

# 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	MAX	MAXIMUM
ADJ	ADJUSTABLE	MBH	THOUSANDS OF BTU PER HOUR
AFF	ABOVE FINISHED FLOOR	MC	MECHANICAL CONTRACTOR
AL	ALUMINUM	MCA	MINIMUM CIRCUIT AMPACITY
ALT	ALTERNATE	MCC	MOTOR CONTROL CENTER
AP	ACCESS PANEL	MEP	MECHANICAL, ELECTRICAL AND PLUMBING
APD	AIR PRESSURE DROP	MER	MECHANICAL EQUIPMENT ROOM
APPROX	APPROXIMATE	MEZZ	MEZZANINE
ARCH	ARCHITECTURAL	MFR	MANUFACTURER
AVG	AVERAGE	MIN.	MINIMUM
		MISC	MISCELLANEOUS
BAS	BUILDING AUTOMATION SYSTEM	NA	NOT APPLICABLE
BOB	BOTTOM OF BEAM	NC	NORMALLY CLOSED
BOD	BOTTOM OF DUCT	NIC	NOT IN CONTRACT
BOP	BOTTOM OF PIPE	NO	NORMALLY OPEN
BTU	BRITISH THERMAL UNITS	NPS	NOMINAL PIPE SIZE
BTUH	BRITISH THERMAL UNITS PER HOUR	NPSH	NET POSITIVE SUCTION HEAD
		NPT	NATIONAL PIPE THREAD
CAV	CONSTANT AIR VOLUME	NR	NEAR
CFH	CUBIC FEET PER HOUR	NTS	NOT TO SCALE
CFM	CUBIC FEET PER MINUTE	OA	OUTSIDE AIR
CL	CENTERLINE	OC	ON CENTER
CLG	CEILING	OED	OPEN END DUCT
COND	CONDENSATE	OLP	OVERLOAD PROTECTION
CONTR	CONTRACTOR	OV	OUTLET VELOCITY
COP	COEFFICIENT OF PERFORMANCE	PC	PLUMBING CONTRACTOR
CU	COPPER	PCF	POUNDS PER CUBIC FOOT
DAP	DUCT ACCESS PANEL	PD	PRESSURE DROP
DB	DRY BULB	PH	PHASE
DDC	DIRECT DIGITAL CONTROL	PLBG	PLUMBING
DEG	DEGREES	POC	POINT OF CONNECTION
DIA	DIAMETER	PPH	POUNDS PER HOUR
DIM	DIMENSION	PRV	PRESSURE RELIEF VALVE
DN	DOWN	PSF	POUNDS PER SQUARE FOOT
DWG	DRAWING	PSI	POUNDS PER SQUARE INCH
DX	DIRECT EXPANSION	PSIA	POUNDS PER SQUARE INCH ABSOLUTE
		PSIG	POUNDS PER SQUARE INCH GAUGE
EA	EXHAUST AIR	PVC	POLYVINYL CHLORIDE
EAT	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EC	ELECTRICAL CONTRACTOR	REQD	REQUIRED
EDR	EQUIVALENT DIRECT RADIATION	RF	ROOF
EFF	EFFICIENCY	RH	RELATIVE HUMIDITY
ELEC	ELECTRICAL	RPM	REVOLUTIONS PER MINUTE
ELEV	ELEVATION	SA	SUPPLY AIR
EM	EMERGENCY	SCH	SCHEDULE
ESP	EXTERNAL STATIC PRESSURE	SHT	SHEET
ETR	EXISTING TO REMAIN	SP	STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE	SPEC	SPECIFICATION
EXH	EXHAUST	SQ	SQUARE
EXP	EXPANSION	SS	STAINLESS STEEL
EXIST	EXISTING	STD	STANDARD
		STRUT	STRUCTURAL
F	FAHRENHEIT	T&P	TEMPERATURE AND PRESSURE
FC	FORWARD CURVED	TA	TRANSFER AIR
FLA	FULL LOAD AMPS	TBR	TO BE REMOVED
FLR	FLOOR	TC	TEMPERATURE CONTROL
FM	FACTORY MUTUAL	TEMP	TEMPERATURE
FPD	FLUID PRESSURE DROP	TOB	TOP OF BEAM
FPI	FINS PER INCH	TOD	TOP OF DUCT
FPM	FEET PER MINUTE	TOP	TOP OF PIPE
FPS	FEET PER SECOND	TOS	TOP OF SLAB
F&T	FLOAT AND THERMOSTATIC	TSP	TOTAL STATIC PRESSURE
FT	FEET	TYP	TYPICAL
FTG	FOOTING	UC	UNDERCUT DOOR 1" (BY GENERAL CONTRACTOR)
		UNO	UNLESS OTHERWISE NOTED
GA	GAUGE	V	VOLTS
GAL	GALLON	VA	VALVE
GALV	GALVANIZED	VAV	VARIABLE AIR VOLUME
GBD	GRAVITY BACKDRAFT DAMPER	VEL	VELOCITY
GC	GENERAL CONTRACTOR	VP	VELOCITY PRESSURE
GPM	GALLONS PER MINUTE	VTR	VENT THRU ROOF
GPH	GALLONS PER HOUR		
HP	HORSEPOWER	W	WITH
		W/O	WITHOUT
ID	INSIDE DIAMETER	WB	WET BULB
IE	INVERT ELEVATION	WC	WATER COLUMN
IN	INCHES	WG	WATER GAUGE
		X	EXISTING

