MECHANICAL SHEET INDEX

RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED			INSTALLED			REMARKS
	GC	OWNER	LL	GC	OWNER	LL	
DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING							
23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION							
HVAC DUCTWORK SYSTEM IDENTIFICATION	●			●			
PIPING SYSTEM IDENTIFICATION	●			●			
UTILITY SHUT OFF IDENTIFICATION IN KITCHEN	●			●			
VALVE TAGS AND CHART	●			●			
HVAC DAMPER IDENTIFICATION	●			●			
23.2 ROOF CURBS							
EXHAUST FAN CURBS		●		●			
ROOFTOP UNIT CURBS		●		●			
CONDENSING UNIT CURBS		●		●			
MAKE UP AIR UNIT CURBS		●		●			
KITCHEN EXHAUST FAN CURBS		●		●			
23.3 HVAC DUCTWORK SYSTEM COMPONENTS							
HVAC DUCTWORK	●			●			
GREASE DUCTWORK INSIDE TENANT SPACE	●			●			
MAKEUP AIR DUCTWORK INSIDE TENANT SPACE	●			●			
GENERAL EXHAUST AIR DUCTWORK INSIDE TENANT SPACE	●			●			
INSULATION AND FIRE WRAP	●			●			
DAMPERS	●			●			
SMOKE DETECTORS	●			●			
SUPPLY, RETURN, AND EXHAUST GRILLS AND REGISTERS	●			●			
23.4 MECHANICAL PIPING SYSTEM COMPONENTS							
WALK-IN COOLER AND FREEZER WATER COOLED CONDENSERS		●		●			1
REFRIGERANT PIPING FOR HVAC EQUIPMENT	●			●			
VALVES AND ACCESSORIES (E.G. AIR VENTS)	●			●			
23.5 HVAC EQUIPMENT							
GENERAL EXHAUST FAN		●		●			
KITCHEN EXHAUST PRECIPITATOR		●		●			
DUCTED AND NON-DUCTED HEATING AND COOLING UNITS		●		●			
MAKEUP AIR UNIT		●		●			
23.6 KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM							
HOOD CONTROL PANEL		●		●			
KITCHEN EXHAUST HOOD		●		●			
STRUCTURAL SUPPORT	●			●			
ELECTRICAL AND CONTROL WIRING	●			●			
ANSUL SYSTEM		●		●			2
ANSUL WIRING AND UTILITIES CONNECTION	●			●			
ANSUL GAS VALVE		●		●			
23.7 COMMISSIONING ACTIVITIES							
GREASE EXHAUST WATER LEAKAGE TEST	●			●			
TEST AND BALANCE (TAB) REPORT	●			●			

GENERAL NOTES:
1. INFORMATION CONTAINED WITHIN IS BASED ON THE EXECUTED WORK LETTER DATED 04/19/2021.
2. REFER TO FINAL WORK LETTER FOR ALL LANDLORD / TENANT SCOPE OF WORK RESPONSIBILITIES.

REMARKS:
1. WALK-IN COOLER AND FREEZER SUPPLIED BY VENDOR NO. 27. GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE PIPING INSTALLATION AND FINAL CONNECTION.
2. GENERAL CONTRACTOR TO COORDINATE AND FACILITATE SYSTEM SIGN-OFF.

SUBMITTAL MATRIX

GENERAL CONTRACTORS TO ALSO REVIEW ARCHITECTRUAL SPECIFICATIONS AS NOTED IN PLANS IN PLAN SECTION 700 OF THE ARCHITECTURAL PACKAGE FOR REQUIRED SUBMITTALS THAT MIGHT NOT BE LISTED BELOW.

SUBMITTAL DESCRIPTION	Required Review Time (Business Days)	Architect of Record	Shake Shack	Physical Sample Required	Submittal for Record	Submittal for Record Only
Diffusers, Grills & Registers	5	X			X	
Ductwork Layout (if there are signifcant changes in field)	5	X			X	
HVAC Equipment (if Carrier - Submitted by Owner Vendor directly to Owner/AOR prior to constructio	5	x			X	
MEP Tests, Start-Up, and Programming Reports	5	X			X	

GENERAL NEW NOTES:

1. 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.
2. 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.
3. DURING INSTALLATION OF NEW WORK, AVOID DAMAGING EXISTING SURFACES AND EQUIPMENT TO REMAIN. REPAIR DAMAGE CAUSED DURING CONSTRUCTION AT NO EXTRA COST TO THE OWNER.
4. ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.
5. 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.
6. 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.
7. COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.
8. 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.
9. INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING COLUMN LINES UNLESS OTHERWISE SHOWN OR NOTED.
10. 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.
11. COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTER REPLACEMENT.
12. SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH U.L. REQUIREMENTS.
13. ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.
14. 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.
15. COORDINATE THE LOCATION AND ELEVATION OF WALL-MOUNTED DEVICES WITH PRESENTATION BOARDS, DISPLAY CABINETS, SHELVES OR OTHER COMPONENTS SHOWN ON THE ARCHITECTURAL DRAWINGS THAT ARE TO BE INSTALLED UNDER OTHER DIVISIONS. CONTRACTOR WILL NOT BE REIMBURSED FOR RELOCATION OF WALL-MOUNTED DEVICES CAUSED BY A LACK OF COORDINATION.
16. PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.
17. BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.
18. 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.
19. 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.
20. 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.
21. DUCTWORK CROSSING FIRE RATED WALLS OR OTHER FIRE RATED ASSEMBLIES SHALL BE MINIMUM 26 GAUGE SHEET METAL.
22. PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR/ROUND BRANCH DUCT TAKEOFF FITTING FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS, REGISTERS AND GRILLES. PROVIDE WITH INTEGRAL MANUAL BALANCING DAMPER AND LOCKING QUADRANT WHERE INDICATED ON PLANS.
23. 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.
24. 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.
25. RIGIDLY SUSPEND UNIT HEATER FROM STRUCTURE WITH SUPPORTING ANGLES AND ALL-THREAD HANGING RODS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
26. PROVIDE WALL MOUNTED LOUVERS AND DAMPERS WITH SUITABLE MOUNTING FRAME TO MATCH WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL DRAWINGS.
27. PROVIDE A NEW SET OF AIR FILTERS IN UNITS PRIOR TO TESTING, ADJUSTING AND BALANCING AND BEFORE TURNING SYSTEM(S) OVER TO OWNER.
28. PROVIDE SEISMIC RESTRAINTS AS NEEDED FOR THE MECHANICAL SYSTEMS IN THE PROJECT BASED ON THE SEISMIC ANALYSIS REQUIRED BY THE SPECIFICATIONS.
29. PROVIDE TEMPORARY BARRIERS TO CONTAIN DUST AND DEBRIS RESULTING FROM THE PERFORMANCE OF THE WORK TO THE AREA WHERE WORK IS BEING PERFORMED.

MECHANICAL SYMBOLS

NOTE: THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS, ABBREVIATIONS, ETC. ARE NECESSARILY USED ON THE DRAWINGS.

HVAC EQUIPMENT & DUCTWORK

NOTE: ALL DUCT DIMENSIONS SHOWN ON DRAWINGS ARE INSIDE DIMENSIONS. SEE SECTION 15250 OF THE SPECIFICATION FOR DUCTWORK TO RECEIVE INSULATION OR LINER.

- EXISTING DUCTWORK OR EQUIPMENT TO REMAIN
- EXISTING DUCTWORK OR EQUIPMENT TO BE REMOVED
- LINEAR SLOT DIFFUSER
- INSULATED FLEXIBLE DUCT (MAX. 5'-0" LONG)
- BRANCH DUCT WITH 45° RECTANGLE-ROUND BRANCH FITTING AND MANUAL VOLUME DAMPER
- ELBOW WITH TURNING VANES
- BRANCH DUCT WITH BELL-MOUTH FITTING & MANUAL VOLUME CONTROL DAMPER
- RETURN, EXHAUST, OR OUTSIDE AIR DUCT UP
- RETURN, EXHAUST, OR OUTSIDE AIR DUCT DOWN
- SUPPLY AIR DUCT UP
- SUPPLY AIR DUCT DOWN
- EQUIPMENT WITH FLEXIBLE DUCT CONNECTION
- 10" CSD-1 300 CFM — NECK SIZE, TYPE, CFM OF SUPPLY DIFFUSER OR REGISTER
- 24x24 CEG-1 800 CFM — SIZE, TYPE, CFM OF EXHAUST GRILLE
- MANUAL VOLUME DAMPER
- SQUARE TO ROUND TRANSITION
- RD — DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RD=RETURN)

#	RISER DESIGNATION	CO	CARBON MONOXIDE SENSOR
FD	FIRE DAMPER	CO2	CARBON DIOXIDE SENSOR
FSD	FIRE SMOKE DAMPER	FS	FLOW SWITCH
SD	SMOKE DAMPER	HS	HUMIDITY SENSOR
VD	VOLUME DAMPER	PS	PULL STATION
MD	MOTORIZED DAMPER	SP	STATIC PRESSURE SENSOR
BD	BACKDRAFT DAMPER	TS	TEMPERATURE SENSOR
H	HUMIDISTAT		
T	THERMOSTAT		

STANDARD MOUNTING HEIGHTS

MECHANICAL (AFF, AFG, UNLESS NOTED OTHERWISE)

THERMOSTATS (USER ADJUSTABLE)(TOP OF DEVICE)	48"
CONTROLS (TOP OF DEVICE)	48"

PIPING

- DIRECTION OF FLOW
- EXISTING PIPING TO BE REMOVED
- EXISTING PIPING TO REMAIN
- FLOOR SINK (FS), SIZE & TYPE
- FLOOR DRAIN (FD), SIZE & TYPE
- ROOF DRAIN (RD), SIZE & TYPE
- OXYGEN OUTLET
- NITROUS OXIDE OUTLET
- MEDICAL AIR OUTLET
- NITROGEN OUTLET
- MEDICAL VACUUM INLET
- BALL VALVE
- CONTROL VALVE
- THREE-WAY CONTROL VALVE
- SHUTOFF VALVE
- CHECK VALVE
- BALANCING VALVE WITH PRESSURE PORTS
- TRIPLE DUTY VALVE WITH PRESSURE PORTS
- WATER METER
- STRAINER
- STRAINER WITH BLOWOFF
- RELIEF/SAFETY VALVE
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- GAS PRESSURE REGULATOR
- THERMOSTATIC MIXING VALVE
- PA — PIPE ANCHOR
- EJ — EXPANSION JOINT
- PIPE GUIDE
- PIPING SUPPORT
- F & T TRAP
- BUCKET TRAP
- THERMOSTATIC TRAP
- BACKFLOW PREVENTER
- PRESSURE GAUGE
- THERMOMETER
- PRESSURE AND TEMPERATURE TEST PLUG
- UNION
- FLANGE CONNECTION
- HOSE BIBB (HB)
- NONFREEZE WALL HYDRANT (NW)
- VACUUM RELIEF VALVE
- AV — AUTOMATIC AIR VENT
- MV — MANUAL AIR VENT
- PRESSURE / VACUUM SWITCH
- CLEANOUT
- CAP
- WALL CLEANOUT (WCO)
- FLOOR CLEANOUT (FCO)
- EXTERIOR CLEANOUT (ECO)
- ELBOW UP
- ELBOW DOWN
- TEE UP
- TEE DOWN
- ELBOW UP WITH SHUT-OFF VALVE (SOV)
- ELBOW DOWN WITH SHUT-OFF VALVE (SOV)
- TEE UP WITH SHUT-OFF VALVE (SOV)
- TEE DOWN WITH SHUT-OFF VALVE (SOV)
- REDUCER
- "A" — WATER HAMMER ARRESTER (WHA) WITH PDI SIZES, (A, B, C, D, & E)
- RECIRCULATION PUMP
- P-TRAP
- GAS COCK
- TRAP PRIMER
- TRAP PRIMER WITH DISTRIBUTION UNIT
- FIRE DEPARTMENT CONNECTION
- FIRE PUMP TEST HEADER
- INSPECTOR'S TEST CONNECTION / AUXILIARY DRAIN
- SPRINKLER RISER
- TOP BEAM CLAMP
- TRAPEZE HANGER

ANNOTATION

- 1 — MECHANICAL OR FIRE PROTECTION PLAN CALLOUT
- 1 — PLUMBING PLAN NOTE CALLOUT
- 1 — ELECTRICAL PLAN NOTE CALLOUT
- 1 — TECHNOLOGY PLAN CALLOUT
- 1 — PLUMBING EQUIPMENT DESIGNATION. (CONTRACTOR FURNISHED AND INSTALLED). REFER TO PLUMBING FIXTURE OR EQUIPMENT SCHEDULES
- 1 — EQUIPMENT DESIGNATION (OWNER FURNISHED, CONTRACTOR INSTALLED)
- CU / 1 — MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)
- CONNECTION POINT OF NEW WORK TO EXISTING
- 1 / M1 — DETAIL REFERENCE UPPER NUMBER INDICATES DETAIL NUMBER LOWER NUMBER INDICATES SHEET NUMBER
- 1 / M1 — SECTION CUT DESIGNATION

ABBREVIATIONS

(ALL ABBREVIATIONS SHOWN ARE NOT NECESSARILY USED ON THE DRAWINGS.)

A
A AMPERES
A AIR (COMPRESSED)
A/C AIR CONDITIONING
ACC AIR COOLED CHILLER
ACCU AIR COOLED CONDENSING UNIT
ADA AMERICANS WITH DISABILITIES ACT
AF AMPERE FUSE
AFC ABOVE FINISHED CEILING
AFCI ARC FAULT CIRCUIT INTERRUPTER
AFEA AREA FOR EVACUATION ASSISTANCE
AFF ABOVE FINISHED FLOOR
AFG ABOVE FINISHED GRADE
AHJ AUTHORITY HAVING JURISDICTION
AHU AIR HANDLING UNIT
AI ANALOG INPUT
AIC AMPERE INTERRUPTING CURRENT
AL ALUMINUM
AO ANALOG OUTPUT
AP ACCESS PANEL
AP ACCESS POINT
ATL ACROSS–THE–LINE
ATS AUTOMATIC TRANSFER SWITCH
AV AUDIO VISUAL
AWG AMERICAN WIRE GAUGE

B
B BOILER
BAS BUILDING AUTOMATION SYSTEM
BB BACKBONE
BD BACKDRAFT DAMPER
BD BLOWDOWN
BD BUILDING DISTRIBUTOR
BDF BUILDING DISTRIBUTION FRAME
BFF BELOW FINISHED FLOOR
BFG BELOW FINISHED GRADE
BFP BOILER FEED PUMP
BI BINARY INPUT
BKR BREAKER
BO BINARY OUTPUT
BOD BOTTOM OF DUCT
BOP BOTTOM OF PIPE
BOS BOTTOM OF STRUCTURE
BTU BRITISH THERMAL UNIT

C
C CONDUIT
CAT CATEGORY
CATV CABLE TELEVISION SYSTEM
CD CANDELA
CD CAMPUS DISTRIBUTOR
CT CURRENT TRANSFORMER
CCTV CLOSED CIRCUIT TELEVISION
CH CHILLER
CFM CUBIC FEET PER MINUTE
CKT CIRCUIT
CMP COMMUNICATIONS PLENUM CABLE
CMR COMMUNICATIONS RISER CABLE
CP CONDENSATE PUMP
CPT CONTROL POWER TRANSFORMER
CPVC CHLORINATED POLYVINYL CHLORIDE
CRAC COMPUTER ROOM AIR CONDITIONING UNIT
CRU COMPUTER ROOM UNIT
CT COOLING TOWER
CWP COOLING TOWER PUMP
CU COPPER
CU CONDENSING UNIT
CVD CUMULATIVE VOLTAGE DROP
CHP CHILLED WATER PUMP

D
DB DECIBELS
DDC DIRECT DIGITAL CONTROL
DFU DRAINAGE FIXTURE UNIT
DI DIGITAL INPUT
DI DUCTILE IRON
DN DOWN
DPDT DOUBLE–POLE, DOUBLE–THROW
DPI DIFFERENTIAL PRESSURE INDICATOR
DPST DOUBLE–POLE, SINGLE–THROW
DS DOWNSPOUT
DS DUCT SILENCER
DX DIRECT EXPANSION

E
(E) EXISTING
EA EXHAUST AIR
EAT ENTERING AIR TEMPERATURE
EDB ENTERING DRY BULB
EER ENERGY EFFICIENCY RATIO
EF EXHAUST FAN
EIA ELECTRONIC INDUSTRIES ASSOCATIONS
EL ELECTRIFIED LOCK OR LATCH
EM EMERGENCY
EMI ELECTROMAGNETIC INTEFERENCE
EMS ENERGY MANAGEMENT SYSTEM
EMT ELECTRICAL METALLIC TUBING
EPO EMERGENCY POWER OFF
ER EQUIPMENT ROOM
ESFR EARLY SUPPRESSION FAST RESPONSE
ETR EXISTING TO REMAIN
EWB ENTERING WET BULB
EWC ELECTRIC WATER COOLER
EWT ENTERING WATER TEMPERATURE

F
FACP FIRE ALARM CONTROL PANEL
FBO FURNISHED BY OTHERS/OWNER
FCA FAULT CURRENT AMPS
FCU FAN COIL UNIT
FD FLOOR DISTRIBUTOR
FD FLOOR DRAIN
FFA FROM FLOOR ABOVE
FFB FROM FLOOR BELOW
FF FINISHED FLOOR
FHC FIRE HOSE CABINET
FL FLOW LINE
FLA FULL LOAD AMPS
FLR FLOOR
FU FURNACE
FVNR FULL–VOLTAGE, NON–REVERSING

G
GC GENERAL CONTRACTOR
GE GROUNDING EQUALIZER
GFCI GROUND FAULT CIRCUIT INTERRUPTER
GFR GROUND FAULT RELAY
G GROUND
GND GROUND
GPM GALLONS PER MINUTE
GRS GALVANIZED RIGID STEEL
GYP GYPSUM BOARD

H
HC HORIZONTAL CROSS–CONNECT
HD HEAD
HD HUB DRAIN
HOA HAND–OFF–AUTOMATIC
HTG HEATING
HTR HEATER
HVU HEATING AND VENTILATING UNIT
HWP HEATING WATER PUMP
HZ HERTZ

I
IC INTERMEDIATE CROSS–CONNECT
IE INVERT ELEVATION
IG ISOLATED GROUND
IMC INTERMEDIATE METAL CONDUIT
IN WC INCHES OF WATER COLUMN
IP INTERNET PROTOCOL
ISC SHORT CIRCUIT CURRENT
ISDN INTEGRATED SERVICES DIGITAL NETWORK
ISP INTERNET SERVICE PROVIDER
ISP INSIDE PLANT CABLE

J
JB JUNCTION BOX
J–BOX JUNCTION BOX

K
kcmil 1000 CIRCULAR MILS
KK KIRK KEY
kV KILOVOLT
kVA KILOVOLT–AMPS
kVAR KILOVOLT–AMPS REACTIVE
kW KILOWATT
kWH KILOWATT–HOUR

L
L LOUVER
LAN LOCAL AREA NETWORK
LAT LEAVING AIR TEMPERATURE
LCC LIMITED COMBUSTIBLE CABLE
LDB LEAVING DRY BULB
LEC LOCAL EXCHANGE CARRIER
LED LIGHT–EMITTING DIODE
LF LINEAR FEET
LP LOW PRESSURE
LRA LOCKED ROTOR AMPS
LWB LEAVING WET BULB
LWT LEAVING WATER TEMPERATURE

M
M–M MULTIMODE
MAN METROPOLITAN AREA NETWORK
MATV MASTER ANTENNA TELEVISION SYSTEM
MAU MAKE–UP AIR UNIT
MAX MAXIMUM
MBH 1000 BTU PER HOUR
MC MAIN CROSS–CONNECT
MCA MINIMUM CIRCUIT AMPACITY
MCB MAIN CIRCUIT BREAKER
MCC MOTOR CONTROL CENTER
MD MOTORIZED DAMPER
MDF MAIN DISTRIBUTION FRAME
MDP MAIN DISTRIBUTION PANEL
MFR MANUFACTURER
MG MOTOR GENERATOR
MH MAINTENANCE HOLE
MH MANHOLE
MIN MINIMUM
MLO MAIN LUGS ONLY
MOCP MAXIMUM OVERCURRENT PROTECTION
MPOE MAIN POINT OF ENTRANCE
MPOP MAIN POINT OF PRESENCE
MSB MAIN SWITCHBOARD
MSWB MAIN SWITCHBOARD
MS/TP MASTER SLAVE/TOKEN PASSING – COMMUNICATION TRUNK
MTD MOUNTED
MU MAKE–UP

N
N/A NOT APPLICABLE
N/C NORMALLY CLOSED
N/O NORMALLY OPEN
NC NOISE CRITERIA
NEC NATIONAL ELECTRICAL CODE
NF NON–FUSED
NFPA NATIONAL FIRE PROTECTION ASSOCIATION, INC.
NIC NOT IN CONTRACT
NL NIGHT LIGHT
NM NANO METER

O
OA OUTSIDE AIR
OC ON CENTER
ORD OVERFLOW ROOF DRAIN
OS OCCUPANCY SENSOR
OSHA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OSP OUTSIDE PLANT

P
P POLE
PBX PRIVATE BRANCH EXHANGE
PCR PUMPED CONDENSATE RETURN
PDI PLUMBING DRAINAGE INSTITUTE
PDU POWER DISTRIBUTION UNIT
PH PHASE
ø PHASE
PIV POST INDICATOR VALVE
PNL PANEL
PNLBD PANELBOARD
POE POWER OVER ETHERNET
POTS STANDARD ANALOG TELEPHONE LINE
POTS PLAIN OLD TELEPHONE SERVICE
PROVIDE FURNISH AND INSTALL
PRV PRESSURE REDUCING VALVE
PSTN PUBLIC SWITCHED TELELPHONE NETWORK
PT POTENTIAL TRANSFORMER
PTP POINT–TO–POINT
PTZ PAN, TILT, ZOOM
PVC POLYVINYL CHLORIDE

Q
QTY QUANTITY

R
RA RETURN AIR
RC ROOM CRITERIA
RCP REINFORCED CONCRETE PIPE
RCPT RECEPTACLE
RD ROOF DRAIN
RD RETURN DUCT
REV REVISION
RF RETURN FAN
RH RELATIVE HUMIDITY
RH ROOF HOOD
RHG REFRIGERANT HOT GAS
RLA RUNNING LOAD AMPS
RMC RIGID METAL CONDUIT
RPM REVOLUTIONS PER MINUTE
RTU ROOFTOP UNIT
RU RACK UNIT

S
SA SUPPLY AIR
SATV SYNCHRONOUS OPTICAL NETWORK
SCP STEAM CONDENSATE PUMP
SD SMOKE DUCT DETECTOR
SD SUPPLY DUCT
SEER SEASONAL ENERGY EFFICIENCY RATIO
SF SQUARE FEET
SF SUPPLY FAN
SPDT SINGLE–POLE, DOUBLE–THROW
SPST SINGLE–POLE, SINGLE–THROW
SP STATIC PRESSURE
SP SUMP PUMP
SS STAINLESS STEEL
SS SANITARY SEWER
SS SOIL STACK
ST SHUNT TRIP
ST STEAM TRAP
STC SOUND TRANSMISSION CLASS
STM STEAM
SWBD SWITCHBOARD

T
TBB TELECOMMUNICATIONS BONDING BACKBONE
TBD TO BE DETERMINED
TC/C TEMPERATURE CONTROLS CONTRACTOR
TDH TOTAL DYNAMIC HEAD
TFA TO FLOOR ABOVE
TFB TO FLOOR BELOW
TGB TELECOMMUNICATIONS GROUND BUS BAR
TIA TELECOMMUNICATIONS INDUSTRY ASSOCIATION
TL TWISTLOCK
TMGB TELECOMMUNICATIONS MAIN GROUND BUS BAR
TR TAMPER RESISTANT
TR TELECOMMUNICATIONS ROOM
TT TEMPERATURE TRANSMITTER
TWU THROUGH WALL AIR CONDITIONING UNIT
TX TRANSFORMER
TYP TYPICAL

U
U/F UNDERFLOOR
U/G UNDERGROUND
U/S UNDERSLAB
UH UNIT HEATER
UL UNDERWRITERS LABORATORIES, INC.
UNO UNLESS NOTED OTHERWISE
UPS UNINTERRUPTIBLE POWER SUPPLY
UTP UNSHIELDED TWISTED PAIR

V
V VOLT(S)
VAC VOLTS ALTERNATING CURRENT
VD VOLTAGE DROP
VDC VOLTS DIRECT CURRENT
VAV VARIABLE AIR VOLUME
VCP VITRIFIED CLAY PIPE
VFD VARIABLE FREQUENCY DRIVE
VS VENT STACK
VTR VENT THROUGH ROOF

W
W WIRE
W/ WITH
W/O WITHOUT
WAN WIDE AREA NETWORK
WAP WIRELESS ACCESS POINT
WB WET BULB
WC WATER COLUMN
WG WATER GONG
WPD WATER PRESSURE DROP
WP WEATHER PROOF COVER
WR WEATHER RESISTANT
WS WASTE STACK
WSFU WATER SUPPLY FIXTURE UNIT
WT WATERTIGHT
WT WEIGHT

X
XP EXPLOSION–PROOF

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
1950001623

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE I
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER 84639PE DIGITALLY SIGNED OREGON NOVEMBER 09, 2017 SEAN O. EISLER
03/25/2022

Drawing Title: MECHANICAL ABBREVIATIONS & SYMBOLS

Job No. 194243 | Drawn HEI
Scale SEE PLAN | Date 03/28/2022

Sheet No. M001

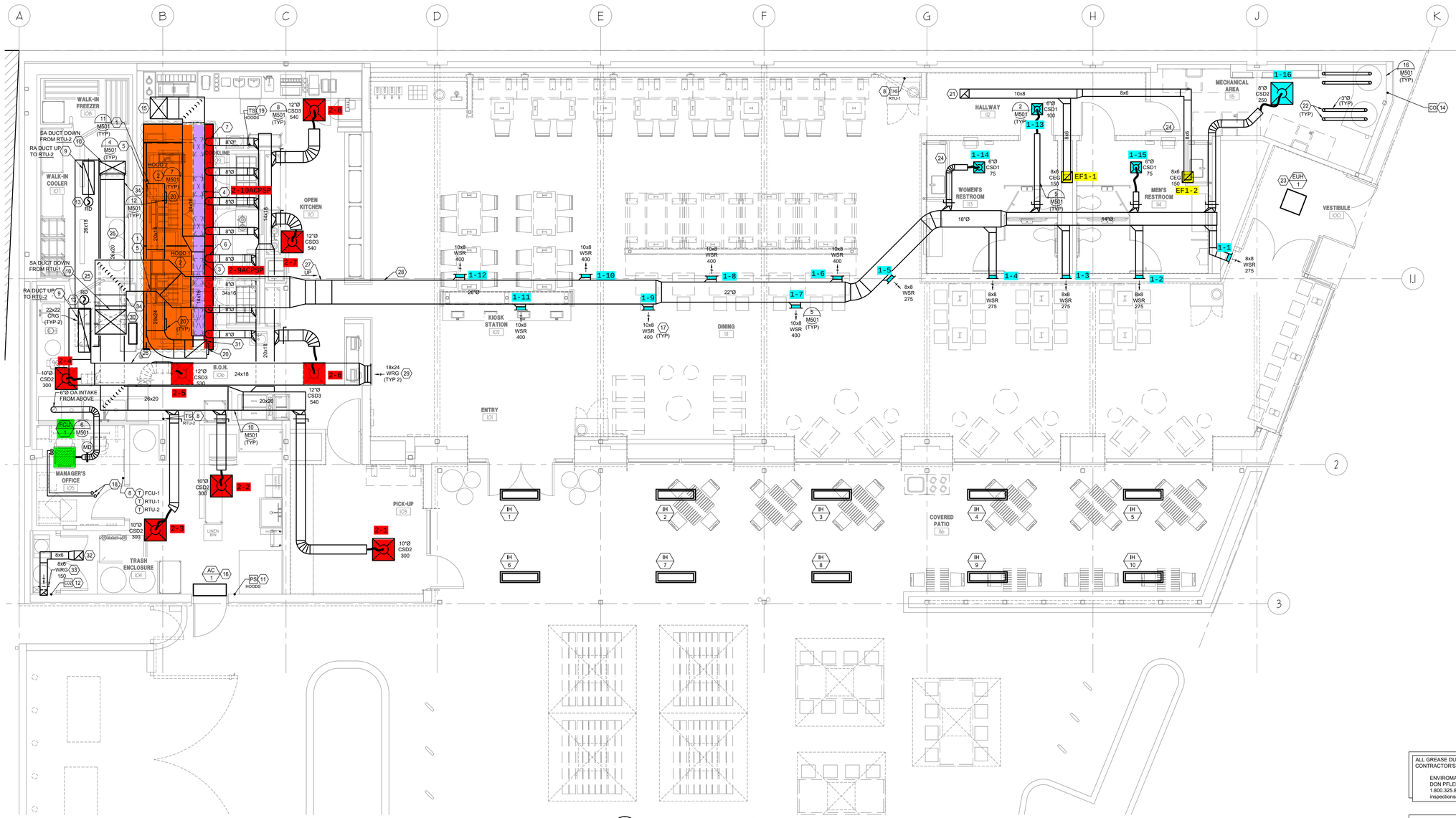
SEAN O. EISLER

MECHANICAL GENERAL NOTES:

