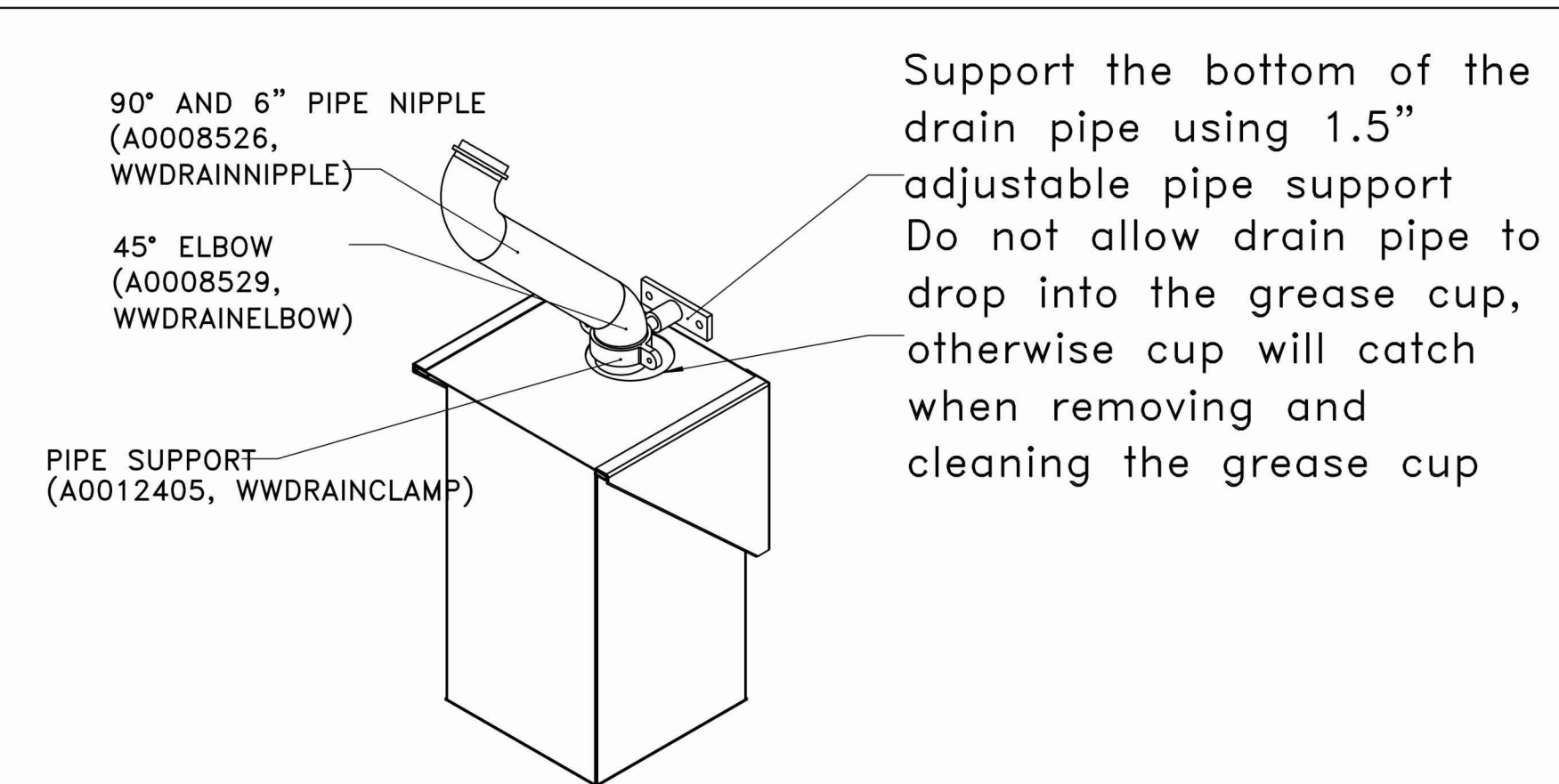
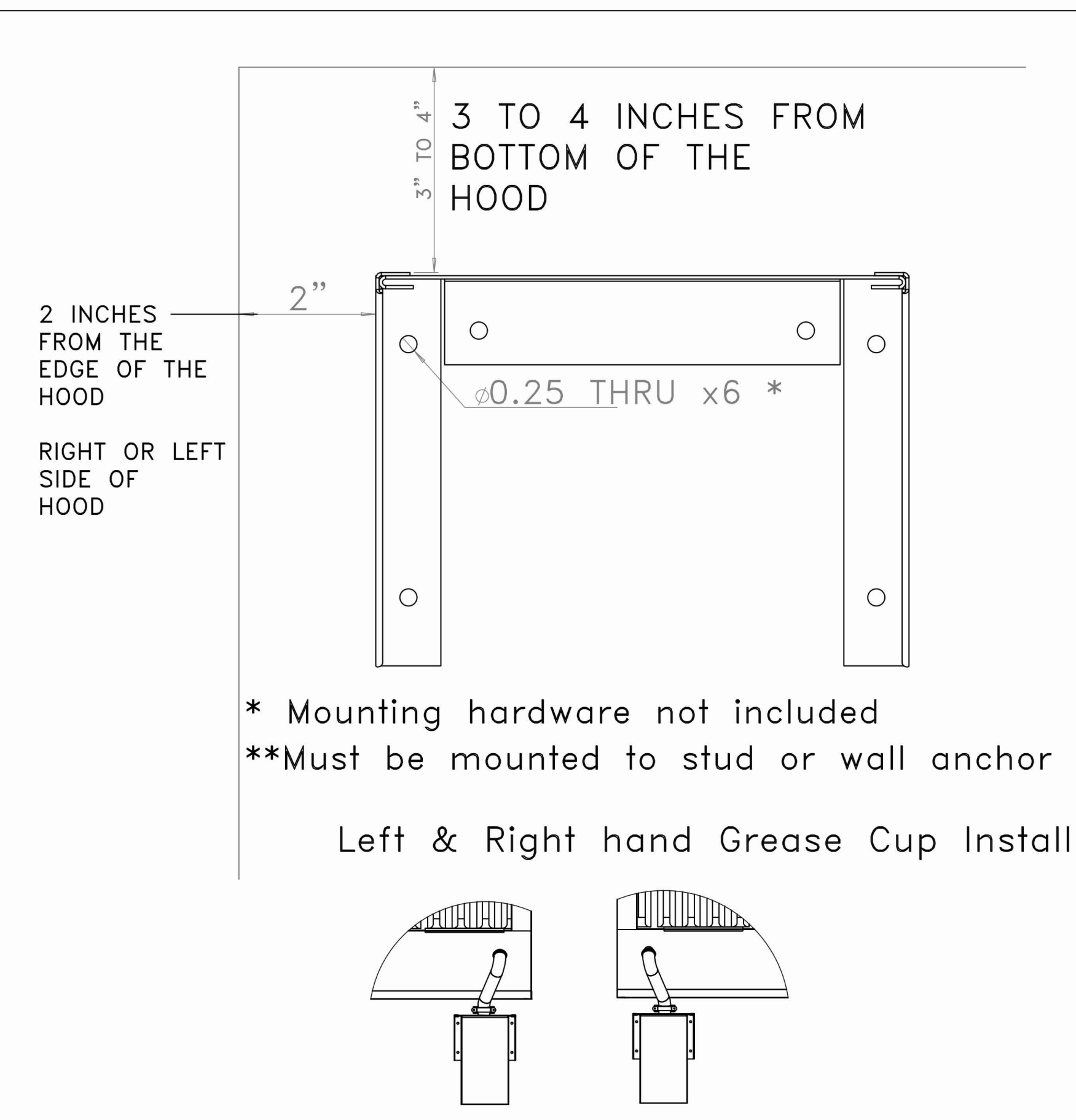
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Instructions below outline single, or dual, one gallon grease cup installation for ND-2 hood models.

