MECHANICAL SHEET INDEX

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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. EXISTING CONDITIONS WERE TAKEN FROM ORIGINAL DRAWINGS AND SITE VISITS AND MAY NOT REFLECT EXACT "AS-BUILT" CONDITIONS. FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING FINAL BIDS. COORDINATE NEW WORK AND DEMOLITION WITH OTHER DISCIPLINES AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION.

3. 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.

4. 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.

5. PROVIDE TEMPORARY BARRIERS TO CONTAIN DUST AND DEBRIS RESULTING FROM THE PERFORMANCE OF THE WORK TO THE AREA WHERE WORK IS BEING PERFORMED.

6. ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.

7. 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.

8. 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.

9. COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.

10. 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.

11. INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING COLUMN LINES UNLESS OTHERWISE SHOWN OR NOTED.

12. 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.

13. COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTER REPLACEMENT.

14. SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH U.L. REQUIREMENTS.

15. 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.

16. ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.

17. PAINT PORTIONS OF DUCTWORK AND INSULATION THAT ARE EXPOSED TO VIEW BY THE INSTALLATION OF DIFFUSERS, REGISTERS, AND GRILLES IN CEILINGS OR WALLS FLAT BLACK. PORTIONS INCLUDE BOTH THE INTERIOR OF UNLINED DUCTWORK AND THE EXTERIOR OF DUCTWORK AND INSULATION.

18. 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.

19. 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.

20. PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.

21. 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.

22. BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.

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. 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.

26. 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.

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. TEMPORARY INSTALLATIONS OF INFECTION CONTROL MEASURES DURING CONSTRUCTION SHALL BE COORDINATED WITH THE FACILITY'S INFECTION CONTROL STAFF. PRIOR TO CONSTRUCTION PROVIDE ALL REQUIRED TEMPORARY INSTALLATIONS, INCLUDING DETAILS OF THE INFECTION CONTROL MEASURES SUCH AS TEMPORARY BARRIERS AND MEMBRANES, PORTABLE EXHAUST FANS AND TEMPORARY DUCTWORK. TEMPORARY INSTALLATIONS MUST NOT HAVE A NEGATIVE IMPACT ON EXISTING SYSTEMS NOR CAUSE UNSAFE CONDITIONS. TEMPORARY INSTALLATIONS SHALL MAINTAIN ADEQUATE EGRESS AND SHALL NOT OBSTRUCT EXISTING EXITS, CREATE A FIRE HAZARD OR REDUCE REQUIRED FIRE RESISTANCE. TEMPORARY VENTILATION SYSTEMS SHALL NOT CAUSE THE AIR BALANCE OF ADJACENT ROOMS OR SPACES TO BE IMPACTED OR ALTER THE PERFORMANCE OF PERMANENT BUILDING VENTILATION SYSTEMS. AIRFLOW MEASUREMENTS SHALL BE TAKEN TO VERIFY ADJACENT ROOMS OR SPACES ARE NOT IMPACTED.

RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED			INSTALLED			NOTES
	GC	OWN...	LL	GC	OWN...	LL	
DIVISION 23: HEATING, VENTILATION, AND AIR...							
HVAC DUCTWORK AND PIPING IDENTIFICATION: HVAC DUCTWORK SYSTEM, PIPING SYSTEM, UTILITY SHUT OFF, VALVE TAGS AND CHART, AND HVAC DAMPER IDENTIFICATION(S)	●			●			
ROOF CURBS: EXHAUST FAN CURBS, ROOFTOP UNIT CURBS, CONDENSING UNIT CURBS, MAKE UP AIR UNIT CURBS, KITCHEN EXHAUST FAN CURBS	●			●			1
ROOF CURBS: MAKE UP AIR UNIT CURBS, KITCHEN EXHAUST FAN CURBS		●			●		1
HVAC DUCTWORK SYSTEM COMPONENTS: HVAC DUCTWORK, INSULATION AND FIRE WRAP, DAMPERS, SMOKE DETECTORS,...	●			●			2
MECHANICAL PIPING SYSTEM COMPONENTS: WALK-IN COOLER AND FREEZER REFRIGERATION		●			●		3
MECHANICAL PIPING SYSTEM COMPONENTS: REFRIGERATION FOR OTHER HVAC EQUIPMENT, CHILLED WATER, CONDENSER WATER, HEATING HOT WATER, VALVES AND ACCESSORIES (E.G. AI...	●			●			
HVAC EQUIPMENT: SUPPLY FAN, TOILET EXHAUST FAN, DUCTED AND NON-DUCTED HEATING AND COOLING UNITS, NATURAL GAS PATIO HEATERS,...	●			●			4
HVAC EQUIPMENT: KITCHEN EXHAUST FAN, MAKE UP AIR UNITS		●		●			4,5
KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM: HOOD CONTROL PANEL, KITCHEN EXHAUST HOOD, ANSUL SYSTEM, ANSUL GAS...		●		●			
KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM: STRUCTURAL SUPPORT, ELECTRICAL AND CONTROL WIRING, ANSUL WIRING AND...		●		●			
COMMISSIONING ACTIVITIES: GREASE EXHAUST WATER LEAKAGE TEST, TESTING AIR BALANCE...	●			●			

GENERAL NOTES
1. INFORMATION CONTAINED WITHIN IS BASED ON THE DRAFT WORK LETTER AVAILABLE AT THE TIME OF... DESIGN.
2. REFER TO FINAL WORK LETTER FOR ALL LANDLORD/TENANT SCOPE OF WORK RESPONSIBILITIES.

SCHEDULED NOTES
1. GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES.
2. GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE TENANT FIT OUT FROM LANDLORD POINT OF...
3. WALK-IN COOLER AND FREEZER SUPPLIED BY VENDOR NO. 27 GENERAL CONTRACTOR SCOPE OF WO...
4. GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING FOR ALL ROOFTOP EQUIPMENT.
5. SUPPLIED BY VENDOR NO. 26.

MECHANICAL SYMBOLS

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

V2.06

STANDARD MOUNTING HEIGHT

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

INSTALL DEVICES AT THE MOUNTING HEIGHTS SHOWN ABOVE UNO IN THE CONSTRUCTION DOCUMENTS. MOUNTING HEIGHTS LISTED ABOVE OR ELSEWHERE IN THE CONSTRUCTION DOCUMENTS ARE AFF OR AFG TO BOTTOM OF DEVICE UNO. ALL DEVICES SHALL BE INSTALLED IN COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS.

ANNOTATION

1	MECHANICAL PLAN NOTE CALLOUT
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

A/C	AIR CONDITIONING
ACC	AIR COOLED CHILLER
ACCU	AIR COOLED CONDENSING UNIT
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AI	ANALOG INPUT
AO	ANALOG OUTPUT
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
AWG	AMERICAN WIRE GAUGE
B	BOILER
BAS	BUILDING AUTOMATION SYSTEM
BB	BACKBONE
BD	BACKDRAFT DAMPER
BD	BLOWDOWN
BFC	BELOW FINISHED CEILING
BFF	BELOW FINISHED FLOOR
BFG	BELOW FINISHED GRADE
BFP	BOILER FEED PUMP
BHP	BRAKE HORSEPOWER
BI	BINARY INPUT
BO	BINARY OUTPUT
BOD	BOTTOM OF DUCT
BOS	BOTTOM OF STRUCTURE
BTU	BRITISH THERMAL UNIT
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CLG	COOLING
CP	CONDENSATE PUMP
CPT	CONTROL POWER TRANSFORMER
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CRU	COMPUTER ROOM UNIT
CT	COOLING TOWER
CV	CONTROL VALVE
CWP	CONDENSER WATER PUMP
CU	CONDENSING UNIT
CHWP	CHILLED WATER PUMP
DB	DECIBELS
DBA	DECIBEL AVERAGE
DDC	DIRECT DIGITAL CONTROL
DI	DIGITAL INPUT
DISC	DISCONNECT
DN	DOWN
DS	DUCT SILENCER
DX	DIRECT EXPANSION
(E)	EXISTING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
ED	EXHAUST DUCT
EDB	ENTERING DRY BULB
EF	EXHAUST FAN
EFF	EFFICIENCY
EMS	ENERGY MANAGEMENT SYSTEM
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EWB	ENTERING WET BULB
EWT	ENTERING WATER TEMPERATURE
FCU	FAN COIL UNIT
FFA	FROM FLOOR ABOVE
FFB	FROM FLOOR BELOW
FF	FINISHED FLOOR
FPI	FINS PER INCH
FPM	FEET PER MINUTE
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HTG	HEATING
HWP	HEATING WATER PUMP
IN WC	INCHES OF WATER COLUMN
L	LOUVER
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB
LP	LOW PRESSURE
LWB	LEAVING WET BULB
LWT	LEAVING WATER TEMPERATURE
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MBH	1000 BTU PER HOUR
MD	MOTORIZED DAMPER
MFR	MANUFACTURER
MIN	MINIMUM
N/A	NOT APPLICABLE
N/C	NORMALLY CLOSED
N/O	NORMALLY OPEN
NOM	NOMINAL
NC	NOISE CRITERIA
NF	NON-FUSED
NIC	NOT IN CONTRACT
OA	OUTSIDE AIR
PICV	PRESSURE INDEP. CONTROL VALVE
PROVIDE	FURNISH AND INSTALL
QTY	QUANTITY
RA	RETURN AIR
RC	ROOM CRITERIA
RD	RETURN DUCT
REA	RELIEF AIR
RF	RETURN FAN
RFR	REFRIGERANT
RH	RELATIVE HUMIDITY
RH	ROOF HOOD
RPM	REVOLUTIONS PER MINUTE
RTU	ROOFTOP UNIT
SA	SUPPLY AIR
SCP	STEAM CONDENSATE PUMP
SD	SMOKE DUCT DETECTOR
SD	SUPPLY DUCT
SF	SUPPLY FAN
SH	SENSIBLE HEAT CAPACITY
SOW	SCOPE OF WORK
SP	STATIC PRESSURE
ST	STEAM TRAP
STM	STEAM
TBD	TO BE DETERMINED
TC/C	TEMPERATURE CONTROLS CONTRACTOR
TCP	TEMPERATURE CONTROL PANEL
TF	TRANSFER FAN
TFA	TO FLOOR ABOVE
TFB	TO FLOOR BELOW
TH	TOTAL HEAT CAPACITY
TSP	TOTAL STATIC PRESSURE
TT	TEMPERATURE TRANSMITTAL
TYP	TYPICAL
U/F	UNDERFLOOR
U/G	UNDERGROUND
U/S	UNDERSLAB
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VRF	VARIABLE REFRIGERANT FLOW
VRV	VARIABLE REFRIGERANT VOLUME
W/	WITH
W/O	WITHOUT
WB	WET BULB
WC	WATER COLUMN
WPD	WATER PRESSURE DROP
XP	EXPLOSION PROOF

HVAC DUCTWORK AND ACCESSORIES

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" (NECK SIZE)
CSD-1 (TYPE)
300 CFM (CFM OF SUPPLY DIFFUSER OR REGISTER)
24x24 (NECK SIZE)
CEG-1 (TYPE)
800 CFM (CFM OF EXHAUST GRILLE)
MANUAL VOLUME DAMPER
SQUARE TO ROUND TRANSITION
DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RD=RETURN)
ROUND DUCT TAG INDICATING DIAMETER
RECTANGULAR DUCT TAG INDICATING INTERNAL DUCT DIMENSIONS.
FLAT OVAL DUCT TAG INDICATING INTERNAL DUCT DIMENSIONS
RISER DESIGNATION
FIRE DAMPER
FIRE SMOKE DAMPER
SMOKE DAMPER
VOLUME DAMPER
MOTORIZED DAMPER
BACKDRAFT DAMPER

ALL DUCT DIMENSIONS SHOWN ON DRAWINGS ARE INSIDE DIMENSIONS. REFER TO DUCTWORK SPECIFICATIONS FOR DUCTWORK INSULATION AND LINER INFORMATION.

HVAC CONTROL DEVICES

H	HUMIDISTAT
T	THERMOSTAT
CO	CARBON MONOXIDE SENSOR
CO2	CARBON DIOXIDE SENSOR
DP	DIFFERENTIAL PRESSURE SENSOR
FS	FLOW SWITCH
HS	HUMIDITY SENSOR
PS	PULL STATION
RT	REMOTE TESTING STATION WITH INDICATING LIGHT
SP	STATIC PRESSURE
TS	TEMPERATURE SENSOR

PIPING SYMBOLS

DIRECTION OF FLOW
CONTROL VALVE
THREE-WAY CONTROL VALVE
SHUTOFF VALVE
CHECK VALVE
BALANCING VALVE WITH PRESSURE PORTS
TRIPLE DUTY VALVE WITH PRESSURE PORTS
STRAINER
STRAINER WITH BLOWDOWN VALVE
RELIEF / SAFETY VALVE
SOLENOID VALVE
PRESSURE REDUCING VALVE
GAS PRESSURE REGULATOR
THERMOSTATIC MIXING VALVE
PIPE ANCHOR
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
VACUUM RELIEF VALVE
AUTOMATIC AIR VENT
MANUAL AIR VENT
PRESSURE / VACUUM SWITCH
CLEANOUT
CAP
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
RECIRCULATION PUMP
P-TRAP
GAS COCK
TOP BEAM CLAMP
TRAPEZE HANGER
FLEXIBLE CONNECTION

PIPING LINETYPES

—CD—	CONDENSATE DRAIN (CD)
—ACD—	AUXILIARY CONDENSATE DRAIN (ACD)
—NPW—	NON-POTABLE WATER (NPW)
—G—	NATURAL GAS (G)
—G—	NATURAL GAS ON ROOF (G)
—MPG—	MEDIUM PRESSURE NATURAL GAS (MPG)
—MPG—	MEDIUM PRESSURE NATURAL GAS ON ROOF (MGP)
—FOS—	FUEL OIL SUPPLY (FOS)
—FOR—	FUEL OIL RETURN (FOR)
—FOV—	FUEL OIL VENT (FOV)
—LPG—	LIQUEFIED PETROLEUM GAS (LPG)
—BFW—	BOILER FEED WATER (BFW)
—HPS—	HIGH PRESSURE STEAM SUPPLY (HPS)
—HPC—	HIGH PRESSURE STEAM CONDENSATE (HPC)
—LPS—	LOW PRESSURE STEAM SUPPLY (LPS)
—LPC—	LOW PRESSURE STEAM CONDENSATE (LPC)
—PD—	CONDENSATE PUMP DISCHARGE (PD)
—HWS—	HEATING HOT WATER SUPPLY (HWS)
—HWR—	HEATING HOT WATER RETURN (HWR)
—CHWS—	CHILLED WATER SUPPLY (CHWS)
—CHWR—	CHILLED WATER RETURN (CHR)
—HCS—	HOT / CHILLED WATER SUPPLY (HCS)
—HCR—	HOT / CHILLED WATER SUPPLY (HCR)
—CWS—	CONDENSER WATER SUPPLY (CWS)
—CWR—	CONDENSER WATER RETURN (CWR)
—HPWS—	HEAT PUMP WATER SUPPLY (HPWS)
—HPWR—	HEAT PUMP WATER SUPPLY (HPWR)
—RL—	REFRIGERANT LIQUID (RL)
—RD—	REFRIGERANT DISCHARGE (HOT GAS) (RD)
—RS—	REFRIGERANT SUCTION (RS)
—RDB—	REFRIGERANT DISCHARGE BYPASS (RDB)
—RV—	REFRIGERANT VENT (RV)

LINETYPE LEGEND

THROUGHOUT THE DRAWINGS DIFFERENT LINETYPES ARE USED IN COMBINATION WITH THE SYMBOLS TO INDICATE THE STATUS OF ITEMS AS EXISTING, TO BE DEMOLISHED, TO BE INCLUDED AS PART OF NEW WORK AND/OR ITEMS WHICH ARE ANTICIPATED TO BE PROVIDED IN THE FUTURE. THE STATUS OF ITEMS USING THESE LINETYPES ARE RELATIVE TO THE VIEW IN WHICH THEY APPEAR. PHASING SHOWN IN DRAWINGS IS NOT INTENDED TO FULLY DESCRIBE ALL NECESSARY CONSTRUCTION PHASING, WHICH IS DETERMINED BY THE CONTRACTOR AS PART OF THEIR RESPONSIBILITIES. ANY SUCH PHASES DESCRIBED IN THE CONSTRUCTION DOCUMENTS ARE GENERAL AND ONLY INTENDED TO INDICATE A BROAD ORDER FOR THE SAKE OF DESCRIBING THE PROJECT. THE FOLLOWING LINETYPES MAY BE USED ON ANY DEVICE, EQUIPMENT, NOTE, LINE, SHAPE, ETC.

EXISTING	————	NEW	━━━━
DEMOLISH	— — — —	FUTURE	- - - - - - -

MECHANICAL AND PLUMBING EQUIPMENT COMPONENTS EARTHQUAKE LOAD RESISTANCE

Occupancy Category (II) **Seismic Design Category (D)**

LISTING OF EQUIPMENT AND SYSTEM COMPONENTS	ANCHORAGE TO FLOORS, ROOFS, ETC. (See Note 1 below)		SWAY BRACING (See Note 1 below)		LOCATION OF PROFESSIONALLY SEALED ANCHORAGE AND SWAY BRACING DETAILS		COMMENTS
					ON CONST. DOCUMENTS	SUBSEQUENT SUBMITTAL Separate Permit & Plans (See Note 2 below)	
	Not Provided For Project	Provided For Project	Not Provided For Project	Provided For Project	Drawing No. or Spec. Section		
FIRE PROTECTION, DETECTION & ALARM EQUIPMENT & SYSTEM COMPONENTS;							
Fire Sprinkler Piping		X	X			X	
HAZARDOUS EQUIPMENT & SYSTEM COMPONENTS;							All equipment shall be adequately anchored to resist all seismic forces. Submit signed and stamped calculations for seismic forces and anchorage capacities to the architect/engineer for review and approval. Exemptions: ASCE 13.1.4 & 13.6.8
Gas Piping		X	X				
Kitchen Exhaust Hood		X	X			X	
Kitchen Exhaust Fan		X	X			X	
OTHER EQUIPMENT & SYSTEM COMPONENTS NEEDED FOR CONTINUED OPERATION OF OCCUPANCY CATEGORY IV FACILITIES OR WHOSE FAILURE COULD IMPAIR THEIR CONTINUED OPERATION							
OTHER GENERAL EQUIPMENT & SYSTEM COMPONENTS Rooftop equipment:							
Rooftop Unit(s) (RTU, DOAS)		X	X			X	
Exhaust Fans (EF-1, KEF-1-4)		X	X			X	
Condensing Unit(s) (CU-1, Walk-ins, Custard machine)		X	X			X	All equipment shall be adequately anchored to resist all seismic forces. Submit signed and stamped calculations for seismic forces and anchorage capacities to the architect/engineer for review and approval. Contractor shall provide shop drawings to the engineer of record for review and approval prior to submittal to the plan reviewer. Exemptions: ASCE 13.1.4, 13.6.7
Equipment Suspended from structure:							
Fan Coil Unit (FCU-1)		X	X			X	
Unit Heater (UH-1)		X	X			X	
Air Curtain (AC-1)		X	X			X	
Diffusers, Registers, Grilles, Ductwork		X	X			X	

Notes:

1. It is the basic intent of this Code Block to declare whether or not anchorage and sway bracing is being provided on the project. If so, to declare whether or not the details are shown on the plans or will be shown on a subsequent submission. If seismic restraint of a component is not required by code this should be stated in comments. If seismic restraint, which is not required by code, is being provided due to owner/designer requirements this should also be stated in the comments.

2. Plans signed and sealed by a Missouri Professional Engineer along with a separate permit application need to be submitted to the County a minimum of two weeks prior to the planned installation to allow for plan review and distribution to the inspector. Additional time may be needed if such submissions are deficient.

