MECHANICAL SYMBOLS AND ABBREVIATIONS

NOTE: NOT ALL SYMBOLS AND ABBREVIATIONS INDICATED HERE ARE USED IN THE DRAWINGS AND MAY NOT APPLY TO THIS PROJECT. ADDITIONAL SYMBOLS MAY BE INDICATED IN THE DRAWINGS.

MECHANICAL ABBREVIATIONS

AD	ACCESS DOOR
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ALT	ALTERNATE
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AVG	AVERAGE
BAS	BUILDING AUTOMATION SYSTEM
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BTU	BRITISH THERMAL UNITS
BTUH	BRITISH THERMAL UNITS PER HOUR
CAV	CONSTANT AIR VOLUME
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CL	CENTERLINE
CLG	CEILING
COND	CONDENSATE
CONTR	CONTRACTOR
COP	COEFFICIENT OF PERFORMANCE
CU	COPPER
DAP	DUCT ACCESS PANEL
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DEG	DEGREES
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EDR	EQUIVALENT DIRECT RADIATION
EFF	EFFICIENCY
ELEC	ELECTRICAL
ELEV	ELEVATION
EM	EMERGENCY
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
EXP	EXPANSION
EXIST	EXISTING
F	FAHRENHEIT
FC	FORWARD CURVED
FLA	FULL LOAD AMPS
FLR	FLOOR
FM	FACTORY MUTUAL
FPD	FLUID PRESSURE DROP
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
F&T	FLOAT AND THERMOSTATIC
FT	FEET
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GBD	GRAVITY BACKDRAFT DAMPER
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
GPH	GALLONS PER HOUR
HP	HORSEPOWER
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
LAT	LEAVING AIR TEMPERATURE
LB/HR	POUNDS PER HOUR
LF	LINEAR FEET
LTG	LIGHTING
LWT	LEAVING WATER TEMPERATURE

MAX	MAXIMUM
MBH	THOUSANDS OF BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MEP	MECHANICAL, ELECTRICAL AND PLUMBING
MER	MECHANICAL EQUIPMENT ROOM
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN.	MINIMUM
MISC	MISCELLANEOUS
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NPS	NOMINAL PIPE SIZE
NPSH	NET POSITIVE SUCTION HEAD
NPT	NATIONAL PIPE THREAD
NR	NEAR
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OC	ON CENTER
OED	OPEN END DUCT
OLP	OVERLOAD PROTECTION
OV	OUTLET VELOCITY
PC	PLUMBING CONTRACTOR
PCF	POUNDS PER CUBIC FOOT
PD	PRESSURE DROP
PH	PHASE
PLBG	PLUMBING
POC	POINT OF CONNECTION
PPH	POUNDS PER HOUR
PRV	PRESSURE RELIEF VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAUGE
PVC	POLYVINYL CHLORIDE
RA	RETURN AIR
REQD	REQUIRED
RF	ROOF
RH	RELATIVE HUMIDITY
RPM	REVOLUTIONS PER MINUTE
SA	SUPPLY AIR
SCH	SCHEDULE
SHT	SHEET
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
S/S	STAINLESS STEEL
STD	STANDARD
STRUCT	STRUCTURAL
T&P	TEMPERATURE AND PRESSURE
TA	TRANSFER AIR
TBR	TO BE REMOVED
TC	TEMPERATURE CONTROL
TEMP	TEMPERATURE
TOB	TOP OF BEAM
TOD	TOP OF DUCT
TOP	TOP OF PIPE
TOS	TOP OF SLAB
TSP	TOTAL STATIC PRESSURE
T STAT	THERMOSTAT
TYP	TYPICAL
UC	UNDERCUT DOOR 1" (BY GENERAL CONTRACTOR)
UNO	UNLESS OTHERWISE NOTED
V	VOLTS
VA	VALVE
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
VP	VELOCITY PRESSURE
VTR	VENT THRU ROOF
W/	WITH
W/O	WITHOUT
WB	WET BULB
WC	WATER COLUMN
WG	WATER GAUGE
X	EXISTING

MECHANICAL EQUIPMENT ABBREVIATIONS

AC	AIR CONDITIONING UNIT/AIR COMPRESSOR
ACC	AIR COOLED CONDENSER
ACCU	AIR COOLED CONDENSING UNIT
ACU	AIR CONDITIONING UNIT
AHU	AIR HANDLING UNIT
AMD	AIR MIXING DEVICE
ARU	AIR ROTATION UNIT
AS	AIR SEPARATOR
AT	AIR TERMINAL DEVICE
B	BOILER
BBS	BOILER BLOWDOWN SEPARATOR
BC	BOOSTER COIL
BFS	BOILER FEEDWATER SYSTEM
C	CONVECTOR
CC	COOLING COIL
CH	CHILLER
CP	CONDENSATE PUMP
CRU	CONDENSATE RETURN UNIT
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
DC	DUST COLLECTOR
DH	DEHUMIDIFIER
EBB	ELECTRIC BASEBOARD
EF	EXHAUST FAN
EH	EXHAUST HOOD
EJ	EXPANSION JOINT
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
F	FILTER
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
FOP	FUEL OIL PUMP
FOT	FUEL OIL TANK
FTR	FIN TUBE RADIATION

GF	GAS FURNACE
GV	GRAVITY VENTILATOR
H	HUMIDIFIER
HC	HEATING COIL
HP	HEAT PUMP
HRC	HEAT RECOVERY COIL
HRD	HEAT RECLAIM DEVICE
HX	HEAT EXCHANGER
IAH	INTAKE AIR HOOD
IF	INLINE FAN
IFH	INFRARED HEATER
LP	LOUVERED PENTHOUSE
MAU	MAKE-UP AIR UNIT
MCC	MOTOR CONTROL CENTER
P	PUMP
RAHU	ROOFTOP AIR HANDLING UNIT
RCP	RADIANT CEILING PANEL
REF	ROOF EXHAUST FAN
RF	RETURN FAN
RH	RELIEF HOOD
RTU	ROOFTOP UNIT
RV	ROOF VENTILATOR
SA	SOUND ATTENUATOR
SF	SUPPLY FAN
T	TANK
TXV	THERMAL EXPANSION VALVE
UH	UNIT HEATER
UST	UNDERGROUND STORAGE TANK
UV	UNIT VENTILATOR
V	VALVE
VFD	VARIABLE FREQUENCY DRIVE
VP	VACUUM PUMP

PIPING SYSTEMS AND FITTINGS

BBD	BOILER BLOW DOWN
BF	BOILER FEED
BA	BREATHABLE AIR
CWS	CHILLED WATER SUPPLY
CWR	CHILLED WATER RETURN
A	COMPRESSED AIR
CDS	CONDENSER WATER SUPPLY
CDR	CONDENSER WATER RETURN
D	DRAIN LINE
FOF	FUEL OIL FILL
FOS	FUEL OIL SUPPLY
FOR	FUEL OIL RETURN
FOV	FUEL OIL VENT
GCWS	GLYCOL CHILLED WATER SUPPLY
GCWR	GLYCOL CHILLED WATER RETURN
HPWS	HEAT PUMP WATER SUPPLY
HPWR	HEAT PUMP WATER RETURN
HPS	HIGH PRESSURE STEAM
HPC	HIGH PRESSURE CONDENSATE
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
H	HUMIDIFICATION
LP	LIQUEFIED PETROLEUM GAS
LPS	LOW PRESSURE STEAM (10 PSIG)
LPC	LOW PRESSURE CONDENSATE
MU	MAKE-UP WATER
MPS	MEDIUM PRESSURE STEAM
MPC	MEDIUM PRESSURE CONDENSATE
G	NATURAL GAS
N2	NITROGEN
V	VENT LINE
PC	PUMPED CONDENSATE
RHG	REFRIGERANT HOT GAS
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RV	REFRIGERANT VENT
VAC	VACUUM (AIR)

- FLANGE
- UNION
- ANCHOR
- PIPE GUIDE
- ECCENTRIC REDUCER
- CONCENTRIC REDUCER
- LINE CONTINUATION BREAK
- PIPELINE STRAINER
- ELBOW DOWN
- ELBOW UP
- TEE DOWN
- TEE UP
- PIPE CAP
- VALVE IN VERTICAL

NOTE:
(X) PRIOR TO SYSTEM TYPE DENOTES EXISTING PIPING
(i.e. XHWS - EXISTING HOT WATER SUPPLY)

(XX) = SYSTEM PRESSURE IN PSIG
(i.e. —— (5 PSIG)G ——)

PIPE VALVES AND SPECIALTIES

- ANGLE VALVE
- BALANCING VALVE (CIRCUIT SETTER) (C.S.)
- BALL VALVE
- BUTTERFLY VALVE
- BUTTERFLY VALVE WITH ACTUATOR
- CHECK VALVE (ARROW INDICATES FLOW DIRECTION)
- DIAPHRAGM VALVE
- DRAIN VALVE WITH CAPPED OUTLET
- FLOAT OPERATED VALVE
- GATE VALVE
- GLOBE VALVE
- PLUG VALVE
- PRESSURE REDUCING VALVE
- PRESSURE RELIEF VALVE
- SHUTOFF VALVE (SEE SPECIFICATION FOR TYPE)
- SOLENOID VALVE
- THERMAL EXPANSION VALVE
- TRIPLE DUTY VALVE
- 2-WAY CONTROL VALVE
- 3-WAY CONTROL VALVE
- AUTOMATIC AIR VENT (AV)
- MANUAL AIR VENT (HMV)
- BALL JOINT
- EXPANSION JOINT (EJ)
- FLEXIBLE CONNECTION
- FLOW SWITCH (FS)
- FLOW METER (FM)
- PETE'S PLUG
- PRESSURE GAUGE
- PRESSURE SWITCH (PS)
- STEAM TRAP (XX) (INDICATE TYPE:
  - T - THERMOSTATIC TRAP
  - F&T - FLOAT AND THERMOSTATIC TRAP
  - IB - INVERTED BUCKET TRAP)
- THERMOMETER
- DIRECTION OF FLOW
- DIRECTION OF PITCH RISE (R) OR DROP (D)

DUCTWORK FITTINGS

SINGLE LINE DUCTWORK — DOUBLE LINE DUCTWORK

- RECTANGULAR/ROUND BRANCH TAKE OFF (SA, RA, AND EA)
- 1/4 D BUT NOT NOT LESS 6"
- 1/4 W BUT NOT NOT LESS 6"
- TEE (FOR LOW PRESSURE SUPPLY AIR DUCTWORK ONLY) (45°, D, W)
- 15° MAX. FOR DIVERGING TRANSITION, 25° MAX. FOR CONVERGING TRANSITION - ECCENTRIC
- 15° MAX. FOR DIVERGING TRANSITION, 25° MAX. FOR CONVERGING TRANSITION - CONCENTRIC
- DUCT WITH FLOW DIRECTION ARROW
- LINE CONTINUATION BREAK (RECTANGULAR, ROUND)
- SUPPLY AIR (SA) OR OUTDOOR AIR (OA) DUCT UP
- SUPPLY AIR (SA) OR OUTDOOR AIR (OA) DUCT DOWN
- RETURN AIR (RA), RELIEF AIR OR TRANSFER AIR (TA) DUCT UP
- RETURN AIR (RA), RELIEF AIR OR TRANSFER AIR (TA) DUCT DOWN
- EXHAUST AIR (EA) DUCT UP
- EXHAUST AIR (EA) DUCT DOWN
- DUCT RISE/DROP W/ 90° ELBOWS (SUPPLY RECTANGULAR DUCT SHOWN)
- EITHER RADIUS OR SQUARE ELBOW (REFER TO SPECIFICATION FOR ADDITIONAL REQUIREMENTS) (W, R=1.5W RADIUS ELBOW)
- SQUARE ELBOW WITH TURNING VANES
- DUCT RISE (R) OR DROP (D) W/ 30° ELBOWS (RECTANGULAR DUCTS)
- DUCT CROSS OVER (THIS DUCT RUNS UNDERNEATH)