## MECHANICAL EQUIPMENT ABBREVIATIONS

AC	AIR CONDITIONING UNIT/AIR COMPRESSOR	GF	GAS FURNACE
ACC	AIR COOLED CONDENSER	GV	GRAVITY VENTILATOR
ACCU	AIR COOLED CONDENSING UNIT	H	HUMIDIFIER
ACU	AIR CONDITIONING UNIT	HC	HEATING COIL
AHU	AIR HANDLING UNIT	HP	HEAT PUMP
AMD	AIR MIXING DEVICE	HRC	HEAT RECOVERY COIL
ARU	AIR ROTATION UNIT	HRD	HEAT RECLAIM DEVICE
AS	AIR SEPARATOR	HX	HEAT EXCHANGER
AT	AIR TERMINAL DEVICE	IAH	INTAKE AIR HOOD
		IFH	INFRARED HEATER
B	BOILER	LP	LOUVERED PENTHOUSE
BBS	BOILER BLOWDOWN SEPARATOR	MAU	MAKE-UP AIR UNIT
BC	BOOSTER COIL	MCC	MOTOR CONTROL CENTER
BFS	BOILER FEEDWATER SYSTEM	P	PUMP
		RAHU	ROOFTOP AIR HANDLING UNIT
C	CONVECTOR	RCP	RADIANT CEILING PANEL
CC	COOLING COIL	REF	ROOF EXHAUST FAN
CH	CHILLER	RF	RETURN FAN
CRU	CONDENSATE PUMP	RH	RELIEF HOOD
CT	CONDENSATE RETURN UNIT	RTU	ROOFTOP UNIT
CUH	COOLING TOWER	RV	ROOF VENTILATOR
		SA	SOUND ATTENUATOR
DC	DUST COLLECTOR	SF	SUPPLY FAN
DH	DEHUMIDIFIER	T	TANK
		TXV	THERMAL EXPANSION VALVE
EBB	ELECTRIC BASEBOARD	UH	UNIT HEATER
EF	EXHAUST FAN	UST	UNDERGROUND STORAGE TANK
EH	EXHAUST HOOD	UV	UNIT VENTILATOR
EJ	EXPANSION JOINT	V	VALVE
ET	EXPANSION TANK	VFD	VARIABLE FREQUENCY DRIVE
EUH	ELECTRIC UNIT HEATER	VP	VACUUM PUMP
F	FILTER		
FCU	FAN COIL UNIT		
FD	FLOOR DRAIN		
FOP	FUEL OIL PUMP		
FOT	FUEL OIL TANK		
FTR	FIN TUBE RADIATION		