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 DECRIPTION	Required Review Time (Business Days)	Architect of Record	Shake Shack	Commissioning Agent	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		X	
HVAC Equipment (if Carrier - Submitted by Owner Vendor directly to Owner/AOR prior to construction))	5	x		X		X	
MEP Tests, Start-Up, and Programming Reports	5	X		X		X	

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SEAL/ SIGNATURE:

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10/18/2021
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SHAKE SHACK

SHAKE SHACK -
CHESTERFIELD MO

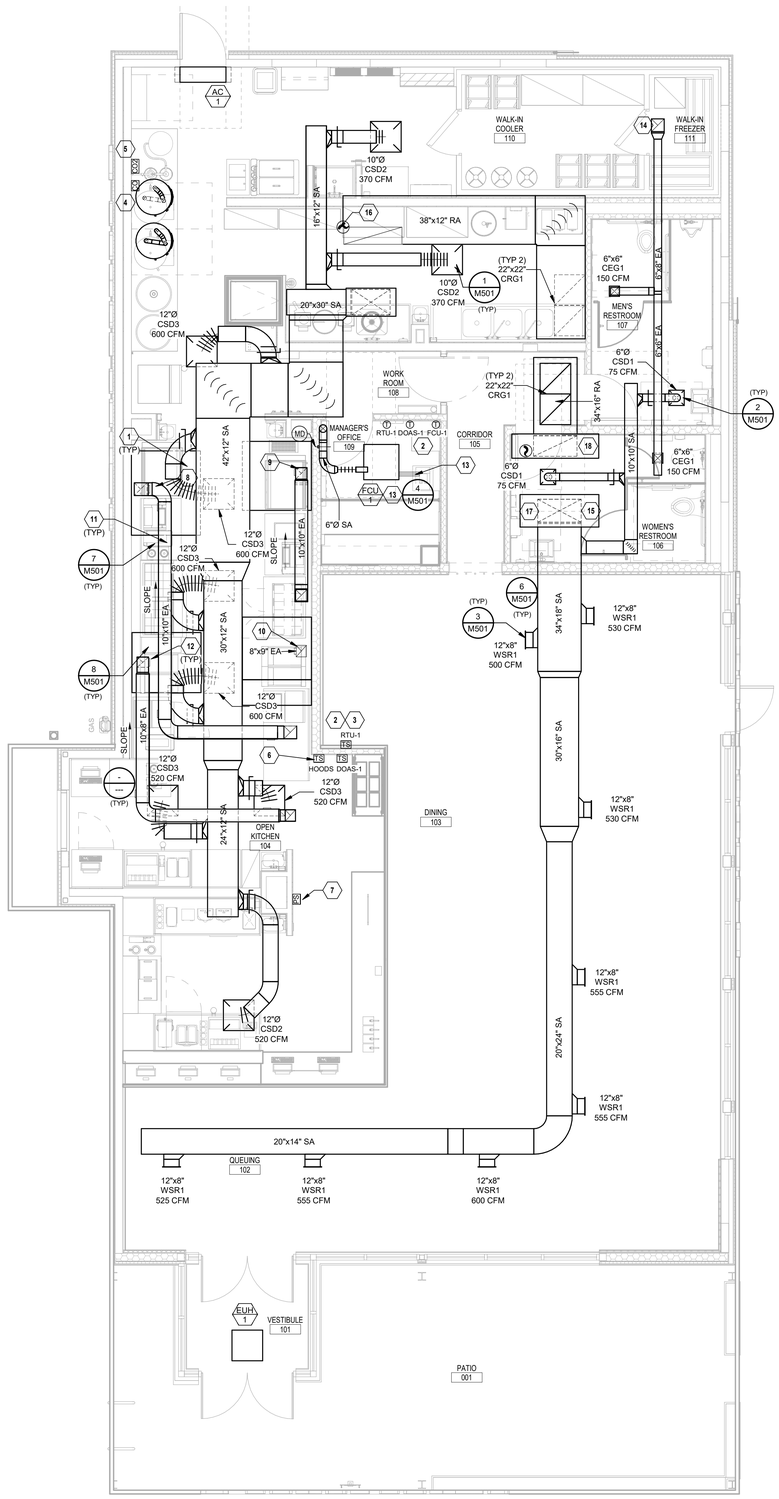
17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL
ABBREVIATIONS &
SYMBOLS

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

M001



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

MECHANICAL PLAN NOTES:

1. 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.
2. MOUNT THERMOSTATS AND TEMPERATURE SENSOR(S) ON WALL. THERMOSTATS AND SENSOR(S) SHALL BE LABELED TO MATCH THE UNIT TAG AND CORRESPOND TO THE ELECTRICAL LEGEND IN THE ELECTRICAL PANELBOARD SERVING THE EQUIPMENT. COORDINATE COLOR WITH ARCHITECT.
3. COMBINATION TEMPERATURE SENSOR AND HUMIDITY SENSOR.
4. CARBON MONOXIDE DETECTOR FURNISHED BY OWNER. INSTALL AT 5'-0" AFF. COORDINATE FINAL LOCATION WITH OWNER REPRESENTATIVE.
5. 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.
6. MOUNT TEMPERATURE SENSOR PROVIDED WITH KITCHEN EXHAUST HOODS ON WALL.
7. INSTALL HOOD FIRE SUPPRESSION MANUAL PULL STATION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FIRE SUPPRESSION SYSTEM INSTALLER AND THE AUTHORITY HAVING JURISDICTION.
8. 10"X10" GREASE DUCT UP THRU ROOF TO KEF-1, REF M150 FOR CONTINUATION. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION TO FAN.
9. 9"X9" GREASE DUCT UP THRU ROOF TO KEF-2, REF M150 FOR CONTINUATION. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION TO FAN.
10. 9"X8" GREASE DUCT UP THRU ROOF TO KEF-4, REF M150 FOR CONTINUATION. PROVIDE TRANSITION AS REQUIRED TO MAKE FULL SIZE CONNECTION TO FAN.
11. TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 16 GAUGE STEEL OR MINIMUM 18 GAUGE STAINLESS STEEL WITH LIQUID TIGHT WELDS. INSTALL ACCESS PANELS FOR CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES. TRANSITION GREASE DUCTWORK AS REQUIRED TO HOOD AND FAN CONNECTIONS. PROVIDE 45° MAX OFFSETS AS REQUIRED TO COORDINATE WITH STRUCTURE. PROVIDE RADIUS ELBOWS WITHOUT TURNING VANES. SLOPE HORIZONTAL GREASE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT. GREASE DUCTS SHALL BE CONTAINED IN A UL APPROVED GREASE DUCT WRAP SYSTEM.
12. 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.
13. REFRIGERANT PIPING UP TO CU-1 ON ROOF, REF 1/M150.
14. UP TO EF-1 ON ROOF.
15. PROVIDE SA DUCT THROUGH ROOF, FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR.
16. INSTALL DUCT SMOKE DETECTOR IN RETURN AIR PLENUM.
17. 60 DEGREE TRANSITION DOWN TO SA DUCT.
18. 60 DEGREE TRANSITION DOWN TO RA DUCT.

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

CONTACT:
WILL TURNBOUGH
WILL@NATIONALTAB.COM
855-682-6822 ext704

PROVIDE GREASE DUCT WRAP TO MEET EXCEPTION 3 OF SECTION 506.3.6 OF THE 2015 IMC.WRAP GREASE DUCT FROM NECK TO EXHAUST FAN INCLUDING WITHIN CURB WITH 3M FIRE WRAP. REFERENCE SPECS ON SHEET M591.

HOODS TO BE INSTALLED TO COMPLY WITH SECTION 507.2.6 OF THE 2015 IMC. REFER TO SHEET M701 FOR INCLUDED INTERNAL STANDOFFS TO MEET THE EXCEPTION OF THE CODE.

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SHAKE SHACK

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SHACK #1352

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MECHANICAL FLOOR PLAN

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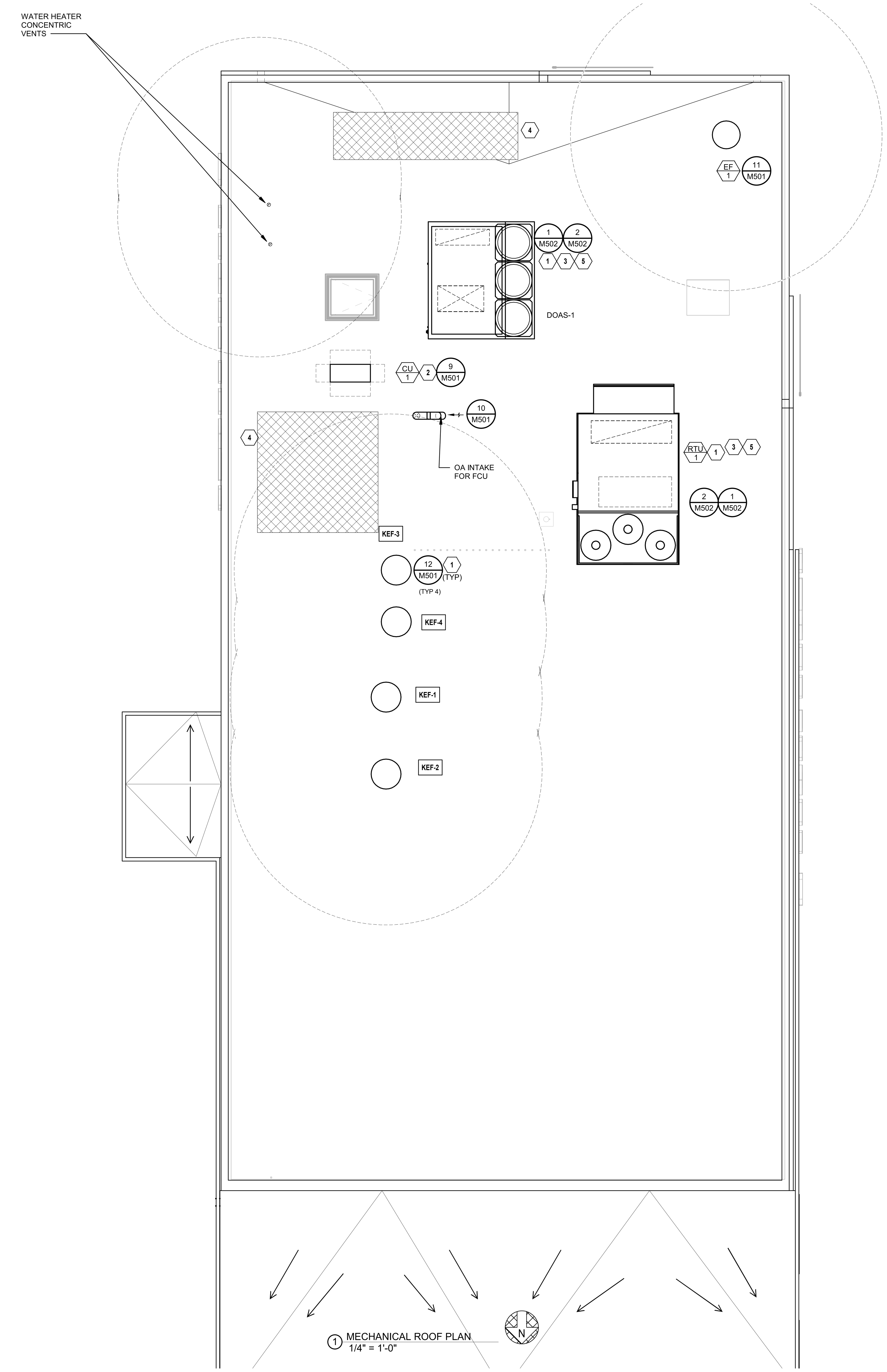
JOSHUA N. HOVER



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

MECHANICAL PLAN NOTES:

1. MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST, TYPICAL.
2. CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
3. REFERENCE P150 FOR CONDENSATE DRAIN ROUTING AND TERMINATION REQUIREMENTS.
4. AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR.
5. PROVIDE EQUIPMENT WITH NATIONAL TAB UV-PHI INDOOR AIR PURIFICATION SYSTEM, MODEL PHI-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.

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MECHANICAL ROOF PLAN

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JOB NO: 20087.00

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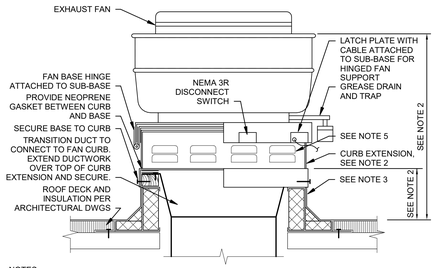
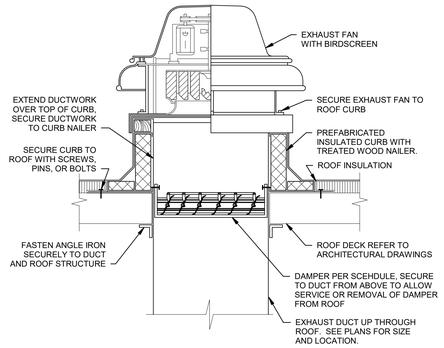
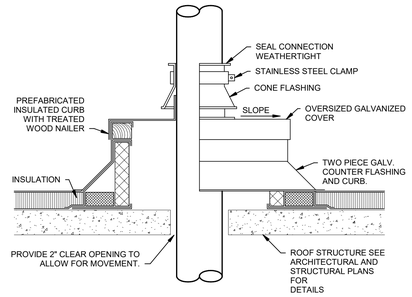


NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC. ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE.
2. IF DAMPER IS SPECIFIED IN EQUIPMENT SCHEDULE, INSTALL DAMPER AT BASE OF CURB AND SECURE FROM ABOVE TO ALLOW SERVICE THROUGH TOP OF CURB.
3. PREFABRICATED INSULATED ROOF CURB WITH TREATED WOOD NAILER, CANT, AND STEP AS REQUIRED TO ACCOMMODATE ROOF INSULATION. FRAME AND SECURE CURB TO ROOF WITH METHOD CONSISTENT WITH ROOF CONSTRUCTION. ROOF CURB SHALL BEAR ON ROOF STRUCTURE. REFER TO ARCHITECTURAL DRAWINGS AND CURB MANUFACTURER'S DETAILS FOR MORE INFORMATION.
4. FOR SLOPED ROOFS, PROVIDE CURB WITH DIMENSIONS CAPABLE OF COMPENSATING ROOF SLOPE TO ENSURE FAN IS INSTALLED LEVEL.
5. VENTED CURB EXTENSION. IF DOUBLE-WALL U.L. LISTED ZERO CLEARANCE GREASE DUCT IS USED, PROVIDE BLANK OFF PANELS ON INTERIOR OF CURB OPENINGS AND SEAL AIRTIGHT.

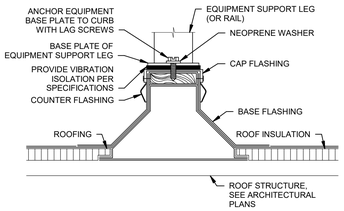
12 UPBLAST GREASE EXHAUST FAN DETAIL
NTS



11 DOWNBLAST EXHAUST FAN DETAIL
NTS

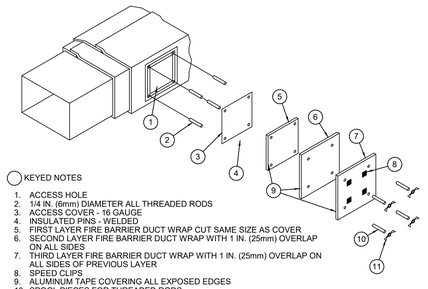


ROUND AIR DUCT OR PIPE PENETRATION THROUGH ROOF DETAIL
NTS



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

9 ROOF EQUIPMENT SUPPORT RAIL DETAIL
NTS

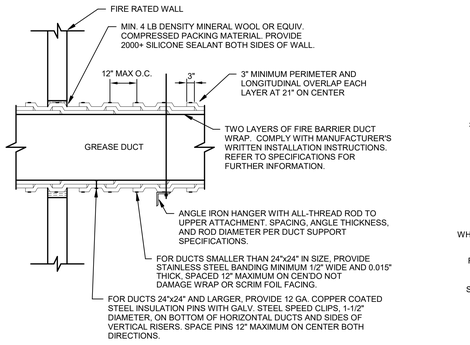


KEYED NOTES
1. ACCESS HOLE
2. 1/4 IN. (6mm) DIAMETER ALL THREADED RODS
3. ACCESS COVER - 16 GAUGE
4. INSULATED PINS - WELDED
5. FIRST LAYER FIRE BARRIER DUCT WRAP CUT SAME SIZE AS COVER
6. SECOND LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES
7. THIRD LAYER FIRE BARRIER DUCT WRAP 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

NOTES:

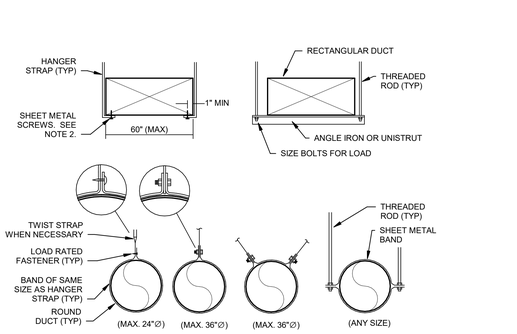
1. FOR REFERENCE ONLY. INSTALL PER MANUFACTURERS RECOMMENDATIONS.
2. AT CONTRACTOR'S OPTION, A LISTED UL 1978 GREASE ACCESS DOOR PRODUCT MAY BE SUBSTITUTED FOR THE ACCESS DOOR PICTURED IN THIS DETAIL. DOOR SHALL BE RATED FOR UP TO 2,300F AND MEET NFPA96 STANDARDS. BOLTS SHALL BE LONG ENOUGH FOR DUCT WRAP SYSTEM (WHEN USED). INSTALL IN ACCORDANCE WITH MANUFACTURER'S LITERATURE.

8 GREASE DUCT CLEANOUT ACCESS DOOR DETAIL
NTS



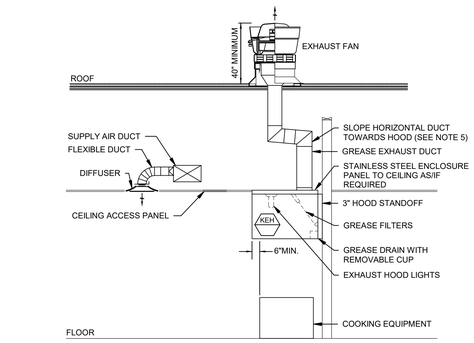
NOTES:
1. INSTALL GREASE EXHAUST AND FIRE RATED DUCT WRAP IN ACCORDANCE WITH THE MANUFACTURER'S APPROVED INSTRUCTIONS AND UL LISTED INSTALLATION DETAILS. TECHNIQUES THAT DIFFER FROM THE ABOVE METHOD ARE ACCEPTABLE IF THEY ARE UL TESTED AND APPROVED.

7 GREASE DUCT FIRE WRAP INSULATION INSTALLATION DETAIL
NTS



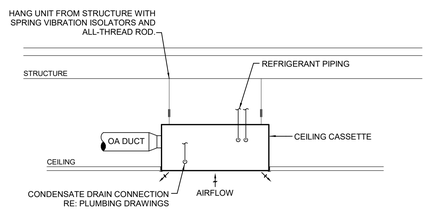
NOTES:
1. USE THREADED ROD FOR RECTANGULAR DUCTS LARGER THAN 60" WIDE.
2. OMIT SHEET METAL SCREWS IF HANGER STRAP IS CONTINUOUS AND LOOPS UNDER ENTIRE RECTANGULAR DUCT.
3. FOR ROUND DUCTS LARGER THAN 36"∅, USE TWO HANGER RODS TO SUPPORT DUCT FROM EACH SIDE.
4. HANGERS MUST NOT DEFORM DUCT SHAPE.

6 DUCT HANGER LOWER ATTACHMENT DETAILS
NTS



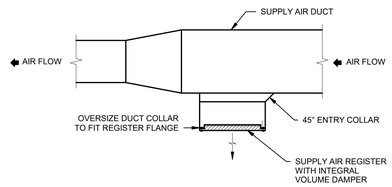
NOTES:
1. SUBMIT SHOP DRAWINGS OF ALL HOOD SYSTEMS TO CITY FOR APPROVAL PRIOR TO INSTALLATION.
2. TOTAL HOOD SYSTEM TO BE IN COMPLETE CONFORMANCE WITH NFPA, AND ALL LOCAL CODES AND REGULATIONS.
3. COORDINATE ALL FIRE PROTECTION SYSTEMS WITH FIRE PROTECTION CONTRACTOR WHO SHALL ALSO BE RESPONSIBLE FOR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

5 KITCHEN EXHAUST HOOD ELEVATION DETAIL
NTS

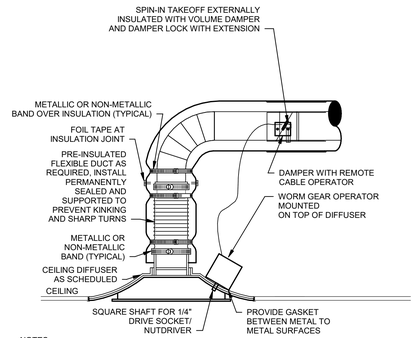


NOTES:
1. ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.
2. SET DAMPER TO DELIVER SCHEDULED OUTSIDE AIR FLOW.
3. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR MAXIMUM CONDENSATE DRAIN LIFT HEIGHTS.
4. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR HORIZONTAL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

4 CEILING CASSETTE DETAIL
NTS

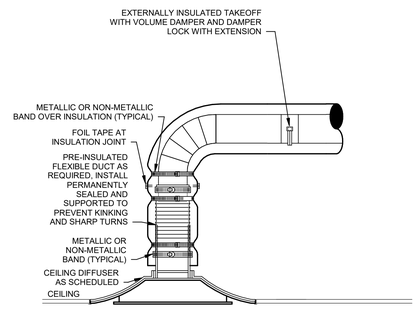


3 DUCT MOUNTED REGISTER DETAIL
NTS



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

2 HARD CEILING DIFFUSER DETAIL
NTS



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

1 LAY-IN CEILING DIFFUSER DETAIL
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SHAKE SHACK

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SHACK #1352

PERMIT SET

MECHANICAL DETAILS

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JOB NO: 20087.00

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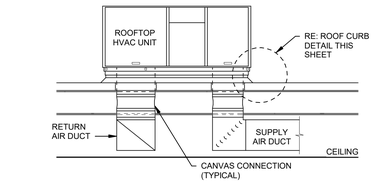
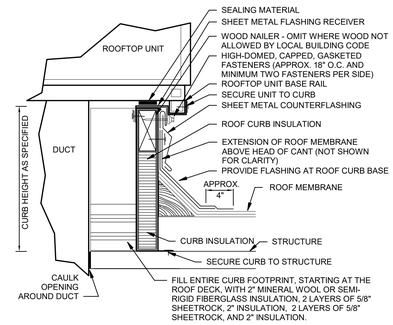


NOTES:

1. PROVIDE OPENING THROUGH ROOF AND ROOF DECK INSULATION NO LARGER THAN REQUIRED TO ALLOW DUCTS TO PASS THROUGH. REFER TO PLANS FOR DUCT SIZES. TRANSITION AS REQUIRED IN ROOF CURB TO RTU SUPPLY AND RETURN OPENINGS.
2. PROVIDE SLOPED ROOF CURB TO INSTALL ROOFTOP UNIT LEVEL TO ENSURE PROPER DRAINAGE. COORDINATE ROOF SLOPE WITH ARCHITECTURAL. FLASH AND COUNTER FLASH ROOF PENETRATIONS, ETC. TO ENSURE WEATHER TIGHT INSTALLATION.