DIFFUSER, GRILLE, AND REGISTER NOTATION

DUCT SIZE IN INCHES (NET INSIDE DIMENSIONS) FIRST FIGURE: SIDE SHOWN SECOND FIGURE: SIDE NOT SHOWN (12X12)

DIFFUSER/GRILLE MARK (A1), CFM (000), NECK SIZE (10"Ø), TYPICAL OF QUANTITY (TYP.2)

12"Ø INDICATES ROUND DUCTWORK
12X12ø INDICATES OVAL ROUND DUCTWORK

- SQUARE/RECTANGULAR SUPPLY DIFFUSER, GRILLE OR REGISTER
- ROUND DIFFUSER
- RETURN REGISTER OR GRILLE (HORIZONTAL MOUNT)
- EXHAUST REGISTER OR GRILLE (HORIZONTAL MOUNT)
- SIDEWALL REGISTER OR GRILLE WITH DAMPER (DUCT MOUNT)
- SUPPLY REGISTER OR GRILLE (VERTICAL MOUNT)
- EXHAUST OR RETURN REGISTER OR GRILLE (VERTICAL MOUNT)

DAMPERS AND CONTROLS

- MANUAL VOLUME DAMPER
- FIRE DAMPER
- SMOKE DAMPER
- COMBINATION FIRE/ SMOKE DAMPER
- BACKDRAFT DAMPER (B)
- MOTORIZED DAMPER (M)
- (T) SPACE THERMOSTAT
- (H) SPACE HUMIDISTAT
- (T_N) NIGHT CYCLE CONTROL THERMOSTAT
- [T] TEMPERATURE SENSOR
- [H] HUMIDITY SENSOR
- [P] PRESSURE SENSOR
- (SD) DUCT SMOKE DETECTOR
- (ST) STARTER
- (S) SWITCH

DUCTWORK SPECIALTIES

- DUCT REHEAT COIL
- TEST HOLE
- ACCESS DOOR (AD)
- NEW TO EXISTING DUCT CONNECTION (NEW / EXISTING)
- REMOVE EXISTING DUCTWORK
- FLEXIBLE DUCT
- POINT OF CHANGE IN DUCT CONSTRUCTION BY PRESSURE CLASS (3/2)
- LINED DUCTWORK

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER AND SHALL COMPLY WITH ALL ADOPTED LOCAL, STATE, AND NATIONAL CODES.
2. DO NOT SCALE THE DRAWINGS.
3. DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR TO INSTALL PIPE AND DUCTWORK IN A MANNER ACCORDING TO GOOD PRACTICE. ANY MAJOR DEVIATIONS REQUIRED FROM THE DESIGN DRAWINGS SHALL BE VERIFIED WITH THE ENGINEER/ARCHITECT.
4. FINAL ELECTRICAL CONNECTIONS AT OR ABOVE 120V SHALL BE MADE BY THE ELECTRICAL CONTRACTOR.
5. INSTALL BALANCING DAMPERS AND SPLITTER DAMPERS AS SHOWN AND AS REQUIRED FOR PROPER BALANCING OF THE MECHANICAL SYSTEM. PROVIDE TO THE ENGINEER/OWNER A BALANCING REPORT SHOWING RESULTS OF BALANCE TESTING. ALL BALANCE TESTING SHALL MEET THE CURRENT NEBB STANDARDS.
6. DO NOT LOCATE FCU'S, VAV'S, OR FPT'S ABOVE LIGHTS OR CONFERENCE ROOMS.
7. REFER TO STRUCTURAL DRAWINGS AND OTHER DISCIPLINES FOR COORDINATING DUCT ROUTING IN CEILING PLENUM SPACE.
8. PROVIDE A SET OF RECORD DRAWINGS OF THE ACTUAL INSTALLATION. RECORD DRAWINGS SHALL INCLUDE AS A MINIMUM, THE LOCATION AND PERFORMANCE DATA ON EACH PIECE OF EQUIPMENT, GENERAL CONFIGURATION OF DUCT & PIPE DISTRIBUTION SYSTEM INCLUDING SIZES AND THE TERMINAL AIR DESIGN FLOW RATES.
9. AVOID ROUTING OF PIPING OR DUCTWORK ABOVE IT, ELECTRICAL OR FIRE EQUIPMENT ROOMS.
10. PROVIDE APPROPRIATELY RATED FIRE STOPPING FOR PENETRATIONS THROUGH FIRE-RATED WALLS. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE RATED STRUCTURES.
11. COORDINATE THERMOSTAT, SENSOR AND SWITCH LOCATIONS WITH ARCHITECT/OWNER PRIOR TO INSTALLATION.
12. PROVIDE DUCT TRANSITIONS FROM EQUIPMENT CONNECTIONS TO DUCT SIZES SHOWN.
13. FLEXIBLE DUCT SHALL BE INSULATED AND SHALL BE THE SAME SIZE OF THE NECK OF THE AIR DEVICE. FLEXIBLE DUCTWORK SHALL NOT EXCEED 8'-0" IN LENGTH, PROVIDE WRAPPED RIGID ROUND DUCTWORK FOR TAKE-OFFS IN EXCESS OF 8'-0".
14. MAINTAIN A MINIMUM 10'-0" SEPARATION FROM OUTSIDE AIR INTAKES TO EXHAUST TERMINATIONS AND VENTS.
15. MAINTAIN A MINIMUM 5'-0" SEPARATION FROM EXHAUST TERMINATIONS TO OPERABLE WINDOWS.
16. ALL UNLINED DUCTWORK VISIBLE THOUGH THE AIR DEVICE SHALL BE PAINTED FLAT BLACK.
17. CEILING TILES USED TO ACCESS FAN COIL UNITS TO BE LABELED.
18. CONDENSATE DRAIN LINES SHALL BE COMPLETELY INSTALLED FOR ALL EQUIPMENT AND COMPLY WITH MANUFACTURER'S RECOMMENDED INSTALLATION INSTRUCTIONS. ALL CONDENSATE LINES TO BE INSULATED.

ISSUES

No.	Date	Description
01	12/19/2018	ISSUED FOR PERMIT & PRICING

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Date: 12/19/2018
Drawn by: SN
Checked by: WD
Phase:

Sheet Name: MECHANICAL SYMBOLS & ABBREVIATIONS

Sheet No.: M0.00

1.1 15010 MECHANICAL GENERAL

A. Reference: All portions of General Conditions apply to Mechanical and Plumbing work.

B. Guarantees: Provide written one year guarantee for all systems and equipment. Compressors shall be guaranteed for five years.

C. Codes: Comply with National, State and City codes and other applicable standards. All portions of the International Energy Conservation Code (IECC) and Current Local AHJ Commercial Energy Conservation Codes must be complied with.

D. Supervision: Provide supervisor in field for each phase of work.

E. Coordination: Coordinate all work with other trades. Provide mechanical and plumbing equipment with electrical characteristics compatible with that shown on the Electrical Drawings and described in the Electrical Division of the specifications. The engineer reserves the right to move services as required to coordinate the work, at no cost to the owner.

F. The drawings are schematic in nature, and should not be scaled, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. The drawings indicate general routing of the various parts of the systems, but do not indicate all fittings, offsets, and run outs which are required. The Contract shall include all fittings, offsets, and run outs required to fit the system into spaces allotted to them.

G. Shop Drawings and Submittal Data: PAPERLESS SUBMITTAL ONLY TO ENGINEER. All Shop Drawings and Submittal Data shall be an electronic file format only. PDF format is acceptable. All equipment and materials shall be submitted, including ductwork and equipment changes, as required. Submitted items that deviate from the drawings and specifications shall be highlighted in yellow for easy distinction. Mark all items and show that they comply with the IECC. The Engineer shall issue a letter stating the action taken on the submittal. The letter shall be copied and attached to the submittal, by the contractor, and distributed as required.

H. Record Data: Obtain, at Contractor's expense, a set of prints and keep these on the job site during construction. During construction, mark on these prints any changes that are made, noting particularly locations of those items that will need to be for servicing. Convert record data to an Electronic Format (PDF) and submit to the Architect. Furnish one set of shop drawings and maintenance manuals in brochure form. Record Brochures shall be given to the owner at completion of the work.

I. Permits, Fees: Secure and pay for all fees and charges for the work. Furnish certificates of acceptance at completion of the job from City.

J. Substitutions: No substitutions shall be made without prior approval from the Architect and Engineer.

K. Cutting and Patching: Cutting to be by this section, with patching and furring by General Contractor. Patching required after completion of work shall be paid for by Contractor.

L. Clean Up: Clean and touch-up paint all equipment at completion of work. Protect all equipment from damage during construction. Provide name plates on all equipment.

M. Tests: Tests all piping systems per local code. Sterilize all new water piping per Health Department requirements.

N. Test all equipment and prove performance results to Architect. Modify all drives, balance all air as shown on the drawings. After Owner has occupied and is using the building, make additional inspections of the system. Correct any Owner's observed temperature imbalances. Check correct operation of equipment and verify by letter to the Architect, on each trip. List in the letter corrections made. At the opposite season of the startup inspect and verify correct operation of all systems. Tests all control systems. Test refrigerant piping per manufacture's recommendations. Furnish complete copy of all test data to Architect. Instruct owner for one day in operation of all systems. Filters shall be clean when systems are accepted by the owner. Testing Regulations must meet local City Requirements.

O. Excavating and Backfilling: Excavate to provide minimum 2 feet cover over all piping and conduit. Back fill to original compaction. Saw-cut existing finishes and patch to matching original conditions.

P. Noise and Vibration: All equipment shall operate with minimum of noise and vibration. Contractors shall rectify any objectionable conditions.

Q. Temporary Services: Furnish temporary utility as required for new construction.

R. Equipment Connections: Provide all martial and labor for connecting of all equipment furnished in other sections or by owner. Field verify all equipment for dimensions and roughing-in. Furnish all valves, drain piping, traps, etc., as required to install the equipment.

S. Floor Drains: Final location will be determined by equipment layout and location must be field approved. Provide trap primers to all floor drains.

T. Examination of Site: The contractor is responsible for visiting the job site and confirming the location of existing conditions before bidding. If existing conditions require modification due to elevation, obstruction, size, etc., the contractor will advise in writing before beginning construction.

END OF SECTION 15010

1.1 15020 MECHANICAL SPECIFICATIONS

A. Provide all labor and materials for complete mechanical systems. Systems must comply with IECC.

B. Plates: Provide chrome plated plates over all pipes through walls, floors, and ceilings. Provide galvanized pipe sleeves for all lines through walls, floors, and roofs. Sleeves in outside walls and roof shall be water tight. Sleeves through walls above ceilings shall be air tight.

C. Piping Material:

1. Pipe handling materials to be galvanized. Separate copper pipe with insulating tape. Provide maximum headroom and clearances for access.

2. Refrigerant piping: Type "L" copper, with solder-type fittings.

3. Drain lines shall be provided for each air handling unit. Drains piping shall be Type "L" copper, or schedule 40 galvanized steel.

4. Joints for copper pipe shall be silver solder. Use malleable fittings for screwed joints for steel pipes 2.5" and smaller. Use welded joints for 3" and larger pipe.

D. Duct Insulation:

1. External: All ductwork shall be insulated and vapor sealed with R-8. External insulation shall comply with IECC, and be a minimum of 2" thick, with a vapor barrier applied over joints. Insulate outer cores of diffuses (externally). Insulation shall be applied per manufacture's recommendations.

2. Internal: Internal duct insulation shall be a minimum of 1-1/2" thick with R-8, and comply with IECC. Insulation shall be applied per manufacture's recommendations, with insulating pins speed washers 12" on centers on tops and sides of the duct.

