

## MECHANICAL SHEET INDEX

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## RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED			INSTALLED			REMARKS
	GC	OWNER	LL	GC	OWNER	LL	
<b>DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING</b>							
<b>23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION</b>							
HVAC DUCTWORK SYSTEM IDENTIFICATION	*			*			
PIPING SYSTEM IDENTIFICATION	*			*			
UTILITY SHUT OFF IDENTIFICATION IN KITCHEN	*			*			
VALVE TAGS AND CHART	*			*			
HVAC DAMPER IDENTIFICATION	*			*			
<b>23.2 ROOF CURBS</b>							
EXHAUST FAN CURBS							
ROOFTOP UNIT CURBS							
CONDENSING UNIT CURBS							
KITCHEN EXHAUST FAN CURBS							
<b>23.3 HVAC DUCTWORK SYSTEM COMPONENTS</b>							
HVAC DUCTWORK	*			*			
GREASE DUCTWORK	*			*			
OUTSIDE AIR DUCTWORK	*			*			
SUPPLY AND RETURN AIR DUCTWORK	*			*			
RESTROOM EXHAUST AIR DUCTWORK	*			*			
INSULATION AND FIRE WRAP	*			*			
<b>23.4 MECHANICAL PIPING SYSTEM COMPONENTS</b>							
WALK-IN COOLER AND FREEZER CONDENSER REFRIGERANT LINE...	*	*		*	*		
REFRIGERANT PIPING FOR HVAC EQUIPMENT	*			*			
VALVES AND ACCESSORIES (E.G. AIR VENTS)	*			*			
<b>23.5 HVAC EQUIPMENT</b>							
RESTROOM EXHAUST FAN							
KITCHEN EXHAUST FAN WITH CURB EXTENSION							
DUCTED AND NON-DUCTED HEATING AND COOLING UNITS		*			*		
WALK-IN COOLER AND FREEZER CONDENSING UNITS		*			*		
<b>23.6 KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM</b>							
HOOD CONTROL PANEL	*			*			
REMOTE HOOD SWITCHES IN OFFICE	*			*			
KITCHEN EXHAUST HOOD	*			*			
STRUCTURAL SUPPORT	*			*			
ELECTRICAL AND CONTROL WIRING	*			*			
TANK SYSTEM	*			*			
TANK SYSTEM WIRING AND UTILITIES CONNECTION	*	*		*	*		
TANK SYSTEM GAS VALVE	*			*			
PULL STATION	*			*			
<b>23.7 MECHANICAL SAFETY SENSORS</b>							
CO MONITOR	*			*			
<b>23.8 COMMISSIONING ACTIVITIES</b>							
GREASE EXHAUST WATER LEAKAGE TEST	*			*			
TEST AND BALANCE (TAB) REPORT	*			*			
<b>GENERAL NOTES:</b>							
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.							
<b>REMARKS:</b>							
1. WALK-IN COOLER AND FREEZER CONDENSING UNITS FURNISHED AND INSTALLED BY OWNER VENDOR.							
2. GENERAL CONTRACTOR TO COORDINATE TANK INSTALLATION TIME WITH OWNER VENDOR AND FACILITATE SYSTEM SIGN-OFF.							

## SPECIAL INSPECTIONS

- VENTILATION AND AIR DISTRIBUTION SYSTEM
- SHUTOFF DAMPERS
- DUCT LEAKAGE TESTING, ISULATION AND DESING

## 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.
- 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. COORDINATE INSTALLATION OF DUCTWORK AND PIPING 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.
- 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 U.L. 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 REBURSED 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 AROUND 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.
- 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

STANDARD MOUNTING HEIGHT		HVAC DUCTWORK AND ACCESSORIES		PIPING SYMBOLS	
THERMOSTATS (USER ADJUSTABLE)(TOP OF DEVICE) 48"		LINEAR SLOT DIFFUSER		DIRECTION OF FLOW	
CONTROLS (TOP OF DEVICE) 48"		INSULATED FLEXIBLE DUCT (MAX. 5'-0" LONG)		CONTROL VALVE	
INSTALL DEVICES AT THE MOUNTING HEIGHTS SHOWN ABOVE UNO IN THE CONSTRUCTION DOCUMENTS. MOUNTING HEIGHTS LISTED ABOVE OR ELSEWHERE IN THE CONSTRUCTION DOCUMENTS ARE AFF OR AFG TO BOTTOM OF DEVICE UNO. ALL DEVICES SHALL BE INSTALLED IN COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS.		BRANCH DUCT WITH 45° RECTANGLE-ROUND BRANCH FITTING AND MANUAL VOLUME DAMPER		THREE-WAY CONTROL VALVE	
ANNOTATION		ELBOW WITH TURNING VANES		SHUTOFF VALVE	
MECHANICAL PLAN NOTE CALLOUT		BRANCH DUCT WITH BELL-MOUTH FITTING & MANUAL VOLUME CONTROL DAMPER		CHECK VALVE	
MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)		RETURN, EXHAUST, OR OUTSIDE AIR DUCT UP		BALANCING VALVE WITH PRESSURE PORTS	
CONNECTION POINT OF NEW WORK TO EXISTING		RETURN, EXHAUST, OR OUTSIDE AIR DUCT DOWN		TRIPLE DUTY VALVE WITH PRESSURE PORTS	
DETAIL REFERENCE. UPPER NUMBER INDICATES DETAIL NUMBER LOWER NUMBER INDICATES SHEET NUMBER		SUPPLY AIR DUCT UP		STRAINER	
SECTION CUT DESIGNATION		SUPPLY AIR DUCT DOWN		STRAINER WITH BLOWDOWN VALVE	
ABBREVIATIONS		EQUIPMENT WITH FLEXIBLE DUCT CONNECTION		RELIEF / SAFETY VALVE	
A/C AIR CONDITIONING	HWP HEATING WATER PUMP	10" (NECK SIZE) INCHES OF WATER		SOLENOID VALVE	
ACC AIR COOLED CHILLER	IN WC AIR COOLED WATER UNIT	300 CFM (CFM OF SUPPLY DIFFUSER OR REGISTER)		PRESSURE REDUCING VALVE	
AFU ABOVE FINISHED FLOOR	L LOUVER	24x24 (NECK SIZE) CEQ-1 (TYPE)		GAS PRESSURE REGULATOR	
AFG ABOVE FINISHED GRADE	LAT LEAVING AIR TEMPERATURE	800 CFM (CFM OF EXHAUST GRILLE)		THERMOSTATIC MIXING VALVE	
AHJ AUTHORITY HAVING JURISDICTION	LDB LEAVING DRY BULB LOW PRESSURE	MANUAL VOLUME DAMPER		PIPE ANCHOR	
AHU AIR HANDLING UNIT	LWB LEAVING WET BULB LEAVING WATER TEMPERATURE	SQUARE TO ROUND TRANSITION		EXPANSION JOINT	
AI ANALOG INPUT	LWT LEAVING WATER TEMPERATURE	DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RD=RETURN)		PIPE GUIDE	
AD ANALOG OUTPUT	MAU MAKE-UP AIR UNIT MAXIMUM	ROUND DUCT TAG INDICATING DIAMETER		PIPING SUPPORT	
AP ACCESS PANEL	MBH 1000 BTU PER HOUR	RECTANGULAR DUCT TAG INDICATING INTERNAL DUCT DIMENSIONS.		F & T TRAP	
APD AIR PRESSURE DROP	MD MOTORIZED DAMPER MANUFACTURER	FLAT OVAL DUCT TAG INDICATING INTERNAL DUCT DIMENSIONS		BUCKET TRAP	
AWG AMERICAN WIRE GAUGE	MIN MINIMUM	RISER DESIGNATION		THERMOSTATIC TRAP	
B BOILER	N/A NOT APPLICABLE	FIRE DAMPER		PRESSURE GAUGE	
BAS BUILDING AUTOMATION SYSTEM	N/C NORMALLY CLOSED	FIRE SMOKE DAMPER		THERMOMETER	
BB BACKBONE	NO NORMALLY OPEN	SMOKE DAMPER		PRESSURE AND TEMPERATURE TEST PLUG	
BD BACKDRAFT DAMPER	NOM NOMINAL	VOLUME DAMPER		UNION	
BDW BLOWDOWN	NC NOISE CRITERIA	MOTORIZED DAMPER		FLANGE CONNECTION	
BFC BELOW FINISHED CEILING	NF NOT IN CONTRACT	SMOKE DAMPER		VACUUM RELIEF VALVE	
BFF BELOW FINISHED FLOOR	OA OUTSIDE AIR	VOLUME DAMPER		AUTOMATIC AIR VENT	
BFG BELOW FINISHED GRADE	PICV PRESSURE INDEP. CONTROL VALVE	MOTORIZED DAMPER		MANUAL AIR VENT	
BFP BOILER FEED PUMP	QTY QUANTITY	SMOKE DAMPER		PRESSURE / VACUUM SWITCH	
BHP BRAKE HORSEPOWER	RA RETURN AIR ROOM CRITERIA	VOLUME DAMPER		CLEANOUT	
BI BINARY INPUT	RD RETURN DUCT RELIEF AIR	SMOKE DAMPER		CAP	
BO BINARY OUTPUT	REA RETURN FAN REFRIGERANT	SMOKE DAMPER		ELBOW UP	
BOD BOTTOM OF DUCT	RFR REFRIGERANT RELATIVE HUMIDITY	SMOKE DAMPER		ELBOW DOWN	
BOS BOTTOM OF STRUCTURE	RH ROOF HOOD REVOLUTIONS PER MINUTE	SMOKE DAMPER		TEE UP	
BTU BRITISH THERMAL UNIT	RTU ROOFTOP UNIT SUPPLY AIR	SMOKE DAMPER		TEE DOWN	
CFM CUBIC FEET PER MINUTE	SA STEAM CONDENSATE PUMP SMOKE DETECTOR	SMOKE DAMPER		ELBOW UP WITH SHUT-OFF VALVE (SOV)	
CH CHILLER	SD SUPPLY DUCT SUPPLY FAN	SMOKE DAMPER		ELBOW DOWN WITH SHUT-OFF VALVE (SOV)	
CLG COOLING	SE SENSIBLE HEAT CAPACITY SCOPE OF WORK	SMOKE DAMPER		TEE UP WITH SHUT-OFF VALVE (SOV)	
CO CLEANOUT	SH SHOCK PRESSURE STEAM TRAP	SMOKE DAMPER		TEE DOWN WITH SHUT-OFF VALVE (SOV)	
CP CONDENSATE PUMP CONTROL POWER	SI STATIC PRESSURE	SMOKE DAMPER		REDUCER	
CRAC COMPUTER ROOM AIR CONDITIONING UNIT	SP STATIC PRESSURE	SMOKE DAMPER		RECIRCULATION PUMP	
CRU COMPUTER ROOM UNIT COOLING TOWER	STM STEAM	SMOKE DAMPER		P-TRAP	
CV CONTROL VALVE	TBD TO BE DETERMINED	SMOKE DAMPER		GAS COCK	
CWP CONDENSER WATER PUMP	TCG TO FLOOR ABOVE TO FLOOR BELOW	SMOKE DAMPER		TOP BEAM CLAMP	
CJ CONDENSING UNIT	TCF TO FLOOR ABOVE TO FLOOR BELOW	SMOKE DAMPER		TRAPEZE HANGER	
CHWP CHILLED WATER PUMP	TF TRANSFER FAN TO FLOOR ABOVE TO FLOOR BELOW	SMOKE DAMPER		FLEXIBLE CONNECTION	
DB DECIBELS	TFB TO FLOOR ABOVE TO FLOOR BELOW	SMOKE DAMPER			
DBA DECIBEL AVERAGE	TH TOTAL HEAT CAPACITY TEMPERATURE	SMOKE DAMPER			
DDC DIRECT DIGITAL CONTROL	TT TEMPERATURE TRANSMITTAL	SMOKE DAMPER			
DI DIGITAL INPUT	UH UNDERFLOOR UNDERGROUND	SMOKE DAMPER			
DISC DISCONNECT	UIS UNDERSLAB UNIT HEATER	SMOKE DAMPER			
DN DOWN	UNO UNLESS NOTED OTHERWISE	SMOKE DAMPER			
DS DUCT SILENCER	VAV VARIABLE AIR VOLUME VELOCITY	SMOKE DAMPER			
DX DIRECT EXPANSION	VFD VARIABLE FREQUENCY DRIVE	SMOKE DAMPER			
(E) EXISTING	VRF VARIABLE REFRIGERANT FLOW	SMOKE DAMPER			
EA EXHAUST AIR ENTERING	VRV VARIABLE REFRIGERANT VOLUME	SMOKE DAMPER			
EAT ENTERING AIR TEMPERATURE	W/ WITH	SMOKE DAMPER			
EDB EXHAUST DUCT ENTERING DRY BULB TEMPERATURE	WO WITHOUT	SMOKE DAMPER			
EF EFFICIENCY	WB WET BULB	SMOKE DAMPER			
EMS ENERGY MANAGEMENT SYSTEM	WC WATER COLUMN	SMOKE DAMPER			
ESP EXTERNAL STATIC PRESSURE	WPD WATER PRESSURE DROP	SMOKE DAMPER			
ETR EXISTING TO REMAIN	XP EXPLSION PROOF	SMOKE DAMPER			
EWB ENTERING WET BULB TEMPERATURE		SMOKE DAMPER			
EWT ENTERING WATER TEMPERATURE		SMOKE DAMPER			
FCU FAN COIL UNIT		SMOKE DAMPER			
FFA FROM FLOOR ABOVE FINISHED FLOOR		SMOKE DAMPER			
FFB FROM FLOOR BELOW FINISHED FLOOR		SMOKE DAMPER			
FFI FINS PER INCH		SMOKE DAMPER			
FFM FEET PER MINUTE		SMOKE DAMPER			
GC GENERAL CONTRACTOR		SMOKE DAMPER			
GPM GALLONS PER MINUTE		SMOKE DAMPER			
HDA HAND-OFF-AUTOMATIC HORSEPOWER		SMOKE DAMPER			
HTG HEATING		SMOKE DAMPER			
HVAC CONTROL DEVICES		SMOKE DAMPER			
① HUMIDISTAT		SMOKE DAMPER			
② THERMOSTAT		SMOKE DAMPER			
CO CARBON MONOXIDE SENSOR		SMOKE DAMPER			
CO2 CARBON DIOXIDE SENSOR		SMOKE DAMPER			
DP DIFFERENTIAL PRESSURE SENSOR		SMOKE DAMPER			
FS FLOW SWITCH		SMOKE DAMPER			
HS HUMIDITY SENSOR		SMOKE DAMPER			
PS PULL STATION		SMOKE DAMPER			
RT REMOTE TESTING STATION WITH INDICATING LIGHT		SMOKE DAMPER			
SP STATIC PRESSURE		SMOKE DAMPER			
SW SWITCH		SMOKE DAMPER			
TS TEMPERATURE SENSOR		SMOKE DAMPER			

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TEL 480.448.6250  
WWW.SARGARCH.COM



CONSULTANTS:



SEAL SIGNATURE:



NO.	BY	DATE	DESCRIPTION
3		2025-09-10	BUILDING COMMENTS
		2025-05-05	PERMIT SET
		2025-04-14	75% SET

SHAKE SHACK SUN VET



SHAKE SHACK SUN VET

5801 SUNRISE HWY. SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

MECHANICAL GENERAL INFORMATION

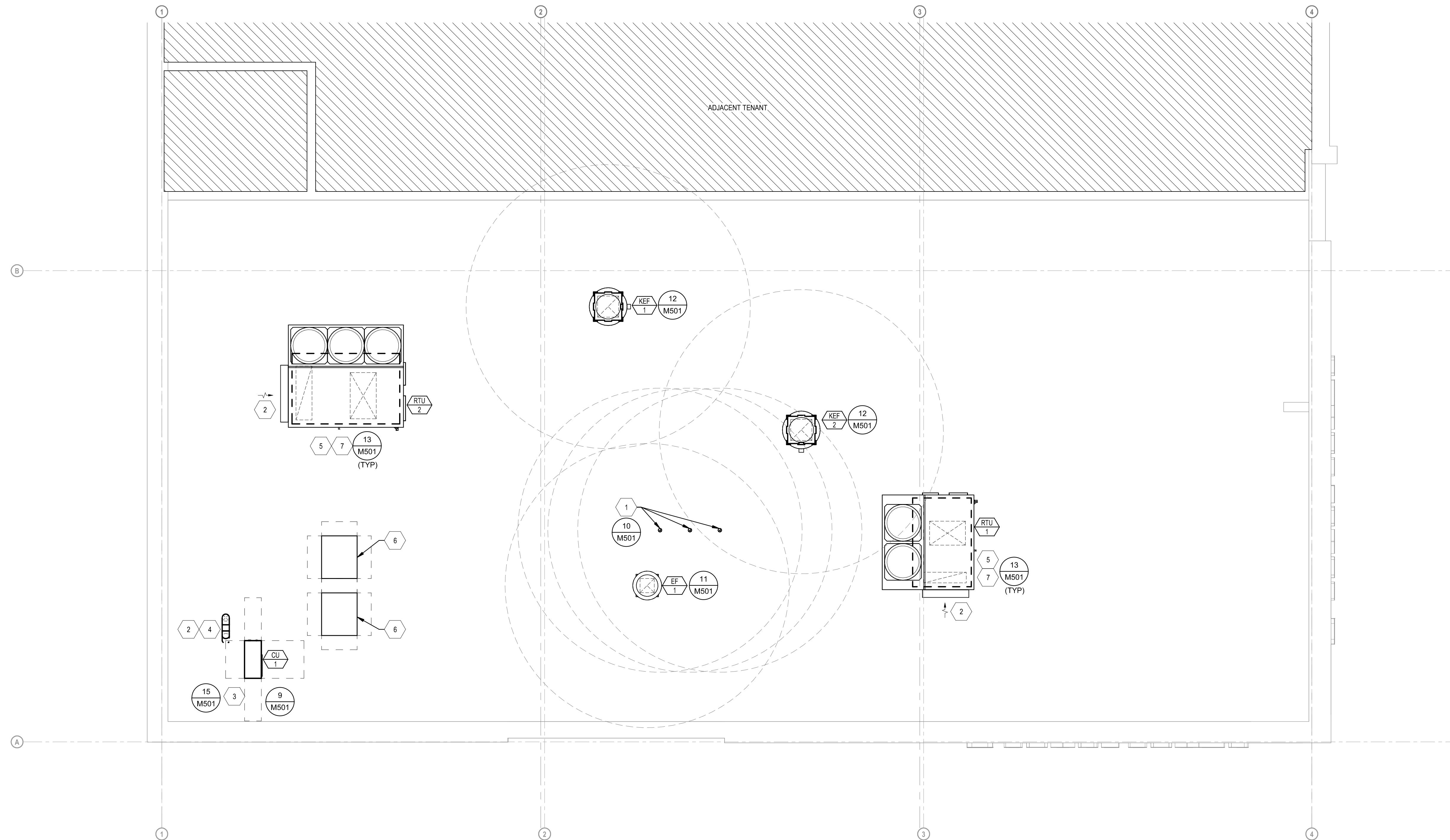
DRAWN BY: BK

CHECKED BY: JE

PROJECT NO: 12426-25

M001

MECHANICAL ROOF PLAN NOTES:	
1	PROVIDE CONCENTRIC VENT MODEL NUMBER PVC-3CT.
2	MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST AND PLUMBING VENT. TYPICAL.
3	CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. SINGLE LINESET SHOWN FOR CLARITY. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
4	OUTSIDE AIR DUCT FROM FCU-1. TURN DOWN 6"Ø INTAKE AND END OPEN OVER ROOF (MIN. 24") WITH INSECT SCREEN.
5	CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-PHI INDOOR AIR PURIFICATION SYSTEM. MODEL PHH-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.
6	AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR. COORDINATE EQUIPMENT LOCATION AND CONDENSER INSTALLATION WITH KITCHEN EQUIPMENT CONTRACTOR.
7	REFERENCE PLUMBING DRAWINGS FOR CONDENSATE DRAIN ROUTING AND TERMINATION REQUIREMENTS.



M150 - MECHANICAL ROOF PLAN

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

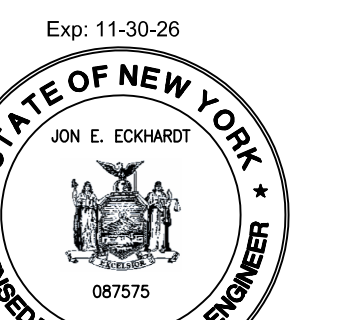
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5310 E HIGH STREET SUITE 350  
 PHOENIX, AZ 85054  
 T 480.448.6250  
 WWW.SARGARCH.COM



CONSULTANTS:

SEAL SIGNATURE:



Jon Eckhardt

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

5801 SUNRISE HWY. SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

PERMIT SET

MECHANICAL ROOF PLAN

DRAWN BY: BK  
 CHECKED BY: JE  
 PROJECT NO: 12428-25

M150

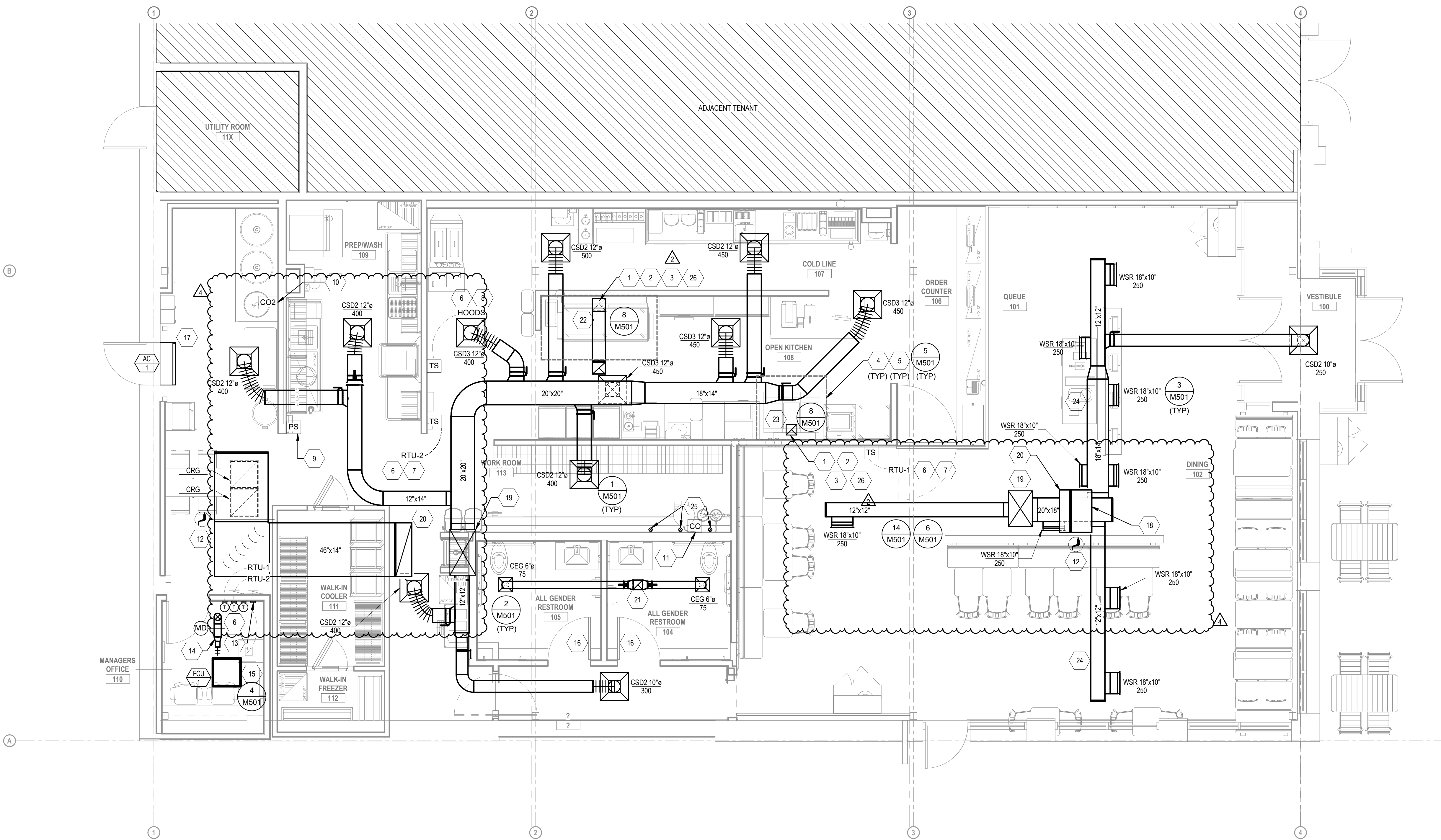


CONSULTANTS:

SEAL SIGNATURE:



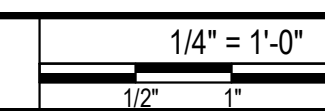
Jon Eckhardt



**MECHANICAL PLAN NOTES:**

- 1 TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 16 GAUGE STEEL OR MINIMUM 18 GAUGE STAINLESS STEEL WITH LIQUID TIGHT WELDS.
- 2 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 A UL APPROVED GREASE DUCT WRAP SYSTEM.
- 3 INSTALL "DUCTMATE ULTIMATE DOOR" ON DUCTS 12" OR LARGER AND INSTALL "DUCTMATE F2 SANDWICH ACCESS DOOR" FOR DUCTS LESS THAN 12" ON GREASE DUCT FOR CLEANING IN LOCATION SHOWN AT A MINIMUM AND AS REQUIRED BY NFPA 96 AND LOCAL CODES.
- 4 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.
- 5 HOOD SHALL OVERHANG THE COOKING SURFACE BY AT LEAST 6" ON BOTH SIDES.
- 6 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 PANEL BOARD SERVING THE EQUIPMENT. COORDINATE COLOR WITH ARCHITECT. TEMPERATURE SENSOR SHALL BE CAPABLE OF DEMAND RESPONSE.
- 7 COMBINATION TEMPERATURE SENSOR AND HUMIDITY SENSOR.
- 8 MOUNT TEMPERATURE SENSOR PROVIDED WITH KITCHEN EXHAUST HOODS ON WALL.
- 9 INSTALL HOOD FIRE SUPPRESSION MANUAL PULL STATION. COORDINATE EXACT LOCATION AND SYSTEM INSTALLER AND THE AUTHORITY HAVING JURISDICTION.
- 10 PROVIDE ANALOX AX60 OR APPROVED EQUAL CARBON DIOXIDE SENSOR WITH REMOTE ALARM REPEATER TO BE MOUNTED AT 12" AFF. PROVIDE CARBON DIOXIDE SENSOR WITH RELAY. RELAY SHALL BE INTERLOCKED WITH THE BUILDING FIRE ALARM SYSTEM. THE SENSOR SHALL BE EQUIPPED WITH A LOCAL AUDIBLE AND VISUAL ALARM. THE LOW LEVEL ALARM SHALL ACTIVATE THE LOCAL AUDIBLE AND VISUAL ALARM. THE HIGH LEVEL ALARM SHALL ACTIVATE RELAY. INSTALL SENSOR PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. LOW LEVEL ALARM - 0.5% = 5,000 PPM HIGH LEVEL ALARM - 3.0% = 30,000 PPM
- 11 CARBON MONOXIDE DETECTOR FURNISHED BY OWNER. INSTALL AT 5'-0" AFF. COORDINATE FINAL LOCATION WITH OWNER REPRESENTATIVE.
- 12 INSTALL DUCT SMOKE DETECTOR IN RETURN AIR PLENUM.
- 13 INSTALL EMERGENCY ALARM IN MANAGER'S OFFICE TO INDICATE CARBON MONOXIDE AND CARBON DIOXIDE DETECTION IN MECHANICAL ROOM. PROVIDE LIGHT IN OFFICE WITH TAG FOR EACH ALARM.
- 14 TRANSITION 6" OUTDOOR AIR DUCT TO 4" FLEXIBLE DUCTWORK AND CONNECT TO UNIT.
- 15 REFRIGERANT PIPING UP TO CU-1 ON ROOF, REF 1M150.
- 16 CONTRACTOR TO COORDINATE 1" UNDERCUT ON DOOR FOR EXHAUST AIR PATH.
- 17 AIR CURTAIN MOUNTED ABOVE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- 18 PROVIDE 1/4" GALVANIZED CONSTRUCTION HARDWARE CLOTH SCREEN OVER OPEN END OF RETURN DUCT. PROVIDE DUCT LINER IN BOOT. RETURN AIR DUCT SHALL BE MINIMUM 36" HORIZONTAL EXTENSION FOR SOUND ATTENUATION.
- 19 PROVIDE SA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR. TRANSITION 45 DEGREES THROUGH ROOF CURB.
- 20 PROVIDE RA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR. TRANSITION 45 DEGREES THROUGH ROOF CURB.
- 21 PROVIDE EA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR. TRANSITION 45 DEGREES THROUGH ROOF CURB.
- 22 10"x11" GREASE EXHAUST DUCT UP TO KEF-1 ON ROOF.
- 23 9"x9" GREASE EXHAUST DUCT UP TO KEF-2 ON ROOF.
- 24 ROUTE DUCTWORK LEVEL, TIGHT TO STRUCTURE, AND ABOVE LIGHTS. COORDINATE WITH STORM DRAINAGE, STRUCTURAL, AND ELECTRICAL.
- 25 PROVIDE COMBUSTION AIR AND EXHAUST PIPE AND ROUTE TO CONCENTRIC VENT THROUGH ROOF.
- 26 INTERLOCK THE HOODS AND RTUS, SUCH THAT THE RTUS WILL OPERATE WHEN HOODS ARE IN OPERATION.

MECHANICAL FLOOR PLAN



1

4	2025-12-05	RTU REVISIONS
2	2025-08-14	BUILDING COMMENTS
	2025-05-05	PERMIT SET
	2025-04-14	75% SET

NO.	BY	DATE	DESCRIPTION
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SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

MECHANICAL PLAN

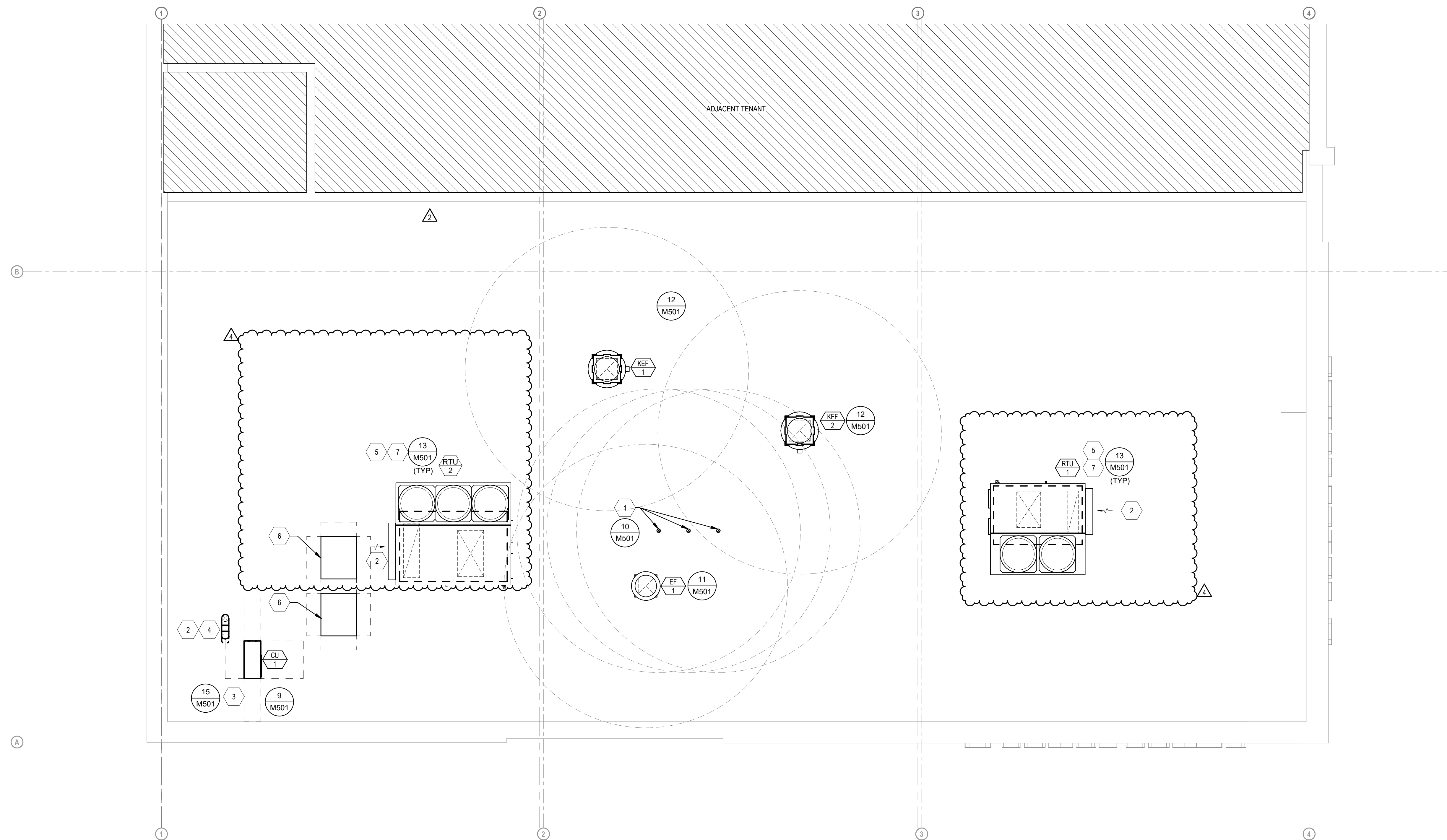
DRAWN BY: BK

CHECKED BY: JE

PROJECT NO: 12426-25

M101

MECHANICAL ROOF PLAN NOTES:	
1	PROVIDE CONCENTRIC VENT MODEL NUMBER PVC-3CT.
2	MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST AND PLUMBING VENT. TYPICAL.
3	CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. SINGLE LINESET SHOWN FOR CLARITY. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
4	OUTSIDE AIR DUCT FROM FCU-1. TURN DOWN 6"Ø INTAKE AND END OPEN OVER ROOF (MIN. 24") WITH INSECT SCREEN.
5	CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-PHI INDOOR AIR PURIFICATION SYSTEM. MODEL PHH-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.
6	AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR. COORDINATE EQUIPMENT LOCATION AND CONDENSER INSTALLATION WITH KITCHEN EQUIPMENT CONTRACTOR.
7	REFERENCE PLUMBING DRAWINGS FOR CONDENSATE DRAIN ROUTING AND TERMINATION REQUIREMENTS.