2 ROOFTOP UNIT WITH DUCTWORK DETAIL
NTS



NOTES:

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

1 ROOF CURB DETAIL
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STATE OF MISSOURI
JOSHUA N. HOVER
NUMBER PE-2017008503
PROFESSIONAL ENGINEER

10/18/2021
JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK -
CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL DETAILS

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

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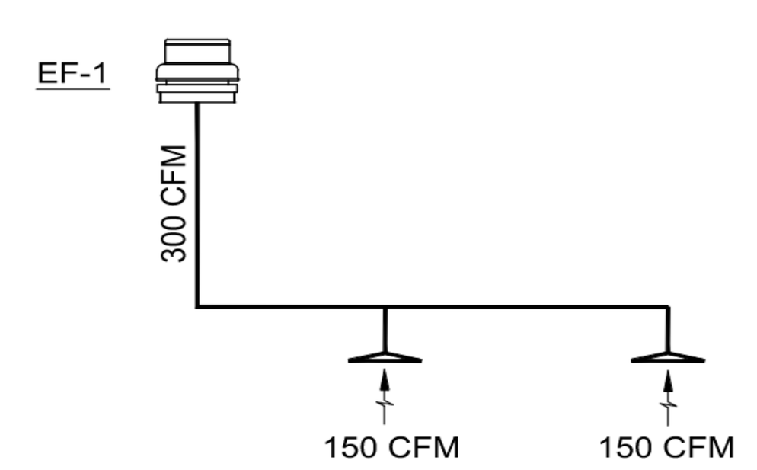
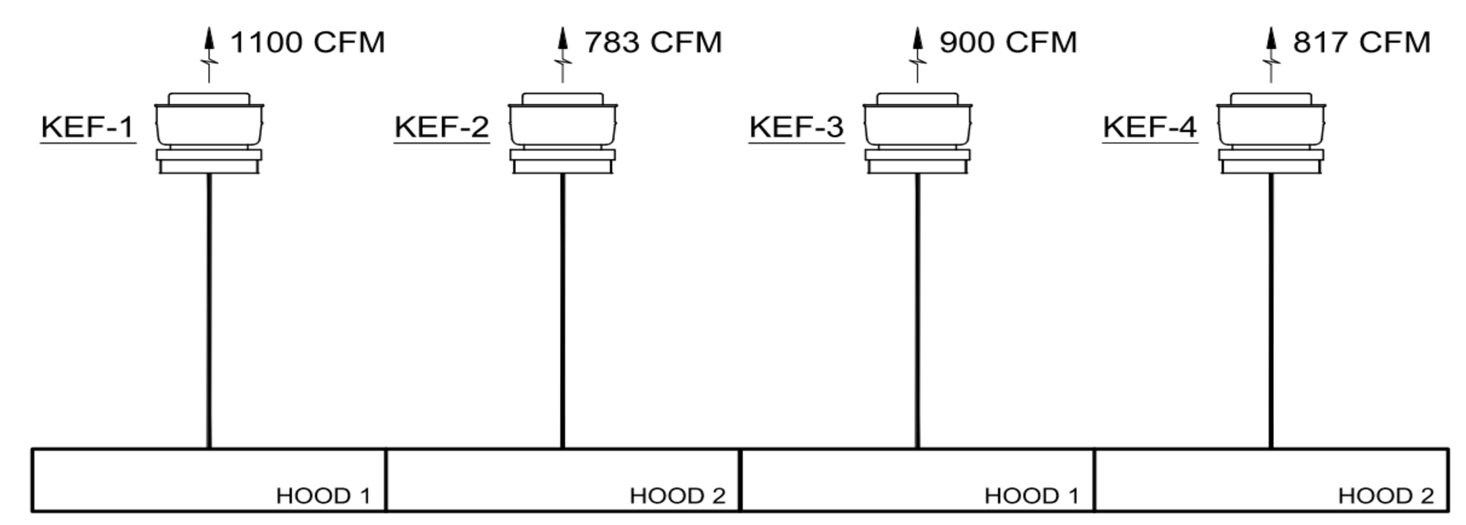


3 HVAC ONE-LINE DIAGRAM - EF-1
SCALE: NTS



4 HVAC ONE-LINE DIAGRAM - KEF 1,2,3,4
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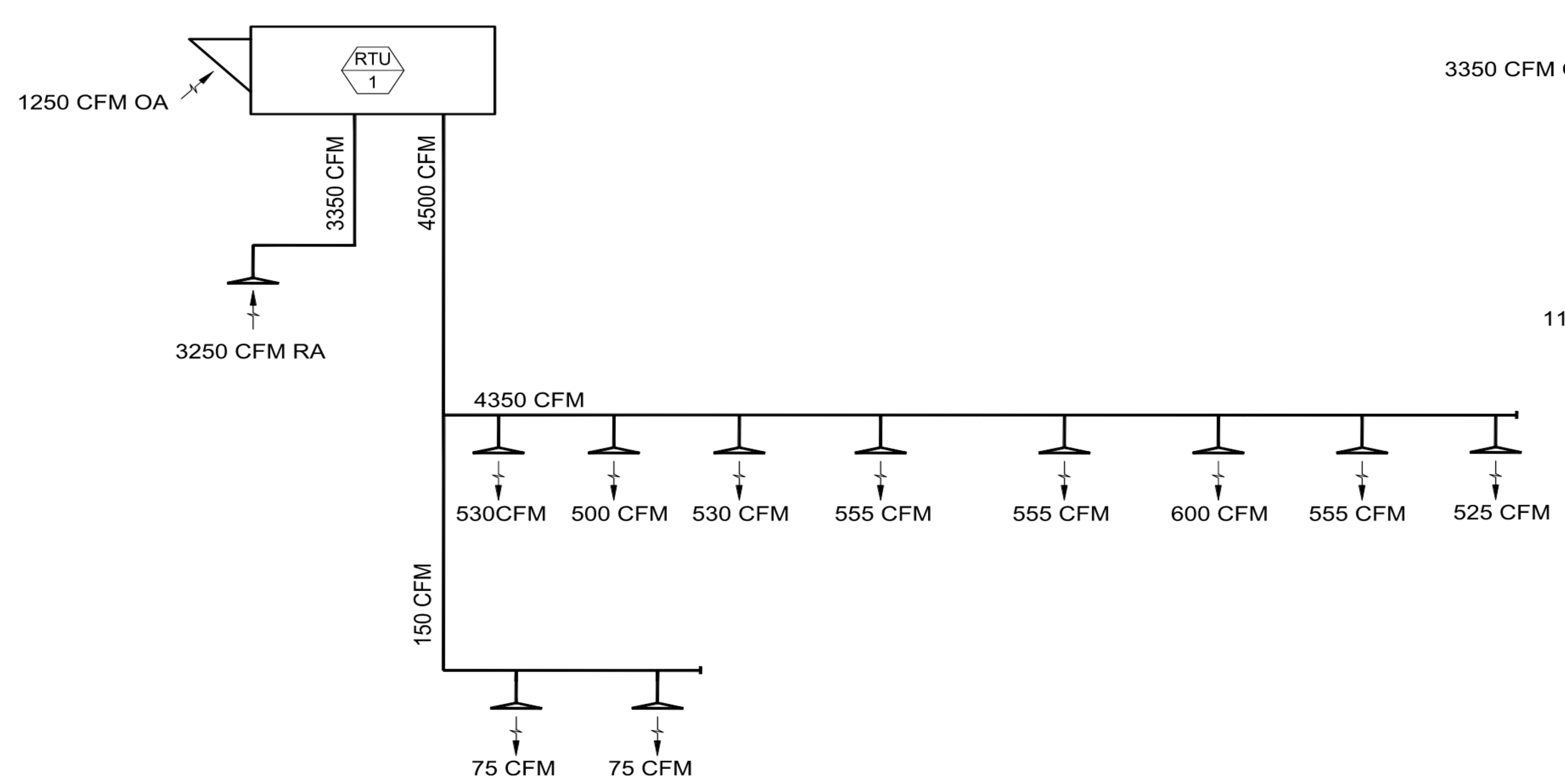

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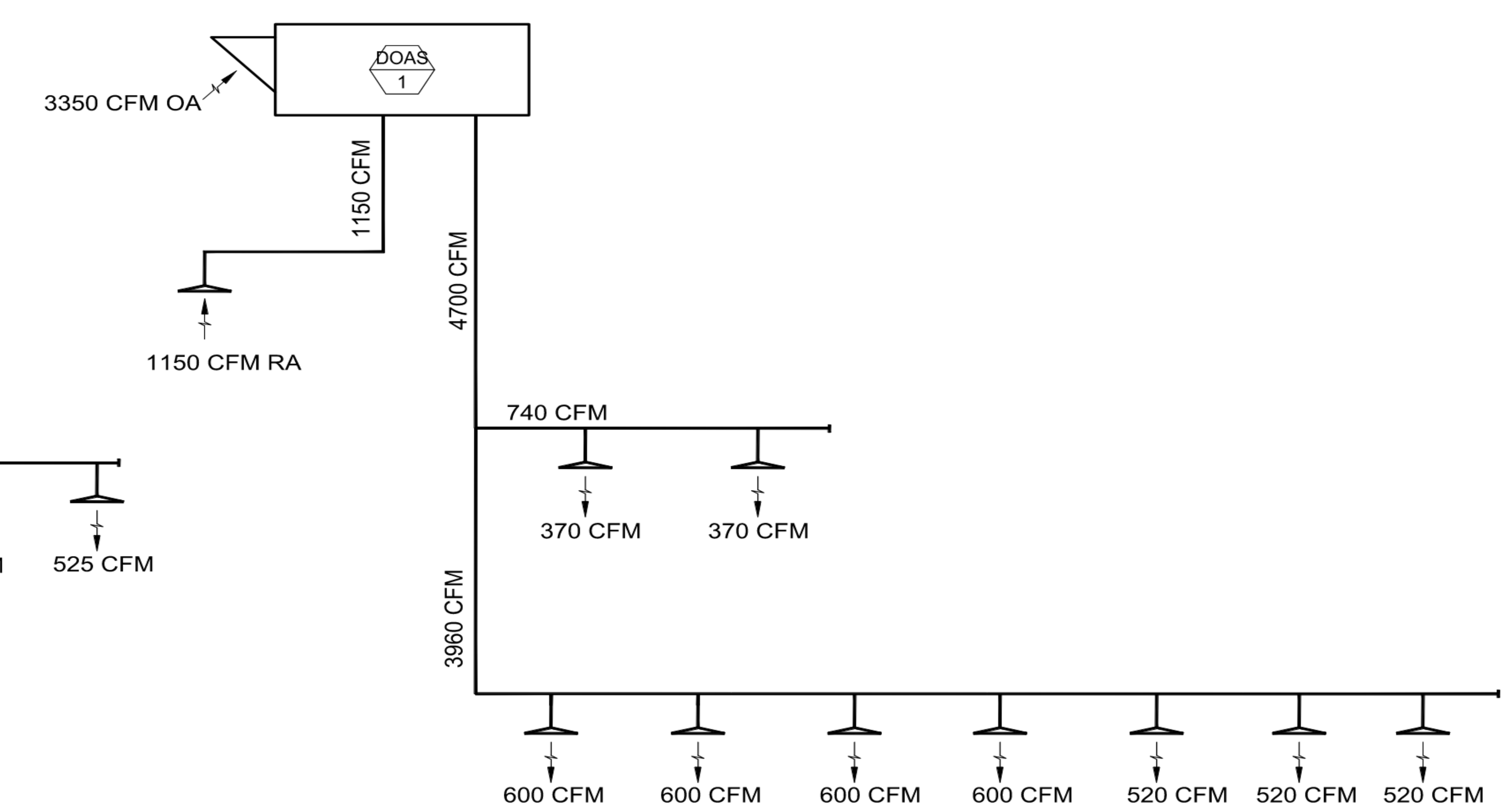

1 HVAC ONE-LINE DIAGRAM - DOAS 1
SCALE: NTS

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Bergmeyer
BOS
51 Sleeper St.
6th Floor
Boston, MA 02210
617.542.1025
LA
800 South Figueroa St.
Suite 1060
Los Angeles, CA 90017
212.337.1090
www.bergmeyer.com

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
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M503

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Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

1. GENERAL INSTRUCTIONS

A. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. 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 Electrical Code (NEC)
2. National Fire Protection Association (NFPA)
3. Underwriters Laboratories (UL)
4. Occupational Safety and Health Administration (OSHA)
5. American Society of Mechanical Engineers (ASME)
6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
7. American National Standards Institute (ANSI)
8. American Society of Testing and Materials (ASTM)
9. Other national standards and codes where applicable.

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

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

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

H. PROTECTION OF EQUIPMENT AND MATERIALS

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

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

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

I. SUBSTITUTIONS

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. The base bid shall include only the products from manufacturers specifically named in the drawings and specifications. To request a substitution, 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. BUILDING OPERATION

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

B. EXISTING EQUIPMENT REUSE AND REMOVAL

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

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

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

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

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

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

C. EXCAVATION AND BACKFILLING

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

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

D. COINCIDENTAL DAMAGE

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

E. CUTTING AND PATCHING

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

F. ROUGH-IN

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

G. STRUCTURALSUPPORT SYSTEMS

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

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

H. PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS AND CURBS

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

Attach equipment directly to pre-engineered roof equipment support using one of the following methods:
1. Rail Equipment Supports: Secure each equipment support leg to the rail with a minimum of 4 points of connection per leg.
2. Roof Curbs: Secure each corner of the equipment to the curb nailer using a minimum of 4 lag screws, located along the length of the equipment. Alternatively, Secure equipment to the curb using hold-down brackets. Provide minimum 6 inch long, 14 gauge galvanized steel brackets sized to wrap around top of curb and under equipment base rail with sufficient horizontal offset to cover overlap gap between the equipment rail and curb. Secure bracket to equipment and curb nailer using a minimum of 8 points of connection per bracket. Provide one bracket at each corner along the length of the unit.
3. Hold-Down Brackets: Coordinate with the curb manufacturer to determine the quantity and size of hold-down brackets and fasteners, with installation instructions for each unit to meet a Building Design Risk Category of [II][III or IV] and a Design Wind Speed of [XXX] mph.
4. Submit signed and sealed drawings that indicate the design and installation requirements of pre-engineered roof supports can withstand the design criteria listed. Include installation requirements for anchoring to the roof structure. The Engineer is not responsible and will not provide the seal and signature. Deliver submittal to the local AHJ for approval prior to installation of the contractor provided, pre-engineered roof supports.
5. Provide seismic restraints in accordance with Article “Seismic Controls for MEPF Systems.”

I. ACCESS PANELS AND DOORS

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

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

J. PENETRATIONS

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

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

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

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

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

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

Seal concrete or masonry exterior wall penetrations below grade with “wall pipes” and mechanical sleeve seals. Provide cast iron “wall pipes” with integral waterstop ring manufactured by Jay R. Smith, Josam, Wade, Watts or Zurn. Provide modular mechanical sleeve seals, manufactured by Calpico, Metraflex, or Thunderline / Link Seal.

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

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

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

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

K. FIRESTOPPING

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

Manufacturers: Hilti, RectorSeal, Specified Technologies Inc., United States Gypsum Company, or 3M corp.

Through and Membrane Penetration Firestopping Systems Product Schedule: Provide UL listing, location, wall or floor rating, and installation drawing for each penetration fire stop system.

Where project conditions require modification to qualified testing and inspecting agency’s illustrations for a particular firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer’s fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Include qualifications data for testing agency.

L. 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 5 horsepower and larger controlled by variable frequency drives shall be provided with a shaft grounding system equal to Aegis SGR Bearing Protection Ring, Inpro/Seal Current Diverter Ring (CDR) or approved equal. 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.

M. VARIABLE FREQUENCY DRIVES

Provide PWM variable frequency drives (VFD) to control fan or pump motors as indicated on the drawings. Provide VFD as manufactured by AC Technology, Asea Brown Boveri, Danfoss, Reliance Electric, or Yaskawa. Include an integral, door-interlocked input circuit breaker or fused disconnect which may be padlocked in the “OFF” position.

Provide a magnetic contactor manual bypass integral to each drive. Provide two magnetic contactors, mechanically and electrically interlocked, to isolate the inverter output from line voltage. The inverter input shall be isolated by either a third magnetic contactor or a second disconnect switch to allow removal of power to the inverter for service while still operating the motor across the line. Bypass shall include a 120/1/60 control transformer, fused on both the primary and secondary, and bi-metallic thermal motor overload relays with adjustable trip settings.

Provide input AC line reactors without exception. Reactors shall be minimum 3 percent impedance, and “K” rated per IEEE C57-110 for harmonic current content. Reactors shall be integral to the drive enclosure without need for field wiring.

The VFD shall have an RS-485 port as standard. The standard protocols shall be Johnson Controls N2 bus, Modbus, and Siemens Building Technologies FLN. Optional protocols for BACnetc, DeviceNet, Ethernet, LonWorks, and Profibus shall be available. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be “certified” by the governing authority. Use of non-certified protocols is not allowed. The VFD shall allow the DDC system to control the digital and analog outputs of the drive via the serial interface. This control shall be independent of any VFD function. In addition, all the digital and analog inputs of the drive shall be capable of being monitored by the DDC system.

Drive supplier shall provide jobsite start-up, Owner training, and a one-year parts and on-site labor warranty. Multiple visits shall be included to allow for tuning and troubleshooting of the controls system as required.

N. 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.

O. EQUIPMENT FURNISHED BY OTHERS

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

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

Bergmeyer

BOS
51 Sleeper St.
6th Floor
Boston, MA 02210
617.542.1025

LA
800 South Figueroa St.
Suite 1080
Los Angeles, CA 90017
212.337.1090

www.bergmeyer.com

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

JOSHUA N. HOVER
NUMBER PE-2017008503

10/18/2021
JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK -
CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL
SPECIFICATIONS

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

M590

P. SYSTEM TESTING, ADJUSTING, AND BALANCING

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

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.

Q. VIBRATION ISOLATION

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

General Requirements: Select vibration isolators by the weight distribution to produce uniform deflection. Vibration isolators shall have either known un-deflected heights or calibration markings so that, after adjustment, the static deflection can be verified, thus determining that the load is within the proper range of the isolator. Isolators shall operate in the linear portion of their load versus deflection curves. Spring 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 WP (Waffle Pads): Provide 5/16 inch thick neoprene pads ribbed or waffled on both sides. Manufacture pads with bridge bearing quality neoprene and select for a maximum durometer of 50 and designed for 15 percent strain, with a static deflection of 0.05 inches. Incorporate steel load-spreading plates where required between the equipment and the neoprene pad to provide selected deflection. If the isolator is bolted to the structure, install a neoprene mounting sleeve under the bolt head between the steel washer and the base plate to prevent metal to metal contact. Provide Mason Industries Type W or equal.

2. Type SPNH (Spring and Neoprene Hangers): Provide a steel hanger box containing a laterally stable, double-deflecting neoprene isolator in series with a steel spring. Design springs so the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80 percent of the compressed height of the spring at rated load. Loaded springs shall operate within the linear portion of their load versus deflection curve over a deflection range of not less than 50 percent above design deflection. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. Include a neoprene bushing to prevent contact between the lower hanger rod and hanger box and short-circuiting the isolating function. The neoprene element shall have a maximum durometer of 50 and designed for 15 percent strain, with a static deflection of not less than 0.4 inches. Unless otherwise specified, the static deflection of SPNH hangers shall be 2 inches. Provide SPNH hangers with 1 inch static deflection for water source heat pumps and fan-powered VAV terminal units. When installed, do not 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.

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

R. SEISMIC CONTROLS FOR MEPF SYSTEMS

Seismic Protection Criteria:

Risk/Occupancy Category:	II
Site Soil Category:	Contractor’s Seismic Engineer to Determine.
Seismic Design Category:	Contractor’s Seismic Engineer to Determine.
Component Importance Factor:	Determined from ASCE 7, most recent version.

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

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

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

The Contractor shall submit the following shop drawing information to the AHJ and the Engineer for review and approval:

1. Seismic analysis listing all applicable seismic design criteria.
2. Descriptive 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.

S. AIR FILTERS

Provide AAF/Flanders Perfect Pleat HC M8, Camfil Farr 30/30, pleated, throwaway type filters, minimum MERV 8, or similar as manufactured by Air Filter, Inc., Bioclimatic, Columbus, Koch, or approved equal, unless otherwise indicated.

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

T. REFRIGERANT AND OIL

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

U. IDENTIFICATION

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

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

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

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

Provide manufacturer’s standard laminated plastic, color coded equipment markers. Conform to the following color code: Green for Cooling; Yellow for 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

A. DUCT INSULATION

Provide fiberglass duct liner with fibers firmly bonded together with a thermosetting resin. Liner surface shall serve as a barrier against infiltration of dust and dirt, shall meet ASTM C1338 for fungi resistance, and shall be cleanable using duct cleaning methods and equipment outlined by 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 is1-1/2 inch thick, 1-1/2 pound density, minimum R-6.0 Certainteed 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-6.0duct 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.