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

MECHANICAL PLAN NOTES:

1. TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 16 GAUGE BLACK IRON WITH LIQUID TIGHT WELDS. INSTALL ACCESS PANELS FOR CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES. TRANSITION GREASE DUCTWORK AS REQUIRED TO HOOD AND FAN CONNECTIONS. PROVIDE 45° MAX OFFSETS AS REQUIRED TO COORDINATE WITH STRUCTURE. PROVIDE RADIUS ELBOWS WITHOUT TURNING VANES. SLOPE HORIZONTAL GREASE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT. GREASE DUCTS SHALL BE CONTAINED IN A UL APPROVED GREASE DUCT WRAP SYSTEM.
2. 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.
3. PROVIDE 36x8 DUCT DROP TO CONNECT TO MAKE-UP AIR PLENUM SUPPLY RISER WITH DAMPER AT HOOD. BALANCE EACH CONNECTION AT HOOD 1 TO 696 CFM (TYP 2).
4. PROVIDE 24x10 DUCT DROP TO CONNECT TO MAKE-UP AIR PLENUM SUPPLY RISER WITH DAMPER AT HOOD. BALANCE EACH CONNECTION AT HOOD 1 TO 539 CFM (TYP 3).
5. REFER TO CAPTIVE AIRE SHEETS FOR DUCT CONNECTION SIZES.
6. PROVIDE AN 8"ø SUPPLY DUCT WITH DAMPER TO HOOD 1 SUPPLY PLENUM. BALANCE SUPPLY AIR TO 125 CFM EACH (TYP. 4).
7. PROVIDE AN 8"ø SUPPLY DUCT WITH DAMPER TO HOOD 2 SUPPLY PLENUM. BALANCE SUPPLY AIR TO 137 CFM EACH (TYP. 4).
8. MOUNT THERMOSTATS AND TEMPERATURE/HUMIDITY SENSOR(S) ON WALL. THERMOSTAT IN OFFICE AND TEMPERATURE/HUMIDITY SENSORS IN ZONE. THERMOSTATS AND SENSOR(S) SHALL BE LABELED TO MATCH THE UNIT TAG AND CORRESPOND TO THE ELECTRICAL LEGEND IN THE ELECTRICAL PANELBOARD SERVING THE EQUIPMENT. COORDINATE COLOR WITH ARCHITECT.
9. PROVIDE RA DUCT THROUGH ROOF, FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR.
10. PROVIDE SA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR.
11. INSTALL HOOD FIRE SUPPRESSION MANUAL PULL STATION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FIRE SUPPRESSION SYSTEM INSTALLER AND THE AUTHORITY HAVING JURISDICTION.
12. PROVIDE ANALOX AX60 OR APPROVED EQUAL CARBON DIOXIDE SENSOR WITH REMOTE ALARM REPEATER TO BE MOUNTED AT 18"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.
    ALARM SET POINTS:
    LOW LEVEL ALARM - 0.5% = 5,000 PPM
    HIGH LEVEL ALARM - 3.0% = 30,000 PPM.
13. INSTALL DUCT SMOKE DETECTOR IN RETURN AIR PLENUM.
14. CARBON MONOXIDE DETECTOR FURNISHED BY OWNER. INSTALL AT 5'-0" AFF. COORDINATE FINAL LOCATION WITH OWNER REPRESENTATIVE.
15. PROVIDE FLEXIBLE CONNECTOR AT OUTLET OF MAU-1 AND ROUTE MAKEUP SA DUCT THROUGH ROOF. TRANSITION IN VERTICAL (BELOW ROOF) TO 24x16 AND ROUTE TO KITCHEN HOODS AS SHOWN.
16. AIR CURTAIN MOUNTED ABOVE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
17. INSTALL REGISTER ALONG CENTER LINE OF DUCT. ADJUST AS NECESSARY TO PREVENT DRAFTS.
18. REFRIGERANT PIPING UP TO CU-1 ON ROOF, REF 1/M150.
19. MOUNT TEMPERATURE SENSOR PROVIDED WITH KITCHEN EXHAUST HOODS ON WALL.
20. INSTALL "DUCTMATE ULTIMATE DOOR" GREASE DUCT ACCESS PANELS FOR CLEANING IN LOCATION SHOWN AT A MINIMUM AND AS REQUIRED BY NFPA 96 AND LOCAL CODES.
21. 10x8 EA DUCT UP TO EF-1 ON ROOF. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION TO FAN.
22. PROVIDE COMBUSTION AIR AND EXHAUST PIPE AND ROUTE THROUGH ROOF.
23. COORDINATE LOCATION AND INSTALLATION OF RECESSED CEILING MOUNTED ELECTRIC HEATER IN VESTIBULE. FIELD PAINT TO MATCH CEILING, COORDINATE WITH ARCHITECT.
24. COORDINATE WITH GENERAL CONTRACTOR TO PROVIDE 1" DOOR UNDERCUT.
25. MOUNT BOTTOM OF DUCTWORK IN BOH AREA AT MINIMUM 11-4" AFF. COORDINATE EXACT HEIGHT WITH STRUCTURAL.
26. ROUTE RA DUCT ABOVE SA DUCT.
27. RAISE DUCT TO ROUTE THRU TRUSSWORK. COORDINATE EXACT HEIGHT WITH STRUCTURAL.
28. ROUTE DUCTWORK THRU TRUSSWORK IN DINING AREA.
29. MOUNT BOTTOM OF RETURN AIR DUCTWORK AT 13'-8" A.F.F. AND ROUTE DUCT TIGHT TO STRUCTURE. TRANSITION DUCT AS/IF REQUIRED TO TERMINATE DUCT AS HIGH AS POSSIBLE AT WALL. PENETRATING WITH WALL RETURN GRILLE. MOUNT WALL RETURN GRILLE ABOVE ATAS.
30. LOCATION OF ESP ANSUL SYSTEM CONTROL PANEL. REFER TO TRION SHEETS FOR DETAILS.
31. 24x20 GREASE DUCT UP THRU ROOF TO ESP-1, REF M150 FOR CONTINUATION. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION.
32. 8x6 EA DUCT UP TO EF-2 ON ROOF. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION TO FAN.
33. MOUNT WALL RETURN GRILLE WITHIN 12" FROM FLOOR TO 8"X6" EXHAUST DUCT.
34. REFER TO SHEET M601 ROOFTOP UNIT SCHEDULES FOR UV AIRBORNE DISINFECTION SYSTEM AND INSTALL PER MANUFACTURER'S INSTRUCTIONS. EACH RTU WILL REQUIRE TWO (2) AXIAL UV LIGHTS IN THE SUPPLY DUCT.



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

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

ENVIROMATIC
DON PFLEDERER
1.800.325.8476
inspections@enviromatic.com

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

CONTACT:
WILL TURNBOUGH
will@natonaltab.com
855-682-6822 ext704

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
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SHAKE SHACK

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Shack #1317

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	10/14/19	ISSUE FOR 1ST REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
DIGITALLY SIGNED
OREGON
NOVEMBER 09, 2021
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL FLOOR PLAN

Job No.	Drawn
194243	HEI
Scale	Date
SEE PLAN	03/28/2022

Sheet No.
M101

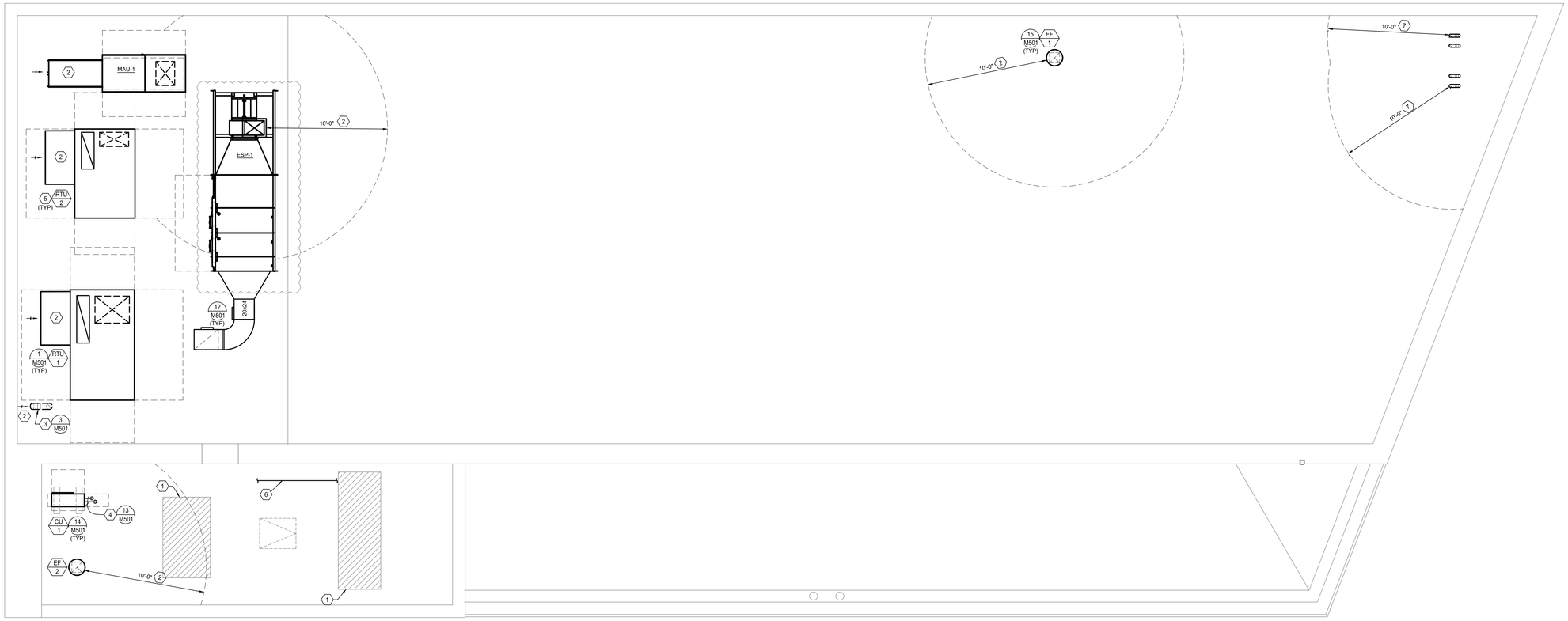
SEAN O. EISLER

MECHANICAL GENERAL NOTES:

1. ALL VENT STACKS SHALL BE NO LESS THAN 12" FROM PARAPET, AT LEAST 10 FEET FROM OUTSIDE AIR INTAKES, AND ABOVE ROOF SURFACE 6" MINIMUM TO FULL HEIGHT OF PARAPET, WHICHEVER IS GREATER. CONTRACTOR SHALL PROVIDE BRACING AS SPECIFIED.
2. COORDINATE EXACT EQUIPMENT LOCATIONS WITH OTHER TRADES PRIOR TO INSTALLATION.
3. REFER TO SHEET M001 FOR ADDITIONAL GENERAL NOTES.
4. REFER TO DETAILS AND SCHEDULES SHEETS FOR FURTHER INFORMATION.

MECHANICAL PLAN NOTES:

1. AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR. COORDINATE EQUIPMENT LOCATION AND CONDENSER INSTALLATION WITH KITCHEN EQUIPMENT CONTRACTOR.
2. MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST, TYPICAL.
3. TURN DOWN 6"ø INTAKE AND END OPEN OVER DOGHOUSE ROOF (MIN. 24") WITH INSECT SCREEN.
4. CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
5. INSTALL POWER RELIEF ACCESSORY FURNISHED WITH RTU PROVIDE CLEARANCES AS REQUIRED BY MANUFACTURER.
6. ROUTE REFRIGERANT LINES ON ROOF TO KITCHEN EQUIPMENT, DROP OVER BOH AREA TO EQUIPMENT BEING SERVED. DO NOT DROP REFRIGERANT LINES OVER DINING AREA. SINGLE LINE SHOWN FOR CLARITY.
7. MAINTAIN A MINIMUM 10'-0" RADIUS FROM WATER HEATER GOOSENECK EXHAUST DUCT.



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

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8345 LENEXA DRIVE, SUITE 300
LENEXA, KANSAS 66214
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WWW.HENDERSONENGINEERS.COM
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REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
DIGITALLY SIGNED
OREGON
NOVEMBER 09, 2010
SEAN O. EISLER
03/25/2022

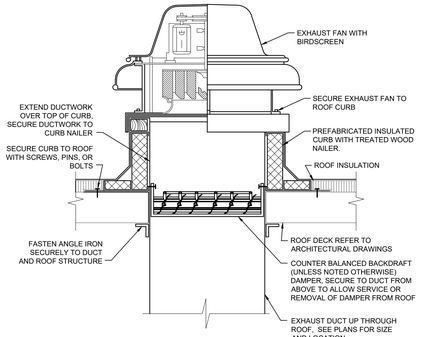
Drawing Title
MECHANICAL ROOF PLAN

Job No.	Drawn
194243	HEI

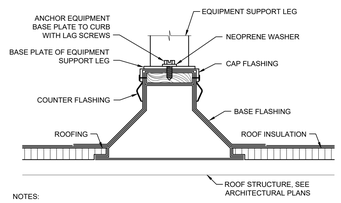
Scale	Date
SEE PLAN	03/28/2022

Sheet No.
M150

SEAN O. EISLER



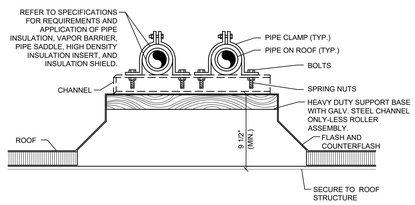
15 DOWNBLAST EXHAUST FAN DETAIL
NO SCALE



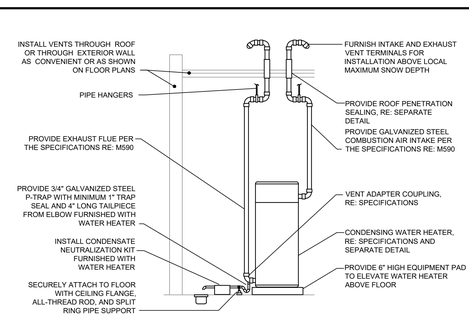
NOTES:

1. SUPPORT OUTDOOR UNITS ON MECHANICAL EQUIPMENT RAIL PER SUPPORT MANUFACTURER'S INSTALLATION DETAILS IN COMPLIANCE WITH LOCAL SEISMIC AND WIND RESTRAINT REQUIREMENTS.
2. SEE TYPICAL EQUIPMENT SUPPORT RAIL AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

14 ROOF EQUIPMENT SUPPORT RAIL DETAIL
NO SCALE

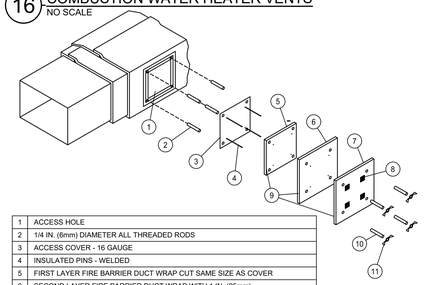


13 ROOF PIPE SUPPORT DETAIL
NO SCALE



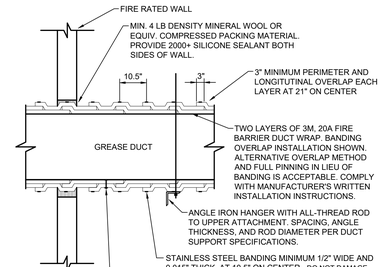
DETAIL SHOWS GENERAL SCHEMATIC REQUIREMENTS. ADJUST TO SUIT FIELD CONDITIONS. INSTALL THROUGH ROOF OR THROUGH WALL AS SHOWN ON PLANS. REFER TO MANUFACTURERS INSTALLATION MANUAL FOR MORE INFORMATION: MAINTAIN PROPER DISTANCES FROM EACH OTHER, AND FROM OTHER CONSTRUCTION FEATURES. VERIFY PIPE SIZE FOR MAXIMUM LENGTH OF RUN AND QUANTITY OF FITTINGS. VERIFY WATER HEATERS PROVIDED WITH CONDENSATE NEUTRALIZATION KITS HAVE THEM PROVIDED.

16 COMBUSTION WATER HEATER VENTS
NO SCALE

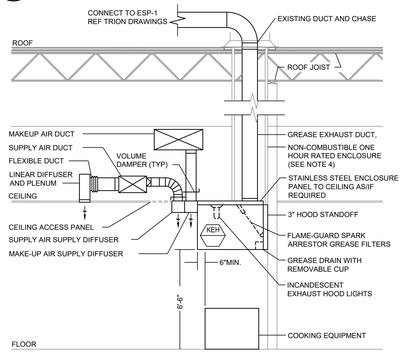


1	ACCESS HOLE
2	1/4 IN. (6mm) DIAMETER ALL THREADED RODS
3	ACCESS COVER - 16 GAUGE
4	INSULATED PINS - WELDED
5	FIRST LAYER FIRE BARRIER DUCT WRAP CUT SAME SIZE AS COVER
6	SECOND LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES
7	THIRD LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES OF PREVIOUS LAYER
8	SPEED CLIPS
9	ALUMINUM TAPE COVERING ALL EXPOSED EDGES
10	SPOOL PIECES FOR THREADED RODS
11	1/4 IN. (6mm) DIAMETER WING NUTS
	FOR REFERENCE ONLY. INSTALL PER MANUFACTURERS RECOMMENDATIONS.

12 GREASE DUCT CLEANOUT ACCESS DOOR
NO SCALE



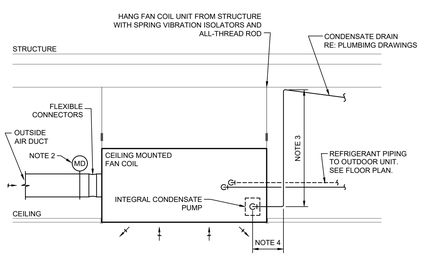
11 GREASE DUCT FIRE WRAP INSULATION INSTALLATION DETAIL
NO SCALE



NOTES:

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

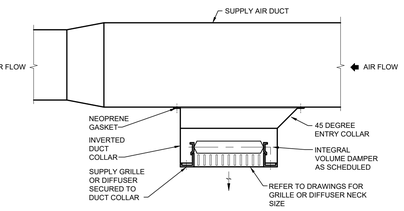
7 TYPICAL KITCHEN EXHAUST HOOD ELEVATION
NO SCALE



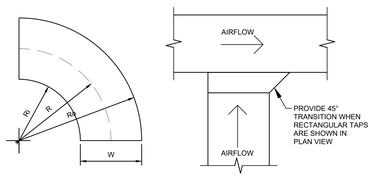
NOTES:

1. ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS OR MEET LOCAL CODE REQUIREMENTS.
2. SET DAMPER TO DELIVER SCHEDULED OUTSIDE AIRFLOW.
3. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR MAXIMUM CONDENSATE DRAIN LIFT LENGHTS.
4. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR HORIZONTAL CONDENSATE DRAIN CONNECTION FROM THE UNIT.

6 CEILING CASSETTE FAN COIL UNIT
NO SCALE



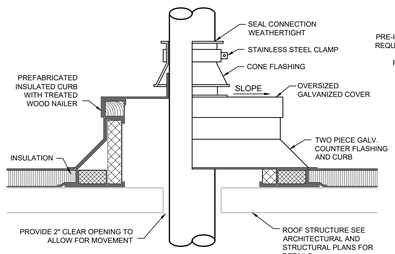
5 DUCT MOUNTED REGISTER DETAIL
NO SCALE



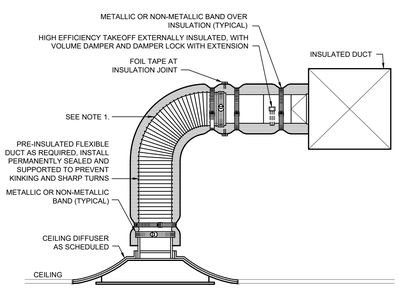
W = DUCT WIDTH
R = 1.5W (MAX) [Ro = 2W, RI = 1.0W]

NOTE: 90° ELBOW SHOWN. IF OTHER ANGLE LESS THAN 90° IS PROVIDED USE RADIUS DIMENSIONS SHOWN ABOVE.

4 GREASE DUCT RADIUS ELBOW DETAIL
NO SCALE



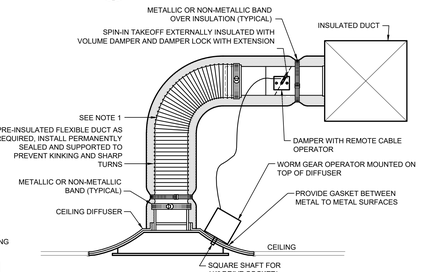
3 ROUND AIR DUCT OR PIPE PENETRATION THROUGH ROOF DETAIL
NO SCALE



NOTES:

1. EXTEND RIGID METAL DUCT SO THAT MAXIMUM FLEXIBLE DUCT LENGTH DOES NOT EXCEED 5'-0". PROVIDE RIGID 90° ELBOW WHERE REQUIRED TO KEEP FLEXIBLE DUCT WITHIN 5'-0" LENGTH LIMITATION.

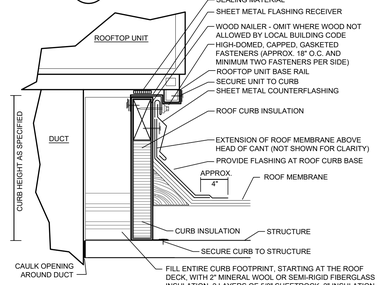
8 LAY-IN CEILING DIFFUSER DETAIL
NO SCALE



NOTES:

1. EXTEND HARD METAL DUCT SO THAT MAXIMUM FLEXIBLE DUCT LENGTH DOES NOT EXCEED 5'-0". PROVIDE RIGID 90° ELBOW WHERE REQUIRED TO KEEP FLEXIBLE DUCT WITHIN 5'-0" LENGTH LIMITATION.
2. PROVIDE WORM GEAR OPERATOR AND DAMPER WITH REMOTE CABLE FOR DAMPERS ABOVE HARD CEILINGS.

2 HARD CEILING DIFFUSER DETAIL
NO SCALE



NOTES:

1. CUT METAL DECKING TO ALLOW CURB INSTALLATION ON STEEL FRAMING. AFTER CURB IS SET IN PLACE, TRIM REMAINING METAL DECKING AND INSTALL WITHIN CURB. TACK WELD DECKING TO SUPPORT STEEL. DO NOT WELD INTERIOR DECKING TO ROOF CURB. PROVIDE ADDITIONAL CROSS FRAMING TO SUPPORT INTERIOR DECKING AND FILL MATERIAL AS REQUIRED.
2. PROVIDE WITH HURRICANE WIND SUPPORTS.

1 ROOF CURB DETAIL
NO SCALE

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.3000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
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REVISIONS

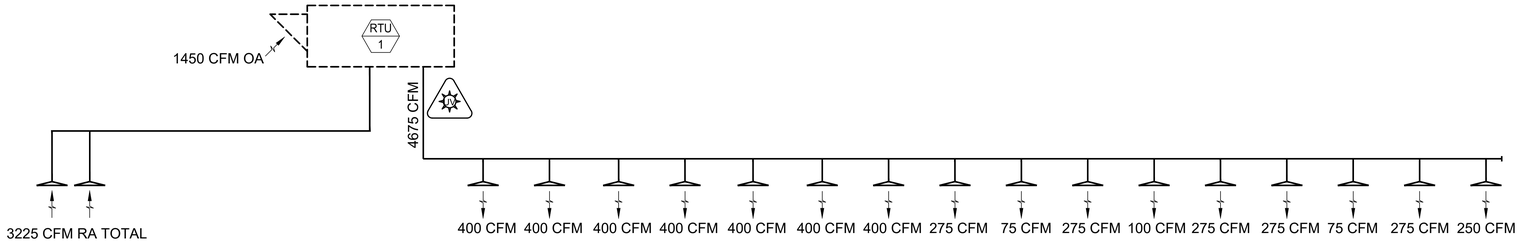
EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
OREGON
NOVEMBER 09, 2011
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL DETAILS

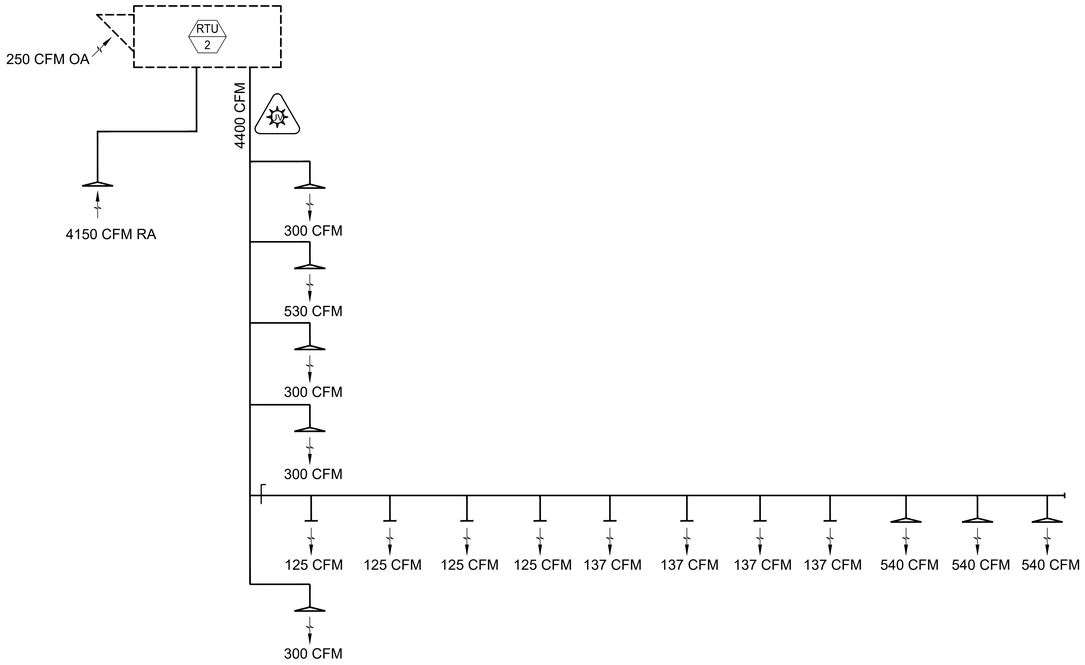
Job No.	Drawn
194243	HEI
Scale	Date
SEE PLAN	03/28/2022

Sheet No.
M501

SEAN O. EISLER



1 RTU-1 ONE-LINE DIAGRAM
NO SCALE



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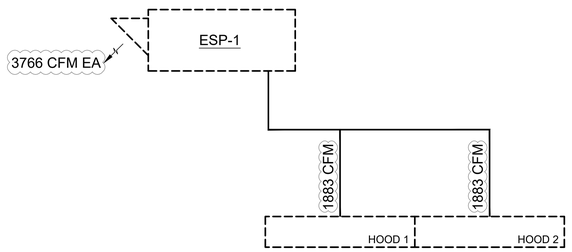

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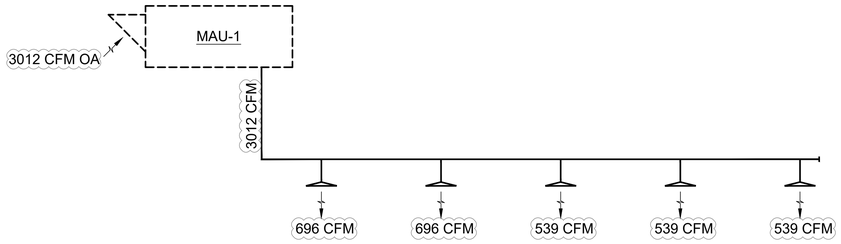

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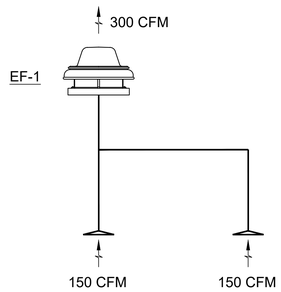
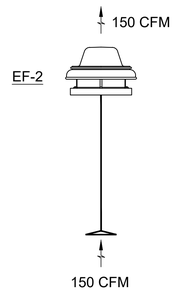


5 EF-1 ONE-LINE DIAGRAM
NO SCALE



6 EF-2 ONE-LINE DIAGRAM
NO SCALE

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KANSAS 66214
TEL 913.742.3000 FAX 913.742.3001
WWW.HENDERSONENGINEERS.COM
1950001623

SHAKE SHACK

1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III FIELD NOTICE 1
3	10/29/21	
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	11/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR T.I. REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
OREGON
NOVEMBER 19, 2021
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL SYSTEM DETAILS

Job No.	Drawn
194243	HEI
Scale	Date
SEE PLAN	03/28/2022

Sheet No.
M502

SEAN O. EISLER

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. Where the requirements of this section and division exceed those of Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division includes all 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 facilitate the function of each system as implied by the design and the equipment specified.