3. Ductwork sizes shown on drawings are inside dimension.

E. Pipe Insulation:

1. Insulate condensate drain pipe with Armaflex.

2. Insulate refrigerant suction pipe with Armaflex. Systems must comply with IECC.

3. Exposed insulation outside shall have a waterproof paint applied according to manufacturer recommendations.

F. Isolate air handling units with spring type isolators. Install all equipment on minimum 4" concrete pads. Equipment installed on roofs shall have approved pads. Pads and enclosure's walls are based on equipment specified. The contractor shall increase pads and enclosures wall sizes, as required, for equipment supplied, at not extra cost to contract.

G. Ductwork: All ductwork materials shall be galvanized steel. Gauges, bracing, and supports shall be per SMACNA Manual. Plenums shall be 18-gauge. Provide airfoil type turning vanes at all changes in direction. Extractors shall have operators. Paint flat black behind grilles. Cross-break all ducts 12 inches and wider. Duct dimensions shown on drawings are clear inside dimensions. Submit shop drawings and changes to plan layouts and to provide adequate clearances. Flexible ductwork connections shall be provided for all fan unit connections. Ventglas fabric shall be 4" wide. Support ducts a maximum of 6 feet on centers with 1" x 26 gauge hangers. Secure supports with a sheetmetal screw on bottom, and 12" centers on sides. Dampers shall have felt edges and be 16 gauge. Provide locking quadrants for dampers. Provide concealed regulators for extractors on branch ducts, on takeoffs to the ceiling diffuses. Flexible ducts shall be pre insulated type, and a maximum of 8 feet long, U.L. fire dampers with access doors shall be provided as shown on the plans or required by code. Install dampers and access doors per U.L. requirements. Units above ceilings shall have auxiliary drain pans. Auxiliary drain pans shall be a minimum 4" high and made out of sheetmetal. Pans shall have auxiliary drain and a fan float switch.

H. Motors: Shall be an NEMA Standards high efficiency motor, operating non overloaded.

I. Motor Controls and Disconnects: Furnished by Electrical Contractor. This Contractor shall furnish disconnects, thermal overloads, starters, relays and extra contacts for interlocking.

J. Electrical: Contractors shall coordinate electrical characteristics with Electrical Contractor. Before ordering any equipment, submit a list of maximum overload circuits for all equipment to the Electrical Contractor and Engineer. This Contractor shall furnish all control instruments and wiring diagrams showing terminal identification numbers.

K. Rooftop A/C Unit:

1. Combination electric heating, electric cooling unit make for mounting exposed to weather. Units shall have economizers and must comply with IECC. Units shall be designed to operate at ambient temperatures of 105 degrees F, ARI rated, and approved. Casing shall be leak proof, galvanized steel, acrylic epoxy finish or bonded and coated with baked enamel. Mount units on factory roof curbs, with all duct and electrical connections inside the curb. Provide access panels. Insulate interior of casing with 1" thick matt faced glass fiber. Outside air intakes shall have motorized dampers. The hermetic compressors shall have a independent refrigeration circuits. Mount compressors on vibration isolators and provide factory-installed service valves, crankcase heaters, liquid line sight glass, filter-drier, expansion valves, low and high pressure cutouts, overload protection, and anti short cycling control. Coils to have copper tubes with aluminum coil, and minimum 1" condensate drain from evaporator drain pans. Evaporator Fans shall be centrifugal type with galvanized steel housing and adjustable pitch pulley-belt drive. Direct drive propeller condenser fans with guard. Electric heaters shall be factory installed on cooling/heating units. Heater models more than 10 KW shall have heating elements sequenced on and off as scheduled on the drawings. All heaters, above 10 KW, shall be equipped with thermal overload devices, fuses and current overloads. Provide a 24-volt transformer. Low-voltage connections shall be point-to-point on terminal board. Reference the filter specifications for filters. The following manufacturers are acceptable Carrier, Trane, York or McQuay.

2. Combination gas heating, electric cooling unit make for mounting exposed to weather. As noted on the drawings units shall have economizers and must comply with IECC. Units shall be designed to operate at ambient temperatures of 105 degrees F, ARI rated, and AGA approved. Casing shall be leak proof, galvanized steel, acrylic epoxy finish or bonded and coated with baked enamel. Mount units on factory roof curbs, with all duct and electrical connections inside the curb. Provide access panels. Insulate interior of casing with 1" thick matt faced glass fiber. Outside air intakes shall have motorized dampers. The hermetic compressors shall have a independent refrigeration circuits. Mount compressors on vibration isolators and provide factory-installed service valves, crankcase heaters, liquid line sight glass, filter-drier, expansion valves, low and high pressure cutouts, overload protection, and anti short cycling control. Coils to have copper tubes with aluminum coil, and minimum 1" condensate drain from evaporator drain pans. Evaporator Fans shall be centrifugal type with galvanized steel housing and adjustable pitch pulley-belt drive. Direct drive propeller condenser fans with guard. Heaters shall be AGA and U.L. Listed, and with all necessary parts for a complete system. System shall have a thermostat, electronic ignition, safety controls, relays, disconnects, contractors, etc. and be suitable for specified voltage. Locate thermostat as directed by Architect. Heaters shall be factory installed on cooling/heating units. Heater models shall have heating elements sequenced on and off as scheduled on the drawings. Provide a 24-volt transformer. Low-voltage connections shall be point-to-point on terminal board. Reference the filter specifications for filters. The following manufacturers are acceptable Carrier, Trane, York or McQuay.

L. Filters: Provide 2" filters by American Air Filters Co. Use pleated, disposable type, and install in all air handling units.

M. Outside Air Intake: Through outside wall or roof louvers with motorized aluminum OBD dampers.

N. Air Devices: Krueger, Carnes, Titus, or Metalaire. All devices shall be aluminum. Ceiling mounted outlets shall be off-white, other outlets shall be primed coated suitable for painting on the job. Operating dampers above non accessible ceiling shall have access doors or young regulators. See schedules on plans.

O. Fans: Roof mounted, ceiling mounted, wall mounted, vent sets or inline type as shown on the drawings. Provide factory curbs for all roof mounted fans or hoods. Provide aluminum discharge grilles as required. Fans shall be Greenheck, Loren Cook, Penn, or Acme.

P. Controls:

1. System shall have Honeywell electronic programmable type and must comply with IECC. Controls shall be electronic. Thermostats shall be a Honeywell electronic programmable type and must comply with IECC. The thermostat shall have the capability to set back and shut down the system based on day of week and time of day and provide a readily accessible manual over ride that will return to preset back or shutdown schedule without reprogramming. Programmable thermostats manufactured by the A/C unit manufacture are acceptable. Outside air dampers shall close when fan cycles off or when unit is in the off condition. Provide fire/ionization detectors in entering and leaving sides of all air discharge units. Exhaust fans shall be switched.

2. Sequence of Operation: Start Stop: Start-stop air handling unit thought a programmable time switch located in the A/C control cabinet. Run fans continuously. Provide 60 minute after hour manual timer for each AHU and to start complete systems cooling coils: A combination cooling heating thermostat shall modulate a three-way valve to maintain supply air temperature adequate to cool the desired zone heating: A combination cooling heating thermostat shall operate two stages on the electric heating coil to maintain supply air temperature adequate to heat the desired zone. Provide fire/ionization detectors in entering and leaving sides of all air discharge units.

Q. Kitchen Grease Exhaust Ductwork:

1. In concealed locations use minimum 16-gauge black steel or minimum 18-gauge 304 stainless steel with joints welded liquid tight or prefabricated grease duct, U.L. Inc. listed with aluminized steel shell.

2. In exposed areas, use 18-gauge or heavier 304 stainless steel with a number 3 finish and with joints welded liquid tight or prefabricated U.L. Inc. listed duct with stainless steel shell. Grind and polish welded joints and seams to a number 3 finish.

3. Provide expanded take-offs for branch duct connections or 45-degree entry fittings. Square edge 90-degree take-off fittings or straight taps will not be accepted.

4. Use elbows and tees with a centerline radius to width or diameter ratio of 1.5 wherever space permits.

5. Use shorter radius elbows in areas with limited space with prior approval of engineer.

6. No turning vanes may be used in kitchen exhaust duct.

7. Supporting steel hangers shall not be lighter than duct gauge.

8. Where using welded joints with black steel duct, coat external welded joints and seams with paint.

9. Grind and polish exposed stainless steel joints and seams to number 3 finish.

10. Apply bracing and reinforcement to outside of duct to prevent breathing, rattling, vibration, or sagging of duct.

11. Install without forming dips, sag, or traps which might collect residue by providing supports at not greater than 5-foot intervals.

12. Fasteners at hangers shall not penetrate the duct, do not use sheet metal screws on supports; use bolted, riveted, or welded connections.

13. Where ductwork is u.l. listed, install in accordance with listing.

14. Construct grease tight access doors of same material and thickness as duct and as large as possible, up to 24 inches in any dimension.

15. Locate access doors on duct sides for ease of inspection and cleaning at each change in direction, not less than every 10 lineal feet of duct, including risers, and not less than 1-1/2 inches from bottom of duct.

16. Insulation or fire protection enclosure shall be removable at each access door and clean out.

17. Pitch horizontal ducts back to hood at 1-inch per foot.

18. Grease duct to be insulated with fire stop insulation. Fire stop insulation to be noncombustible, non-asbestos, non-ceramic fiber, high temperature blanket or board fireproofing insulation, constructed of calcium silicate or calcium-magnesium-silica amorphous wool with 2 hour ASTM E119 and ASTM E814 "F" and "T" fire ratings, U.L. or equivalent third party listed and labeled. foil-scrim-polyethylene fiberglass reinforced factory applied jacket.

19. Install per smacna and nfpa 96.

END OF SECTION 15020

ISSUES

No.	Date	Description
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Job No.:	18130.00
Date:	12/19/2018
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Sheet Name
MECHANICAL SPECIFICATIONS

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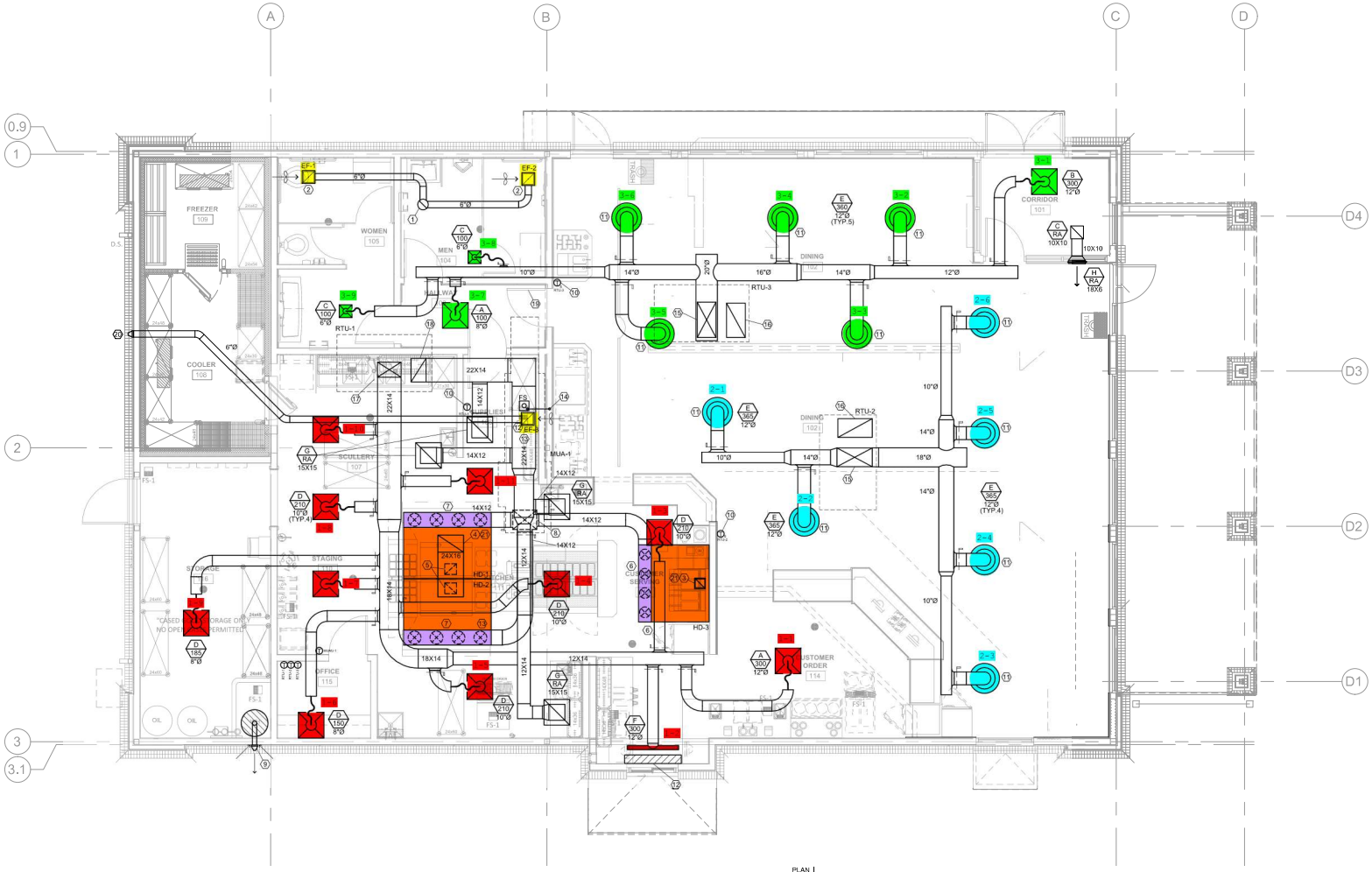
M0.01