M150 - MECHANICAL ROOF PLAN

1/4" = 1'-0"  
 1

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 PHOENIX, AZ 85054  
 T 480.448.6250  
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NO.	BY	DATE	DESCRIPTION
4		2025-12-05	RTU REVISIONS
2		2025-08-14	BUILDING COMMENTS
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

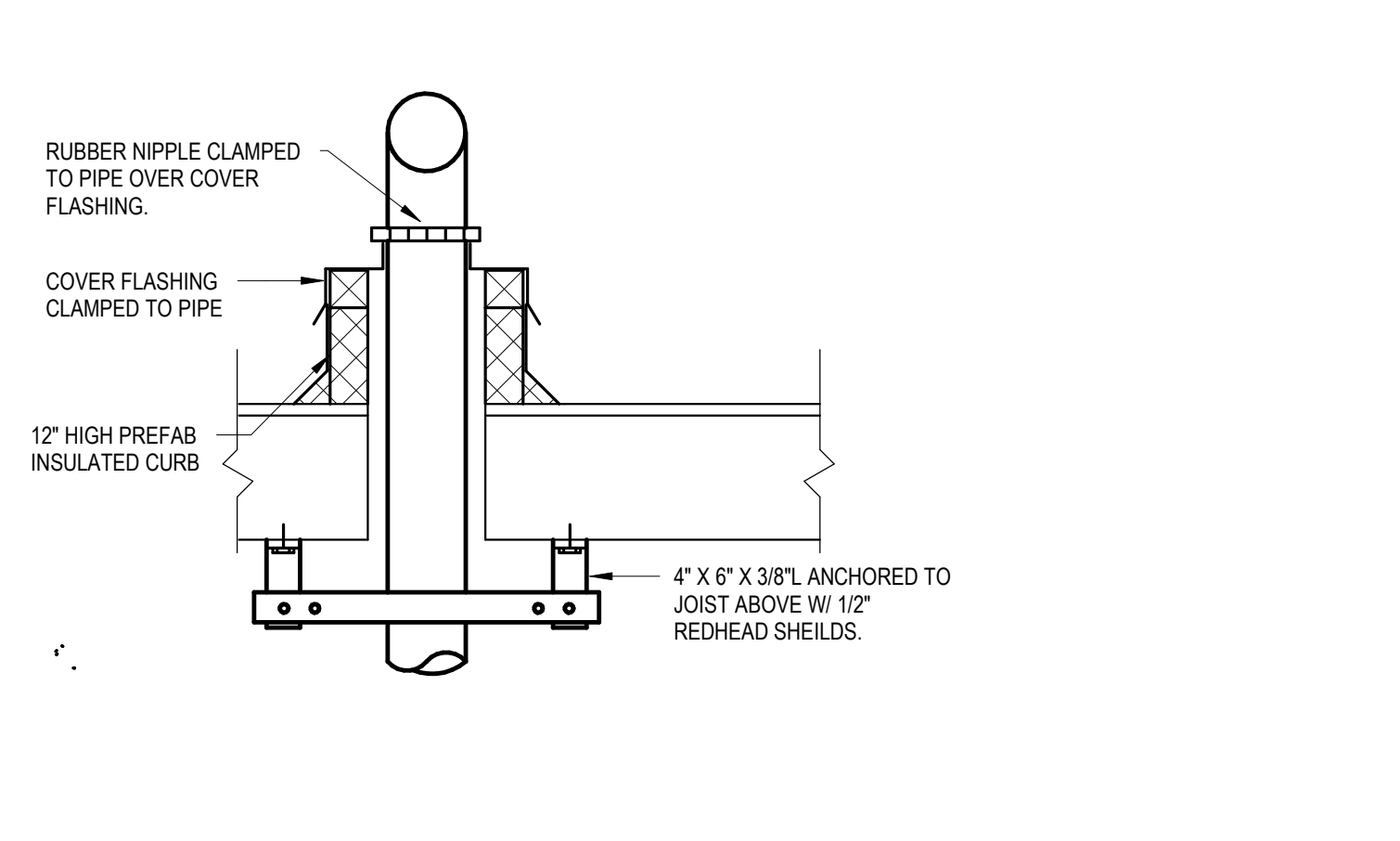
5801 SUNRISE HWY. SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

PERMIT SET

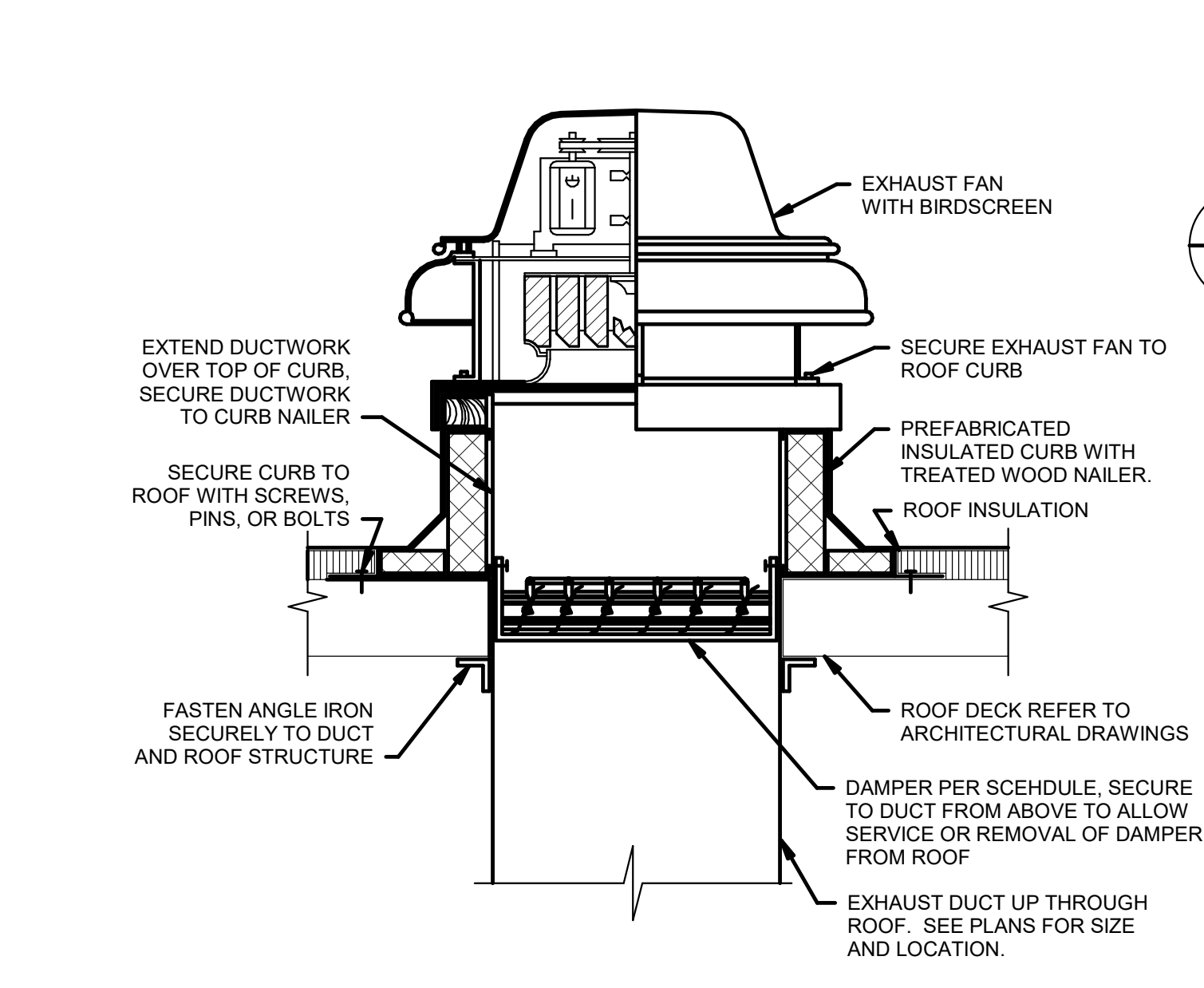
MECHANICAL ROOF PLAN

DRAWN BY: BK  
 CHECKED BY: JE  
 PROJECT NO: 12426-25

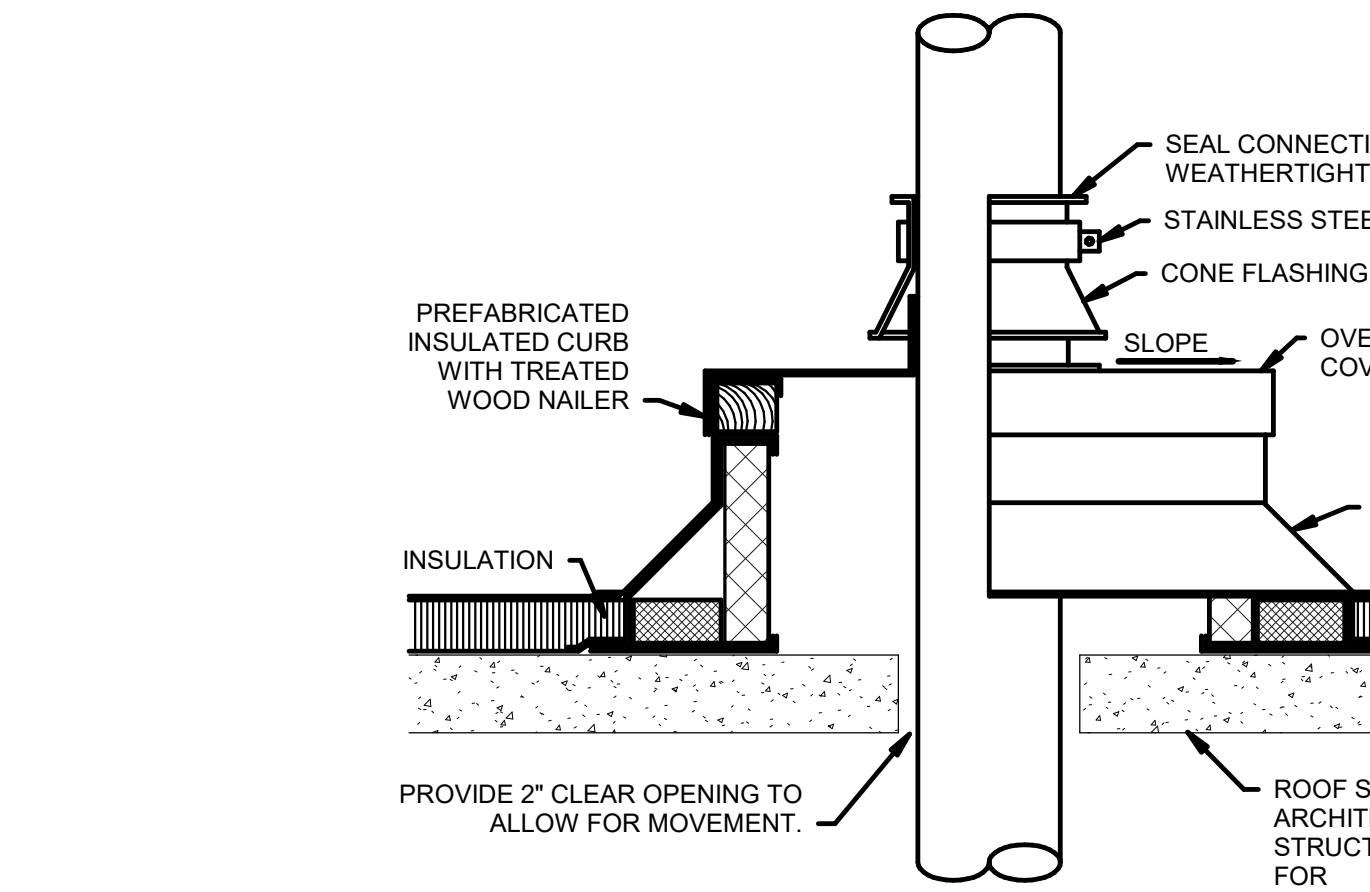
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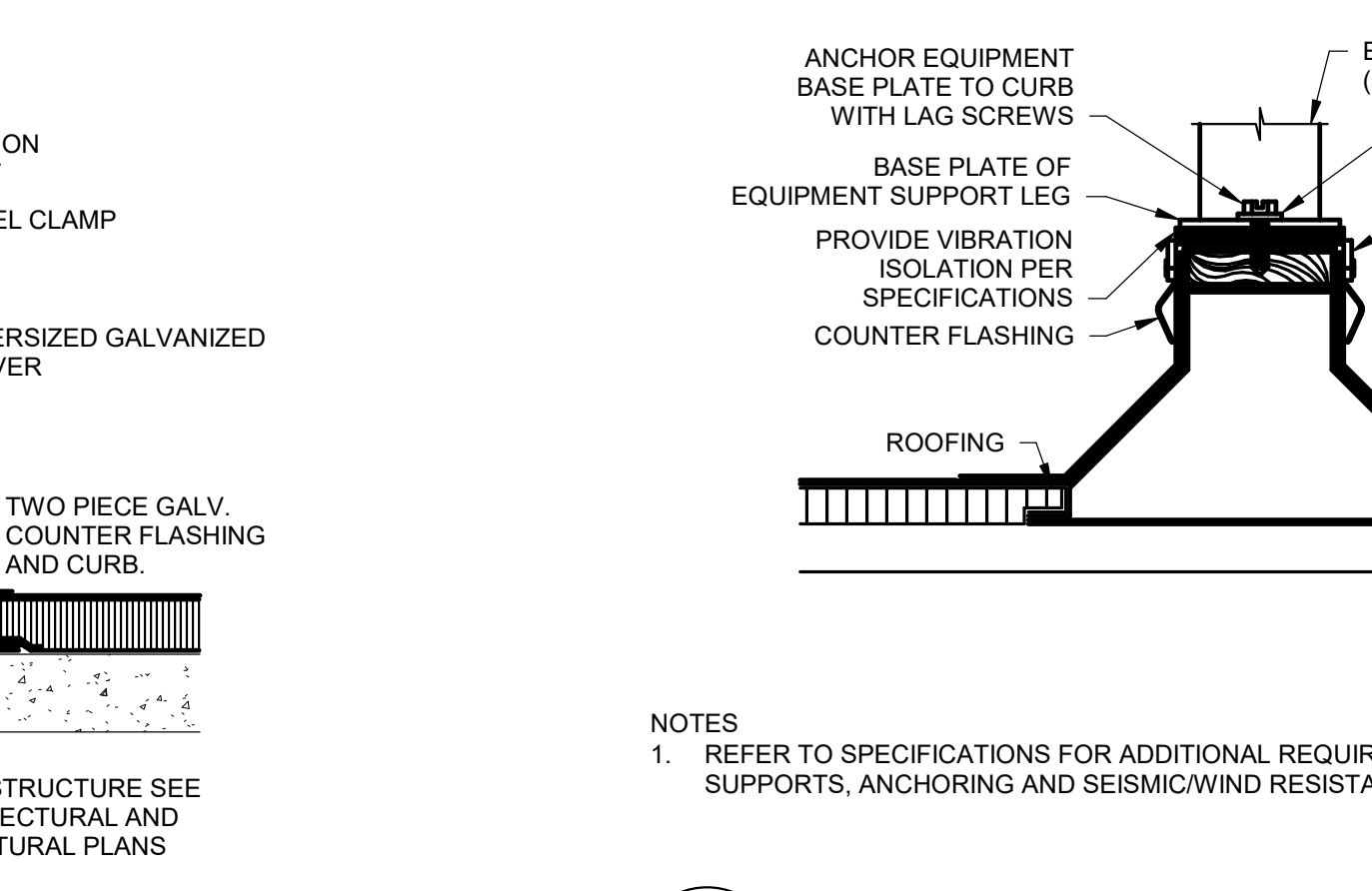
**15 PIPE CURB DETAIL**  
SCALE: N.T.S.



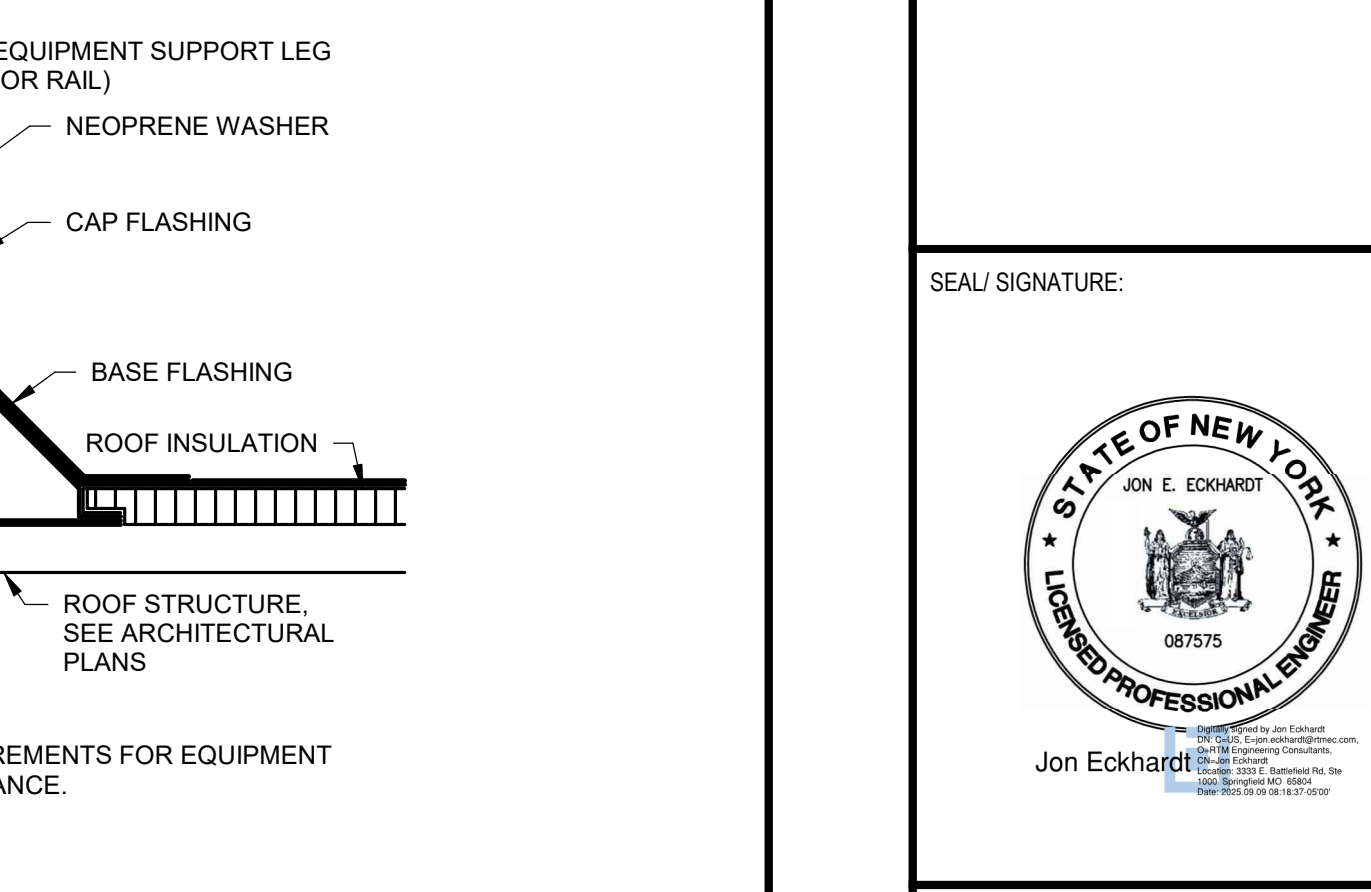
**14 HANGER UPPER ATTACHMENT DETAILS**  
SCALE: N.T.S.



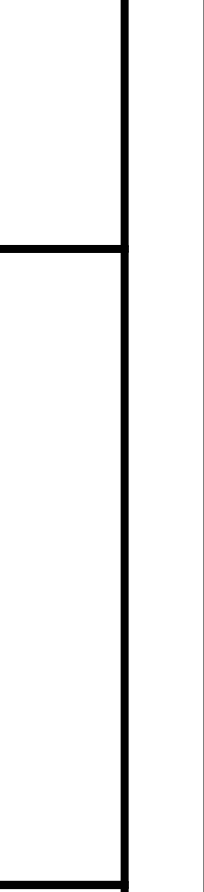
**13 ROOF CURB DETAIL**  
SCALE: N.T.S.



**12 UPBLAST GREASE EXHAUST FAN DETAIL**  
SCALE: N.T.S.



**11 DOWNBLAST EXHAUST FAN DETAIL**  
SCALE: N.T.S.



**10 ROUND AIR DUCT OR PIPE PENETRATION THROUGH ROOF DETAIL**  
SCALE: N.T.S.



**9 ROOF EQUIPMENT SUPPORT RAIL DETAIL**  
SCALE: N.T.S.



**8 GREASE DUCT CLEANOUT ACCESS DOOR DETAIL**  
SCALE: N.T.S.



**7 INSULATION INSTALLATION DETAIL**  
SCALE: N.T.S.



**6 DUCT HANGER LOWER ATTACHMENT DETAILS**  
SCALE: N.T.S.



**5 KITCHEN EXHAUST HOOD ELEVATION DETAIL**  
SCALE: N.T.S.



**4 CEILING CASSETTE DETAIL**  
SCALE: N.T.S.



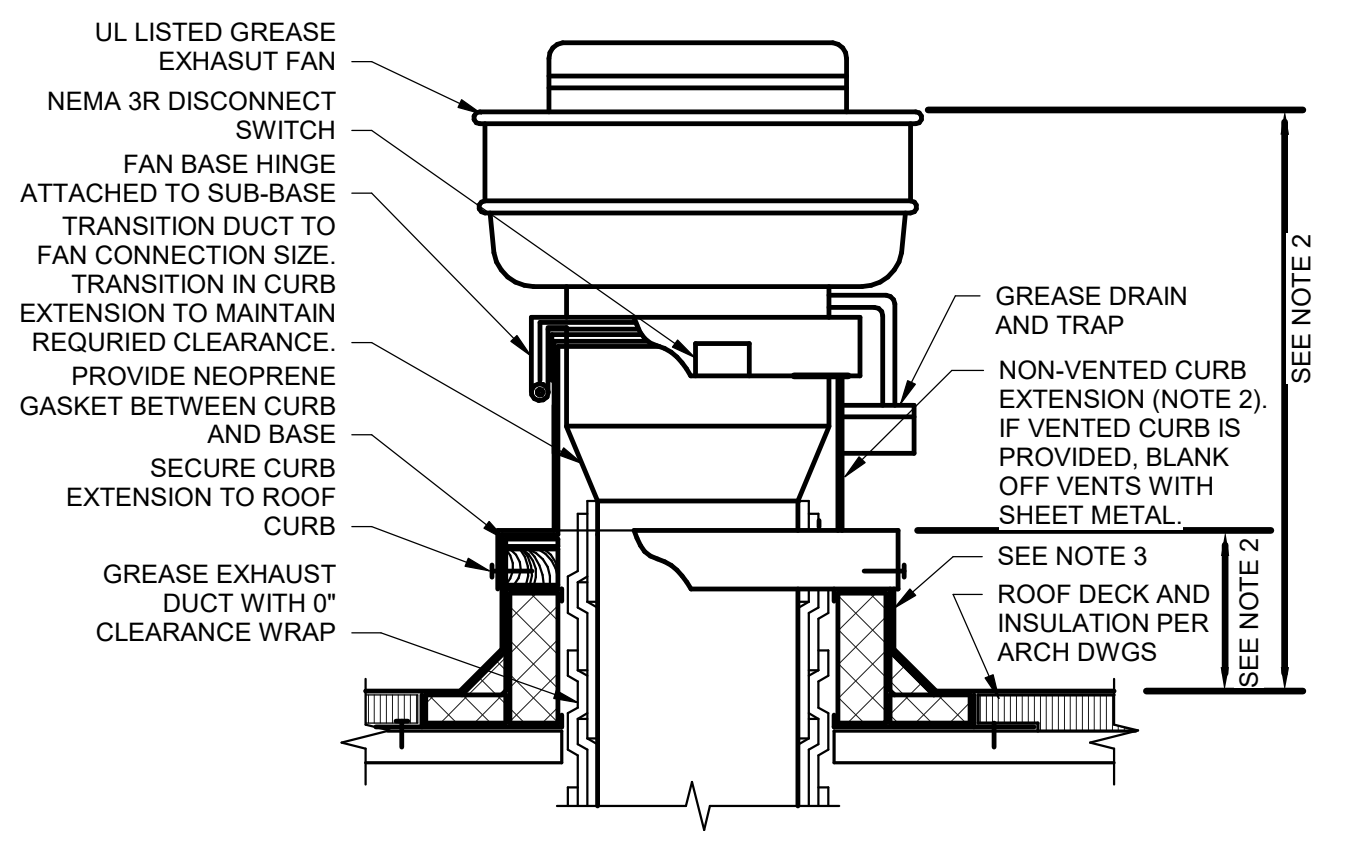
**3 DUCT MOUNTED REGISTER DETAIL**  
SCALE: N.T.S.



**2 HARD CEILING DIFFUSER DETAIL**  
SCALE: N.T.S.



**1 LAY-IN CEILING DIFFUSER DETAIL**  
SCALE: N.T.S.

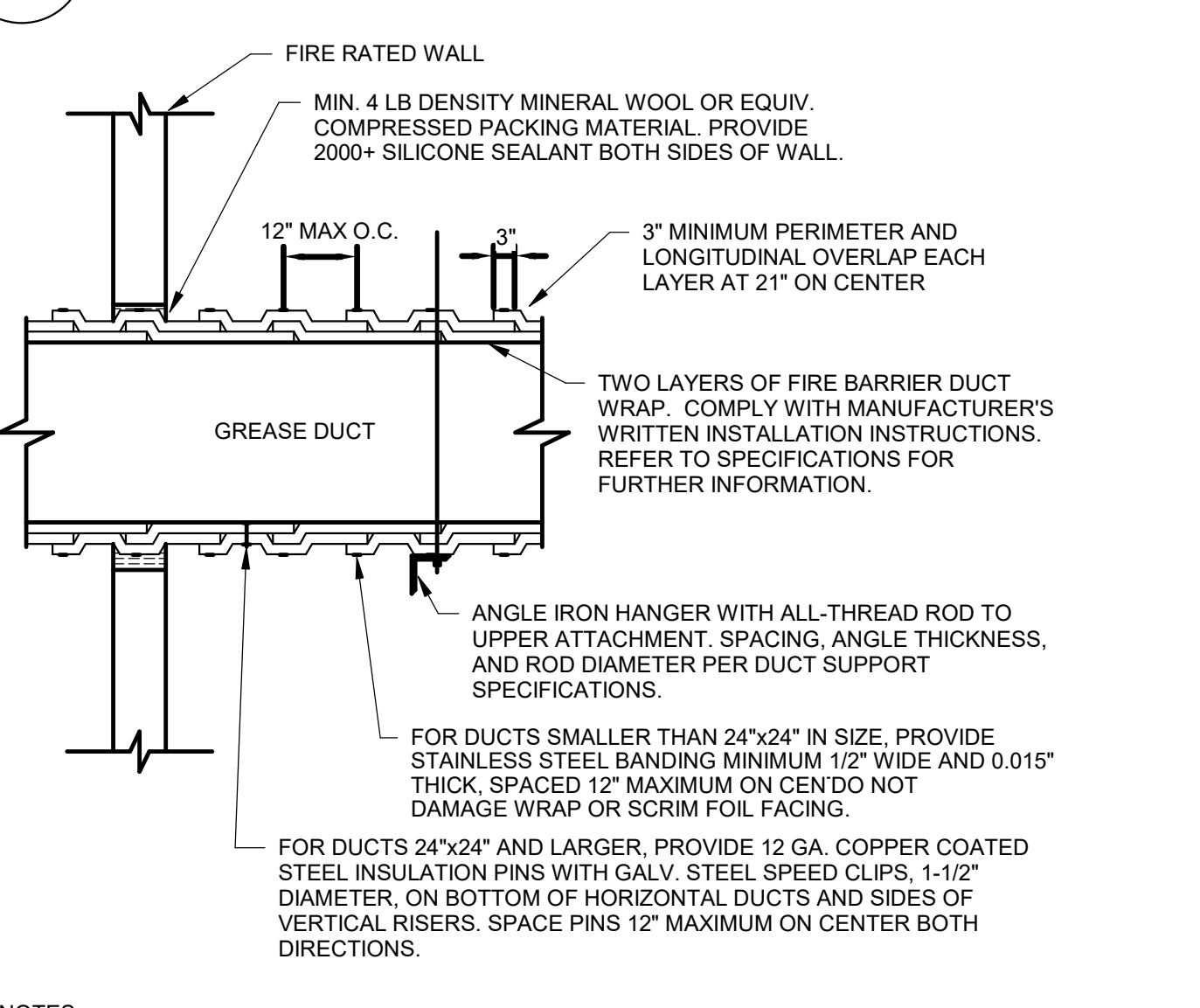


**KEYED NOTES**

- ACCESS HOLE
- 1/4 IN. (6mm) DIAMETER ALL THREADED RODS
- ACCESS COVER - 16 GAUGE
- INSULATED PINS - WELDED
- FIRST LAYER FIRE BARRIER DUCT WRAP CUT SAME SIZE AS COVER
- SECOND LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES
- THIRD LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES OF PREVIOUS LAYER
- SPEED CLIPS
- ALUMINUM TAPE COVERING ALL EXPOSED EDGES
- SPOOL PIECES OF THREADED RODS
- 1/4 IN. (6mm) DIAMETER WING NUTS

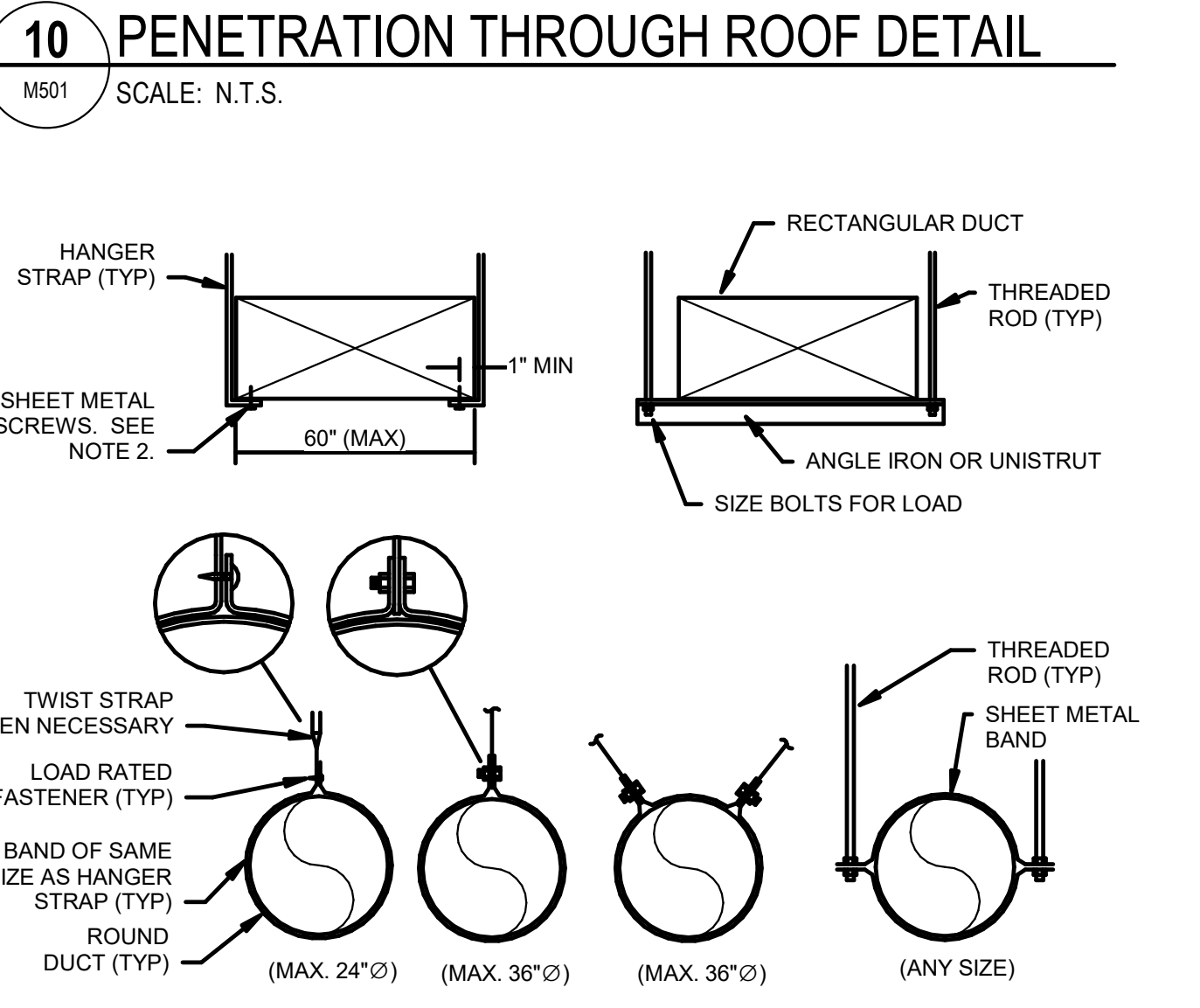
**NOTES:**

- FOR REFERENCE ONLY. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- AT CONTRACTOR'S OPTION, A LISTED UL 1976 GREASE ACCESS DOOR PRODUCT MAY BE SUBSTITUTED FOR THE ACCESS DOOR PICTURED IN THIS DETAIL. DOOR SHALL BE RATED FOR UP TO 2,300°F AND MEET NFPA STANDARDS. BOLTS SHALL BE LONG ENOUGH FOR DUCT WRAP SYSTEM (WHEN USED). INSTALL IN ACCORDANCE WITH MANUFACTURER'S LITERATURE.