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

Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without 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:

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

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

Install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, 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 incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division."

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

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

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

Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified". The term "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. Install material and equipment in accordance with the manufacturer's installation instructions. Model numbers listed in the specifications or shown on the drawings are not necessarily intended to designate the required trim, written descriptions of the trim govern model numbers.

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

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

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

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

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

E. MANUFACTURERS

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

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

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

F. COORDINATION

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

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. 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.

Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:
1. National Electric 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, Refrigeration, and Air Conditioning Engineers (ASHRAE)
7. American National Standards Institute (ANSI)
8. American Society of Testing 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, dirt, paint, water, or physical damage. 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.

Plug 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.

I. SUBSTITUTIONS

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

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

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

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

J. SUBMITTALS

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

Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus 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 other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are being proposed. General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

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

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly bound, identified, indexed and tabbed in a 3-ring binder. Each item or model number shall be clearly marked and accessories indicated. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical requirements and deviations from specified equipment or materials. For equipment with motor starters or VFDs, include short circuit current ratings. Mark out 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; coordination of electrical requirements; and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

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 Engineer for the necessary release agreement form and to specify shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

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

See Division 01 and General Conditions for 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, unless specific items are noted to carry a longer warranty in the construction documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01.

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

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

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

2. GENERAL MATERIALS AND INSTALLATION

A. COINCIDENTAL DAMAGE

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

B. 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. Cut holes as small as possible. Patch walls, floors, and other portions of the facility as required by work under this division. Patching shall match the original material and construction including fire ratings, if applicable. Repair and refinish areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

C. 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.

D. SUPPORT 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.

E. ACCESS 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 Milcor, Titus, Zurn, or equal.

F. PENETRATIONS

Provide prefabricated roof curbs manufactured by Custom Curb, Inc., Pate Company, Thycurb or approved equal. Provide roof curb with factory installed wood nailer; welded, 18 gauge galvanized steel shell, base plate and flashing; 1-1/2 inch thick, 3 pound rigid insulation; fully mitered 3-inch raised cant; cover of weather-resistant, weather-proof material and pipe collar of weather-resistant material with stainless steel pipe clamps.

G. MOTORS AND STARTERS

Provide motors and starting equipment where not furnished with the equipment package. Motors shall have copper windings, Class B insulation, and standard squirrel cage with starting torque characteristics suitable for the equipment served. Motors controlled by variable frequency drives shall be rated for voltage peaks and minimum rise times in accordance with NEMA MG1, Part 31. Motors for air handling equipment shall be selected for quiet operation. Each motor shall be checked for proper rotation after electrical connection has been completed. Provide drip-proof enclosure for locations protected from weather and not in air stream of fan; and totally enclosed fan cooled enclosure for motors exposed to weather. Motors shall be manufactured by Century, General Electric, Louis Allis, Westinghouse, or approved equal.

Provide every motor, except fractional horsepower single phase motors with an approved type of "built-in" thermal overload protection, with a motor starter. Each starter shall be provided with overload heaters sized to the motor rating, and every three phase motor starter shall have overload heaters in each phase. Ambient compensated heaters shall be installed wherever necessary. Unless noted otherwise, motor starters shall be furnished by the Division 23 Contractor for installation and connection by the Division 26 Contractor. Starters shall be Allen-Bradley, Clark, Furnas, Square D, or approved equal.

H. ELECTRICAL WIRING

High voltage wiring is defined as 50 Volts or higher. Low voltage wiring is defined as less than 50 Volts. Line voltage wiring shall be provided by Division 26. Line voltage control and interlock wiring for mechanical systems shall also be provided by Division 26. Low voltage control wiring shall be provided by Division 23. Furnish wiring diagrams to Division 26 as required for proper equipment hookup. Coordinate with Division 26 the actual wire sizing amps for mechanical equipment (from the equipment nameplate) to ensure proper installation.

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

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

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

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

I. EQUIPMENT FURNISHED BY OTHERS

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

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

J. SYSTEM TESTING AND ADJUSTING

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.

Final system testing, balancing and adjustments (TAB) shall be performed by a Contractor certified by the National Environmental Balancing Bureau (NEBB), Associated Air Balance Council (AABC), or Testing, Adjusting and Balancing Bureau (TABB). TAB shall be performed in accordance with the most current edition of the certified agencies procedural standard for testing, adjusting and balancing and shall comply with the strictest interpretation of 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 to the Architect for evaluation and approval before final inspection of the project. Balance air systems to within plus or minus 10 percent for terminal devices and branch lines and plus or minus 5 percent for main ducts and air handling equipment of the amount of air shown on the drawings. TAB Contractor shall record space temperatures and make adjustments in airflow to each diffuser to obtain uniform temperature (no greater than +/- 3 F) in spaces. Document temperatures and adjustments in 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 adjustment to operate in accordance with the performance requirements of the Construction Documents. Adjust pumps, fans, etc. for proper and efficient operation. Certify to Architect that adjustments have been made and that system is operating 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.

K. 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. Approved manufacturers include Amber Booth, Kinetics Noise Control, Mason Industries, Inc., Vibration Eliminator Co., Inc., and Vibration Mounting and Controls, 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. Coat vibration isolators with factory-applied paint. Coat vibration isolators exposed to weather and other corrosive environments with factory-applied corrosion resistance protection. Install and adjust vibration isolators in accordance with manufacturers written instructions.

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

Isolator Types:

1. Type SPNH (Spring and Neoprene Hangers): Provide a steel spring in series with a neoprene isolating element. The spring shall have a minimum additional travel to solid equal to 50 percent of the specified deflection. The neoprene element shall have a static deflection of not less than 0.3 inches with a strain not exceeding 15 percent. Unless otherwise specified, the static deflection of SPNH hangers shall be 2 inches. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. Provide neoprene sleeve where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod. When installed, do not cock the spring element and do not allow the hanger box to rotate through a full 360 degree arc without encountering obstructions. Provide Mason Industries Type 30N or equal.

L. SEISMIC CONTROLS FOR MEPF SYSTEMS

Seismic Protection Criteria:

Risk/Occupancy Category:	I, II or III
Site Soil Category:	Contractor's Seismic Engineer to Determine.
Seismic Design Category:	Contractor's Seismic Engineer to Determine.
Component Importance Factor:	Determined from ASCE 7-2010.

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 catalog data of seismic 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. Approved manufacturers are: Amber/Booth Company, Inc., B-Line/Tolco, 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 to structure for support of mechanical and electrical equipment, regardless of the need for seismic restraints, shall be shown on shop drawings.

M. AIR FILTERS

Provide Farr 30/30, pleated, throwaway type filters, or similar as manufactured by Air Filter, Inc., American Air Filter, Flanders, or approved equal, unless otherwise indicated. Air units shall have new filters installed when they are operated before final acceptance.

If HVAC equipment is used during the construction period, Contractor shall provide one set of filters when the unit is started and replace filters when needed, but not less than every month. On the day of Substantial Completion, the Contractor shall clean the unit and provide a new set of filters in the unit.

N. REFRIGERANT AND OIL

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

O. 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.

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

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

Provide duct markers or provide stenciled signs and arrows indicating ductwork service and flow direction in black or white lettering for 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 or branch ducts more than 25 feet length and within 5 feet on each side of wall, floor, and ceiling penetrations. Provide additional markers in congested areas or at multiple duct runs as required for clarity.

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

P. 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 North American 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 metal by liner thickness in both directions where liner is installed.

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

Provide round liner that is 1-1/2 inch thick, 4 pound density, minimum R-6.0 Johns Manville "Spiracoustic 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 C553, Type II flexible fiberglass insulation. Installed insulation shall be 2 inch thick, 3/4 pound density, minimum R-6.0 duct wrap, Certainteed or equivalent Johns Manville, Owens-Corning, or Knauf with heavy-duty foil-scrim-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.

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.

B. DUCTWORK

Provide galvanized steel ductwork and housings as shown on drawings. Construct ductwork including fittings and transitions in conformance with current SMACNA standards relative to gauge, bracing, joints, etc. Minimum thickness of duct shall be 26-gauge sheet metal. Reinforce housings and ductwork over 30 inches with 1-1/4 inch angles not less than 5'-6" on centers, and 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, conduits, pipes, equipment, etc. from ductwork. Coordinate routing of ductwork with other contractors such that piping, electrical conduit, and associated supports are not routed through the ductwork.

Construct non-VAV supply ducts to meet SMACNA positive pressure of 2 inches w.g. Construct Return, Outdoor and Exhaust ductwork upstream of fans to meet SMACNA negative pressure of 1 inch w.g. Construct exhaust ductwork downstream of fans to meet SMACNA positive pressure of 1 inch w.g.

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

Seal ductwork with heavy liquid sealant, Hardcast Irongrip 601, Design Polymer DP 1010 , United Mcgill duct sealer or approved equal, applied according to sealant manufacturer's instructions. Seal all longitudinal and transverse ductwork joints airtight to meet SMACNA Seal Class A. Tapes and mastics shall be listed and labeled in accordance with UL 181A.

Provide radius elbows, turns, and offsets with a minimum centerline radius of 1-1/2 times the duct width. Where space does not permit full radius elbows, provide short radius elbows with a minimum of two continuous splitter vanes. Vanes shall be the entire length of the bend. Provide mitered elbows where space does not permit radius elbows, where shown on the drawings, or at the option of the contractor with the engineer's approval. Mitered elbows less than 45 degrees shall not require turning vanes. Mitered elbows 45 degrees and greater shall have single thickness turning vanes of same gauge as ductwork, rigidly fastened with guide strips in ductwork. Vanes for mitered elbows shall be provided in all supply and exhaust ductwork and in return and outside air ductwork that has an air velocity exceeding 1000 fpm. Do not install vanes in grease ductwork.

Ducts shall be connected to fans, fan casings and fan plenums by means of flexible connectors. Flexible connectors shall be neoprene coated glass cloth canvas connections, Duro-Dyne, Elgen, Ventfabric 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, Nailor Industries, Pottorff, 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 Young Regulator or Ventlok end bearings for the damper rod. Rectangular volume dampers shall be opposed blade interlocking type. Round volume dampers shall be single-blade type consisting of circular blade mounted to a shaft. Provide Flexmaster model STO or equal 45 degree rectangular/round side takeoff fitting with model BO3 damper with locking quadrant and insulation build out for round ductwork branch takeoffs to individual air devices. Omit damper at takeoff fitting when damper is located downstream of takeoff.

Where access to dampers through a hard ceiling is required, provide a Metropolitan Air Technology model RT-250 or equal by Young's Regulator concealed, cable operated volume damper with remote operator. Damper shall be adjustable through the diffuser face or frame with standard 1/4 inch nutdriver or flat screwdriver. Cable assembly shall attach to damper as one piece with no linkage adjustment. Positive, direct, two-way damper control shall be provided with no sleeves, springs or screw adjustments to come loose after installation. Support cable assembly to avoid bends and kinks in cable. Where approved by architect, a ceiling cup with cover plate can be used for access to cable operator.

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 26"	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 joint 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. 90 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 6 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 type 8B, Thermaflex type G-KM, M-KE, JPL type Silver Jacket, or equal (fire retardant polyethylene) protective vapor barrier, U.L.181 Class 1, acoustical insulated duct, R-6.0 fiberglass insulation. Provide CPE liner with steel 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 not be 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 clamp 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. SPECIAL GAS VENT FLUES

Vent flues for condensing type appliances shall be special gas vent or schedule 40 CPVC, meeting ASTM F441/F441M. Fittings shall be schedule 40 CPVC meeting ASTM F438 with solvent cement socket joints. Solvent used for joints shall meet ASTM F493. For combustion air ductwork follow 'Section B Ductwork' above.

E. AIR DEVICES

Provide air devices as scheduled on drawings, manufactured by Carnes, Krueger, Metalaire, Nailor 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, throw, CFM for each air device, styles, borders, etc. Clearly marked with specified equipment number. Submit samples of each air device as requested by the Engineer.

Provide wall supply air registers with double deflection blades and opposed blade dampers. Provide wall return air grilles and exhaust air registers with horizontal 35 or 45 degree angle vision-proof bars. Provide concealed fasteners for wall mounted registers and grilles.

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.

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.C. Size two-position dampers full duct 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, Pottorff, Nailor, 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 tight 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 motors if different voltages are required.

G. SMOKE DETECTORS

Provide smoke detectors where shown on drawings in addition to locations required by the specifications. Provide smoke detectors manufactured by the following manufacturers: Notifier; SimplexGrinnell; Siemens-Cerberus Division; Kidde/Edwards; Gamewell-FCI; FIKE Corporation; Farenhyt or approved equal.

Duct Mounted Smoke Detector: Photoelectric detector along with a standard, relay or isolator detector mounting base. Provide for variations in duct air velocity between 100 and 4000 feet per minute. Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube that extends the full width of the duct. Support tubing longer than 36 inches at both ends. Provide drilling templates and gaskets to facilitate locating and mounting of the housing.

Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72 for smoke detector spacing. Do not install smoke detectors in a direct air flow and not closer than 3 feet from an air supply diffuser or return air opening. Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover. Test all detectors in accordance with NFPA 72 and local fire department requirements.

H. EXHAUST AIR SYSTEMS

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

Provide roof mounted upblast exhaust fans as scheduled on the drawings, Accurex, ACME, Carnes, Cook, Greenheck, Pennbarry, or Twin City Fans complete with aluminum housing, aluminum centrifugal wheel, motor with integral thermal overload protection, disconnect switch mounted inside the housing, drain trough, birdscreen and pate prefabricated roof curb with minimum height of 12 inches for roofs with no insulation, 14 inches for roofs with insulation or as scheduled on the drawings. Exhaust fans serving Type I kitchen exhaust hoods shall discharge a minimum of 40 inches above the roof surface, shall have hinged access including access for blade inspection and cleaning per NFPA 96, grease drain trough filled with replaceable, absorbent material or replaceable cup and cap with absorbent material which absorbs grease and rejects water, and insulated curb, and shall be installed in accordance with NFPA 96 and local codes.

I. KITCHEN EXHAUST AIR SYSTEMS

Install kitchen grease exhaust package furnished by the owner. System includes kitchen hood, grease exhaust fan, 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 I 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 local code official, in fire rated wrap insulation. Insulation shall be minimum two-hour rated duct wrap insulation for Type I hood grease exhaust duct applications and shall conform to ASTM E2336 where required to comply with IMC. Insulation shall be flexible wrap enclosure rated for minimum 2000 degrees Fahrenheit and for zero clearance to combustibles. Insulation shall be non-mineral wool, passive, low bio-persistent fiber totally encapsulated on all sides with aluminum foil. Insulation shall be as manufactured by Certainteed, Thermal Ceramics, Unifrax or 3M. Slope duct back towards hood at minimum of 1/4 inch per lineal foot. At Contractor's option, a UL listed concentric ductwork package that complies with UL 1978 standard for grease ducts may be used in lieu of the welded black iron duct for connecting hood to exhaust fan. Ductwork package shall be as manufactured by Metal-Fab, Schebler, Selkirk, or approved equal. Provide manufacturers UL listing number and verification certificate as a part of the shop drawing submittal. Install duct package in strict conformance with manufacturer's instructions and recommendations.

All portions of grease duct systems shall be tested for leakage in accordance with the "Grease Duct Test" paragraph of the IMC. 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 Enviromatic 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

Provide electric cooling, gas heating rooftop units as scheduled on the drawings, manufactured by Aaon, Carrier, Daikin, Lennox, Johnson Controls, Trane, or York, 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, minimum SEER or EER rating (cooling) as required by the applicable energy code or greater if scheduled on the drawings, centrifugal evaporator blower; air filter rack with 2 inch thick throwaway filters, propeller type condenser fan; aluminized 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-short cycle timers, 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; remote mounted barometric relief damper or power relief fan per the RTU Control Matrix and drawings; weathertight housing constructed of zinc coated, heavy gauge, galvanized steel with weather-resistant baked enamel finish; minimum insulated downflow standard roof curb with minimum height of 12 inches for roofs with no insulation, 14 inches for roofs with insulation or as scheduled on the drawings; single point electrical power connection. Provide sloped roof curb as required to match slope of roof structure so that unit is installed level. Provide guards or louvered 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 with remote sensor. 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. 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, Daikin, Friedrich, Fujitsu, Lennox, LG, Mitsubishi, Sanyo, Trane, or York. Evaporator cabinet shall be factory assembled pre-wired consisting of furniture-grade steel with baked-enamel finish, front access, with direct-drive 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 prefabricated equipment support rails equivalent to Thycurb model TEMS-1 fastened securely to roof for condensing sections 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.

Control System: Unit-mounted panel with contactors, control transformer with circuit breaker, solid-state temperature- and humidity-control modules. Provide solid-state, unit-mounted control panel with start-stop switch, adjustable humidity set point, and adjustable temperature set point. Refer to sequence of operation.

C. AIR CURTAINS

Provide air curtains manufactured by Berner, Marley, Mars, or Powered Air, of sizes and capacities shown on drawings. Units shall comply with AMCA 220, AHRI 410 and NSF 37. Unit housing shall be constructed of aluminum, aluminized steel, or galvanized steel with powder coated anodized finish, color selection by architect, with steel mounting brackets. Unit shall have air adjustment by way of multi-speed motors or adjustable intake louvers. Unit shall have an adjustable integral discharge nozzle. Units shall have statically and dynamically balanced fans with direct drive fan drives. Motors shall be single speed resiliently mounted, continuous duty, with permanently sealed pre-lubricated ball bearings, and internal disconnect.

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

5. PIPING AND PIPING SPECIALTIES

A. REFRIGERANT PIPING AND INSULATION

Copper tubing: ASTM B 280, alloy C12200, type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

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

Brazing filler metals: BCUP - 5: copper (CU), phosphorus (P) 4.8 - 5.2 percent, and silver (AG) 14.5 - 15.5 for joining wrought copper fittings and copper tubing. Braze joints with a slow stream of dry nitrogen passing through the piping.

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

Run refrigerant lines parallel and perpendicular to wall and floor lines and to appear straight and in good order. Pitch suction lines down slightly (1 inch in 20 feet) towards the compressor. Provide oil traps at the base of vertical suction risers over 6 feet high.

Install liquid line sight glasses in liquid lines nearest the expansion valve. Factory mount expansion valves with the sensing bulbs shipped loose. Field mount expansion valve bulb after refrigerant piping is complete (damage may occur if bulbs come in contact with heat).

For systems of 5 ton capacity and smaller, the contractor shall have the option to provide copper refrigerant tubing line set sized as recommended by equipment manufacturer and of length as required for the installation. Provide minimum 1 inch thick foamed plastic insulation, Armaflex or equal, on the suction and liquid lines. Provide quick-connect flare tubing compression fittings or solder connections as required to match the connections of the condensing unit and evaporator coil.

B. SYSTEM EVACUATION AND CHARGING

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

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

6. TEMPERATURE CONTROLS

A. GENERAL REQUIREMENTS

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

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

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

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

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

B. WIRING

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

C. THERMOSTAT CONTROL EQUIPMENT

Manufacturers and model numbers are listed for reference as to quality and features required for the control devices. Provide control devices by Honeywell with quality and features as indicated.

Seven day programmable, occupied/unoccupied thermostats for on/off or multiple stages of heating and cooling systems shall be Honeywell series T7350 or equal with integral subbase. Order thermostat with multi-stage capability as required to match scheduled unit cooling/heating stages.

Control of economizer system shall be Honeywell YW7220 Jade Economizer module kit or equal. Economizer module kit shall include the economizer logic module, damper actuator, and sensors of type required to implement the type of economizer scheduled on the drawings.

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

D. SENSORS AND RELAYS

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

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

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

Provide 24 Volt or 120 Volt timeswitches Intermatic Series FM1D20 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, 6-hour, normally open type. Coordinate 120 V wiring of timeswitch with electrical contractor if 120 V model is provided.

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

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 heating to maintain room thermostat set point (75 degrees Fahrenheit cooling, 70 degrees Fahrenheit heating).

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

B. AIR CURTAIN CONTROL

Reference equipment schedule for related information.

C. PUBLIC RESTROOM EXHAUST FAN CONTROL (EF-1)

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

D. KITCHEN EXHAUST FAN CONTROL

Kitchen exhaust fans shall be energized through on-off switches at their 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.

E. MAKE-UP AIR UNIT CONTROL

Make-up air unit supply air fan shall be energized and the outside air damper shall open 100% when exhaust fans are energized. Exhaust fans and make-up air units shall modulate thru the hood control panel. Refer to installation, operation, and maintenance manual.

F. ROOFTOP UNIT CONTROL

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

G. COMPRESSED GAS ROOM EXHAUST FAN (EF-2)

Fan shall normally be off. The fan shall energize upon alarm of the CO2 monitoring system and shall remain energized until the alarm is cleared.

H. 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.

1

9. COMMISSIONING OF MECHANICAL SYSTEM

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. Electrostatic precipitator (ESP)
   7. Ductwork and piping
   8. Variable Frequency Drives
   9. Condensate Pumps

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. Electrostatic precipitator (ESP)
      h. 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.

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.

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Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE I
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
DIGITALLY SIGNED
OREGON
NOVEMBER 09, 2017
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL SPECIFICATIONS

Job No. 194243 | Drawn HEI

Scale SEE PLAN | Date 03/28/2022

Sheet No.
M590

SEAN O. EISLER

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

3.10 Packaged Heating and Cooling Units

A. Include all applicable "Start-Up Checks Common to All Systems".
B. Refer to AC Motors in this section.
C. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide startup service, and to demonstrate and train Owner's maintenance personnel is required by the Owner.
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 filters after start-up.

3.11 Terminal Units

A. Include all applicable "Start-Up Checks Common to All Systems".
B. Start-Up Checks: Perform the following inspections/checks during start-up:
1. After construction is completed, including painting if applicable, clean unit exposed surfaces.
2. Clean factory-finished surfaces. Repair any marred or scratches surfaces with manufacturer's touch-up paint.
3. Verify adequate access for maintenance.
4. Check power and control 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 and ESPs

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 ESP 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

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84639PE
OREGON
SEAN O. EISLER
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Drawing Title
MECHANICAL SPECIFICATIONS

Job No.	Drawn
194243	HEI
Scale	Date
SEE PLAN	03/28/2022

Sheet No.
M591

SEAN O. EISLER

UNIT HEATER SCHEDULE (ELECTRIC)

MARK	MANUFACTURER	MODEL	OUTPUT (MBH)	OUTPUT (KW)	MIN. NO. OF STAGES	CFM	MAX AMPS	V/PH	NOTES
EUH-1	QMARK	CDF-558	17.1	5	3	300	24	208/3	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.
B. PROVIDE WITH UNIT MOUNTED THERMOSTAT.
C. FURNISH WITH RECESSED MOUNTING ENCLOSURE.
D. PROVIDE NECESSARY MOUNTING BRACKET AND ACCESSORIES FOR CEILING MOUNTING.
E. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.

AIR CURTAIN SCHEDULE

MARK	SERVICE AREA	MANUFACTURER	MODEL	UNIT SPECS				V/PH/HZ	NOTES
				LENGTH (IN)	MAX. AIRFLOW	HEATING CAPACITY (KW)	MOTOR		
AC-1	SERVICE ENTRY	MARS	STD2	36	1379	--	1/2 HP	120/1	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 BY MECHANICAL CONTRACTOR, REF ARCHITECTURAL DRAWINGS.
B. MOUNT UNIT PER MANUFACTURERS RECOMMENDATIONS TO FACE OF WALL AND SUPPORT VERTICALLY.
C. PROVIDE INTEGRAL STARTER AND DISCONNECT SWITCH.
D. PROVIDE AIR CURTAIN WITH NORMALLY CLOSED DOOR LIMIT SWITCH FOR INSTALLATION ON DOOR. THE IR CURTAIN SHALL ENERGIZE WHEN DOOR OPENS.
E. PROVIDE WITH DELAY MICROSWITCH WITH ADJUSTABLE DELAY TIMERS PRE MOUNTED IN THE AIR CURTAIN CONTROL PANEL.

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	38MAQB18	R410A	11.6	91.0	19.0	12.2	8.7	3.3	13	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

NOTES:
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
B. EQUIPMENT CAPACITY SCHEDULED IS MINIMUM CAPACITY THAT MUST BE PROVIDED AT AMBIENT TEMPERATURE INDICATED.
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.

FAN COIL UNIT SCHEDULE (HEAT PUMP)

MARK	MFR	MODEL	SUPPLY FAN			COOLING COIL							HEAT PUMP HEATING COIL				MIN	ELECTRICAL				WEIGHT	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)	LAT (°F DB)	O/A (CFM)	V/PH	MCA	MOCP	DISC TYPE	(LBS)	
FCU-1	CARRIER	40MBQB18C	420	0.025	0.061	11.6	10.0	76.5	62.6	54.8	53.0	R410A	12.2	8.7	64.2	90	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.

1

MAKEUP AIR UNIT SCHEDULE (DX COOLING, NATURAL GAS HEAT)

MARK	MANUFACTURER	MODEL	AREA SERVED	SUPPLY FAN				DX COOLING COIL						GAS HEAT EXCHANGER			ELECTRICAL			WEIGHT (LBS)	NOTES
				CFM	ESP (IN)	BHP	NOM HP	TH (MBH)	SH (MBH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	MIN OUT (MBH)	NOM INPUT (MBH)	MIN EFF (%)	V/PH	DISC TYPE	STARTER TYPE		
MAU-1	CAPTIVE AIRE	A2-D.250-20D	KITCHEN	2936	0.9	1.37	2.0	--	--	--	--	--	--	179.0	194.5	92.0	208/3	NF	COMB	775	A - O

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 PROVIDED BY KITCHEN EQUIPMENT MANUFACTURER. REFER TO SHEETS M701 - M710.
B. PROVIDE INLET HOOD WITH CLEANABLE ALUMINUM MESH FILTERS.
C. PROVIDE FACTORY MOUNTED DISCONNECT NSTALLED ON SERVICE SIDE OF UNIT.
D. STARTER PROVIDED BY DIVISION 26 CONTRACTOR.
E. PROVIDE UNIT WITH SINGLE POINT ELECTRICAL CONNECTION.
F. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT. FILTER LOSS IS AT A MAXIMUM OF 400 FPM FACE VELOCITY.
G. PROVIDE MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE
H. PROVIDE INSULATED ROOF CURB WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 20 INCHES ABOVE FINISHED ROOF SURFACE. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDINATE CURB TYPE WITH DRAWINGS.
I. SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT AND CURB.
J. PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING
K. PROVIDE UNIT WITH VERTICAL SUPPLY AIR DUCT DISCHARGE THROUGH UNIT CURB.
L. PROVIDE UNIT WITH MOTORIZED BACKDRAFT DAMPERS.
M. PROVIDE FREEZESTAT IN THE SUPPLY AIR DUCT TO SHUT DOWN THE SUPPLY FAN AND CLOSE THE OUTDOOR AIR DAMPER IF TEMPERATURE IN THE SUPPLY DUCT DROPS BELOW 40 DEGREES FAHRENHEIT.
N. DIVISION 26 SHALL INTERLOCK MAKE UP AIR UNIT WITH HOOD CONTROL PANEL TO OPERATE AT THE SAME TIME AS THE KITCHEN EXHAUST FAN(S).
O. DIVISION 26 SHALL INTERLOCK MAKE UP AIR UNIT TO SHUT DOWN FROM A SIGNAL FROM THE HOOD FIRE SUPRESSION ANSUL SYSTEM.