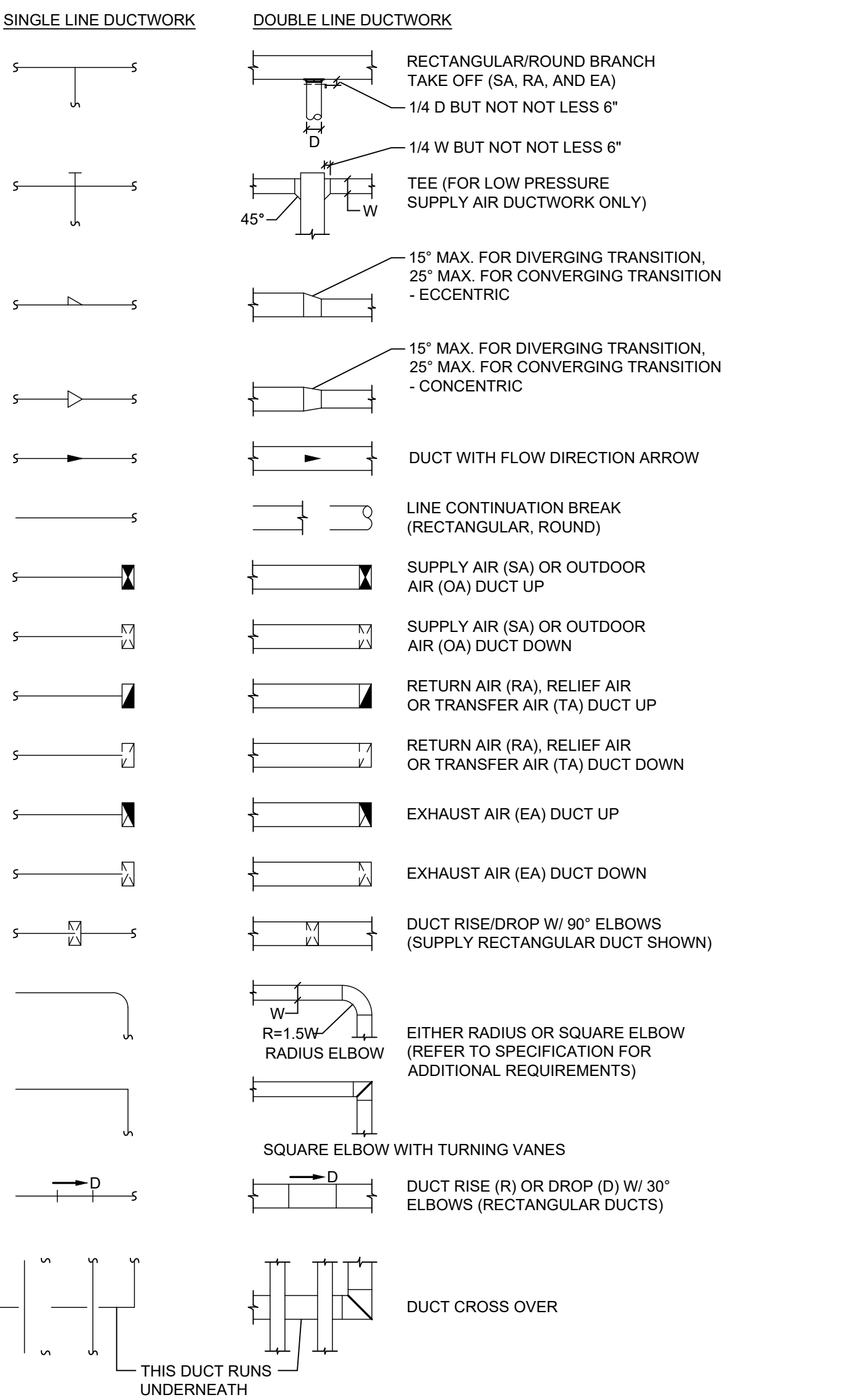
## PIPING SYSTEMS AND FITTINGS

BBB	BOILER BLOW DOWN	FLANGE
BF	BOILER FEED	UNION
BA	BREATHABLE AIR	ANCHOR
CWS	CHILLED WATER SUPPLY	PIPE GUIDE
CWR	CHILLED WATER RETURN	ECCENTRIC REDUCER
A	COMPRESSED AIR	CONCENTRIC REDUCER
CDS	CONDENSER WATER SUPPLY	LINE CONTINUATION BREAK
CDR	CONDENSER WATER RETURN	PIPELINE STRAINER
D	NOT APPLICABLE	DRAIN LINE
DF	NOT IN CONTRACT	FUEL OIL FILL
DFD	FUEL OIL DRAIN	FUEL OIL SUPPLY
FOS	FUEL OIL SUPPLY	FUEL OIL RETURN
FOR	FUEL OIL RETURN	FUEL OIL VENT
FOV	FUEL OIL VENT	GLYCOL CHILLED WATER SUPPLY
GCWS	GLYCOL CHILLED WATER SUPPLY	GLYCOL CHILLED WATER RETURN
GCWR	GLYCOL CHILLED WATER RETURN	HEAT PUMP WATER SUPPLY
HPWS	HEAT PUMP WATER SUPPLY	HEAT PUMP WATER RETURN
HPWR	HEAT PUMP WATER RETURN	HIGH PRESSURE STEAM