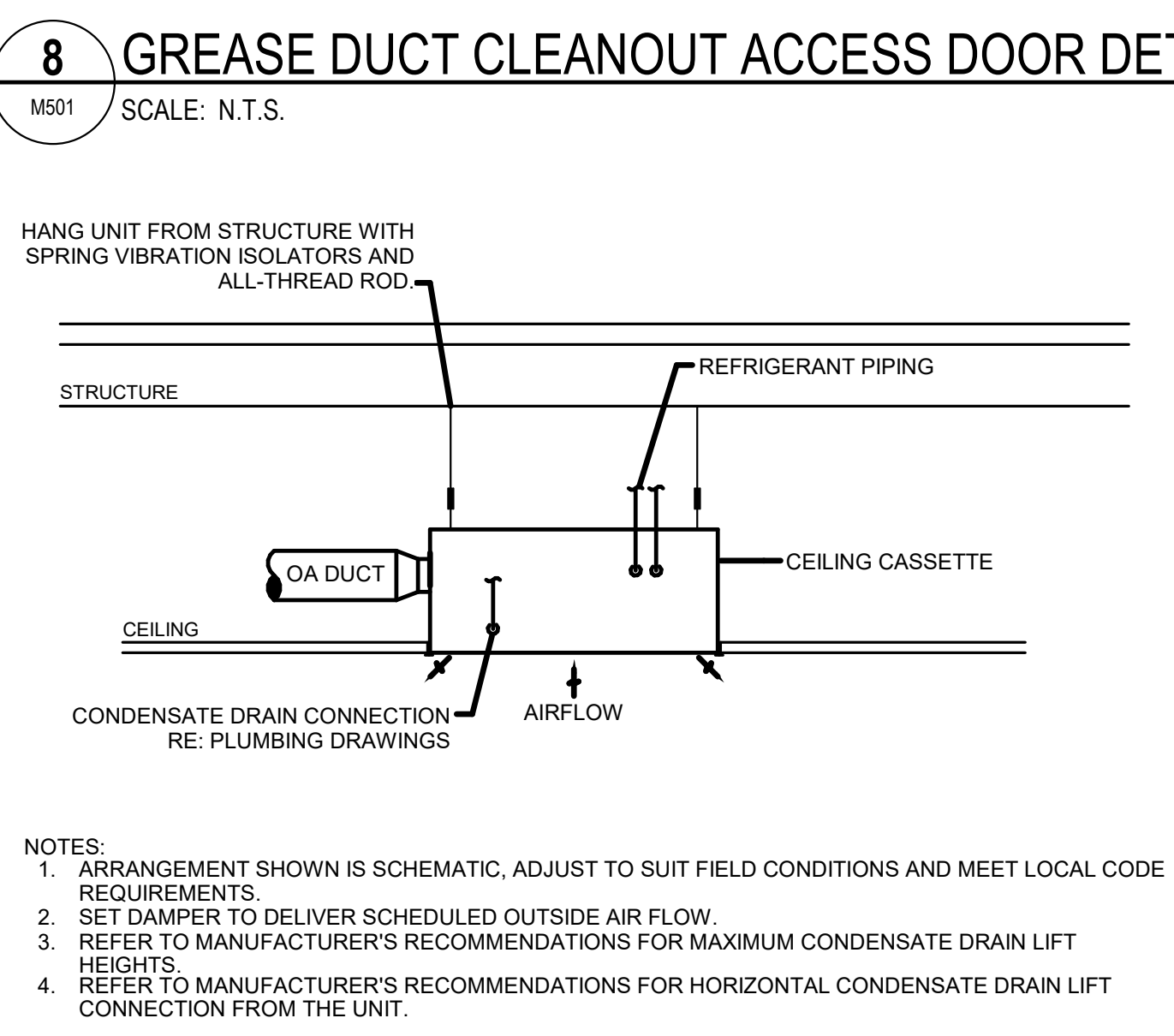
**KEYED NOTES**

- 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.



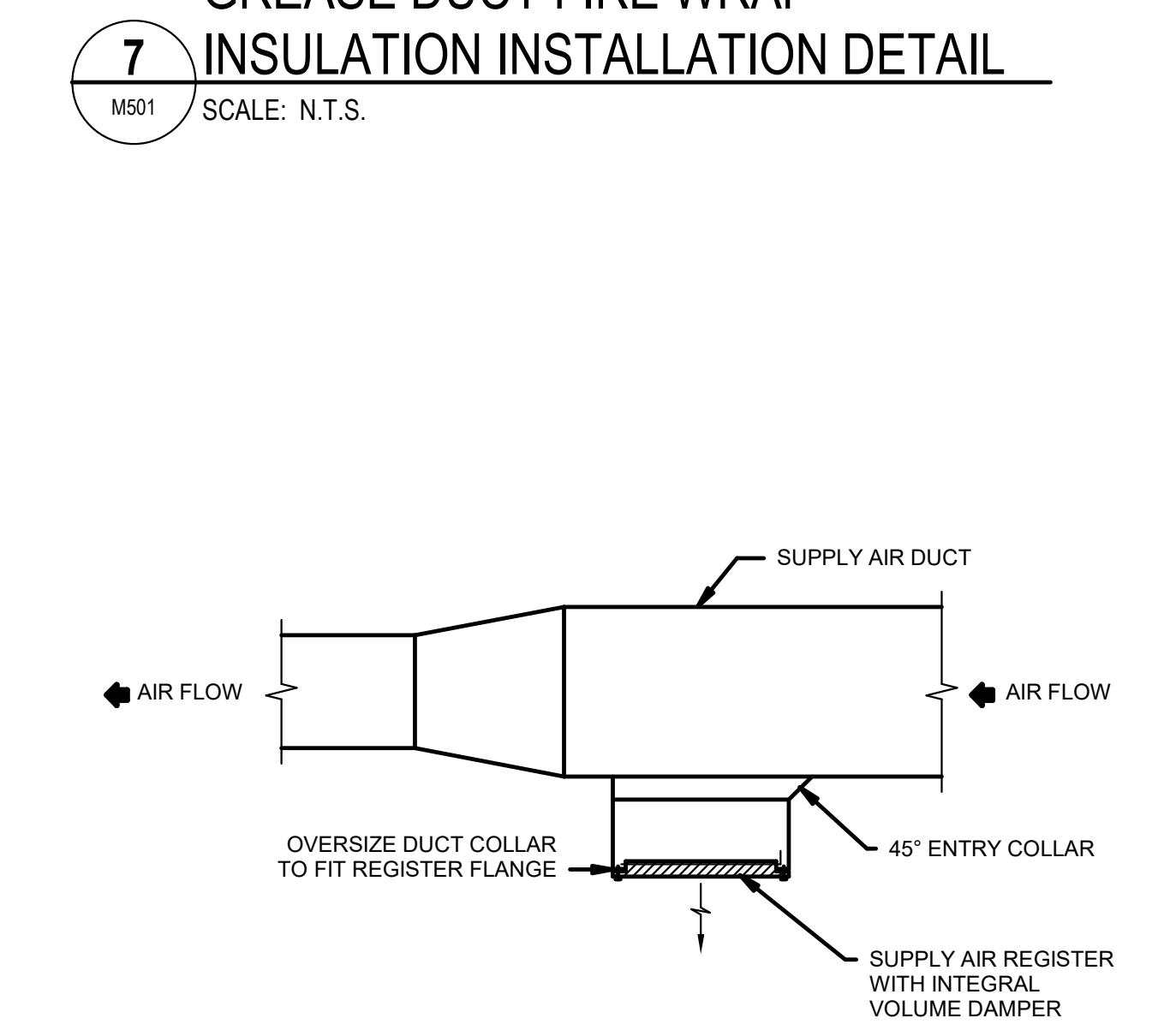
**KEYED NOTES**

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



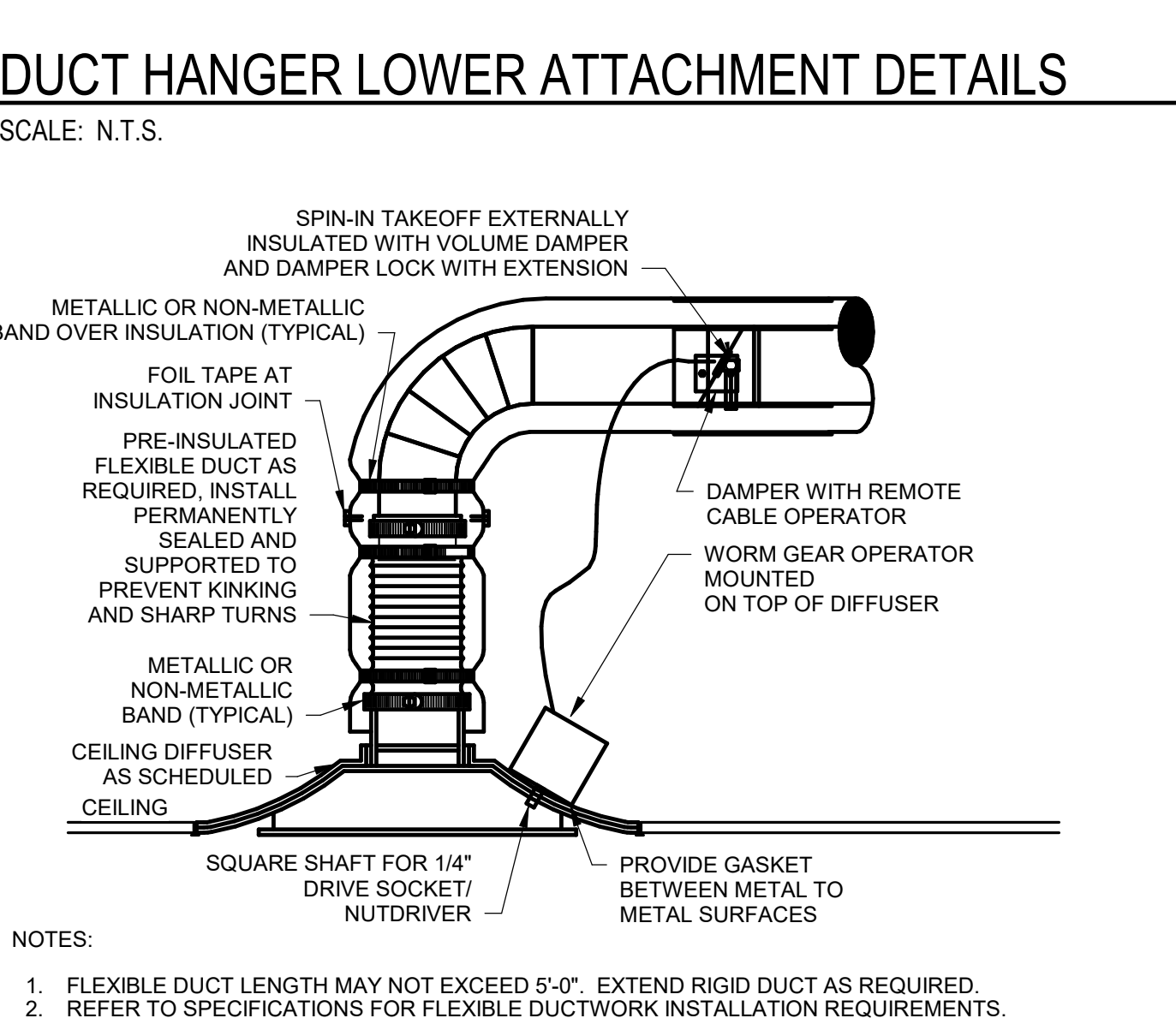
**KEYED NOTES**

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



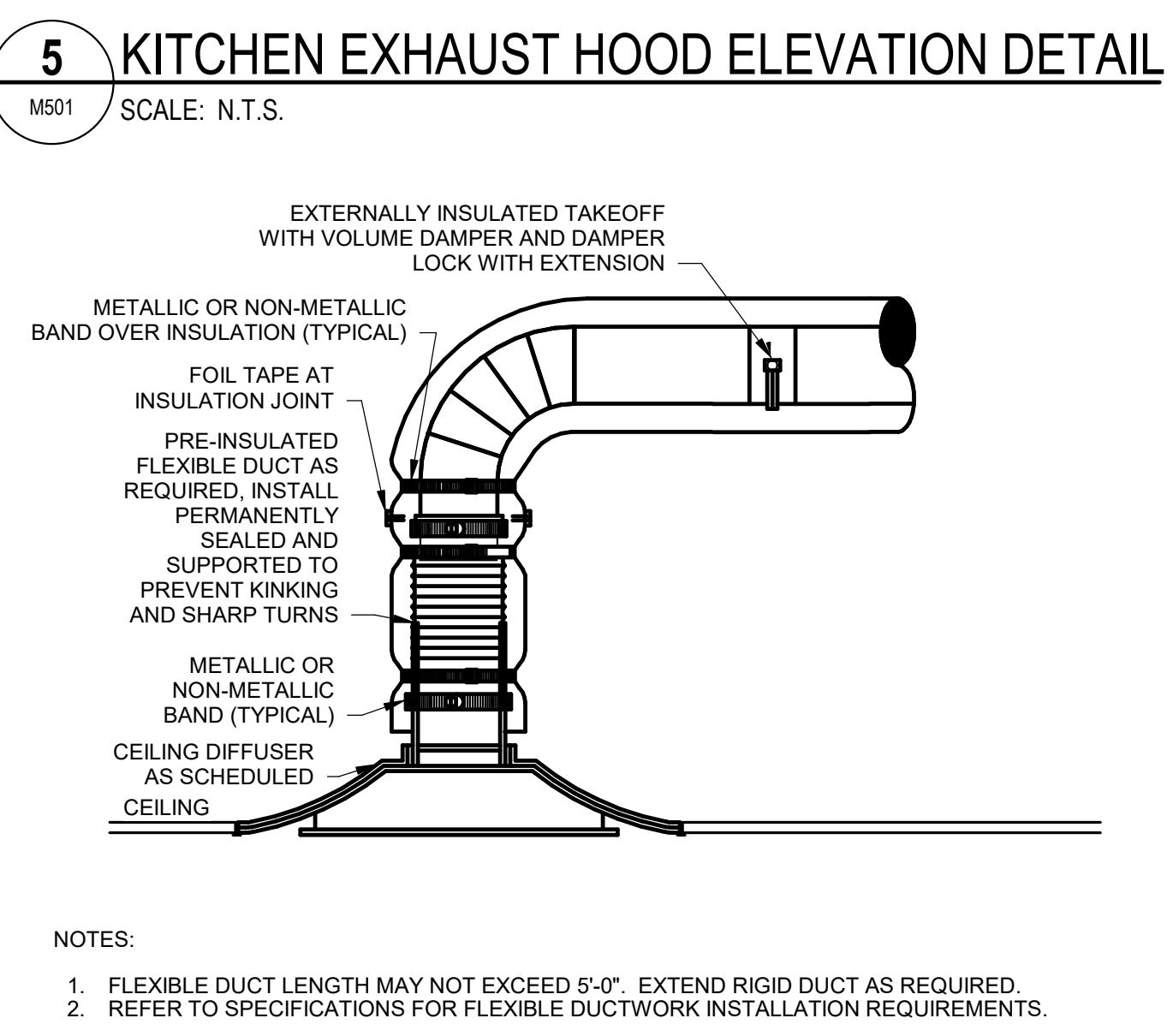
**KEYED NOTES**

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



**KEYED NOTES**

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



**KEYED NOTES**

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PHOENIX, AZ 85054  
TJ 480.448.6250  
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SHAKE SHACK SUN VET

5801 SUNRISE HWY. SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

MECHANICAL DETAILS

DRAWN BY: BK

CHECKED BY: JE

PROJECT NO: 1242625

M501

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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. This section and division 23 exceed those of Division 01, this section and division 23 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 material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to fabricate 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 showing all of the exact details as to elevations, 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:

- 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, placing, anchoring, applying, 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 essential 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 approved 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 "approved" 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. Initial 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 from 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. Contractor shall furnish the General Contractor with information where chases and openings 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.

Provides 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 damaged by construction activities shall be rejected 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, include 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 authorities having jurisdiction.
- 4. Same warranty will be furnished for the proposed substitution as for the 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 for 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 to/from 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 all 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 not be reviewed.

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 followed.

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 inapplicable 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; 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.

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 shipping 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 the Engineer for the necessary release agreement form 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 below.

See Division 01 and General Conditions for the additional information.

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. Include an inside cover sheet that lists the project name, date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.

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 and construction 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: 6" or 8" for conduits; 12" for pipes. Excavation shall be performed to a depth of 12" below the bottom of the trench. 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-lamped 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 stairs, 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-tensioning cables, 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 and the component. Each area opened and patched shall be repaired to match the existing construction including fire ratings, if applicable. Repair and refresh 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., Pace Company, Thybar 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 interval 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. Rail Equipment Supports: Secure each equipment support leg to the rail with a minimum of 4 points of connection per leg.
- 2. Roof Curbs: Secure each corner of the equipment to the curb using a minimum of 4 lag screws, located near the length of the equipment. Alternatively, secure equipment to the curb using hold-down brackets. Provide minimum 6 inch long, 14 gauge galvanized steel brackets sized to wrap around top of curb and under equipment base with sufficient overlap to allow for overlap gap between the equipment rail and curb. Secure bracket to equipment and curb nailer using a minimum of 8 points of connection per bracket. Provide one bracket at each corner along the length of the unit.

3. 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 of [I/II/III or IV] and a Design Wind Speed of [XXX] mph.

4. 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 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, Milcor, Tlux, Zum, or equal.

J. PENETRATIONS

Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide 10 gauge galvanized steel sleeves for sleeves 6 inches and smaller. Provide galvanized steel sleeves for larger than 6 inches. Schedule 40 PVC sleeves are acceptable for installation in areas without return air plenums.

Seal elevated floor, exterior wall and roof penetrations weatherlight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of 1/2 inch sealant.

Seal around penetrations of fire rated assemblies. Coordinate fire ratings and locations with the architectural drawings. Refer to architectural specifications for fire stoppings. Provide a product schedule for UL listing, location, wall or floor rating and installation drawing for each penetration fire stop system.

Extend pipe insulation for insulated pipe through floor, wall and roof penetrations, including fire rated walls and floors. The vapor barrier shall be maintained. Size sleeve for a minimum of 1 inch annular clear space between inside of sleeve and outside of insulation.

Provide prefabricated roof curbs where pipes and/or ductwork penetrate elevated slabs or the roof to the exterior. Provide cover over curb of weather-resistant material and seal duct or pipe penetrations through the cover. Provide pipe collar of weather-resistant material with stainless steel pipe clamps for piping penetrations.

Provide box frames for rectangular openings welded 12 gauge galvanized steel attached to forms and of a maximum dimension established by the Architect. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural drawings.

Seal concrete or masonry exterior wall penetrations below grade with "wall pipes" and mechanical sealers. Provide cast iron "wall pipes" with integral waterstop ring manufactured by Jay R. Smith, Josam, Wade, Watts or Zum. Provide modular mechanical seal seals, manufactured by Capico, Metraflex, or Thundertime / Link Seal.

Seal elevated concrete slab with water proof membrane penetrations with "wall pipes" and water proof sealant. Secure waterproof membrane flashing between "wall pipe" clamping flange and clamping ring. Provide cast iron "wall pipes" with integral waterstop ring manufactured by Jay R. Smith, Josam, Wade, Watts or Zum.

Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

Provide Schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.

Provide 1/2 inch thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2 inches above and below the concrete slab.

K. FIRESTOPPING

Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with UL 2079 or ASTM E 814, or other NRTL acceptable to AHJ.

Manufacturers: Hilli, RectorSeal, Specified Technologies Inc., United States Gypsum Company, or 3M corp. Through and Membrane Penetration Firestopping Systems Product Schedule: Provide UL listing, location, wall or floor rating, and installation drawing for

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 fuses, 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 service 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 damages 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 version of the standard for testing, adjusting and balancing and shall comply with the strictest interpretation of that standard for execution and reporting 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 log 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 final approval before final system start-up. Test and balance the system 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 temperatures (no greater than +/- 1°F) in spaces. Document temperatures and adjustments in tab 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 adjustments in accordance with 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 satisfactorily. 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 "HVAC Applications" or provide per manufacturer's recommendations. Acceptable manufacturers include Calroy, 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 isolators shall have 50 percent excess capacity without becoming coil bound. Coit vibration isolators with factory-applied paint. Coit 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 sprung 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 bellows, 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 bearing 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 determined 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 both 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 or 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 box 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 allow the isolator to allow the hanger box to rotate through a full 360 degree arc without encountering obstructions. Provide Mason Industries Type 30N or equal.
3. Type NR (Neoprene Bushing): Provide neoprene, inner-in-bush 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 HMB or equal.

#### R. SEISMIC CONTROLS FOR MEFP SYSTEMS

Seismic Protection Criteria:  
Risk/Occupancy Category: [I, II or III/IV]  
Site Soil Category: Contractor's Seismic Engineer to Determine.  
Seismic Design Category: Contractor's Seismic Engineer to Determine.  
Component Importance Factor: Determined from ASCE 7, most recent version.

The Contractor shall be responsible for determining the requirements for seismic bracing of mechanical, electrical, and plumbing systems. Seismic protection criteria used to determine seismic bracing requirements of all mechanical, electrical, and plumbing systems shall be determined by the applicable code adopted in the project jurisdiction. Where not already determined within the contract documents, the Contractor shall be responsible for contracting a licensed professional engineer to establish building site class, seismic design category, seismic zone, or any other criteria necessary to determine the requirements for seismic bracing on mechanical, electrical, and/or plumbing systems.

Seismic bracing of fire protection systems shall be installed in strict accordance with the provisions of NFPA 13 (2010 or later edition).

The Contractor shall determine the type and location of seismic bracing required for the mechanical, electrical, and plumbing elements shown on the drawings based on the established seismic criteria, the size and weight of the supported element, and the distance from structure of the supported element.

The Contractor shall submit the following shop drawing information to the AHJ and the Engineer for review and approval:  
1. Seismic analysis listing all applicable seismic design criteria.  
2. Descriptive bracing materials.  
3. Shop drawings showing bracing type and location.  
4. Installation details of all bracing used.  
5. Calculations showing that the seismic restraints meet the seismic requirements.  
Shop drawings and calculations shall be signed and sealed by a registered professional engineer, licensed in the state of the project and employed by the manufacturer of the seismic bracing products. Calculations shall include dead loads, static seismic loads, and capacity of materials utilized for connections.

Seismic bracing, restraints, isolators, and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer. Acceptable manufacturers are: AmberBoth Company, Inc., D-UnionTolo, ISAT, Kinetics Noise Control, Inc., Loos & Company, Inc., Mason Industries, Inc., Uni-Strut, or Vibro-Acoustics. Each device shall have a pre-approval number from California OSHPD or other recognized government agency showing maximum restraint ratings.

Seismic bracing measures to be applied to mechanical, electrical, and plumbing equipment/systems shall be installed in strict accordance with all applicable local, state, and/or federal codes as well as manufacturer's requirements. The most stringent criteria shall apply. All anchor connections for support of mechanical and electrical equipment, regardless of the need for seismic restraints, shall be shown on shop drawings.

#### S. AIR FILTERS

Provide AAF/Flanders Perfect Pleat HC M8, Camfil FFR 3030, pleated, throwaway type filters, minimum MERV 8, or similar as manufactured by Air Filter, Inc., Bioclimatic, 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.

#### T. REFRIGERANT AND OIL

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

#### U. IDENTIFICATION

Provide manufacturer's 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, cock 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 fixtures and units.

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

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 best contrast with duct or insulation color. Locate markers maximum 50 feet along each duct side and within 5 feet of all control and balancing dampers on 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. Liner 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 that standard. All new Insulation Manufacturers Association (NAIMA) duct cleaning guide. Install with liner adhesive and mechanical fasteners in accordance with manufacturer's instructions and recommendations. Ductwork sizes shown on drawings are inside clear dimensions. Increase sheet thickness 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 Certainteed 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 "Spracoustic Plus" or equivalent, Certainteed or Owens-Corning.

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

1. Exposed round and rectangular supply ductwork.
2. Exposed round and rectangular return ductwork.

At interface of lined and wrapped ductwork, overlap lined ductwork at least 2 feet beyond wrapped insulation.

Cover concealed, rigid ductwork with ASTM C535, Type II flexible fiberglass insulation. Installed insulation shall be 2 inch thick, 3/4 pound density, minimum R-6.0Duct wrap, Certainteed or equivalent Johns Manville, Owens-Corning, or Knaf with heavy-duty foil-sheathed kraft facing, and with joints taped with 3 inch wide foil tape as follows:

1. Round and rectangular supply and return air ductwork.
2. Unlined Round and rectangular outside air ductwork.
3. 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 U.L. 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:

1. Exterior insulation and jacket consisting of 2 inch thickness of Armaflex flexible elastomeric insulation or equivalent meeting ASTM C534 with integral 12 mils thick UV resistant cladding laminated at factory. Cover all seams with Armaflex seal tape.
2. Exterior insulation consisting of 2 inch thickness of flexible elastomeric insulation meeting ASTM C534 or 3 to 3.5 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.
3. Exterior insulation consisting of 2 inch thickness of flexible elastomeric insulation meeting ASTM C534 or 3 to 3.5 density rigid fiberglass meeting ASTM C612, and jacket consisting of 15.5 mils thick Venturoduct 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 ducting ductwork - not by duct 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, spacing, 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 closer 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 components, etc. on ductwork. Provide support for ductwork with other contractors such that piping, electrical conduit, and associated supports are not over-burdened by the ductwork.

Provide pre-engineered roof duct supports by Cooper B-Line, Elite Components, ERICO, FNVH, Miro, PHD Manufacturing, PHP Systems, Roof Top Box, Unistrut (Atkore), Zol 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 membrane. Provide rectangular duct 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. Reference 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 that complies with 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 polishing.

Seal ductwork with heavy liquid sealant. Hardcoat Infrongrip 601, Design Polymers DP 1010, United Megill 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 spring vanes. Vanes shall be the entire length of the bend. Provide mirrored 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. Mirrored elbows less than 45 degrees shall not require turning vanes. Mirrored elbows 45 degrees and greater shall have single thickness turning vanes of same gauge as ductwork, rigidly fastened with guide strips in ductwork. Vanes for mirrored elbows shall be provided at 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 an additional coat to the owner.

Connect ducts to vibrating equipment and when transitioning between two different metallic 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, Egan, Ventabloc or equal. Flexible connectors shall have a flame spread of 25 or less and smoke developed rating not higher than 50. Make airtight joints and install with minimum 1-1/2 inches slack.

Provide balancing dampers, manufactured by Cesco, Greenheck, Louvers & Dampers, Nalor Industries, Pottuff, Ruskin, Tamco, or approved equal, where shown on drawings and wherever necessary for complete control of air flow. Splitter dampers shall be controlled by locking quadrants; provide Vane Regulator or Ventlok end bearings for the damper rod. Rectangular volume dampers shall be opposed blade interlocking type. Round volume dampers shall be single-plate type consisting of circular blade mounted to a shaft. Provide Flexmaster model STO or equal 45 degree rectangular-round takeoff fitting with model B03 damper with locking quadrant and insulation built 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 hand ceiling is required, provide a concealed, remote cable-operated, butterfly-type volume damper assembly with external work gear operator. Damper assembly shall include duct casing with rolled lead 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 remote operator on the back of the diffuser frame or side of a slot diffuser plenum. Support cable assembly to avoid bends and kinks in cable at manufacturer recommended intervals. Where approved by architect, a ceiling cup with cover plate may be used for access to cable operator. Provide round dampers by Metropolitan Air Technology model RT-250, Young's Regulator model 5020-1200, or approved equal. Provide rectangular dampers by Metropolitan Air Technology model RT-200, Young's Regulator model 620-1200, or approved equal. Provide remote cable control by Metropolitan Air Technology model RT-WGA, Young's Regulator model 270-275, or approved equal.

Round or oval ductwork shall be FlaktGroup Semco, United, Hercules Industries or equal, sheetmetal, with smooth interior surface, with low pressure (duct pressure class up to and including 2 inches w.g.) Round ductwork gauges per the following table (reference SMACNA HVAC duct construction standards for gauges when pressures exceed 2 inches w.g.):

Size	Duct Gauge	Fitting Gauge
14" & under	26	24
15" thru 20"	24	22
28" thru 36"	22	20
38" thru 50"	20	20
52" thru 60"	18	18

Lewis & Lambert, Linx Industries Lindab Safe, or approved equal factory-manufactured round ductwork and fittings may be substituted for specified round branch ductwork, at Contractors option. Heavy liquid sealant may be omitted on factory-manufactured round ductwork.

Low pressure (duct pressure class up to and including 2 inches w.g.) Fittings 24 inches in diameter and less shall be prefabricated, spot-welded and internally sealed. Continuously weld fittings larger than 24 inches in diameter. Fitting gauge shall be 22 gauge for 36 inch fittings and under, 20 gauge for larger sizes. 30 degree tees shall be conical type. Seal longitudinal and transverse ductwork joints airtight with heavy liquid sealant applied according to manufacturer's instructions. Provide gauge thickness in medium pressure (duct pressure class 3 inches to 8 inches w.g.) ductwork as recommended by SMACNA.

#### C. FLEXIBLE DUCT

Low pressure (duct pressure class up to and including 2 inches w.g.) and medium pressure (duct pressure class 2.1 inch to 6 inches w.g.) flexible duct shall be Flexmaster Model 88, Thermi-Flex Silver Jacket, RPE, JPI, type Silver Jacket, or equal (fire resistant polyethylene) protective vapor barrier, UL 181 Class 1, acoustical insulated duct, R-6.0 fiberglass insulation. Provide CPE liner with wire helix mechanically locked or permanently bonded to the liner.

Flexible duct runs shall not exceed 5 feet in length, and shall be installed fully extended and straight as possible avoiding tight turns. Install flexible duct in accordance with manufacturer's instructions. Support flexible duct at maximum 5 feet on center and within 6 inches of bends. Bends shall not exceed a centerline radius of one duct diameter. Duct sag shall not exceed 1/2 inch. Supporting material in direct contact with the duct shall be not less than 1-1/2 inches in width.

Connect flexible duct to rigid metal duct or air devices as recommended by the manufacturer. At a minimum, install two wraps of duct tape around the inner core connection and a metallic or non-metallic damper over the tape and two wraps of duct tape or a clamp over the outer jacket. Duct clamps shall be labeled in accordance with UL-181B and marked 181B-C. Duct tape shall be labeled in accordance with UL 181B and marked 181B-FX.

#### D. PLASTIC FLUE GAS VENTS

Provide UL 1738 listed plastic flue gas vents, with positive or negative flue pressures complying with NFPA 211 and suitable for condensing gas appliances. Provide PVC system by IPEX "System 1738" or Polypropylene system by Centrotherm "flexiduct" or equal by Nova Flex Group "Z-DENS".

Vents and combustion air ducts for condensing type appliances shall be Schedule 40 PVC pipe and socket fittings meeting ASTM D2665 and UL 1738, manufactured by IPEX. Use solvent cement meeting ASTM D2564 and make joints in accordance with ASTM D2665.

Where plastic gas vents are installed in a return air plenum, wrap the vent with fire rated plenum insulation. Reference Article "Plenum Insulation" for plenum-rated fire wrap. Coordinate vent material compatibility with the appliance manufacturer's installation instructions prior to purchasing and installation.

#### E. AIR DEVICES

Provide air devices as scheduled on drawings, manufactured by Carnes, Krueger, Metalaire, Nalor Industries, Price, Titus, or Tuttle & Bailey. Select air devices to limit room noise level to no higher than NC-30 unless otherwise shown. Provide devices with a soft plastic gasket to make an airtight seal against the mounting surface. Coordinate final location, frame, and mounting type of air devices with Architectural reflected ceiling plans.

Submit complete shop drawings including information on noise level, pressure drop, CFM for each air device, styles, borders, etc. Clearly mark with specified equipment number. Submit sample of each air device as requested by the Engineer.

Provide wall return air grilles and exhaust air registers with horizontal 35 or 45 degree angle vision-proof fans. Provide concealed fasteners for wall mounted registers and grilles. Provide floor supply air registers of aluminum heavy duty type with 0 degree deflection. Provide opposed blade dampers for supply air registers and exhaust air registers unless indicated otherwise.

Provide ceiling mounted air devices of lay-in or surface mounted type as required to be compatible with ceiling construction. Provide ceiling diffusers and grilles with white enamel finish unless noted otherwise.

Provide linear slot diffusers of standard one-piece lengths up to 6-feet and furnish in multiple sections greater than 6-feet. Join multiple sections together end-to-end with alignment pins to form a continuous slot appearance. For installations in a hard ceiling, install diffuser per manufacturer's installation instructions prior to installation of drywall. Contractor shall use manufacturer's hard ceiling clips for mounting to ceiling frame. Screws facing face of linear slot diffuser are not acceptable. Provide alignment components by the manufacturer. Provide plenums by the slot diffuser manufacturer. Plenums shall be internally insulated by the manufacturer with minimum 1/4 inch thick, Bergglas insulation.

#### F. CONTROL DAMPERS

Provide factory fabricated, parallel blade control dampers sized as shown on the drawings and as specified. Individual damper sections shall not be larger than 48 inches x 60 inches with maximum blade width of 6 inches. Frame construction shall be minimum 16 gauge galvanized steel for rectangular dampers, 20 gauge for round, 1/8 inch thick for aluminum, with flanges for duct mounting. Provide elastomeric or neoprene seals, mechanically attached and field replaceable. Provide a minimum of one damper actuator per section. Test damper performance in accordance with AMCA 500-D.

Provide modulating dampers with linear flow characteristics. Size modulating dampers based on the smaller of 1,500 FPM through the damper or full open air pressure drop of 0.1 inches W.G. Use two-position dampers full size and select to minimize pressure drop. Motorized dampers used for ventilation air intake, exhaust air, or relief air shall have leakage rates not to exceed 4.0 CFM/square foot in full closed position at 1 inch W.G. pressure differential across the damper.

Provide dampers as manufactured by Greenheck, Cesco, Pottuff, Nalor, or Ruskin. Reference manufacturer with model number for outside air dampers is Ruskin CD-50 constructed of aluminum, and all other applications is Ruskin CD-35 constructed of galvanized steel.

Provide damper operator for each automatic damper with sufficient capacity to operate the damper under all conditions and to guarantee light close-off of dampers against system pressure encountered. Each operator shall be provided with spring-return for normally closed or normally open position for fail safe operation to account for fire, low temperatures, or power interruption as required by the control systems specified on the drawings. Damper operators shall be manufactured by Belimo, Johnson Controls or approved equal. Provide transformer for damper motor if different voltages are required.

#### G. LOUVERS, PLENUMS, SCREENS

Provide intake and exhaust air louvers by Ruskin model ELF375X or equal American Warming & Ventilating, Cesco, Greenheck, Industrial Louvers and Dampers as scheduled on the drawings. Coordinate exact size and location with architectural drawings. Louvers shall be stationary, with mill finish. Louvers shall have extruded aluminum blades, 0.080 inch wall thickness, 45 degree blade angle, blades on 5 inch centers; frame shall be extruded aluminum, 0.080 inch wall thickness; with expanded flattened aluminum birdscreen. Provide louvers with a minimum free area of 45 percent, with a maximum air pressure drop of 0.1 inch at scheduled airflow.

Construct plenums with galvanized steel framing members and galvanized sheet metal, braced with galvanized angles. Gauges and bracing shall conform to SMACNA recommendations for ductwork of like sizes. Where access doors are shown, provide hinged doors with #252 Ventlok latch. Make watertight connections to louvers, sloping bottom of plenum to drain water to weepholes in bottom of louver.

Provide screens on louvers, ducts, hoods, fans, and openings to the outdoors as scheduled and/or noted on the drawings. Insect screens shall be 0.012-inch thickness, 1/4 inch mesh, aluminum wire. Bird screens shall be 0.041-inch, 1/2 inch mesh galvanized steel wire. Provide motorized control dampers or backdraft dampers where shown on the drawings.

Wind Driven Rain Resistance: Louvers shall comply with ANSI/AMCA 500 for wind driven rain performance. Louvers shall have not less than 90 percent effectiveness when subjected to wind velocities of 20 and 50 mph with rainfall rates of 3 in/hr and 9 in/hr respectively and a core intake velocity not less than what is scheduled on the plans.

Windborne-Debris Impact Resistance: Louvers located within 30 feet of grade shall comply with AMCA 540.

#### H. EXHAUST AIR SYSTEMS

Provide roof mounted exhaust fans as scheduled on the drawings, or equal ACME, Carnes, Coak, Greenheck, Pennbray, or Twin City Fans complete with aluminum housing, aluminum centrifugal wheel, motor with integral thermal overload protection, disconnect switch located inside the housing, birdscreen, backdraft damper, and palle prefabricated roof curb. These phase fans shall be furnished with magnetic starters with push button station.