1

MAKE-UP AIR UNIT (MAU-1) MODEL NUMBER: A2-D.250-20D
KITCHEN HOOD(S) MODEL NUMBER: 5430ND-2-ACPSP-F

NOTE: HOOD MOUNTED ELECTRICAL CONTROL PACKAGE PROVIDES INTERLOCK OF EXHAUST AND DEDICATED MAU.

REFER TO CAPTIVE AIRE SHEETS M701 - M710 FOR INFORMATION ON VENDOR KITCHEN EQUIPMENT.

PROJECT DESIGN CONDITIONS

CLIMATE CONDITONS

WEATHER STATION:		PORTLAND INTL, OR, USA			
CLIMATE ZONE		4C			
HEATING (DB):	99.6%	25	°F		
COOLING (DB/MCWB):	0.4%	91.2	°F/	67.5	°F/

BUILDING OPERATING HOURS:

MONDAY - FRIDAY	TBD BY OWNER
SATURDAY	TBD BY OWNER
SUNDAY	TBD BY OWNER
HOLIDAY	TBD BY OWNER

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

ROOFTOP UNIT SCHEDULE (DX COOLING, NATURAL GAS HEAT)

MARK	MANUFACTURER	MODEL	NOMINAL TONS	UNIT TYPE	SUPPLY FAN				COOLING COIL										HEAT EXCHANGER						MIN	ELECTRICAL				WEIGHT (LBS)	NOTES
					CFM	ESP (IN)	BHP	NOM HP	TH (MBH)	SH (MBH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	REFR TYPE	MIN EFF (EER)	MIN EFF (IEER)	MIN NO STAGES	MIN OUT (MBH)	NOM INPUT (MBH)	MIN EFF (%)	EAT (°F DB)	LAT (°F DB)	MIN NO STAGES	O/A CFM	V/PH	MCA	MOCP	DISC TYPE		
RTU-1	CARRIER	48HCFD14	12.5	SINGLE-ZONE	4,675	1.0	2.6	--	144.2	122.0	80.0	64.9	56.3	54.7	R-410A	12.2	13.9	2	195.0	240.0	81%	56.0	94.5	2	1450	208/3	58	70	NON-FUSED	1825	A - V
RTU-2	CARRIER	48HCED11	10	SINGLE-ZONE	4,400	1.0	3.6	--	118.0	101.2	75.9	62.8	55.0	53.7	R-410A	12.0	14.3	2	184.0	224.0	82%	67.4	106.0	2	250	208/3	56	60	NON-FUSED	1370	A - V

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. REFER TO ROOFTOP UNIT CONTROL MATRIX FOR CONTROL FEATURES, MODULES, AND ACCESSORIES THAT SHALL BE PROVIDED WITH THE EQUIPMENT.
B. EQUIPMENT SIZED FOR 100°F AMBIENT TEMPERATURE.
C. PROVIDE 2 INCH MERV 8, EFFICIENT PLEATED THROWAWAY AIR FILTERS.
D. DISCONNECT SWITCH FURNISHED BY DIVISION 26 CONTRACTOR.
E. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.
F. PROVIDE FACTORY MOUNTED VARIABLE FREQUENCY DRIVE OR 2-SPEED MOTOR TO FACILITATE STAGED FAN SPEED CONTROL.
H. PROVIDE SINGLE POINT POWER CONNECTION.
J. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
K. PROVIDE 125 VAC, 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMPER LOCATIONS WHEN IN USE.
L. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
N. PROVIDE MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE REQUIRED BHP.
P. PROVIDE STANDARD INSULATED ROOF CURB WITH MINIMUM HEIGHT OF 14 INCHES. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE.
R. SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT AND CURB.
S. COOLING COIL LAT IS LEAVING AIR TEMPERATURE OF COIL.
T. PROVIDE GUARDS TO PROTECT CONDENSER COIL FROM HAIL OR OTHER DAMAGE.
U. PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED. MEET
V. PROVIDE ADS AIRBORNE DISINFECTION SYSTEM, ADS MODEL TUVC-ADS-224D-HO.

FAN SCHEDULE

MARK	SERVICE (EA, RA, SA,OA)	MANUFACTURER	MOUNTING	MODEL	CFM	ESP (IN)	DRIVE (BELT/DIRECT)	MIN. HP	FAN RPM	VFD (Y/N)	ELECTRICAL			NOTES
											V/PH	DISC. TYPE	STARTER TYPE	
EF-1	EA	GREENHECK	ROOF	G-095-D	300	0.5	DIRECT	1/8	1550	N	120/1	NF	COMBINATION	A-D
EF-2	EA	GREENHECK	ROOF	G-097-B	150	0.5	DIRECT	1/6	1140	N	120/1	NF	COMBINATION	A, D, 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.
B. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
C. INTERLOCK FAN OPERATION WITH TIME CLOCK.
D. PROVIDE WITH MANUFACTURER'S FAN SPEED CONTROLLER FOR BALANCING PURPOSES.
E. INTERLOCK FAN WITH CO2 MONITORING SYTEM TO ENERGIZE UPON ALARM.

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
CSD1	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	SURFACE	12x12	30	A B C F H J K L
CSD2	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	LAY-IN	24x24	30	A B C F H K
CSD3	E.H. PRICE	SUPPLY DIFFUSER	PDDR	STEEL	PERFORATED	LAY-IN	24x24	30	A B C F H
WRG	E.H. PRICE	RETURN GRILLE W/DAMPER	530D	STEEL	LOUVERED FACE	WALL OR DUCT	(SEE PLANS)	30	A B C D F H
WSR	E.H. PRICE	SUPPLY REGISTER W/ DAMPER	520D	STEEL	LOUVERED FACE	WALL OR DUCT	(SEE PLANS)	30	A B C D E F G H
LSD1	E.H. PRICE	LINEAR SLOT DIFFUSER	SDS100	STEEL	LINEAR SLOT	WALL OR DUCT	(4)-1.5" SLOTS, 48" LENGTH	30	A B C F H J M

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 WORM GEAR OPERATOR OR EQUIVALENT YOUNG REGULATOR BUTTERFLY DAMPER WITH 270-275 CONTROLLER. OPERATOR SHALL HAVE A SQUARE DRIVE FOR 1/4" NUT DRIVER. DAMPER ASSEMBLY SHALL INCLUDE GALVANIZED STEEL DUCT WITH ROLLED BEAD STIFFENERS, REINFORCED BLADE, SELF LUBRICATING BEARING AND WORM GEAR MOUNTING PLATE. DAMPER SHALL BE INSTALLED IN BRANCH DUCT NOT INLET OF PLENUM DIFFUSER. (RE: 2/M501)
K. 4-WAY THROW PATTERN UNLESS OTHERWISE INDICATED BY FLOW ARROWS ON DRAWINGS.
L. PROVIDE RAPID MOUNT FRAME FOR INSTALLATION IN HARD CEILING.
M. PROVIDE E.H. PRICE MODEL SDB INTERNALLY LINED SUPPLY AIR PLENUM.

BUILDING AIR BALANCE SUMMARY NORMAL OPERATION

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OA/SA
MUA-1	3,012	3,012	--	100%
RTU-1	4,675	1,450	--	31%
RTU-2	4,400	250	--	6%
FCU-1	420	40	--	10%
ESP-1	--	--	3,766	--
EF-1	--	--	300	--
TOTAL	12,507	4,752	4,066	--
DESIGN BUILDING PRESSURIZATION AIRFLOW (CFM)				686
PRESSURIZATION CHECK				14%

ROOFTOP UNIT CONTROL MATRIX

CONTROL FEATURE	UNITS	RTU-1 (DINING) SETPOINT OR Y/N	RTU-2 (DINING) SETPOINT OR Y/N	NOTES
SETPOINTS				
COOLING - OCCUPIED SETPOINT	°F	75	75	
COOLING - UNOCCUPIED SETPOINT	°F	80	80	
HEATING - OCCUPIED SETPOINT	°F	70	70	
HEATING - UNOCCUPIED SETPOINT	°F	60	60	
DEHUMIDIFICATION SETPOINT - HUMIDITY SENSOR FEEDBACK	% RH	50%	N	B
PROGRAMMED CONTROL FEATURES				
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT		Y	Y	B
REMOTE TEMPERATURE SENSOR		Y	Y	B
EQUIPMENT ACCESSORIES AND CONTROL MODULES				
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)		Y	Y	K
INTEGRATED ECONOMIZER - DIFFERENTIAL ENTHALPY ENABLE (OA ENTHALPY < RA ENTHALPY)	BTU/LB	Y	Y	E
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM		Y	Y	F, G
RELIEF - CONSTANT VOLUME POWERED EXHAUST FAN		Y	Y	H
COOLING COIL (DX - STAGED)		Y	Y	M
DEHUMIDIFICATION - HOT GAS REHEAT		Y	N	O
HEATING COIL (NATURAL GAS)		Y	Y	M
SUPPLY FAN CONTROL METHOD				
ON DURING OCCUPIED HOURS		Y	Y	
OPTIMUM START SEQUENCE		Y	Y	
VARIABLE VOLUME - MODULATE FAN SPEED IN RESPONSE TO ZONE TEMPERATURE		Y	Y	M, R
SAFETIES, INTERLOCKS, AND ALARMS				
GAS VALVE SAFETY		Y	Y	F
RETURN AIR SMOKE DETECTOR - SAFETY SHUTDOWN		Y	Y	B
DIFFERENTIAL PRESSURE SWITCH - FILTER CHANGE ALARM		Y	Y	F
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK		Y	Y	
KITCHEN EXHAUST SYSTEM INTERLOCK		Y	Y	S

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

NOTES:
B. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE. REFERENCE DIVISION SPECIFICATIONS FOR DEVICE REQUIREMENT
E. THE FOLLOWING SENSORS SHALL DETERMINE ECONOMIZER ON POINT. REFERENCE SPECIFICATIONS FOR DEVICE REQUIREMENTS:
OUTSIDE AIR TEMPERATURE; DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
RETURN AIR TEMPERATURE; DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
OUTSIDE AIR HUMIDITY; DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
RETURN AIR HUMIDITY; DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
F. DEVICE SHALL BE FACTORY MOUNTED AND PRE-WIRED FOR OPERATION SUBJECT TO THE ONBOARD CONTROLLER.
G. PROVIDE UNIT WITH AN FDD SYSTEM CONSISTING OF PERMANENTLY INSTALLED OUTSIDE AIR, SUPPLY AIR, AND RETURN AIR TEMPERATURE SENSORS. THE UNIT CONTROLLER SHALL AT A MINIMUM BE CAPABLE OF PROVIDING SYSTEM STATUS OF ECONOMIZER, COMPRESSOR, HEATING, MIXED AIR LOW LIMIT ALARM, AND SENSOR VALUES. EACH OPERATING MODE SHALL BE CAPABLE OF INDEPENDENTLY OPERATING FOR TESTING. THE SYSTEM SHALL REPORT FAULTS TO AN APPLICATION ACCESSIBLE BY SERVICE PERSONNEL. THE FOLLOWING FAULTS SHALL BE DETECTED: AIR TEMPERATURE SENSOR FAILURE, ECONOMIZER ENABLED/DISABLED WHEN ECONOMIZER SHOULD BE OFF/ON, RESPECTIVELY, DAMPER NOT MODULATING, AND EXCESS OUTSIDE AIR.
H. POWERED EXHAUST FAN SHALL STAGE ON AND OFF ACCORDING TO DAMPER POSITION. INSTALL FAN WHERE SHOWN ON PLAN. PROVIDE CONTROL WIRING INSTALLED IN CONDUIT FROM RTU CONTROLLER TO FAN.
K. DETERMINE MINIMUM DAMPER POSITION IN FIELD DURING BALANCING TO PROVIDE SCHEDULED OUTDOOR AIRFLOW DURING OCCUPIED HOURS. DAMPER SHALL BE CLOSED DURING UNOCCUPIED HOURS.
M. UNITARY CONTROLLER SHALL MODULATE AND/OR CYCLE SUPPLY FAN SPEED SETTING AND COIL CAPACITY STAGES SUBJECT TO THE INTERNAL SAFETIES AND SEQUENCES TO MAINTAIN SCHEDULED SETPOINTS.
O. PROGRAM DEHUMIDIFICATION SEQUENCE BASED ON RETURN AIR HUMIDITY.
R. PROVIDE MODULATING FAN CONTROL WITH MINIMUM SPEED LESS THAN 50% OF FULL SPEED. AT MINIMUM SPEED THE FAN SHALL DRAW NO MORE THAN 30% OF FULL SPEED POWER.
S. INTERLOCK RTU WITH KITCHEN EXHAUST HOOD SYSTEM(S) TO SHUT DOWN UPON SIGNAL FROM HOOD FIRE EXTINGUISHING SYSTEM. INTERLOCK RTU WITH KITCHEN EXHAUST FAN TO ENERGIZE WHEN HOOD SYSTEM IS ENERGIZED FOR PRESSURIZATION.

OUTSIDE AIR REQUIREMENTS, 2019 OMSC

SYSTEM DESIGNATION	SYSTEM TAB NAME OR LIST 'SINGLE'	SINGLE-ZONE SYSTEMS ONLY: SINGLE-ZONE SYSTEM ASSOCIATED VENTILATION ZONE	SINGLE-ZONE SYSTEMS ONLY: SINGLE ZONE WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS [Ez]	MULTI-ZONE SYSTEMS ONLY: SYSTEM VENTILATION EFFICIENCY [Ev]	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/P)	REQUIRED OA INTAKE FLOW [Vot] (CFM)	REQUIRED DCV OA INTAKE FLOW [Vot] (CFM)	DESIGN OA INTAKE FLOW [Vot] (CFM)
RTU-1	MULTIZONE (RTU-1)	-	-	0.91	2,955	0.151	110	7.50	1,399	N/A	1,450
RTU-2	MULTIZONE (RTU-2)	-	-	1.00	1,195	0.120	12	7.50	233	N/A	250
FCU-1	SINGLE ZONE	OFFICE	0.80	-	72	0.060	2	5.00	18	N/A	40
								TOTALS	1,650	0	1,740

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 = $\sum_{all\ zones}$ 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 VRP 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.

ELECTRIC INFRARED HEATERS

MARK	MANUFACTURER/ MODEL	ALTERNATE MANUFACTURER	DIMENSIONS (L x W x H)	CAPACITY (KW)	ELECTRICAL		CLEARANCE TO COMBUSTIBLES (IN)			WEIGHT (LBS)	NOTES
					AMPS	V/PH	TOP	SIDES	BOTTOM		
IH 1 - 10	INFRATECH WD-4028	SCHWANK	39" x 8.1875" x 3"	4.0	19	208 / 1	6	18	36	12	A-D

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NOTES:
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
B. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR MOUNTING HEIGHTS. MAINTAIN MINIMUM HEIGHT ABOVE FLOOR PER MANUFACTURER'S REQUIREMENTS.
C. MAINTAIN RECOMMENDED CLEARANCES ON ALL SIDES AS INDICATED BY THE MANUFACTURER.
D. PROVIDE HEATERS WITH W-39-BL FLUSH MOUNT FRAME.

SSE V1.00

BUILDING AIR BALANCE SUMMARY ECONOMIZER MODE

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OA/SA
MUA-1	3,012	3,012	--	100%
RTU-1	3,132	3,132	--	100%
RTU-2	2,948	2,948	--	100%
FCU-1	420	40	--	10%
ESP-1	--	--	3,766	--
EF-1	--	--	300	--
POWER EF RTU-1	--	--	1,682	--
POWER EF RTU-2	--	--	2,698	--
TOTAL	9,512	9,132	8,446	--
DESIGN BUILDING PRESSURIZATION AIRFLOW (CFM)				686
PRESSURIZATION CHECK				8%

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
1950001623

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE I
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
DIGITALLY SIGNED
OREGON
NOVEMBER 09, 2017
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL SCHEDULES

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/28/2022
Sheet No. M601

SEAN O. EISLER

COMcheck Software Version 4.1.4.0

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2016) Standard
Project Title:	Shake Shack
Location:	Portland, Oregon
Climate Zone:	4c
Project Type:	New Construction

Construction Site:
120 W 42nd St
Portland, OR 10036

Owner/Agent:

Designer/Contractor:
Henderson Engineers
8345 Lenexa Drive
Suite 300
Lenexa, KS 66214

Mechanical Systems List

Quantity **System Type & Description**

1 RTU-1 (Single Zone):
Heating: 1 each - Central Furnace, Gas, Capacity = 195 kBtu/h
Proposed Efficiency = 81.00% Et, Required Efficiency: 80.00 % Et (or 78% AFUE)
Cooling: 1 each - Single Package DX Unit, Capacity = 144 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.20 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: RTU-1 | Dining -- Compliance (Brake HP method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 4675 CFM, 2.9 motor nameplate hp, 2.5 design brake hp (2.5 max. BHP), 0.0 fan efficiency grade

1 RTU-2 (Single Zone):
Heating: 1 each - Central Furnace, Gas, Capacity = 184 kBtu/h
Proposed Efficiency = 82.00% Et, Required Efficiency: 80.00 % Et (or 78% AFUE)
Cooling: 1 each - Single Package DX Unit, Capacity = 118 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.00 EER, Required Efficiency: 11.00 EER + 12.7 IEER
Fan System: RTU-2 | Kitchen & BOH -- Compliance (Brake HP method) : Passes

Fans:
RTU 2 Supply, Constant Volume, 4400 CFM, 3.7 motor nameplate hp, 3.6 design brake hp (3.6 max. BHP), 0.0 fan efficiency grade

1 FCU-1/CU-1 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 12 kBtu/h,
Proposed Efficiency = 9.00 HSPF, Required Efficiency = 8.20 HSPF
Cooling Mode: Capacity = 10 kBtu/h,
Proposed Efficiency = 19.00 SEER, Required Efficiency: 14.00 SEER
Fan System: FCU-1/CU-1 | Office -- Compliance (Motor nameplate HP method) : Passes

Fans:
FCU1 Supply, Constant Volume, 420 CFM, 1.0 motor nameplate hp, 0.0 fan efficiency grade

1 Water Heater:
Electric Storage Water Heater, Capacity: 80 gallons w/ Circulation Pump
Proposed Efficiency: 0.64 SL, %/h (if > 12 kW), Required Efficiency: 0.64 SL, %/h (if > 12 kW)

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2016) Standard requirements in COM*check* Version 4.1.4.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Malvin Warrick - Mechanical Designer — Name - Title
Signature
11/6/2020 — Date

COMcheck Software Version 4.1.4.0

Inspection Checklist

Energy Code: 90.1 (2016) Standard

Requirements: 100.0% were addressed directly in the COM*check* 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
4.2.2, 6.4.4.2.1, 6.7.2 [PR2][1]	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.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2, 7.7.1, 10.4.2 [PR3][1]	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 manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [PR5][1]	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft2.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.7 [FO9][1]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

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

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
7.4.4.1 [PL2][1]	Temperature controls installed on service water heating systems (<=120ºF to maximum temperature for intended use).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
7.4.4.2 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4, 6.4.1.5 [ME1][2]	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency:____	Efficiency:____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
6.4.3.4.1 [ME3][1]	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.2, 6.4.3.4.3 [ME4][1]	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.4.5 [ME39][1]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.4 [ME5][1]	Ventilation fans >0.75 hp have automatic controls to shut off fan when not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.8 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >25 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.3.2.1 [ME40][2]	DX cooling systems >= 75 kBtu/h (>= 65 kBtu/h effective 1/2016) and chilled-water and evaporative cooling fan motor hp >= ¼ designed to vary supply fan airflow as a function of load and comply with operational requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. *See the Mechanical Systems list for values.*
6.4.4.1.1 [ME7][1]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.2 [ME8][2]	HVAC ducts and plenums insulated per Table 6.8.2. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	____ in.	____ in.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.1.4 [ME41][1]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.1 [ME10][2]	Ducts and plenums having pressure class ratings are Seal Class A construction.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.8.1-15, 6.8.1-16 [ME110][2]	Electrically operated DX-DOAS units meet requirements per Tables 6.8.1-15 or 6.8.1-16.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.4.2.2 [ME11][2]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][2]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][2]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.2.3 [ME19][2]	Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.2.4.1 [ME68][2]	Humidifiers with airstream mounted preheating jackets have preheat auto-shutoff value set to activate when humidification is not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.2.4.2 [ME69][1]	Humidification system dispersion tube hot surfaces in the airstreams of ducts or air-handling units insulated >= R-0.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.2.5 [ME70][2]	Preheat coils controlled to stop heat output whenever mechanical cooling, including economizer operation, is active.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.2.6 [ME106][1]	Units that provide ventilation air to multiple zones and operate in conjunction with zone heating and cooling systems are prevented from using heating or heat recovery to warm supply air above 60°F when representative building loads or outdoor air temperature indicate that most zones demand cooling.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

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

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.6 [ME72][2]	Motors for fans >= 1/12 hp and < 1 hp are electronically-commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.3.6 [ME72][2]	Motors for fans >= 1/12 hp and < 1 hp are electronically-commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.3.6 [ME72][2]	Motors for fans >= 1/12 hp and < 1 hp are electronically-commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.4 [ME108][2]	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.4 [ME108][2]	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

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

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SHAKE SHACK

1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE 1
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR 11. REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
REGISTERED PROFESSIONAL ENGINEER
84639PE
REGISTERED ENGINEER
OREGON JULY 1, 1997
RENEWAL 06/30/2023
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL ENERGY CODE COMPLIANCE

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/18/2022

Sheet No.
M630

SEAN O. EISLER

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.4 [ME108]^{2}	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.7 [ME109]^{2}	Required minimum outdoor air rate is the larger of minimum outdoor air rate or minimum exhaust air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum system outdoor air provided < 135% of the required minimum outdoor air rate, b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set-point adjustment., or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.7 [ME109]^{2}	Required minimum outdoor air rate is the larger of minimum outdoor air rate or minimum exhaust air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum system outdoor air provided < 135% of the required minimum outdoor air rate, b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set-point adjustment., or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.7 [ME109]^{2}	Required minimum outdoor air rate is the larger of minimum outdoor air rate or minimum exhaust air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum system outdoor air provided < 135% of the required minimum outdoor air rate, b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set-point adjustment., or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.3 [ME42]^{3}	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42]^{3}	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.3.3 [ME42]^{3}	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.4.2 [ME25]^{3}	HVAC pumping systems with >= 3 control values designed for variable fluid flow (see section details).			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.6.1 [ME56]^{1}	Exhaust air energy recovery on systems meeting Tables 6.5.6.1-1, and 6.5.6.1-2.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1 [ME100]^{2}	Conditioned supply air to space with mechanical exhaust <= the greater of criteria of supply flow, required ventilation rate, exhaust flow minu the available transffer air (see section details).			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.7.1 [ME100]^{2}	Conditioned supply air to space with mechanical exhaust <= the greater of criteria of supply flow, required ventilation rate, exhaust flow minu the available transffer air (see section details).			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.7.1 [ME100]^{2}	Conditioned supply air to space with mechanical exhaust <= the greater of criteria of supply flow, required ventilation rate, exhaust flow minu the available transffer air (see section details).			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.7.2.1 [ME32]^{2}	Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.2.4 [ME49]^{3}	Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.8.1 [ME34]^{2}	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.9 [ME35]^{1}	Hot gas bypass limited to: <=240 kBtu/h – 15% >240 kBtu/h – 10%			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.9 [ME35]^{1}	Hot gas bypass limited to: <=240 kBtu/h – 15% >240 kBtu/h – 10%			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
7.4.2 [ME36]^{2}	Service water heating equipment meets efficiency requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
6.4.3.9 [ME63]^{2}	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.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.10 [ME73]^{3}	Doors separating conditioned space from the outdoors have controls that disable/reset heating and cooling system when open.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10]^{2}	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
8.4.3 [EL11]^{2}	New buildings have electrical energy use measurement devices installed. Where tenant spaces exist, each tenant is monitored separately. In buildings with a digital control system the energy use is transmitted to to control system and displayed graphically.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Individual tenant spaces less than 10,000 ft2.
10.4.1 [EL9]^{2}	Electric motors meet requirements where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [FI3]^{3}	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.2 [FI20]^{3}	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.1 [FI21]^{3}	HVAC systems equipped with at least one automatic shutdown control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.2 [FI22]^{3}	Setback controls allow automatic restart and temporary operation as required for maintenance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.5 [FI5]^{3}	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.12 [FI200]^{3}	Air economizer has a fault detection and diagnostics (FDD) system (see details for configuration and operational requirements).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.12 [FI200]^{3}	Air economizer has a fault detection and diagnostics (FDD) system (see details for configuration and operational requirements).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.6 [FI6]^{3}	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited. Humidity control prohibits the use of fossil fuel or electricity to produce RH > 30% in the warmest zone humidified and RH < 60% in the coldest zone dehumidified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.1 [FI7]^{3}	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.2 [FI8]^{3}	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.3 [FI9]^{1}	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft2 of conditioned area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [FI10]^{1}	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
7.4.4.3 [FI11]^{3}	Public lavatory faucet water temperature <=110°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
7.4.4.4 [FI12]^{3}	Controls are installed that limit the operation of a recirculation pump installed to maintain temperature of a storage tank.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
10.4.3 [FI24]^{2}	Elevators are designed with the proper lighting, ventilation power, and standby mode.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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SHAKE SHACK
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Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
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2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

EXPIRES ON: 12/31/2023
84639PE
DIGITALLY SIGNED
NOVEMBER 09, 2017
SEAN O. EISLER
03/25/2022

Drawing Title
MECHANICAL ENERGY CODE COMPLIANCE

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/28/2022
Sheet No. M631

SEAN O. EISLER

HOOD INFORMATION – JOB#4955078

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S) WIDTH	LENG	HEIGHT	DIA	CFM	VEL	SP	MUA CFM	AC CFM	HOOD CONSTRUCTION	HOOD CONFIG END TO END	ROW
1	Hood 1 Left	5430 ND-2-ACPSP-F	CAPTIVEAIRE	9' 5"	600 DEG	I	HEAVY	200	1883	10"	18"	4"		1883	1506	-0.603"	1393	500	430 SS WHERE EXPOSED	LEFT	ALONE
2	Hood 2 Right	5430 ND-2-ACPSP-F	CAPTIVEAIRE	9' 5"	600 DEG	I	HEAVY	200	1883	10"	18"	4"		1883	1506	-0.603"	1619	548	430 SS WHERE EXPOSED	RIGHT	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S) TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	LIGHT(S) QTY	TYPE	WIRE GUARD	UTILITY CABINET(S) LOCATION	SIZE	FIRE SYSTEM TYPE	FIRE SYSTEM SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WEIGHT
1	Hood 1 Left	CAPTRATE SOLO FILTER	7	20"	16"	85% SEE FILTER SPEC	3	RECESSED ROUND	NO							YES	670 LBS
2	Hood 2 Right	CAPTRATE SOLO FILTER	7	20"	16"	85% SEE FILTER SPEC	3	RECESSED ROUND	NO	RIGHT	20"x54"x30"	ANSUL R102	3.0/3.0/3.0/3.0	SC-311110WG-TRION	1 LIGHT 1 FAN	YES	911 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	Hood 1 Left	FIELD WRAPPER 12.00" HIGH FRONT, LEFT.
		BALANCE DAMPERS.
		LEFT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
2	Hood 2 Right	FIELD WRAPPER 12.00" HIGH FRONT, RIGHT.
		BALANCE DAMPERS.
		RIGHT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.