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

KEYED NOTES:

1. 10"Ø EXHAUST DUCT UP TO ROOF CAP VENT ON ROOF.
2. PROVIDE EXHAUST FAN WITH BACKDRAFT DAMPER.
3. 10X10 HOOD EXHAUST DUCT WITH ACCESS DOOR FOR CLEANING UP TO KEF-2 ON ROOF.
4. 24X16 HOOD EXHAUST DUCT WITH ACCESS DOOR FOR CLEANING UP TO KEF-1 ON ROOF. PROVIDE WITH 2-LAYERS OF 3M FIRE BARRIER DUCT WRAP 615+.
5. 12X10 HOOD EXHAUST DUCT WITH ACCESS DOOR FOR CLEANING TO CONNECT TO 24X16 DUCT ABOVE. PROVIDE WITH 2-LAYERS OF 3M FIRE BARRIER DUCT WRAP 615+.
6. 10"Ø HOOD SUPPLY DUCTS TO CONNECT TO 14X12 MAKE UP AIR SUPPLY DUCT. (TYPICAL 4)
7. 12"Ø HOOD SUPPLY DUCTS TO CONNECT TO 14X12 MAKE UP AIR SUPPLY DUCT. (TYPICAL 4)
8. FULL SIZE SUPPLY DUCT FROM MUA-1 ON ROOF.
9. PROVIDE CONCENTRIC VENT AT THIS LOCATION FOR WATER HEATER. INTAKE OPENING AT 1" MAXIMUM AWAY FROM WALL FACE. INSTALL 12" MINIMUM ABOVE GRADE. INTAKE LEG INSIDE BUILDING MUST FACE UP. ROUTE AND INSTALL PER ALL MANUFACTURER'S RECOMMENDATIONS.
10. LOCATION OF RTU TEMPERATURE SENSORS MOUNTED 7'-0" A.F.F.
11. PROVIDE AND INSTALL ROUND SUPPLY DIFFUSERS AS HIGH AS POSSIBLE IN DINING ROOM.
12. PROVIDE ELECTRIC AIR CURTAIN ABOVE DRIVE-THRU WINDOW. MODEL NUMBER QUICKSERV QSAC 24.
13. PROVIDE ACCESS DOOR FOR RETURN DUCT AT THIS LOCATION.
14. ROUTE 1-1/4" CONDENSATE DRAIN FROM ROOF PENETRATION TO FLOOR SINK.
15. FULL SIZE SUPPLY DUCT FROM RTU ON ROOF.
16. FULL SIZE RETURN DUCT FROM RTU ON ROOF. PROVIDE OPENING WITH ALUMINUM BIRDSCREEN.
17. 22X14 SUPPLY DUCT FROM RTU-1 ON ROOF. PROVIDE TRANSITION AS REQUIRED.
18. 22X14 RETURN DUCT FROM RTU-1 ON ROOF. PROVIDE TRANSITION AS REQUIRED.
19. UNDERCUT DOOR 1"
20. 6"Ø EXHAUST TO EXTERIOR WALL. PROVIDE WITH BRIEDERT EXHAUST WALL CAP OR EQUAL.
21. KITCHEN EXHAUST FANS TO BE CONTROLLED BY CAPTIVEAIRE THERMOSTATIC CONTROL. ACTIVATION TEMPERATURE TO BE 85 DEGREES. TEMPERATURE PROBE TO BE INSTALLED IN EXHAUST RISER PER MANUFACTURER SPECIFICATIONS.

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Job No.:	18130.00
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Phase:	

Sheet Name
MECHANICAL FLOOR PLAN

Sheet No.:
M2.11

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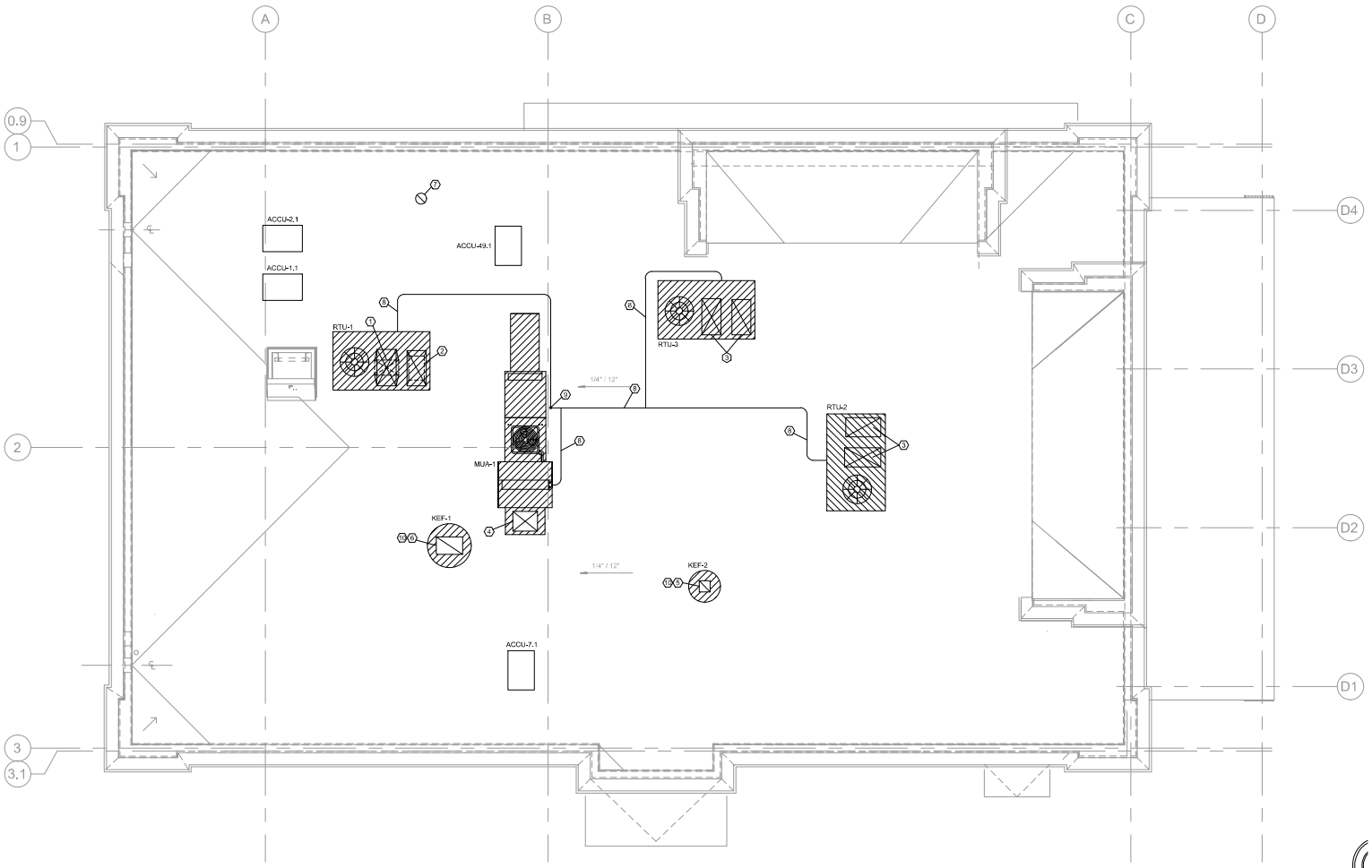

1 MECHANICAL ROOF PLAN
1/4" = 1'-0"

KEYED NOTES:

1. 22X14 SUPPLY DUCT DOWN TO PLENUM. PROVIDE TRANSITION AS REQUIRED.
2. 22X14 RETURN DUCT DOWN TO PLENUM. PROVIDE TRANSITION AS REQUIRED.
3. FULL SIZE SUPPLY / RETURN DUCTS DOWN TO DINING SPACE.
4. FULL SIZE MAKE UP AIR SUPPLY DUCT DOWN TO PLENUM.
5. 10X10 EXHAUST DUCT DOWN TO HD-3.
6. 24X16 EXHAUST DUCT DOWN TO HD-1 & HD-2. PROVIDE WITH 2-LAYERS OF 3M FIRE BARRIER DUCT WRAP 615+.
7. 10"Ø EXHAUST DUCT UP FROM RESTROOM EXHAUST FANS BELOW TO ROOF CAP VENT.
8. ROUTE 1-1/4" CONDENSATE DRAIN TO SINGLE ROOF PENETRATION.
9. ROUTE 1-1/4" CONDENSATE DRAIN DOWN TO FLOOR SINK.
10. KITCHEN EXHAUST FANS TO BE CONTROLLED BY CAPTIVEAIRE THERMOSTATIC CONTROL. ACTIVATION TEMPERATURE TO BE 85 DEGREES, TEMPERATURE PROBE TO BE INSTALLED IN EXHAUST RISER PER MANUFACTURER SPECIFICATIONS.

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ROOFTOP A/C UNIT SCHEDULE

MARK	DX COOLING COIL: SUPPLY CFM	DX COOLING COIL: OA CFM	DX COOLING COIL: TOTAL BTUH	DX COOLING COIL: SENSIBLE BTUH	SUPPLY FAN: MOTOR POWER KW	SUPPLY FAN: STATIC PRESS	VOLTS PHASE	MCA	MOCP	N.G. HEAT MBH IN / OUT	WEIGHT LBS.	REFRIG.	SEER / EER	MANUFACTURER
RTU-1	2,400	340	74,834	59,511	0.83	1.00	208 / 3	39.0	50	120 / 96	1,228	R-410A	11.2 EER	TRANE YSC092
RTU-2	2,200	370	69,962	55,379	0.83	1.00	208 / 3	35.0	50	120 / 96	1,228	R-410A	11.2 EER	TRANE YSC072
RTU-3	2,400	485	83,689	62,804	0.83	1.00	208 / 3	39.0	50	120 / 96	1,228	R-410A	11.2 EER	TRANE YSC092

* WEIGHTS ARE APPROXIMATE AND MAY VARY FROM MANUFACTURER TO MANUFACTURER.

1. SELECT RTU AT 105 F DB AMBIENT FOR ROOF MOUNT APPLICATIONS AND 95 F DB AMBIENT FOR GRADE MOUNT APPLICATIONS, ARI CONDITIONS.
2. FILTERS AS SPECIFIED.
3. FURNISH RTU WITH FACTORY CURB, ELECTRONIC PROGRAMMABLE THERMOSTAT, 12O VOLT GFI RECEPTACLE.
4. BALANCE UNITS FOR CFM SHOWN ON MECHANICAL FLOOR PLANS.
5. ROOM CONDITIONS: COOLING 75 F, 55% RH HEATING 70F
6. PROVIDE WITH CONDENSER COIL HAIL GUARDS.
7. PROVIDE RTU'S WITH CONDENSATE FLOAT SWITCH IN THE PRIMARY DRAIN PAN TO DEACTIVATE THE UNIT IN EVENT OF A PRIMARY DRAIN PAN OVERFLOW.