#### I. KITCHEN EXHAUST AIR SYSTEMS

Install kitchen grease exhaust package furnished by the owner. System includes kitchen hood, grease exhaust fan/pollution control unit, filtered makeup air unit and a mechanical or electrical gas shutoff valve provided with the kitchen exhaust system to shutoff fuel or power source to cooking equipment upon detection of fire. Valve shall have a clearly marked open/closed indicator.

Provide ducts connecting Type 1 exhaust hoods to exhaust fans made of #16 gauge black iron with continuously welded joints and clean-out doors. Provide transition at connection to fan with opening size equal to or greater than the venturi opening of the fan inlet. Provide gasket at flanged connection to fan rated for 1500 degrees Fahrenheit and grease applications. Enclose duct in fireproof enclosure per locally adopted mechanical code or, if approved by the applicable energy code or greater if scheduled on the drawings, centrifugal evaporator blower; air filter rack, propeller type condenser fan; aluminum steel heat exchanger, minimum AFUE rating (heating) as required by the applicable energy code or greater if scheduled on the drawings, forced combustion air blower; complete factory installed micro-processor controls including anti-shock cycle times, time delay relays and minimum "on" time controls; 100 percent safety gas shutoff; direct spark ignition system; built-in thermal overload protection on motors and compressors; outdoor air damper; relief; weathertight housing constructed of zinc coated, heavy gauge, 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 CMF if unit is not equipped with internal vibration isolators; single point electrical power connection. Provide gauges or louvers panels to protect the condenser coil from hail or other damage. Provide a 125 VAC, 20 amp duplex convenience receptacle mounted to 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 and heat exchangers. For units equipped with an economizer assembly, the assembly shall be covered with minimum 5 year manufacturer warranty, certified to operate through 60,000 damper opening and closing cycles, and certified to meet leakage requirements specified under the section, "Control Dampers."

All portions of grease duct systems shall be tested for leakage in accordance with the "Grease Duct Test" paragraph of the Washington Mechanical Code. Leakage tests shall be by water leakage type or equivalent test methods as approved by the local code official to determine that all joints are liquid tight. Water leakage test shall be performed by Environmental Corporation of America or owner approved testing contractor. Tests shall be performed in the presence of the local code official. Any joints found defective shall be repaired and retested until satisfactory results are obtained. The contractor shall submit a copy of the grease duct leakage test report to the architect/engineer complete with the approval signature of the local code official.

#### 4. HVAC EQUIPMENT

#### A. ROOFTOP UNITS (GAS FIRED HEAT) 3-25 TONS

Install electric cooling, gas heating rooftop units as scheduled on the drawings furnished by owner, manufactured by Captive Air with features as noted in the RTU schedule and in the RTU Control Matrix, and complete with factory installed direct-drive hermetic compressors with internal spring vibration isolation, built-in motor thermal overload protection, crankcase heater, and low pressure switches; direct expansion cooling 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 SEER or EER rating (cooling) as specified on the applicable energy code or greater if scheduled on the drawings, centrifugal evaporator blower; air filter rack, propeller type condenser fan; aluminum steel heat exchanger, minimum AFUE rating (heating) as required by the applicable energy code or greater if scheduled on the drawings, forced combustion air blower; complete factory installed micro-processor controls including anti-shock cycle times, time delay relays and minimum "on" time controls; 100 percent safety gas shutoff; direct spark ignition system; built-in thermal overload protection on motors and compressors; outdoor air damper; relief; weathertight housing constructed of zinc coated, heavy gauge, 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 CMF if unit is not equipped with internal vibration isolators; single point electrical power connection. Provide gauges or louvers panels to protect the condenser coil from hail or other damage. Provide a 125 VAC, 20 amp duplex convenience receptacle mounted to 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 and heat exchangers. For units equipped with an economizer assembly, the assembly shall be covered with minimum 5 year manufacturer warranty, certified to operate through 60,000 damper opening and closing cycles, and certified to meet leakage requirements specified under the section, "Control Dampers."

#### B. ELECTRIC UNIT HEATERS

Provide electric unit heaters as scheduled on the drawings, manufactured by Berko, Brasch, Indesco, Markee, Qmark, or Raywall. Standard type propeller unit heaters with oval mounting brackets and hardware for horizontal airflow. Furnish heater fan motors complete with a manual motor starter with automatic thermal cutouts sized to the motor load, disconnect switch, and other code required safety devices. Provide unit mounted thermostat and manual summer/winter changeover switch.

#### C. SPLIT DUCTLESS AIR-CONDITIONING SYSTEMS

Provide split ductless system consisting of evaporator section for wall or ceiling mounting as indicated and remote condensing section similar to Carrier, Comfort Star, Dakin, Friedrich, Fujitsu, Lennox, LG, Mitsubishi, Samsung, Sanyo, Trane, or York. Evaporator cabinet shall be factory assembled pre-wired consisting of furniture-grade steel with baked-enamel finish, with direct-drive, wall or ceiling centrifugal fans, 2-speed motor, and cleanable foam filter. Evaporator coil shall be direct-expansion cooling coil of seamless copper tubes expanded into aluminum fins, with thermal-expansion valve with external equalizer. Air-cooled condenser shall be of corrosion-resistant cabinet containing compressor, copper-tube aluminum-fin coils, direct-drive propeller fans with motors with internal overload protection; capacity control to 0 degrees Fahrenheit.

Provide concrete bases for units located on grade. Provide pre-engineered roof equipment support rails for units located on roof. Securely attach units to rail.

Provide refrigerant piping sized as recommended by equipment manufacturer with foamed plastic insulation on the suction line as specified in this section.

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 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 "ons" and "offs" per day. Battery backup shall provide 48 hours of memory retention. Override timer switches shall be spring wound, 8-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.

7. SEQUENCE OF OPERATION

A. FAN COIL UNIT CONTROL

During occupied hours, operate fan coil unit supply fan continuously and open outdoor air damper to maintain minimum ventilation. Cycle stage(s) of DX cooling and electric heating to maintain room thermostat set point (75 degrees Fahrenheit cooling, 70 degrees Fahrenheit heating). Duct mounted smoke detectors shall shutdown unit upon alarm.

During unoccupied hours, cycle the fan coil unit supply fan and cooling or heating system to maintain unoccupied setback temperature set points. Outdoor motorized air damper shall be closed during unoccupied hours.

Connect the Outdoor motorized air damper to the same time clock as the restroom exhaust.

B. 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.

C. ROOFTOP UNIT CONTROL

Refer to RTU CONTROL MATRIX on Sheet M601 for required rooftop unit control options.

D. RESTROOM EXHAUST FAN (EF-1) CONTROL

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

E. AIR CURTAIN CONTROL

Interlock air curtain with door limit switch to energize when the door opens. Units scheduled with heating coils shall cycle the stages of heat to maintain room temperature setpoint of 70 F (adj).

F. ELECTRIC UNIT HEATER CONTROL

Unit heater shall be activated by unit mounted thermostat to maintain room temperature setpoint (60 deg F).

8. 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 and how 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.

9. 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.  
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.  
f. Exhaust fans.  
g. 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. Checkout 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 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 tags, piping, duct, and equipment 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. Sterilize 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 sections of pipe 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:  
1. Verify proper alignment, installation, and rotation.  
2. 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 instructions:  
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.  
d. 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 filter units 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 voltages.  
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 connections.  
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.

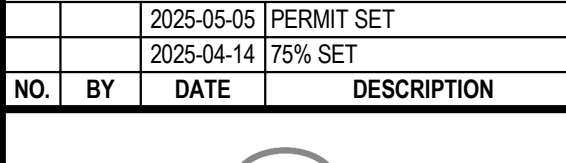
END OF SECTION 23

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM

CONSULTANTS:

SEAL SIGNATURE:

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

5801 SUNRISE HWY. SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

MECHANICAL SPECIFICATIONS

DRAWN BY: BK  
CHECKED BY: JE  
PROJECT NO: 12426-25

M592

**ROOFTOP UNIT CONTROL MATRIX**

CONTROL FEATURE		UNITS	RTU-1 SETPOINT OR Y/N	RTU-2 SETPOINT OR Y/N	NOTES
<b>CONTROL STRATEGY</b>					
SPACE TEMPERATURE CONTROL			Y	Y	
HEATING AND COOLING SET POINTS					
COOLING MODE ENABLE - SPACE TEMPERATURE - OCCUPIED SETPOINT	"F DB	75	75		
COOLING MODE ENABLE - SPACE TEMPERATURE - UNOCCUPIED SETPOINT	"F DB	80	80		
COOLING - SUPPLY AIR TEMPERATURE SETPOINT	"F DB	55	55		
HEATING MODE ENABLE - SPACE TEMPERATURE - OCCUPIED SETPOINT	"F DB	70	70		
HEATING MODE ENABLE - SPACE TEMPERATURE - UNOCCUPIED SETPOINT	"F DB	60	60		
HEATING - SUPPLY AIR TEMPERATURE SETPOINT	"F DB	85	85		
DEAD BAND - MINIMUM HEATING AND COOLING TEMPERATURE SETPOINT DIFFERENCE	"F DB	5	5		
VENTILATION ONLY MODE ENABLE - OUTSIDE AIR TEMPERATURE	"F DB	55 < X < 75	55 < X < 75		
VENTILATION ONLY MODE - SUPPLY AIR TEMPERATURE SETPOINT	"F DB	N/A	N/A	Q	
VENTILATION AIR HEATING/REHEAT CONTROL RESET - SUPPLY AIR TEMPERATURE SETPOINT	"F DB	65	65	N	
DEHUMIDIFICATION MODE ENABLE - OUTSIDE AIR DEW POINT	"F DP	55	55	F	
DEHUMIDIFICATION - COOLING CONTROL - COIL LEAVING AIR TEMPERATURE SETPOINT	"F DB	DYNAMIC	DYNAMIC	F	
DEHUMIDIFICATION - REHEAT CONTROL - SUPPLY AIR TEMPERATURE SETPOINT	"F DB	70	70	F	
<b>PROGRAMMED CONTROL FEATURES</b>					
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT			Y	Y	B
OPTIMUM START SEQUENCE			Y	Y	
<b>EQUIPMENT COMPONENTS, ACCESSORIES AND CONTROL FEATURES</b>					
COOLING COIL (DX - MODULATING CAPACITY)		Y	Y	Y	K
DEHUMIDIFICATION - MODULATING HOT GAS REHEAT		Y	Y		
HEATING - NATURAL GAS - MODULATING		Y	Y	Y	K
RETURN AIR PATH WITH MOTORIZED RETURN AIR DAMPER FOR UNOCCUPIED OPERATION		Y	Y		D, T
OUTSIDE AIR DAMPER - MOTOR OPERATED		Y	Y		J, T
RELIEF/EXHAUST AIR DAMPER - BAROMETRIC		Y	N		
RELIEF/EXHAUST AIR DAMPER - MOTOR OPERATED		N	Y		J
OUTSIDE/SUPPLY AIR AIRFLOW MONITORING		Y	Y		
REMOTE TEMPERATURE SENSOR		N	Y		B
REMOTE COMBINATION TEMPERATURE AND HUMIDITY SENSOR		Y	N		B
INTEGRATED ECONOMIZER - DIFFERENTIAL ENTHALPY ENABLE (OA ENTHALPY < RA ENTHALPY)	BTULB	Y	Y		U
SUPPLY FAN CONTROL METHODS					
ON DURING OCCUPIED MODE		Y	Y		
CYCLE WITH LOADS DURING UNOCCUPIED HOURS		Y	Y		
VARIABLE VOLUME - STAGED FAN CONTROL IN RESPONSE TO ACTIVE COOLING COIL STAGES		Y	Y		K, V
<b>SAFETIES, INTERLOCKS, AND ALARMS</b>					
GAS VALVE SAFETY		Y	Y		F
RETURN AIR SMOKE DETECTOR - SAFETY SHUTDOWN		Y	Y		E
LOW LIMIT FREEZE/STAT - FREEZE PROTECTION SAFETY SHUTDOWN		Y	Y		F
DIFFERENTIAL PRESSURE SWITCH - FILTER CHANGE ALARM		Y	Y		F
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK		Y	Y		F
OUTSIDE AIR DAMPER END SWITCH - SAFETY SHUTDOWN		Y	Y		S
KITCHEN EXHAUST SYSTEM INTERLOCK		Y	Y		L
<b>NOTES:</b>					
B. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.					
D. DURING UNOCCUPIED OPERATION, EXHAUST AND OUTSIDE AIR DAMPERS SHALL CLOSE. THE RETURN AIR DAMPER SHALL OPEN TO PERMIT RECIRCULATION OF INDOOR AIR THROUGH UNIT.					
E. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.					
F. DEVICE SHALL BE FACTORY MOUNTED AND PRE-WIRED FOR OPERATION SUBJECT TO THE ONBOARD CONTROLLER.					
J. DAMPER SHALL BE CLOSED DURING UNOCCUPIED MODE.					
K. UNITARY CONTROLLER SHALL MODULATE AND/OR CYCLE SUPPLY FAN SPEED AND COIL CAPACITY SUBJECT TO THE INTERNAL SAFETIES AND SEQUENCES TO MAINTAIN SCHEDULED SETPOINTS.					
L. INTERLOCK RTU WITH KITCHEN EXHAUST HOOD SYSTEM(S) TO SHUT DOWN UPON SIGNAL FROM HOOD FIRE EXTINGUISHING SYSTEM.					
N. RTU WITH KITCHEN EXHAUST FAN TO ENERGIZE WHEN HOOD SYSTEM IS ENERGIZED FOR PRESSURIZATION.					
O. UNITS THAT PROVIDE VENTILATION AIR TO MULTIPLE ZONES AND OPERATE IN CONJUNCTION WITH ZONE HEATING AND COOLING SYSTEMS SHALL NOT USE HEATING OR HEAT RECOVERY TO WARM SUPPLY AIR TO A TEMPERATURE GREATER THAN VALUE INDICATED WHEN THE OUTSIDE AIR TEMPERATURE EXCEEDS 75F.					
Q. VENTILATION ONLY MODE PROVIDES OUTSIDE AIR DIRECTLY TO SPACE WITHOUT HEATING OR COOLING WHEN OUTDOOR AIR IS FAVORABLE.					
R. VENTILATION ONLY MODE CAN BE INTERRUPTED ON A CALL FOR DEHUMIDIFICATION.					
S. 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.					
T. DURING UNOCCUPIED OPERATION, OUTSIDE AIR DAMPERS SHALL CLOSE AND RETURN AIR DAMPER SHALL MODULATE.....					

**AIR CURTAIN SCHEDULE**

MARK	SERVICE AREA	MANUFACTURER	MODEL	UNIT SPECS				VPH/Hz	NOTES
				LENGTH (IN)	MAX AIRFLOW	HEATING CAPACITY (KW)	MOTOR HP		
AC-1	SERVICE ENTRY	MARS	STD2	36	1379	N/A	1/2	115/1	A-F

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:  
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.  
B. MOUNT UNIT PER MANUFACTURERS RECOMMENDATIONS TO FACE OF WALL AND SUPPORT VERTICALLY.  
C. PROVIDE INTEGRAL STARTER AND DISCONNECT SWITCH.  
D. REFER TO SEQUENCE OF OPERATION FOR UNIT CONTROLS.  
E. PROVIDE AIR CURTAIN WITH NORMALLY CLOSED DOOR LIMIT SWITCH FOR INSTALLATION ON DOOR. THE AIR CURTAIN SHALL ENERGIZE WHEN DOOR OPENS.  
F. PROVIDE WITH DELAY MICROSWITCH WITH ADJUSTABLE DELAY TIMERS PRE MOUNTED IN THE AIR CURTAIN CONTROL PANEL.  
G. PROVIDE WITH INTEGRAL THERMOSTAT.

**FAN SCHEDULE**

MARK	SERVICE	MANUFACTURER	MOUNTING	MODEL	CFM	ESP (IN)	DRIVE	MIN HP	FAN RPM	VFD (Y/N)	ELECTRICAL			NOTES
											V/PH	DISC.	STARTER	
EF-1	TOILETS	GREENHECK	STRL MTD.	SQ-097-VG	150	0.5	DIRECT	1/4	1099	N	120/1	NF	COMBI	A-E

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:  
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.  
B. COORDINATE WITH STRUCTER FOR MOUNTING.  
C. EQUIPMENT CAPACITY SCHEDULED IS MINIMUM CAPACITY THAT MUST BE PROVIDED AT AMBIENT TEMPERATURE INDICATED.  
D. INTERLOCK FAN OPERATION WITH TIME CLOCK.  
E. PROVIDE WITH MANUFACTURER'S FAN SPEED CONTROLLER FOR BALANCING PURPOSES.  
F. FAN TO RUN CONTINUOUSLY.

**HEAT PUMP CONDENSING UNIT SCHEDULE**

MARK	SERVICE	MANUFACTURER	MODEL	REFR TYPE	COOLING CAPACITY			HEATING CAPACITY			ELECTRICAL			WEIGHT (LBS)	NOTES
					TH (MBH)	AMBIENT (DB)	MIN EFF (SEER)	CAP (MBH)	AMBIENT (DB)	MIN EFF COP 47°F	MCA	MOCP	V/PH		
CU-1	FCU-1	CARRIER	38MARBQ18AA3	R410A	10.6	98.0	19.0	9.2	13.8	3.3	18	25	208/1	102.5	A-H

\*EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T002 / VENDOR LIST FOR MORE INFORMATION. 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:  
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.  
B. SYSTEM POPULATIONS BASED ON MAX SEATING AND/OR CODE MAXIMUM VALUES.  
C. CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT QUANTITY AND SIZE OF REFRIGERANT PIPING.  
D. PROVIDE LIQUID LINE FILTER DRYER AND SIGHT GLASS.  
E. PROVIDE PREFABRICATED EQUIPMENT SUPPORT RAILS.  
F. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.  
G. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.  
H. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.

**OUTSIDE AIR REQUIREMENTS, IMC-2018 (IP)**

SYSTEM DESIGNATION	SYSTEM TAB NAME OR LIST 'SINGLE'	SINGLE-ZONE SYSTEMS ONLY		SYSTEM VENTILATION EFFICIENCY [E-v]	FLOOR AREA SERVED BY SYSTEM [As] (SF)	SYSTEM AVERAGED AREA-BASED OUTDOOR AIR RATE (CFM/SF)	SYSTEM POPULATION [Ps] (PEOPLE)	SYSTEM AVERAGED PEOPLE-BASED OUTDOOR AIR RATE (CFM/PP)	REQUIRED OA INTAKE FLOW [Vot] (CFM)	REQUIRED DCV OA INTAKE FLOW [Vot] (CFM)	DESIGN OA INTAKE FLOW [Vot] (CFM)	NOTES
		SINGLE-ZONE SYSTEM ASSOCIATED VENTILATION ZONE	SINGLE ZONE WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS [Ez]									
RTU-1	-	DINNING/WORKROOM	0.80	-	2,100	.15	28	7.50	375	N/A	1,000	ALL
RTU-2	-	KITCHEN	0.80	-	500	.12	12	7.50	120	N/A	1,300	ALL
FCU 1	SINGLE ZONE	OFFICE	0.80	-	75	0.060	2	5.00	18	N/A	40	ALL
TOTALS									941	0	2,340	

GENERAL NOTES:  
1. VENTILATION CALCULATIONS BASED ON IMC-2018.  
2. SYSTEM POPULATIONS BASED ON MAX SEATING AND/OR CODE MAXIMUM VALUES.  
3. SINGLE ZONE SYSTEMS (Vot = Voz): SYSTEM VENTILATION EFFICIENCY CALCULATION IS NOT REQUIRED FOR SINGLE ZONE SYSTEMS. WORST CASE AIR DISTRIBUTION EFFECTIVENESS BETWEEN HEATING AND COOLING MODES OF OPERATION IS SHOWN IN TABLE.  
4. 100% OA SYSTEMS (Vot = Σ all zones Voz): WHEN ONE AIR HANDLER SUPPLIES ONLY OUTDOOR AIR TO ONE OR MORE ZONES. EACH ZONE IS INDIVIDUALLY CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (HEATING/COOLING).  
5. MULTI-ZONE RECIRCULATING SYSTEMS: CALCULATOR USED TO DETERMINE VENTILATION AIRFLOW IN COMPLIANCE WITH IMC-2018 VPP AND ASHRAE 62.1-2016 APPENDIX A. VENTILATION RATE SHOWN IS ACTUAL CALCULATED WITH CORRECTION FACTORS INCLUDED. EACH ZONE IS CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (HEATING/COOLING) AS PART OF CALCULATIONS TO FIND EV.

**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
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	PODR	STEEL	PERFORATED	LAY-IN	24x24	30	A B C 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:  
A. EQUIPMENT FURNISHED AND INSTALLED PER THE EQUIPMENT RESPONSIBILITY SCHEDULE.  
B. NECK SIZE SHOWN ON DRAWINGS. PROVIDE BRANCH DUCT TO MATCH NECK SIZE UNLESS OTHERWISE SHOWN ON DRAWINGS.  
C. DIFFUSERS SHALL BE PREFINISHED TO MATCH CEILING/WALL/EXPOSED DUCT COLOR (COORDINATE WITH ARCHITECT).  
D. FRONT BLADES PARALLEL TO LONG DIMENSION.  
E. DOUBLE DEFLECTION BARS SHALL BE ADJUSTABLE.  
F. FRAME TYPE TO MATCH CEILING/WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING/WALL PLAN.  
G. PROVIDE OPPOSED BLADE DAMPER ADJUSTABLE FROM FACE OF DEVICE.  
H. PROVIDE DIFFUSERS, LINEAR SLOTS, AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.  
J. CONTRACTOR SHALL PROVIDE REMOTE CABLE-OPERATED VOLUME DAMPER BY METROPOLITAN AIR TECHNOLOGIES MODEL RT-250 WITH EXTERNAL WORK 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 BLADE, SELF LUBRICATING BEARING AND WORK GEAR MOUNTING PLATE. DAMPER SHALL BE INSTALLED IN BRANCH DUCT NOT INLET OF PLENUM DIFFUSER. (RE: 2M501)  
K. 4-WAY THROW PATTERN UNLESS OTHERWISE INDICATED BY FLOW ARROWS ON DRAWINGS.  
L. PROVIDE RAPID MOUNT FRAME FOR INSTALLATION IN HARD CEILING.

**AIR CURTAIN SCHEDULE**

DESIGNATION	LOCATION	AIRFLOW (CFM)	VELOCITY AT NOZZLE (FPM)	WEIGHT (LBS)	ELECTRICAL			MANUFACTURER/ MODEL NUMBER
					V/PH/Hz	FLA	HP	
AC-1	KITCHEN	1200	1800	40	208/1/50	1.2	1/6	MARS/ LPV248-1UA-0B

NOTES:  
1. PROVIDE DOOR ACTIVATION SWITCH. COORDINATE MOUNTING LOCATION WITH ELECTRICAL CONTRACTOR.  
2. MOUNT ABOVE KITCHEN BACK DOOR. COORDINATE INSTALLATION IN GENERAL WITH THE CONTRACTOR.  
3. CONFIRM COLOR WITH ARCHITECT/OWNER.

**FAN COIL UNIT SCHEDULE (HEAT PUMP)**

MARK	MFR	MODEL	SUPPLY FAN				COOLING COIL				HEAT PUMP HEATING COIL				ELECTRICAL			WEIGHT (LBS)	NOTES				
			CFM	ESP (IN)	NOM HP	TH (MBH)	SH (MBH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	REFR TYPE	MIN OUT (MBH)	AMBIENT (DB)	EAT (°F DB)	EAT (°F WB)	V/PH			MCA	MOCP	DISC TYPE	
FCU-1	CARRIER	40MBCQ18	420	0.025	0.061	10.6	9.1	76.8	63.9	57.0	55.5	R410A	9.2	13.8	64.6	85	40	208/1	N/A	N/A	NF	45	A - J

\*EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T002 / VENDOR LIST FOR MORE INFORMATION. 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:  
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.  
B. ASSOCIATED CONDENSING UNIT SHALL BE BY THE SAME MANUFACTURER.  
C. FOR COOLING, EQUIPMENT SIZED FOR 95°F AMBIENT TEMPERATURE. HEAT PUMP HEATING CAPACITY BASED ON AMBIENT TEMPERATURE LISTED.  
D. PROVIDE UNIT WITH CLEANABLE AIR FILTERS.  
E. PROVIDE WITH 7-DAY PROGRAMMABLE THERMOSTAT WITH STAGED HEATING AND COOLING CAPABILITY AS REQUIRED FOR OPERATION OF HEATING AND COOLING CONTROLS.  
F. PROVIDE FACTORY MOUNTED STARTER AND DISCONNECT SWITCH INSTALLED ON SERVICE SIDE OF UNIT.  
G. PROVIDE SINGLE POINT POWER CONNECTION.  
H. PROVIDE WITH SPRING VIBRATION ISOLATION AND ALL-THREAD HANGING RODS.  
J. REFERENCE PLUMBING PLANS FOR CONDENSATE DRAIN PIPING FROM UNIT.

**Project Design Conditions**

CLIMATE CONDITIONS				BUILDING OPERATING HOURS:			
WEATHER STATION: LA GUARDIA, NY, USA				MONDAY-FRIDAY: TBD BY OWNER			
CLIMATE ZONE: 4A				SATURDAY: TBD BY OWNER			
HEATING (DB): 99.6%				SUNDAY: TBD BY OWNER			
COOLING (DB/MCWB): 0.4%				HOLIDAY: TBD BY OWNER			

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

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

**BUILDING AIR BALANCE SUMMARY NORMAL OPERATION**

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OAVSA
RTU-1	2,500	1,000	--	32%
RTU-2	4,600	1,300	--	30%
FCU-1	420	40	--	10%
KEF-1	--	--	1,188	--
KEF-2	--	--	860	--
EF-1	--	--	150	--
TOTALS	7,520	2,340	2,198	--
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				142
PERCENT POSITIVE PRESSURIZATION				6%

**BUILDING AIR BALANCE SUMMARY ECONOMIZER MODE**

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OAVSA
RTU-1	2,500	2,500	--	100%
RTU-2	4,600	4,600	--	100%
FCU-1	420	40	--	10%
KEF-1	--	--	1,188	--
KEF-2	--	--	860	--
EF-1	--	--	150	--
RELIEF RTU-1	--	--	1,500	--
RELIEF RTU-2	--	--	3,300	--
TOTALS	7,920	7,540	6,998	--
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				542
PERCENT POSITIVE PRESSURIZATION				7.1%

**ROOFTOP UNIT SCHEDULE (DX COOLING, GAS HEAT)**

MARK	MANUFACTURER	MODEL	NOMINAL TONS	UNIT TYPE	SUPPLY FAN				COOLING COIL				GAS HEAT INFORMATION				MIN O/A CFM	ELECTRICAL			WEIGHT (LBS)	NOTES							
					CFM	ESP (IN)	HP	VFD (Y/N)	TH (MBH)	SH (MBH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	REFR TYPE	MIN EFF (IEER)		MIN NO STAGES	GAS TYPE	INPUT(MBH)			OUTPUT(MBH)	TEMP RISE (°F)	REQUIRED INPUT GAS PRESSURE				
RTU-1	CAPTIVEAIRE	CAS-HVAC2-1.150-18-10T	10	SINGLE ZONE	2,500	1.0	3.0	Y	139.2	82.5	80.5	68.7	50	49.0	R454B	18.6	3	NATURAL	121	98	35	7 IN. W.C. - 14 IN. W.C.	1,000	208/3	60.9	70	FUSED	1979	A-O
RTU-2	CAPTIVEAIRE	CAS-HVAC3-1.250-24-20T	20	SINGLE ZONE	4,600	0.85	5	Y	255.3	151.3	78.8	67.6	48	47	R454B	18.2	3	NATURAL											

COMcheck Software Version COMcheckWeb  
**Mechanical Compliance Certificate**

**Project Information**  
 Energy Code: 2020 New York City Energy Conservation Code  
 Project Title: Shake Shack - SunVet, NY  
 Location: New York, New York  
 Climate Zone: 4a  
 Project Type: Alteration

Construction Site: 5803 Sunrise Hwy, Suite 220, Holbrook, New York 11741  
 Owner/Agent: Designer/Contractor:

**Mechanical Systems List**

**Quantity System Type & Description**

- HVAC System (Single Zone):**  
 Heating: 1 each - Central Furnace, Gas, Capacity = 120 kBtu/h  
 Proposed Efficiency = 80.00% EER, Required Efficiency: 80.00% EER or 80% AFUE  
 Cooling: 1 each - Single Package DX Unit, Capacity = 139 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 10.80 EER, Required Efficiency = 10.80 EER  
 Proposed Part Load Efficiency = 12.20 IER, Required Part Load Efficiency = 12.20 IER  
 Fan System: FAN SYSTEM 1 - Compliance (Motor nameplate HP and fan efficiency method) : Passes  
 Fans:  
 FAN 1 Supply, Constant Volume, 2500 CFM, 3.0 motor nameplate hp, 0.0 fan efficiency grade, 0.0 total fan efficiency, 0.0 design fan efficiency, fan exception: Part of code listed equipment
- HVAC System (Single Zone):**  
 Heating: 1 each - Central Furnace, Gas, Capacity = 214 kBtu/h  
 Proposed Efficiency = 80.00% EER, Required Efficiency: 80.00% EER or 80% AFUE  
 Cooling: 1 each - Single Package DX Unit, Capacity = 255 kBtu/h, Air-Cooled Condenser, Air Economizer  
 Proposed Efficiency = 9.80 EER, Required Efficiency = 9.80 EER  
 Proposed Part Load Efficiency = 11.40 IER, Required Part Load Efficiency = 11.40 IER  
 Fan System: FAN SYSTEM 2 - Compliance (Motor nameplate HP and fan efficiency method) : Passes  
 Fans:  
 FAN 2 Supply, Constant Volume, 4600 CFM, 5.0 motor nameplate hp, 0.0 fan efficiency grade, 0.0 total fan efficiency, 0.0 design fan efficiency, fan exception: Part of code listed equipment
- HVAC System (Single Zone):**  
 Split System Heat Pump  
 Heating Mode, Capacity = 9 kBtu/h,  
 Proposed Efficiency = 8.20 HSPF, Required Efficiency = 8.20 HSPF  
 Cooling Mode, Capacity = 10 kBtu/h,  
 Proposed Efficiency = 14.00 SEER, Required Efficiency = 14.00 SEER  
 Proposed Part Load Efficiency = 0.00, Required Part Load Efficiency = 0.00  
 Fan System: FAN SYSTEM 3 - Compliance (Motor nameplate HP and fan efficiency method) : Passes  
 Fans:  
 FAN 3 Supply, Constant Volume, 420 CFM, 0.1 motor nameplate hp, 0.0 fan efficiency grade, 0.0 total fan efficiency, 0.0 design fan efficiency, fan exception: Single fan <= SHP
- Water Heater:**  
 Gas Instantaneous Water Heater, Capacity: 1 gallons, Input Rating: 58 kBtu/h  
 No minimum efficiency requirement applies

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
 Data filename: Page 1 of 11

Section # & Req ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.12.2	Snow/ice melting system and freeze protection systems have sensors and controls configured to limit service for pavement temperature and outdoor temperature, future connection to controls.	<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 - SunVet, NY Report date: 04/29/25  
 Data filename: Page 4 of 11

**Mechanical Compliance Statement**

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2020 New York City Energy Conservation Code requirements in COMcheck Software Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

David R. Lippe, P.E. Signature Date: 04/29/2025

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
 Data filename: Page 2 of 11

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	
C404.6.3 (PL7)	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C404.7 (PL8)	Demand recirculation water systems have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	<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 - SunVet, NY Report date: 04/29/25  
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COMcheck Software Version COMcheckWeb  
**Inspection Checklist**

Energy Code: 2020 New York City Energy Conservation Code

Requirements: 0.0% 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 systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C103.2 [PR3]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water system sized per manufacturers sizing guide.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.5.2 [PR36]	Electrical meters for tenant spaces in covered buildings. Each covered tenant space in a new building shall be equipped with a separate meter or sub-meter to measure the electrical consumption of such space when let or sublet. See section details and Section 26-311.2 of the Administrative Code. As new covered tenant spaces are created, they shall be equipped with meters or sub-meters as provided in this section.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.10 [PR38]	New parking garages and new parking lots powered by the energy services for a building, and with 10 or greater parking spaces, provide either: 1. Panel capacity and conduit for the future installation of minimum 208/240V 40-amp outlets for 5 percent of the total parking spaces and not less than two parking spaces; or 2. Minimum 208/240V 40-amp outlets for 5 percent of the total parking spaces and not less than two parking spaces.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

**Additional Comments/Assumptions:**

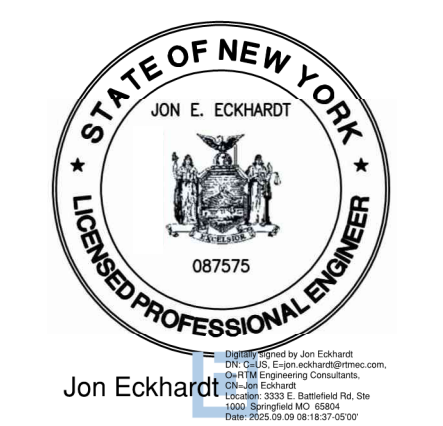
1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
 Data filename: Page 3 of 11

Section # & Req ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME1]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-5.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.11.3 [ME1]	HVAC piping insulation insulated in accordance with Table C403.11.3. Insulation exposed to weather is protected from damage and is provided with shading from solar radiation.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
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	
C403.8.5 [ME143]	Each DX cooling system > 65 kBtu 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	
C403.12.1 [ME71]	Systems that heat outside the building envelope are radiant heat systems controlled by an occupancy sensing device or timer switch.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.2.3 [ME53]	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.
C405.8.1.2 [ME36]	New traction elevators with a rise of 75 feet or more have a power conversion system that complies as follows: C405.8.1.1 Induction motor with a Class IE2 efficiency ratings are used. C405.8.1.1.2 Transmission does not reduce the efficiency of the combined motor/transmission below that shown for the Class IE2 motor for elevators with capacities below 4,000 lbs. C405.8.1.1.3 Potential energy released during motion recovered with a regenerative drive that supplies electrical energy to the building electrical system.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.10 [ME37]	Commercial kitchen equipment shall comply with the minimum efficiency requirements of Tables C405.10(1) through Table C405.10(5).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.3.2 Table 12 [ME144]	Vapor Compression Based Indoor Pool Dehumidifiers comply with the minimum efficiency requirements of Table C403.3.2(1).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
 Data filename: Page 6 of 11

CONSULTANTS:

SEAL SIGNATURE:



	2025-05-05	PERMIT SET
	2025-04-14	75% SET

NO.	BY	DATE	DESCRIPTION
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SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