PERFORATED SUPPLY PLENUM(S)

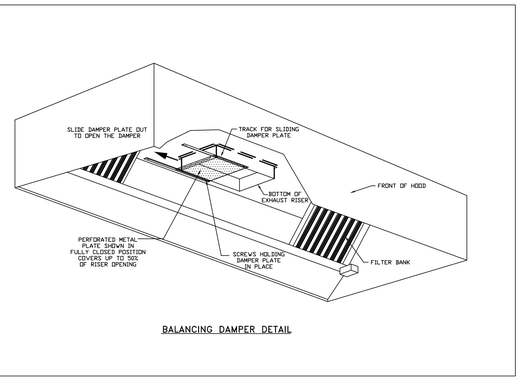
HOOD NO	TAG	POS	LENGTH	WIDTH	HEIGHT	RISER(S) TYPE	WIDTH	LENG	DIA	CFM	SP
1	Hood 1 Left	Front	113"	22"	6"	MUA	8"	36"		696	0.184"
						MUA	8"	36"		696	0.184"
						AC			8"	125	0.049"
						AC			8"	125	0.049"
						AC			8"	125	0.049"
						AC			8"	125	0.049"
2	Hood 2 Right	Front	133"	22"	6"	MUA	10"	24"		539	0.159"
						MUA	10"	24"		539	0.159"
						MUA	10"	24"		539	0.159"
						AC			8"	137	0.058"
						AC			8"	137	0.058"
						AC			8"	137	0.058"
						AC			8"	137	0.058"
						AC			8"	137	0.058"

FOR QUESTIONS, CALL THE:
NORTHEAST SALES DIVISION
450 COTTAGE STREET SPRINGFIELD, MA 01104
PHONE: (888) 594-8390
FAX: (919) 227-5956

CAPTIVE-AIRE HOODS ARE BUILT IN COMPLIANCE WITH

ETL Listed Intertek NFPA

NFPA #96 - 2014 EDITION
ETL LISTED TO UL-710 REQUIREMENTS
IMC 2015



BALANCING DAMPER DETAIL

SPECIFICATION: CAPTRATE® GREASE-STOP® SOLO FILTER

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

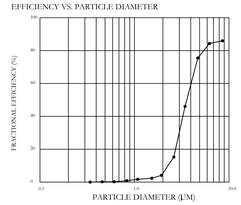
FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNEL(S).

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

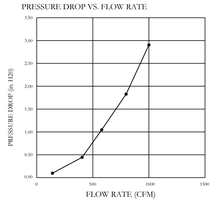
GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 85% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 1.0 INCHES OF WATER GAUGE.

THE CAPTRATE GREASE-STOP SOLO WAS TESTED TO ASTM STANDARD ASTM F2519-05. MANUFACTURER APPROVED FOR USE IN SOLID FUEL APPLICATIONS AS A SPARK ARRESTER.

EFFICIENCY VS. PARTICLE DIAMETER



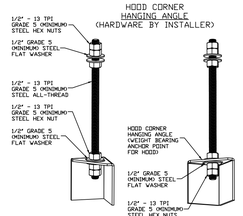
PRESSURE DROP VS. FLOW RATE



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

NSF Listed ETL Listed Built in accordance with NFPA No. 96

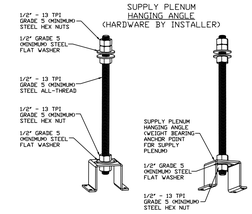
HOOD CORNER HANGING ANGLE (HARDWARE BY INSTALLER)



ASSEMBLY INSTRUCTIONS

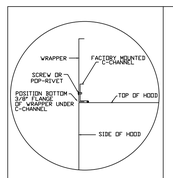
HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 (MINIMUM) ALL-THREAD. SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 (MINIMUM) STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 (MINIMUM) HEX NUTS AS SHOWN. MUST USE DOUBLED HEX NUT CONFIGURATION BENEATH HOOD HANGING ANGLES AND ABOVE CEILING ANCHORS. MAINTAIN 1/4" OF EXPOSED THREADS BENEATH BOTTOM HEX NUT. TORQUE ALL HEX NUTS TO 57 FT-LBS.

SUPPLY PLENUM HANGING ANGLE (HARDWARE BY INSTALLER)

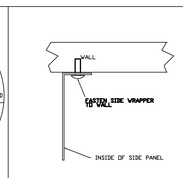


ASSEMBLY INSTRUCTIONS

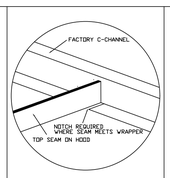
HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 (MINIMUM) ALL-THREAD. SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 (MINIMUM) STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 (MINIMUM) HEX NUTS AS SHOWN. MUST USE DOUBLED HEX NUT CONFIGURATION ABOVE CEILING ANCHORS. SINGLE HEX NUT BENEATH HANGING ANGLE IS ACCEPTABLE FOR PSP HANGING ANGLES. MAINTAIN 1/4" OF EXPOSED THREADS BENEATH BOTTOM HEX NUT. TORQUE ALL HEX NUTS TO 57 FT-LBS.



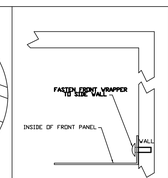
WRAPPER DETAIL



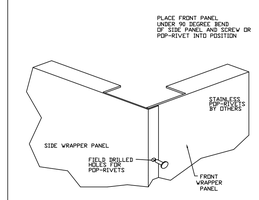
REAR WALL ATTACHMENT



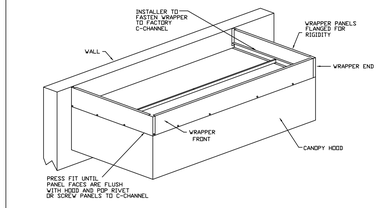
TOP HOOD SEAM DETAIL



SIDE WALL ATTACHMENT

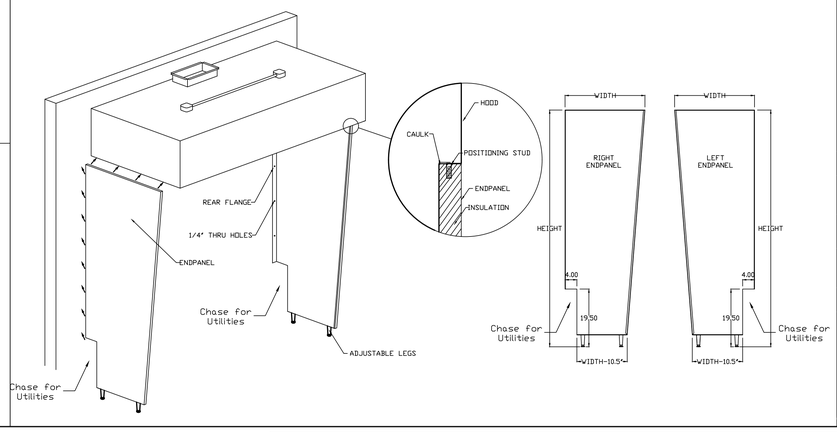


FRONT CORNER ASSEMBLY



COMPLETED WRAPPER ASSEMBLY

ND-2 VERTICAL ENDPANEL



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

VENDOR SUPPLIED SHEETS ARE PROVIDED FOR REFERENCE ONLY REGARDING THE KITCHEN EXHAUST HOODS, EXHAUST FANS, AND MAKE-UP AIR UNIT.

No	DESCRIPTION	DATE:

CAPTIVE-AIRE

PO Box 2520, 1 Union Ave, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: reg108@captiveaire.com

Eastern PA Mechanical

Shake Shack - 1317 - Portland, OR (West End) R1
PORTLAND, OR, 97209

10/5/2021

4955078

joe.shiiba

3/4" = 1'-0"

MASTER DRAWING

1

SHAKE SHACK

1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE 1
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	2/28/20	ISSUE FOR PERMIT
	10/4/00	ISSUE FOR PERMIT/BID
	01/4/19	ISSUE FOR 11" REVIEW

REVISIONS

FOR REFERENCE ONLY

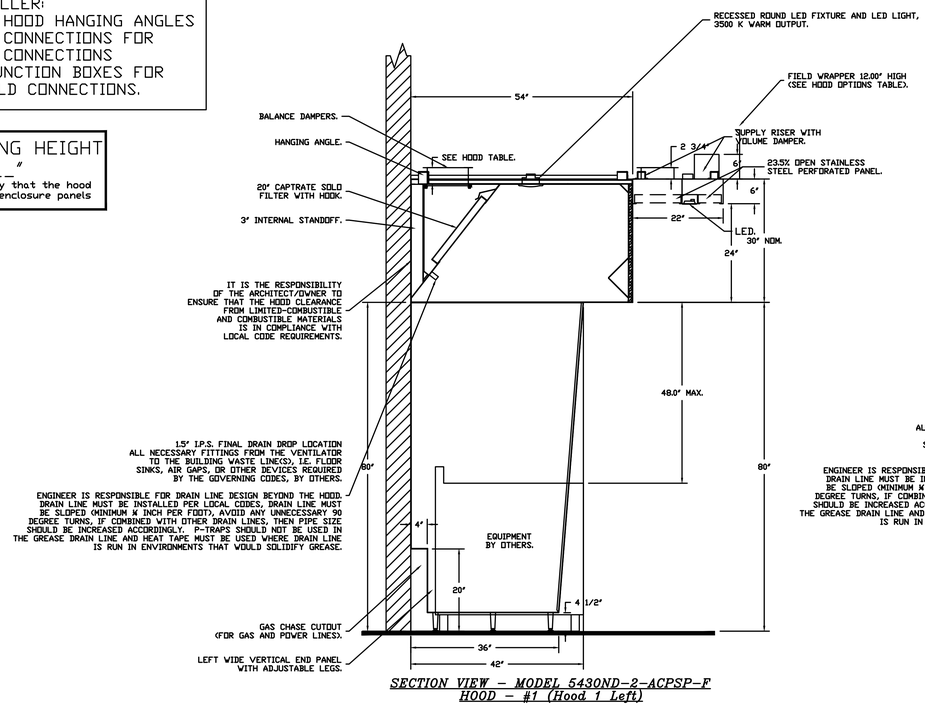
Drawing Title
CAPTIVE AIRE DRAWINGS

Job No.	Drawn
194243	HEI
Scale	Date
SEE PLAN	03/28/2022

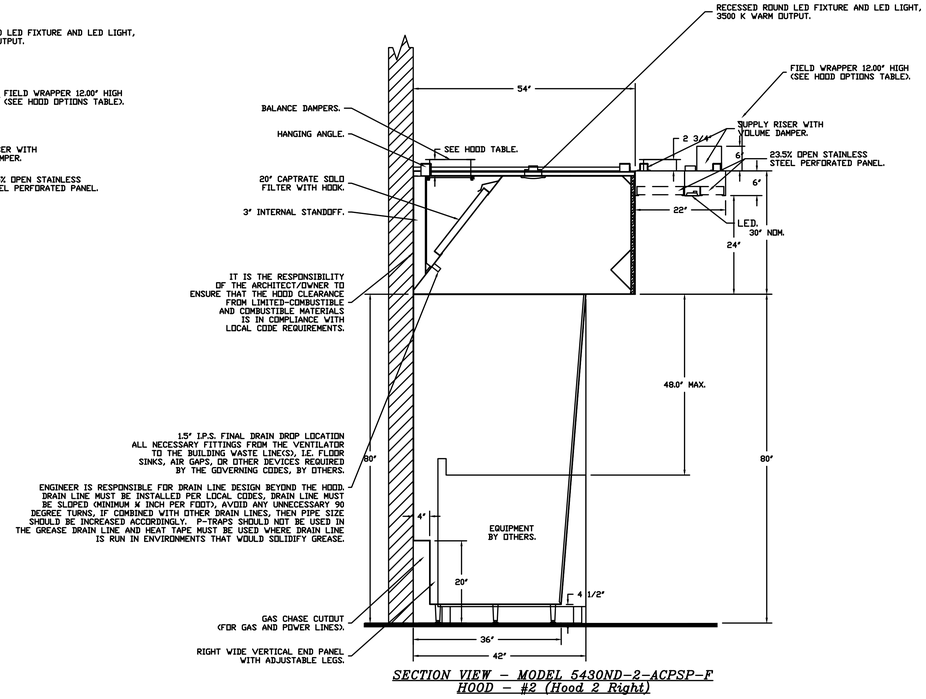
Sheet No.
M701

NOTE TO DUCT INSTALLER:
- DO NOT OBSTRUCT HOOD HANGING ANGLES
- DO NOT OBSTRUCT CONNECTIONS FOR ANSUL FIELD PIPING CONNECTIONS
DO NOT OBSTRUCT JUNCTION BOXES FOR ALL ELECTRICAL FIELD CONNECTIONS.

VERIFY CEILING HEIGHT
___' ___"
Height required to verify that the hood will fit and to size the enclosure panels



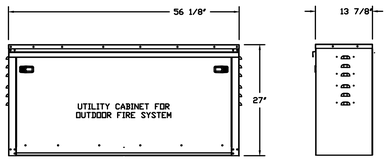
SECTION VIEW – MODEL 5430ND-2-ACPSP-F
HOOD – #1 (Hood 1 Left)



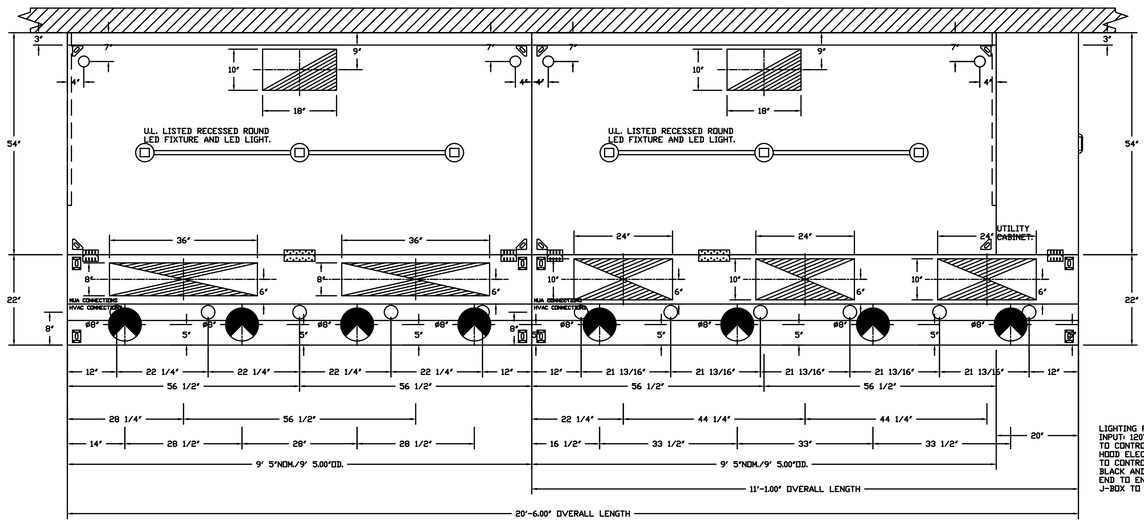
SECTION VIEW – MODEL 5430ND-2-ACPSP-F
HOOD – #2 (Hood 2 Right)

ALL INTERCONNECTING WIRING FROM HOOD ANSUL SYSTEM TO PCU ANSUL SYSTEM TO BE FIELD INSTALLED BY ELECTRICAL CONTRACTOR. THIS WIRING IS NOT INSTALLED BY CAPTIVE-AIRE OR THE ANSUL INSTALLER.

TRION/PCU FIRE SUPPRESSION SYSTEM CABINET



NOTES: THE FIRE SUPPRESSION SYSTEM CABINET FOR THE TRION UNIT WILL BE SHIPPED LOOSE. THE INSTALLING GC/CONTRACTOR IS RESPONSIBLE FOR MOUNTING THE CABINET CLOSE TO HE TRION UNIT THE ELECTRICIAN MUST INSTALL ALL FIELD WIRING AS SHOWN ON WIRING SCHEMATICS. THE ANSUL SYSTEM CONTRACTOR WILL INSTALL THE SYSTEM INTO THE CABINET. THE ANSUL CONTRACTOR DOES NOT MOUNT THE CABINET OR DO ANY WIRING.



PLAN VIEW – HOOD #1 (Hood 1 Left)
9' 5.00" LONG 5430ND-2-ACPSP-F

ACPSP SHIPS LOOSE FOR FIELD INSTALLATION

PLAN VIEW – HOOD #2 (Hood 2 Right)
9' 5.00" LONG 5430ND-2-ACPSP-F

ACPSP SHIPS LOOSE FOR FIELD INSTALLATION

LIGHTING FOR ACPSP JOB # 4955078 - HOODS #1, #2
INPUT: 120V AC, 1 PHASE, 50/60HZ, 3.5 WATTS PER LIGHT.
TO CONTROL LIGHTS WITH HOOD LIGHT SWITCH, WIRE PER HOOD ELECTRICAL CONTROL PANEL SCHEMATIC.
TO CONTROL LIGHTS WITH BUILDING LIGHT SWITCH, WIRE BLACK AND WHITE WIRE TO A 120VAC SERVICE.
END TO END ACPSPS REQUIRE 120VAC FIELD WIRING FROM J-BOX TO J-BOX. REPLACE LIGHTS WITH LED LIGHTS ONLY.

VENDOR SUPPLIED SHEETS ARE PROVIDED FOR REFERENCE ONLY REGARDING THE KITCHEN EXHAUST HOODS, EXHAUST FANS, AND MAKE-UP AIR UNIT.

	DESCRIPTION	DATE:
1		
2		
3		
4		

CAPTIVE-AIRE
Eastern PA Mechanical
PO Box 2520, 1 Union Ave, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: req108@captiveaire.com

Shake Shack - 1317 - Portland, OR (West End) R1
PORTLAND, OR, 97209

10/5/2021

4955078

joe.shilba

3/4" = 1'-0"

MASTER DRAWING

2

No	Date	Remarks
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	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR 11 REVIEW

REVISIONS

FOR REFERENCE ONLY

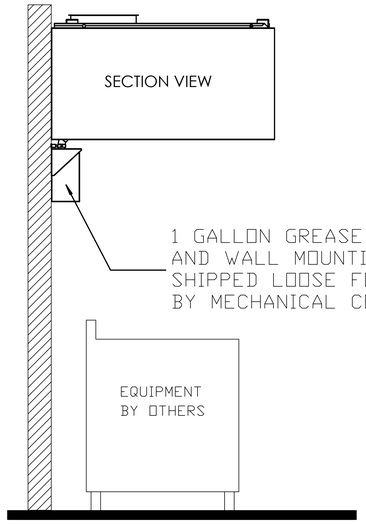
Drawing Title
CAPTIVE AIRE DRAWINGS

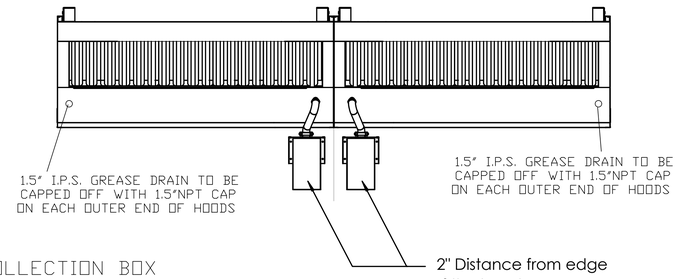
Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/28/2022

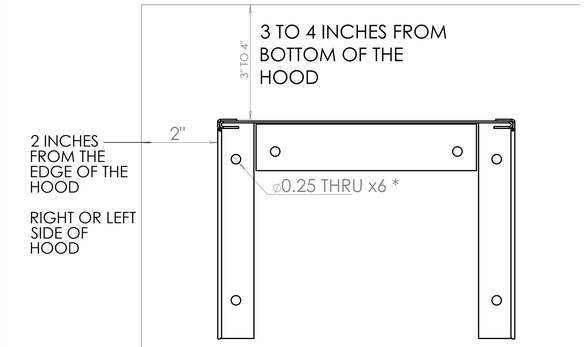
Sheet No.
M702

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

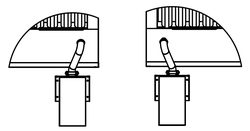


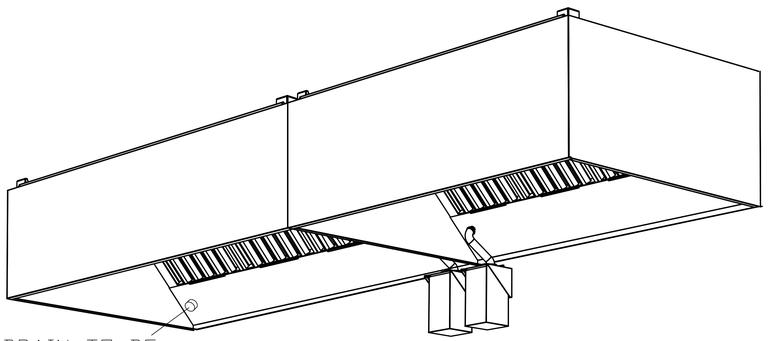




* Mounting hardware not included
**Must be mounted to stud or wall anchor

Left & Right hand Grease Cup Install





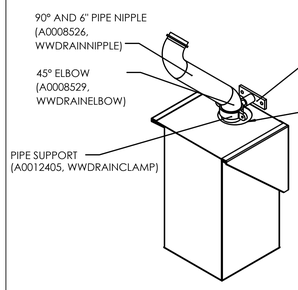
1.5" I.P.S. GREASE DRAIN TO BE CAPPED OFF WITH 1.5"NPT CAP ON EACH OUTER END OF HOODS

One Gallon Grease Cup Installation

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

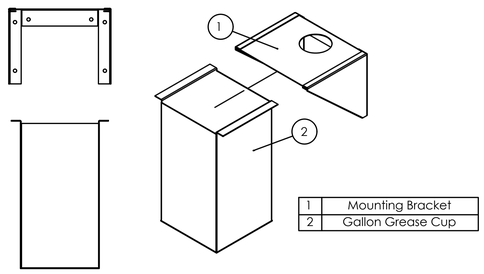
The one gallon grease cup comes as an assembly of stainless steel wall mounting bracket and one gallon cup. The mounting bracket should be installed 2" from the edge of the containment plenum and 3"-4" below the bottom of the hood.

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.



Support the bottom of the drain pipe using 1.5" adjustable pipe support
Do not allow drain pipe to drop into the grease cup, otherwise cup will catch when removing and cleaning the grease cup

Gallon Grease Cup Assembly



1	Mounting Bracket
2	Gallon Grease Cup

1 GALLON GREASE COLLECTION BOX
AND WALL MOUNTING BRACKET
SHIPPED LOOSE FOR FIELD INSTALLATION
BY MECHANICAL CONTRACTOR.

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Shake Shack - 1317 - Portland, OR (West End) R1
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10/5/2021
4955078
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3/4" = 1'-0"
MASTER DRAWING

3

No	Date	DESCRIPTION

No	Date	Remarks
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	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

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Drawing Title
CAPTIVE AIRE DRAWINGS

Job No.	Drawn
194243	HEI
Scale: SEE PLAN	Date: 03/18/2022

Sheet No.
M703

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

FIRE SYSTEM INFORMATION – JOB#4955078

FIRE SYSTEM NO	TAG	TYPE	SIZE	FLOW POINTS	INSTALLATION	
					SYSTEM	LOCATION ON HOOD
1	FS-1	ANSUL R102	3.0/3.0/3.0/3.0	42	FIRE CABINET RIGHT	RIGHT, HOOD 2

GAS VALVE(S)

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1	FS-1	MECHANICAL	2.000	DISTRIBUTOR

FIRE SYSTEM PARTS LIST KEY

FIRE SYSTEM NO	TAG	KEY NUMBER – PART DESCRIPTION	QTY BY FACTORY	QTY BY DIST
1	FS-1	0 – 0 – 31810 ELBOW 7/16 X 1/4 BRASS ANSUL-FOR BRAIDED STAINLESS HOSE.	1	0
		0 – 0 – 43-15733 AIR CYLINDER ASSEMBLY – AIR CYLINDER AND TUBING FOR MECHANICAL GAS VALVES (ANSUL PART #15733).	0	1
		0 – 0 – 439861 LARGE BLOWOFF CAP, METAL, TO FIT NEW LASER-ETCHED ANSUL NOZZLES, A0024201.	22	0
		0 – 0 – HOSE HOSE – STAINLESS STEEL ACTUATION HOSE, 42".	1	0
		0 – 0 – TANK STRAP TANK STRAP – USED FOR ANSUL TANKS.	4	0
		0 – 0 – UCTANKBRACKET TANK BRACKET FOR FIRE SYSTEM TANK INSTALLATION IN UTILITY CABINETS.	4	0
		1 – 1 – AT – 3.0 TANK(#1B) – 3.0 GALLON SS TANK (FOR USE WITH AUTOMAN RELEASE, ACTUATOR, OR SS ENCLOSURE (UL/ULC) MACOLA # 01-429862.	4	0
		3 – 3 – ANS-DEM REGULATED RELEASE – ANSUL REGULATED MECHANICAL RELEASE/BRACKET ASSEMBLY, DEM, R-102, CARTRIDGE DETECTION INCLUDED, ANSUL PART # 79493.	1	0
		4 – 4 – ANS-DEMRA ACTUATOR – REGULATED, DEM, R-102.	1	0
		5 – 5 – LIQ-3.0 AGENT – ANSULEX LOW PH WET CHEMICAL AGENT, 3 GALLON (UL) 79372.	0	4
		9 – 9 – 101-30 CARTRIDGE – CARBON DIOXIDE, 101-30, CARTRIDGE (R-102) 19-15851.	0	2
		10 – 10 – TLINK LINK – TEST LINK (1 TEST LINK) ANSUL PART # 24916, MACOLA # 20-24916.	0	1
		11 – 11 – MICRO-SDA MICROSWITCH KIT– INCLUDES 2 SWITCHES AND MOUNTING HARDWARE. SINGLE DUAL ELECTRIC SWITCH, ONE STANDARD SWITCH, ONE ALARM DUTY SWITCH ANSUL PART # 437155, MACOLA # 08-437155.	1	0
		12 – 12 – HOSE HOSE – RUBBER HOSE.	2	0
		13 – 13 – 419337 NOZZLE – 2W NOZZLE, DUCT (REPLACES ANSUL PART# 419348, CAS PART# 419337) A0001267.	2	0
		16 – 16 – 419335 NOZZLE – 1N NOZZLE, PLENUM/APPLIANCE (REPLACES ANSUL PART# 419346, CAS PART# 419335) A0001265.	2	0
		20 – 20 – 419340 NOZZLE – 245 NOZZLE, APPLIANCE (REPLACES ANSUL PART# 419351, PART# 419340) A0001270.	18	0
		25 – 25 – 418569 NOZZLE ADAPTOR – SWIVEL NOZZLE ADAPTOR (REPLACES CAS PART # 418569) A0001274.	18	0
		26 – 26 – QSA-3/8 QUIK SEAL – 3/8" (UL).	22	0
		27 – 27 – QPSA-1/2 PULLEY SEAL – 1/2" HOOD SEAL (UL) ANSUL PART # 423253, MACOLA # 32-75768.	5	0
		28 – 28 – S-DET DETECTOR – SERIES (SCISSOR LINKAGE) ANSUL PART # 435547/435548 (OLD # 417369/434480); MACOLA # 05-417369.	10	0
		30 – 30 – ANS-500FL FUSIBLE LINK – 500DEG F, R-102 AND PIRANHA, ANSUL PART # 439232.	10	0
		34 – 34 – RPS-A REMOTE PULL STATION – RED COMPOSITE (WITHOUT WIRE ROPE) 434618 (OLD MACOLA #06-4835).	1	0
		35 – 35 – PE-LT PULLEY ELBOW – LOW TEMP. PULLEY ELBOW, SET SCREW TYPE ANSUL PART # 415670, MACOLA # 11-415671.	5	0
		36 – 36 – PE-HT PULLEY ELBOW – HIGH TEMP PULLEY ELBOW, COMPRESSION TYPE, ANSUL PART # 423251, MACOLA # 10-45771.	4	0

NOTES
- FIELD PIPE DROPS AS SHOWN
  SLEEVING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELVING, SALAMANDERS, ETC.
- MAXIMUM 9 ELBOWS IN SUPPLY LINE.
- MINIMUM 72 INCHES OF AGENT LINE FROM TANK TO FIRST NOZZLE COVERING A RANGE, FRYER, OR WOK TO REFLECT GENERAL PIPING REQUIREMENTS.
- IF APPLICABLE, PRE-PIPED CHARBROILER DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6" ABOVE THE TOP OF THE HOOD.