FAN SCHEDULE

MARK	SERVICE	CFM	STATIC PRESS	FAN RPM	DRIVE TYPE	VOLT PHASE	WATTS	MANUFACTURER
EF-1	EXHAUST	125	0.25	1,115	DIRECT	120 / 1	128	COOK GC-164
EF-2	EXHAUST	125	0.25	1,115	DIRECT	120 / 1	128	COOK GC-164
EF-3	EXHAUST	125	0.25	1,115	DIRECT	120 / 1	128	COOK GC-164

1. ALL FANS TO HAVE DISCONNECT SWITCHES.
2. PROVIDE SPEED CONTROLLERS ON ALL DIRECT DRIVE FANS. LOCATE WITH FAN.
3. RESTROOM EXHAUST FAN APPLICATIONS TO BE INTERLOCKED WITH LIGHTS.
4. PROVIDE EXHAUST FANS WITH BACKDRAFT DAMPER.

AIR DEVICE SCHEDULE

MARK	DESCRIPTION	RADIATION DAMPER	OBD DAMPER	MANUFACTURER: TITUS OR EQUAL
A	CEILING DIFF	NO	NO	OMNI - AA, SQUARE PLAQUE LAY-IN, 24X24
B	CEILING DIFF	NO	NO	OMNI - AA, SQUARE PLAQUE SURFACE MOUNT, 24X24
C	CEILING DIFF	NO	NO	OMNI - AA, SQUARE PLAQUE SURFACE MOUNT, 12X12
D	CEILING DIFF	NO	NO	PAS - AA, SQUARE PLAQUE LAY-IN, 24X24
E	CEILING DIFF	NO	NO	TMR - AA, ROUND SUPPLY DIFFUSER
F	SLOT DIFF SA	NO	NO	TBDI-80, 3-SLOT, 1" SLOT, 4' LONG
G	RETURN AIR	NO	NO	PAR - AA, PERFORATED FACE LAY-IN, 24X24
H	SIDE WALL RA	NO	YES	350FL - SIDEWALL

1. VERIFY ALL CEILING TYPES WITH ARCHITECTURAL DRAWINGS.
2. ALL AIR DEVICES SHALL BE ALUMINUM, UNLESS NOTED.
3. SUPPLY RADIATION DAMPERS FOR DEVICES PENETRATING RATED CEILINGS.
4. VERIFY FINAL COLOR / FINISH WITH ARCHITECT FOR ALL DIFFUSERS AND GRILLES.
5. VERIFY FINAL COLOR / FINISH WITH ARCHITECT FOR ALL LOUVERS.

A1 — DIFFUSER/GRILLE MARK
000 — CFM
10"Ø — NECK SIZE
(TYP.2) — TYPICAL OF QUANTITY

OUTSIDE AIR CALCULATIONS

BUILDING SPACE	SQ FT	CFM / SF	PERSONS	CFM / PERSON	OA
VESTIBULE	76	0.06	-	-	5
DINING	1,351	0.18	90	7.5	918
KITCHEN	962	0.12	8	7.5	175
OFFICE	43	0.06	1	5	8
STORAGE	217	0.06	1	5	18
CORRIDOR	54	0.06	-	-	3
TOTAL REQUIRED					1,127
TOTAL SUPPLIED					1,190

KITCHEN AIR BALANCE CALCULATIONS

BUILDING ZONE	AIR TYPE	VALUE
RTU-1 - KITCHEN / DRY STORAGE / OFFICE	OUTSIDE AIR	340
	EXHAUST	-3,359
	MAKE UP AIR	2,688
	NET	-331
RTU-2 - DINING	OUTSIDE AIR	370
RTU-3 - DINING / HALLWAY / RESTROOMS	OUTSIDE AIR	485
	EXHAUST	-250
	NET	605
TOTAL NET		274

COOLER - 108 CALCULATIONS

COOLER
VOLUME OF COOLER: 1,012 CUBIC FEET
TYPE OF REFRIGERANT: R404A
POUNDS OF REFRIGERANT: 10.4 LBS.

10.4 LBS / 1,012 CUBIC FEET = 0.0103 LBS / CUBIC FOOT

DOES NOT EXCEED 31 LBS / 1,000 CUBIC FOOT
NO ALARM SYSTEM IS REQUIRED
REFRIGERANT COMPRESSORS LOCATED ON ROOF, 1-1/2 HP.

FREEZER - 109 CALCULATIONS

FREEZER
VOLUME OF FREEZER: 638 CUBIC FEET
TYPE OF REFRIGERANT: R404A
POUNDS OF REFRIGERANT: 13.6 LBS.

13.6 LBS / 638 CUBIC FEET = 0.0213 LBS / CUBIC FOOT

DOES NOT EXCEED 31 LBS / 1,000 CUBIC FOOT
NO ALARM SYSTEM IS REQUIRED
REFRIGERANT COMPRESSORS LOCATED ON ROOF, 2-1/2 HP.

MECHANICAL:
THE CONTRACTOR SHALL PROVIDE THE FOLLOWING ENERGY CODE REQUIREMENTS:
THE FOLLOWING REQUIREMENTS ARE MANDATORY PROVISIONS AND ARE NECESSARY FOR COMPLIANCE WITH THE CODE.

DRAWINGS: CONSTRUCTION DOCUMENTS SHALL REQUIRE THAT WITHIN 90 DAYS AFTER THE DATE OF SYSTEM ACCEPTANCE, RECORD DRAWINGS OF THE ACTUAL INSTALLATION BE PROVIDED TO THE BUILDING OWNER OR THE DESIGNATED REPRESENTATIVE OF THE BUILDING OWNER. RECORD DRAWINGS SHALL INCLUDE AS A MINIMUM: THE LOCATION AND PERFORMANCE DATA ON EACH PIECE OF EQUIPMENT, GENERAL CONFIGURATION OF DUCT AND PIPE DISTRIBUTION SYSTEM INCLUDING SIZES, AND THE TERMINAL AIR OR WATER DESIGN FLOW RATES.

MANUALS: CONSTRUCTION DOCUMENTS SHALL REQUIRE THAT AN OPERATING MANUAL AND A MAINTENANCE MANUAL BE PROVIDED TO THE BUILDING OWNER OR THE DESIGNATED REPRESENTATIVE OF THE BUILDING OWNER WITHIN 90 DAYS AFTER THE DATE OF SYSTEM ACCEPTANCE. THESE MANUALS SHALL BE IN ACCORDANCE WITH INDUSTRY-ACCEPTED STANDARDS (SEE APPENDIX E) AND SHALL INCLUDE, AT A MINIMUM, THE FOLLOWING:
(A) SUBMITTAL DATA STATING EQUIPMENT SIZE AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE.
(B) OPERATION MANUALS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE, EXCEPT EQUIPMENT NOT FURNISHED AS PART OF THE PROJECT. REQUIRED ROUTINE MAINTENANCE ACTIONS SHALL BE CLEARLY IDENTIFIED.
(C) NAMES AND ADDRESSES OF AT LEAST ONE SERVICE AGENCY.
(D) HVAC CONTROLS SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, INCLUDING WIRING DIAGRAMS, SCHEMATICS, AND CONTROL SEQUENCE DESCRIPTIONS. DESIRED OR FIELD-DETERMINED SET-POINTS SHALL BE PERMANENTLY RECORDED ON CONTROL DRAWINGS AT CONTROL DEVICES OR, FOR DIGITAL CONTROL SYSTEMS, IN PROGRAMMING COMMENTS.
(E) A COMPLETE NARRATIVE OF HOW EACH SYSTEM IS INTENDED TO OPERATE, INCLUDING SUGGESTED SET-POINTS.

2015 IECC SECTION C403.2.4.2 - OUTDOOR AIR INTAKE AND EXHAUST OPENINGS AND STAIRWAY AND SHAFT VENTS SHALL BE PROVIDED WITH CLASS I MOTORIZED DAMPERS. THE DAMPERS SHALL HAVE AN AIR LEAKAGE RATE NOT GREATER THAN 4 CFM / FT2 OF DAMPER SURFACE AREA AT 1.0 INCH WATER GAUGE AND SHALL BE LABELED BY AN APPROVED AGENCY WHEN TESTED IN ACCORDANCE WITH AMCA 500D FOR SUCH PURPOSE.

OUTDOOR AIR INTAKE AND EXHAUST DAMPERS SHALL BE INSTALLED WITH AUTOMATIC CONTROLS CONFIGURED TO CLOSE WHEN THE SYSTEMS OR SPACES SERVED ARE NOT IN USE OR DURING UNOCCUPIED PERIOD WARM-UP AND SETBACK OPERATION, UNLESS THE SYSTEMS SERVED REQUIRE OUTDOOR OR EXHAUST AIR IN ACCORDANCE WITH INTERNATIONAL MECHANICAL CODE OR THE DAMPERS ARE OPENED TO PROVIDE INTENTIONAL ECONOMIZER COOLING.

EXCEPTIONS: GRAVITY (NONMOTORIZED) DAMPERS SHALL BE PERMITTED TO BE USED AS FOLLOWS:
(A) IN BUILDINGS LESS THAN 3 STORIES IN HEIGHT ABOVE GRADE PLANE.
(B) IN BUILDINGS OF ANY HEIGHT LOCATED IN CLIMATE ZONES 1, 2, OR 3.
(C) WHERE THE DESIGN EXHAUST CAPACITY IS NOT GREATER THAN 300 CFM.

GRAVITY (NONMOTORIZED) DAMPERS SHALL HAVE AN AIR LEAKAGE RATE NOT GREATER THAN 20 CFM / FT2 WHERE NOT LESS THAN 24 INCHES IN EITHER DIMENSION AND 40 CFM / FT2 WHERE LESS THAN 24 INCHES IN EITHER DIMENSION. THE RATE OF AIR LEAKAGE SHALL BE DETERMINED AT 1.0 INCH W.G. WHEN TESTED IN ACCORDANCE WITH AMCA 500D FOR SUCH PURPOSE. THE DAMPERS SHALL BE LABELED BY AN APPROVED AGENCY.

CONTROLS: THERMOSTATIC SETBACK CONTROLS SHALL HAVE THE CAPABILITY TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F OR UP TO 85°F IN ACCORDANCE WITH 2015 IECC SECTION C403.2.4.2.1.

AUTOMATIC TIME CLOCK OR PROGRAMMABLE CONTROLS SHALL BE CAPABLE OF STARTING AND STOPPING THE SYSTEM FOR SEVEN DIFFERENT DAILY SCHEDULES PER WEEK AND RETAINING THEIR PROGRAMMING AND TIME SETTING DURING A LOSS OF POWER FOR AT LEAST 10 HOURS. ADDITIONALLY, THE CONTROLS SHALL HAVE A MANUAL OVERRIDE THAT ALLOWS TEMPORARY OPERATION OF THE SYSTEM FOR UP TO 2 HOURS; A MANUALLY OPERATED TIMER CAPABLE OF BEING ADJUSTED TO OPERATE THE SYSTEM FOR UP TO 2 HOURS; OR AN OCCUPANCY SENSOR IN ACCORDANCE WITH 2015 IECC SECTION C403.2.4.2.2.

(B) AN OCCUPANT SENSOR THAT IS CAPABLE OF SHUTTING THE SYSTEM OFF WHEN NO OCCUPANT IS SENSED FOR A PERIOD OF UP TO 30 MINUTES.
(C) A MANUALLY OPERATED TIMER CAPABLE OF BEING ADJUSTED TO OPERATE THE SYSTEM FOR UP TO TWO HOURS.