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

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

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.

Coordinate with the pre-engineered roof duct support manufacturer to anchor the duct supports directly to the roof structure in accordance with the manufacturer’s installation instructions or provide intermediate duct supports engineered to meet the wind resistance and seismic design criteria. Reference Section, “PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS.”

Construct non-VAV supply ducts to meet SMACNA positive pressure of 2 inches w.g. Construct Return, Outdoor and Exhaust ductwork 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. The use of square throat, radius heel elbows is prohibited. Remove and replace all installed elbows of this type with an approved elbow at no additional cost to the owner.

Connect ducts to vibrating equipment and when transitioning between two different metallic duct materials (e.g., aluminum to galvanized steel) by means of flexible connectors. Flexible connectors shall be neoprene coated glass cloth canvas connections, Duro-Dyne, 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 concealed, remote cable-operated, butterfly-type volume damper assembly with external worm gear operator. Damper assembly shall include duct casing with rolled bead stiffeners, reinforced blade, self-lubricating bearing, and remote operator mounting plate. External operator shall attach to damper as a single piece with no linkage adjustment required. Damper shall be adjustable through the diffuser frame with standard 1/4 inch nutdriver or flat screwdriver. Provide positive, direct, two-way damper control with no sleeves, springs or screw adjustments to come loose after installation. Provide cable length to span the distance from the damper to the remote operator location. Install damper in branch duct. Do not install in diffuser neck. Install remote operator on the back of the diffuser frame or side of a slot diffuser plenum. Support cable assembly to avoid bends and kinks in cable at manufacturer recommended intervals. Where approved by architect, a ceiling cup with cover plate may be used for access to cable operator. Provide round dampers by Metropolitan Air Technology model RT-250, Young’s Regulator model 5020-1200, or approved equal. Provide rectangular dampers by Metropolitan Air Technology model RT-200, Young’s Regulator model 820-1200, or approved equal. Provide remote cable control by Metropolitan Air Technology model RT-WGA, Young’s Regulator model 270-275, or approved equal.

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

Size	Duct Gauge	Fitting Gauge
14” & under	26	24
15” thru 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.

G. PLASTIC FLUE GAS VENTS

Provide UL 1738 listed plastic flue gas vents, with positive or negative flue pressures complying with NFPA 211 and suitable for condensing gas appliances. Provide Polypropylene system by Centrotherm “Innoflue” or equal by Duravent "PolyPro Single-Wall".

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

H. 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 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 floor supply air registers of aluminum heavy duty type with 0 degree deflection. Provide opposed blade dampers for supply air registers and exhaust air registers unless indicated otherwise.

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

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

I. 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.

J. 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 pre-engineered 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 pre-engineered roof curb with minimum height as scheduled on the drawings. Exhaust fans serving Type I kitchen exhaust hoods shall discharge a minimum of 40 inches above the roof surface, 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 installed in accordance with NFPA 96 and local codes.

Provide wall mounted exhaust fans as scheduled on the drawings, Accurex, ACME, Carnes, Cook, Greenheck, Pennbarry, or Twin City Fans heavy-duty wall-mounted propeller fans, complete with belt drive with minimum of two belts, ball bearing supported fan shaft, ball bearing motor, magnetic starter, inlet screen, and motor-operated shutter.

Provide ceiling mounted exhaust fans as scheduled on the drawings, ACME, Carnes, Cook, Greenheck, Pennbarry, or Twin City Fans complete with isolated blower unit and ceiling grille. Provide disconnect switch, backdraft damper, discharge duct, [wall louver][roof jack][roof gooseneck], and neoprene vibration isolators with all-thread hanging rods.

Provide in-line (duct) mounted exhaust fans as scheduled on the drawings, ACME, Carnes, Cook, Greenheck, Pennbarry, or Twin City Fans complete with isolated blower unit and ceiling grille. Provide backdraft damper, discharge duct, [wall louver][roof jack][roof gooseneck], and vibration isolation as scheduled or shown on the drawings.

Provide dryer vent fan as scheduled on the drawings by Enervex, Fantech or Tjernlund complete with direct or belt drive, factory-mounted, variable speed motor, and consisting of fan wheel and housing. Housing shall be steel with corrosion resistant finish or cast aluminum housing, with duct connections designed to minimize lint collection. The housing shall be designed to allow the entire impeller and motor assembly to be removed as a unit. Provide a service door for cleaning and service. Provide Cast-aluminum, statically and dynamically balanced wheels. Provide totally enclosed, fan-cooled, variable speed motor with pre-lubricated and sealed ball bearings and Class B insulation. Provide modulating Fan Controller Suitable for maintaining constant pressure between 0.00 inches W.C. And 0.6 inches W.C. With a tolerance of 0.01 inches W. C., Duct probe with tubing and transducer and safety shut-off with visual alarm to shut down dryer on insufficient duct pressure or fan failure.

K. KITCHEN EXHAUST AIR SYSTEMS

Provide kitchen hood exhaust fan/filtered makeup air packaged unit as scheduled on the drawings, manufactured by Accurex Captive Aire or Halton, complete with upblast exhaust fan designed for grease applications, downblast makeup air fan, makeup air intake weatherhood with 1 inch thick aluminum mesh washable air filters, roof curb extension for 40 inches minimum exhaust discharge height above roof surface, combination roof curb of required height so that the makeup air intake is 14 inches minimum above roof surface, heavy gauge aluminum housings, aluminum centrifugal fan wheels, heat baffle, belt drive motors with integral thermal overload protection, disconnect switch in housing, bird screens, prewired control center, and accessories required to meet or exceed NFPA-96 requirements for commercial kitchen installations. Provided vented curb extension if a fire-rated, non-combustible enclosure is constructed. Provide a non-vented curb extension or blank off the vented curb extension if zero-clearance fire-rated wrap insulation is utilized.

Provide ducts connecting Type 1 exhaust hoods to exhaust fans made of #16 gauge black iron with continuously welded joints and clean-out doors. Provide at least one opening that is minimum size of 20 inches by 20 inches for personnel entry. Where an opening of this size is not possible, provide access openings at each change in direction and at 12 foot intervals. Locate openings on sides of duct 1-1/2 inches minimum from bottom and fit with grease-tight covers of same material as duct. Support systems for ducts 24 inch and larger in any dimension shall be designed for the weight of the duct plus 800 pounds at any point in the duct system. 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. Horizontal ducts that exceed 75 feet in length shall be sloped not less than 1 inch per 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 other 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, with features as noted in the RTU schedule and in the RTU Control Matrix, and complete with factory installed direct-drive hermetic compressors with internal spring vibration isolation, built-in motor thermal overload protection, crankcase heater, and low pressure switches; direct expansion cooling and condensing coils with1 inch factory installed flexible elastomeric insulation around the suction and liquid lines not directly located above a condensate drain pan and protective UV coating on any insulation exposed to sunlight, minimum SEER or EER rating (cooling) as required by the applicable energy code or greater if scheduled on the drawings, centrifugal evaporator blower; air filter rack, 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; relief; weathertight housing constructed of zinc coated, heavy gauge, galvanized steel with weather-resistant baked enamel finish; pre-engineered roof curb with minimum height as scheduled on the drawings if unit is equipped with internal vibration isolators; Type CMB if unit is not equipped with internal vibration isolators; single point electrical power connection. 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. 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.”

D. ELECTRIC INFRARED RADIANT HEATERS

Provide electric infrared radiant heaters as scheduled on the drawings, or equal by AmbiRad, Chromalox, King Electric, Markel, Berko, or Raywall, complete with painted-steel housing with anodized-aluminum reflector and baked enamel finish. Provide radiation pattern as scheduled, with a beam angle of 30, 60, or 90 degree symmetrical, or 60 degree asymmetrical pattern. Heating elements shall be quartz lamp with coiled tungsten-wire enclosed in clear quartz tube, nickel-chromium-wire enclosed in quartz tube, or nickel-chromium-wire embedded in magnesium oxide power and enclosed in metal sheath. Provide with manufacturer standard thermostat with all required contactors, relays and control transformers. Provide with tilt adjust mounting bracket and manufacturer standard supports for suspending of units from above. Install units with sufficient clearance from adjacent construction, piping, ductwork, and other obstructions to allow for service and maintenance, maintaining all manufacturer required clearances. Verify operation of each unit by measuring input voltage and current simultaneously for a period of ten minutes of continuous operation.

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

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

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.

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

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

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

Solder filler metals: ASTM B32, 95-5 Tin-Antimony.

Brazing filler metals:

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

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

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

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

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

B. SYSTEM EVACUATION AND CHARGING

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

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

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 electric heating to maintain room thermostat set point (75 degrees Fahrenheit cooling, 70 degrees Fahrenheit heating). Duct mounted smoke detectors shall shutdown unit upon alarm.

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

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

B. KITCHEN EXHAUST FAN CONTROL

Kitchen exhaust fan shall be energized through on-off switches at the associated exhaust hoods or cooking equipment or through a master kitchen ventilation control panel as indicated on the drawings.
Kitchen fans shall be interlocked to operate with cooking appliances, make-up air and other air-handling equipment providing fresh air to the kitchen area as noted or scheduled on the drawings.
The kitchen exhaust fan is interlocked with the cooking equipment in accordance with 507.1.1 of the IMC.
The makeup air unit shall be controlled to automatically start and operate with the kitchen exhaust fan per IMC 508.1.

C. DEDICATED OUTDOOR AIR UNIT CONTROL

Dedicated outdoor air unit (DOAS-1) supply air fan shall be energized and the outside air damper shall operate as scheduled when exhaust fans are energized. Exhaust fans and DOAS-1 shall modulate through the hood control panel. Refer to installation, operation, and maintenance manual.

D. ROOFTOP UNIT CONTROL

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

E. RESTROOM EXHAUST FAN (EF-1) CONTROL

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

F. AIR CURTAIN CONTROL

Interlock air curtain with door limit switch to energize when the door opens.

G. FIRE SUPPRESSION SYSTEM

Per section 509.2.2 of St. Louis County Ordinance, the actuation of the fire suppression system automatically shuts down the fuel or power to the cooking equipment (such fuel supply of power is reset manually).
The makeup air unit is interlocked with the automatic fire suppression system to shut down upon activation of the fire suppression system, per Section 509.2.2.1 of St. Louis County Ordinance. The exhaust fan shall remain in operation during fire conditions per 509.2.2.1 of St. Louis County Ordinance.

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.

END OF SECTION 23

Commissioning of Mechanical System
Commissioning of HVAC 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. Ductwork and piping
- B. Related Requirements:
  - 1. Section 019113 "General Commissioning Requirements" for general Cx process requirement and CxA responsibilities.

1.2 Informational Submittals

A. Construction Checklists: Draft construction checklists will be created by CxA for Contractor review.
B. Construction Checklists: Installation and Performance test checklists for systems, assemblies, subsystems, equipment, and components to be part of the Cx process and according to requirement in Section 019113

Bergmeyer

BOS
-
51 Sleeper St.
6th Floor
Boston, MA 02210
617.542.1025

LA
-
800 South Figueroa St.
Suite 1080
Los Angeles, CA 90017
212.337.1090

www.bergmeyer.com

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 **FAX** 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

JOSHUA N. HOVER
NUMBER
PE-2017008503

10/18/2021
JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK -
CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL
SPECIFICATIONS

DRAWN BY:	AJP
CHECKED BY:	BLM
JOB NO:	20087.00

M591

JOSHUA N. HOVER
10/18/2021 1:50:47 PM
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"General Commissioning Requirement."
1. Refrigerant piping, including the following:
a. Refrigerant piping, fittings, and specialties.
b. Refrigerant charge.
c. General duty and specialty valves.
d. Meters and gages.
2. Air distribution systems, including the following:
a. Supply, return, and exhaust systems.
b. Metal ducts, liners, and fittings.
c. Nonmetal ducts and fittings.
d. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.
e. Duct-mounted access doors and panels.
3. Kitchen exhaust system, including the following:
a. Exhaust and makeup air system.
b. Metal ducts, liners, and fittings.
d. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.
e. Duct-mounted access doors and panels.
f. Exhaust fans.
g. Make-Up air unit
4. Air-handling equipment, including the following:
a. Fans and motors.
b. Indoor air-handling units with and without coils, dampers, and filters.
c. Outdoor air-handling units with and without coils, dampers, and filters.

Part 3 Execution

3.1 Construction Checklists
A. Complete detailed construction checklists (prefunctional checklists) prepared by the CxA for HVAC systems, assemblies, subsystems, equipment, and components.
1. Air and hydronic distribution systems, including the following:
a. Supply, return, outdoor-air, and exhaust-air distribution systems.
b. Automatic dampers.
c. Control valves.
2. Heating and cooling terminal and unitary equipment, including the following:
a. Unit heaters.
b. Fan coil units.
c. Electric heating.
3. TAB verification.

3.2 Construction Checklist Review
A. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide item to Contractor.
B. Return draft construction checklist review comments within 5 days of receipt.
C. When review comments have been resolved, the CxA will provide final construction checklists marked "Approved for Use, (date)."
D. Use only construction checklists marked "Approved for Use, (date)."

3.3 Cx Testing Preparation
A. Certify that HVAC systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved submittals.
B. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, and alarm conditions).

3.4 Cx Tests Common to HVAC Systems
A. Comply with construction checklist requirements, including installation checks, startup, and performance tests requirements for HVAC systems and equipment.
B. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment and components, including operational and control functions, to verify compliance with acceptance criteria.
C. Coordinate schedule with, and perform Cx activities at the direction of CxA.
D. Provide technicians, instrumentation, tools, and equipment to perform and document the following:
1. Construction checklist verification tests.
2. Construction checklist verification tests demonstrations
3. Cx test demonstrations.

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

3.6 Mechanical Identification
A. Include all applicable "Start-Up Checks Common to All Systems".
B. Start-Up Checks: Perform the following checks:
1. Verify all valve tags, piping, duct, and equipment labeling corresponds with drawings and indexes and meets requirements specified. Correct any deficiencies for all piping and duct system.
2. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
3. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.7 Mechanical Insulation
A. Include all applicable "Start-Up Checks Common to All Systems".
B. Start-Up Checks: Examine all piping, systems and equipment specified to be insulated.
1. Ensure quality of insulation. Patch and repair all insulation damaged after installation.
2. Ensure the integrity of vapor barrier around all cold surfaces.

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

3.9 AC Motors
A. Include all applicable "Start-Up Checks Common to All Systems".
B. Start-Up Checks: Perform the following checks during start-up and as specified in manufacturer's instructions:
1. Verify proper alignment, installation, and rotation.
2. Verify properly sized overloads are in place.
C. Start-Up Tests: Perform the following tests, measurements, or procedures during start-up and as specified in the manufacturer's 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.

3.9 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.

3.10 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.

3.11 Fans
A. Include all applicable "Start-Up Checks Common to All Systems".
B. General: Provide the services of a factory-authorized service representative to test and inspect exhaust fan installation, provide startup service, and to demonstrate and train Owner's maintenance personnel is required by the Owner.
C. Start-Up Checks: Perform the following inspections/checks during start-up:
1. Inspect the field assembly of components and installation of the units, piping, ductwork, and electrical connections.
2. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, coils entering air face. Ensure volatile irritants are contained and kept out of occupied spaces.
3. Adjust and lubricate dampers and linkages for proper damper operation.
4. Verify the unit is secure on mountings and supporting devices and connections for ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
5. Ensure vibration isolation integrity is maintained with the fan installation and associated connections.
6. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
7. Stroke all dampers to ensure free and full travel.

3.12 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.

Bergmeyer
www.bergmeyer.com
LA - 800 South Figueroa St. Suite 1600, Los Angeles, CA 90017 212.337.1090
BOS - 51 Sleeper St. 6th Floor, Boston, MA 02210 617.542.1025

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 **FAX** 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

STATE OF MISSOURI
JOSHUA N. HOVER
NUMBER PE-2017008503
PROFESSIONAL ENGINEER

10/18/2021
JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL SPECIFICATIONS

DRAWN BY:	AJP
CHECKED BY:	BLM
JOB NO:	20087.00

M592

10/18/2021 1:59:53 PM C:\Revit\Projects\20500\20215_MEP_V20_andrew.pettus_20211018134559.rvt
JOSHUA N. HOVER

ROOFTOP UNIT CONTROL MATRIX

CONTROL FEATURE	UNITS	RTU-1 DINING SETPOINT OR Y/N	NOTES
SETPOINTS			
COOLING - OCCUPIED SETPOINT	°F	75	
COOLING - UNOCCUPIED SETPOINT	°F	80	
HEATING - OCCUPIED SETPOINT	°F	70	
HEATING - UNOCCUPIED SETPOINT	°F	60	
DEHUMIDIFICATION SETPOINT - HUMIDITY SENSOR FEEDBACK	% RH	60%	B
PROGRAMMED CONTROL FEATURES			
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT		Y	B
REMOTE TEMPERATURE SENSOR		Y	B
EQUIPMENT ACCESSORIES AND CONTROL MODULES			
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)		Y	L
INTEGRATED ECONOMIZER - DIFFERENTIAL ENTHALPY ENABLE (OA ENTHALPY < RA ENTHALPY)	BTU/LB	Y	E
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM		Y	F, G
RELIEF - BAROMETRIC DAMPER		Y	
COOLING COIL (DX - STAGED)		Y	M
DEHUMIDIFICATION - HOT GAS REHEAT		Y	O
HEATING COIL (NATURAL GAS)		Y	M
SUPPLY FAN CONTROL METHODS			
ON DURING OCCUPIED HOURS		Y	
CYCLE WITH LOADS DURING UNOCCUPIED HOURS		Y	
SAFETIES, INTERLOCKS, AND ALARMS			
GAS VALVE SAFETY		Y	F
RETURN AIR SMOKE DETECTOR - SAFETY SHUTDOWN		Y	U
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK		Y	
KITCHEN EXHAUST SYSTEM INTERLOCK		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. REFERENCE DIVISION SPECIFICATIONS FOR INDIVIDUAL DEVICE REQUIREMENTS.

NOTES:

B. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.
E. IF SETPOINT VALUE IS LISTED, IT INDICATES ECONOMIZER HIGH-LIMIT SHUTOFF. UNIT SHALL BE IN ECONOMIZER IF CONDITIONS ARE LESS THAN SETPOINT. THE FOLLOWING SENSORS SHALL DETERMINE ECONOMIZER ON POINT.
   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.
L. EQUIPMENT MANUFACTURER SHALL PROVIDE MODULATING DAMPER AND CONTROLS CAPABLE OF ADJUSTING THE DAMPER POSITION TO MAINTAIN THE SCHEDULED OUTSIDE AIR ON THE DRAWINGS ACROSS ALL FAN SPEEDS. DIV. 23 CONTRACTOR SHALL PROGRAM MULTIPLE DAMPER POSITION SETPOINTS IN THE FIELD DURING TESTING AND BALANCING TO MAINTAIN MINIMUM VENTILATION WHEN NOT IN ECONOMIZER. 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 ZONE AIR HUMIDITY.
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.
U. DIVISION 28 CONTRACTOR SHALL PROVIDE DEVICE.

BUILDING AIR BALANCE SUMMARY NORMAL OPERATION

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OA/SA
DOAS-1	4,700	2,700	--	57%
RTU-1	4,500	1,250	--	28%
KEF-1	--	--	700	--
KEF-2	--	--	1,050	--
KEF-3	--	--	642	--
KEF-4	--	--	642	--
EF-1	--	--	300	--
TOTAL	9,200	3,950	3,334	--
DESIGN BUILDING PRESSURIZATION AIRFLOW (CFM)				616
X PRESSURIZATION CHECK				16%

BUILDING AIR BALANCE SUMMARY ECONOMIZER MODE

UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT OA/SA
DOAS-1	4,700	2,700	--	57%
RTU-1	3,015	3,015	--	100%
KEF-1	--	--	700	--
KEF-2	--	--	1,050	--
KEF-3	--	--	642	--
KEF-4	--	--	642	--
EF-1	--	--	300	--
BAROMETRIC RELIEF RTU-1	--	--	1,765	--
TOTAL	7,715	5,715	5,099	--
DESIGN BUILDING PRESSURIZATION AIRFLOW (CFM)				616
X PRESSURIZATION CHECK				11%

PROJECT DESIGN CONDITIONS

CLIMATE CONDITONS

WEATHER STATION:		ST LOUIS DOWNTOWN AP, IL			
CLIMATE ZONE		4A			
HEATING (DB):	99.6%	12.7	°F		
COOLING (DB/MCWB):	0.4%	95.4	°F/	76.6	°F/

BUILDING...