HPS	HIGH PRESSURE STEAM	HIGH PRESSURE CONDENSATE
HPC	HIGH PRESSURE CONDENSATE	HOT WATER SUPPLY
HWS	HOT WATER SUPPLY	HOT WATER RETURN
HWR	HOT WATER RETURN	HUMIDIFICATION
H	PHASE	LIQUEFIED PETROLEUM GAS
LP	LIQUEFIED PETROLEUM GAS	LOW PRESSURE STEAM (10 PSIG)
LPS	LOW PRESSURE STEAM (10 PSIG)	LOW PRESSURE CONDENSATE
LPC	LOW PRESSURE CONDENSATE	MAKE-UP WATER
MU	MAKE-UP WATER	MEDIUM PRESSURE STEAM
MPS	MEDIUM PRESSURE STEAM	MEDIUM PRESSURE CONDENSATE
MPC	MEDIUM PRESSURE CONDENSATE	NATURAL GAS
G	NATURAL GAS	NITROGEN
N2	NITROGEN	ROOF
V	VENT LINE	PUMPED CONDENSATE
PC	PUMPED CONDENSATE	REFRIGERANT HOT GAS
RHG	REFRIGERANT HOT GAS	REFRIGERANT LIQUID
RL	REFRIGERANT LIQUID	REFRIGERANT SUCTION
RS	REFRIGERANT SUCTION	REFRIGERANT VENT
RV	REFRIGERANT VENT	VACUUM (AIR)
VAC	VACUUM (AIR)	