CONSTRUCTION DOCUMENTS SHALL REQUIRE THAT ALL HVAC SYSTEMS BE BALANCED IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING STANDARDS (SECTION C408.2.2 OF 2015 IECC). CONSTRUCTION DOCUMENTS SHALL REQUIRE THAT A WRITTEN BALANCE REPORT BE PROVIDED TO THE OWNER OR THE DESIGNATED REPRESENTATIVE OF THE BUILDING OWNER FOR THE HVAC SYSTEMS SERVING ZONES WITH A TOTAL CONDITIONED AREA EXCEEDING 5000 SF.
AIR SYSTEMS SHALL BE BALANCED IN A MANNER TO FIRST MINIMIZE THROTTLING LOSSES. THEN, FOR FANS WITH FAN SYSTEM POWER GREATER THAN 1 HP, FAN SPEED SHALL BE ADJUSTED TO MEET DESIGN FLOW CONDITIONS. EACH SUPPLY OUTLET AND ZONE TERMINAL DEVICE SHALL BE EQUIPPED WITH MEANS FOR AIR BALANCING.
INDIVIDUAL HYDRONIC HEATING AND COOLING COILS SHALL BE EQUIPPED WITH MEANS FOR BALANCING AND MEASURING FLOW. HYDRONIC SYSTEMS SHALL BE PROPORTIONATELY BALANCED IN A MANNER TO FIRST MINIMIZE THROTTLING LOSSES, THEN THE PUMP IMPELLER SHALL BE TRIMMED OR PUMP SPEED SHALL BE ADJUSTED TO MEET DESIGN FLOW CONDITIONS. EACH HYDRONIC SYSTEM SHALL HAVE EITHER THE CAPABILITY TO MEASURE ACROSS THE PUMP, OR TEST PORTS AT EACH SIDE OF EACH PUMP.
EXCEPTIONS: THE FOLLOWING EQUIPMENT IS NOT REQUIRED TO BE EQUIPPED WITH A MEANS FOR BALANCING OR MEASURING FLOW:
1. PUMPS WITH PUMP MOTORS OF 5 HP OR LESS.
2. WHERE THROTTLING RESULTS IN NO GREATER THAN 5 PERCENT OF THE NAMEPLATE HORSEPOWER DRAW ABOVE THAT REQUIRED IF THE IMPELLER WERE TRIMMED.

ALL MECHANICAL/PLUMBING SUPPLY AND RETURN PIPING SHALL BE INSULATED PER THE 2015 INTERNATIONAL ENERGY CONSERVATION CODE - TABLE C403.2.10 - MINIMUM PIPE INSULATION.

ALL THERMOSTATS TO BE NEW AND PROGRAMMABLE PER THE 2015 INTERNATIONAL ENERGY CONSERVATION CODE - SECTION C403.2.4.

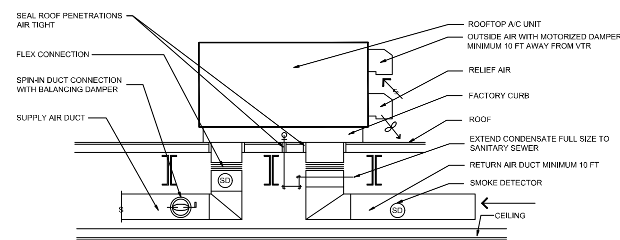
ALL SUPPLY AND RETURN AIR DUCTS LOCATED IN UNCONDITIONED ATTICS, UNCONDITIONED SPACES INCLUDING MECHANICAL ROOMS, UNCONDITIONED PLENUMS, OUTSIDE OF THE ENVELOPE OR OUTSIDE THE BUILDING SHALL BE INSULATED USING R-8 INSULATION AND COMPLY WITH THE 2015 INTERNATIONAL ENERGY CONSERVATION CODE. ALL SUPPLY AND RETURN DUCTS LOCATED IN A CONDITIONED SPACE OR CONDITION PLENUM SHALL BE INSULATED USING R-6 INSULATION. EXTERNALLY INSULATED DUCT SHALL BE R-8 PER 2015 INTERNATIONAL ENERGY CONSERVATION CODE. INSULATION SHALL BE CONTINUOUS THROUGH ALL WALLS/CEILINGS INCLUDING RATED WALLS. NO INSULATION / VAPOR BARRIER BREAKS WILL BE ALLOWED. ALL SUPPLY AIR DIFFUSER BACKS TO BE INSULATED PER SPECIFICATIONS ABOVE AND PER LOCATION INSTALLED. ALL EXPOSED DUCTWORK TO BE 1" THICK DOUBLE WALL SPIRAL ROUND WITH 1" THICK INSULATION BETWEEN INNER AND OUTER LAYERS OF SHEET METAL.

ALL DUCTWORK TO BE SHEETMETAL AS SPECIFIED WITH EXTERNAL INSULATION AS SPECIFIED. ACOUSTICAL LINER IS NOT APPROVED.

ANCHOR AND SUPPORTS MUST MEET VERTICAL AND HORIZONTAL LOADS WITHIN THE STRESS LIMITATIONS SPECIFIED IN THE INTERNATIONAL BUILDING CODE FOR THE MINIMUM BASIC WIND SPEED. ANCHOR AND SUPPORTS TO COMPLY WITH SECTION 1609 - 2015 IBC.

DUCTWORK AND PLENUMS SHALL BE SEALED IN ACCORDANCE WITH SECTION 603.9 OF THE 2015 INTERNATIONAL MECHANICAL CODE AND SECTION C403.2.9 OF THE 2015 INTERNATIONAL COMMERCIAL ENERGY CONSERVATION CODE.

ALL DUCTWORK MATERIALS SHALL BE GALVANIZED STEEL. GAUGES, BRACING, AND SUPPORTS SHALL BE PER SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE MANUAL, 3RD EDITION. PLENUMS SHALL BE 18-GAUGE. PROVIDE AIRFOIL TYPE TURNING VANES AT ALL CHANGES IN DIRECTION. EXTRACTORS SHALL HAVE OPERATORS. CROSS-BREAK ALL DUCTS 12 INCHES AND WIDER. DUCT DIMENSIONS SHOWN ON DRAWINGS ARE CLEAR INSIDE DIMENSIONS. SUPPORT DUCTS A MAXIMUM OF 6 FEET ON CENTERS WITH 1" X 26 GAUGE HANGERS. SECURE SUPPORTS WITH A SHEETMETAL SCREW ON BOTTOM, AND 12" CENTERS ON SIDES. DAMPERS SHALL HAVE FELT EDGES AND BE 16 GAUGE. PROVIDE LOCKING QUADRANTS FOR DAMPERS. PROVIDE CONCEALED REGULATORS FOR EXTRACTORS ON BRANCH DUCTS, ON TAKEOFFS TO THE CEILING DIFFUSES. U.L. FIRE DAMPERS WITH ACCESS DOORS SHALL BE PROVIDED AS SHOWN ON THE PLANS OR REQUIRED BY CODE. INSTALL DAMPERS AND ACCESS DOORS PER U.L. REQUIREMENTS.



01 ROOFTOP A/C UNIT DETAIL

SCALE: NTS

1. UNIT TO MEET 2015 IECC REQUIREMENTS AND ALL LOCAL CODES.
2. PROVIDE UNITS WITH BAROMETRIC RELIEF DAMPERS
3. SECURE RTU TO CURB WITH FACTORY CONNECTORS, PER LOCAL CODE.
4. ROOF MOUNTED EQUIPMENT TO BE SECURED TO ROOF AT CURB TO RESIST UPLIFT IN 120 MPH WIND EVENT. (COLC 22-35).

MINIMUM PIPE INSULATION THICKNESS

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY: CONDUCTIVITY BTU·IN. / (H·FT2·°F)	INSULATION CONDUCTIVITY: MEAN RATING TEMPERATURE, °F	NOMINAL PIPE OR TUBE SIZE (INCHES): < 1	1 TO < 1 1/2	1 1/2 TO < 4	4 TO < 8	≤ 8
> 350	0.32 - 0.34	250	4.5	5.0	5.0	5.0	5.0
251 - 350	0.29 - 0.32	200	3.0	4.0	4.5	4.5	4.5
201 - 250	0.27 - 0.30	150	2.5	2.5	2.5	3.0	3.0
141 - 200	0.25 - 0.29	125	1.5	1.5	2.0	2.0	2.0
105 - 140	0.21 - 0.28	100	1.0	1.0	1.5	1.5	1.5
40 - 60	0.21 - 0.27	75	0.5	0.5	1.0	1.0	1.0
< 40	0.20 - 0.26	50	0.5	1.0	1.0	1.0	1.5

ISSUES

No.	Date	Description
01	12/19/2018	ISSUED FOR PERMIT & PRICING

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STATE OF TEXAS — JASON W. DAWSON — 108125 — LICENSED PROFESSIONAL ENGINEER

FREDDY'S FROZEN CUSTARD & STEAKBURGERS - TOMBALL

27645 TOMBALL PKWY
TOMBALL, TX 77377

OWNER:
TOMBALL CUSTARD, LLC
7309 E. 21st STREET N, STE. 120
WITCHITA, KANSAS 67206-1178
(316) 261-5369

Job No.: 18130.00
Date: 12/19/2018
Drawn by: SN
Checked by: WD
Phase:

Sheet Name
MECHANICAL NOTES, DETAILS & SCHEDULES

Sheet No.:
M3.11

DVO PROJECT – 181189

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HOOD INFORMATION - Job#2900399

HOOD NO.	TAG	MODEL	LENGTH	MAX CEILING TEMP.	EXHAUST PLENUM RISER(S) TOTAL EXH. CFM	WIDTH	LENG.	HEIGHT	DIA.	CFM	S.P.	TOTAL SUPPLY CFM	HOOD CONSTRUCTION	HOOD CONFIG. END TO END	ROW
1	HD-1	4824 ND-2-PSP-F	6' 10.00"	450 Deg.	1292	10"	18"	4"		1292	-0.662"	1034	430 SS Where Exposed	ALCOVE	FRONT
2	HD-2	4824 ND-2-PSP-F	6' 10.00"	450 Deg.	1292	10"	18"	4"		1292	-0.662"	1034	430 SS Where Exposed	ALCOVE	BACK
3	HD-3	5424 ND-2-PSP-F	5' 0.00"	450 Deg.	775	9"	8"	4"		775	-0.479"	666	430 SS Where Exposed	ALCOVE	ALCOVE

PATENT NUMBERS
AC-PSP (United States) - US Patent 7963830 B2
AC-PSP Wall (Canada) - CA Patent 2605509
AC-PSP Island (Canada) - CA Patent 2502330

HOOD INFORMATION

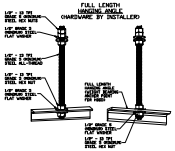
HOOD NO.	TAG	FILTER(S) TYPE	QTY.	HEIGHT	LENGTH	EFFICIENCY @ 9 MICRONS	LIGHT(S) QTY.	TYPE	WIRE GUARD	UTILITY CABINET(S) LOCATION	SIZE	PIPE SYSTEM TYPE	SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WGHT
1	HD-1	Captrate Solo Filter	5	16"	16"	93% See Filter Spec	2	LSS Series E26	NO							NO	393 LBS
2	HD-2	Captrate Solo Filter	5	16"	16"	93% See Filter Spec	2	LSS Series E26	NO							NO	393 LBS
3	HD-3	Captrate Solo Filter	3	16"	16"	93% See Filter Spec	2	LSS Series E26	NO	Left	12"x54"x24"			SC-E1101SFP	1 Light 1 Fan	NO	477 LBS

HOOD OPTIONS

HOOD NO.	TAG	OPTION
1	HD-1	FIELD WRAPPER 9.00" High. Front, Left, Right
2	HD-2	FIELD WRAPPER 9.00" High. Front, Left, Right
3	HD-3	FIELD WRAPPER 9.00" High. Front, Left, Right
		LEFT QUARTER END PANEL 23" Top Width, 0" Bottom Width, 23" High 430 SS
		RIGHT VERTICAL END PANEL 27" Top Width, 21" Bottom Width, 80" High Insulated 430 SS