PERMIT SET

MECHANICAL ENERGY  
 CODE COMPLIANCE

DRAWN BY: BK

CHECKED BY: JE

PROJECT NO: 12426-25

M630

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.3.2 13, Table C403.3.2 14 [ME145]	Electrically operated DX DOAS units, single-package and remote condenser, without energy recovery comply with minimum efficiency requirements of Table C403.3.2(13). Units with energy recovery comply with minimum efficiency requirements of Table C403.3.2(14).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.5.5 [ME113]	Fault detection and diagnostics installed with air-cooled unitary DX units having economizers.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.2.2 [ME59]	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	
C403.7.1 [ME59]	Demand control ventilation provided for spaces >500 ft <sup>2</sup> and >25 people/1000 ft <sup>2</sup> 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	
C403.7.2 [ME113]	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	
C403.7.6 [ME141]	HVAC systems serving guestrooms in Group 6-1 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	
C403.7.4 [ME57]	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	
C403.7.5 [ME116]	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	
C403.11.1 [ME60]	HVAC ducts and plenums insulated in accordance with C403.11.1 and constructed in accordance with C403.11.2. Verification may need to occur during Foundation Inspection.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.5. C403.5.1, C403.5.2 [ME62]	Air economizers provided where required, meet the requirements for C403.5.2 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	

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

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
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Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3. C408.2.5. 3 [F18]	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	
C403.2.2 [F127]	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	
C403.2.4. 1 [F147]	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	
C403.2.4. 1, 1.1, 1.2 [F142]	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	
C403.4.1. 1, 1.1 [F138]	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	
C403.2.4. 1.1, [F120]	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	
C403.2.4. 2 [F139]	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	
C403.2.4. 2.1, C403.2.4. 2.2 [F140]	Automatic Controls: Setback to 55°F (heat) and 65°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	
C403.2.4. 2.3 [F141]	Systems include optimum start controls.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C404.3 [F113]	Heat traps installed on supply and discharge piping of non-circulating systems.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C404.4 [F125]	All piping insulated in accordance with section details and Table C403.11.3.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

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

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
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Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.5.3. [ME124]	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 C403.5.3.3 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	
C403.5.3. 4 [ME125]	System capable of relieving excess outdoor air during air economizer operation to prevent overpressuring 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	
C403.5.3. 5 [ME126]	Return, 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	
C403.4.3. 3.2 [ME121]	Closed-circuit cooling tower within heat pump loop have either automatic bypass valve or lower leakage positive closure dampers. Open-circuit tower within heat pump loop have automatic valve to bypass all heat pump water flow around the tower. Open- or closed-circuit cooling towers used in conjunction with a separate heat exchanger have heat loss by shutting down the circulation pump on the cooling tower loop. Open- or closed circuit cooling towers have a separate heat exchanger to isolate the cooling tower from the heat pump loop, and heat loss is controlled by shutting down the circulation pump on the cooling tower loop.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.4.1. [ME3]	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	
C403.3.3 [ME35]	Hot gas bypass limited to: <=240 kBtu/h - 50% >240 kBtu/h - 25%	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C403.5. C403.5.1, C403.5.2 [ME123]	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 C403.5.1 and refrigeration compressor systems that comply with C403.5.2.	<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 - SunVet, NY Report date: 04/29/25  
Data filename: Page 8 of 11

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.1.1 [F157]	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	

Additional Comments/Assumptions:

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

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
Data filename: Page 11 of 11

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.6 [EL26]	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	
C405.7 [EL27]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). 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	
C405.8.2. 1 [EL28]	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	
C405.9 [EL29]	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	

Additional Comments/Assumptions:

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

Project Title: Shake Shack - SunVet, NY Report date: 04/29/25  
Data filename: Page 9 of 11

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM



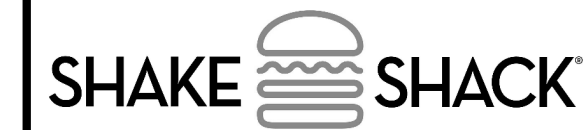
CONSULTANTS:

SEAL SIGNATURE:



Jon Eokhardt

	2025-05-05	PERMIT SET	
	2025-04-14	75% SET	
NO.	BY	DATE	DESCRIPTION



SHAKE SHACK SUN VET

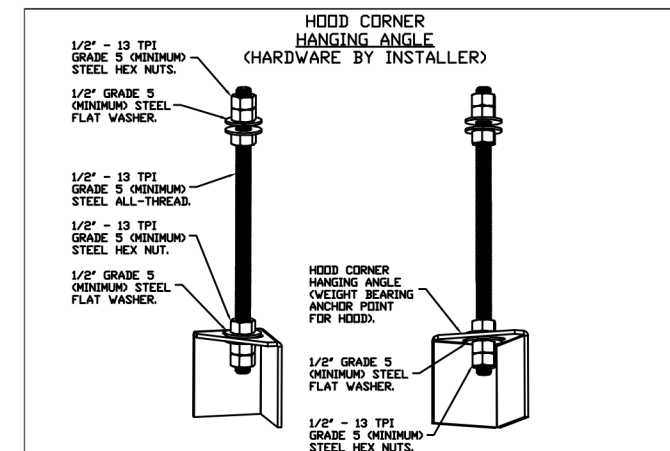
5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

MECHANICAL ENERGY  
CODE COMPLIANCE

DRAWN BY: BK  
CHECKED BY: JE  
PROJECT NO: 12426-25

M631



**HANGING ANGLE DETAILS**

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 SNO-2	228	294	-
ISLAND ND-2WI	269	300	350
ISLAND ND-2I	346	422	475

**ETL HOOD LISTING DETAIL**

EXHAUST CFM = LENGTH OF HOOD X CFM/LIN.FT. (LOAD)  
 SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED  
 TOTAL DUCT AREA (sq. in.) = 144 X  
 DUCT LENGTH = TOTAL DUCT AREA / DUCT WIDTH

\*CAPTIVEAIRE VENTILATOR SIZES ARE CALCULATED USING AN EXHAUST VELOCITY OF 1500-1800 FPM AND A SUPPLY VELOCITY OF 1000 FPM

**CALCULATIONS UTILIZED**

CAPTIVEAIRE HOODS BUILT IN COMPLIANCE WITH

ETL LISTING: ETL-1111-1111  
 LISTED UNDER ETL FILE NUMBER 3054804-001/002

**BUILDING CODES**

CAPTIVEAIRE HOODS HAVE OPTIONAL CLEARANCE REDUCTION SYSTEMS AVAILABLE AS FOLLOWS:

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

**CLEARANCE TO COMBUSTIBLES**

**INSTALLATION**

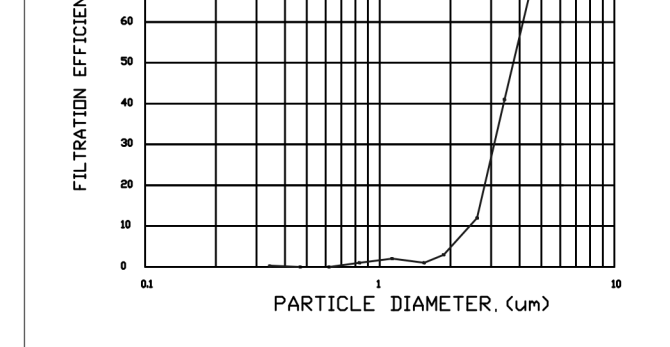
- ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.
- ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
- HANGING BRACKETS LOCATED AND HELDS AS SHOWN ON PLANS. ALL OTHER HANGER MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
- 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 SHOWN INSTALLED BY CAPTIVEAIRE ARE FACTORY PREWIRED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES ARE BY ELECTRICAL CONTRACTOR.
- LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
- SEALING RESTRICTIONS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
- INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION, AND ADMINISTRATION OF CODE REQUIREMENTS IN STRICT PRIORITY TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

**BALANCE**

- KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
- KITCHEN SHALL BE NEGATIVE WITH RESPECT TO DRAFT AREA.
- RESTAURANT SHALL BE POSITIVE WITH RESPECT TO AMBIENT PRESSURE.

**ADDITIONAL**

- WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
- SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT TO BE PROVIDED TO THE CONTRACTOR PRIOR TO COMMENCEMENT OF FABRICATION.



**FILTER DETAIL**

FOR QUESTIONS, CALL THE  
 Eastern PA Mechanical  
 REGION 108  
 PHONE: (267) 504 - 4126  
 EMAIL: regi108@captiveaire.com

**HOOD INFORMATION - JOB#7326051**

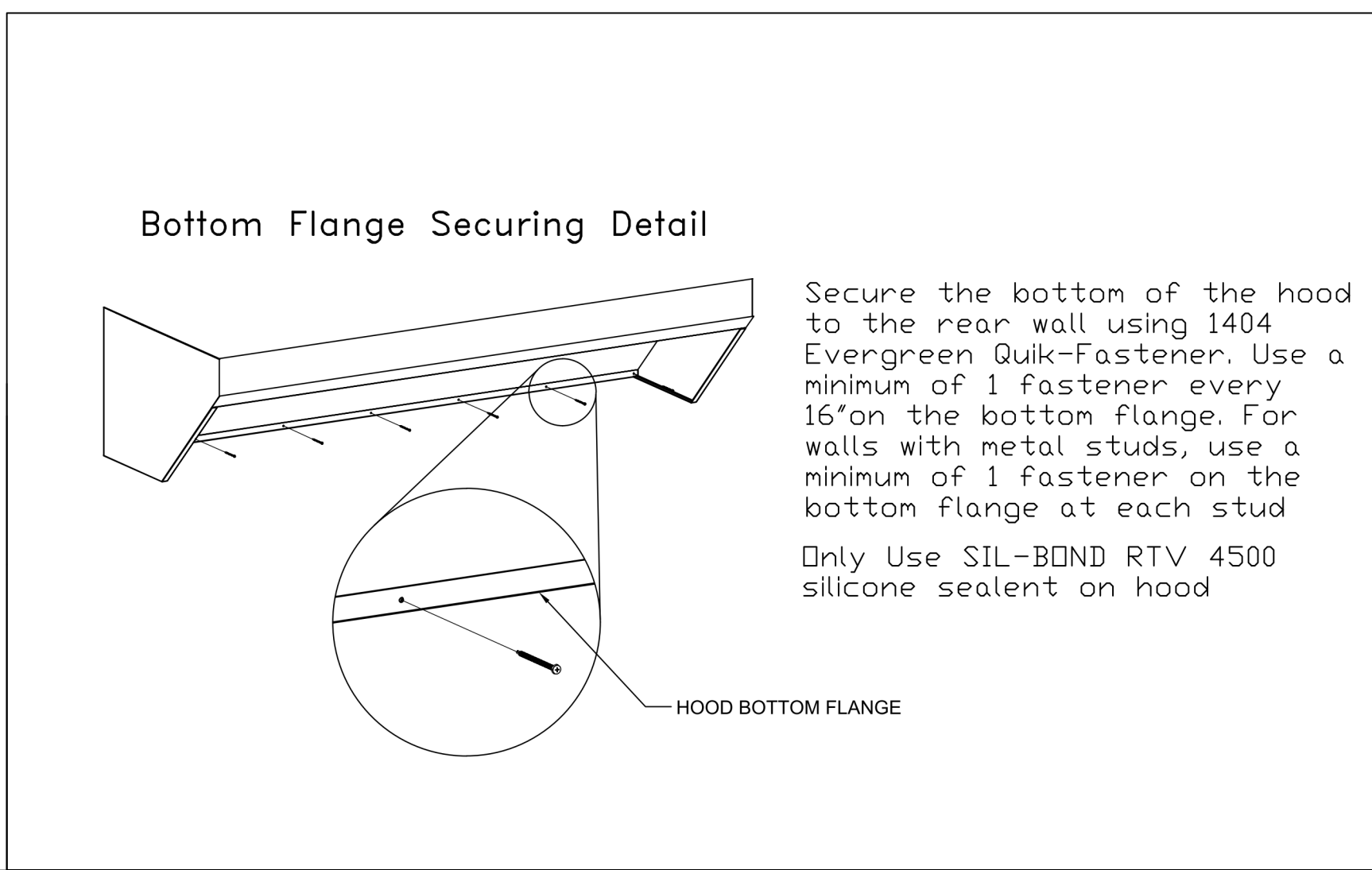
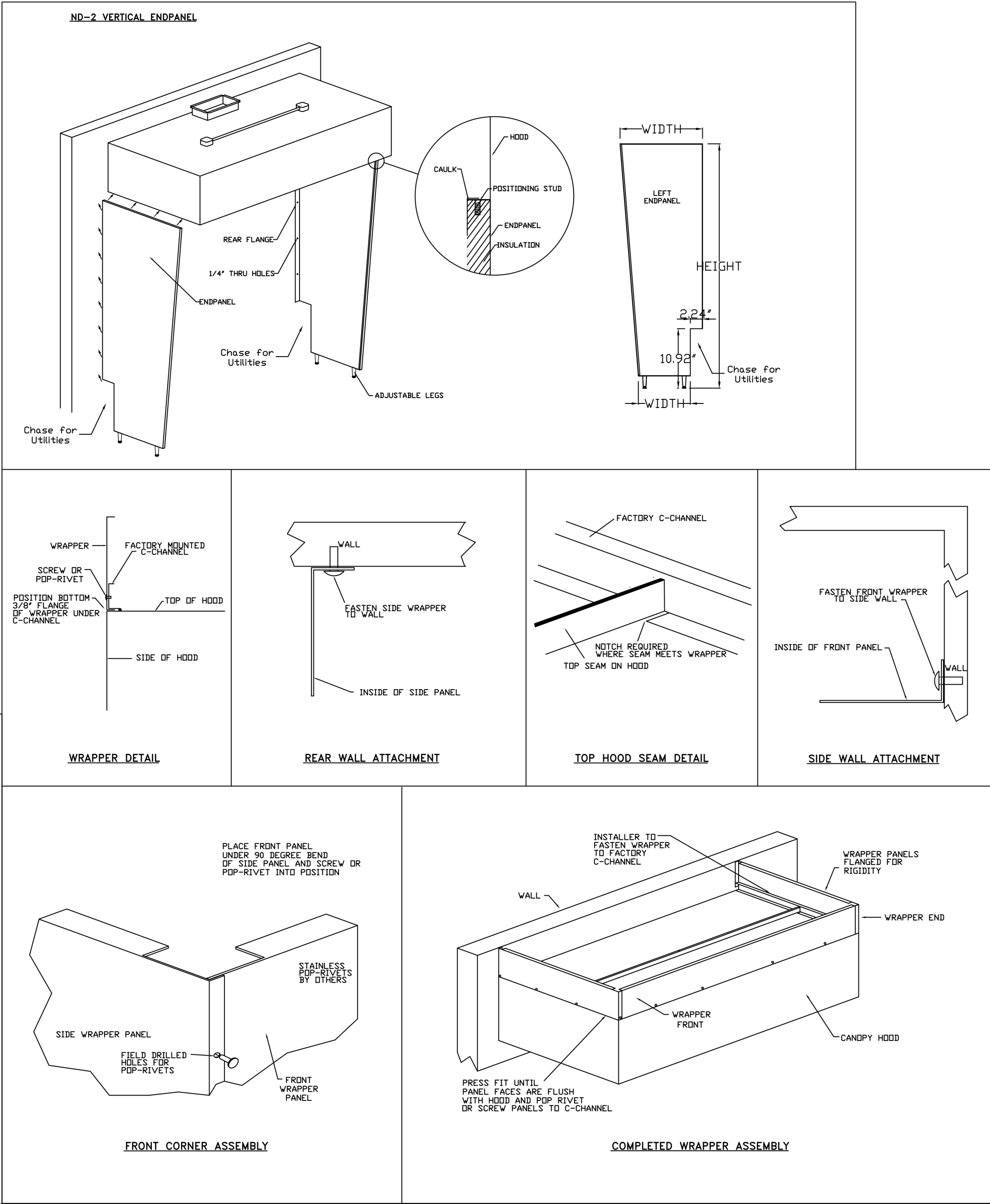
HOOD NO.	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S)				HOOD CONSTRUCTION	HOOD CONFIG			
										WIDTH	LENG	HEIGHT	DIA		CFM	VEL	SP	END TO END
1	Hood (Grill)	5430 ND-2	CAPTIVEAIRE	7' 11"	450 DEG	I	MEDIUM	150	1188	10"	11"	4"	1188	1555	-0.462'	430 SS WHERE EXPOSED	ALONE	ALONE
2	Hood (Fryer)	5430 ND-2	CAPTIVEAIRE	4' 11"	600 DEG	I	HEAVY	175	860	9"	9"	4"	860	1529	-0.494'	430 SS WHERE EXPOSED	ALONE	ALONE

**HOOD INFORMATION**

HOOD NO.	TAG	TYPE	FILTER(S)		LIGHT(S)		UTILITY CABINET(S)		FIRE SYSTEM PIPING	HOOD HANGING WEIGHT		
			QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE			WIRE GUARD	LOCATION
1	Hood (Grill)	CAPTRATE SOLD FILTER	5	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	484 LBS		
2	Hood (Fryer)	CAPTRATE SOLD FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	748 LBS		

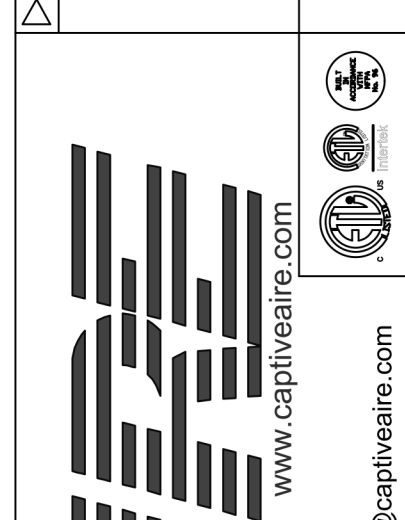
**HOOD OPTIONS**

HOOD NO.	TAG	OPTION
1	Hood (Grill)	FIELD WRAPPER 18.00' HIGH FRONT, LEFT, RIGHT. LEFT END STANDOFF (FINISHED) 1' WIDE 54" LONG INSULATED. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN. RIGHT 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.
2	Hood (Fryer)	FIELD WRAPPER 12.00' 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. INSULATION FOR BACK OF HOOD. RISER SENSOR INSTALL 6IN PLEN.



**REVISIONS**

NO.	DESCRIPTION	DATE



**CAPTIVEAIRE**

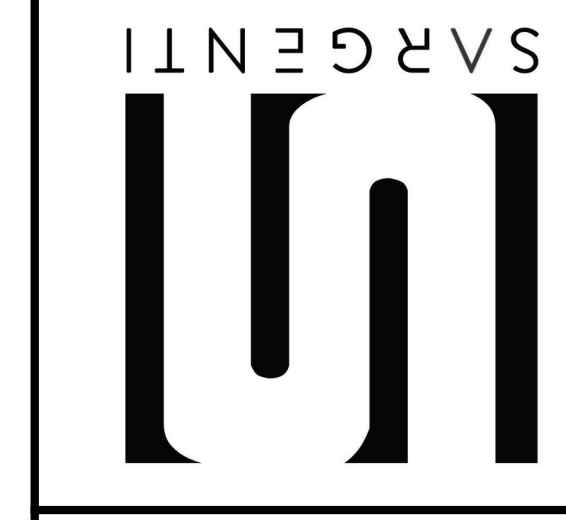
Snake Shack-1545-Sun Vet, NY(Kitchen)  
 HOLBROOK, NY, 11741

**DATE:** 3/4/2025  
**DWG.#:** 7326051  
**DRAWN BY:** Joe.shilka  
**SCALE:** 3/4" = 1'-0"  
**MASTER DRAWING**

**SHEET NO.**  
 1

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

5310 E HIGH STREET SUITE 350  
 PHOENIX, AZ 85054  
 T: 480.448.6250  
 WWW.SARGARCH.COM

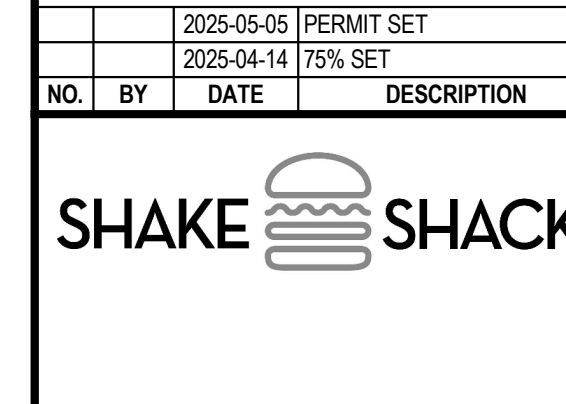


CONSULTANTS:

SEAL SIGNATURE:

Jon Eckhardt

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

PERMIT SET

CAPTIVE AIRE DRAWINGS

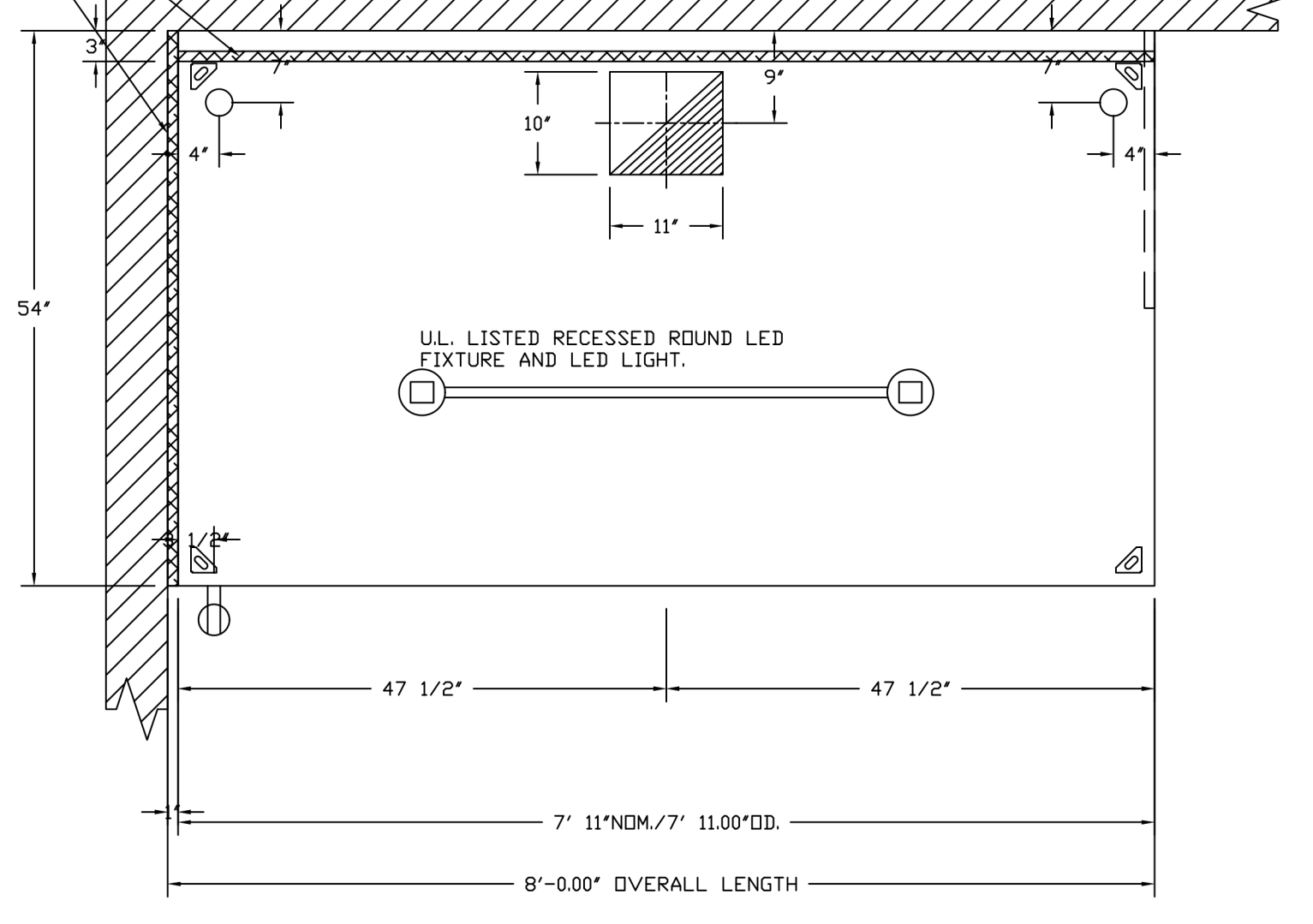
DRAWN BY: -  
 CHECKED BY: -  
 PROJECT NO: 12426-25

**M701**

11 OF 19

1" LAYER OF INSULATION FACTORY INSTALLED IN INTERNAL BACK STANDOFF. MEETS 0 INCH REQUIREMENTS FOR CLEARANCE TO COMBUSTIBLE SURFACES.

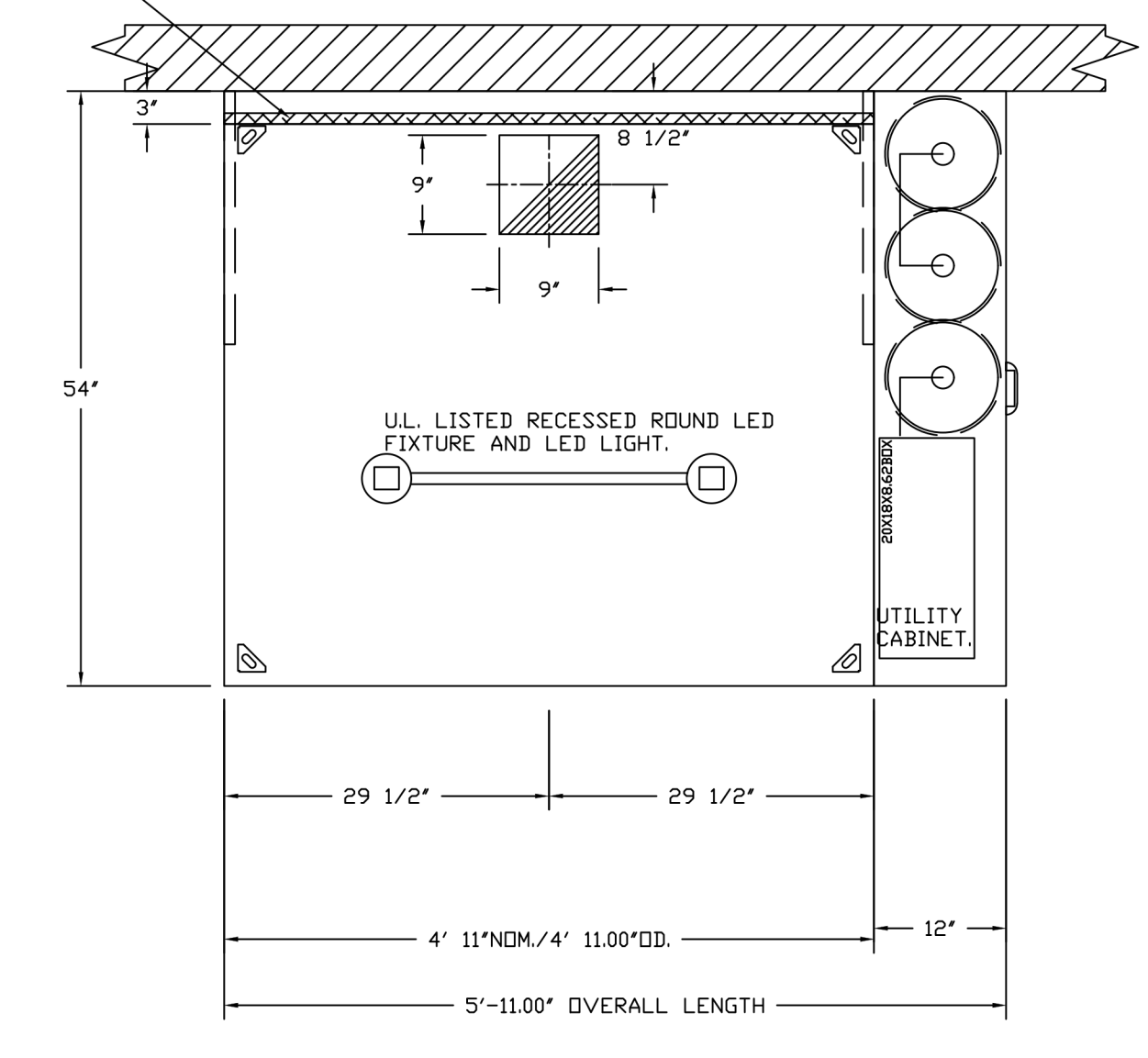
1" LAYER OF INSULATION FACTORY INSTALLED IN 100" END STANDOFF MEETS 0" REQUIREMENTS CLEARANCE TO COMBUSTIBLE SURFACES.



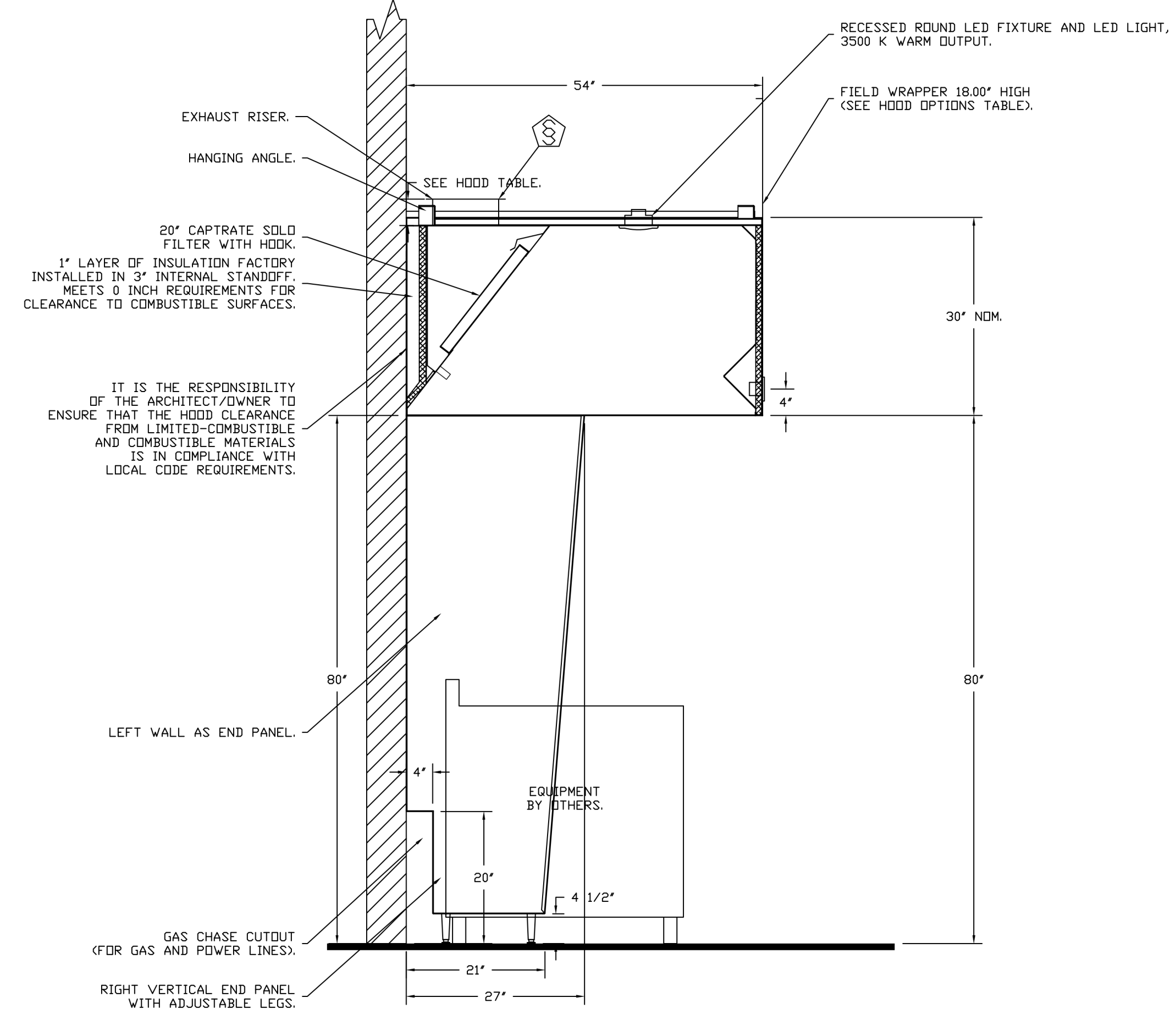
PLAN VIEW - HOOD #1 (Hood (Grill))  
7' 11.00\"/>

⊕ DUPLEX OUTLET

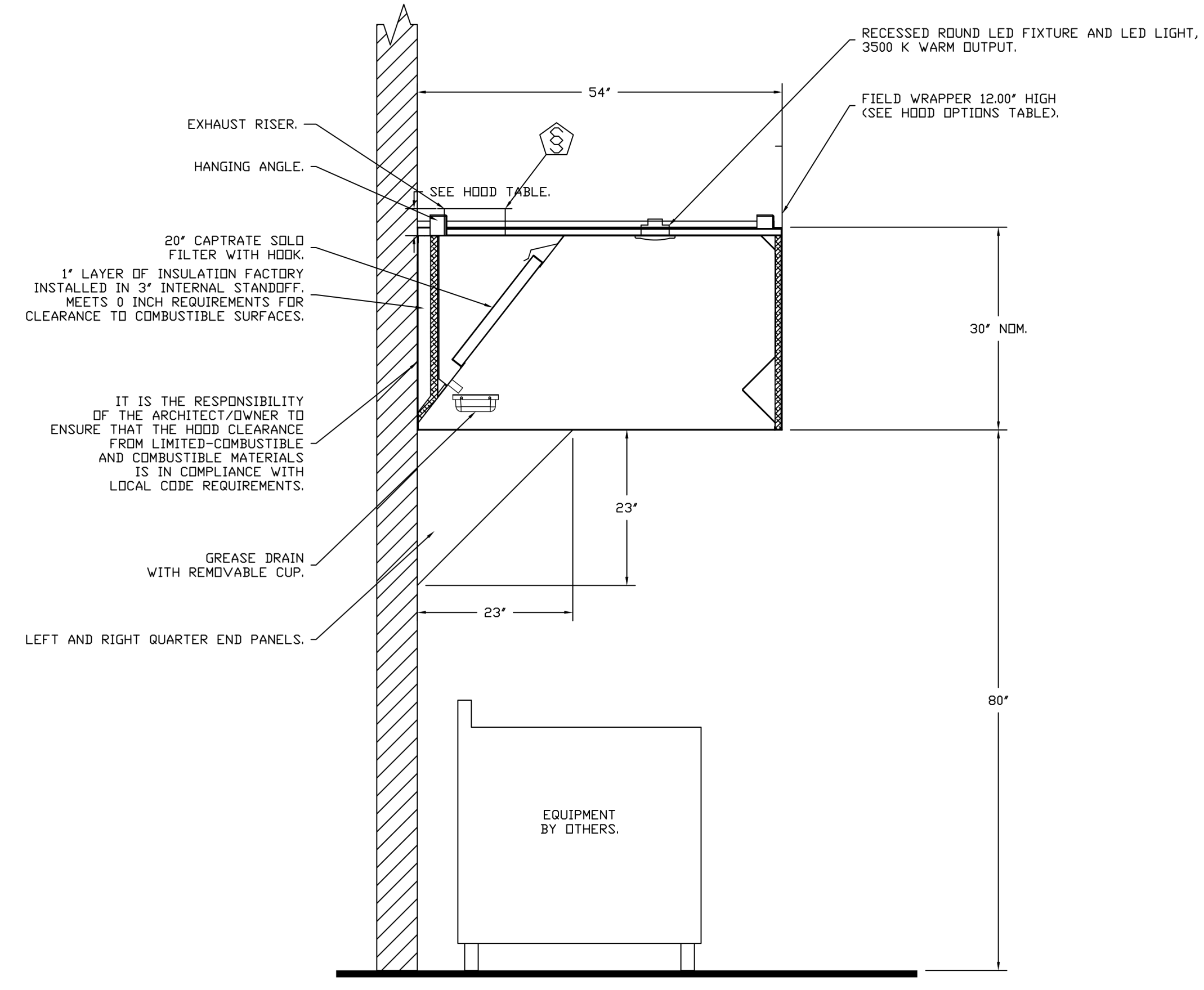
1" LAYER OF INSULATION FACTORY INSTALLED IN INTERNAL BACK STANDOFF. MEETS 0 INCH REQUIREMENTS FOR CLEARANCE TO COMBUSTIBLE SURFACES.