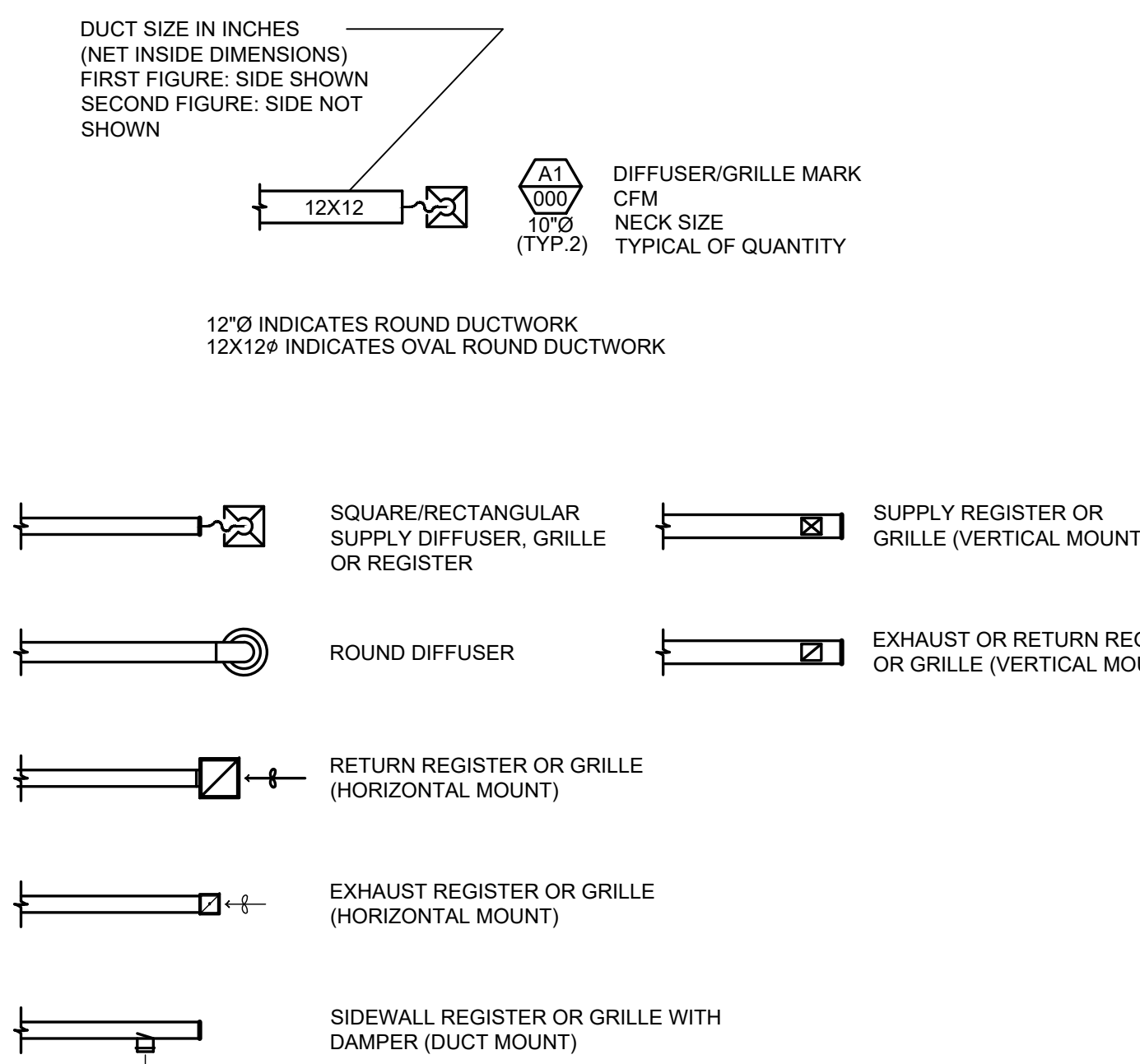
## PIPE VALVES AND SPECIALTIES

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