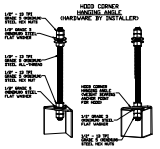
PERFORATED SUPPLY PLENUM(S)

HOOD NO.	TAG	POS.	LENGTH	WIDTH	HEIGHT	TYPE	RISER(S) WIDTH	LENG.	DIA.	CFM	S.P.
1	HD-1	Front	82"	14"	6"	MUA			12"	258	0.085"
						MUA			12"	258	0.085"
						MUA			12"	258	0.085"
						MUA			12"	258	0.085"
2	HD-2	Front	82"	14"	6"	MUA			12"	258	0.085"
						MUA			12"	258	0.085"
						MUA			12"	258	0.085"
						MUA			12"	258	0.085"
3	HD-3	Front	78"	18"	6"	MUA			18"	166	0.053"
						MUA			18"	166	0.053"
						MUA			18"	166	0.053"
						MUA			18"	166	0.053"



ASSEMBLY INSTRUCTIONS

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



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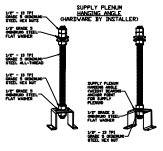

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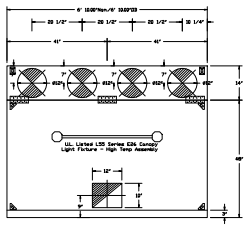
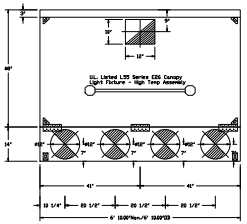
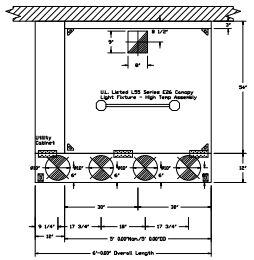
PLAN VIEW - Hood #2 (HD-2)
6' 10.00" LONG 4824ND-2-PSP-F

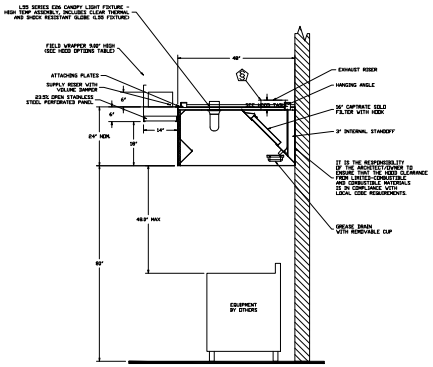


PLAN VIEW - Hood #1 (HD-1)
6' 10.00" LONG 4824ND-2-PSP-F

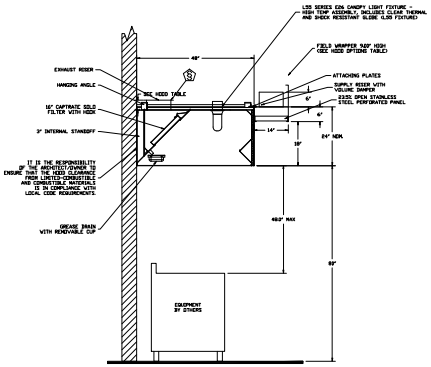


PLAN VIEW - Hood #3 (HD-3)
5' 0.00" LONG 5424ND-2-PSP-F

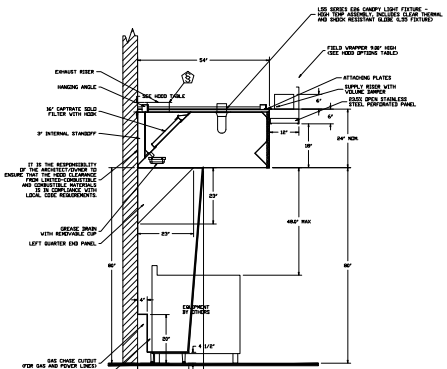




SECTION VIEW - MODEL 4824ND-2-PSP-F
HOOD - #2 (HD-2)



SECTION VIEW - MODEL 4824ND-2-PSP-F
HOOD - #1 (HD-1)



SECTION VIEW - MODEL 5424ND-2-PSP-F
HOOD - #3 (HD-3)

SHEET NO.	WATER SUPPLY	DRAWN BY	DATE	Freddy's Kingwood, TX For: HOCKENBERGS LENEXA, KS	CAPTIVE-AIRE
1	1/4" = 1'-0"	SN	1/29/2018		HBT 104 W 9th St Suite 204, Kansas City, MO, 64105 PHONE: (816) 221-4575 FAX: (816) 221-4311 EMAIL: mgill@captiveaire.com www.captiveaire.com

ISSUES

No.	Date	Description
03	12/19/2018	ISSUED FOR PERMIT & PRICING

DVO PROJECT - 181189

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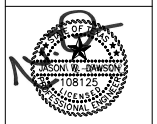

FREDDY'S FROZEN CUSTARD & STEAKBURGERS - TOMBALL
27605 TOMBALL PKWY
TOMBALL, TX 77377

OWNER:
TOMBALL CUSTARD, LLC
7309 E. 21st STREET N, STE. 120
WITCHITA, KANSAS 67206-1178
(316) 261-5369

Job No.: 18130.00
Date: 12/19/2018
Drawn by: SN
Checked by: WD
Phase:

Sheet Name
MECHANICAL NOTES, DETAILS & SCHEDULES

Sheet No.:
M3.12

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EXHAUST FAN INFORMATION – Job#2900399

FAN UNIT NO.	TAG	FAN UNIT MODEL #	CFM	ESP.	RPM	H.P.	B.H.P.	Ø	VOLT	FLA	WEIGHT (LBS.)	SONES
1	KEF-1	NCA36HPFA	2584	1.400	1329	1.500	1.1040	3	208	4.6	153	12.9
2	KEF-2	BUS0HFA	775	1.000	1292	0.500	0.2390	1	115	8.4	66	13.5

CONDENSER DETAILS

FAN UNIT NO.	TAG	FAN UNIT MODEL #	CONDENSER NO.	TONNAGE	VOLTAGE	PHASE	FREQUENCY	MCA	RLA	MAX. FUSE SIZE	MIN. WIRE SIZE	SEER
3	MUA-1	A2-B250-GI5-MPU	1	5	208-230	3 PHASE	60 Hz	21.4 Amps	17.4 Amps	30 Amps	12 AVG	14

MUA FAN INFORMATION – Job#2900399

FAN UNIT NO.	TAG	FAN UNIT MODEL #	BLOWER	HOUSING	DESIGN CFM	ESP.	RPM	H.P.	B.H.P.	Ø	VOLT	FLA	COOLING COIL ENTERING DB TEMP.	COOLING COIL ENTERING WB TEMP.	COOLING COIL LEAVING DB TEMP.	COOLING COIL LEAVING WB TEMP.	COOLING COIL TOTAL CAPACITY	COOLING COIL SENSIBLE CAPACITY	COOLING COIL LATENT CAPACITY	WEIGHT (LBS.)	SONES	BURNER EFFICIENCY(%)
3	MUA-1	A2-B250-GI5-MPU	GI5-PB	A2-B250	2688	0.400	794	1.500	1.0960	3	208	4.6	95.0°F	78.0°F	63.0°F	72.8°F	660 MBH	34.9 MBH	25.1 MBH	1598	12	92

GAS FIRED MAKE-UP AIR UNIT(S)

FAN UNIT NO.	TAG	INPUT BTUh	OUTPUT BTUh	TEMP. RISE	REQUIRED INPUT GAS PRESSURE	GAS TYPE
3	MUA-1	175623	157893	55 deg F	7 in. w.c. - 14 in. w.c.	Natural

FAN OPTIONS

FAN UNIT NO.	TAG	OPTION (Qty. - Descr.)
1	KEF-1	1 - Grease Box 1 - Upblast Fan Wheel Access Port
2	KEF-2	1 - Grease Box 1 - Upblast Fan Wheel Access Port
3	MUA-1	1 - Motorized Backdraft Damper For A2-B Housing 1 - AC Interlock Relay - 24VAC Coil 1 - Low Fire Start 1 - Inlet Pressure Gauge, 0-35" 1 - Manifold Pressure Gauge, -5 to 15" wc 1 - Curb Duct Hanger 1 - Freezestat (2) 1 - 5 Ton Single Circuit Modulex Packaged Cooling Option for Size 2 MUA (2,000 to 3,000 cfm), 208V/230V, 3 phase. Cooling Thermostat or Programmable Stat Required for Proper Operation. 1 - Full Crating For Commercial Heater 1 - Downturn Plenum for Size 2 3X Coil Module 1 - Cooling Thermostat and Relay (Not req for evap)

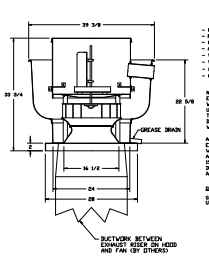
FAN ACCESSORIES

FAN UNIT NO.	TAG	EXHAUST				SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	KEF-1	YES						
2	KEF-2	YES						
3	MUA-1						YES	

CURB ASSEMBLIES

NO.	ON FAN	WEIGHT	ITEM	SIZE
1	# 1	41 LBS	Curb	26.000"W x 26.500"L x 20.000"H Vented Hinged
2	# 2	91 LBS	Curb	19.500"W x 79.750"L x 20.000"H Vented Hinged
3	# 3	76 LBS	Curb	35.000"W x 79.000"L x 15.000"H Insulated
	# 3		Rail	6.000"W x 31.000"L x 15.000"H

FAN #1 NCA36HPFA - EXHAUST FAN KEF-1

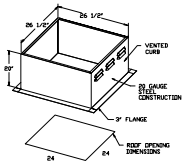


FEATURES:
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705 AND UL762
- AMCA SOUND AND AIR CERTIFIED
- WIRING FROM MOTOR TO DISCONNECT SWITCH
- WEATHERPROOF DISCONNECT
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

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 450°F (232°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

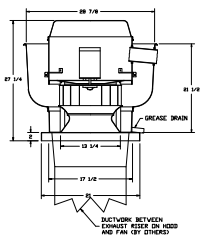
OPTIONS
GREASE BOX
UPBLAST FAN WHEEL ACCESS PORT



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.

SPECIFY PITCH
EXAMPLE: 7/12 PITCH = 30° SLOPE

FAN #2 BUS0HFA - EXHAUST FAN KEF-2

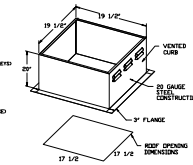


FEATURES:
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS)
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705 AND UL762
- VARIABLE SPEED CONTROL
- INTERNAL WIRING
- WEATHERPROOF DISCONNECT
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE)
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

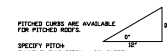
NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 450°F (232°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

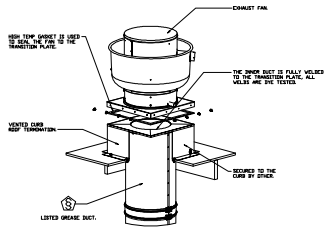
OPTIONS
GREASE BOX
UPBLAST FAN WHEEL ACCESS PORT



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.



SPECIFY PITCH
EXAMPLE: 7/12 PITCH = 30° SLOPE



GREASE DUCT SPECIFICATIONS:
PROVIDE GREASE DUCT EQUAL TO CAPTIVEAIRE SYSTEMS MODEL 'DW' ROUND 20 GAUGE 430 STAINLESS STEEL DUCTWORK. MODEL 'DW' IS LISTED TO UL-1978 AND IS INSTALLED USING 'V' CLAMP LOCKING CONNECTIONS SEALED WITH 3M FIRE BARRIER 2000 PLUS. MODEL 'DW' DOES NOT REQUIRE WELDING PROVIDING IT HAS BEEN INSTALLED PER THE MANUFACTURES INSTALLATION GUIDE.
PROVIDE RATED ACCESS DOORS AT EVERY CHANGE IN DIRECTION AND EVERY 12' ON CENTER. PER MANUFACTURES LISTING MODEL 'DW' HORIZONTAL RUNS LESS THAN 75 FT. CAN BE SLOPED 1/16" PER 12", HORIZONTAL RUNS MORE THAN 75 FT. CAN BE SLOPED 3/16" PER 12". DUCT SHOULD BE SLOPED AS MUCH AS POSSIBLE TO REDUCE THE CHANCE OF GREASE ACCUMULATION IN HORIZONTAL RUNS.