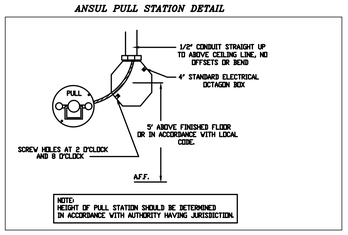
- APPLIANCE DIMENSIONS LISTED REPRESENT THE COOKING SURFACE SIZE, NOT THE OVERALL APPLIANCE SIZE.

- THIS FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.

JOB #: 4955078.
JOB NAME: SHAKE SHACK - 1317 - PORTLAND, OR (WEST END) R1.

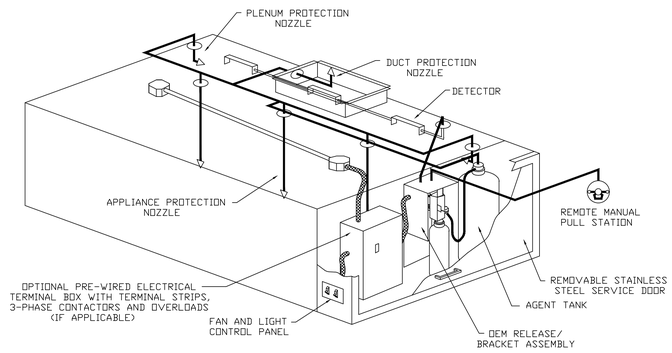
SYSTEM SIZE: ANSUL-3.0/3.0/3.0/3.0-WC TOTAL FP REQUIRED: 42.
HOOD # 1 9' 5.00" LONG x 54" WIDE x 30" HIGH.
RISER # 1 SIZE: 10" x 18".
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.
HOOD # 2 9' 5.00" LONG x 54" WIDE x 30" HIGH.
RISER # 1 SIZE: 10" x 18".
HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.

ANSUL PULL STATION DETAIL

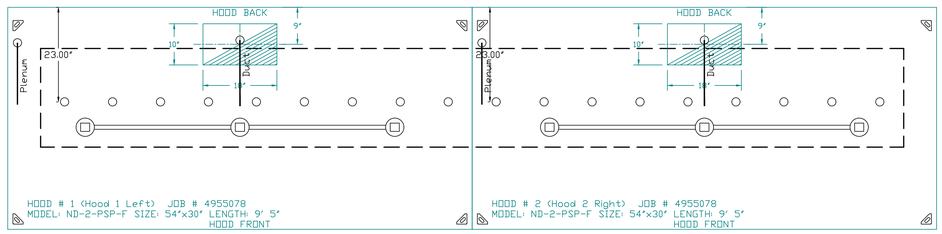


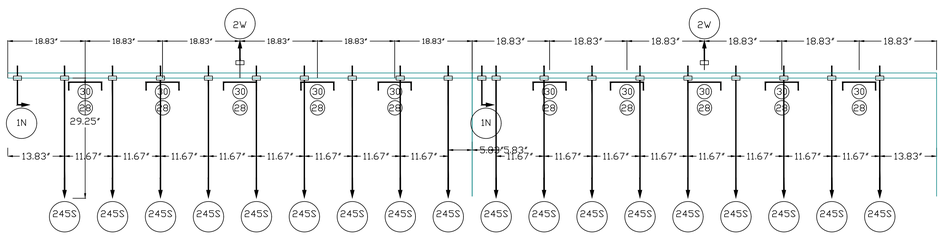
LEGEND – FIRE CABINET ANSUL SYSTEM

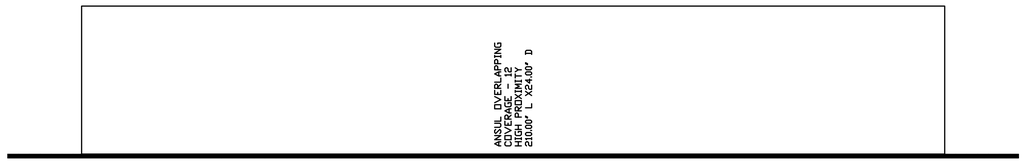
1A	1.5 GALLON TANK
1B	3 GALLON TANK
2	OEM AUTOMAN RELEASE
3	OEM REGULATED RELEASE
4	OEM REGULATED ACTUATOR
5	ANSULEX LIQUID AGENT (3 GAL.)
6	ANSULEX LIQUID AGENT (1.5 GAL.)
7	CARTRIDGE (101-20)
8	CARTRIDGE (101-10)
9	CARTRIDGE (101-30)
9A	CARTRIDGE (LT-A-101-30)
9B	DOUBLE TANK CARTRIDGE
10	TEST LINK
11	DOUBLE MICROSWITCH
12	HOSE ASSEMBLY
1100	DUCT NOZZLE (430913)
2W	DUCT NOZZLE (419337)
1W	NOZZLE ASSEMBLY (419336)
1F	NOZZLE ASSEMBLY (419333)
1N	NOZZLE ASSEMBLY (419335)
1/2N	NOZZLE ASSEMBLY (419334)
3N	NOZZLE ASSEMBLY (419338)
245	NOZZLE ASSEMBLY (419340)
230	NOZZLE ASSEMBLY (419339)
2120	NOZZLE ASSEMBLY (419343)
290	NOZZLE ASSEMBLY (419342)
260	NOZZLE ASSEMBLY (419341)
28	DETECTOR BRACKET
29	LOW TEMP FUSIBLE LINK
30	HIGH TEMP FUSIBLE LINK
MGV	MECHANICAL GAS VALVE
EGV	ELECTRICAL GAS VALVE
34	REMOTE MANUAL PULL STATION
S	SWIVEL ADAPTOR



TYPICAL ANSUL R-102 SYSTEM LAYOUT







VENDOR SUPPLIED SHEETS ARE PROVIDED FOR REFERENCE ONLY REGARDING THE KITCHEN EXHAUST HOODS, EXHAUST FANS, AND MAKE-UP AIR UNIT.

CAPTIVE AIRE
Eastern PA Mechanical
PO Box 2520, 1 Union Ave, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: reg108@captiveaire.com

No	DESCRIPTION	DATE:

Shake Shack - 1317 - Portland, OR (West End) R1
PORTLAND, OR, 97209

10/5/2021
4955078
joe.shilba
3/4" = 1'-0"
MASTER DRAWING

4

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION PERMIT
4	11/22/21	COMMENTS III
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	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

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Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 19423
Drawn HEI
Scale SEE PLAN
Date 03/28/2022

Sheet No.
M704

MUA FAN INFORMATION – JOB#4955078

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	BLOWER	HOUSING	MIN CFM	DESIGN CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	MCA	MOCP	WEIGHT (LBS)	SONES
1	MAU	1	A2-D.250-20D	20MF-2-MOD	A2-D.250	2500	3012	0.900	1373	ODP,PREMIUM	2.000	1.4360	3	208	8.3	11.6A	15A	699	12.6

GAS FIRED MAKE-UP AIR UNIT(S)

FAN UNIT NO	TAG	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE	GAS TYPE	BURNER EFFICIENCY(%)
1	MAU	164170	151036	47°F	7 IN. W.C. - 14 IN. W.C.	NATURAL	92

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	MAU	1	MOTORIZED BACKDRAFT DAMPER FOR A2-D HOUSING. MEETS AMCA CLASS 1A RATING.
		1	LOW FIRE START.
		1	INLET PRESSURE GAUGE, 0-35".
		1	MANIFOLD PRESSURE GAUGE, -5 TO 15" WC.
		1	CURB DUCT HANGER.
		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	MAU						YES	

CURB ASSEMBLIES

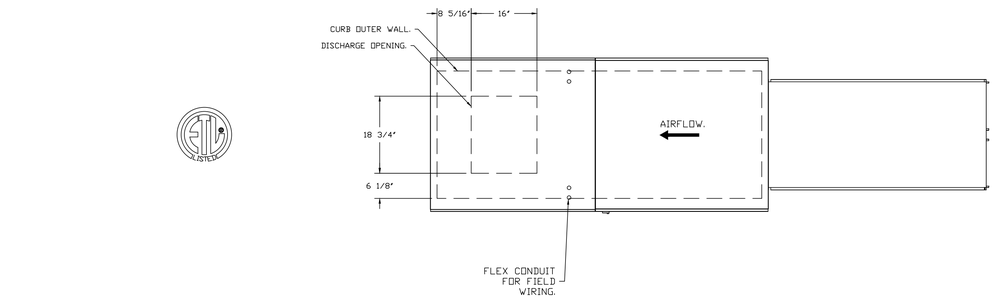
NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	MAU	80 LBS	CURB	31.000"W X 79.000"L X 20.000"H ALONG WIDTH, RIGHT INSULATED.

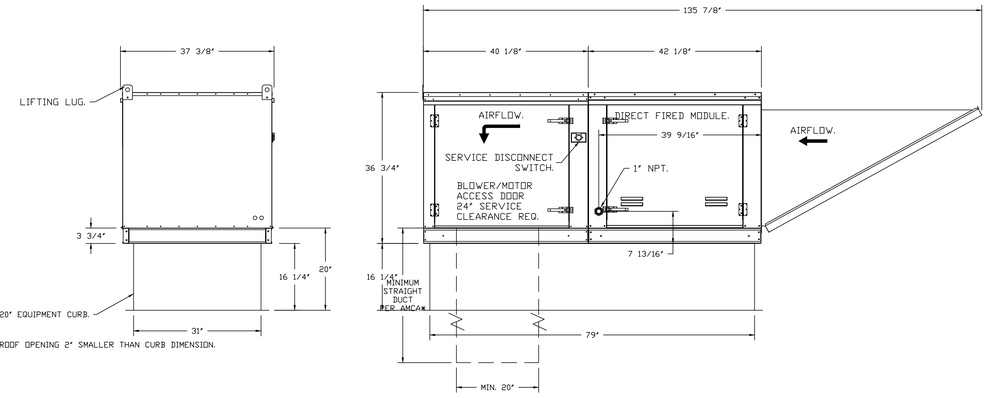
FAN #1 A2-D.250-20D - HEATER (MAU)
1. DIRECT GAS FIRED HEATED MAKE UP AIR UNIT WITH 20" MIXED FLOW DIRECT DRIVE FAN.
2. INTAKE HOOD WITH EZ FILTERS.
3. DOWN DISCHARGE - AIR FLOW RIGHT -> LEFT.
4. COOLING INTERLOCK RELAY. 24VAC COIL 120V CONTACTS. LOCKS OUT BURNER CIRCUIT WHEN AC IS ENERGIZED.
5. MOTORIZED BACK DRAFT DAMPER 22.75" X 24" FOR SIZE 2 STANDARD & MODULAR HEATER UNITS W/EXTENDED SHAFT, STANDARD GALVANIZED CONSTRUCTION, 3/4" REAR FLANGE, LOW LEAKAGE. LF120S ACTUATOR INCLUDED.
6. LOW FIRE START. ALLOWS THE BURNER CIRCUIT TO ENERGIZE WHEN THE MODULATION CONTROL IS IN A LOW FIRE POSITION.
7. GAS PRESSURE GAUGE, 0-35", 2.5" DIAMETER, 1/4" THREAD SIZE.
8. GAS PRESSURE GAUGE, -5 TO +15 INCHES W.C., 2.5" DIAMETER, 1/4" THREAD SIZE.
9. CURB DUCT HANGER - 1-1/4" ANGLE IRON FRAME WELDED TO CURB TO SUPPORT STANDARD SIZE DUCTWORK. PRICED PER CURB. ONLY AVAILABLE WHEN CURB ASSEMBLY IS ORDERED.
10. SEPARATE 120VAC WIRING PACKAGE FOR MAKE-UP AIR UNITS. OPTION MUST BE SELECTED WHEN MOUNTING VFD IN PREWIRE PANEL OR WITH DCV PACKAGE. PROVIDES SEPARATE 120VAC INPUT TO SUPPLY FAN. THIS 120V SIGNAL MUST BE RUN BY ELECTRICIAN FROM DCV TO MUA SWITCH.
11. PROFILE PLATE CONFIGURATION FOR SIZE 2 DIRECT FIRED UNIT FOR LOW CFM APPLICATIONS.
12. HINGED DOUBLE WALL INSULATED DOOR ASSEMBLY (BURNER/BLOWER SECTION).
13. 2 YEAR PARTS WARRANTY.

*NOTE: SUPPLY DUCT MUST BE INSTALLED TO MEET SMACNA STANDARDS. A MINIMUM STRAIGHT DUCT LENGTH MUST BE MAINTAINED DOWNSTREAM OF UNIT DISCHARGE AS OUTLINED IN AMCA PUBLICATION 201. WHEN USING RECTANGULAR DUCTWORK, ELBOWS MUST BE RADIUS THROAT, RADIUS BACK WITH TURNING VANES. FLEXIBLE DUCTWORK AND SQUARE THROAT/SQUARE BACK ELBOWS SHOULD NOT BE USED. ANY TRANSITION AND/OR TURNS IN THE DUCTWORK WILL CAUSE SYSTEM EFFECT. SYSTEM EFFECT WILL DRASTICALLY INCREASE STATIC PRESSURE AND REDUCE AIRFLOW. DO NOT RELY ON UNIT TO SUPPORT DUCT IN ANY WAY. FAILURE TO PROPERLY SIZE DUCTWORK MAY CAUSE SYSTEM EFFECTS AND REDUCE PERFORMANCE OF THE EQUIPMENT. SUGGESTED STRAIGHT DUCT SIZE IS 20" x 20".

SUPPLY SIDE HEATER INFORMATION:

WINTER TEMPERATURE = 28°F. TEMP. RISE = 47°F.
BTUs CALCULATED OFF ACTUAL AIR DENSITY.
OUTPUT BTUs AT ALTITUDE OF 0.0 FT. = 147422.
INPUT BTUs AT ALTITUDE OF 0.0 FT. = 160242.
OUTPUT BTUs AT ALTITUDE OF 37 FT. = 147225.
INPUT BTUs AT ALTITUDE OF 37 FT. = 160028.





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DESCRIPTION	DATE:

CAPTIVE AIRE

Eastern PA Mechanical
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4955078

joe.shilloa

3/4" = 1'-0"

MASTER DRAWING

2

SHAKE SHACK

1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

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	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

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Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 194243 | Drawn HEI

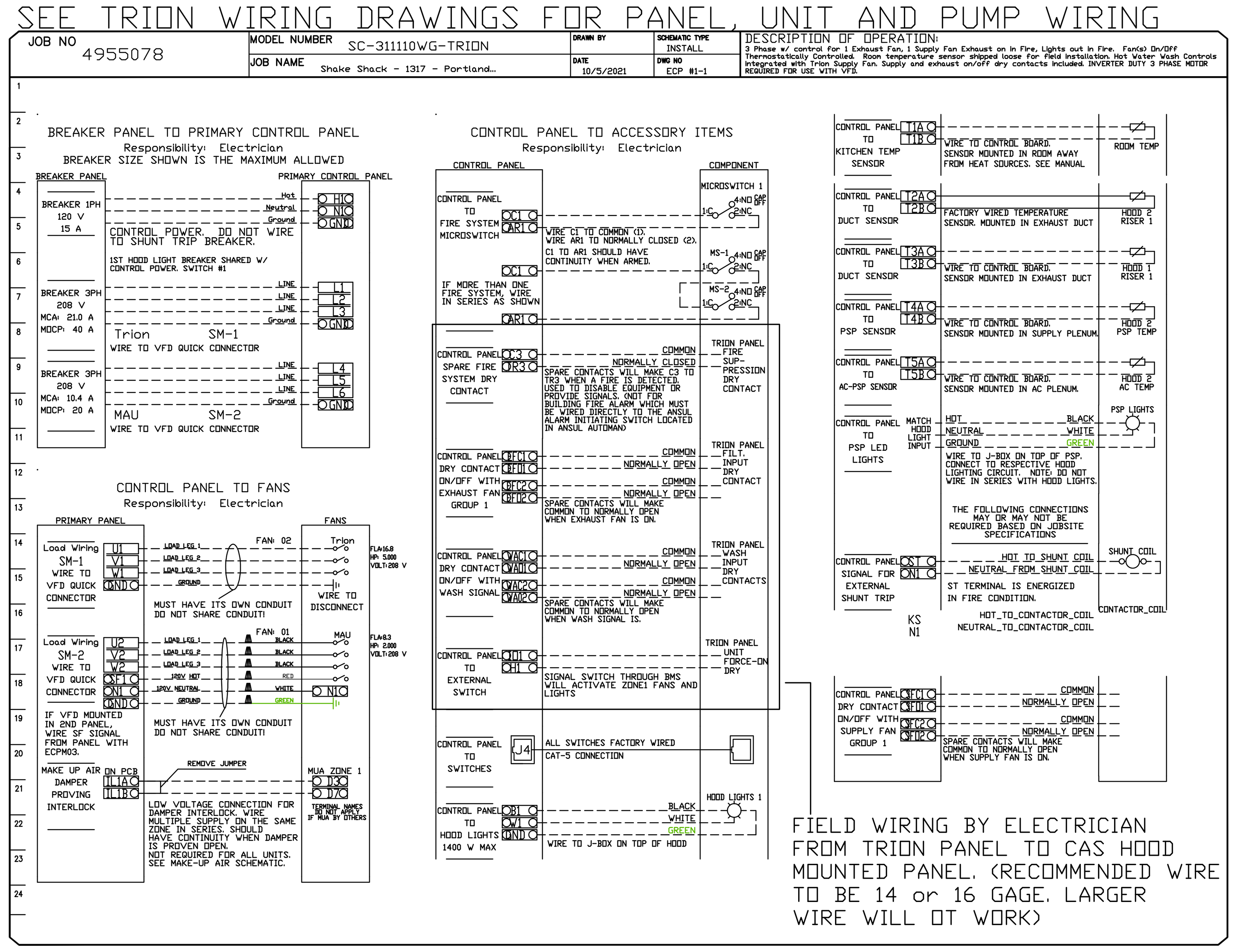
Scale SEE PLAN | Date 03/28/2022

Sheet No.
M705

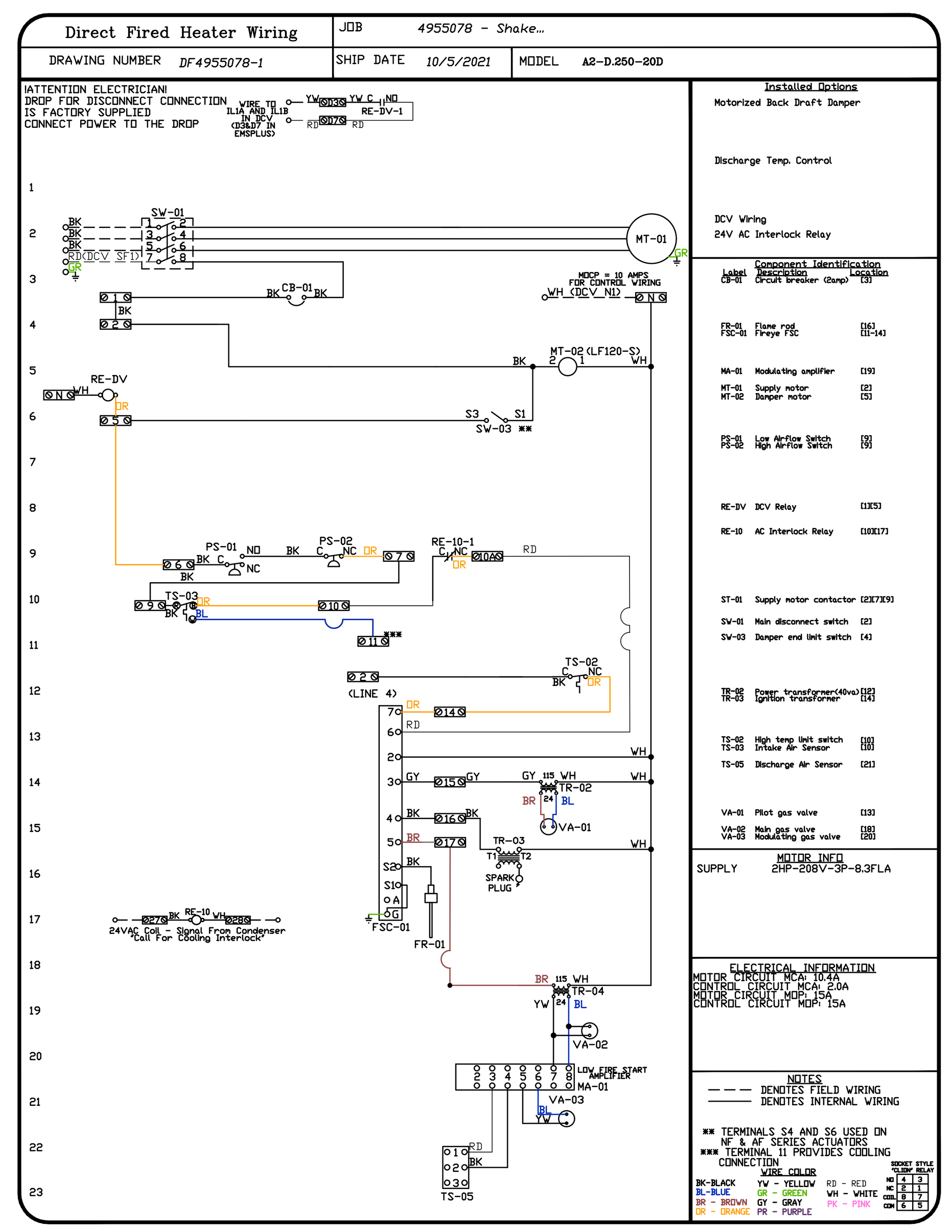
ELECTRICAL PACKAGE – JOB#4955078

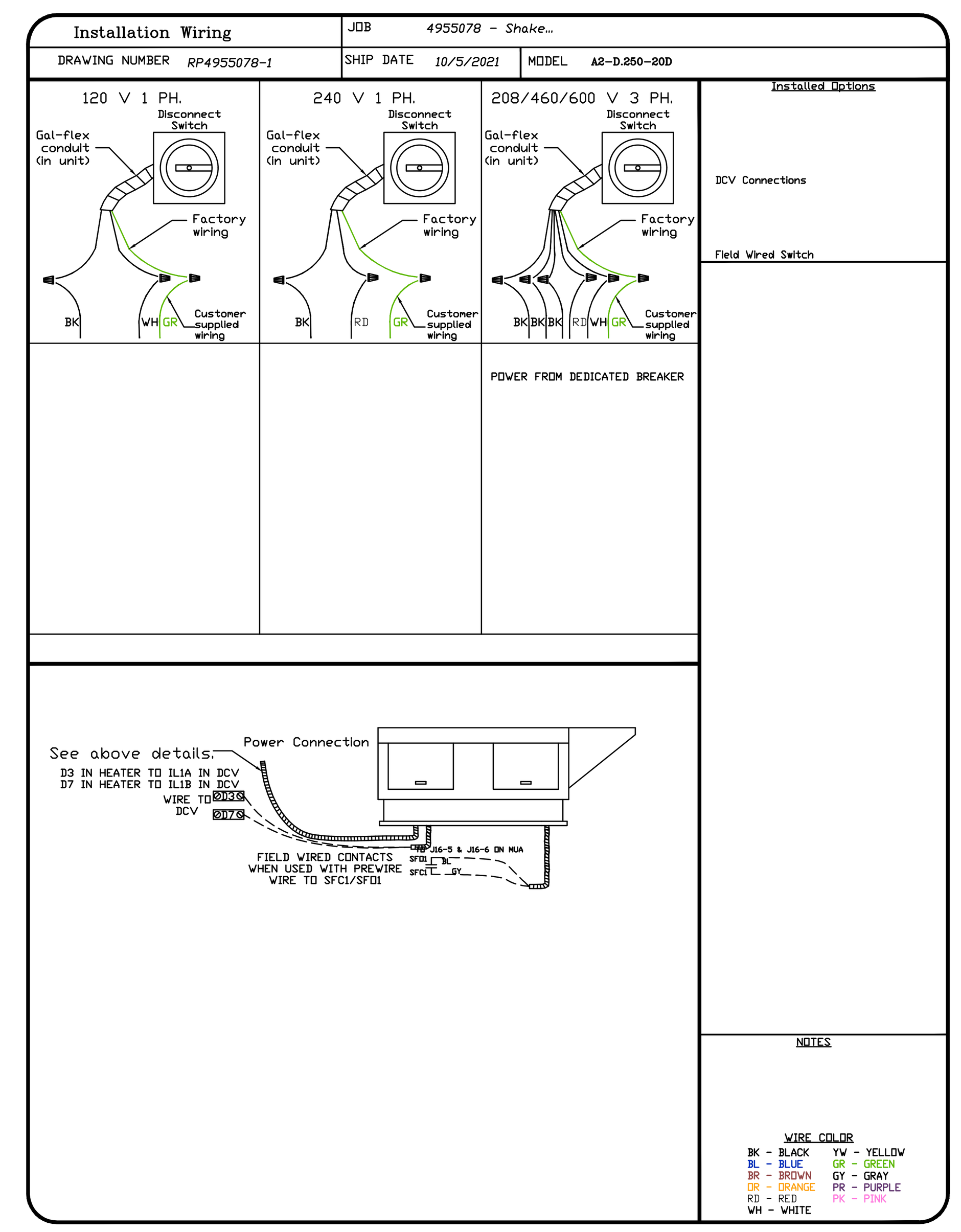
NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	Φ	HP	VOLT	FLA
1		SC-311110WG-TRION	UTILITY CABINET RIGHT	04 – UTILITY CABINET RIGHT	1 LIGHT	SMART CONTROLS W/ HOT WATER CONTROLS ONLY FOR USE WITH AM-2 PANEL	MAU	SUPPLY	3	2.000	208	8.3
				HOOD # 2	1 FAN			EXHAUST	3	5.000	208	16.8