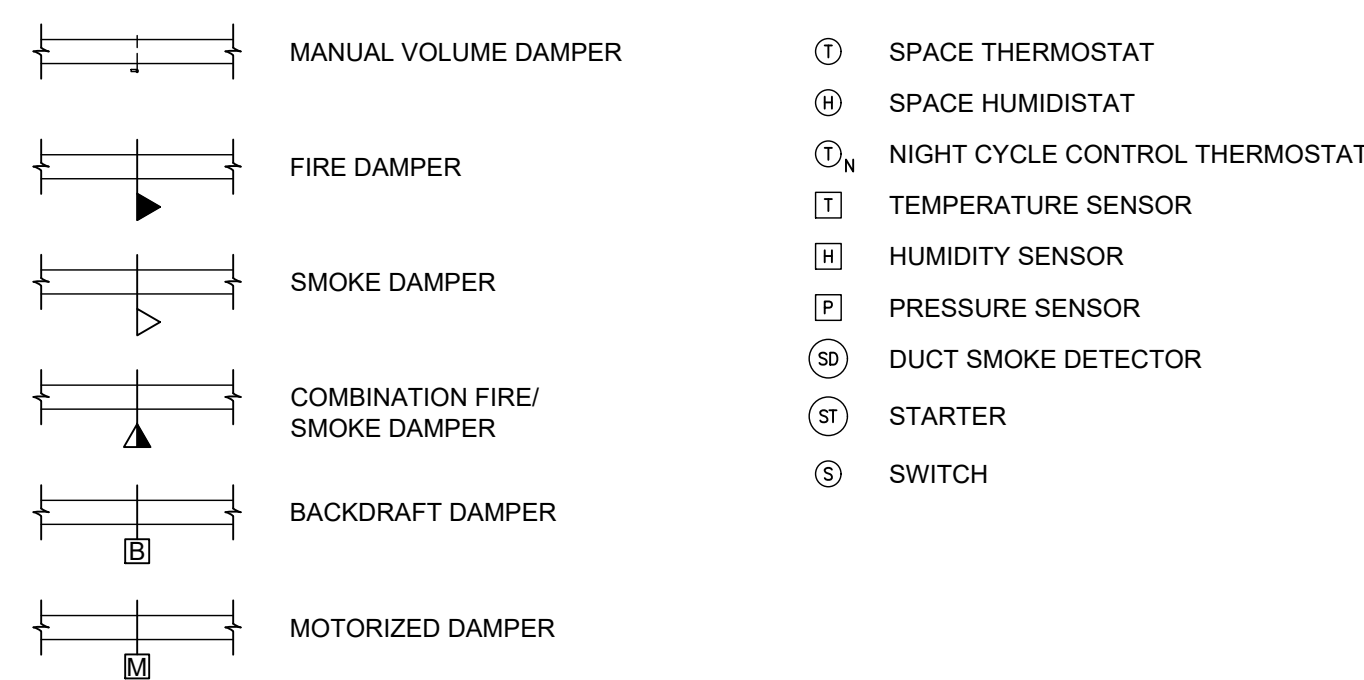
## DUCTWORK FITTINGS



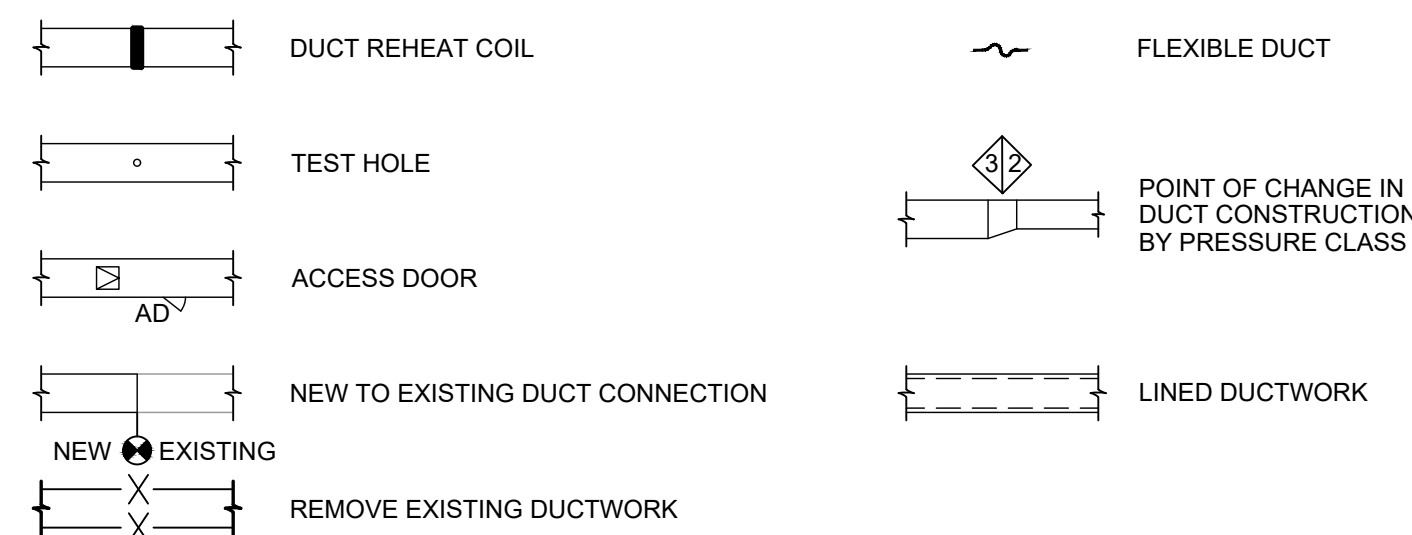
## DIFFUSER, GRILLE, AND REGISTER NOTATION