IF THE DUCT IS WITHIN 18 INCHES OF COMBUSTIBLE MATERIAL, PROVIDE UL-2221 LISTED DOUBLE WALL GREASE DUCT EQUAL TO CAPTIVEAIRE SYSTEMS MODEL 'DW- 2R, 3R, OR 3Z' ROUND 20 GAUGE 430 STAINLESS INNER DUCT INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL.

CUSTOMER APPROVAL TO MANUFACTURE:

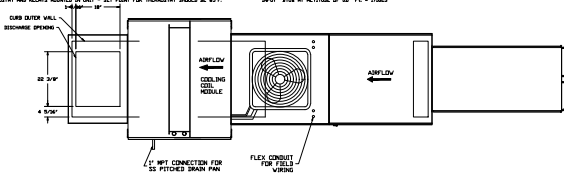
Approved as Noted ☐
Approved with NO Exception Taken ☐
Revise and Resubmit ☐

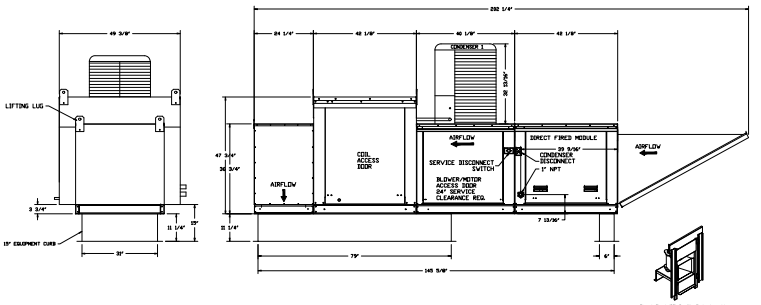
SIGNATURE _____

Your Title _____ Date _____

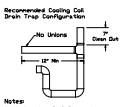
FAN #3 A2-B250-GI5-MPU - HEATER (MUA-1)
1. DIRECT GAS FIRED HEATED MAKE UP AIR UNIT WITH 15" BLOWER
2. BLOWER MOTOR WITH VFD
3. DRIVE ARRANGEMENT 1 (DIRECT DRIVE) - BLOWER RIGHT -> LEFT
4. MOTORIZED BACK DRAFT DAMPER RATED 2.5#/FT FOR SIZE 2 STANDARD & MODULAR DIRECT FIRED HEATERS W/ENTHERED SHAFT, STANDARD GALVANIZED CONSTRUCTION, 1/4" HEAVY FLANGE. LF1050 ACTUATOR INCLUDED
5. COOLING INTERLOCK RELAY 24VAC COIL 30PF CONTACTS. LOCKS OUT BURNER CIRCUIT WHEN AC IS ENERGIZED.
6. GAS PRESSURE GAUGE 0-35" TO MEASURE INLET GAS PRESSURE WHEN THE MODULATION CONTROL IS IN A LOW FIRE POSITION.
7. GAS PRESSURE GAUGE -5 TO 15" WC, 2-1/2" DIAMETER, 1/4" THREAD SIZE
8. GAS PRESSURE GAUGE -5 TO 100 INCHES WC, 2-1/2" DIAMETER, 1/4" THREAD SIZE
9. CURB DUCT HANGER - 1 PER SIDE, 2 PER UNIT. ALLOWS DUCTWORK TO CURB TO SUPPORT STANDARD SIZE DUCTWORK. PRICES PER CURB. ONLY AVAILABLE WHEN CURB ASSEMBLY IS ORDERED.
10. FREEZESTAT WITH 1F SENSOR. FACTORY SET AT 35°F AND 10 MINUTES.
11. 5 TON SINGLE CIRCUIT MODULAR PACKAGED COOLING OPTION FOR SIZE 2 MODULAR PACKAGED UNIT. INCLUDES CONDENSER, EVAPORATOR COIL, AND REFRIGERANT PIPING. SIZING TO 3,000 CFM AND REFRIGERANT PIPING SIZING TO 3,000 CFM MUST BE DONE WITH OPPOSITE SIDE CONTROLS OR OPPOSITE AIRFLOW DIRECTION. CONDENSERS REQUIRE SEPARATE 208V, 3 PHASE POWER SUPPLY. COIL IS SCIENCOR.
12. FULL CRATING FOR COMMERCIAL HEATER FOR SHIPPING.
13. DOWNTURN PLENUM FOR SIZE 2 3X COIL MODULE. REQUIRES FOR DOWN DISCHARGE COOLING COIL APPLICATIONS
14. 24V COOLING ENTRANCE AIR THERMOSTAT AND RELAYS MOUNTED IN UNIT - SET POINT FOR THERMOSTAT SHALL BE 65°F.

SUPPLY SIDE HEATER INFORMATION
WINTER TEMPERATURE = 30°F. TEMP RISE = 55°F.
TOTAL BTU/HR REQUIRED = 175,623 BTU/HR
OUTPUT BTU/HR AT ALTITUDE OF 50 FT. = 157893
INPUT BTU/H AT ALTITUDE OF 50 FT. = 175623





Typical Drain Trap Install



Recommended Cooling Coil Drain Trap Configuration

Notes:
1) 1" diameter PVC Pipe only
2) Use only low profile couplings
3) Add clean out as shown

Direct Fired CM1 Profile Plate Assembly

Direct Fired Profile Plate Specifications

Profile plate burners shall have patented AGA Patent No. 1504290(2000), self-adjusting profile plate assembly to ensure proper air/gas ratio at all firing rates. Profile plate shall be constructed of 409 stainless steel. Profile plate shall be capable of firing natural gas or propane. Profile plate shall be capable of operating at a minimum turndown of 10:1 and a maximum turndown of 20:1 without loss of combustion efficiency.

Construction
All profile plate assemblies shall be factory tested for CO and NOx emissions. Profile plate shall be constructed of 409 stainless steel. Profile plate shall be designed for direct contact modulation (DCM) applications.

Warranty
All profile plate assemblies shall be factory tested for CO and NOx emissions. Profile plate shall be constructed of 409 stainless steel. Profile plate shall be designed for direct contact modulation (DCM) applications.

Optional Construction
Profile plate shall be Perforated Plate 304 galvanized steel.
Profile plate shall have a 304 stainless steel.
Profile plate shall be capable of operating with low inlet gases on the downside of the burner.
Profile plate shall be capable of operating with extremely reactive spring fingers.
Spring fingers shall be made from inconel steel.

SHEET NO.	MASTER DRAWING	SCALE:	DRAWN	DESIGN	DATE:
2		3/4" = 1'-0"	SN	80639	1/25/2017

Freddy's Kingwood, TX
For: HOCKENBERGS LENEXA, KS

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REVISIONS	NO.

ISSUES

No.	Date	Description
03	12/19/2018	ISSUED FOR PERMIT & PRICING

DVO PROJECT – 181189

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PROFESSIONAL ENGINEER

FREDDY'S FROZEN CUSTARD & STEAKBURGERS - TOMBALL
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TOMBALL, TX 77377

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(316) 261-5369

Job No.:	18130.00
Date:	12/19/2018
Drawn by:	SN
Checked by:	WD
Phase:	

Sheet Name
MECHANICAL NOTES, DETAILS & SCHEDULES

Sheet No.:
M3.13

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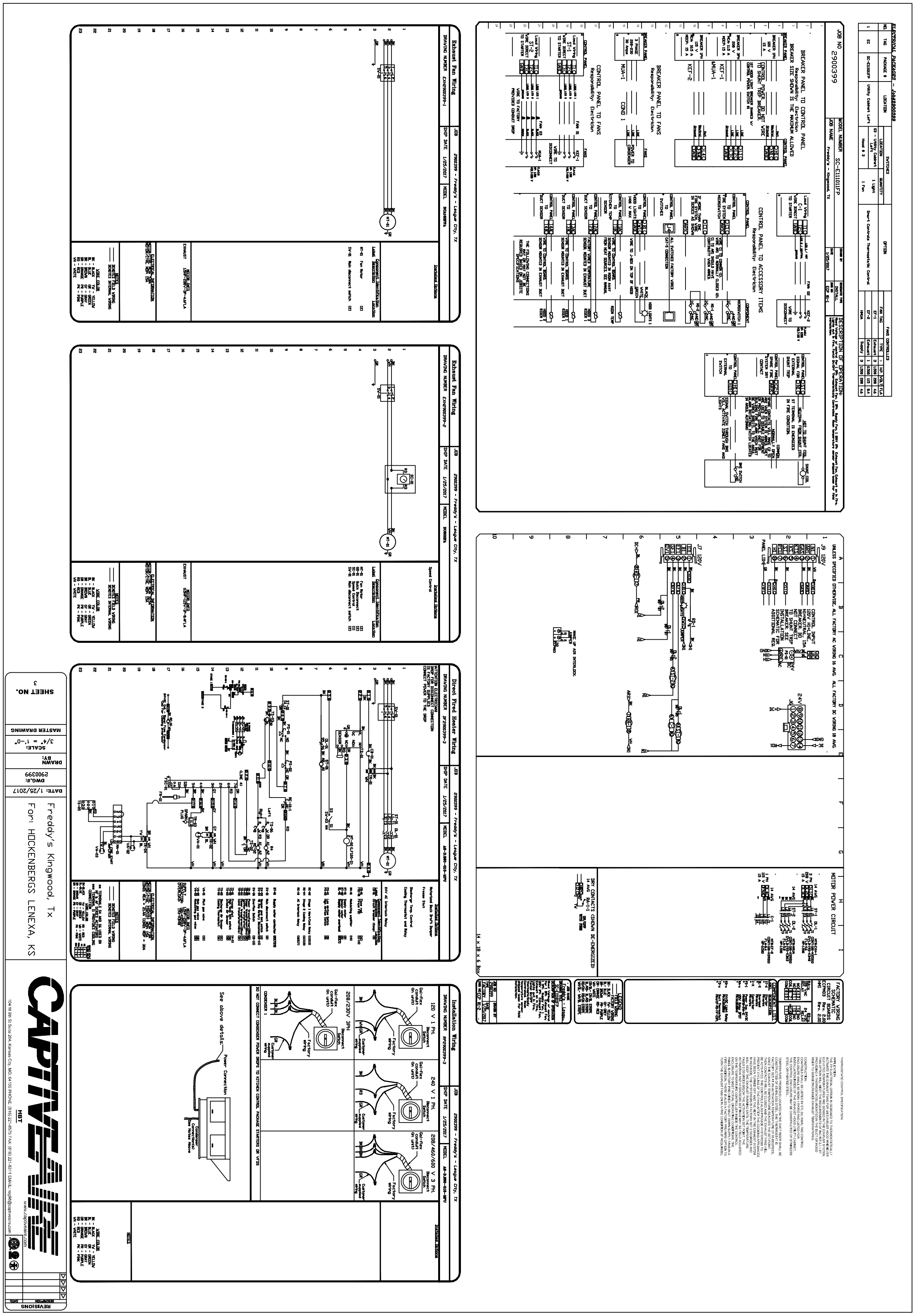

ISSUES

No.	Date	Description
01	12/19/2018	ISSUED FOR PERMIT & PRICING

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FREDDY'S FROZEN CUSTARD & STEAKBURGERS - TOMBALL

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TOMBALL, TX 77377

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Job No.: 18130.00
Date: 12/19/2018
Drawn by: SN
Checked by: WD
Phase:

Sheet Name
MECHANICAL NOTES, DETAILS & SCHEDULES

Sheet No.:
M3.14