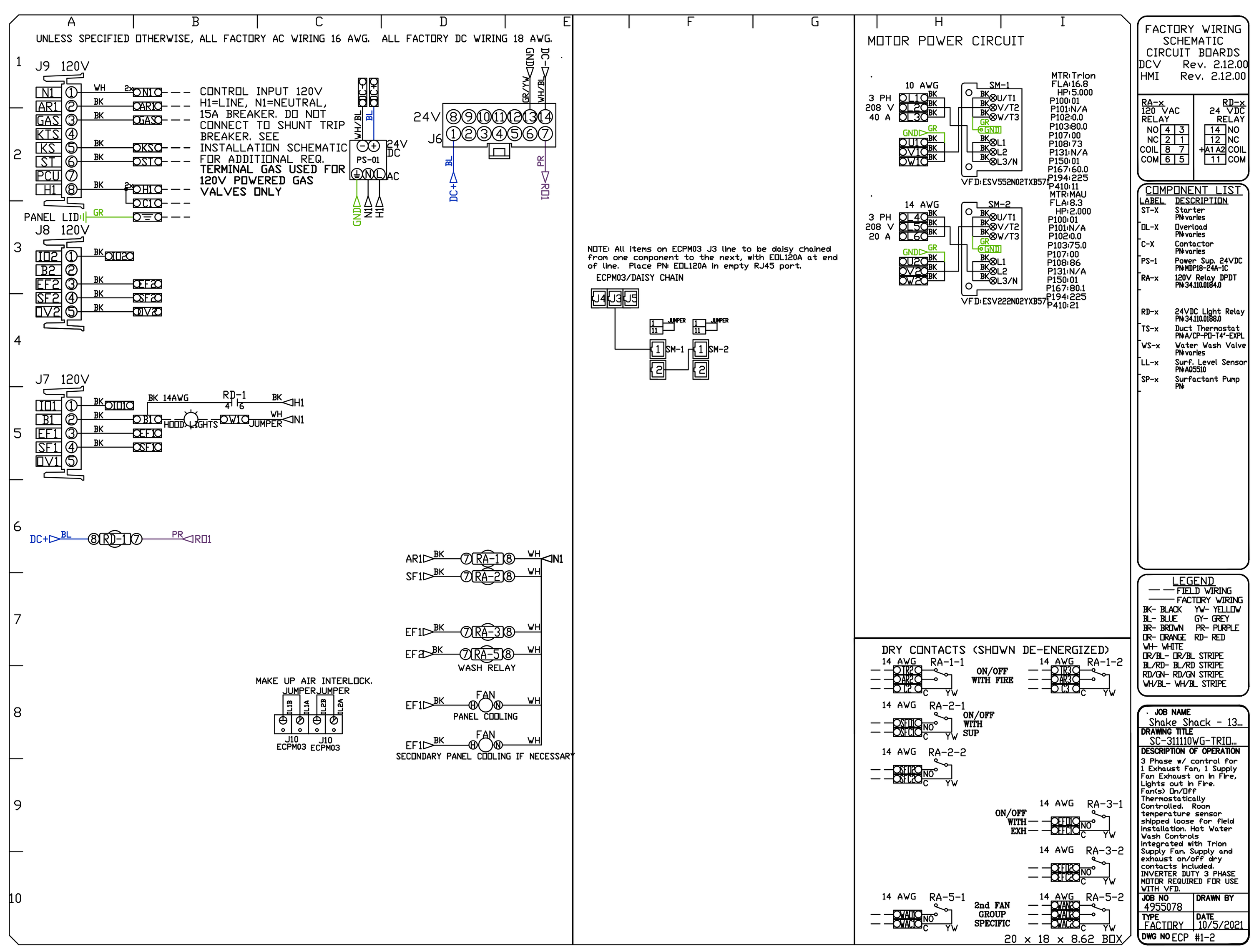
SEE TRION WIRING DRAWINGS FOR PANEL, UNIT AND PUMP WIRING

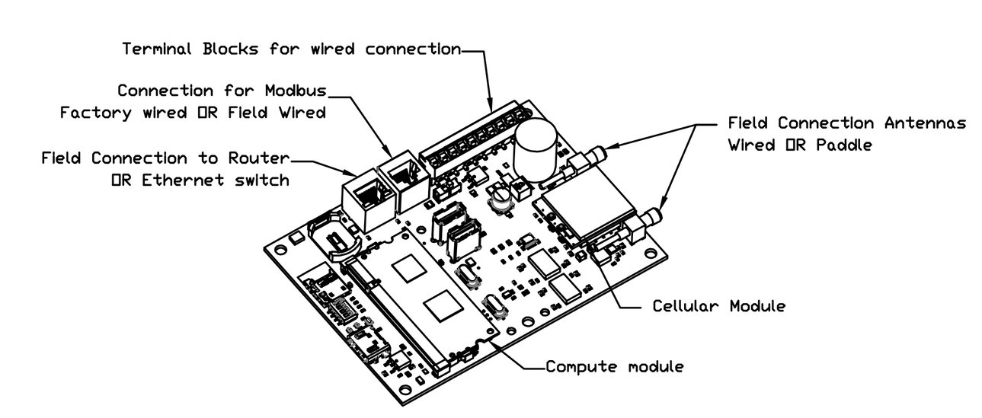


FIELD WIRING BY ELECTRICIAN FROM TRION PANEL TO CAS HOOD MOUNTED PANEL. (RECOMMENDED WIRE TO BE 14 or 16 GAGE. LARGER WIRE IS OK)









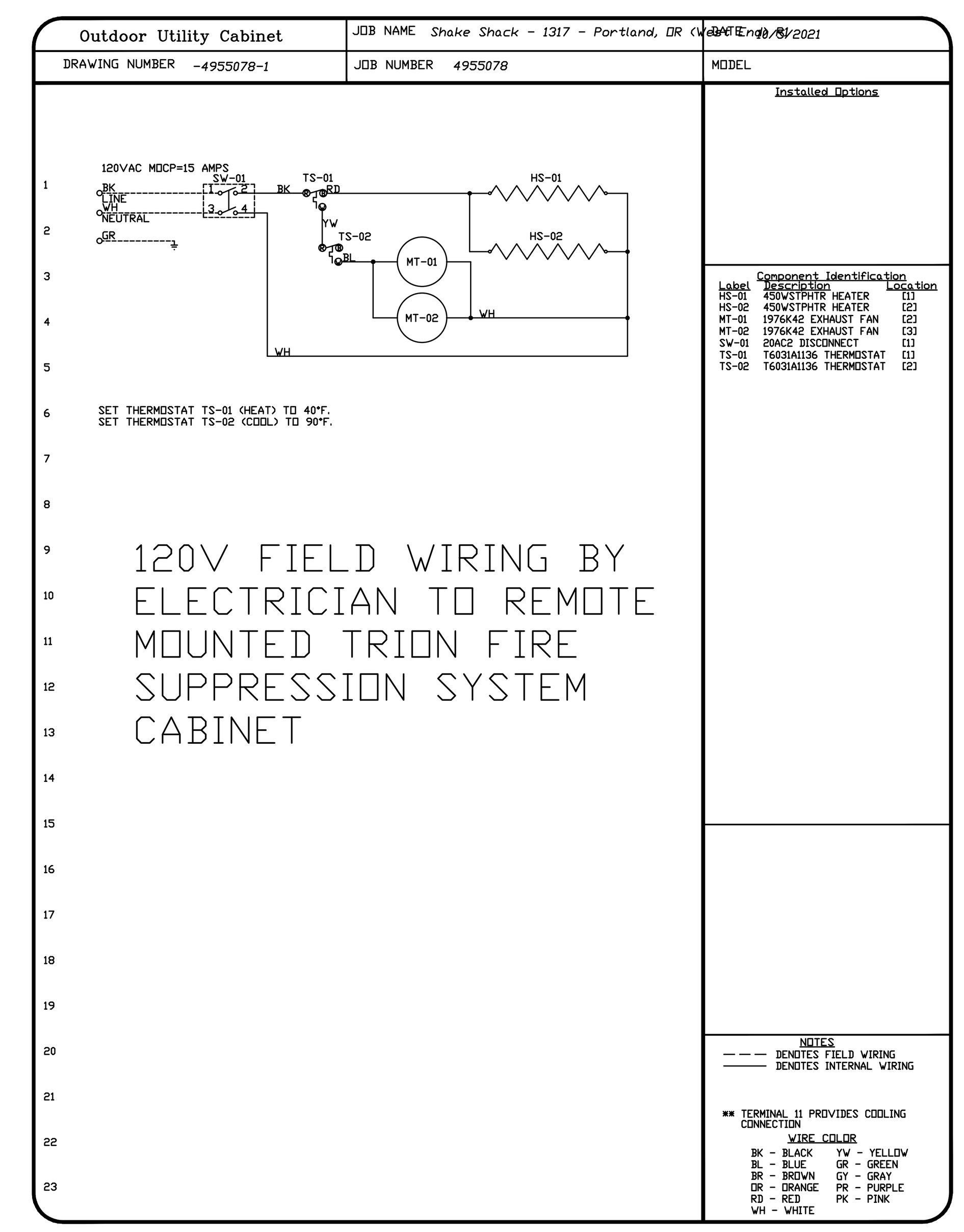
CASlink Monitor and Control

- *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

DCV Packages	Function
Room Temperature	MONITOR
Duct Temperature(s)	MONITOR
MUA Discharge Temperature	MONITOR
Kitchen RTU Discharge Temperature	MONITOR
Fan Speed	MONITOR
Fan Amperage	MONITOR
Fan Power	MONITOR
VFD Faults	MONITOR
Controller Faults	MONITOR
Fan Faults	MONITOR
Fan Status	MONITOR
PCU Faults	MONITOR
PCU Filter Clog Percentages	MONITOR
Fire Condition	MONITOR
CORE Fire System	MONITOR
Building Pressures	MONITOR
Prep Time Button	MONITOR & CONTROL
Fans Button	MONITOR & CONTROL
Lights Button	MONITOR & CONTROL
Wash Button	MONITOR & CONTROL

SC Packages	Function
Room Temperature(s)	MONITOR
Duct Temperature(s)	MONITOR
MUA DIscharge Temperature	MONITOR
Kitchen RTU Discharge Temperature	MONITOR
Controller Faults	MONITOR
Fan Faults	MONITOR
Fan Status	MONITOR
PCU Faults	MONITOR
PCU Filter Clog Percentages	MONITOR
Fire Condition	MONITOR
CORE Fire System	MONITOR
Building Pressures	MONITOR
Fans Button(s)	MONITOR & CONTROL
Lights Button(s)	MONITOR & CONTROL
Wash Button	MONITOR & CONTROL



120V FIELD WIRING BY ELECTRICIAN TO REMOTE MOUNTED TRION FIRE SUPPRESSION SYSTEM CABINET

HOOD MOUNTED ELECTRICAL CONTROL PACKAGE PROVIDES INTERLOCK OF EXHAUST AND DEDICATED MUA UNIT.

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4955078

joe.shiiba

3/4" = 1'-0"

MASTER DRAWING

3

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209

Shack #1317

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REVISIONS

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CAPTIVE AIRE DRAWINGS

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/28/2022

Sheet No.
M706

SC- Specification:

The Electrical Package, typically FP, is designed to thermostatically activate the exhaust fans for an exhaust hood whenever elevated temperatures are sensed in the exhaust system. This option will meet the requirements of IMC 507.2.1.1 by providing a thermostat(s) mounted in the duct or hood riser to sense increased exhaust temperatures.
Controls shall be listed by ETL (UL 508A). The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.

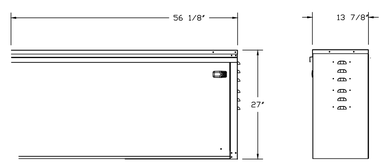
Temperature probes(s) located in the duct riser shall be constructed of Stainless Steel.
A room temperature sensor is also provided for field installation in the kitchen space in order to start the fan(s) based on the temperature differential between the room and the exhaust air in the duct, rather than fixed set-points.
The system is factory pre-set to activate the fans at 10 deg F° above the room temperature.

Once the duct temperature reaches the activation point, the exhaust fans will be activated. The controls also provide hysteresis to prevent cycling of the fans after the cooking appliances have been turned off and the heat in the exhaust system is reduced. The hysteresis is factory set 2 degrees and will keep the exhaust running until the temperature falls 2 degrees below the activation set point. A hysteresis timer also exists to keep the fans running for at least 30 min after being activated by the temperature rise.

The activation and hysteresis settings may be field adjusted on the board LCD interface located inside the control enclosure to meet application needs.
The panel is factory configured to shut down supply fans, turn on the exhaust fans and turn off the hood lights in a fire condition.

ALL INTERCONNECTING WIRING FROM HOOD ANSUL SYSTEM TO PCU ANSUL SYSTEM TO BE FIELD INSTALLED BY ELECTRICAL CONTRACTOR. THIS WIRING IS NOT INSTALLED BY CAPTIVE-AIRE OR THE ANSUL INSTALLER.

TRION/PCU FIRE SUPPRESSION



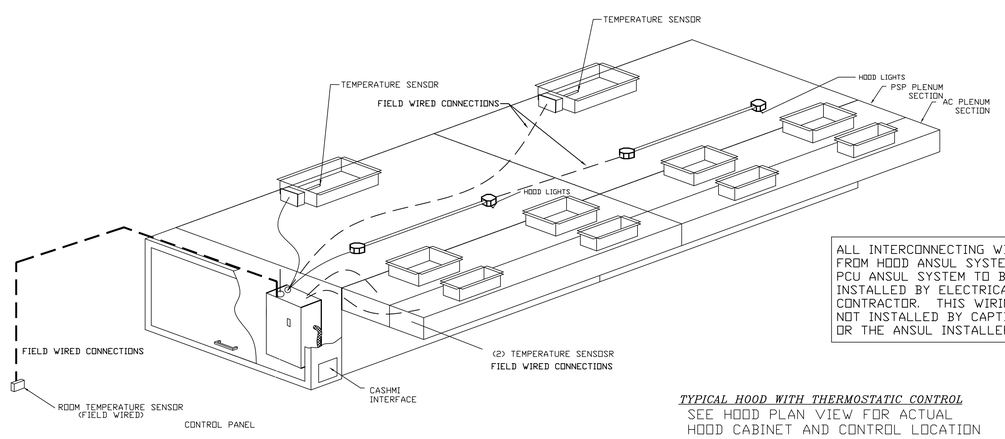
NOTES: THE FIRE SUPPRESSION SYSTEM CABINET FOR THE TRION UNIT WILL BE SHIPPED LOOSE. THE INSTALLING GC/CONTRACTOR IS RESPONSIBLE FOR MOUNTING THE CABINET CLOSE TO HE TRION UNIT THE ELECTRICIAN MUST INSTALL ALL FIELD WIRING AS SHOWN ON WIRING SCHEMATICS. THE ANSUL SYSTEM CONTRACTOR WILL INSTALL THE SYSTEM INTO THE CABINET. THE ANSUL CONTRACTOR DOES NOT MOUNT THE CABINET OR DO ANY WIRING.

System Design Verification (SDV)

If ordered, CAS Service will perform a System Design Verification (SDV) once all equipment has had a complete start up per the Operation and Installation Manual. Typically, the SDV will be performed after all inspections are complete.

Any field related discrepancies that are discovered during the SDV will be brought to the attention of the general contractor and corresponding trades on site. These issues will be documented and forwarded to the appropriate sales office. If CAS Service has to resolve a discrepancy that is a field issue, the general contractor will be notified and billed for the work. Should a return trip be required due to any field related discrepancy that cannot be resolved during the SDV, there will be additional trip charges.

During the SDV, CAS Service will address any discrepancy that is the fault of the manufacturer. Should a return trip be required, the general contractor and appropriate sales office will be notified. There will be no additional charges for manufacturer discrepancies.



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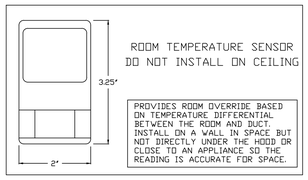
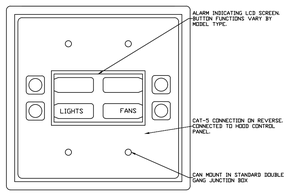
TYPICAL HOOD WITH THERMOSTATIC CONTROL
SEE HOOD PLAN VIEW FOR ACTUAL HOOD CABINET AND CONTROL LOCATION



ROOM TEMPERATURE SENSOR
DO NOT INSTALL ON CEILING

PROVIDES ROOM OVERRIDE BASED ON TEMPERATURE DIFFERENTIAL BETWEEN THE ROOM AND DUCT. INSTALL ON A WALL IN SPACE BUT NOT DIRECTLY UNDER THE HOOD OR CLOSE TO AN APPLIANCE SO THE READING IS ACCURATE FOR SPACE.

HOOD CONTROL PACKAGE INTERFACE with LCD Screen



DETAIL OF HOOD MOUNTED CONTROLS INTERFACE

— — — — — — FIELD WIRING

- (4) TEMP SENSORS TO CONTROL PANEL
- REMOTE ROOM SENSOR TO CONTROL PANEL
- CAT 5 CABLE TO INTERNET ROUTER

NOTE: TEMP SENSOR IN HOOD THAT DOES NOT HAVE BUILT IN END CABINET AND ROOM TEMP SENSOR MUST BE FIELD WIRED TO CONTROL PANEL

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted	☐
Approved with NO Exception Taken	☐
Revise and Resubmit	☐

SIGNATURE _____

Your Title _____ Date _____

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2

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	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR 11" REVIEW

REVISIONS

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Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 194243 | Drawn HEI

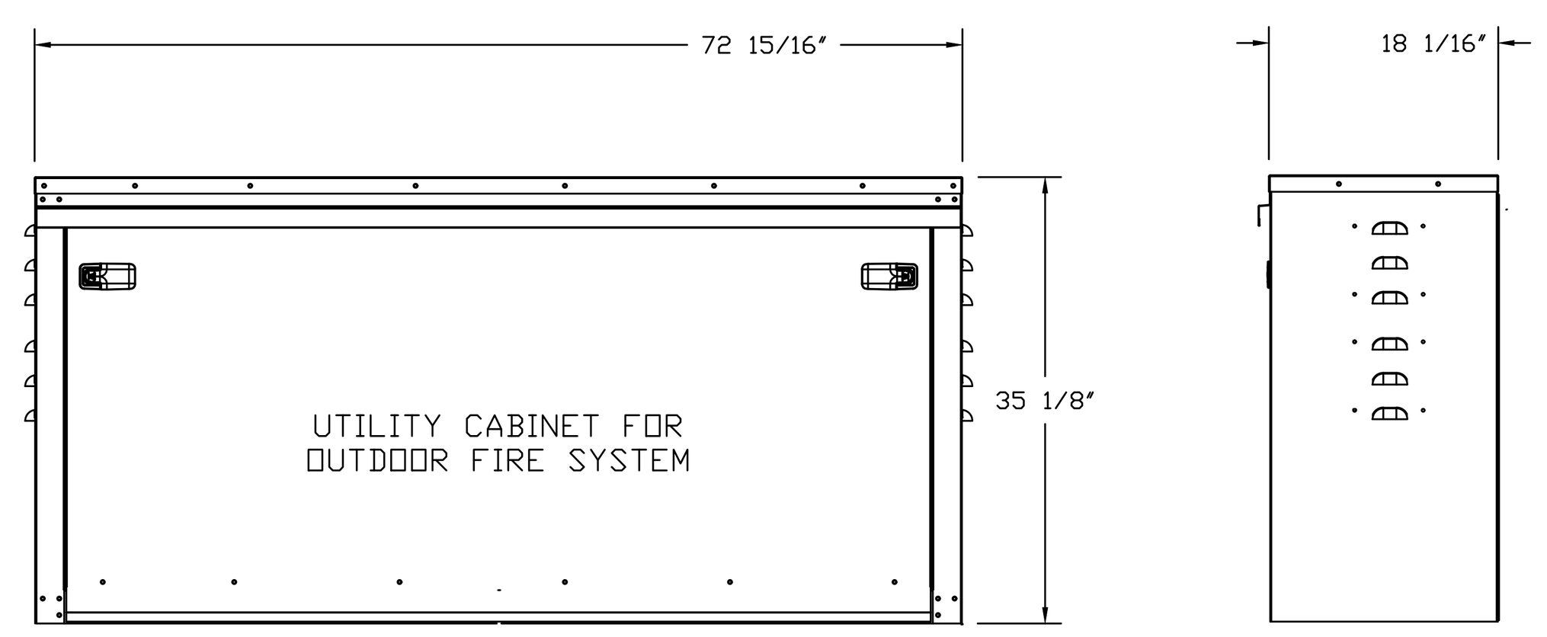
Scale SEE PLAN | Date 03/28/2022

Sheet No.
M707

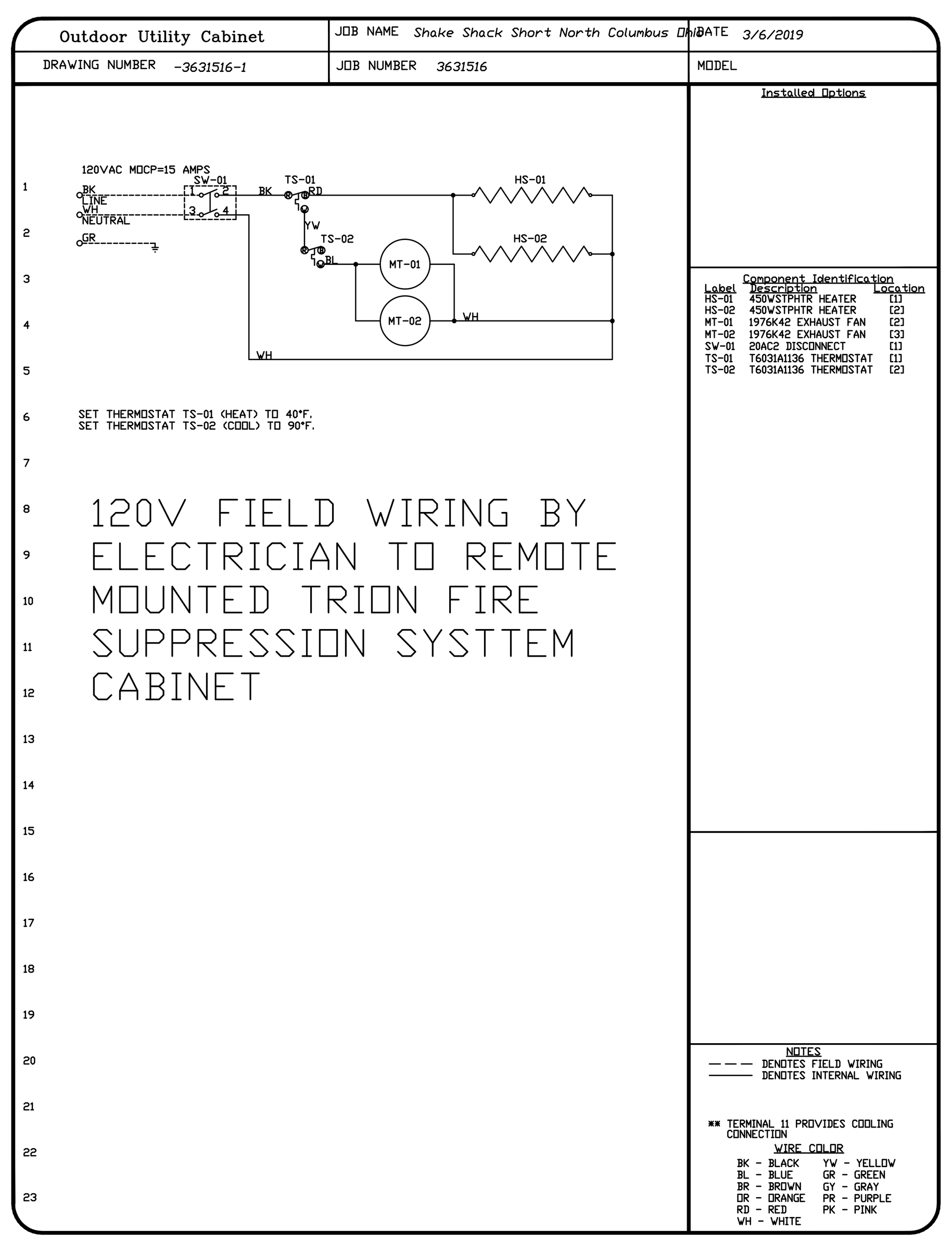
SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

ALL INTERCONNECTING WIRING FROM HOOD ANSUL SYSTEM TO PCU ANSUL SYSTEM TO BE FIELD INSTALLED BY ELECTRICAL CONTRACTOR. THIS WIRING IS NOT INSTALLED BY CAPTIVE-AIRE OR THE ANSUL INSTALLER.

TRION/PCU FIRE SUPPRESSION SYSTEM CABINET



NOTES: THE FIRE SUPPRESSION SYSTEM CABINET FOR THE TRION UNIT WILL BE SHIPPED LOOSE. THE INSTALLING GC/CONTRACTOR IS RESPONSIBLE FOR MOUNTING THE CABINET CLOSE TO HE TRION UNIT THE ELECTRICIAN MUST INSTALL ALL FIELD WIRING AS SHOWN ON WIRING SCHEMATICS. THE ANSUL SYSTEM CONTRACTOR WILL INSTALL THE SYSTEM INTO THE CABINET. THE ANSUL CONTRACTOR DOES NOT MOUNT THE CABINET OR DO ANY WIRING.



CUSTOMER APPROVAL TO MANUFACTURE:

proved as Noted ☐

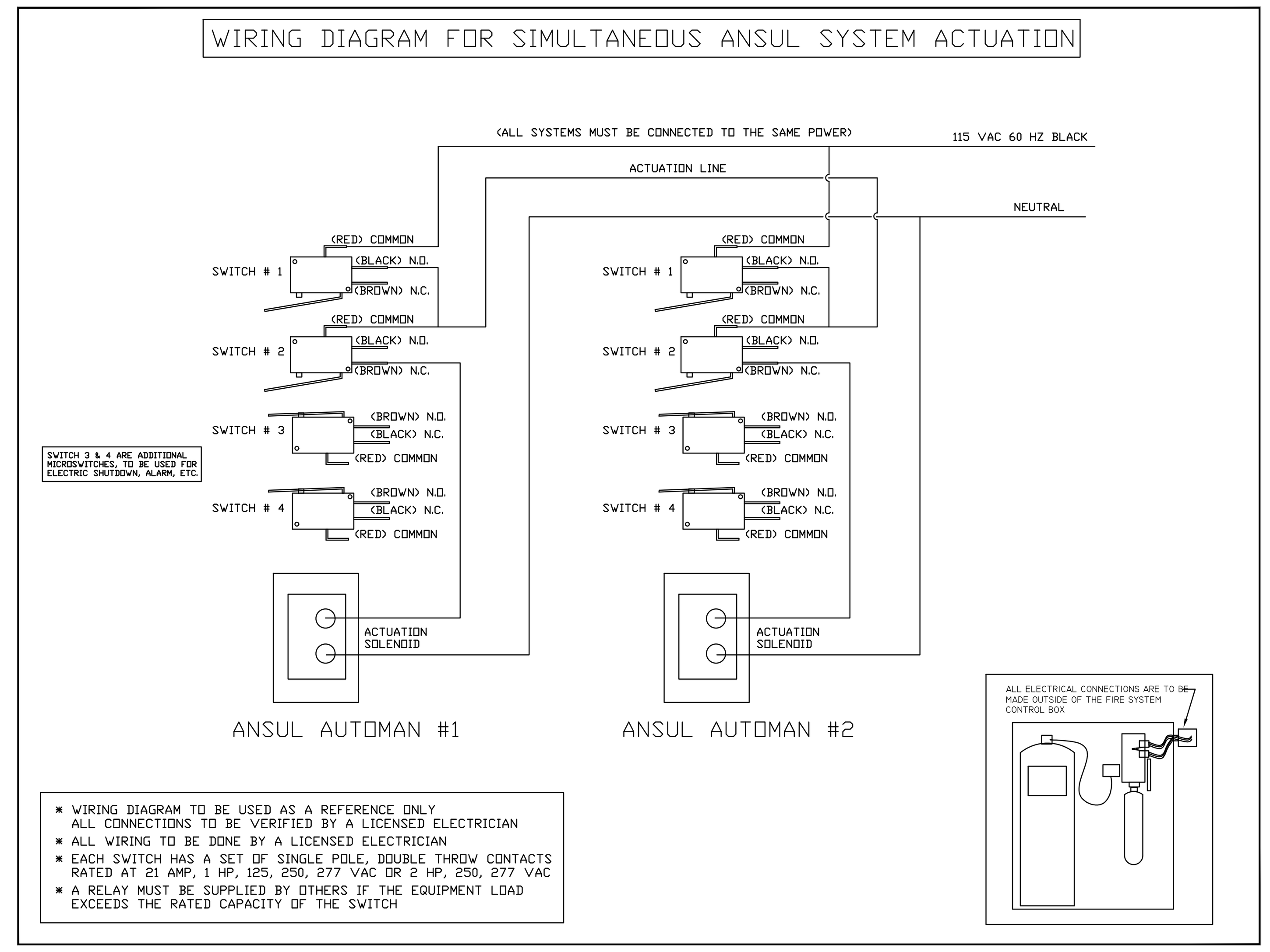
proved with NO Exception Taken ☐

ise and Resubmit ☐

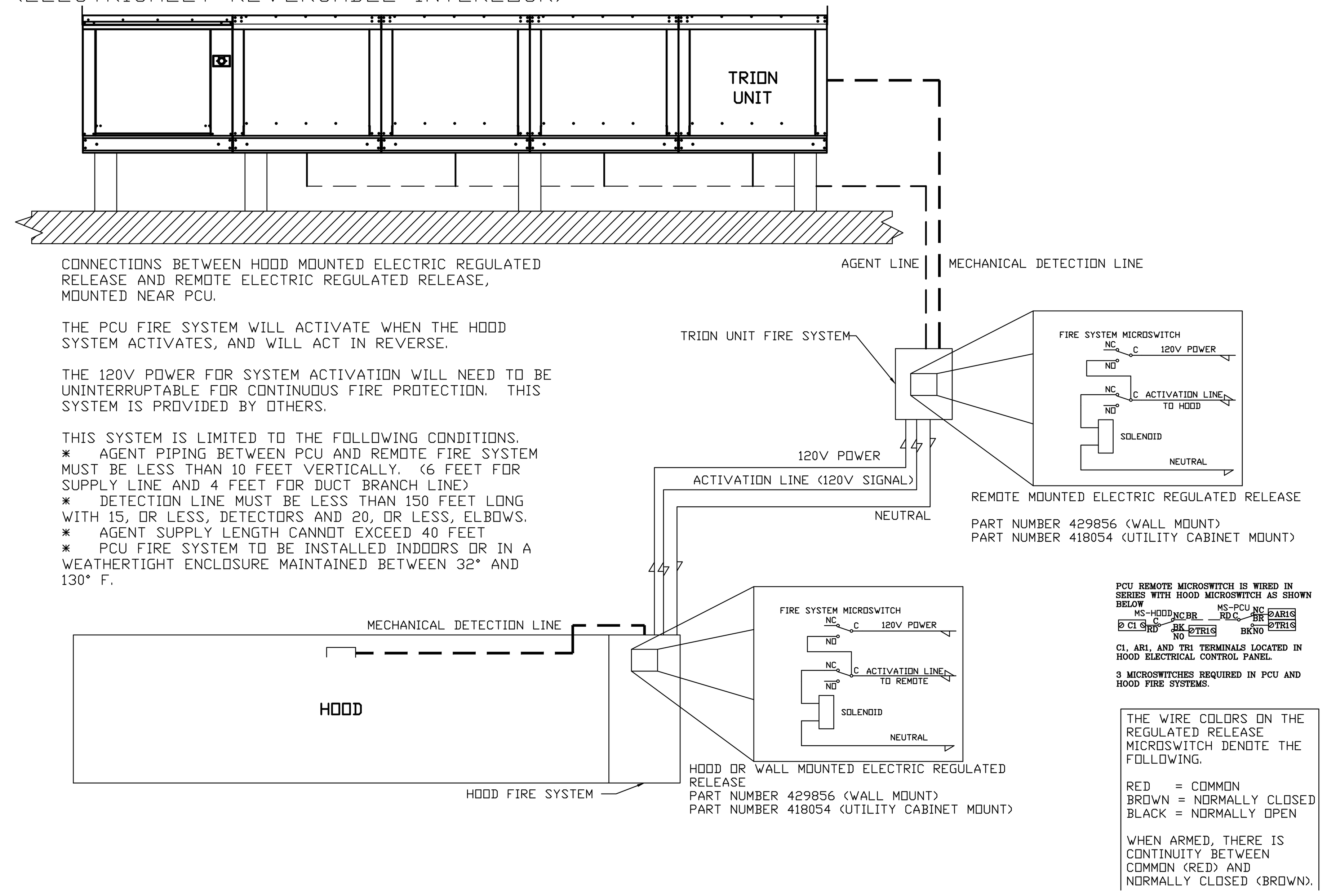
NATURE ____________________

r Title ____________ Date ________

FIELD WIRING BETWEEN HOOD AND TRION UNIT ANSUL FIRE SUPPRESSION SYSTEMS BY ELECTRICIAN



CONNECTIONS FOR HOOD MECHANICAL FIRE SYSTEM TO PCU MECHANICAL FIRE SYSTEM (ELECTRICALLY REVERSABLE INTERLOCK)



CONNECTIONS BETWEEN HOOD MOUNTED ELECTRIC REGULATED RELEASE AND REMOTE ELECTRIC REGULATED RELEASE, MOUNTED NEAR PCU.