## DAMPERS AND CONTROLS



## DUCTWORK SPECIALTIES



## GENERAL NOTES

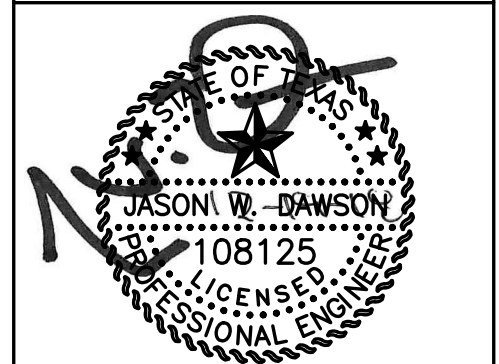
- ALL WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER AND SHALL COMPLY WITH ALL ADOPTED LOCAL, STATE, AND NATIONAL CODES.
- DO NOT SCALE THE DRAWINGS.
- DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR TO INSTALL PIPE AND DUCTWORK IN A MANNER ACCORDING TO GOOD PRACTICE. ANY MAJOR DEVIATIONS REQUIRED FROM THE DESIGN DRAWINGS SHALL BE VERIFIED WITH THE ENGINEER/ARCHITECT.
- FINAL ELECTRICAL CONNECTIONS AT OR ABOVE 120V SHALL BE MADE BY THE ELECTRICAL CONTRACTOR.
- 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.
- DO NOT LOCATE FCUs, VAV'S, OR FPT'S ABOVE LIGHTS OR CONFERENCE ROOMS.
- REFER TO STRUCTURAL DRAWINGS AND OTHER DISCIPLINES FOR COORDINATING DUCT ROUTING IN CEILING PLENUM SPACE.
- 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.
- AVOID ROUTING OF PIPING OR DUCTWORK ABOVE IT, ELECTRICAL OR FIRE EQUIPMENT ROOMS.
- PROVIDE APPROPRIATELY RATED FIRE STOPPING FOR PENETRATIONS THROUGH FIRE-RATED WALLS. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIRE RATED STRUCTURES.
- COORDINATE THERMOSTAT, SENSOR AND SWITCH LOCATIONS WITH ARCHITECT/OWNER PRIOR TO INSTALLATION.
- PROVIDE DUCT TRANSITIONS FROM EQUIPMENT CONNECTIONS TO DUCT SIZES SHOWN.
- 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".
- MAINTAIN A MINIMUM 10'-0" SEPARATION FROM OUTSIDE AIR INTAKES TO EXHAUST TERMINATIONS AND VENTS.
- MAINTAIN A MINIMUM 5'-0" SEPARATION FROM EXHAUST TERMINATIONS TO OPERABLE WINDOWS.
- ALL UNLINED DUCTWORK VISIBLE THROUGH THE AIR DEVICE SHALL BE PAINTED FLAT BLACK.
- CEILING TILES USED TO ACCESS FAN COIL UNITS TO BE LABELED.
- CONDENSATE DRAIN LINES SHALL BE COMPLETELY INSTALLED FOR ALL EQUIPMENT AND COMPLY WITH MANUFACTURER'S RECOMMENDED INSTALLATION INSTRUCTIONS. ALL CONDENSATE LINES TO BE INSULATED.

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

Sheet Name  
**MECHANICAL SYMBOLS & ABBREVIATIONS**

Sheet No.:  
**MO.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 manufacturer'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 manufacturer'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 manufacturer's recommendations, with insulating pins spaced 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 enclosure's 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 airflow 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 9 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 a 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 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.

END OF SECTION 15020

- 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.

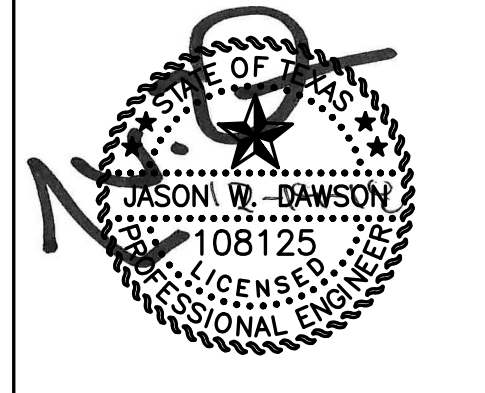
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**FREDDY'S FROZEN CUSTARD & STEAKBURGERS - TOMBALL**

27645 TOMBALL PKWY  
TOMBALL, TX 77377

OWNER:  
**TOMBALL CUSTARD, LLC**

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WITCHITA, KANSAS 67206-1178  
(316) 261-5369