The one gallon grease cup comes as an assembly of stainless steel wall mounting bracket and one gallon cup. The mounting bracket should be installed 2" from the edge of the containment plenum and 3"-4" below the bottom of the hood.

Piping from the hood grease drain should route to the opening of the grease cup, but not into the cup, otherwise the cup will not be able to be removed and emptied.



REVISIONS	
DESCRIPTION	DATE

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Shake Shack-1612-Mercato, FL (Kitchen)

DATE: 8/14/2024
DWG.#: 6980804
DRAWN BY: Joe.shilba
SCALE: 3/4" = 1'-0"
MASTER DRAWING

SHEET NO.
6

Seal

FOR REFERENCE ONLY

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Architect

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SHAKE SHACK
SHAKE SHACK #1612
(MERCATO) NAPLES, FL

Project Number 2450002080
Drawn By JS
Checked By N/A
Date 2/12/2025

Revisions
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DOAS/RTU FAN SCHEDULE - JOB#7003969

FAN INFORMATION										ELECTRICAL INFORMATION										COOLING INFORMATION										REHEAT INFORMATION										GAS HEAT INFORMATION										HEAT PUMP INFORMATION										NOTES
FAN UNIT NO.	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLT	MCA	MCCP	DB	WB	DB	WB	DP	TOTAL	SENS.	LEER	ISMRE	DISCHARGE DB	WB	CAPACITY DESIRED	MAX	MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE	ENTERING TEMP	MAX TEMP RISE	DISCHARGE TEMP	CCP																						
1	DOAS-1	1	CAS-HVAC3-1150-18-15T-DOAS	CAPTIVEAIRE	18P-3	0	2000	2000	2523	1.000	3.00	3	460	30.4A	35A	92.0°F	78.0°F	48.8°F	45.4°F	42.1°F	201.4 MBH	91.5 MBH	18.8	5.7	75.0°F	62.5°F	59.3 MBH	29.6 MBH	99.4 LBS/HR	NATURAL	114756	92952	41°F	7 IN. W.C. - 14 IN. W.C.	44.0°F	43.0°F	90.0°F	3.5	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20																					

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 Eastern PA Mechanical
 REGION 10B
 PHONE: (267) 504 - 4126
 EMAIL: reg10b@captivateair.com