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

SPACE / UNIT DESCRIPTION	SET POINTS: COOLING / DE-HUMIDIFICATION OCC °F	UNOCC °F	MAX RH %	MIN RH %	HEATING OCC °F	HEATING UNOCC °F	HUMIDIFICATION MIN RH %	HUMIDIFICATION MAX RH %	ZONE VENTILATION RESET CONTROL METHOD	ZONE VENTILATION RESET BASE PPM	ZONE VENTILATION RESET MAXIMUM PPM	SPACE OPERATING HOURS OCCUPIED / UNOCCUPIED M-F	SAT	SUN	NOTES
DINING AREAS	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C
OFFICES	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C
STOCKROOM/STORAGE	75	80	50%	NA	70	60	NA	NA	NA	NA	NA	TBD	TBD	TBD	A,B,C
FOOD PREP AREAS	75	80	50%	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 CFM	SUPPLY FAN ESP (IN)	SUPPLY FAN BHP	SUPPLY FAN VFD (Y/N)	COOLING COIL TH (MBH)	COOLING COIL SH (MBH)	COOLING COIL EAT (°F DB)	COOLING COIL EAT (°F WB)	COOLING COIL LAT (°F DB)	COOLING COIL LAT (°F WB)	COOLING COIL REFR TYPE	COOLING COIL MIN EFF (EER)	COOLING COIL MIN EFF (IEER)	COOLING COIL MIN NO STAGES	HEAT EXCHANGER MIN OUT (MBH)	HEAT EXCHANGER NOM INPUT (MBH)	HEAT EXCHANGER MIN EFF (%)	HEAT EXCHANGER EAT (°F DB)	HEAT EXCHANGER LAT (°F DB)	HEAT EXCHANGER MIN NO STAGES	MIN O/A CFM	ELECTRICAL V/PH	ELECTRICAL MCA	ELECTRICAL MOCP	ELECTRICAL DISC TYPE	WEIGHT (LBS)	NOTES
RTU-1	CARRIER	48HCDE17	15	SINGLE ZONE	4,500	0.5	1.31	N	161.5	105.2	80.3	68.2	59.1	57.3	R410A	12	13	2	178	220	81	52.9	89.4	2	1250	208/3	69.2	90	NON-FUSED	2002	A-R

*** EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS. EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T.12 / VENDOR LIST FOR MORE INFORMATION.**
MODEL NUMBERS AND NOMINAL TONS LISTED SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER, MODEL NUMBERS, OR NOMINAL TONS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:

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" MERV 8, EFFICIENT PLEATED THROWAWAY AIR FILTERS.
D. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
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.
G. PROVIDE SINGLE POINT POWER CONNECTION.
H. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
J. 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.
K. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
L. 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.
M. PROVIDE INSULATED ROOF CURB WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 18 INCHES ABOVE FINISHED ROOF SURFACE. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE. COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDINATE CURB TYPE WITH DRAWINGS.
N. SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT ONLY.
O. COOLING COIL LAT IS LEAVING AIR TEMPERATURE OF COIL.
P. PROVIDE GUARDS TO PROTECT CONDENSER COIL FROM HAIL OR OTHER DAMAGE.
Q. PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED. MEET MINIMUM EFFICIENCY SCHEDULED.
R. PROVIDE EQUIPMENT WITH AIRBORNE DISINFECTION SYSTEM, RGF MODEL PHI-PKG14-24V.

FAN SCHEDULE

MARK	SERVICE DESCRIPTION	MANUFACTURER	MOUNTING	MODEL	CFM	ESP (IN)	BHP	NOM HP	FAN RPM	DRIVE (BELT/DIRECT)	VFD (Y/N)	ELECTRICAL V/PH	ELECTRICAL DISC TYPE	ELECTRICAL STARTER TYPE	WEIGHT (LBS)	NOTES
EF-1	TOILETS	GREENHECK	ROOF	G-095-D	300	0.5	0.1	1/8	1550	DIRECT	N	120/1	NON-FUSED	N/A	30	A - E

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

NOTES:

A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
B. PROVIDE WITH MINIMUM 24" HIGH ROOF CURB, BIRDSCREEN AND BACKDRAFT DAMPER.
C. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
D. INTERLOCK FAN OPERATION WITH TIME CLOCK.
E. PROVIDE WITH MANUFACTURER'S FAN SPEED CONTROLLER FOR BALANCING PURPOSES.

FAN COIL UNIT SCHEDULE (HEAT PUMP)

MARK	MFR	MODEL	SUPPLY FAN CFM	SUPPLY FAN ESP (IN)	SUPPLY FAN NOM HP	COOLING COIL TH (MBH)	COOLING COIL SH (MBH)	COOLING COIL EAT (°F DB)	COOLING COIL EAT (°F WB)	COOLING COIL LAT (°F DB)	COOLING COIL LAT (°F WB)	COOLING COIL REFR TYPE	HEAT PUMP HEATING COIL MIN OUT (MBH)	HEAT PUMP HEATING COIL AMBIENT (DB)	HEAT PUMP HEATING COIL EAT (°F DB)	HEAT PUMP HEATING COIL LAT (°F DB)	MIN O/A (CFM)	ELECTRICAL V/PH	ELECTRICAL MCA	ELECTRICAL MOCP	ELECTRICAL DISC TYPE	WEIGHT (LBS)	NOTES
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	15	20	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 ROUTE CONDENSATE DRAIN PIPING FROM UNIT TO NEAREST FLOOR DRAIN AND TERMINATE WITH CODE-APPROVED AIR GAP.

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	208/1	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 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 LENGTH (IN)	UNIT SPECS MAX. AIRFLOW	UNIT SPECS HEATING CAPACITY (KW)	UNIT SPECS MOTOR (HP)	V/PH/HZ	NOTES
AC-1	SERVICE ENTRY	MARS	STD2	36	1379	N/A	1/2	115/1	A-E

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NOTES:

A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
B. MOUNT UNIT PER MANUFACTURERS RECOMMENDATIONS TO FACE OF WALL AND SUPPORT VERTICALLY.
C. PROVIDE INTEGRAL STARTER AND DISCONNECT SWITCH.
D. PROVIDE AIR CURTAIN WITH NORMALLY CLOSED DOOR LIMIT SWITCH FOR INSTALLATION ON DOOR. THE AIR 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 TH (MBH)	COOLING CAPACITY AMBIENT (DB)	COOLING CAPACITY MIN EFF (SEER)	HEATING CAPACITY CAP (MBH)	HEATING CAPACITY AMBIENT (DB)	HEATING CAPACITY MIN EFF COP 47°F	ELECTRICAL MCA	ELECTRICAL MOCP	ELECTRICAL V/PH	WEIGHT (LBS)	NOTES
CU-1	FCU-1	CARRIER	38MAQB18	R410A	11.6	91.0	19.0	12.2	8.7	3.3	13	15	208 / 1	102.5	A - H

*** EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T002 / VENDOR LIST FOR MORE INFORMATION.**
MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

NOTES:
A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
B. 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.

GRILLE, REGISTER, AND DIFFUSER SCHEDULE

MARK	MANUFACTURER	SERVICE	MODEL	CONSTRUCTION MATERIAL	FACE TYPE	MOUNTING LOCATION	FACE SIZE (IN)	MAX. NC	NOTES
CEG1	E.H. PRICE	EXHAUST GRILLE W/ DAMPER	80D	STEEL	EGGCRATE	SURFACE	12x12	30	A B C F G H
CRG1	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
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

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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...

Bergmeyer
www.bergmeyer.com
LA - 800 South Figueroa St. Suite 1600, Los Angeles, CA 90017 213.337.1090
BOS - 51 Sleeper St. 5th Floor, Boston, MA 02210 617.542.1025

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

STATE OF MISSOURI
JOSHUA N. HOVER
NUMBER PE-2017008503
PROFESSIONAL ENGINEER

10/18/2021

JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL SCHEDULES

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

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JOSHUA N. HOVER

DEDICATED OUTDOOR AIR UNIT CONTROL MATRIX

CONTROL FEATURE	UNITS	DOAS-1 SETPOINT OR Y/N	NOTES
SETPOINTS			
COOLING - OCCUPIED SETPOINT	°F	72	
HEATING - OCCUPIED SETPOINT	°F	68	
DEHUMIDIFICATION SETPOINT - HUMIDITY SENSOR FEEDBACK	% RH	60%	B
PROGRAMMED CONTROL FEATURES			
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - OCCUPANCY SENSOR		Y	C
INTEGRAL TEMPERATURE SENSOR		Y	B
EQUIPMENT ACCESSORIES AND CONTROL MODULES			
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)		Y	K
COOLING COIL (DX - VARIABLE SPEED)		Y	M
DEHUMIDIFICATION - HOT GAS REHEAT		Y	O
HEATING COIL (NATURAL GAS)		Y	M
SUPPLY FAN CONTROL METHODS			
ON CONTINUOUSLY DURING OCCUPIED HOURS		Y	
CYCLE WITH LOADS DURING OCCUPIED HOURS		Y	
OFF DURING UNOCCUPIED HOURS		Y	
VARIABLE VOLUME - MODULATE FAN SPEED IN RESPONSE TO DUCT STATIC PRESSURE		Y	M, R
SAFETIES, INTERLOCKS, AND ALARMS			
GAS VALVE SAFETY		Y	F
SUPPLY AIR SMOKE DETECTOR - SAFETY SHUTDOWN		Y	U
LOW LIMIT FREEZESTAT - FREEZE PROTECTION SAFETY SHUTDOWN		Y	F
DIFFERENTIAL PRESSURE SWITCH - FILTER CHANGE ALARM		Y	F
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK		Y	
KITCHEN EXHAUST SYSTEM INTERLOCK		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. REFERENCE DIVISION SPECIFICATIONS FOR INDIVIDUAL DEVICE REQUIREMENTS.

NOTES:

B. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.
C. DIVISION 26 CONTRACTOR SHALL PROVIDE DEVICE.
F. DEVICE SHALL BE FACTORY MOUNTED AND PRE-WIRED FOR OPERATION SUBJECT TO THE ONBOARD CONTROLLER.
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 SUPPLY 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.
U. DIVISION 28 CONTRACTOR SHALL PROVIDE DEVICE.

DEDICATED OUTDOOR AIR UNIT SCHEDULE (DX COOLING, NATURAL GAS HEAT)

MARK	MANUFACTURER	MODEL	UNIT TYPE	SUPPLY FAN				DX COOLING COIL						GAS HEAT EXCHANGER			ELECTRICAL			WEIGHT (LBS)	NOTES
				CFM	ESP (IN)	BHP	MIN OA (CFM)	TH (MBH)	SH (MBH)	EAT (°F DB)	EAT (°F WB)	LAT (°F DB)	LAT (°F WB)	REFR TYPE	MIN OUT (MBH)	NOM INPUT (MBH)	MIN EFF (%)	LAT (°F DB)	V/PH	DISC TYPE	STARTER TYPE		
DOAS-1	CAPTIVE AIRE	CASRTU3-I.300-24-20T-DOAS	DOAS	4700	1	3.95	2700	277.9	169.0	86.8	70.9	54.2	52.6	R410A	280.0	350.0	80	89.6	208 / 3	FUSED	COMBINATION	2648	A-R

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. FOR REFERENCE ONLY.

NOTES:

A. EQUIPMENT FURNISHED AND INSTALLED PER THE EQUIPMENT RESPONSIBILITY SCHEDULE.
B. PROVIDE INLET WITH 2" MERV 8, EFFICIENT PLEATED THROWAWAY AIR FILTERS.
C. PROVIDE FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.
D. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.
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 NOMINAL MOTOR SIZE GREATER THAN THE REQUIRED BHP.
H. DIVISION 28 CONTRACTOR SHALL PROVIDE SMOKE DETECTORS IN RETURN AIR DUCT.
J. PROVIDE SEISMIC WITH VIBRATION ISOLATION INSULATED ROOF CURB WITH MINIMUM HEIGHT OF 14" INCHES. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE.
K. SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT AND CURB.
L. PROVIDE WITH STAINLESS STEEL HEAT EXCHANGER.
M. UNIT DESIGNED FOR NATURAL GAS AT 300 BTU PER CUBIC FOOT AT A GAS SUPPLY PRESSURE OF 7-1/2" W.C.
N. PROVIDE HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL INPUT IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT GAS LOAD WITH PLUMBING CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED. MEET MINIMUM EFFICIENCY SCHEDULED.
P. PROVIDE UNIT WITH VERTICAL SUPPLY AIR DUCT DISCHARGE THROUGH UNIT CURB.
R. 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.

FAN SCHEDULE

MARK	SERVICE DESCRIPTION	MANUFACTURER	MOUNTING	MODEL	CFM	ESP (IN)	BHP	NOM HP	FAN RPM	DRIVE (BELT/DIRECT)	VFD (Y/N)	ELECTRICAL			WEIGHT (LBS)	NOTES
												V/PH	DISC TYPE	STARTER TYPE		
KEF-1	GRILL-SM	CAPTIVE AIRE	ROOF	DU33HFA	700	1	0.277	0.33	1659	DIRECT	Y	115/1	NF	COMB	74	A-T
KEF-2	GRILL-LG	CAPTIVE AIRE	ROOF	DU50HFA	1050	1	0.372	0.5	1544	DIRECT	Y	115/1	NF	COMB	82	A-T
KEF-3	FRYER-CHK	CAPTIVE AIRE	ROOF	DU33HFA	642	1	0.259	0.33	1621	DIRECT	Y	115/1	NF	COMB	74	A-T
KEF-4	FRYER-FRIES	CAPTIVE AIRE	ROOF	DU33HFA	642	1	0.259	0.33	1621	DIRECT	Y	115/1	NF	COMB	74	A-T

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NOTES:

A. 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 SLOPE. COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDINATE CURB TYPE WITH DRAWINGS.
B. PROVIDE GREASE EXHAUST FAN WITH ROOF CURB EXTENSION FOR 40 INCH MINIMUM DISCHARGE HEIGHT ABOVE ROOF SURFACE OR AT ELEVATION HIGHER THAN ADJACENT BUILDING STRUCTURE WITHIN 10 FEET WHICHEVER IS GREATER, GREASE TRAP WITH ABSORBANT MATERIAL AND DRAIN CONNECTION, HINGE KIT, ACCESS PORT FOR CLEANING FAN BLADES AND INTEGRAL MOTOR OVERLOAD PROTECTION.
F. PROVIDE RUBBER IN SHEAR ISOLATION AND ALL-THREAD HANGING RODS.
F. PROVIDE WITH SPRING VIBRATION ISOLATION AND ALL-THREAD HANGING RODS.
G. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
G. DIVISION 26 CONTRACTOR SHALL PROVIDE DISCONNECT SWITCH.
H. DIVISION 26 CONTRACTOR SHALL PROVIDE STARTER.
J. VARIABLE FREQUENCY DRIVE TO BE FURNISHED BY DIVISION 23 CONTRACTOR.
M. PROVIDE SHAFT GROUNDING SYSTEM ON MOTOR. REFER TO MOTOR SPECIFICATION FOR ADDITIONAL INFORMATION.
N. FANS USED FOR SMOKE CONTROL SHALL HAVE 1.5 TIMES THE NUMBER OF BELTS REQUIRED FOR THE DESIGN DUTY.
P. PROVIDE WITH MANUFACTURER'S FAN SPEED CONTROLLER FOR BALANCING PURPOSES.
Q. PROVIDE WITH MANUFACTURER'S ELECTRONICALLY COMMUTATED (EC) MOTOR.
S. PROVIDE 48 INCH EXTENSION ROD TO MAINTAIN MINIMUM 3 FEET VERTICAL CLEARANCE BETWEEN FIRE SPRINKLER DEFLECTOR PLATES AND FAN BLADES.
T. PROVIDE WITH AUXILIARY CONTACTS FOR SHUTDOWN UPON NOTIFICATION FROM FIRE ALARM SYSTEM.

KITCHEN EXHAUST HOOD SCHEDULE (OWNER FURNISHED, CONTRACTOR INSTALLED)

MARK	EQUIPMENT SERVED	MANUFACTURER	MODEL	HOOD DIMENSIONS (IN.) (L x W x H)	EXHAUST AIR CFM	WEIGHT (LBS)	NOTES
HOOD 1	GRILL-SMALL	CAPTIVEAIRE	3650 BD-2	4' x 3' x 2'	700	212	A-J
HOOD 2	GRILL-LARGE	CAPTIVEAIRE	3651 BD-2	6' x 3' x 2'	1,050	275	A-J
HOOD 3	FRYER-CHICKEN	CAPTIVEAIRE	3652 BD-2	3'8" x 3' x 2'	642	204	A-J
HOOD 4	FRYER-FRIES	CAPTIVEAIRE	3653 BD-2	3'8" x 3' x 2'	642	204	A-J

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NOTES:

A. HOOD SUPPLIER SHALL PROVIDE HOOD PRE-PIPED FOR WET-TYPE FIRE EXTINGUISHING SYSTEM MEETING REQUIREMENTS OF NFPA-96 AND LOCAL CODES.
B. HOOD SUPPLIER SHALL FURNISH HOOD WITH UL LISTED BAFFLE-TYPE GREASE FILTERS, GREASE DRAIN WITH REMOVABLE CUP, AND UL LISTED VAPORPROOF INCANDESCENT LIGHT FIXTURES.
C. HOOD SUPPLIER SHALL FURNISH STAINLESS STEEL ENCLOSURE PANELS FROM TOP OF HOOD TO FINISH CEILING AND 3 INCH STANDOFF FROM WALL AS REQUIRED.
D. HOOD SUPPLIER SHALL FACTORY INSTALL THE HOOD CONTROL PACKAGE IN THE HOOD UTILITY CABINET.
E. PROVIDE HOOD FIRE SUPPRESSION SYSTEM MEETING NFPA-96 AND LOCAL CODES.
F. PROVIDE INTERLOCK KIT WITH ONE TEMPERATURE SENSOR PER GREASE EXHAUST COLLAR TO MEET IMC REQUIREMENTS.
G. HOOD FIRE SUPPRESSION SYSTEM SUPPLIER SHALL FURNISH AUTOMATIC SOLENOID GAS SHUT-OFF VALVE TO BE INSTALLED BY PLUMBING CONTRACTOR.
H. REFER TO REFERENCE DRAWINGS OF KITCHEN HOOD MANUFACTURER FOR KITCHEN EXHAUST HOOD DETAILS.
J. HOOD SHALL BE FURNISHED AND INSTALLED BY FOOD SERVICE EQUIPMENT CONTRACTOR.

Bergmeyer
www.bergmeyer.com
LA - 800 South Figueroa St. Suite 1600, Los Angeles, CA 90017 212.337.1090
BOS - 51 Sleeper St. 5th Floor, Boston, MA 02210 617.542.1025

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

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NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL SCHEDULES

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COM*check* Software Version 4.1.5.1

Mechanical Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	Shake Shack
Location:	Chesterfield, Missouri
Climate Zone:	4a
Project Type:	Alteration

Construction Site:
17312 Chesterfield Airport Road
Chesterfield, MO 63005

Owner/Agent:
Shake Shack

Designer/Contractor:
Henderson Engineers Inc.
Lenexa, KS

Mechanical Systems List

Quantity **System Type & Description**

1 RTU-1 (Single Zone):
Heating: 1 each - Other, Gas, Capacity = 178 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 161 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.00 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 4500 CFM, 1.3 motor nameplate hp, 0.0 fan efficiency grade

1 CU-1/FCU-1 (Single Zone)::
Cooling: 1 each - Split System, Capacity = 11 kBtu/h, Air-Cooled Condenser, No Economizer, Economizer exception: None
Proposed Efficiency = 19.00 SEER, Required Efficiency: 13.00 SEER
Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 2 Supply, Constant Volume, 420 CFM, 0.1 motor nameplate hp, 0.0 fan efficiency grade

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.5.1 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Andrew Pettus - Mechanical Designer — Name - Title
Signature
03/09/21 — Date

COM*check* Software Version 4.1.5.1

Inspection Checklist

Energy Code: 2015 IECC

Requirements: 73.0% 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
C103.2 [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.