PLAN VIEW - HOOD #2 (Hood (Fryer))  
4' 11.00\"/>



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



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

REVISIONS	
NO.	DESCRIPTION

**CAPTIVE**  
Eastern PA Mechanical  
www.captiveaire.com  
225 E. City Line Avenue, Suite #103, Belle Cymrud, PA, 19004 PHONE: (267) 504-4126 EMAIL: reg103@captiveaire.com

Shack Shack-1545-Sun Vet, NY(Kitchen)  
HOLBROOK, NY, 11741

DATE: 3/4/2025  
DWG.#: 7326051  
DRAWN BY: Joe Shilba  
SCALE: 3/4" = 1'-0"  
MASTER DRAWING

SHEET NO. 2

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PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM



CONSULTANTS:

SEAL SIGNATURE:

Jon Eckhardt

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
CHECKED BY: -  
PROJECT NO: 12426-25

M702



**EXHAUST FAN INFORMATION - JOB#7326051**

FAN UNIT NO.	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL.	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SDNES
1	KEF(GRILL)	1	DUBSHFA	CAPTIVEAIRE	1188	1.500	1424	TEAD-ECM	0.750	0.4970	1	208	5.2	376 FPM	90	12.7
2	KEF(FRYER)	1	DUBSHFA	CAPTIVEAIRE	860	1.500	1354	TEAD-ECM	0.750	0.4270	1	208	5.2	272 FPM	90	11.4

**FAN OPTIONS**

FAN UNIT NO.	TAG	QTY	DESCRIPTION
1	KEF(GRILL)	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DRB5HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
2	KEF(FRYER)	1	GREASE BOX
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION
		1	FAN BASE CERAMIC SEAL - DU/DRB5HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	2 YEAR PARTS WARRANTY

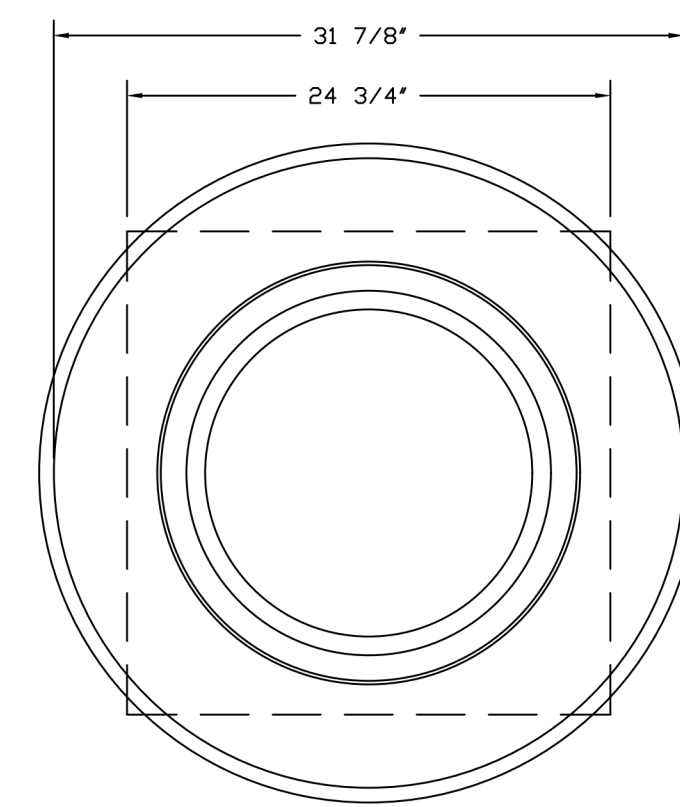
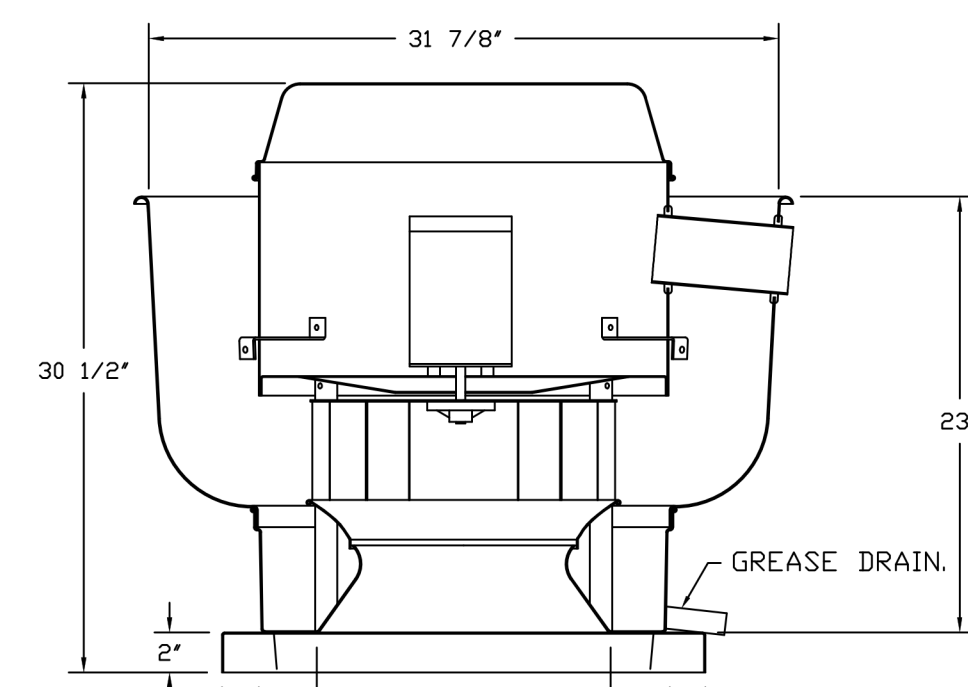
**FAN ACCESSORIES**

FAN UNIT NO.	TAG	EXHAUST				SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT	
1	KEF(GRILL)	YES							
2	KEF(FRYER)	YES							

**CURB ASSEMBLIES**

NO.	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF-1	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.
2	# 2	KEF(FRYER)	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.

FANS #1 (KEF(GRILL)), #2 (KEF(FRYER)) - DUBSHFA EXHAUST FAN



TOP VIEW

**FEATURES:**

- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND UL-C-5645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

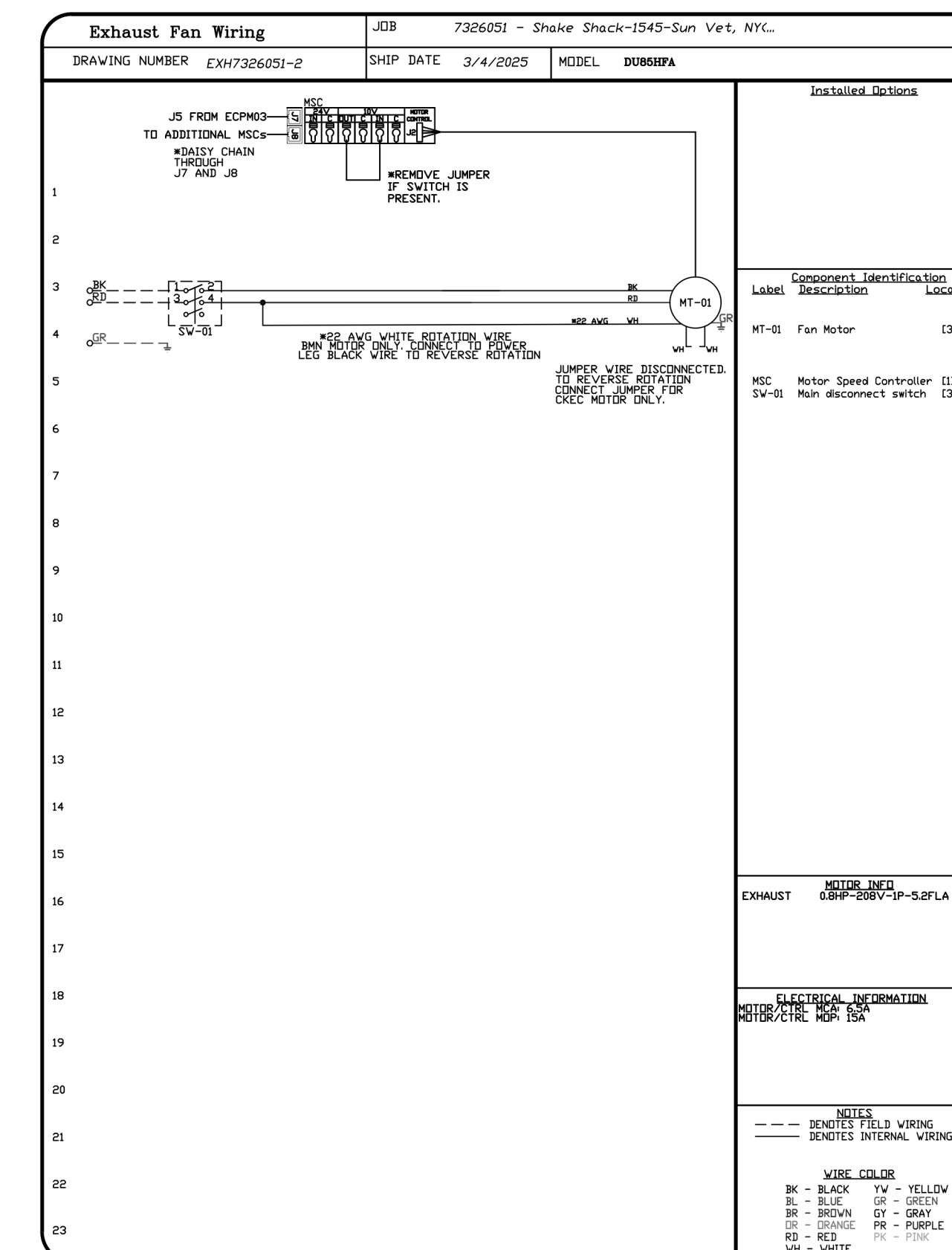
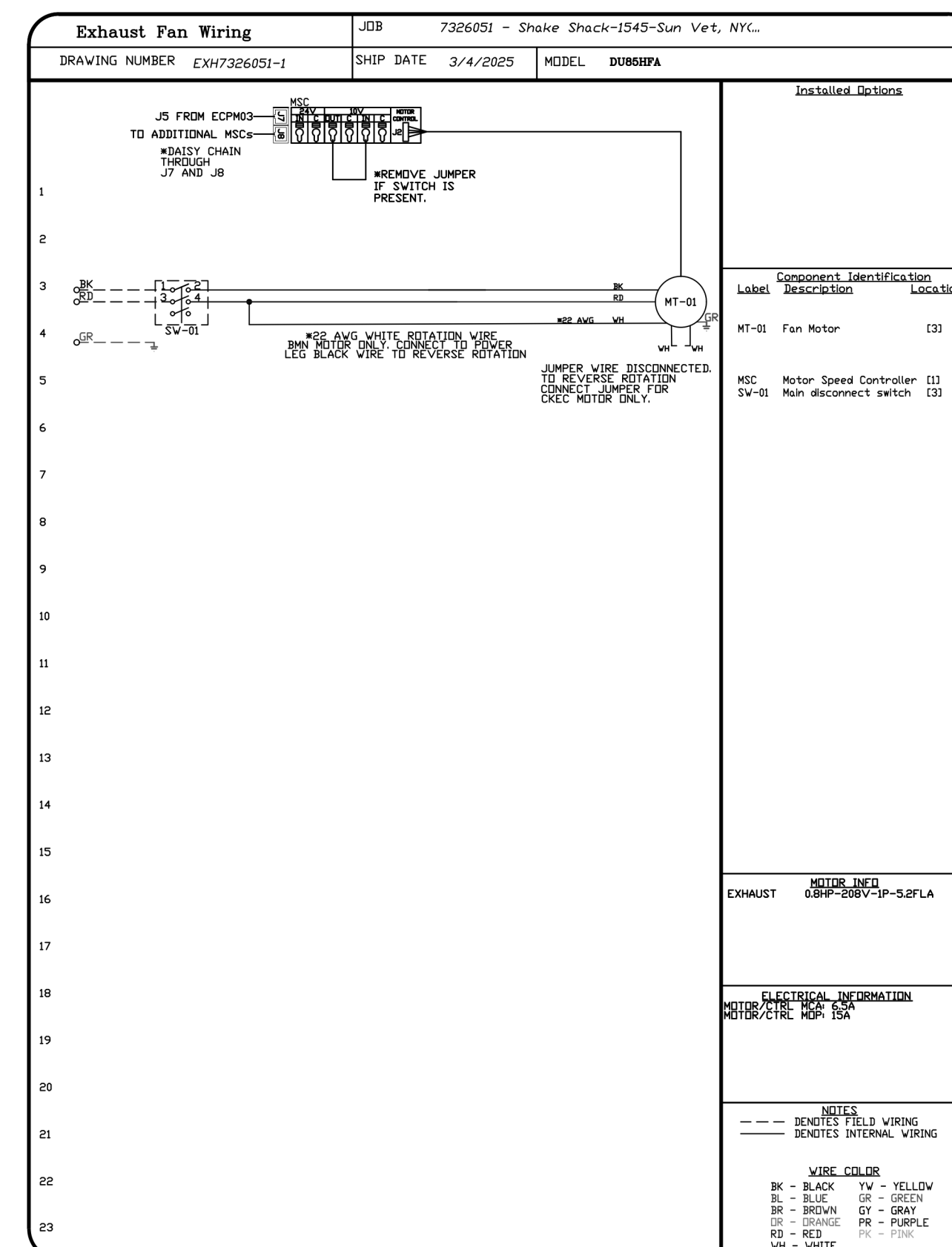
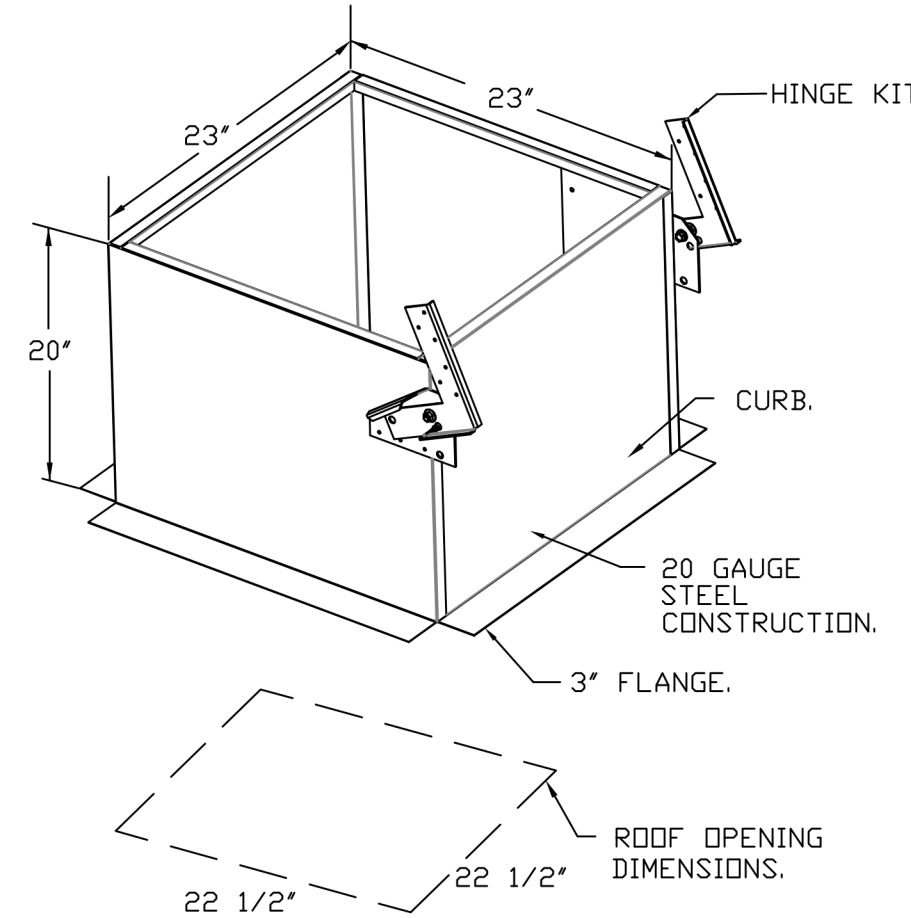
**NORMAL TEMPERATURE TEST**  
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

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

**OPTIONS**

- GREASE BOX.
- FAN BASE CERAMIC SEAL - DU/DRB5HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
- ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION.
- 2 YEAR PARTS WARRANTY.

DUCTWORK BETWEEN EXHAUST RISER ON HOOD AND FAN (BY OTHERS).



**REVISIONS**

NO.	DESCRIPTION	DATE

**CAPTIVE**  
Eastern PA Mechanical  
www.captiveaire.com  
225 E. City Line Avenue, Suite #103, Belle Cymrud, PA, 19304 PHONE: (267) 504-4126 EMAIL: rep103@captiveaire.com

Snake Shack-1545-Sun Vet, NY(Kitchen)  
HOLBROOK, NY, 11741

DATE: 3/4/2025  
DWG.#: 7326051  
DRAWN BY: Joe Shilka  
SCALE: 3/4" = 1'-0"  
MASTER DRAWING  
SHEET NO. 4

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM



CONSULTANTS:

SEAL SIGNATURE:  
STATE OF NEW YORK  
JON E. EDWARDS  
LICENSED PROFESSIONAL ENGINEER  
087575  
Jon Edwards

NO.	BY	DATE	DESCRIPTION



SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

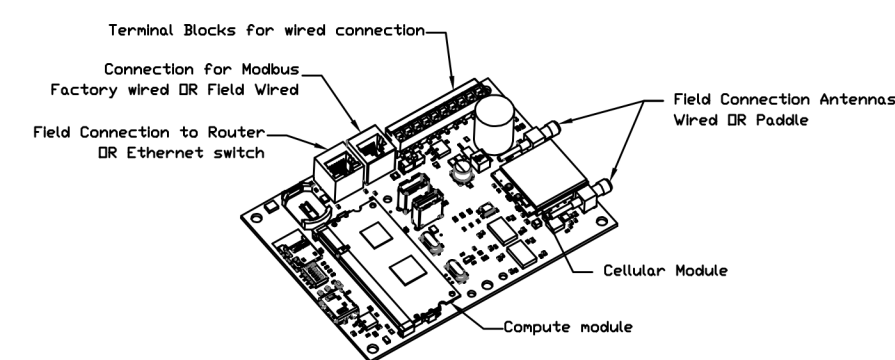
CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
CHECKED BY: -  
PROJECT NO: 12426-25

M704

**ELECTRICAL PACKAGE - JOB#7326051**

NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	HP	VOLTS	FLA	
1		SC-320110MA	UTILITY CABINET RIGHT	UTILITY CABINET RIGHT	1 LIGHT	SMART CONTROLS THERMOSTATIC CONTROL W/ RELAY ON/OFF WITH SUPPLY	KEFGH10	EXHAUST	1	0.750	208	5.2
				HOOD # 2	1 FAN		KEFGFyyer	EXHAUST	1	0.750	208	5.2

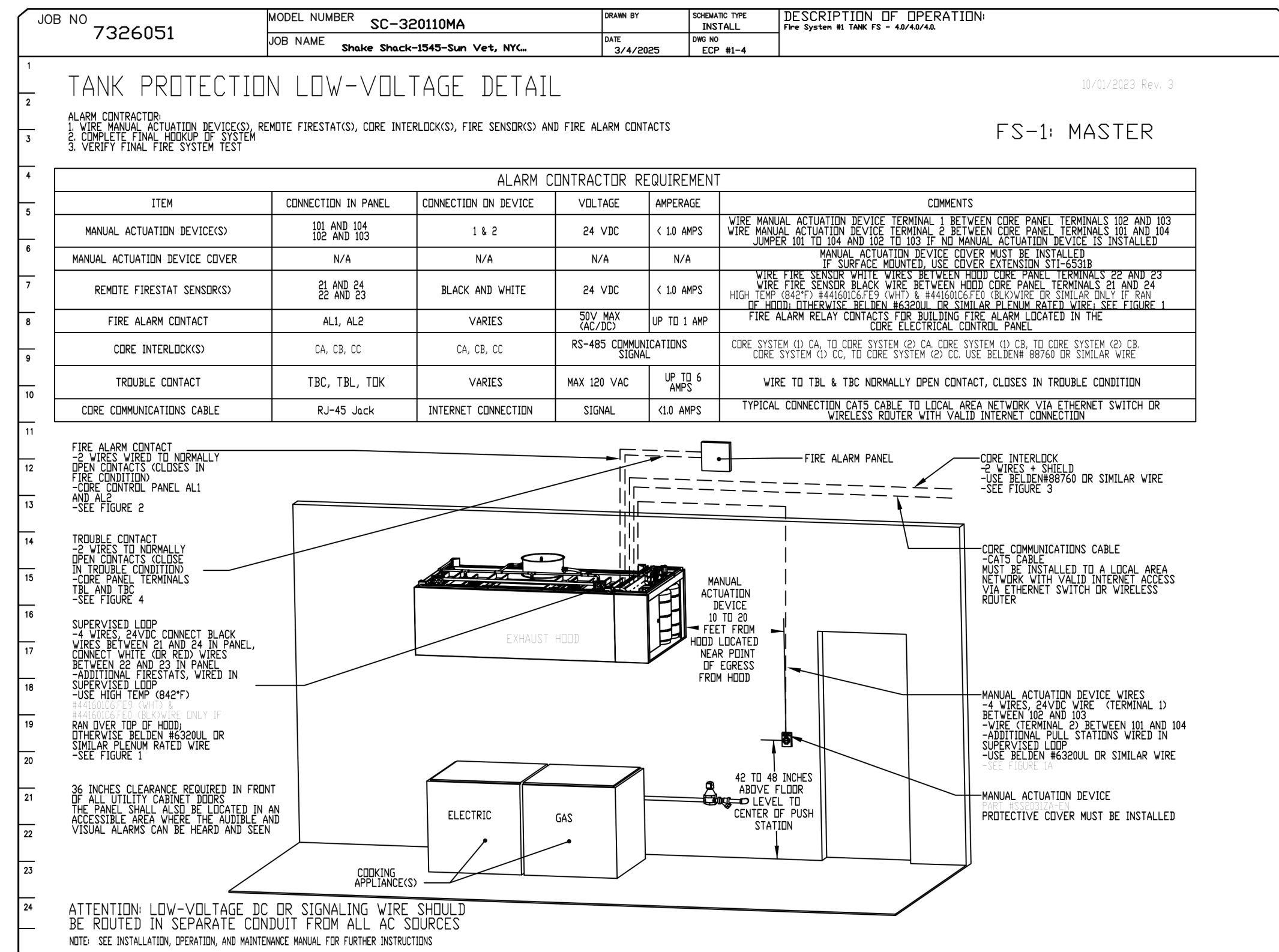
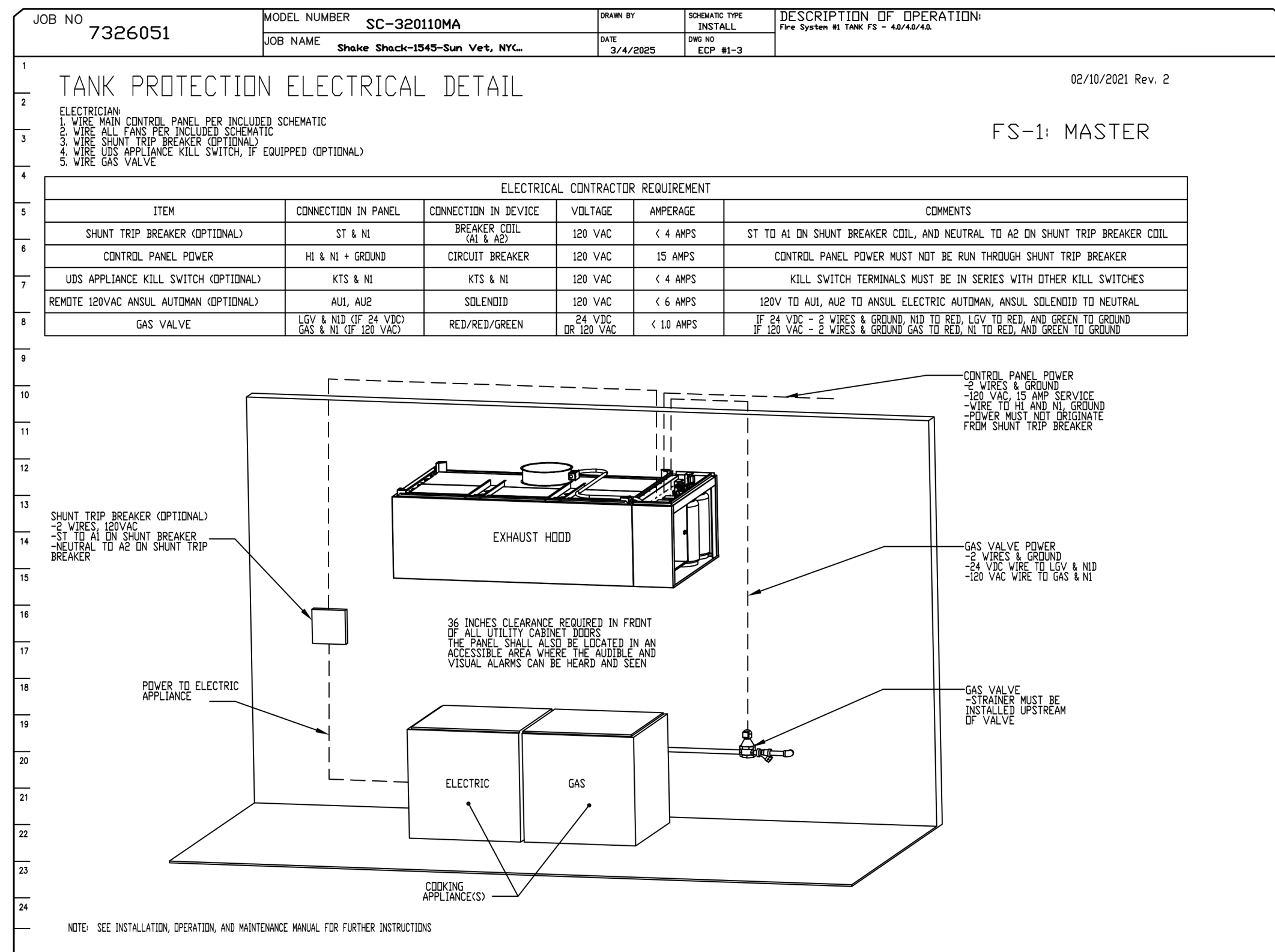
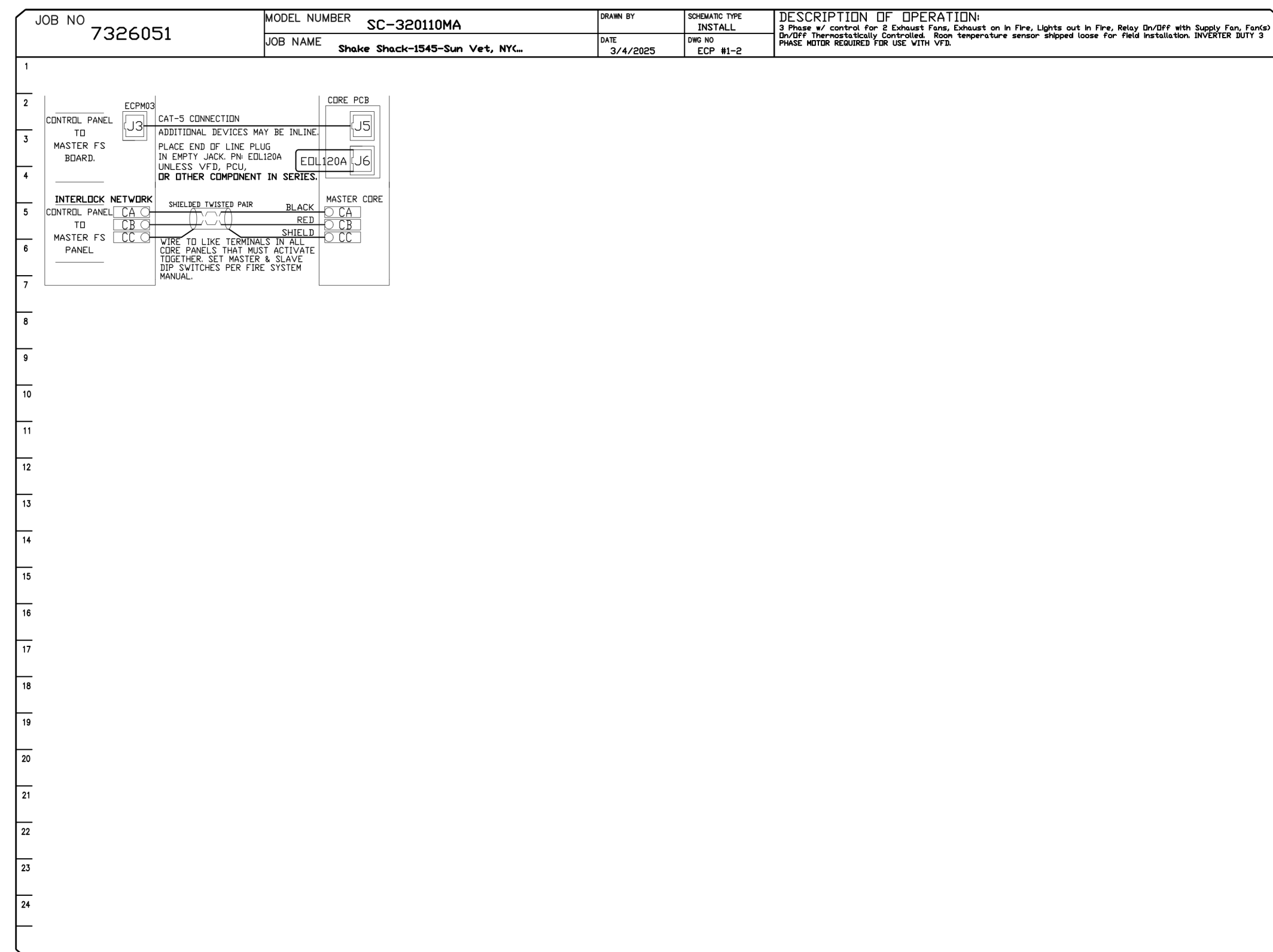
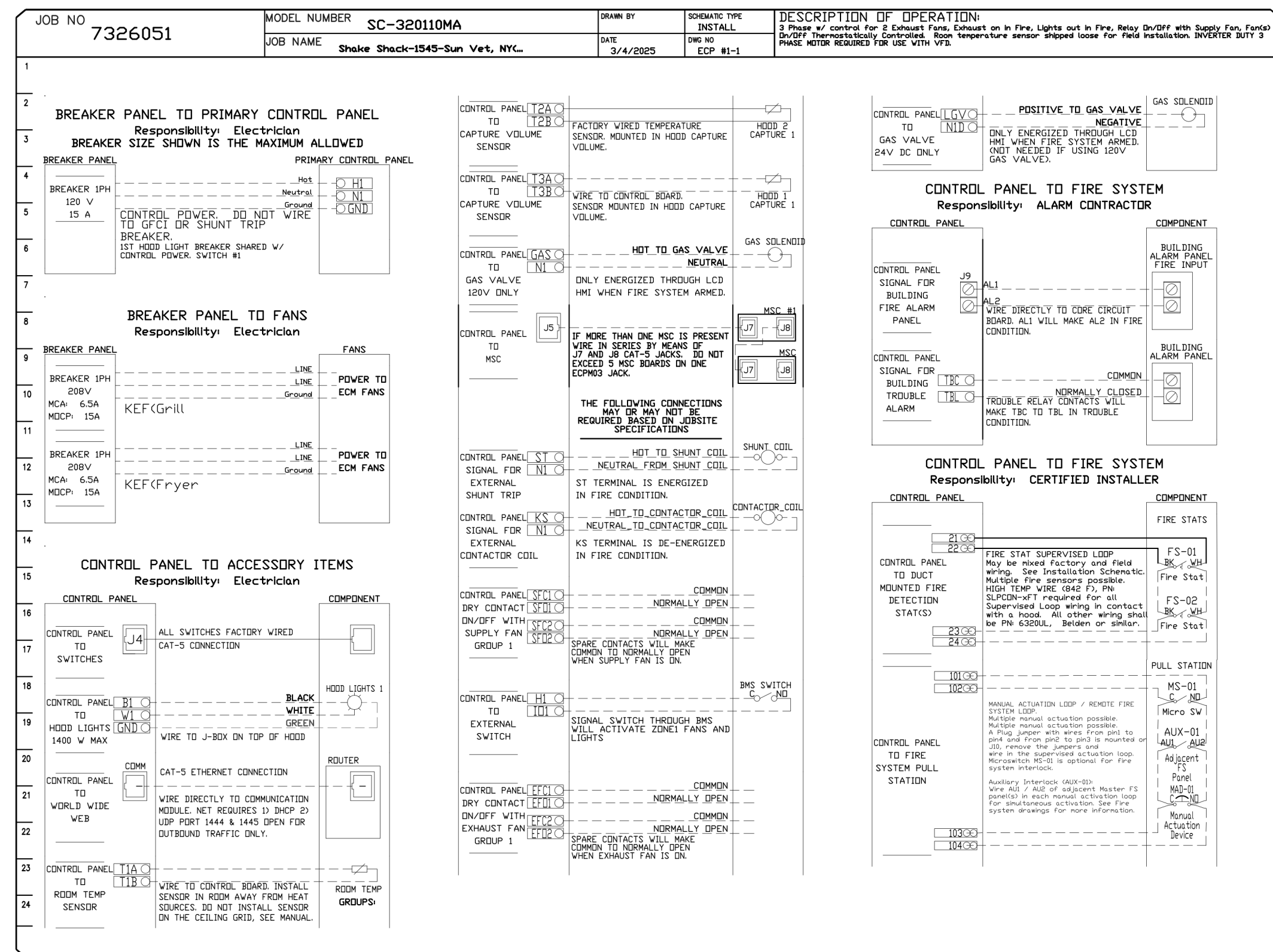


**CASlink Monitor and Control**

Hood control panel to support communications to cloud-based Building Management System.  
 Hood Control Panel to allow cloud-based Building Management System to monitor real time parameters outlined as MONITOR in the points list.  
 Hood Control Panel to allow cloud-based Building Management System to control parameters outlined as CONTROL in the points list.  
 Hood Control Panel to allow cloud-based Building Management System to implement SYSTEM ECONOMIZER control strategies for fully integrated Building Management.