FAN OPTIONS

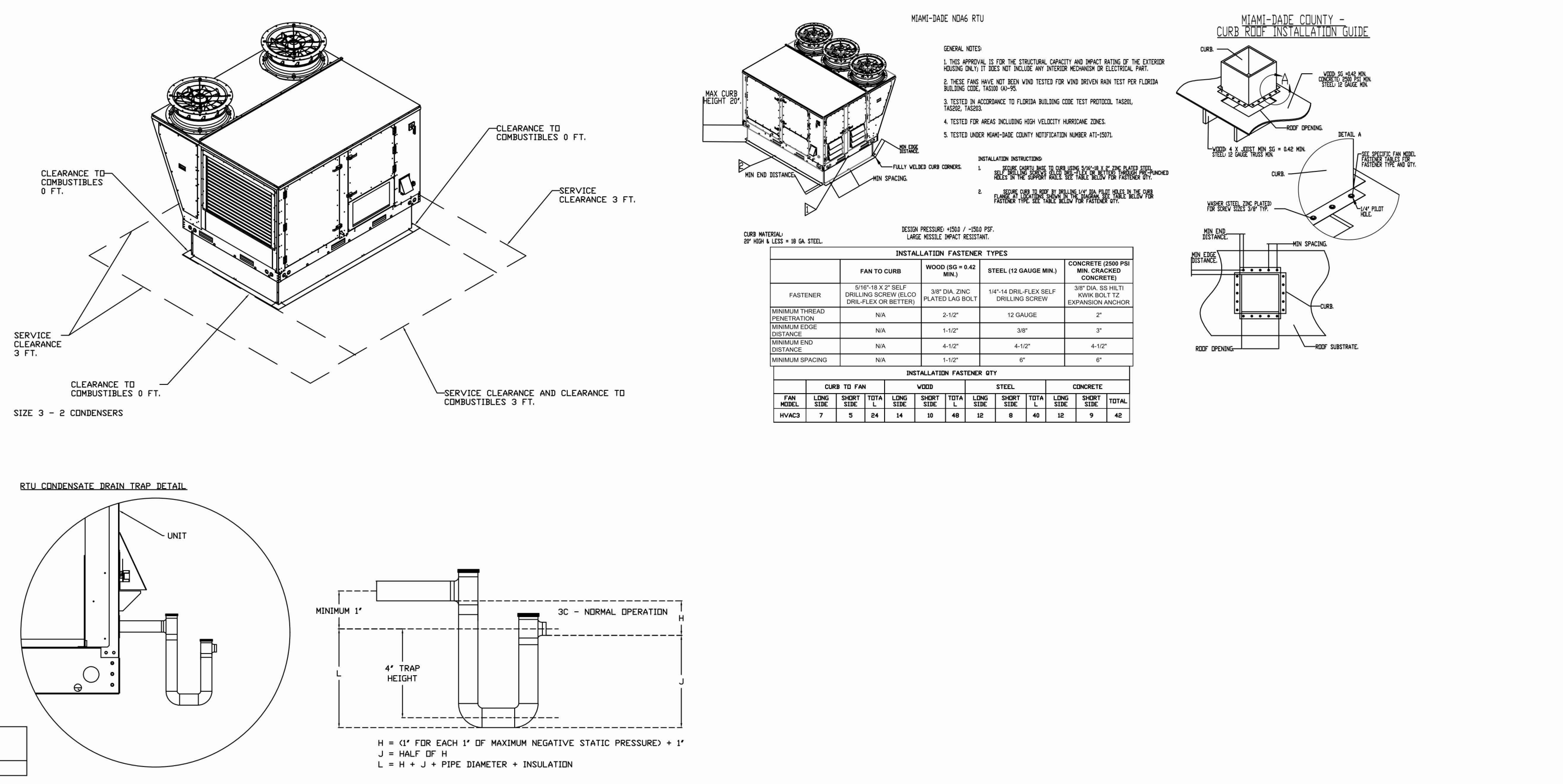
FAN UNIT NO.	TAG	QTY	DESCRIPTION	
1	DOAS-1	1	INLET PRESSURE GAUGE, 0-25"	
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" W.C. 1 FURNACE	
		1	TOTAL CFM MONITORING	
		1	INTAKE FIRESTAT SET TO 135°F	
		1	FREEZESTAT	
		1	DISCHARGE FIRESTAT SET TO 240°F	
		1	SHIP LOOSE GAS STRAINER 3/4"	
		SINGLE POINT ELECTRICAL CONNECTION FOR RTU, 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROL THIS UNIT, THE #02, #47, #44, OR #22 PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE.		
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED	
		1	8" MERV 13 FILTERS FOR RTU3 (QTY: 4)	
		1	8" MERV 8 FILTERS FOR RTU3 (QTY: 4)	
		1	OVERHEAT STAT	
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE	
		1	RTU FIXED 100% DA INTAKE CONTROL	
		1	RTU3 CURB DUCT HANGER	
		1	120V FIRE INPUT	
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK - ALARM SUPPLIED BY OTHERS	
		1	OCCUPIED SCHEDULING	
		1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI	
		1	RTU3 CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX	
		1	15 TON MODULATING COOLING OPTION WITH HEAT PUMP, 460/480V, R410A REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS	
		1	15 TON MODULATING REHEAT OPTION WITH HEAT PUMP - SPACE DEWPOINT CONTROL - R410A	
		1	RTU3 HAIL GUARD	
		1	RTU3 NO RETURN - 100% DA	
		1	VAV PACKAGE W/ MANUAL/BDC CONTROL (571 VFD INCLUDED)	
		1	LOAD REACTOR MOUNTED IN FAN	
		1	RTU3 SIDE DISCHARGE	
		1	ECODATING FOR RTU3 1ST CONDENSER COIL	
		1	ECODATING FOR RTU3 1ST REHEAT COIL	
		1	ECODATING FOR RTU3 1ST EVAP COIL	
1	LOW AMBIENT COOLING OPERATION - DOWN TO OF AMBIENT			
1	RTU3 MIAMI DADE CERTIFICATION			
5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIRE 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			

CURB ASSEMBLIES

NO.	DN	FAN	TAG	WEIGHT	ITEM	SIZE
1	#	1	DOAS-1	104 LBS	CURB	59.500"W X 91.000"L X 14.000"H INSULATED.