THE PCU FIRE SYSTEM WILL ACTIVATE WHEN THE HOOD SYSTEM ACTIVATES, AND WILL ACT IN REVERSE.

THE 120V POWER FOR SYSTEM ACTIVATION WILL NEED TO BE UNINTERRUPTABLE FOR CONTINUOUS FIRE PROTECTION. THIS SYSTEM IS PROVIDED BY OTHERS.

THIS SYSTEM IS LIMITED TO THE FOLLOWING CONDITIONS.
* AGENT PIPING BETWEEN PCU AND REMOTE FIRE SYSTEM MUST BE LESS THAN 10 FEET VERTICALLY. (6 FEET FOR SUPPLY LINE AND 4 FEET FOR DUCT BRANCH LINE)
* DETECTION LINE MUST BE LESS THAN 150 FEET LONG WITH 15, OR LESS, DETECTORS AND 20, OR LESS, EL ELBOWS.
* AGENT SUPPLY LENGTH CANNOT EXCEED 40 FEET
* PCU FIRE SYSTEM TO BE INSTALLED INDOORS OR IN A WEATHERTIGHT ENCLOSURE MAINTAINED BETWEEN 32° AND 130° F.

THE WIRE COLORS ON THE REGULATED RELEASE MICROSWITCH DENOTE THE FOLLOWING.

RED = COMMON
BROWN = NORMALLY CLOSED
BLACK = NORMALLY OPEN

WHEN ARMED, THERE IS CONTINUITY BETWEEN COMMON (RED) AND NORMALLY CLOSED (BROWN).

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CAPTIVEAIRE
Eastern PA Mechanical
PO Box 2520, 1 Union Ave, Bala Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: reg108@captiveaire.com

Shake Shack - 1317 - Portland, OR (West End) R1
PORTLAND, OR, 97209

10/5/2021
4955078
joe.shiiba
3/4" = 1'-0"
MASTER DRAWING
2

SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

No	Date	Remarks
5	03/28/22	ISSUE FOR CONSTRUCTION
4	11/22/21	PERMIT COMMENTS III
3	10/29/21	FIELD NOTICE I
2	09/16/21	PERMIT COMMENTS II
1	06/23/21	PERMIT COMMENTS
	12/28/20	ISSUE FOR PERMIT
	12/04/20	ISSUE FOR PERMIT/BID
	10/14/19	ISSUE FOR LL REVIEW

REVISIONS

FOR REFERENCE ONLY

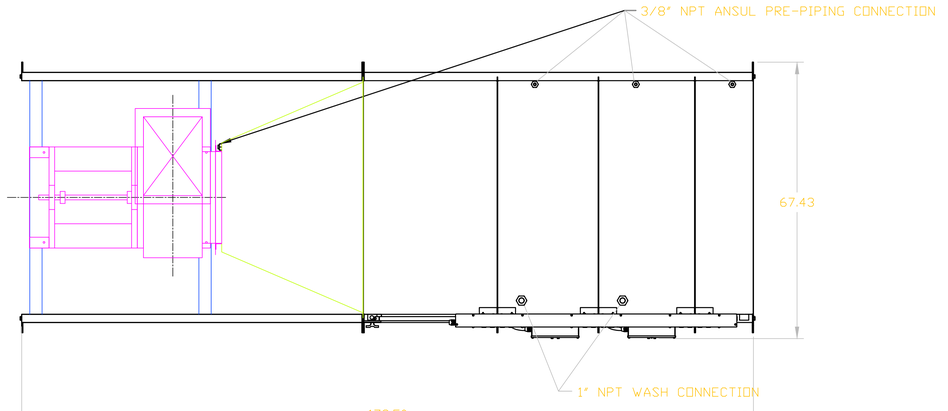
Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/28/2022
Sheet No. M708

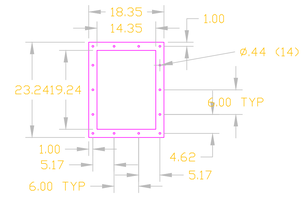
NOTES:

1.0 GREASE VIPER WASH CONTROL ENCLOSURE:
1.1 TRANSFORMER 24 VAC AND DOOR INTERLOCK 24 VDC LEADS MAY BE ROUTED THROUGH COMMON CONDUIT BETWEEN CONTROL ENCLOSURE AND GREASE VIPER ELECTRICAL ENCLOSURE.
1.2 CONTROL ENCLOSURE AND GREASE VIPER SYSTEM MUST BE GROUNDED TO STRUCTURAL STEEL AND EARTH GROUND.
1.3 ALL PRIMARY INTERCONNECTION WIRING BY CUSTOMER MUST MEET APPLICABLE CODE REQUIREMENTS.
1.4 DETERGENT PUMP MOTOR REQUIRES DISCONNECT AT PUMP (BY ELECTRICAL CONTRACTOR).
2.0 FIRE SUPPRESSION PRE-PIPING:
2.1 ANSUL R-102 FIRE SUPPRESSION NOZZLES (TYPE 1W) PLUMBED IN ACCORDANCE WITH ANSUL R-102 RESTAURANT FIRE SUPPRESSION SYSTEM MANUAL. MULTIPLE GREASE VIPER SECTIONS MAY BE PLUMBED BY OTHERS TO SHARE COMMON ANSUL SUPPLY SYSTEM - SEE PLUMBING DETAILS AND RESTRAINTS ON DETAIL (SHT. 2).
3.0 PLUMBING:
3.1 MULTIPLE GREASE VIPER SECTIONS MAY BE PLUMBED BY OTHERS TO SHARE COMMON WASH CYCLE DEPENDANT ON AVAILABLE WATER SUPPLY VOLUME AND PRESSURE - NOT TO EXCEED 40 GPM.
3.2 HOT WATER (MIN. 100°F) RECOMMENDED FOR AN EFFICIENT WASH CYCLE. HOT WATER TANKS SHOULD BE LOCATED AS CLOSE AS POSSIBLE TO THE UNIT BEING WASHED AND PIPING ROUTED AND SIZED TO MINIMIZE FLOW RESTRICTION AND/OR PRESSURE LOSS.
3.3 THE BACKFLOW-PREVENTER MUST BE LOCATED UPSTREAM OF THE DETERGENT FEEDER LINE CONNECTION AND "Y" STRAINER. THIS DEVICE SHOULD BE CONTINUOUS PRESSURE TYPE AND INSTALLED IN ACCORDANCE WITH ALL APPLICABLE PLUMBING CODES.
3.4 DETERGENT INJECTION MUST BE WITHIN 5 FEET OF NEAREST TRION CABINET WASH WATER CONNECTION POINT (1/2" MIN. DETERGENT FEEDER LINE).
3.5 SOLENOID COIL ON VALVE(S) MUST BE POSITIONED IN VERTICAL UP POSITION.
3.6 PROTECT ALL WASH WATER PIPING, DRAIN PIPING AND PLUMBING COMPONENTS THAT ARE SUBJECT TO FREEZING.
4.0 DRAIN PLUMBING:
4.1 ALLOW FOR MAXIMUM AVAILABLE SLOPE ON DRAIN LINES. INSUFFICIENT SLOPE ON DRAIN LINES WILL RESULT IN POOR DRAINAGE, POOLING OF LIQUID IN THE CABINET(S), AND SYSTEM FAILURE (3" DRAIN LINE RECOMMENDED).
4.2 DRAIN LINE TRAP MUST PROVIDE SUFFICIENT WATER COLUMN TO OVERCOME THE INTERNAL STATIC PRESSURE OF THE AIR HANDLING SYSTEM IN WHICH THE GREASE VIPER UNIT IS INSTALLED.
5.0 SYSTEM SPECIFICATIONS: CONFIGURATION 1 TIER HIGHEX CELLS WIDEDOUBLE PASS
HAND LEFT HAND ACCESS
APPROX. WEIGHT 2,300 LBS.
CAPACITY 3,766CFM @ 3.68"TOTAL STATIC PRESSURE
WASH SECTIONS 1 TOTAL
WASH CONFIGURATION (2) MODULES @ 15.0 GPM
WATER CONSUMPTION 54 GAL. PER WASH
DETERGENT CONSUMPTION 0.6 GAL. PER WASH
6.0 AGENCY(S) RECOGNITION:
6.1 GREASE VIPER UNIT/SYSTEM: ETL LISTED ELECTROSTATIC AIR CLEANERS UL 867, FIFTH EDITION.
ETL LISTED - EXHAUST HOODS FOR COMMERCIAL COOKING EQUIPMENTUL 710, SIXTH EDITION.
DESIGNED IN ACCORDANCE WITH RECOMMENDED PRACTICES STEANDARD FOR VENTILATION CONTROL AND FIRE PROTECTION OF COMMERCIAL COOKING OPERATIONSNFPA 96.
6.2 FANS FOR KITCHEN EXHAUST SYSTEMS: UL LISTED POWER ROOF VENTILATORS FOR RESTAURANT EXHAUST APPLIANCES 762.
7.0 REFERENCE DRAWINGS:
GREASE VIPER WIRING DIAGRAMS - DRAWING# 266100
8.0 FIREBARRIER SILICONE SEALANT REQUIRED AT ALL FLANGED CONNECTIONS.
APPLY SEALANT TO CLEAN, DRY SURFACES WITH SUFFICIENT QUANTITY TO EXTRUDE FROM SEAMS VISIBLE FROM INSIDE THE MODULE(S). VISIBLE GAPS OR VOIDS IN EXTRUDED SEALANT MAY RESULT IN EXTERNAL WATER LEAKS DURING SYSTEM WASH CYCLE. COMPLETE MATING OF FLANGES WITH FASTENERS INSTALLED MUST BE COMPLETED WITHIN (1) HOUR TO PREVENT PRE-MATURE CURING OF SEALANT. PROTECT INTERNAL AND EXTERNAL SEAMS FROM WATER / MOISTURE FOR (48) HOURS MINIMUM.
FIREBARRIER SILICONE SEALANT PROPERTIES:

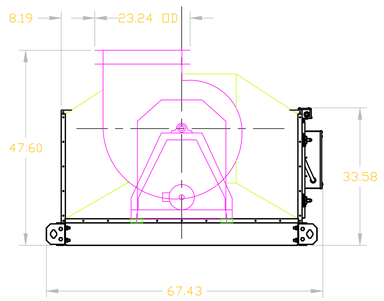
TOOL / WORK TIME	20 MINUTES
SKIN OVER TIME	60 MINUTES MAXIMUM
CURING TIME	48 HOURS
MAXIMUM STRENGTH	21 DAYS



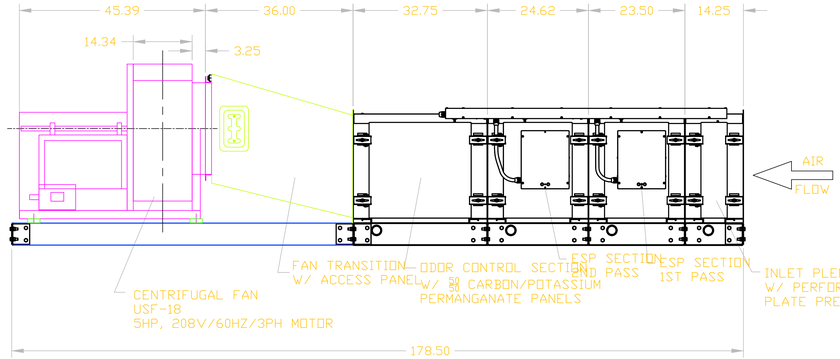
PLAN VIEW



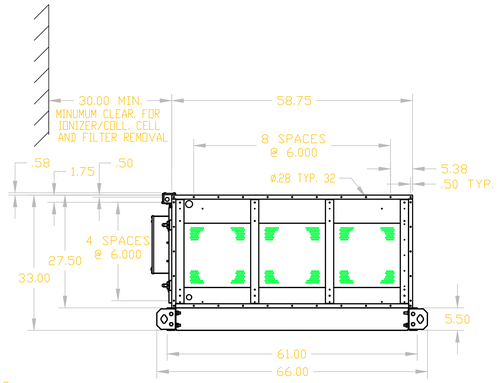
FLANGE DETAIL



OUTLET FLANGE VIEW



ELEVATION VIEW



INLET FLANGE VIEW

ECN-	EP	NUMBER	DIMENSIONS ARE IN INCHES		ADE SYSTEMS	TRION®			TITLE	SYSTEM OUTLINE	REV
			TOLERANCES-UNLESS OTHERWISE SPECIFIED		PROJECT: SHAKE SHACK	PROPERTY OF TRION, Sanford, NC 27330				GVS-1X3DP	–
			.X OR X/X ±.05	CONC .005 TIR	PORTLAND, OR	DRN	CKD	APP	DWG	2021215	SHEET 1/2
			.XX ±.03	BEND RAD: DWG 122223	TAG: ESP-1	AB	AB	MDH			
			.XXX ±.015	FINISH: NONE		10-6-21	10-6-21	10-6-21			
			ANGULAR ±1°	REMOVE BURRS AND SHARPS							

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SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

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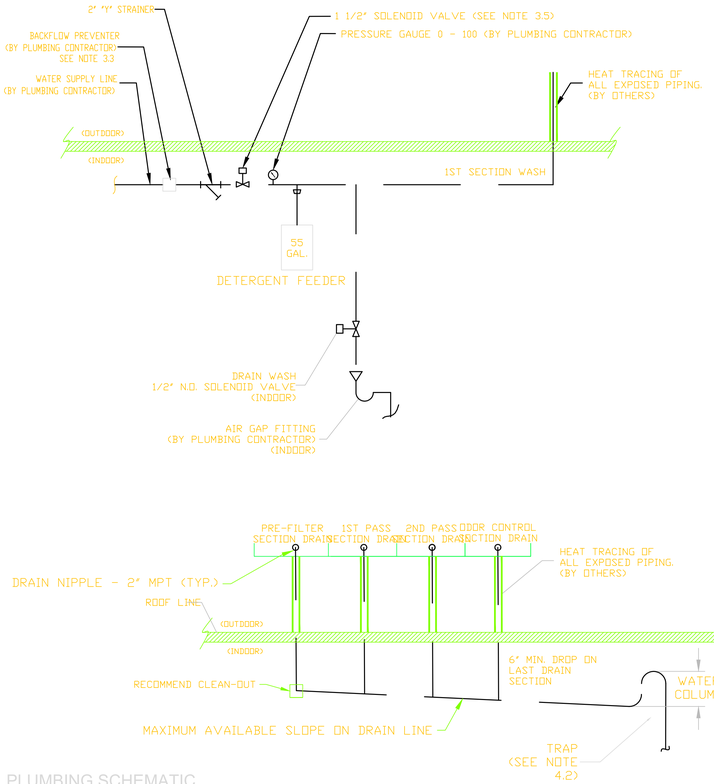
	11/04/20	ISSUE FOR PERMIT/GMP
	10/14/19	ISSUE FOR 11" REVIEW

REVISIONS

FOR REFERENCE ONLY

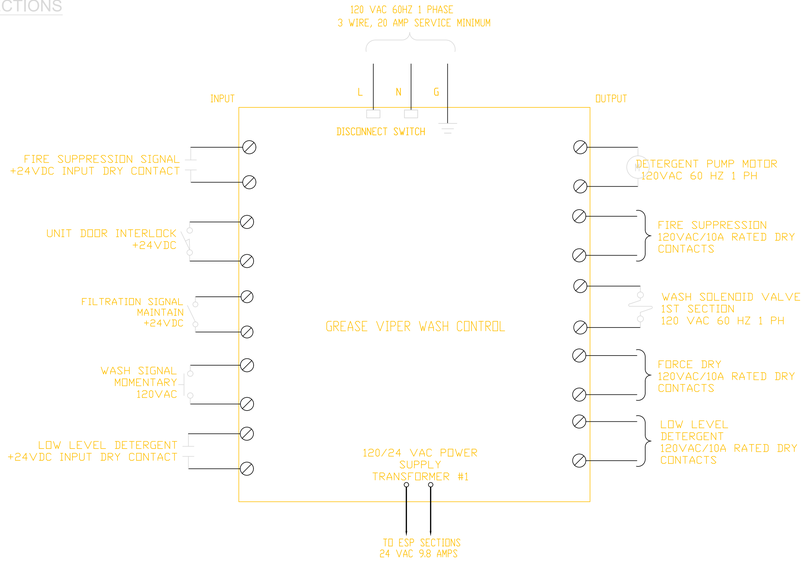
Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 194243 | Drawn HEI
Scale SEE PLAN | Date 03/28/2022
Sheet No. M709



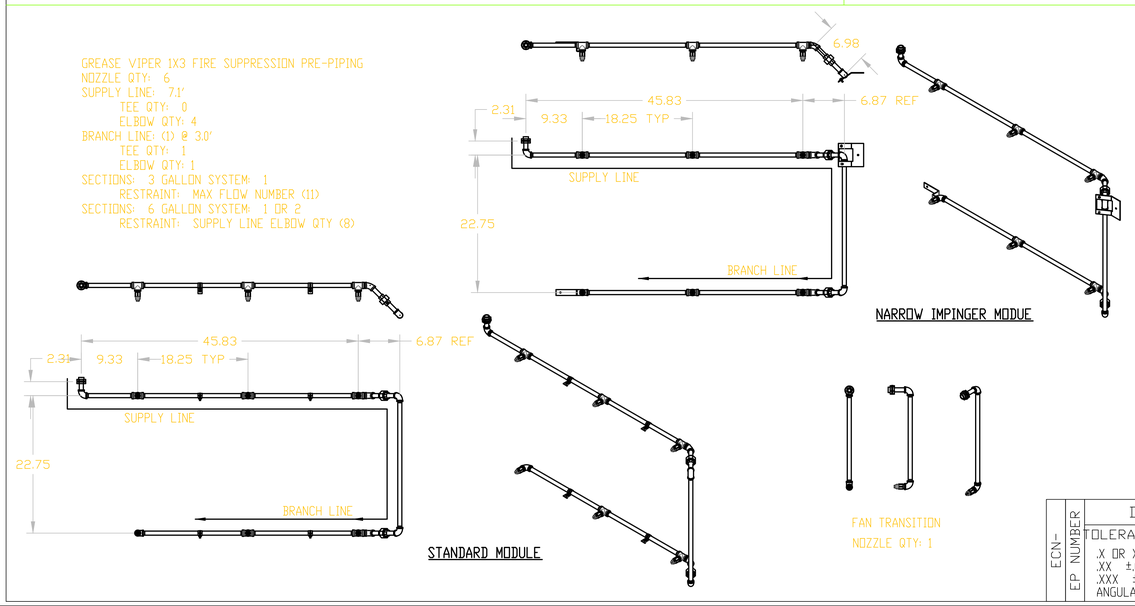
PLUMBING SCHEMATIC

FIELD WIRING CONNECTIONS



ANSUL PRE-PIPING CONFIGURATION

GREASE VIPER 1X3 FIRE SUPPRESSION PRE-PIPING
NOZZLE QTY: 6
SUPPLY LINE: 7.1'
TEE QTY: 0
ELBOW QTY: 4
BRANCH LINE: (1) @ 3.0'
TEE QTY: 1
ELBOW QTY: 1
SECTIONS: 3 GALLON SYSTEM: 1
RESTRAINT: MAX FLOW NUMBER (11)
SECTIONS: 6 GALLON SYSTEM: 1 OR 2
RESTRAINT: SUPPLY LINE ELBOW QTY (8)



1.0 GREASE VIPER ANSUL FIRE SUPPRESSION PRE-PIPING INSTALLATION BY TRION (OPTIONAL)
1.1 ESP MODULES: (6) ANSUL R-102 - TYPE 1W - FIRE SUPPRESSION NOZZLES LOCATED ON IONIZER/COLLECTOR CELL VERTICAL AND 11.37"ABOVE AND BELOW CELL HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF CELL FACE.
1.2 MEDIA FILTER MODULE (OPTIONAL): (6) ANSUL R-102 - TYPE 1W - FIRE SUPPRESSION NOZZLES LOCATED ON FILTER VERTICAL AND 11.37"ABOVE AND BELOW FILTER HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF FILTER FACE.
1.3 ODOR CONTROL MODULE (OPTIONAL): (6) ANSUL R-102 - TYPE 1W - FIRE SUPPRESSION NOZZLES LOCATED ON ADSORBER PANEL BANK OF 6 PANELS VERTICAL AND 11.37" ABOVE AND BELOW BANK HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF PANEL FACE.
1.4 FAN INLET TRANSITION (OPTIONAL):
1.4.1 FAN WITH INLET VENTURI DIAMETER SMALLER THAN OR EQUAL TO 16" DIAMETER - (1) ANSUL R-102 - TYPE 1W - FIRE SUPPRESSION NOZZLE LOCATED ON FAN INLET VERTICAL AND HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF FAN FACE.
1.4.2 FAN WITH INLET VENTURI DIAMETER GREATER THAN 16" AND SMALLER THAN OR EQUAL TO 32" DIAMETER - (1) ANSUL R-102 - TYPE 2W - FIRE SUPPRESSION NOZZLE LOCATED ON FAN INLET VERTICAL AND HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF FAN FACE.
1.4.3 FAN WITH INLET VENTURI DIAMETER GREATER THAN 32" DIAMETER - CONSULT FACTORY.
2.0 ANSUL FIRE SUPPRESSION PIPING AND COMPONENTS PROVIDED BY OTHERS AND INSTALLED BY OTHERS - REFERENCE ANSUL RESTAURANT FIRE SUPPRESSION SYSTEM MANUAL.
2.1 IMPINGER MODULE WITH GREASE BAFFLE OR PERFORATED PLATE REQUIRES (3) ANSUL R-102 - TYPE 1W - FIRE SUPPRESSION NOZZLES (PROVIDED BY OTHERS AND INSTALLED BY OTHERS) LOCATED ON IMPINGER VERTICAL AND HORIZONTAL WITH NOZZLE TIP 11.63" UPSTREAM OF IMPINGER FACE.
2.2 SYSTEM FAN REQUIRES ANSUL R-102 FIRE SUPPRESSION NOZZLE(S)(PROVIDED BY OTHERS AND INSTALLED BY OTHERS) LOCATED IN EXHAUST DUCT IMMEDIATELY DOWNSTREAM OF FAN OUTLET
2.3 FUSE LINKS (PROVIDED BY OTHERS AND INSTALLED BY OTHERS) REQUIRED IMMEDIATELY UPSTREAM AND DOWNSTREAM OF GREASE VIPER SYSTEM (UPSTREAM OF IMPINGER MODULE AND DOWNSTEAM OF FAN).
3.0 TRION GREASE VIPER ANSUL FIRE SUPPRESSION PRE-PIPING IN ACCORDANCE WITH TYCO FIRE PROTECTION PRODUCTS LETTER SUBJECT: TRION GREASE VIPER - ANSUL R-102 RECOMMENDED COVERAGE DATED THURSDAY, OCTOBER 13, 2016 (REF TRION DRAWING 266242 SHEETS 5.1 AND 5.2).
3.1 PER NFPA 96, SECTION 3.2.1, APPROVED IS DEFINED AS "ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION".

ECN-
EP NUMBER

DIMENSIONS ARE IN INCHES
TOLERANCES-UNLESS OTHERWISE SPECIFIED
.X OR X/X ±.05
.XX ±.03
.XXX ±.015
ANGULAR ±1°
CONC .005 TIR
BEND RAD: DWG 122223
FINISH: NONE
REMOVE BURRS AND SHARPS

ADE SYSTEMS
PROJECT: SHAKE SHACK
PORTLAND, OR
TAG: ESP-1

TRION®
PROPERTY OF TRION, Sanford, NC 27330

DRN	AB	CKD AB	APP MDH
	10-6-21	10-6-21	10-6-21

TITLE: SYSTEM OUTLINE
GVS-1X3DP
DWG: 2021215
REV: –
SHEET: 2/2

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SHAKE SHACK
1016 W. BURNSIDE ST., PORTLAND, OR 97209
Shack #1317

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	10/14/19	ISSUE VERI LL REVIEW

REVISIONS

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Drawing Title
CAPTIVE AIRE DRAWINGS

Job No. 194243
Drawn HEI
Scale SEE PLAN
Date 03/18/2022

Sheet No.
M710