**MONITORING AND CONTROL POINTS LIST**

DOV Package	Function	IC Package	Function
Room Temperature	MONITOR	Room Temperature(s)	MONITOR
Plant Temperature(s)	MONITOR	Plant Temperature(s)	MONITOR
Make Discharge Temperature	MONITOR	Make Discharge Temperature	MONITOR
Shake Shack Discharge Temperature	MONITOR	Shake Shack Discharge Temperature	MONITOR
Fan Speed	MONITOR	Condenser Fan(s)	MONITOR
Fan Amps	MONITOR	Fan Faults	MONITOR
Fan Filter	MONITOR	Fan Status	MONITOR
Filter Faults	MONITOR	Filter Status	MONITOR
Filter Faults	MONITOR	Filter Filter Clap Percentage	MONITOR
Fan Status	MONITOR	Filter Condition	MONITOR
Filter Status	MONITOR	CO2 Air System	MONITOR
CO2 Air System	MONITOR	Building Pressure	MONITOR & CONTROL
Building Pressure	MONITOR	Prep Zone Status	MONITOR & CONTROL
Prep Zone Status	MONITOR & CONTROL	Prep Zone Status	MONITOR & CONTROL
Prep Zone Status	MONITOR & CONTROL	Prep Zone Status	MONITOR & CONTROL
Prep Zone Status	MONITOR & CONTROL	Prep Zone Status	MONITOR & CONTROL



**REVISIONS**

NO.	DESCRIPTION	DATE

**CAPTIVE**

Eastern PA Mechanical  
 225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA 19004 PHONE: (267) 504-4126 EMAIL: reg103@captiveme.com

Shake Shack-1545-Sun Vet, NY(Kitchen)  
 HOLBROOK, NY, 11741

DATE: 3/4/2025

DWG.#: 7326051

DRAWN BY: Joe Shilba

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

MASTER DRAWING

SHEET NO. 5

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

5310 E HIGH STREET SUITE 350  
 PHOENIX, AZ 85054  
 T: 480.448.6250  
 WWW.SARGARCH.COM

CONSULTANTS:

SEAL SIGNATURE:

Jon Eckhardt

NO.	BY	DATE	DESCRIPTION

2025-05-05 PERMIT SET  
 2025-04-14 75% SET

**SHAKE SHACK**

SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

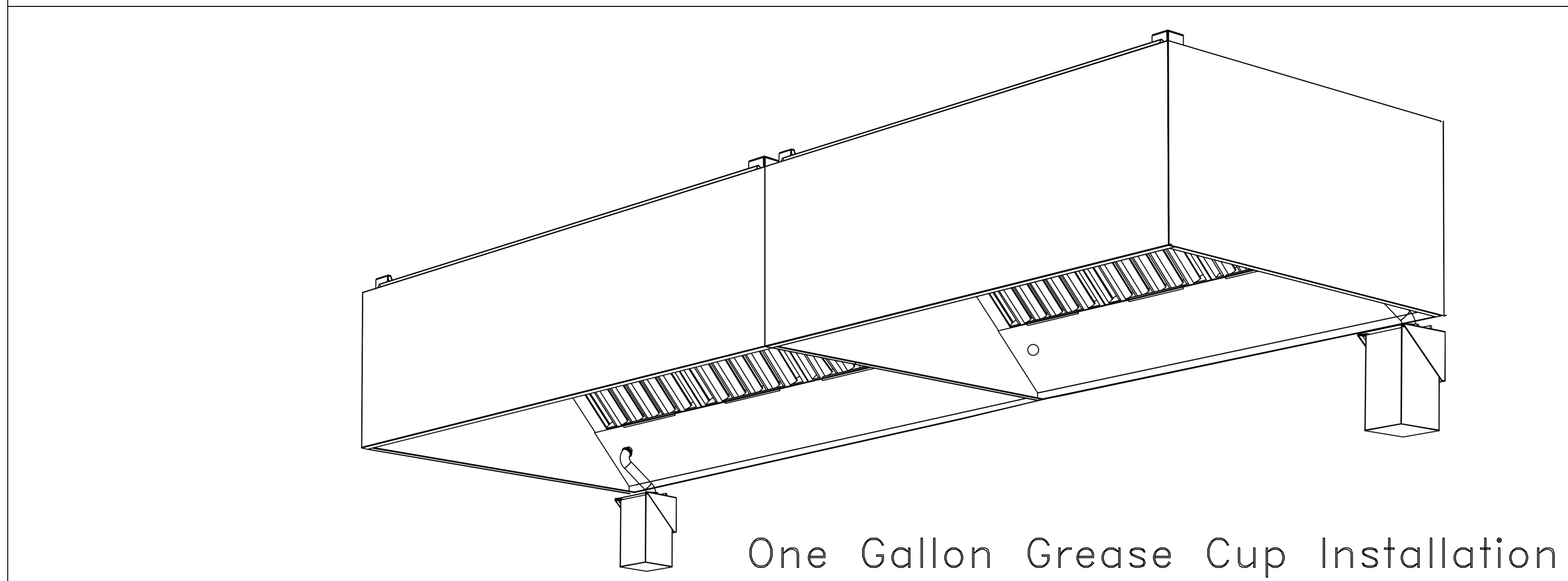
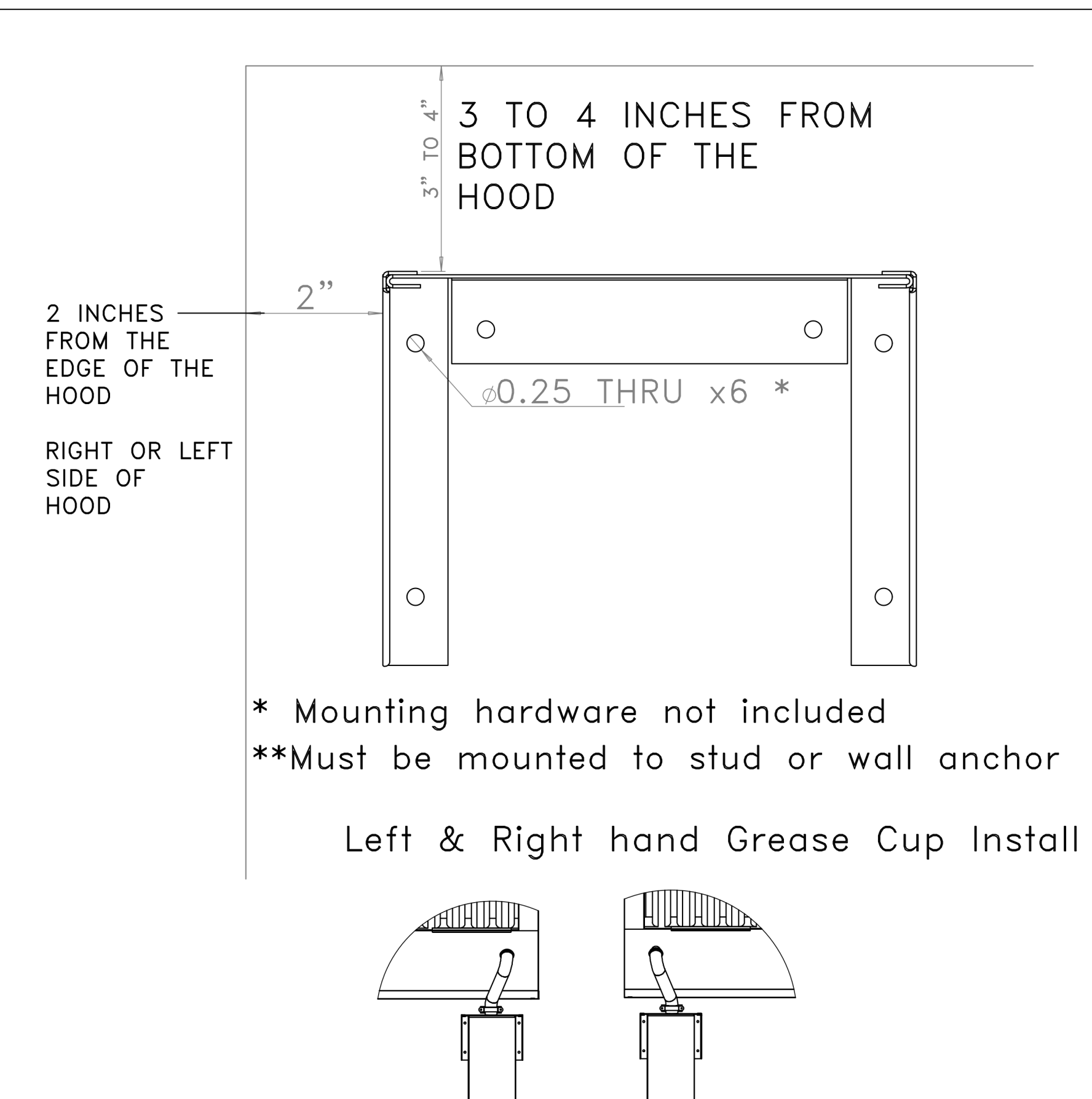
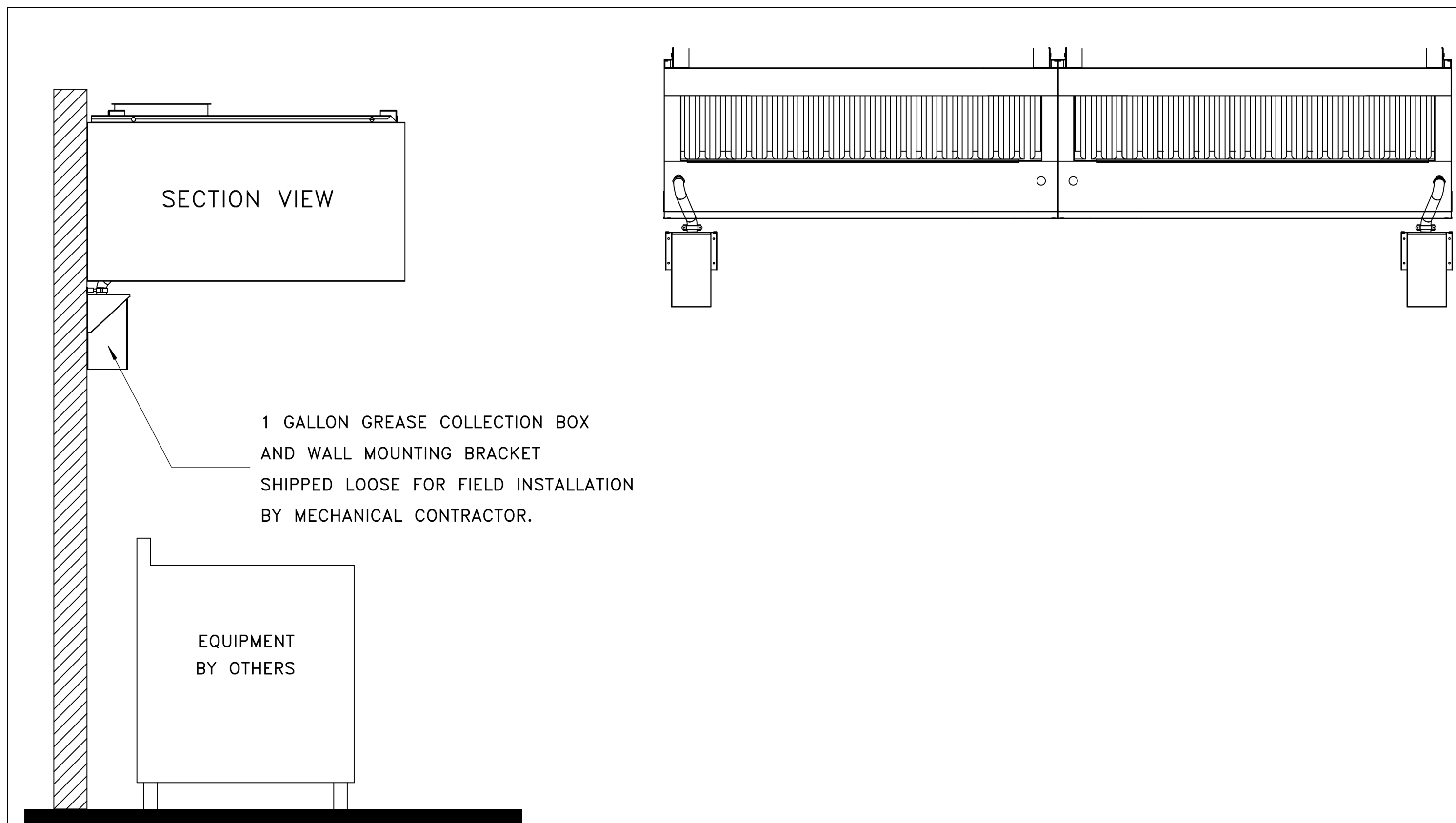
PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
 CHECKED BY: 12426-25  
 PROJECT NO: 12426-25

**M705**

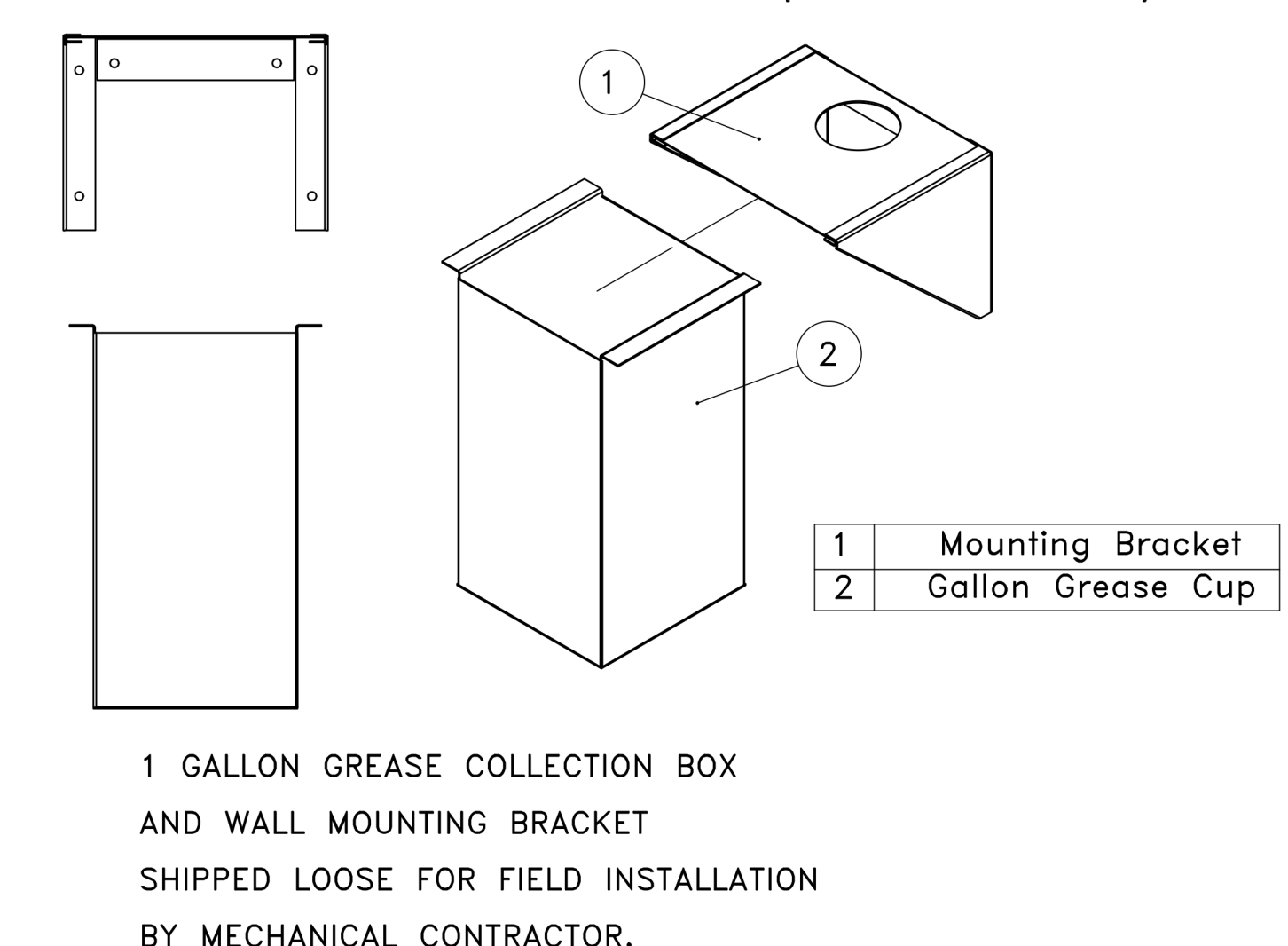
15 OF 19



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

**CAPTIVE**

Eastern PA Mechanical

225 E City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: nsg103@captivemechanical.com

Shake Shack-1545-Sun Vet, NY(Kitchen)  
HOLBROOK, NY, 11741

DATE:	3/4/2025
DWG.#:	7326051
DRAWN BY:	Joe Shilka
SCALE:	3/4" = 1'-0"
MASTER DRAWING	
SHEET NO.	6

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM

S V A R G A R C H

CONSULTANTS:

SEAL SIGNATURE:

STATE OF NEW YORK  
JON E. ECKHARDT  
LICENSED PROFESSIONAL ENGINEER  
1975  
Jon Eckhardt

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET

**SHAKE SHACK**

SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
CHECKED BY: -  
PROJECT NO: 12426-25

M706

**DOAS/RTU FAN SCHEDULE - JOB#7497785**

FAN UNIT NO.	TAG	QTY	DOAS/RTU MODEL #	FAN INFORMATION										ELECTRICAL INFORMATION										COOLING INFORMATION										REHEAT INFORMATION										GAS HEAT INFORMATION										ASL MINIMUM ROOM VOLUME			NOTES
				MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLTS	MCA	MDCP	DB	WB	MIXED AIR DB	MIXED AIR WB	LEAVING AIR DB	LEAVING AIR WB	SP	TOTAL	SENS.	IEER	ISMRE	DISCHARGE DB	DISCHARGE WB	CAPACITY DESIRED	CAPACITY MAX	MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUS	OUTPUT BTUS	TEMP REISE	REQUIRED INPUT GAS PRESSURE	ROOM AREA (F <sup>2</sup> )	AIRFLOW (CFM)	HEIGHT (F <sup>2</sup> )																		
1	RTU-1(DINING)	1	CAS-HVAC-1150-18-10T	CAPTIVEAIR	10M-2-RTU	1500	1000	2500	1982	1.000	3.00	3	208	60.9A	70A	88.7°F	73.7°F	80.5°F	68.7°F	50.1°F	50.0°F	50.0°F	139.1 MBH	82.6 MBH	18.6	4.3	70.0°F	60.7°F	56.1 MBH	96 MBH	50.8 LBS/HR	NATURAL	121690	98569	35°F	7 IN. W.C. - 14 IN. W.C.	396.5	714	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19																	
2	RTU-2(KITCHEN)	1	CAS-HVAC-1250-24-20T	CAPTIVEAIR	24M-3-RTU	3300	1300	4600	2821	0.850	5.00	3	208	92.4A	100A	88.7°F	73.7°F	78.8°F	67.6°F	48.6°F	48.5°F	48.5°F	255.3 MBH	151.3 MBH	18.2	6.0	70.0°F	59.3°F	111.3 MBH	129.6 MBH	93.8 LBS/HR	NATURAL	214542	173779	34°F	7 IN. W.C. - 14 IN. W.C.	572.7	1031	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19																	

**NOTES:**

- INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL.
- DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE.
- INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER.
- REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE.
- EC MOTOR CONDENSING FANS.
- ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE.
- SUCTION LINE ACCUMULATOR.
- FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER.
- AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT).
- 2" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-13 INSULATION-MINIMUM EDGE EXTERIOR W/ 14GA BASE.
- 81% EFFICIENT FURNACE WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 61 TURNDOWN WITH NG AND 51 TURNDOWN WITH LP.
- SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE.
- FULLY MODULATING HOT GAS REHEAT.
- 15 DEGREE LOW AMBIENT OPERATION.
- HAIL GUARD FOR CONDENSING COIL.
- RTU ECONOMIZER WITH DIFFERENTIAL ENTHALPY CONTROL.
- BAROMETRIC RELIEF DAMPER.
- DOWN DISCHARGE/DOWN RETURN.
- MINIMUM ROOM AREA ASSUMED 7.2' SUPPLY DIFFUSER HEIGHT AND IS CALCULATED PER UL60335-2-40 4TH ED. VALUES BASED ON FACTORY CHARGE. ACTUAL SITE CHARGE MAY DIFFER.

FOR QUESTIONS, CALL THE  
Eastern PA Mechanical  
REGION 108  
PHONE: (607) 504 - 4126  
EMAIL: reg108@captiveair.com

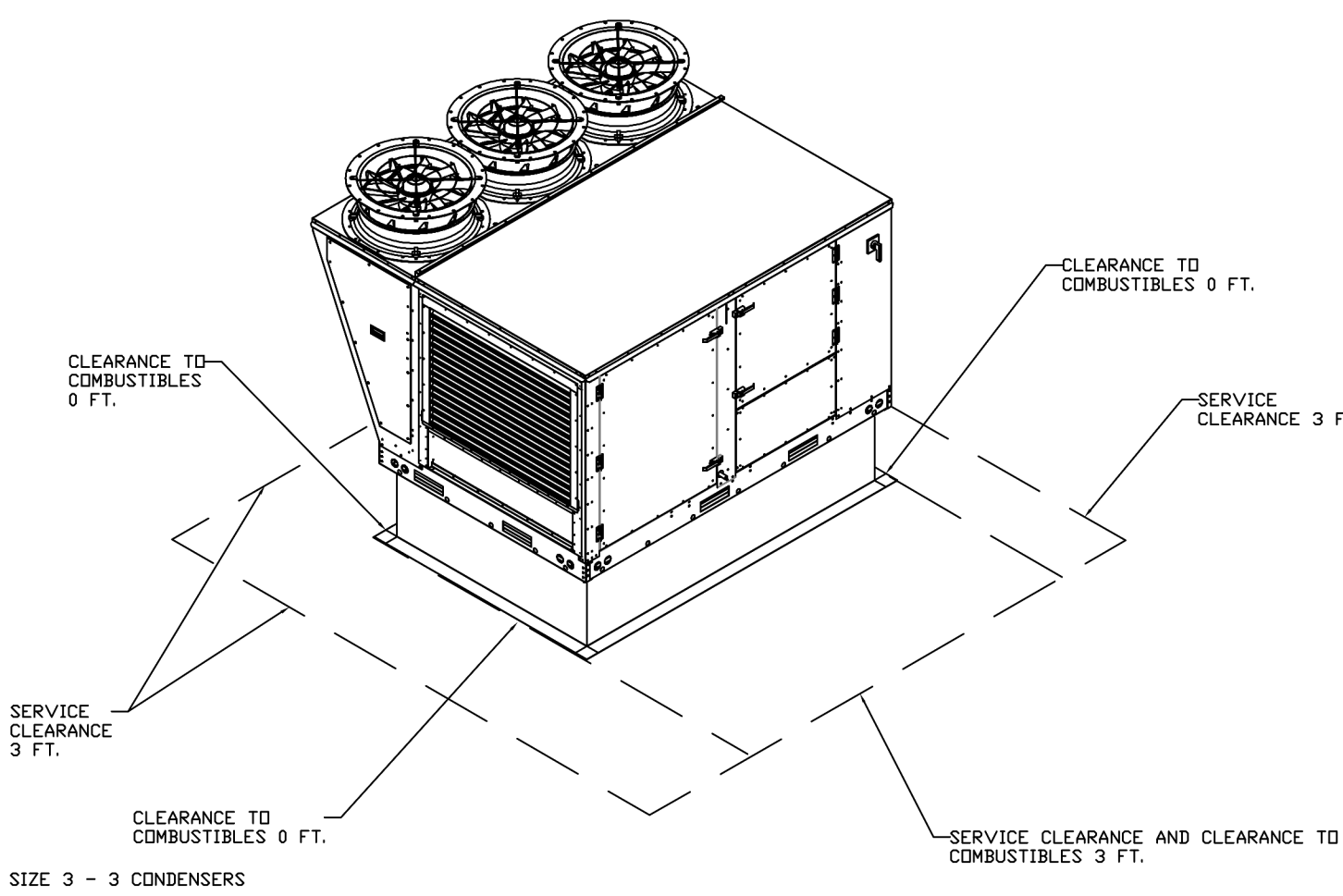
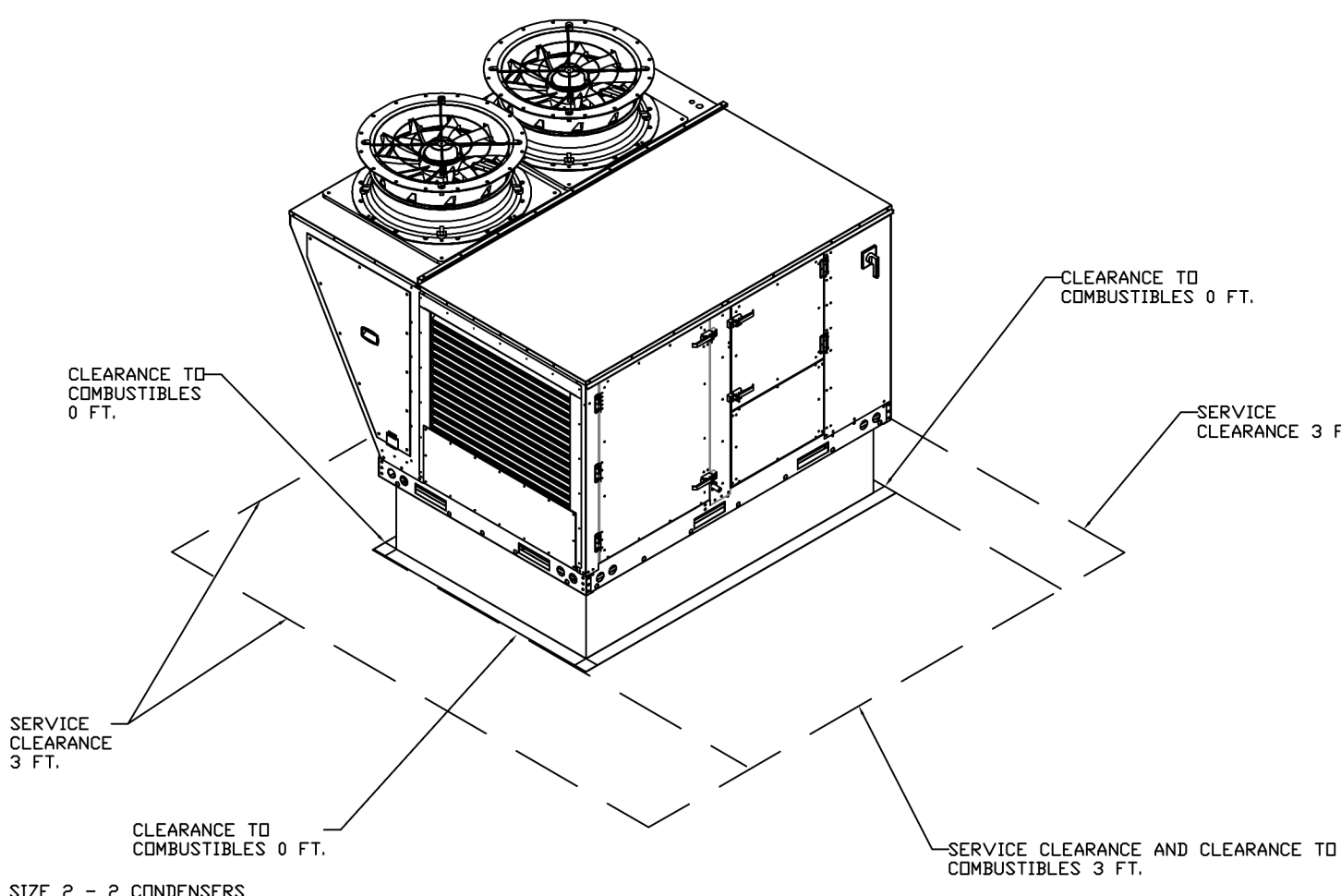
**FAN OPTIONS**

FAN UNIT NO.	TAG	QTY	DESCRIPTION
1	RTU-1(DINING)	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		1	SHIP LOOSE GAS STRAINER 3/4"
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU, 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #8B, #47, "MA", OR "E2" PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE.
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED
		1	RTU BLOWER DOOR SWITCH
		1	RTU DOWN DISCHARGE
		1	2" MERV 13 FILTERS FOR RTU3 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU2 (QTY. 4)
		1	OVERHEAT STAT
		1	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	20 TON MODULATING COOLING OPTION, 208/230V, R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION - DOWN TO 0° AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTUS
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	20 TON MODULATING REHEAT OPTION - SPACE DEWPOINT CONTROL - R454B
		1	RTU CURB DUCT HANGER
		1	120V FIRE INPUT
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK - ALARM SUPPLIED BY OTHERS
		1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI
		1	RTU CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX
		1	RTU ECONOMIZER - DIFFERENTIAL ENTHALPY CONTROL
		1	RTU ECONOMIZER BAROMETRIC RELIEF
		1	RTU INTAKE/RETURN DAMPER - MANUAL CONTROL VIA HMI
		1	RTU HAIL GUARD
		1	RTU DOWN RETURN
		1	VAV PACKAGE W/ MANUAL/BDC CONTROL (S71 VFD INCLUDED)
		1	2" METAL MESH FILTERS FOR RTU2 OUTDOOR INTAKE
		1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIR 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
2	RTU-2(KITCHEN)	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		1	SHIP LOOSE GAS STRAINER 1"
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU, 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #8B, #47, "MA", OR "E2" PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE.
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED
		1	CONSTRUCTION MODE - MODIFIES START-UP SETTINGS TO ALLOW TEMPERING A BUILDING STILL UNDER CONSTRUCTION
		1	RTU BLOWER DOOR SWITCH
		1	RTU DOWN DISCHARGE
		1	2" MERV 13 FILTERS FOR RTU3 (QTY. 4)
		1	OVERHEAT STAT
		1	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	20 TON MODULATING COOLING OPTION, 208/230V, R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION - DOWN TO 0° AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTUS
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	20 TON MODULATING REHEAT OPTION - SPACE DEWPOINT CONTROL - R454B
		1	RTU CURB DUCT HANGER
		1	120V FIRE INPUT
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK - ALARM SUPPLIED BY OTHERS
		1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI
		1	RTU CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX
		1	RTU ECONOMIZER - DIFFERENTIAL ENTHALPY CONTROL
		1	RTU ECONOMIZER BAROMETRIC RELIEF
		1	RTU INTAKE/RETURN DAMPER - MANUAL CONTROL VIA HMI
		1	RTU HAIL GUARD
		1	ZIEHL POWERED EXHAUST FOR RTU3 - MANUAL CONTROL, 3000 CFM MAX AT 0"
		1	RTU3 DOWN RETURN
		1	VAV PACKAGE W/ MANUAL/BDC CONTROL (S71 VFD INCLUDED)
		1	2" METAL MESH FILTERS FOR RTU3 OUTDOOR INTAKE
		1	2" MERV 13 FILTERS FOR RTU3 (QTY. 4)
1	LOAD REACTOR MOUNTED IN FAN		
1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIR 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		

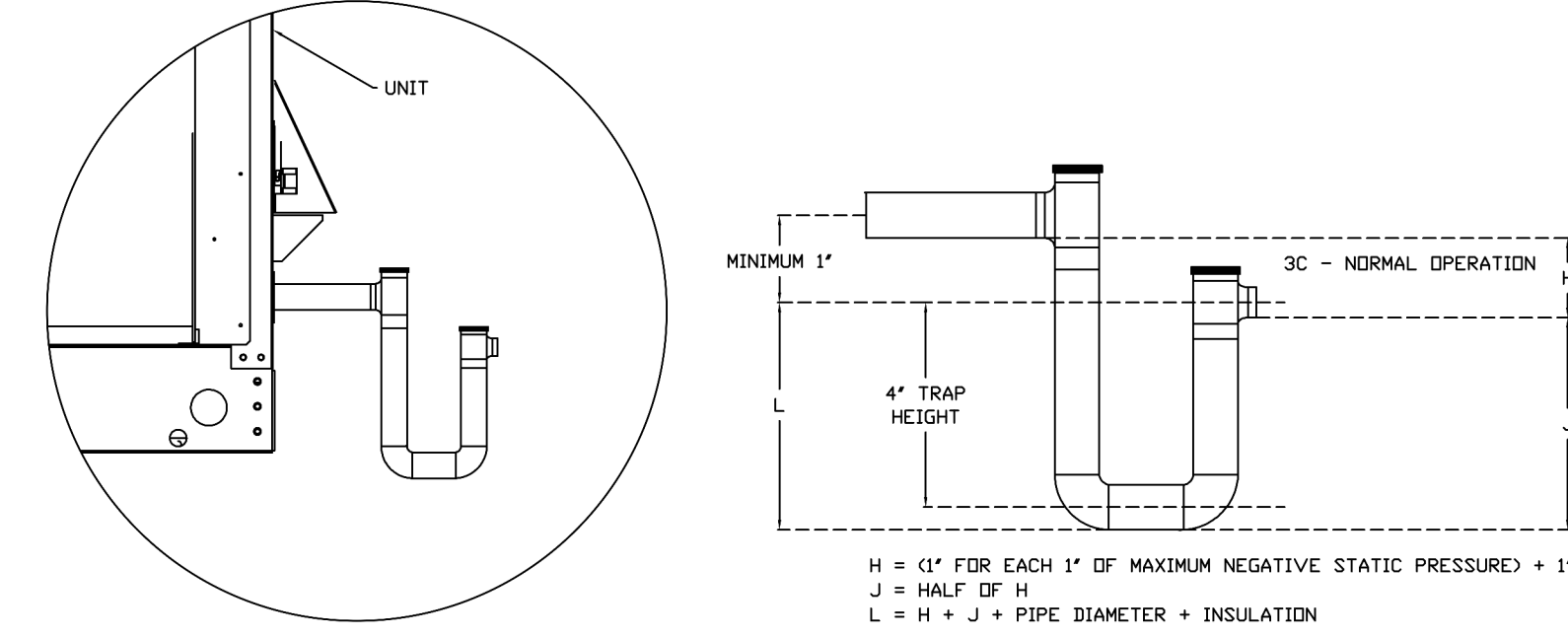
**CURB ASSEMBLIES**

NO.	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	RTU-1(DINING)	84 LBS	CURB	49.500"W X 75.000"L X 12.000"H INSULATED.
2	# 2	RTU-2(KITCHEN)	96 LBS	CURB	59.500"W X 91.000"L X 12.000"H INSULATED.

UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #1	HMI #1 - UNIT	IN UNIT	NOT AVERAGED	55
FAN #1	HMI #2 - SPACE	DINING ROOM	AVERAGED	56
FAN #1	HMI #3 - SPACE	MANAGERS OFFICE	NOT AVERAGED	57
FAN #2	HMI #1 - UNIT	IN UNIT	NOT AVERAGED	55
FAN #2	HMI #2 - SPACE	KITCHEN	AVERAGED	56
FAN #2	HMI #3 - SPACE	MANAGERS OFFICE	NOT AVERAGED	57

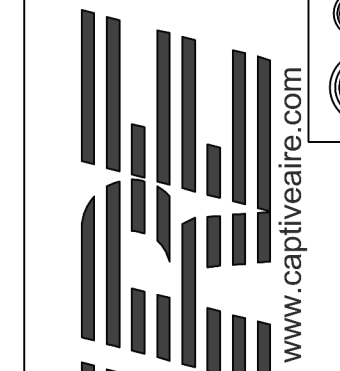


**RTU CONDENSATE DRAIN TRAP DETAIL**



**REVISIONS**

NO.	DESCRIPTION	DATE



**CAPTIVE AIR**  
Eastern PA Mechanical  
225 E City Line Avenue, Suite #103, Balla Croyd, PA, 15004 PHONE: (607) 504 - 4126 EMAIL: reg108@captiveair.com

Shake Shack-1545-Sun Vet, NY(HVAC)-R1  
HOLBROOK, NY, 11741

DATE: 4/28/2025

DWG.#: 7497785

DRAWN BY: Joe.shilva

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

MASTER DRAWING

SHEET NO. 1

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

5310 E HIGH STREET SUITE 350  
PHOENIX, AZ 85054  
TJ 480.448.6250  
WWW.SARGARCH.COM



CONSULTANTS:

SEAL SIGNATURE:



Jon Eckhardt

NO.	BY	DATE	DESCRIPTION
		2025-05-05	PERMIT SET
		2025-04-14	75% SET



SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
HOLBROOK, NY 11741  
SHACK #1545

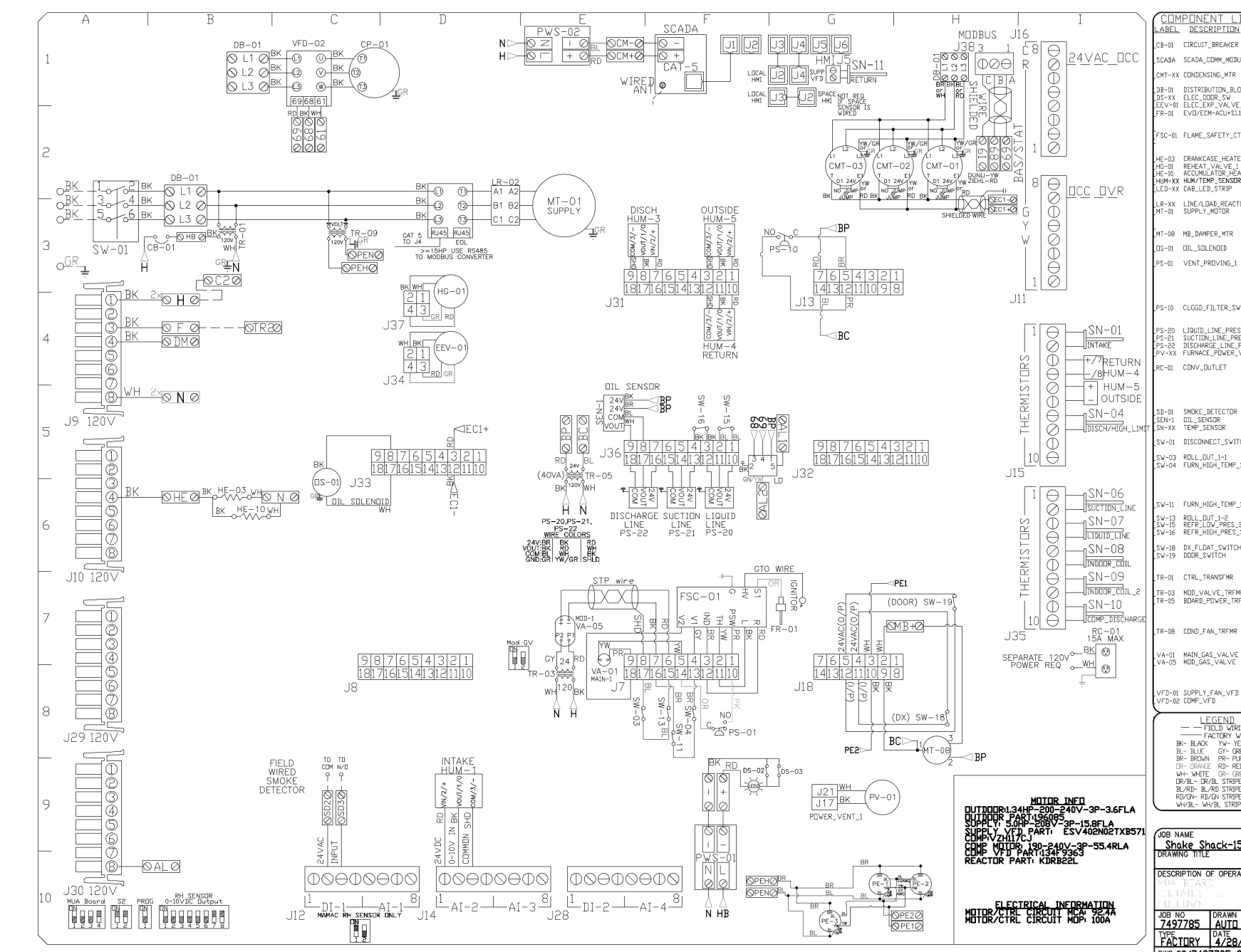
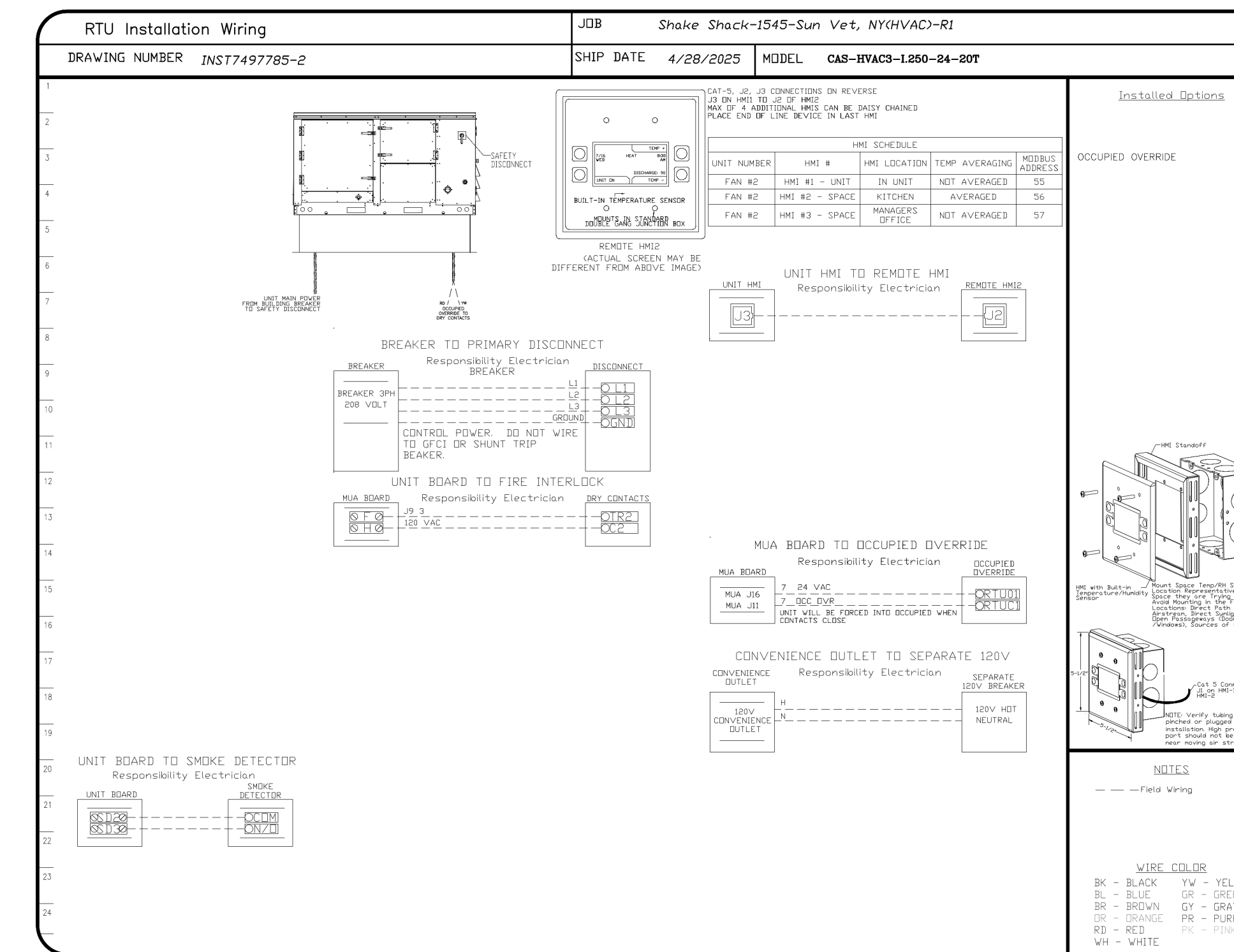
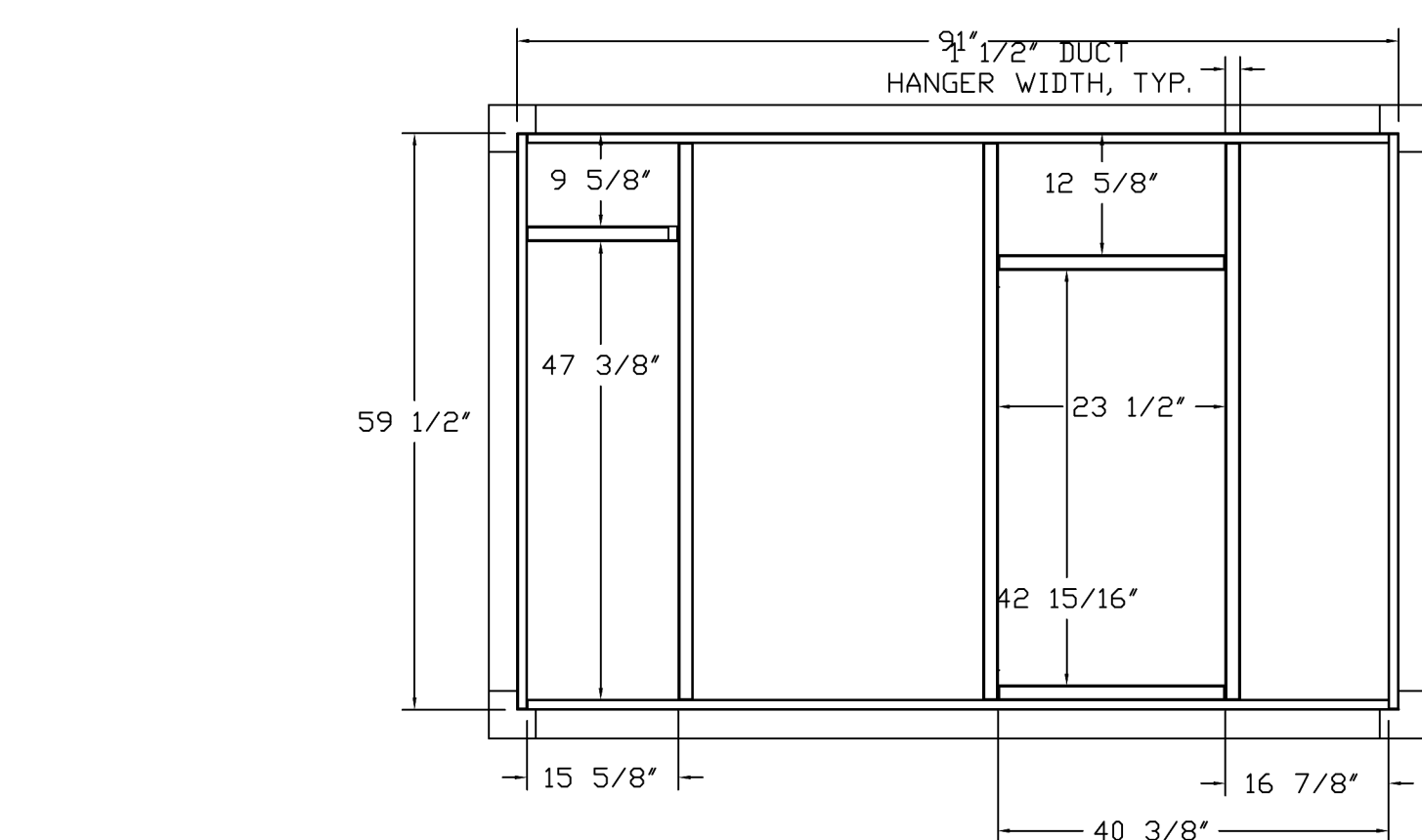
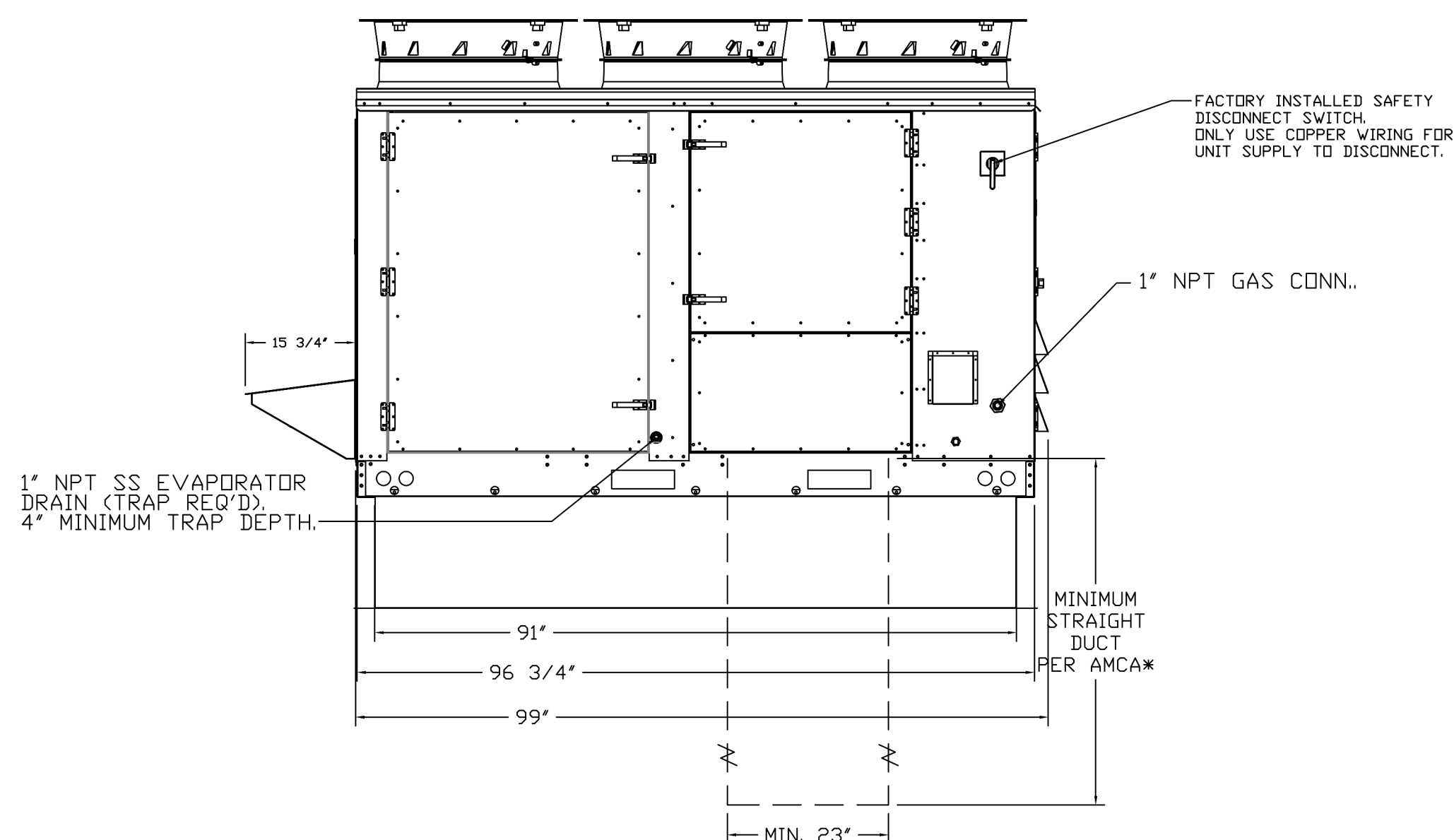
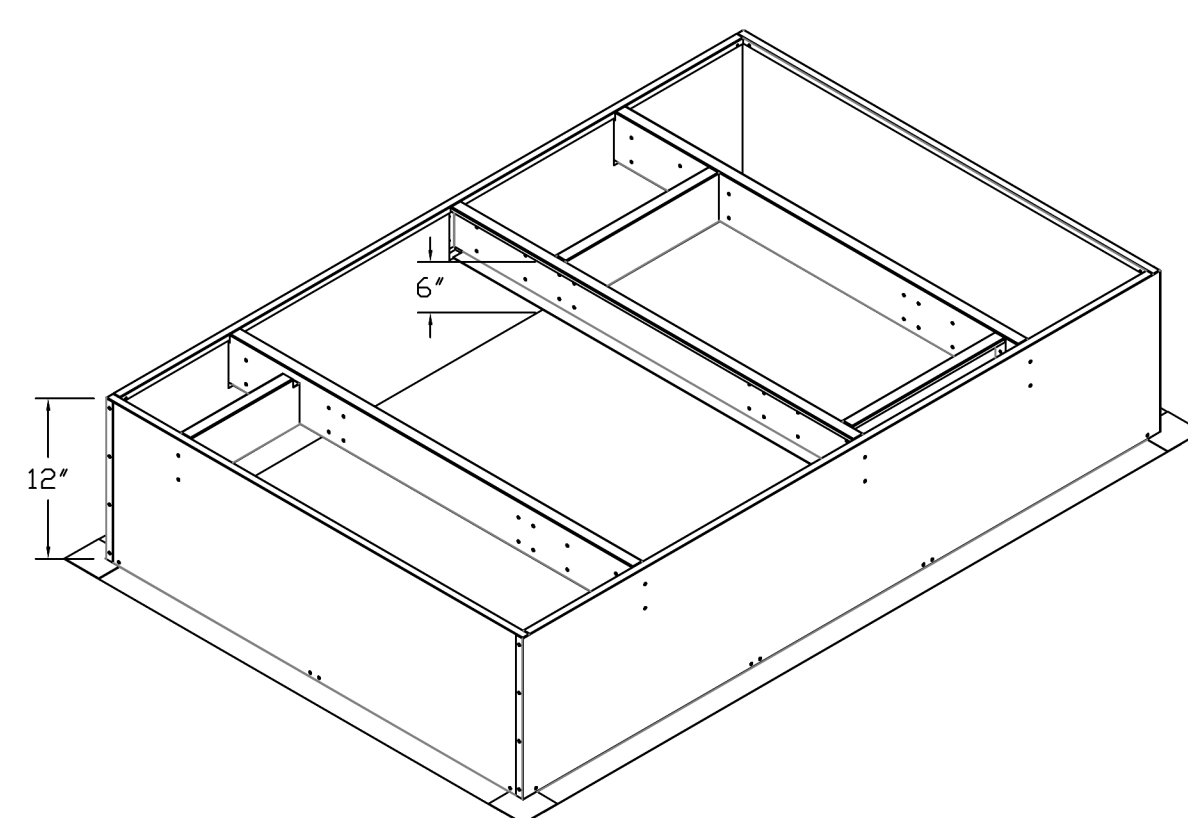
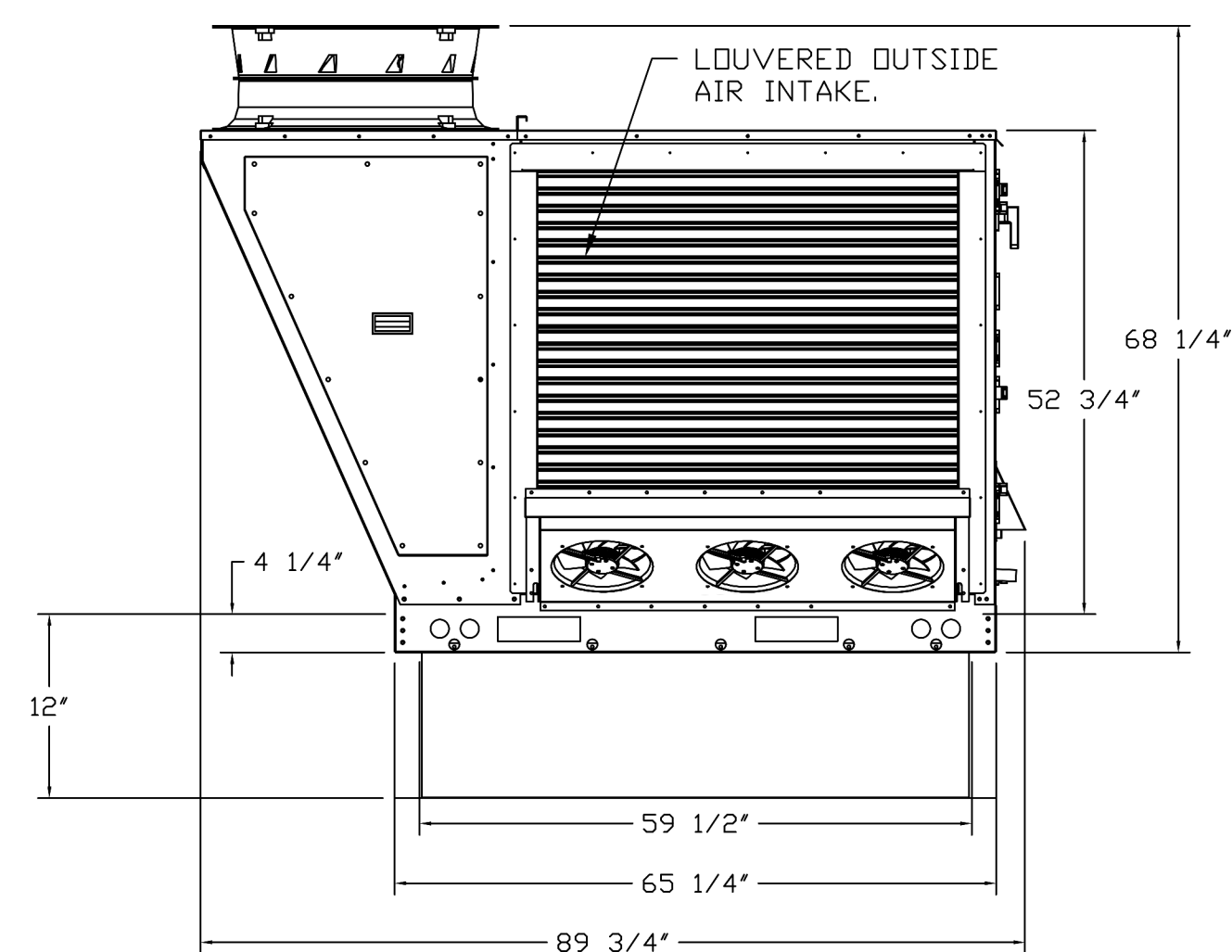
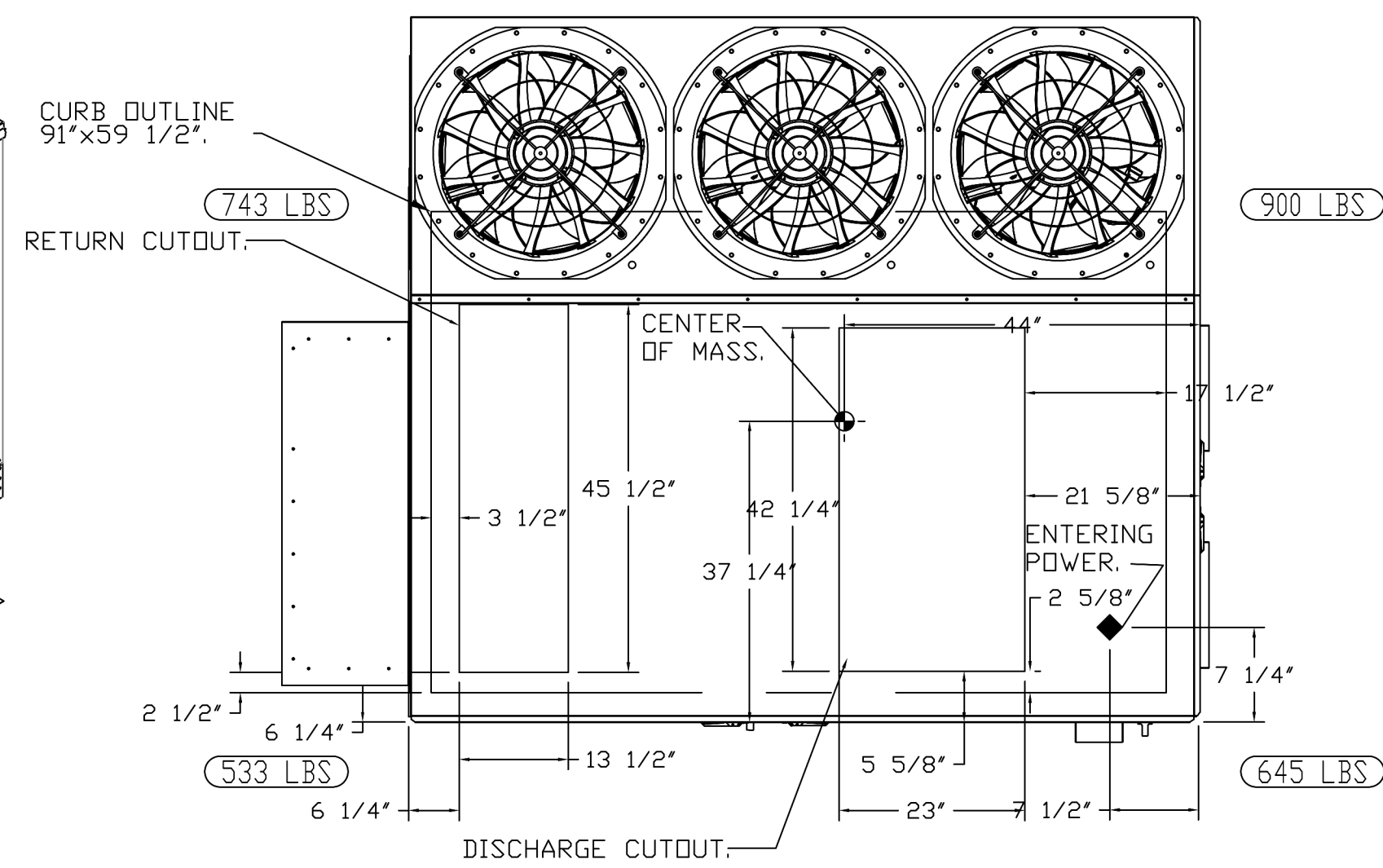
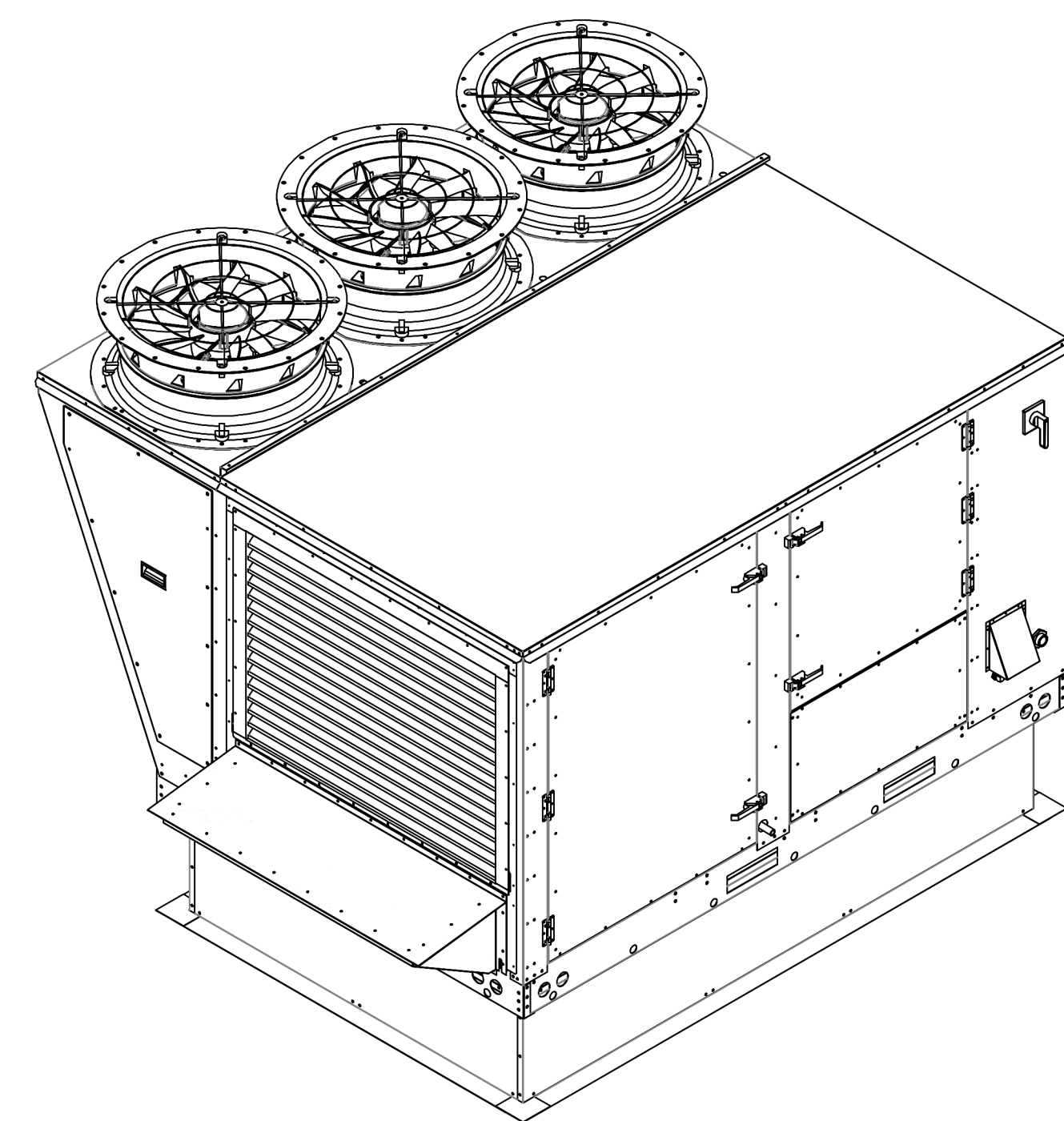
PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
CHECKED BY: -  
PROJECT NO: 12428-25

M707



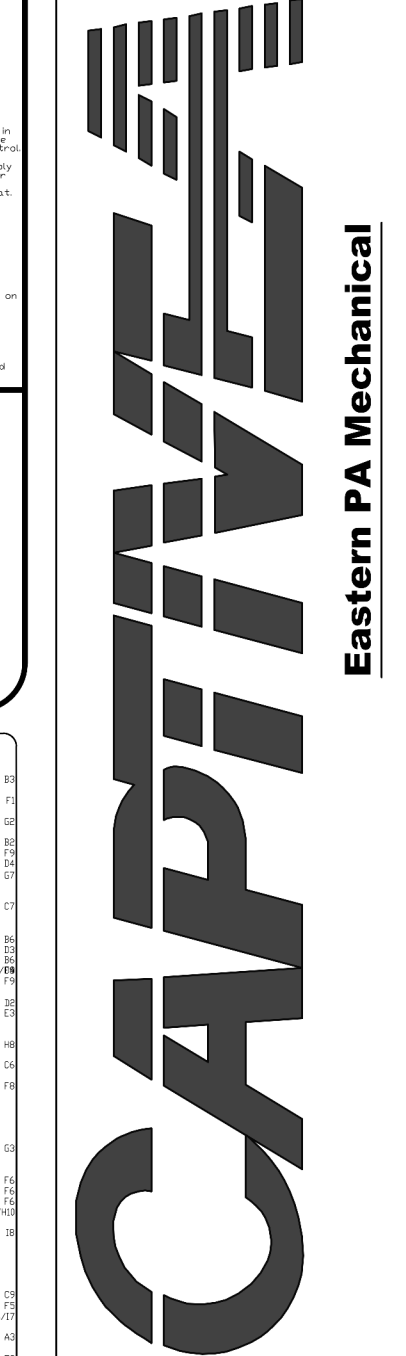


FAN #2 CAS-HVAC3-1250-24MF-20T - HEATER (RTU-2(KITCHEN))

- 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.

\*NOTE: INTEGRAL CO2 MONITORING AND CONTROL CAPABILITIES FOR ALL SPACE MOUNTED THERMOSTATS.

REVISIONS	
DESCRIPTION	DATE



Shake Shack-1545-Sun Vet, NYHVAC-R1  
 HOLBROOK, NY, 11741

DATE: 4/28/2025  
 DWG.#: 7497785  
 DRAWN BY: Joe Shilba  
 SCALE: 1/2" = 1'-0"  
 MASTER DRAWING  
 SHEET NO. 3

THIS DIAGRAM REPRESENTS THE INPUT TO THE ENGINEERING TASKS FOR THE KITCHEN AIR CONDITIONING AND VENTILATION / EXHAUST SYSTEM. THE SYSTEM IS PROVIDED BY THE OWNER OR KITCHEN EQUIPMENT SUPPLIER AND IS SOLELY FOR THE CONTRACTOR'S REFERENCE FOR MANUFACTURER'S INSTALLATION DETAILS. SOME MISCELLANEOUS ITEMS OR ACCESSORIES SHOWN MAY BE REQUIRED TO BE SUPPLIED BY THIS CONTRACTOR.

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 PHOENIX, AZ 85054  
 T: 480.448.6250  
 WWW.SARGARCH.COM



CONSULTANTS:

SEAL SIGNATURE:



NO.	BY	DATE	DESCRIPTION



SHAKE SHACK SUN VET

5801 SUNRISE HWY, SUITE 220,  
 HOLBROOK, NY 11741  
 SHACK #1545

PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: -  
 CHECKED BY: -  
 PROJECT NO: 12426-25

M709