HMI SCHEDULE

UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #1	HMI #1 - UNIT	IN UNIT	NDT AVERAGED	55
FAN #1	HMI #2 - SPACE		AVERAGED	56



REVISIONS

NO.	DESCRIPTION	DATE
1		
2		

DATE: 11/11/2024
DWG.#: 7003969
DRAWN BY: Joe.shiiba
SCALE: 1/2" = 1'-0"
MASTER DRAWING

SHEET NO.
1

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Shake Shack-1612-Mercato, FL(HVAC)-R1
 NAPLES, FL, 34108

Seal

FOR REFERENCE ONLY

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 Architect

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SHAKE SHACK
 SHAKE SHACK #1612
 (MERCATO) NAPLES, FL

Project Number: 2450002080
 Drawn By: JS
 Checked By: N/A
 Date: 2/12/2025

Revisions

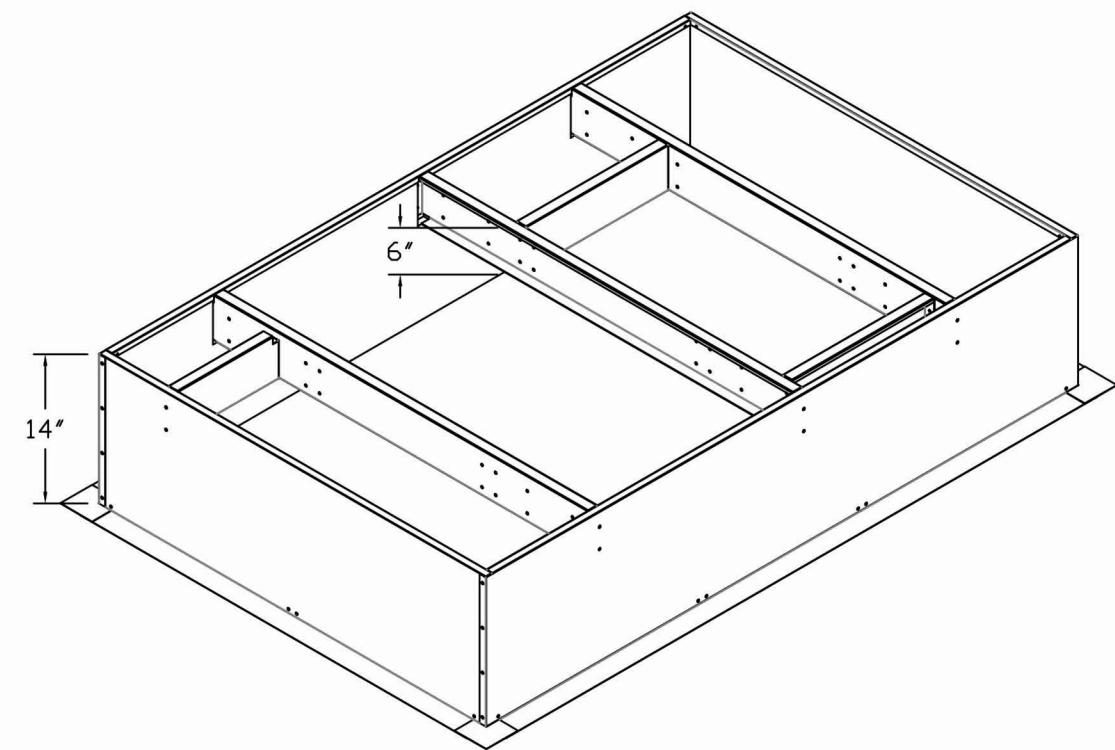
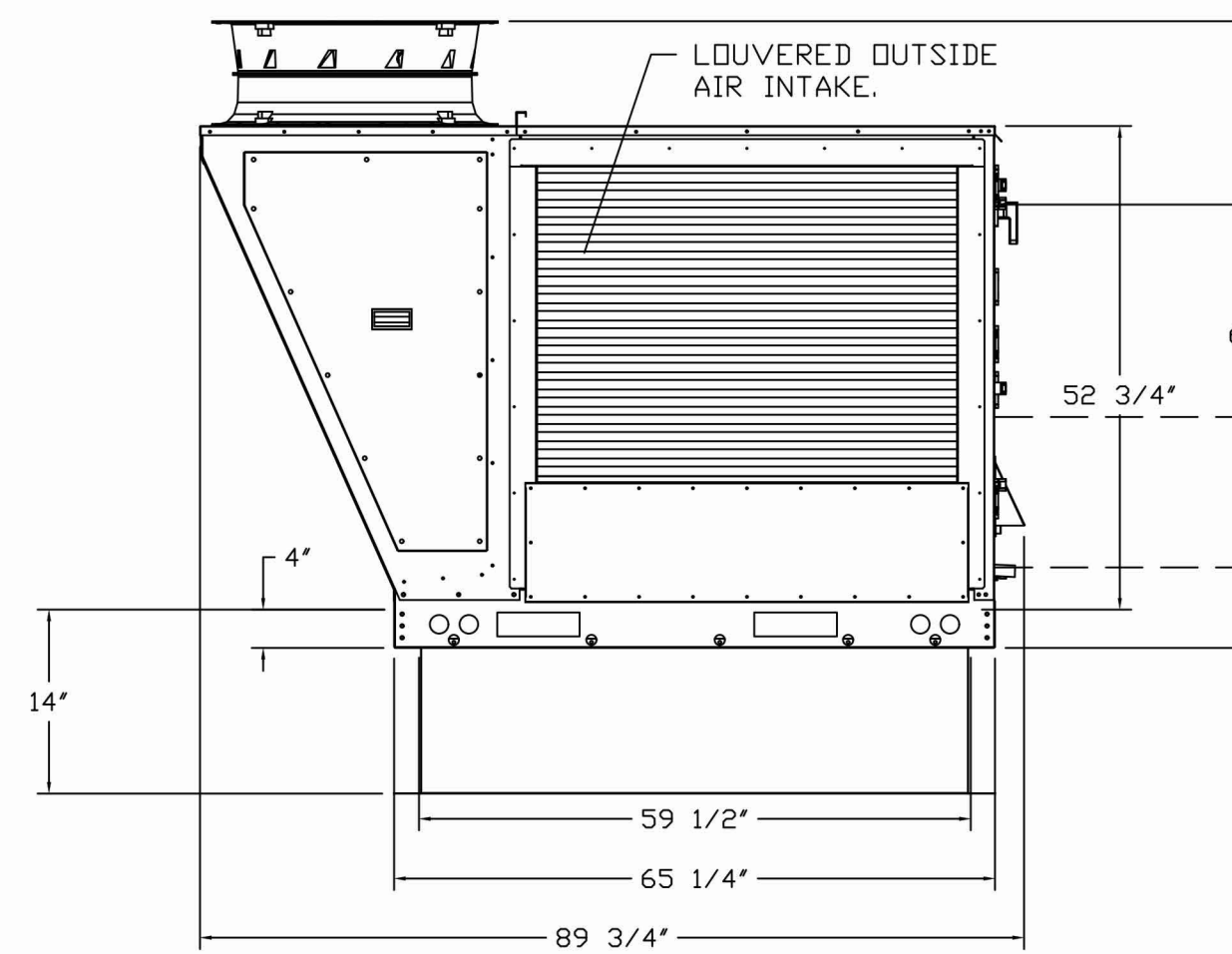
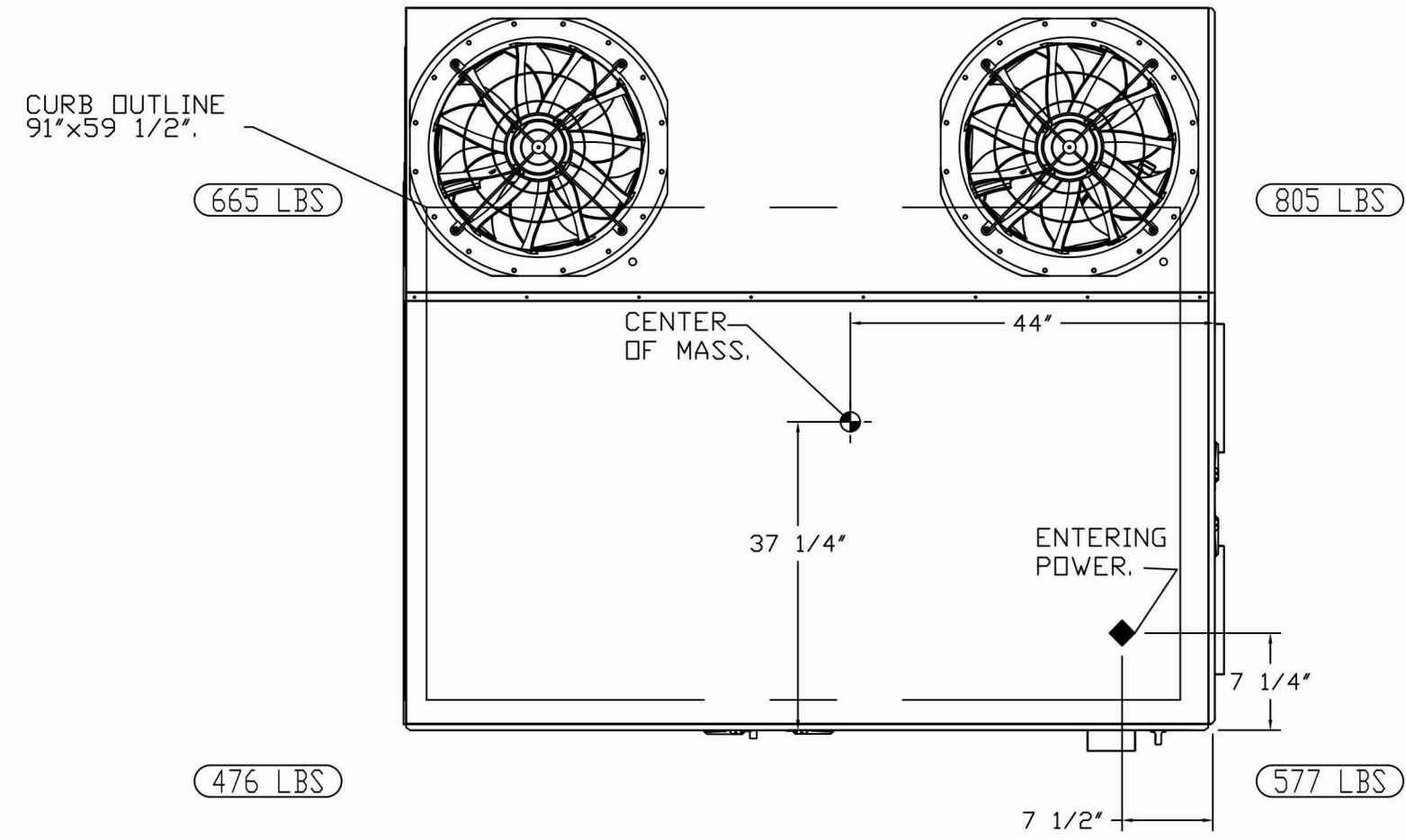
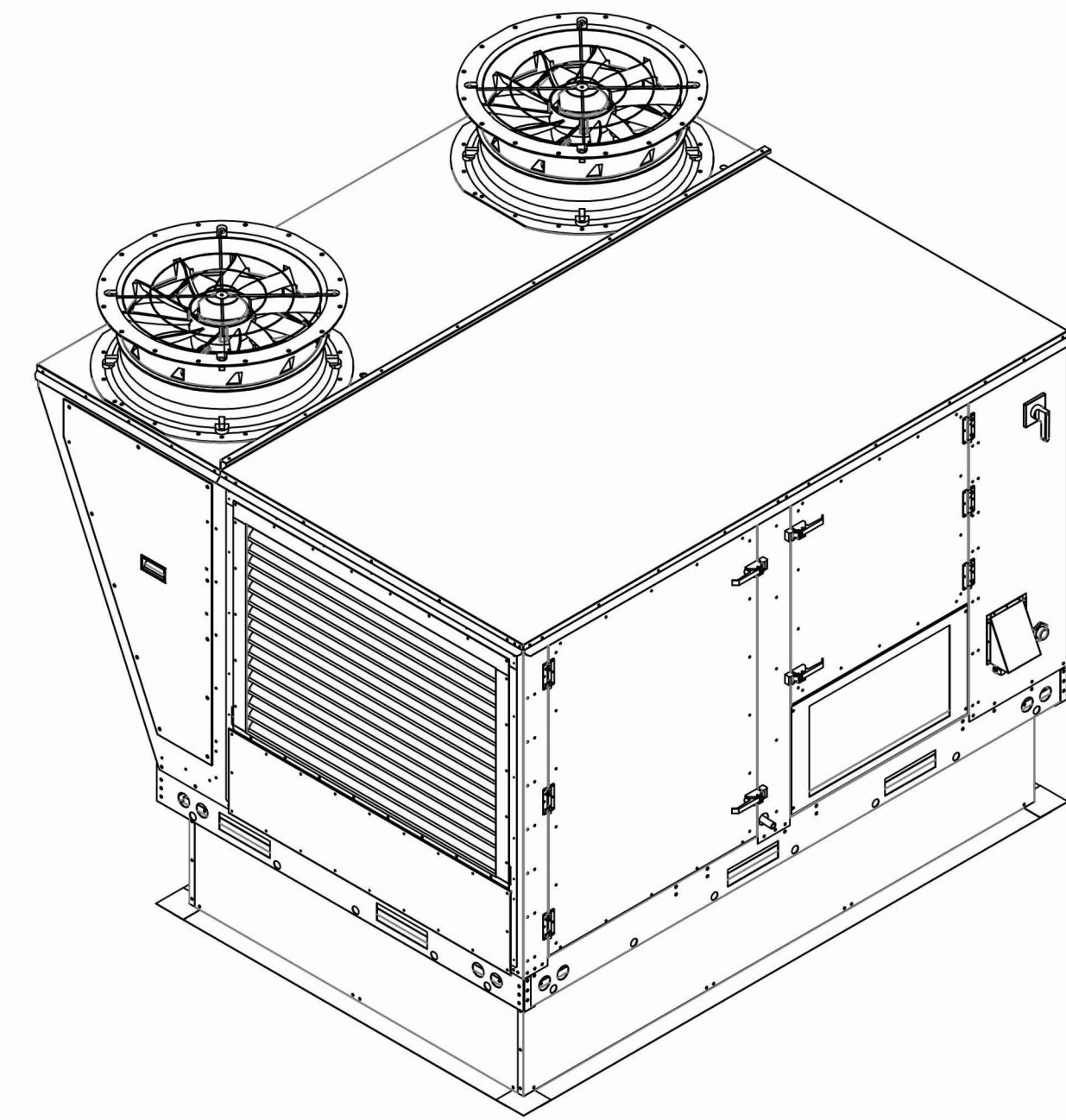
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MINIMUM STRAIGHT DUCT PER AMCA*