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
C403.2.4.5, C403.2.4.6 [FO9][1]	Snow/ice melting system sensors for future connection to controls. Freeze protection systems have automatic controls installed.	☐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	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.7 [PL8][1]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C404.7 [PL8][1]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐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	Complies?	Comments/Assumptions
C402.2.6 [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.
C403.2.13 [ME71][2]	Unenclosed spaces that are heated use only radiant heat.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.3 [ME55][2]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.4.7 [ME113][2]	Fault detection and diagnostics installed with air-cooled unitary DX units having economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.6.1 [ME59][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.
C403.2.6.2 [ME115][3]	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	Requirement will be met.
C403.2.7 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.2.7(1) and C403.2.7(2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.8 [ME116][3]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.9 [ME60][2]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.9 [ME10][2]	Ducts and plenums sealed based on static pressure and location.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.9.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.9.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐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	Complies?	Comments/Assumptions
C403.3 [ME62][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.4.4.6 [ME110][1]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. *See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][1]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. *See the Mechanical Systems list for values.*
C408.2.2.1 [ME53][1]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.5, C403.5.1, C403.5.2 [ME123][1]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.5.1 and refrigeration compressor systems that comply with C403.5.2.	☐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	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.3 [FI8][1]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.2 [FI27][1]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.1 [FI47][1]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.1 [FI47][1]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.1.2 [FI38][1]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.1.3 [FI20][1]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.2 [FI39][1]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.2.1, C403.2.4.2.2 [FI40][1]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.2.3 [FI41][1]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.2.3 [FI41][1]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.3.1 [FI31][1]	HVAC equipment has been tested to ensure proper operation.	☐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	Final Inspection	Complies?	Comments/Assumptions
C408.2.3.2 [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.
C408.2.3.3 [FI32][1]	Economizers have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.1 [FI7][1]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.3 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.4 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐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)

Bergmeyer
www.bergmeyer.com
LA - 800 South Figueroa St. Suite 1600 Los Angeles, CA 90017 212.337.1090
BOS - 51 Sleeper St. 6th Floor Boston, MA 02210 617.542.1025

CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEXA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 **FAX** 913.742.5001
WWW.HENDERSONENGINEERS.COM
2050003215
EXPIRES 12/31/2021

SEAL/ SIGNATURE:

STATE OF MISSOURI
JOSHUA N. HOVER
NUMBER PE-2017008503
PROFESSIONAL ENGINEER

10/18/2021

JOSHUA N. HOVER
LICENSE # PE-2017008503

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

MECHANICAL ENERGY CODE COMPLIANCE

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

M630

JOSHUA N. HOVER
10/18/2021 1:51:08 PM
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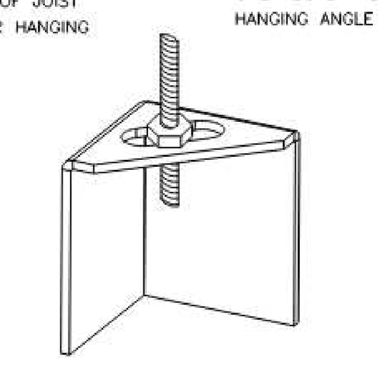
1/2" DIA. ALL THREAD ROD CONNECTED TO ROOF JOIST THROUGH ANOTHER HANGING ANGLE

1/2" DIA. HEAVY DUTY NUT ONE ABOVE AND ONE BELOW HANGING ANGLE



*ROD AND NUTS TO BE SUPPLIED BY INSTALLING CONTRACTOR
HANGING ANGLE IS PRE-PUNCHED AT FACTORY

HANGING ANGLE DETAILS

EXHAUST CFM = LENGTH OF HOOD X CFM/LIN.FT. (LOAD)

SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED

$$\text{TOTAL DUCT AREA (sq. in.)} = 144 \times \frac{\text{CFM}}{\text{FPM(*)}}$$

$$\text{DUCT LENGTH} = \frac{\text{TOTAL DUCT AREA}}{\text{DUCT WIDTH}}$$

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

CALCULATIONS UTILIZED

CAPTIVE-AIRE HOODS BUILT IN COMPLIANCE WITH:

#3054804-001 & #3054804-002

STANDARD 710

BUILT IN ACCORDANCE WITH NFPA No. 96

Listed under ETL File number 3054804-001/002

BUILDING CODES

CAPTIVE-AIRE HOODS HAVE OPTIONAL CLEARANCE REDUCTION SYSTEMS AVAILABLE AS FOLLOWS:

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

CLEARANCE TO COMBUSTIBLES

INSTALLATION

1. ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.
2. ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
3. HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGER MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
4. ALL CONNECTIONS FROM CAPTIVEAIRE HOOD PER MECHANICAL PLANS.
5. COOKING EQUIPMENT TO SHUT OFF IN EVENT OF FIRE.
6. EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
7. ALL LIGHT FIXTURES SHOWN INSTALLED BY CAPTIVEAIRE ARE FACTORY PREWIRED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES ARE BY ELECTRICAL CONTRACTOR.
8. LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
9. SEISMIC RESTRAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
10. INSTALLING CONTRACTORS ASSUME ALL RELATED REPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION, AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

BALANCE

11. KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
12. KITCHEN SHALL BE NEGATIVE WITH RESPECT TO DINING AREA.
13. RESTAURANT SHALL BE POSITIVE WITH RESPECT TO AMBIENT PRESSURE.

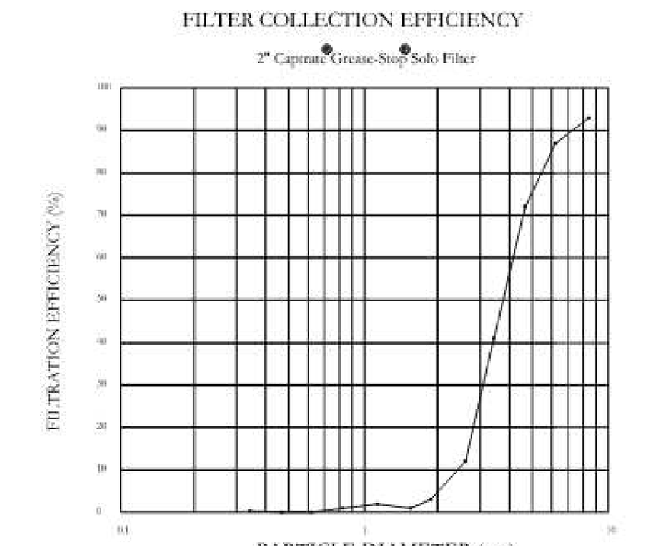
ADDITIONAL

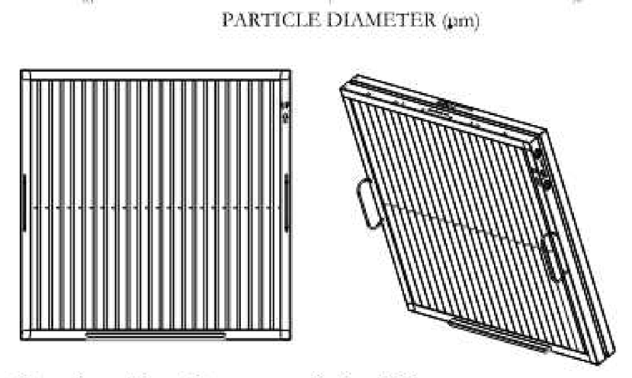
14. WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
15. SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

GENERAL NOTES

FILTER COLLECTION EFFICIENCY

2" Captrate Grease-Stop Solo Filter





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

FILTER DETAIL

HOOD INFORMATION - JOB#4756255

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	HOOD CONSTRUCTION	HOOD CONFIG END TO END	ROW
1	GRILL-SMALL	3650 BD-2	CAPTIVEAIRE	4' 0"	600 DEG	I	HEAVY	175	700	8"	8"	4"		700	1575	-0.574"	430 SS WHERE EXPOSED	ALONE	ALONE
2	GRILL-LARGE	3650 BD-2	CAPTIVEAIRE	6' 0"	600 DEG	I	HEAVY	175	1050	10"	10"	4"		1050	1512	-0.662"	430 SS WHERE EXPOSED	ALONE	ALONE
3	FRYER-CHICKEN	3650 BD-2	CAPTIVEAIRE	3' 8"	600 DEG	I	HEAVY	175	642	8"	7"	4"		642	1651	-0.550"	430 SS WHERE EXPOSED	ALONE	ALONE
4	FRYER-FRIES	3650 BD-2	CAPTIVEAIRE	3' 8"	600 DEG	I	HEAVY	175	642	8"	7"	4"		642	1651	-0.550"	430 SS WHERE EXPOSED	ALONE	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	SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WEIGHT
1	GRILL-SMALL	CAPTRATE SOLO FILTER	2	16"	20"	85% SEE FILTER SPEC	1	RECESSED	NO							NO	212 LBS
2	GRILL-LARGE	CAPTRATE SOLO FILTER	4	16"	16"	85% SEE FILTER SPEC	2	RECESSED	NO							NO	275 LBS
3	FRYER-CHICKEN	CAPTRATE SOLO FILTER	2	16"	20"	85% SEE FILTER SPEC	1	RECESSED	NO							NO	204 LBS
4	FRYER-FRIES	CAPTRATE SOLO FILTER	2	16"	20"	85% SEE FILTER SPEC	1	RECESSED	NO							NO	204 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	GRILL-SMALL	FIELD WRAPPER 35.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		LEFT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		1-PINT GREASE CUP.
		RISER SENSOR INSTALL 6IN PLEN.
2	GRILL-LARGE	FIELD WRAPPER 35.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		LEFT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		1-PINT GREASE CUP.
		RISER SENSOR INSTALL 6IN PLEN.
3	FRYER-CHICKEN	FIELD WRAPPER 35.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		LEFT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		1-PINT GREASE CUP.
		RISER SENSOR INSTALL 6IN PLEN.
4	FRYER-FRIES	FIELD WRAPPER 35.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		LEFT QUARTER END PANEL 26" TOP WIDTH, 0" BOTTOM WIDTH, 26" HIGH 430 SS.
		1-PINT GREASE CUP.
		RISER SENSOR INSTALL 6IN PLEN.

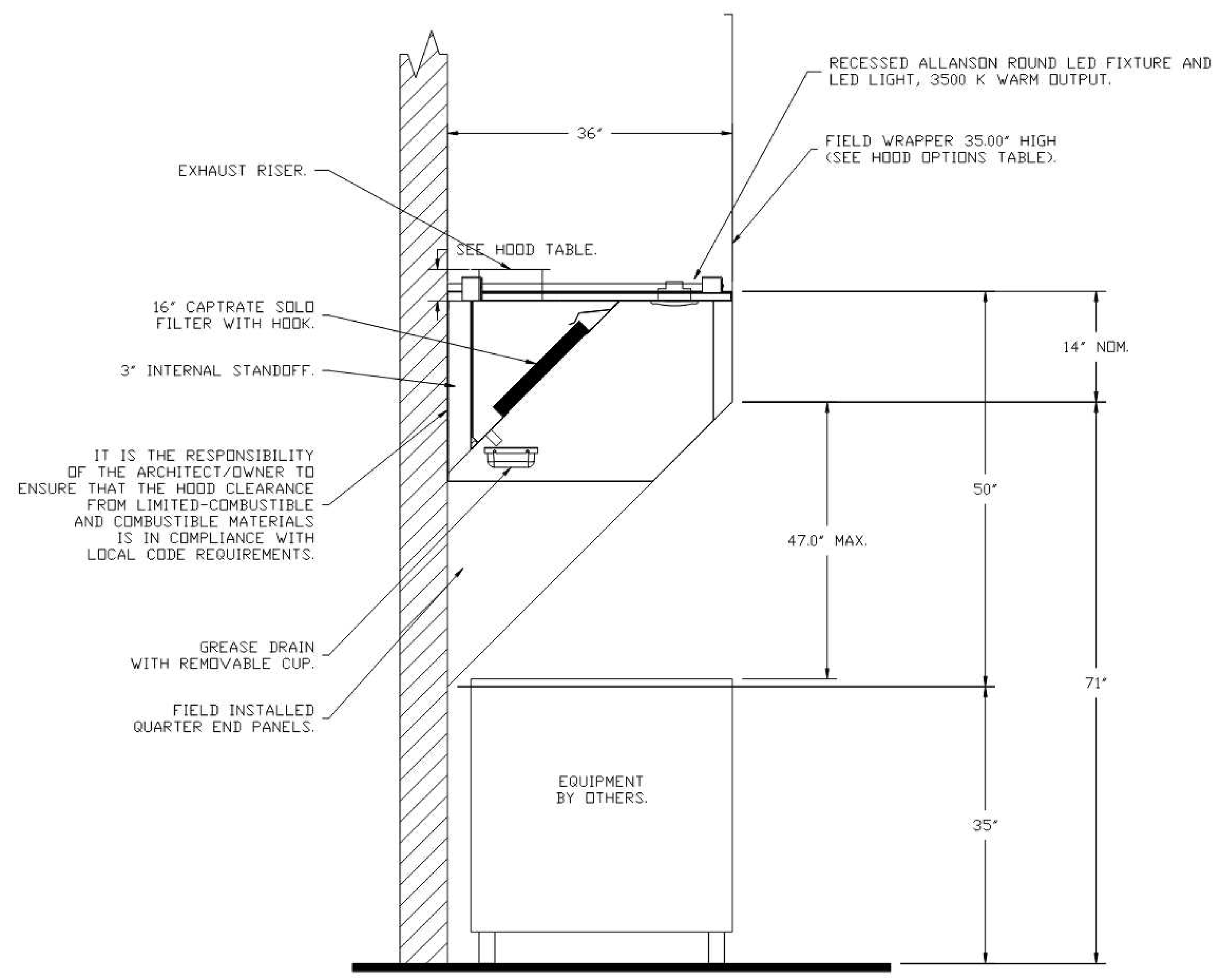
System Design Verification (SDV)

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.

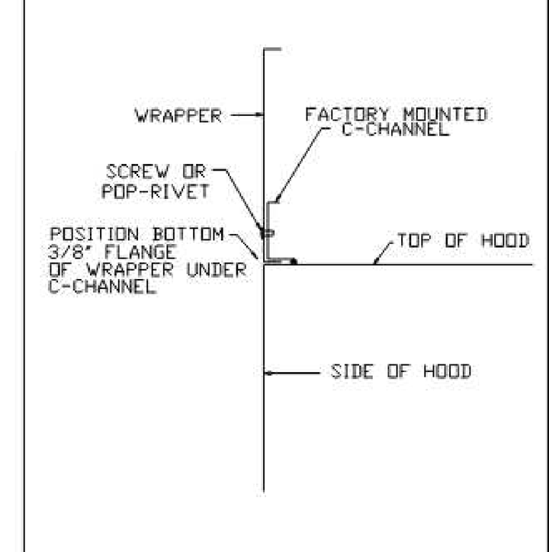
Any field related discrepancies that are discovered during the SDV will be brought to the attention of the general contractor and corresponding trades on site. These issues will be documented and forwarded to the appropriate sales office. If CAS Service has to resolve a discrepancy that is a field issue, 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.

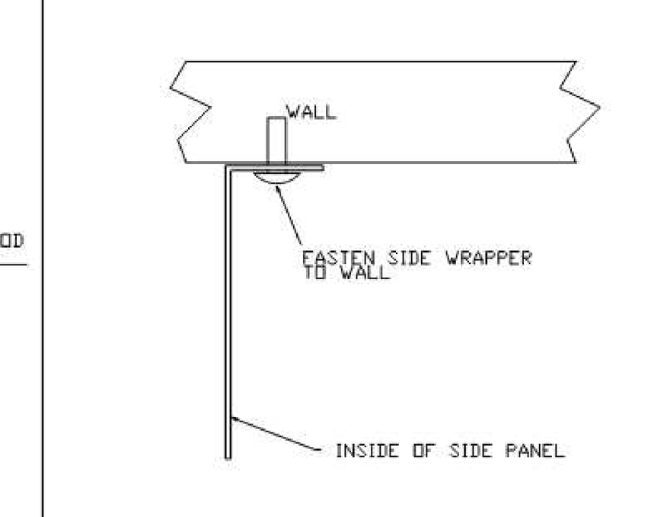
FOR QUESTIONS, CALL THE
EASTERN PA SALES OFFICE
ERIC BUCKMANN
PHONE: (215) 826-5023, (267) 504-4126
reg108@captiveaire.com



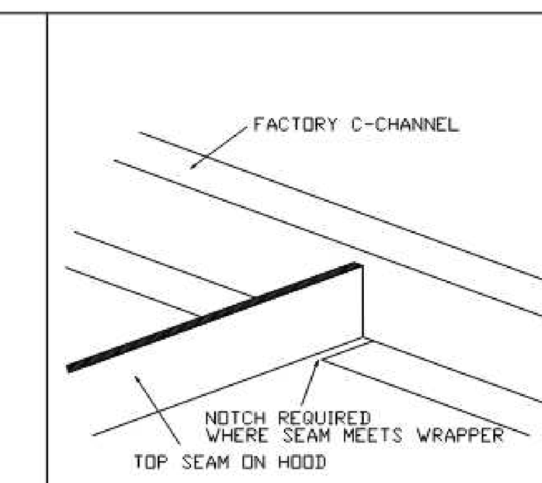
SECTION VIEW - MODEL 3650BD-2



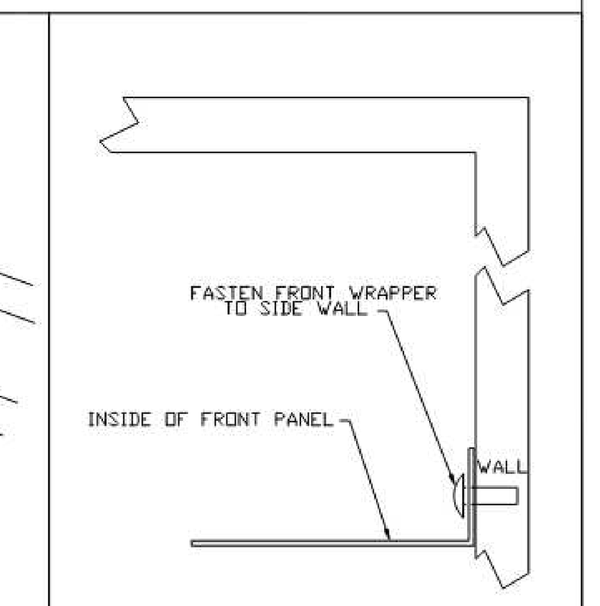
WRAPPER DETAIL



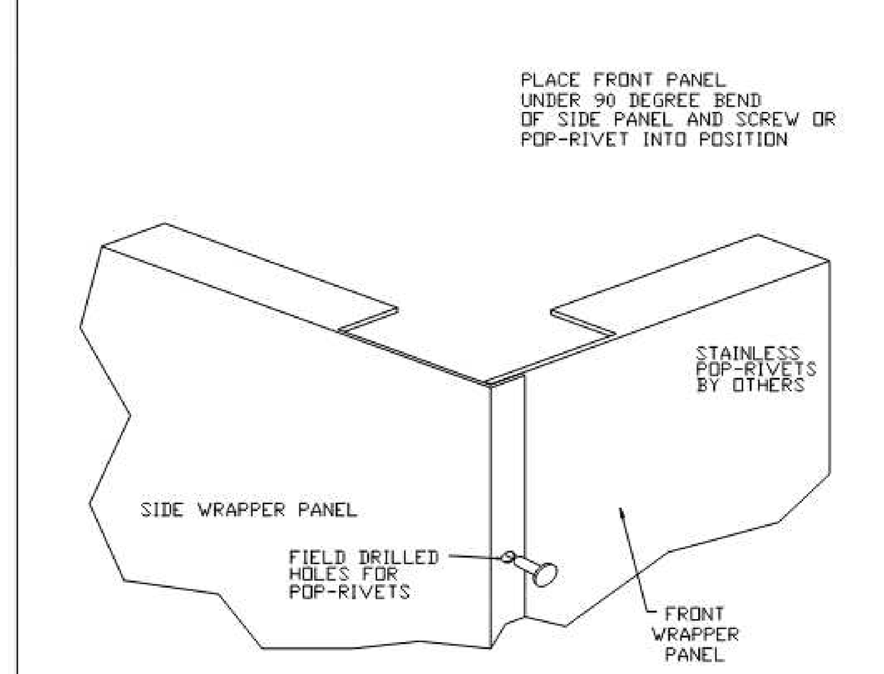
REAR WALL ATTACHMENT



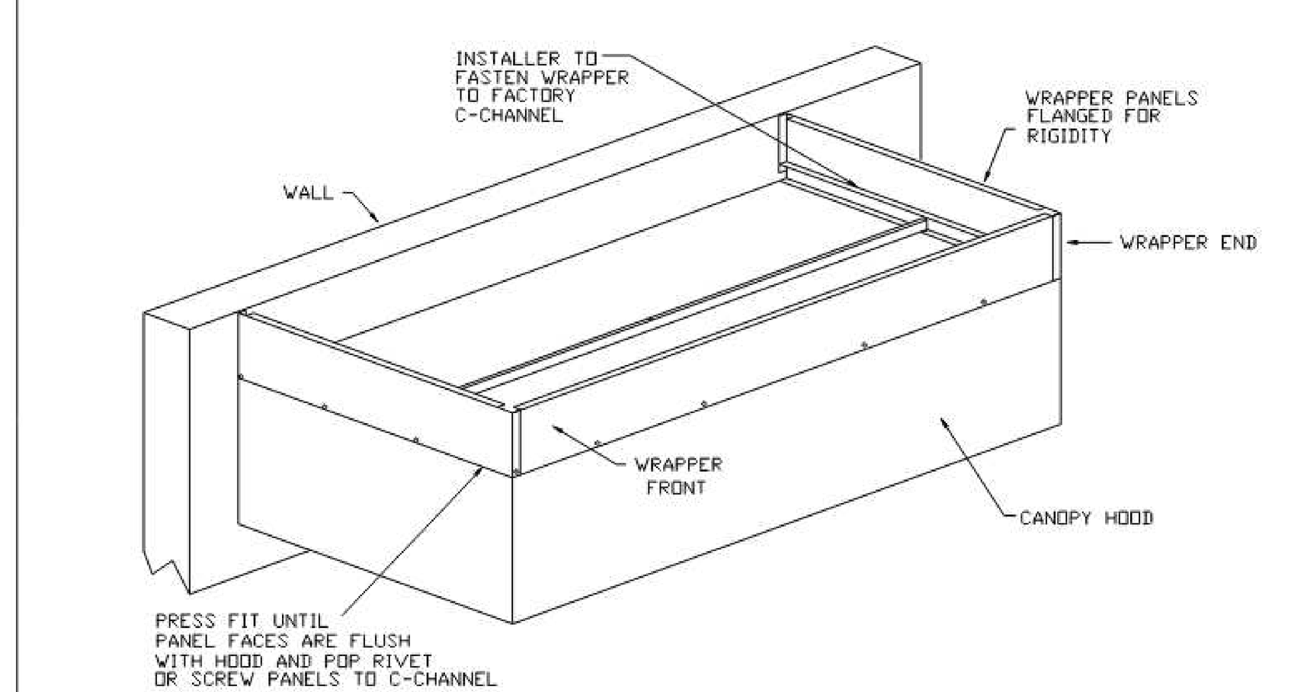
TOP HOOD SEAM DETAIL



SIDE WALL ATTACHMENT



FRONT CORNER ASSEMBLY



COMPLETED WRAPPER ASSEMBLY

VERIFY CEILING HEIGHT

__' - __"

HEIGHT REQUIRED TO VERIFY THAT HOOD FITS SPACE AND TO SIZE THE ENCLOSURE PANELS

CUSTOMER APPROVAL TO MANUFACTURE:

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

SIGNATURE __________

Your Title __________ Date __________

REVISIONS

	DESCRIPTION	DATE:
△		
△		
△		
△		

www.captiveaire.com

Eastern PA Mechanical

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

Shake Shack - 1352 - Chesterfield, MO_R2
17312 Chesterfield Airport Rd,
Chesterfield, MO, 63005

DATE: 2/24/2021

DWG.#: 4756255

DRAWN BY: EB-108

SCALE:

MASTER DRAWING

SHEET NO. 1

Bergmeyer

BOS - 51 Sleeper St. 6th Floor Boston, MA 02210 617.542.1025

LA - 800 South Figueroa St. Suite 1080 Los Angeles, CA 90017 212.337.1090

www.bergmeyer.com

CONSULTANTS:

SEAL/ SIGNATURE:

NO.	BY	DATE	DESCRIPTION
C		2021-10-18	ISSUE FOR CONSTRUCTION
B		2021-08-10	ADDENDUM B
A		2021-06-25	ADDENDUM A
		2021-03-15	BID/PERMIT SET
		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

CAPTIVE AIRE DRAWINGS

NOTE:

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDER ENGINEERS REVIEWED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.