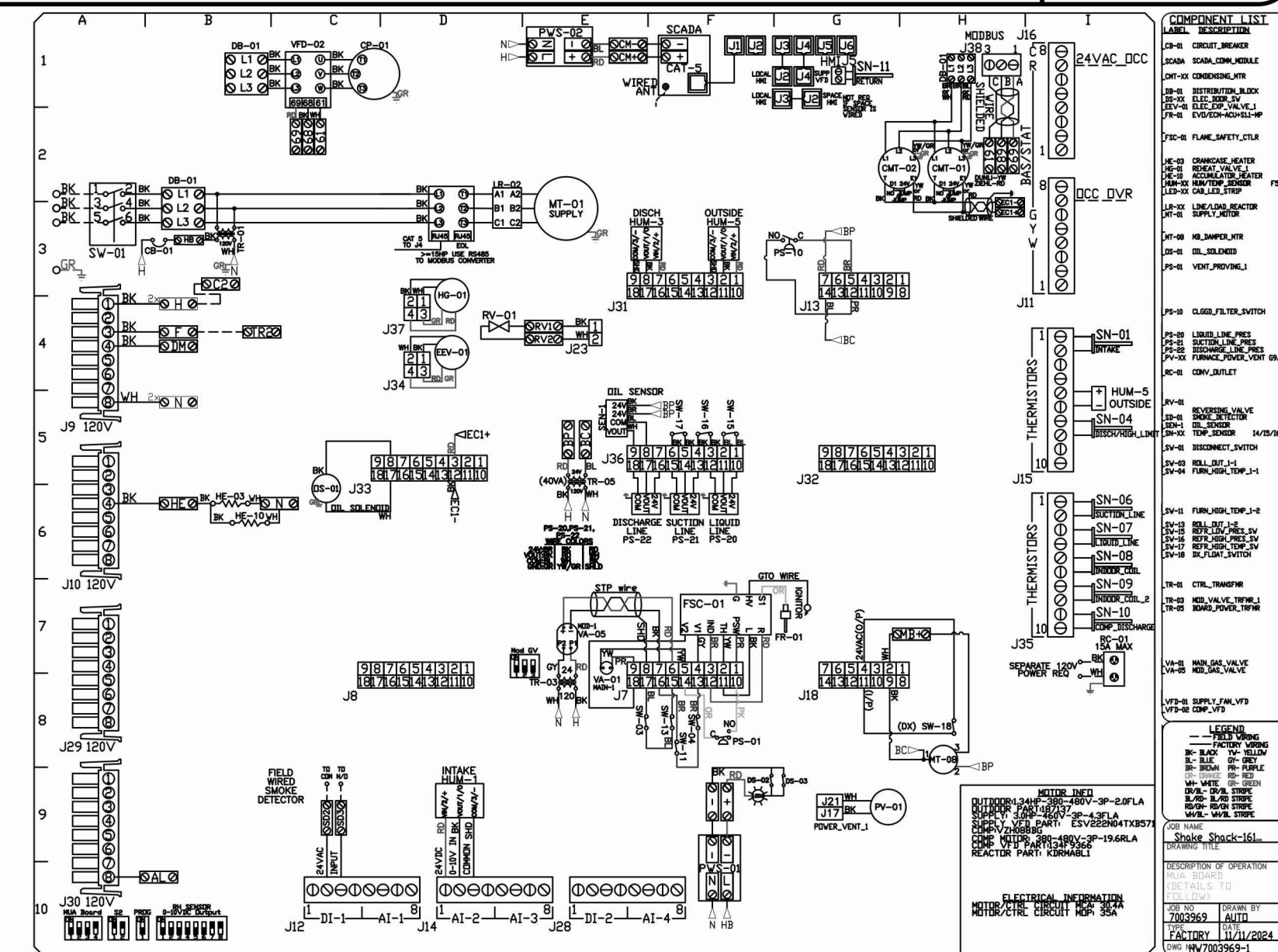
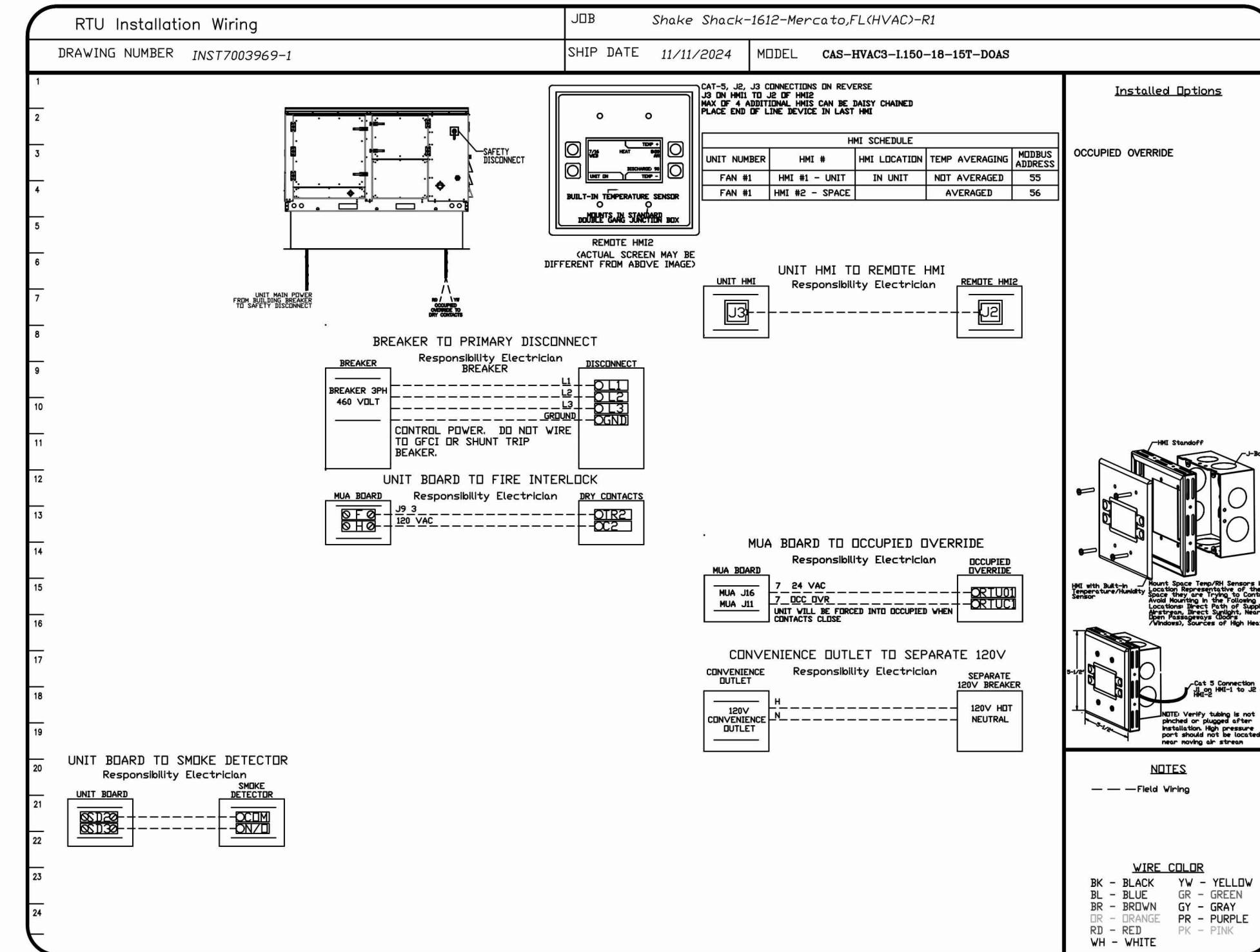
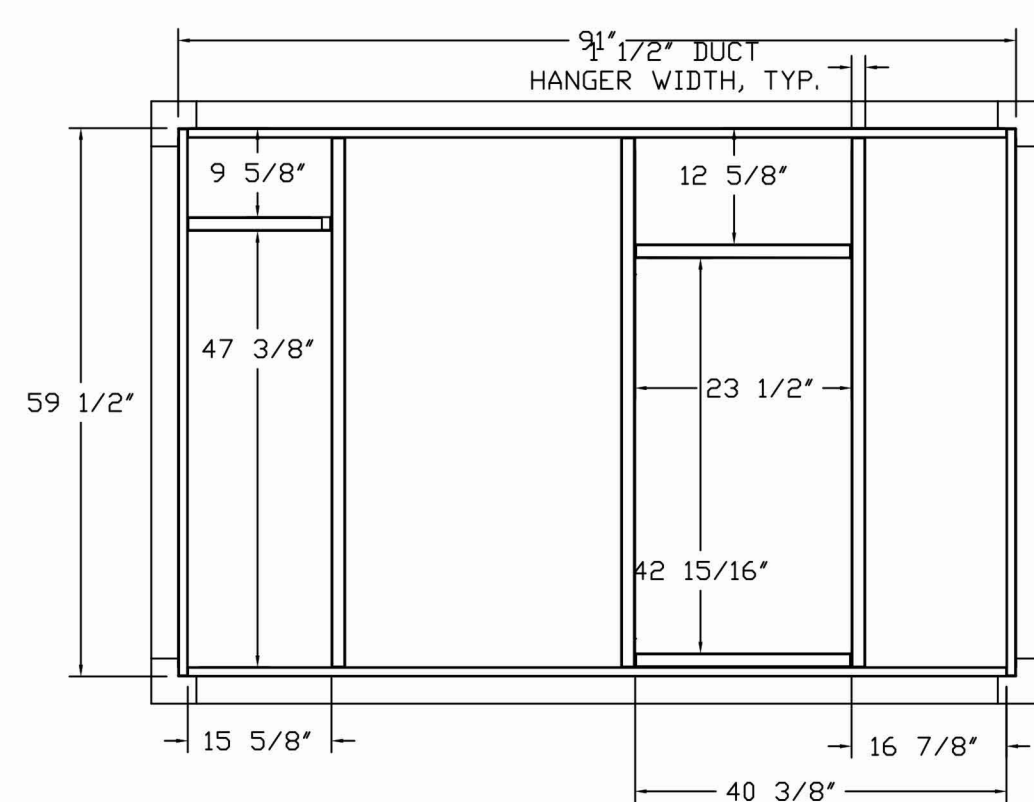
MIN. 14"