DRAWN BY:	AJP
CHECKED BY:	BLM
JOB NO:	20087.00

M701

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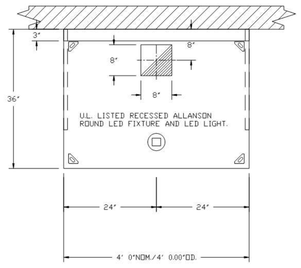
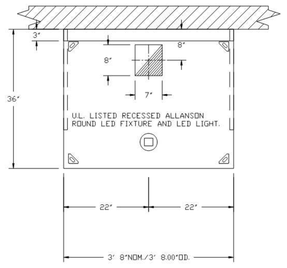


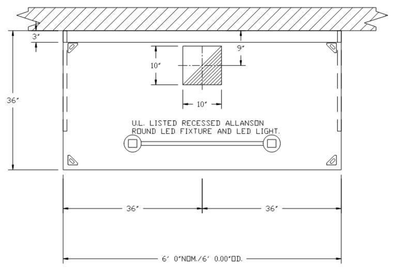
PLAN VIEW – HOOD #1 (GRILL-SMALL)
4' 0.00" LONG 3650BD-2



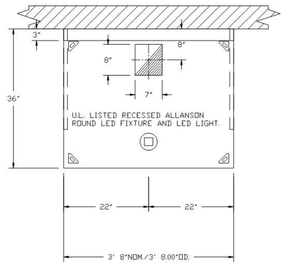
PLAN VIEW – HOOD #3 (FRYER-CHICKEN)
3' 8.00" LONG 3650BD-2

HVAC DISTRIBUTION NOTE

SUPPLY DIFFUSERS WITHIN TEN (10) FEET OF THE EXHAUST HOOD SHOULD BE LOW-VELOCITY / NON-DIRECTIONAL



PLAN VIEW – HOOD #2 (GRILL-LARGE)
6' 0.00" LONG 3650BD-2



PLAN VIEW – HOOD #4 (FRYER-FRIES)
3' 8.00" LONG 3650BD-2

CUSTOMER APPROVAL TO MANUFACTURE:

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Shake Shack - 1352 - Chesterfield, MO_R2
17312 Chesterfield Airport Rd,
Chesterfield, MO, 63005

DATE: 2/24/2021

DWG.#: 4756255

DRAWN BY: EB-108

SCALE:

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SHEET NO. 2

Bergmeyer

BOS
51 Sleeper St.
5th Floor
Boston, MA 02210
617.542.1025

LA
800 South Figueroa St.
Suite 1600
Los Angeles, CA 90017
212.337.1090

www.bergmeyer.com

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		2021-02-23	75% SET
		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK -
CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

CAPTIVE AIRE DRAWINGS

DRAWN BY: AJP
CHECKED BY: BLM
JOB NO: 20087.00

M702

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FIRE SYSTEM INFORMATION

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FLOW POINTS	INSTALLATION SYSTEM
1		ANSUL R102	3.0/3.0/3.0/3.0	44	WALL-MT (54"W x 24"H x 9"D)

GAS VALVE(S)

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1		MECHANICAL	VERIFY	CAPTIVEAIRE SYSTEMS

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.

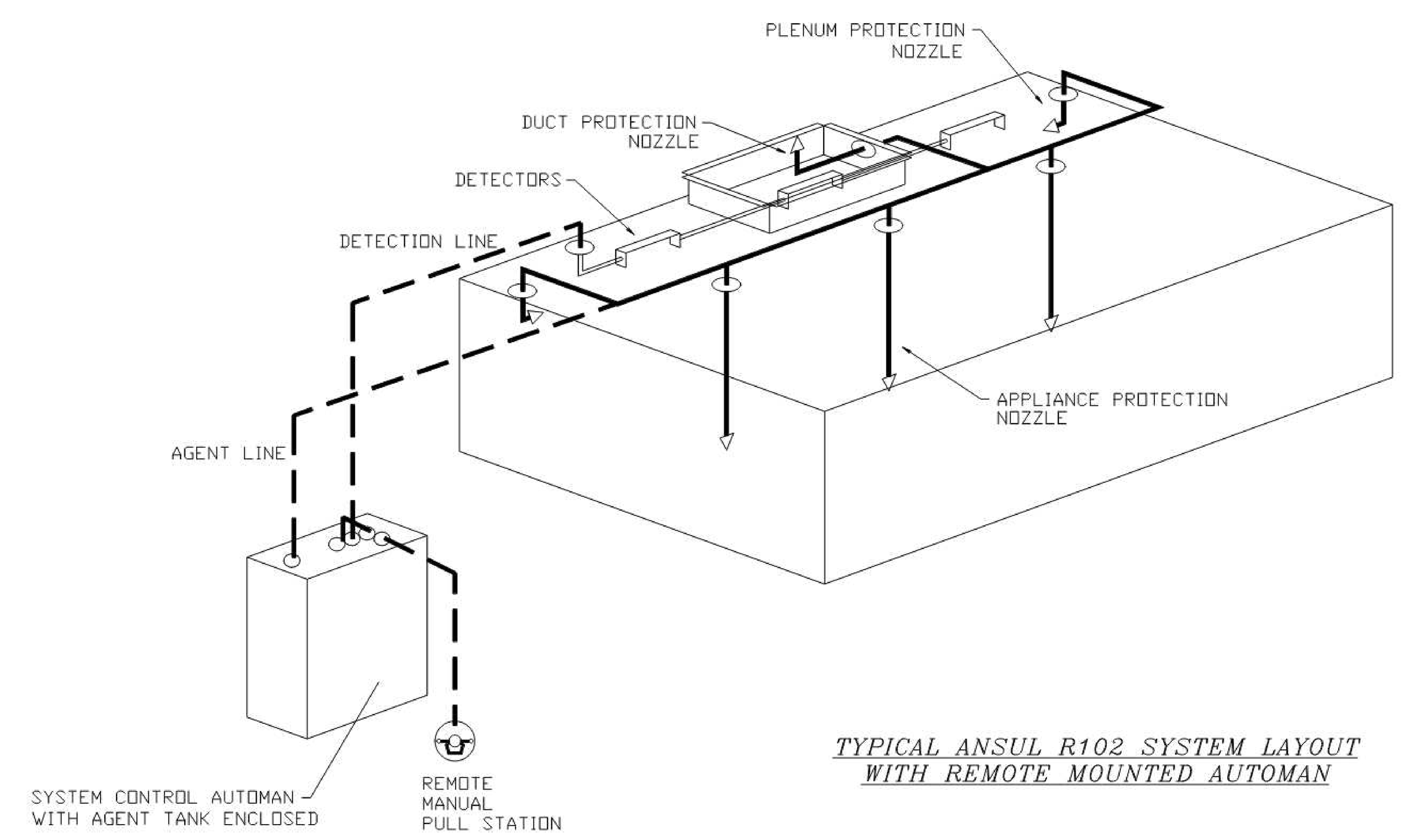
- THIS FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.

JOB #: 4742620.
JOB NAME: SHAKE SHACK - 1370 - ALPHARETTA, GA.

SYSTEM SIZE: ANSUL-3.0/3.0/3.0/3.0 TOTAL FP REQUIRED: 36.
HOOD # 1 4' 0.00" LONG x 36" WIDE x 50" HIGH.
RISER # 1 SIZE: 8" x 8".
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.
HOOD # 2 6' 0.00" LONG x 36" WIDE x 50" HIGH.
RISER # 1 SIZE: 10" x 10".
HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.
HOOD # 3 3' 8.00" LONG x 36" WIDE x 50" HIGH.
RISER # 1 SIZE: 8" x 7".
HOOD # 3 METAL BLOW-OFF CAPS INCLUDED.
HOOD # 4 3' 8.00" LONG x 36" WIDE x 50" HIGH.
RISER # 1 SIZE: 8" x 7".
HOOD # 4 METAL BLOW-OFF CAPS INCLUDED.

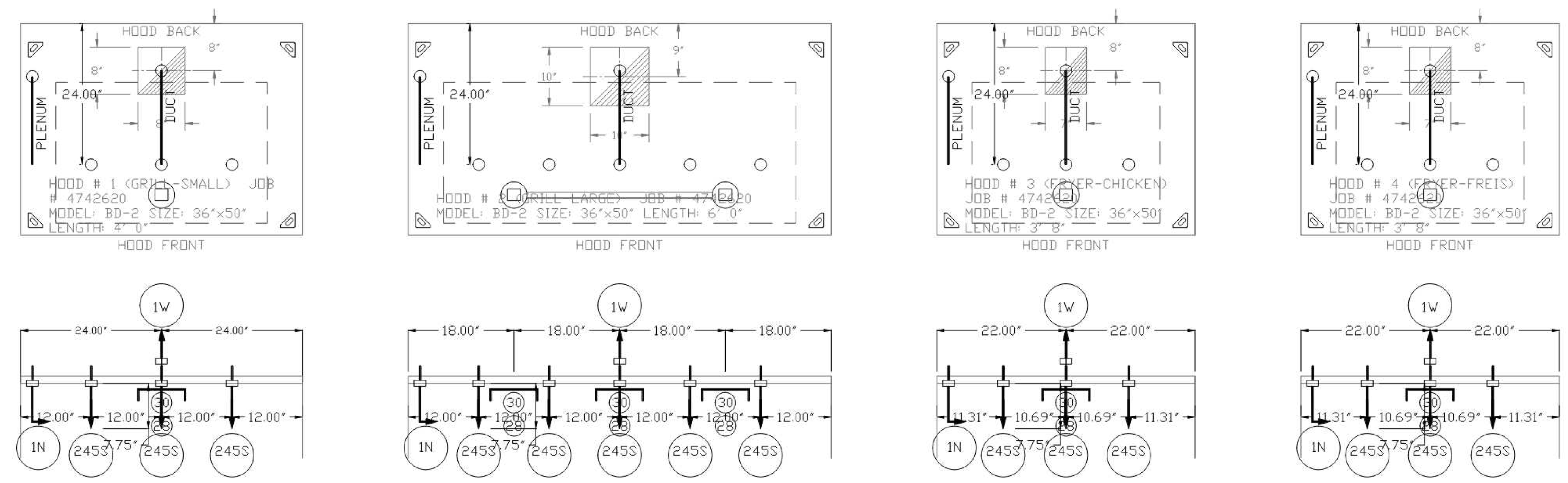
LEGEND - WALL MOUNTED ANSUL SYSTEM

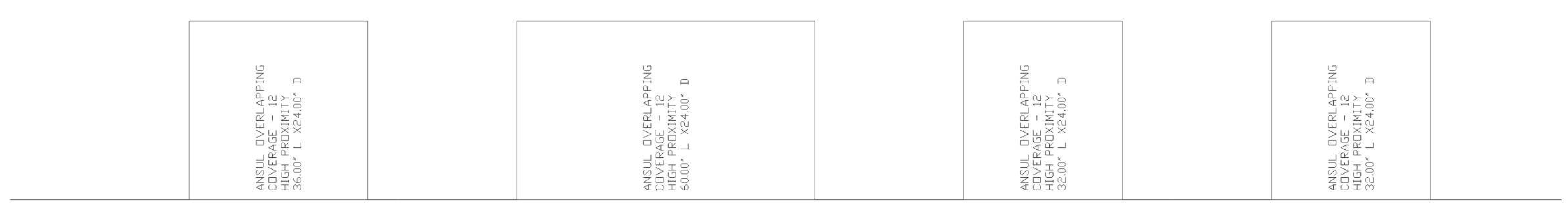
1A	1.5 GALLON TANK.
1B	3.0 GALLON TANK.
2	AUTOMAN RELEASE.
3	3 GALLON TANK ENCLOSURE.
3A	6 GALLON TANK ENCLOSURE.
4	REGULATED ACTUATOR.
5	ANSULEX LIQUID AGENT (3 GAL.).
6	ANSULEX LIQUID AGENT (1.5 GAL.).
7	CARTRIDGE (101-20).
8	CARTRIDGE (101-10).
9	CARTRIDGE (101-30).
9A	CARTRIDGE (LT-A-101-30).
9B	DOUBLE TANK CARTRIDGE.
10	TEST LINK.
11	DOUBLE MICROSWITCH.
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.



WALL-MT (54"W x 24"H x 9"D)

TYPICAL ANSUL R102 SYSTEM LAYOUT WITH REMOTE MOUNTED AUTOMAN





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Shake Shack - 1352 - Chesterfield, MO_R2
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DATE: 2/24/2021
DWG.#: 4756255
DRAWN BY: EB-108
SCALE:
MASTER DRAWING
SHEET NO. 3

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Bergmeyer
BOS
-
51 Sleeper St.
6th Floor
Boston, MA 02210
617.542.1025
LA
-
800 South Figueroa St.
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Los Angeles, CA 90017
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www.bergmeyer.com

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SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

CAPTIVE AIRE DRAWINGS

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CHECKED BY: BLM
JOB NO: 20087.00

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EXHAUST FAN INFORMATION – JOB#4756255

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SONES
1	KEF-1 (GRILL-SM)	1	DU33HFA	CAPTIVEAIRE	700	1.000	1659	TEAO-ECM	0.333	0.2770	1	115	4.3	347 FPM	74	17.6
2	KEF-2 (GRILL-LG)	1	DU50HFA	CAPTIVEAIRE	1050	1.000	1544	TEAO-ECM	0.500	0.3720	1	115	6.3	399 FPM	82	16.8
3	KEF-3 (FRYER-CHK)	1	DU33HFA	CAPTIVEAIRE	642	1.000	1621	TEAO-ECM	0.333	0.2590	1	115	4.3	318 FPM	74	16.9
4	KEF-4 (FRYER-FRIES)	1	DU33HFA	CAPTIVEAIRE	642	1.000	1621	TEAO-ECM	0.333	0.2590	1	115	4.3	318 FPM	74	16.9

DOAS/RTU FAN SCHEDULE – JOB#4756255

FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	ESP	HP	BHP	PHASE	VOLT	MCA	MOCP	WEIGHT (LBS)
5	DOAS-1	1	CASRTU3-1.300-24-20T-DOAS	CAPTIVEAIRE	24MF-3-RTU	2000	2700	4700	1.000	5.000	3.9530	3	208	88.5A	100A	3004

DOAS/RTU COOLING SCHEDULE

FAN UNIT NO	TAG	COMPRESSOR			OUTDOOR FAN				INDOOR COIL		OUTSIDE AIR DB TEMP	OUTSIDE AIR WB TEMP	MIXED AIR DB TEMP	MIXED AIR WB TEMP	LEAVING DB TEMP	LEAVING WB TEMP	LEAVING DP TEMP	TOTAL CAPACITY	SENSIBLE CAPACITY	LATENT CAPACITY	REHEAT LEAVING DB TEMP	REHEAT LEAVING WB TEMP	DESIRED REHEAT CAPACITY	MAX REHEAT CAPACITY	REHEAT LEAVING RELATIVE HUMIDITY	MOISTURE REMOVAL RATE	IEER
		TONNAGE	VOLTAGE	PHASE	MOTOR VOLTAGE	MOTOR ø	MOTOR FREQUENCY	MOTOR QTY	ROWS	FACE AREA																	
5	DOAS-1	20	190-240	3	200-240	3	60	3	7	11.9 SQFT	95.0°F	75.0°F	86.8°F	70.1°F	52.4°F	52.4°F	52.5°F	255.7 MBH	174.4 MBH	81.3 MBH	75.0°F	62.5°F	114.7 MBH	129.6 MBH	50	71.8 LBS/HR	18.2

DOAS/RTU HEATING SCHEDULE

FAN UNIT NO	TAG	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE	GAS TYPE	BURNER EFFICIENCY(%)
5	DOAS-1	300000	240000	47°F	7 IN. W.C. - 14 IN. W.C.	NATURAL	80

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	KEF-1 (GRILL-SM)	1	GREASE BOX.
		1	FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.
		1	2 YEAR PARTS WARRANTY.
2	KEF-2 (GRILL-LG)	1	GREASE BOX.
		1	FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.
		1	2 YEAR PARTS WARRANTY.
3	KEF-3 (FRYER-CHK)	1	GREASE BOX.
		1	FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.
		1	2 YEAR PARTS WARRANTY.
4	KEF-4 (FRYER-FRIES)	1	GREASE BOX.
		1	FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.
		1	2 YEAR PARTS WARRANTY.
5	DOAS-1	1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU. QNTY 1 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #28, #47, "MA", OR "E2" OPTION PREWIRE MUST BE SELECTED. DO NOT PROVIDE SUPPLY STARTER IN PREWIRE.
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED.
		1	RTU SIZE 3 DOWN DISCHARGE.
		1	2" MERV 13 FILTERS FOR SIZE 3 RTU. QTY 4.
		1	2" MERV 8 FILTERS FOR SIZE 3 RTU. QTY 4.
		1	OVERHEAT STAT.
		1	TOTAL CFM MONITORING FOR DOAS.
		1	VFD FACTORY MOUNTED AND WIRED IN COMMERCIAL CONTROL VESTIBULE FOR RTU.
		1	20 TON MODULATING COOLING OPTION, 208/230V. R410A REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FAN(S).
		1	20 TON MODULATING REHEAT OPTION. SPACE DEWPOINT CONTROL.
		1	INLET PRESSURE GAUGE, 0-35".
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE.
		1	SIZE 3 RTU CURB DUCT HANGER.
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK (SUPPLIED BY OTHERS).
		1	OCCUPIED SCHEDULING.
		1	CLOGGED FILTER SWITCH WITH NOTIFICATION ON HMI.
		1	SIZE 3 RTU CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J BOX.
		1	RTU MANUAL INTAKE/RETURN DAMPER CONTROL VIA HMI.
		1	RTU SIZE 3 DOWN RETURN.
		1	FREEZESTAT.
		1	VAV PACKAGE W/ MANUAL/DDC CONTROL (571 VFD INCLUDED).
		1	DAMPER PRESET POSITIONS.
		1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIRE SERVICE CONTRACT, 25 YEAR STAINLESS STEEL FURNACE PARTS WARRANTY (SEE ADDITIONAL DETAILS).

CURB ASSEMBLIES

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF-1 (GRILL-SM)	34 LBS	CURB	19.500"W X 19.500"L X 22.000"H VENTED HINGED.
2	# 2	KEF-2 (GRILL-LG)	31 LBS	CURB	19.500"W X 19.500"L X 20.000"H VENTED HINGED.
3	# 3	KEF-3 (FRYER-CHK)	34 LBS	CURB	19.500"W X 19.500"L X 22.000"H VENTED HINGED.
4	# 4	KEF-4 (FRYER-FRIES)	34 LBS	CURB	19.500"W X 19.500"L X 22.000"H VENTED HINGED.
5	# 5		66 LBS	CURB	59.500"W X 91.000"L X 12.000"H INSULATED.

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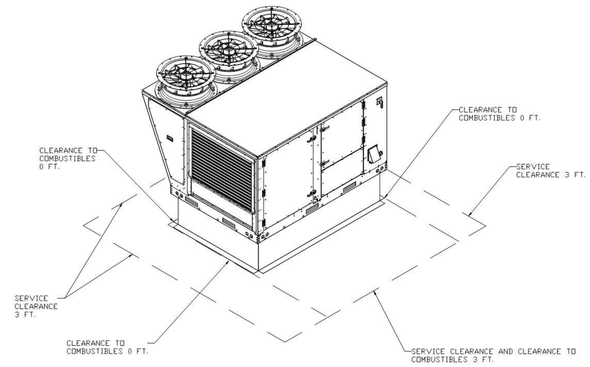
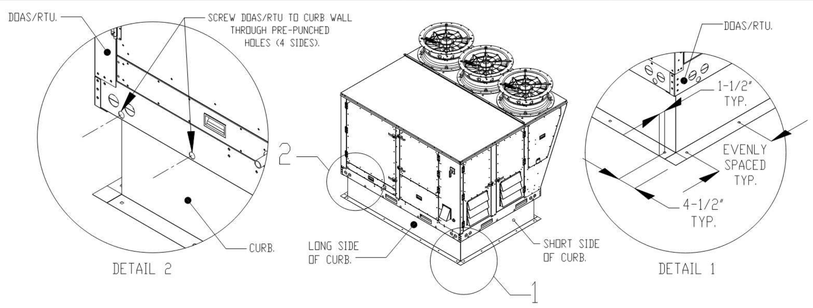


TYPICAL DOAS/RTU ROOF MOUNTING INSTALLATION INSTRUCTIONS

1. SECURE THE CURB TO THE ROOF FRAMING MEMBERS BY DRILLING 1/4" PILOT HOLES IN THE CURB FLANGES AT LOCATIONS SHOWN IN THE DIAGRAM BELOW. USING 3/8" X 2" ZINC PLATED STEEL LAG BOLTS, AND ZINC PLATED WASHERS, SCREW THROUGH THE CURB FLANGES AND INTO THE ROOF FRAMING MEMBERS. A MINIMUM OF (5) LAG BOLTS ON EACH SHORT SIDE, AND (7) LAG BOLTS ON EACH LONG SIDE IS REQUIRED.