1" NPT SS EVAPORATOR DRAIN (TRAP REQ'D) 4" MINIMUM TRAP DEPTH.

FACTORY INSTALLED SAFETY DISCONNECT SWITCH.

DISCHARGE.

1" NPT GAS CONN.



FAN #1 CAS-HVAC3-I.150-18-15T-DDAS - HEATER (DDAS-1)

NOTES:

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

REVISIONS

NO.	DATE	DESCRIPTION
1		
2		
3		

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Shake Shack-1612-Mercato, FL(HVAC)-R1
NAPLES, FL, 34108

DATE: 11/11/2024

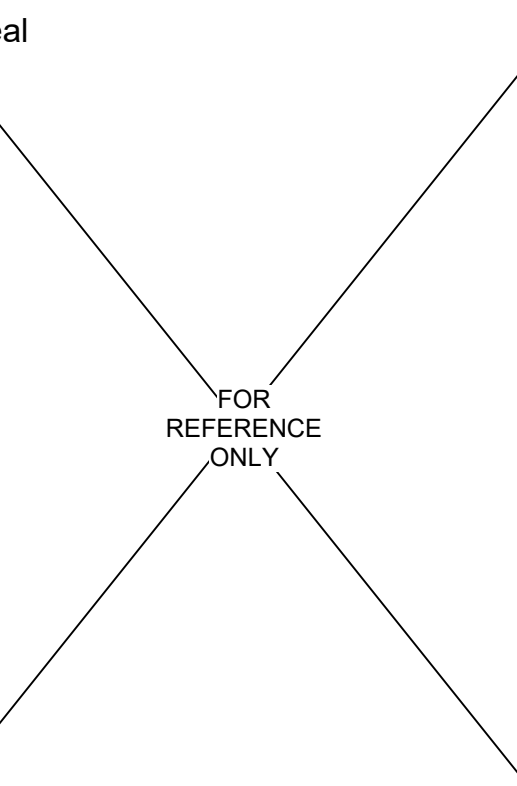
DWG.#: 7003969

DRAWN BY: Joe.shiiba

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SHEET NO. 2



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Project

SHAKE SHACK®
SHAKE SHACK #1612 (MERCATO) NAPLES, FL

Project Number 2450002080
Drawn By JS
Checked By N/A
Date 2/12/2025

Revisions
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