2. SECURE THE UNIT BASE TO THE SIDE WALLS OF THE CURB USING (24) 1/4"-14 X 2" SELF-DRILLING, STEEL ZINC PLATED SCREWS. PRE-PUNCHED HOLES HAVE BEEN PROVIDED FOR EACH SCREW LOCATION.



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SHEET NO. 4

Bergmeyer
www.bergmeyer.com
LA - 800 South Figueroa St. Suite 1600, Los Angeles, CA 90017, 212.337.1090
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SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

PERMIT SET

CAPTIVE AIRE DRAWINGS

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JOB NO: 20087.00

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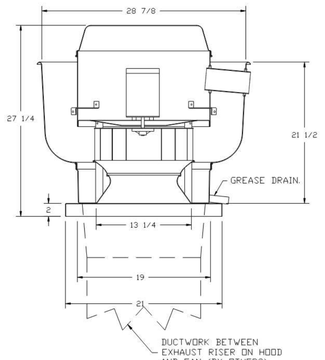
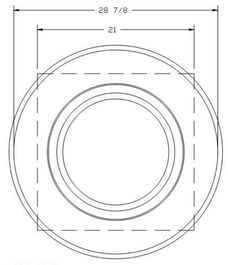
FAN #2 DU50HFA - EXHAUST FAN (KEF-2 (GRILL-LG))





TOP VIEW

FEATURES:

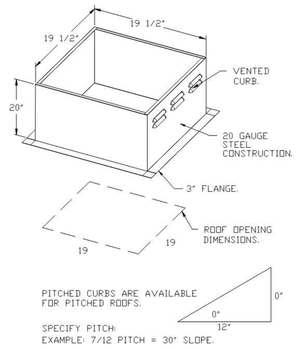
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT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

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

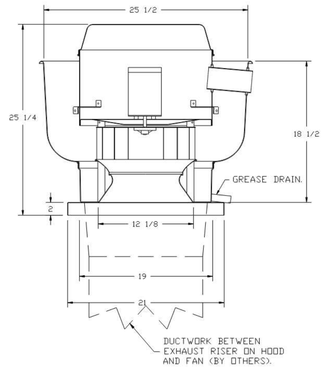
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

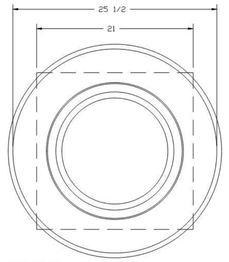
OPTIONS

GREASE BOX.
FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.



FANS #1 (KEF-1 (GRILL-SM)), #3 (KEF-3 (FRYER-CHK)), #4 (KEF-4 (FRYER-FRIES)) - DU33HFA EXHAUST FAN





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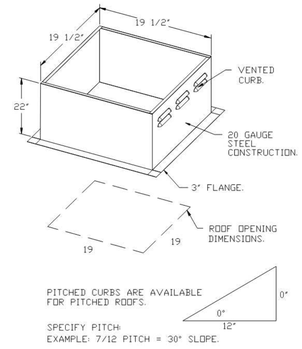
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT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

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

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

OPTIONS

GREASE BOX.
FAN BASE CERAMIC SEAL - INSTALLED AT PLANT - FOR GREASE DUCTS.
ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.



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Shake Shack - 1352 - Chesterfield, MO_R2
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Chesterfield, MO, 63005

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DWG.#: 4756255

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		2020-11-16	DD SET

SHAKE SHACK

SHAKE SHACK - CHESTERFIELD MO

17312 CHESTERFIELD AIRPORT ROAD
CHESTERFIELD, MO 63005
SHACK #1352

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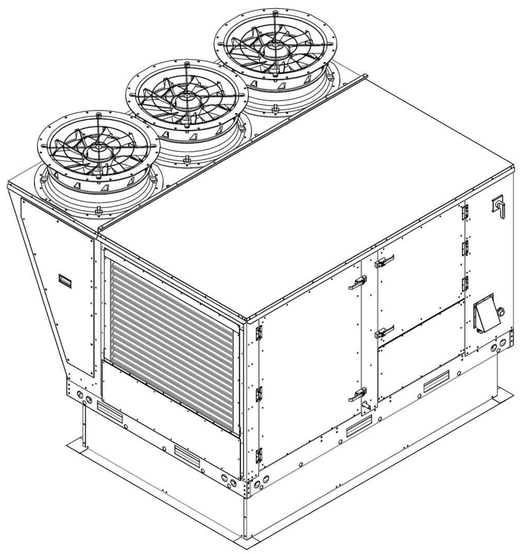

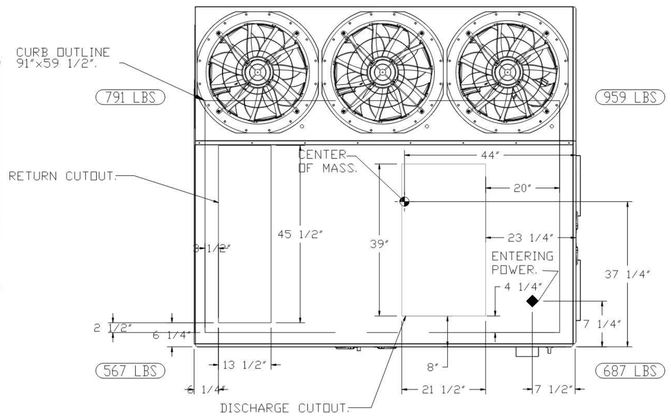

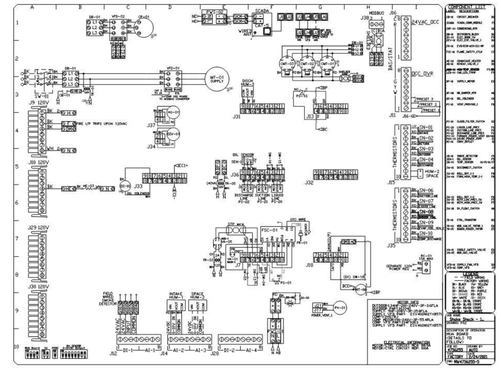

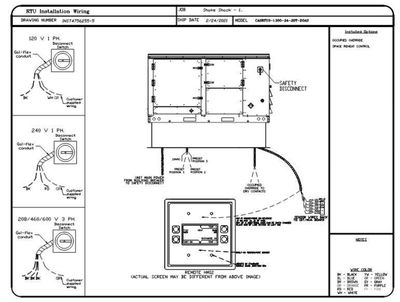

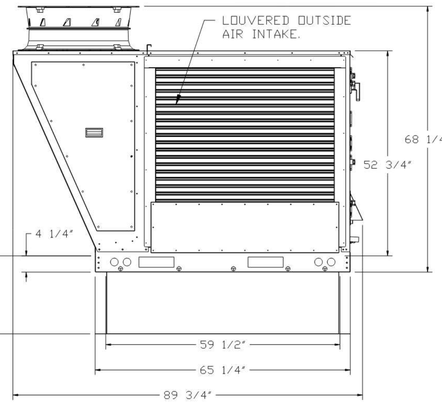

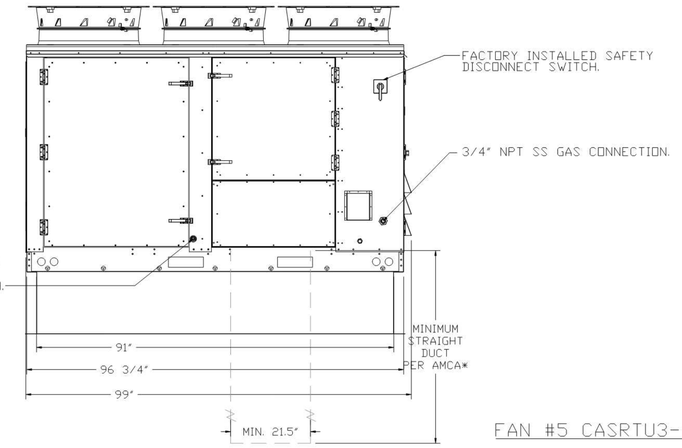

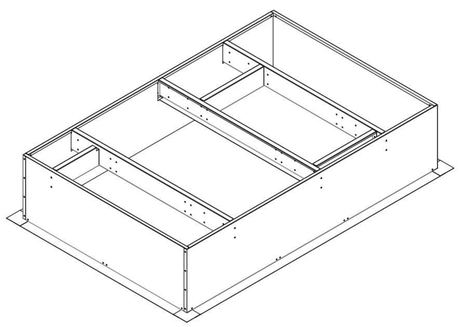

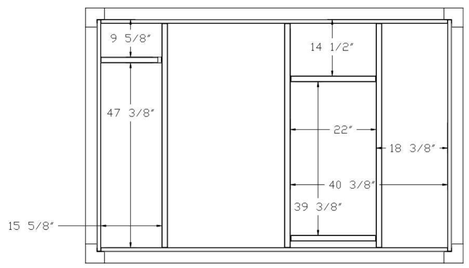

FAN #5 CASRTU3-I.300-24MF-20T-DOAS - HEATER (DOAS-1)

NOTES:

1. DO NOT OBSTRUCT OUTSIDE AIR INLET, OUTSIDE AIR COIL OR OUTSIDE AIR FAN.
2. ( ) DENOTES CORNER WEIGHT.
3. ROOF OPENING MUST BE 2" SMALLER THAN CURB DIMENSIONS IN BOTH DIRECTIONS.

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DWG.#: 4756255

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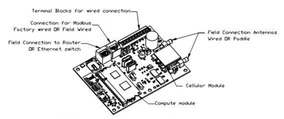
ELECTRICAL PACKAGE – JOB#4756255

NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED				
				LOCATION	QUANTITY		FAN TAG	TYPE	Φ	HP	VOLT	FLA
1		SC-140110MA	WALL MOUNT IN SS BOX (18"W x 18"H x 6"D)	05 - SS WALL MOUNT BOX	1 LIGHT 1 FAN	SMART CONTROLS THERMOSTATIC CONTROL W/ RELAY ON/OFF WITH SUPPLY	KEF-1 (GRILL-SM)	EXHAUST	1	0.333	115	4.3
							KEF-2 (GRILL-LG)	EXHAUST	1	0.500	115	6.3
							KEF-3 (FRYER-CHK)	EXHAUST	1	0.333	115	4.3
							KEF-4 (FRYER-FRIES)	EXHAUST	1	0.333	115	4.3



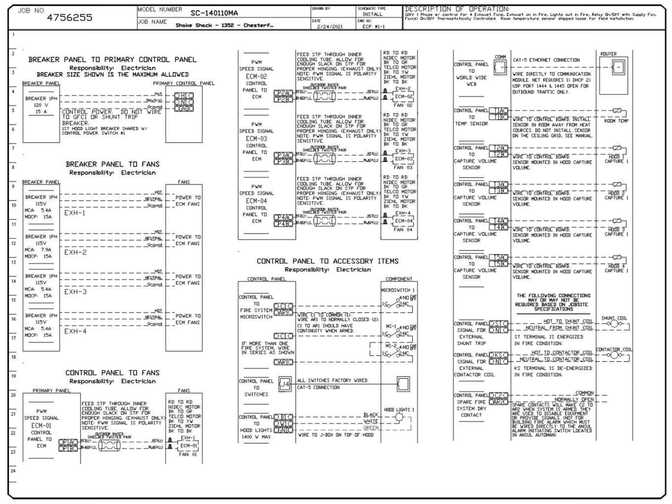
CASlink Monitor and Control

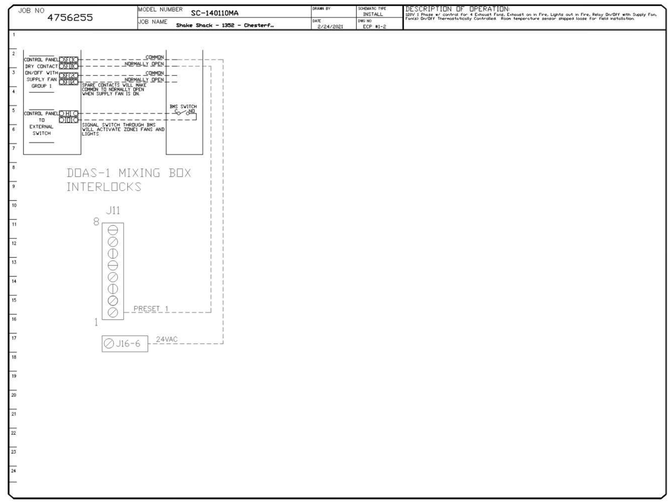
- *Hood control panel to support communications to cloud-based Building Management System.*
- *Hood Control Panel to allow cloud-based Building Management System to monitor real time parameters outlined as MONITOR in the points list.*
- *Hood Control Panel to allow cloud-based Building Management System 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.*

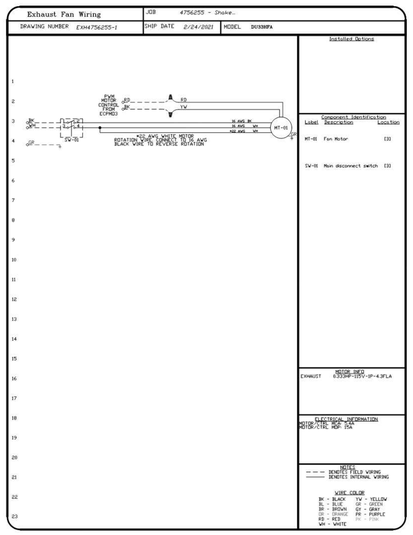
MONITORING AND CONTROL POINTS LIST

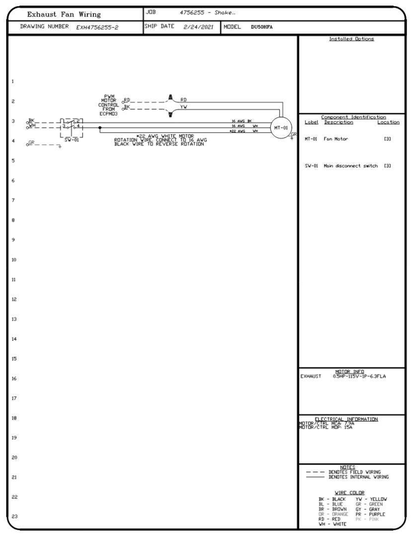
DCV Packages	Function
Room Temperature	MONITOR
Duct Temperature(s)	MONITOR
MUA Discharge Temperature	MONITOR
Kitchen RTU Discharge Temperature	MONITOR
Fan Speed	MONITOR
Fan Amperage	MONITOR
Fan Power	MONITOR
VFD Faults	MONITOR
Controller Faults	MONITOR
Fan Faults	MONITOR
Fan Status	MONITOR
PCU Faults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

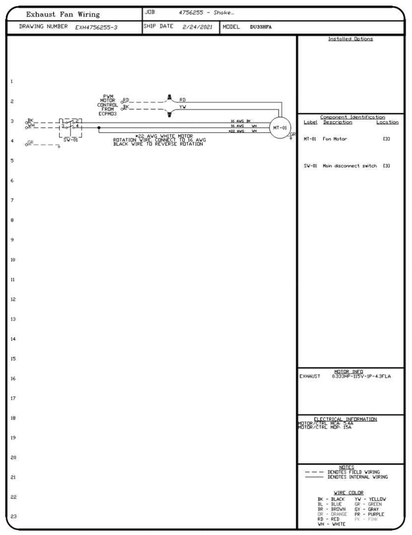
DC Packages	Function
Room Temperature(s)	MONITOR
Duct Temperature(s)	MONITOR
MUA Discharge Temperature	MONITOR
Kitchen RTU Discharge Temperature	MONITOR
Controller Faults	MONITOR
Fan Faults	MONITOR
Fan Status	MONITOR
PCU Faults	MONITOR
Fire Condition	MONITOR
CORE Fire System	MONITOR
Building Pressures	MONITOR
Pause Button(s)	MONITOR & CONTROL
Lights Button(s)	MONITOR & CONTROL
Wash Button	MONITOR & CONTROL

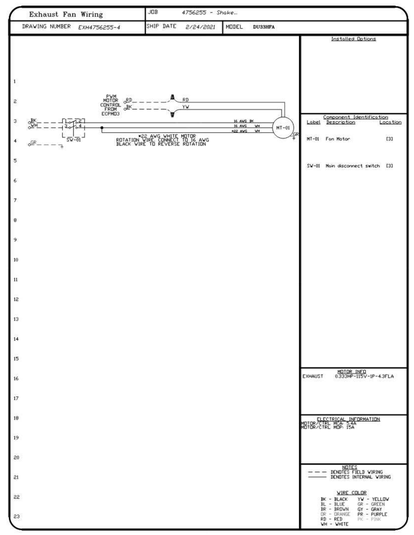












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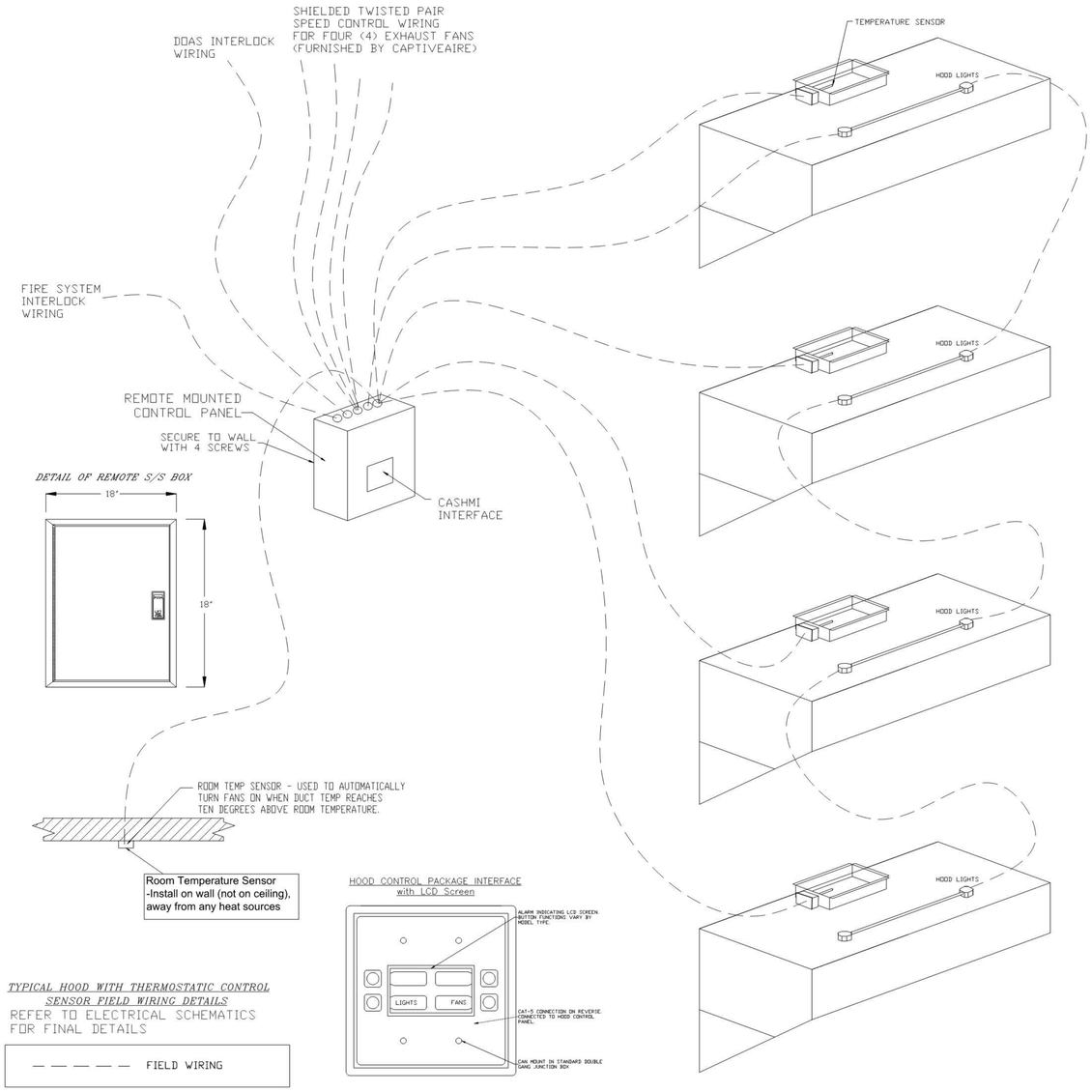
CRIMSON+ CONTROL DETAILS

LOW VOLTAGE & INTERLOCKS (SEE SCHEMATICS FOR LINE VOLTAGE)



TYPICAL HOOD WITH THERMOSTATIC CONTROL SENSOR FIELD WIRING DETAILS

REFER TO ELECTRICAL SCHEMATICS FOR FINAL DETAILS

— — — — — FIELD WIRING

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.

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