Job No.: **18130.00**

Date: **12/19/2018**

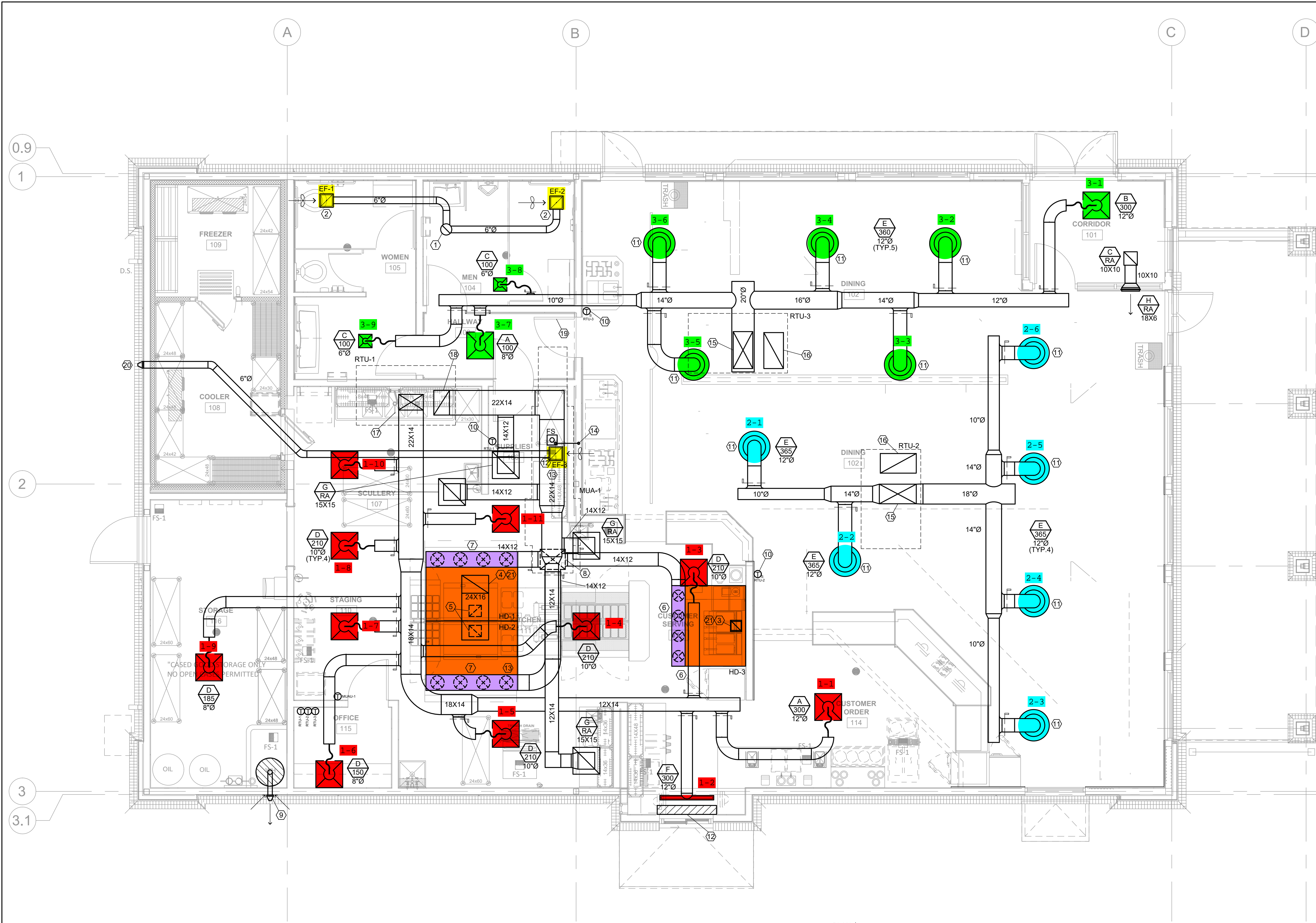
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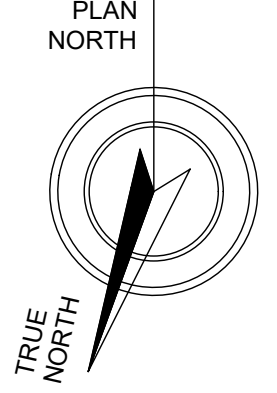
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**MECHANICAL SPECIFICATIONS**

Sheet No.:  
**M0.01**



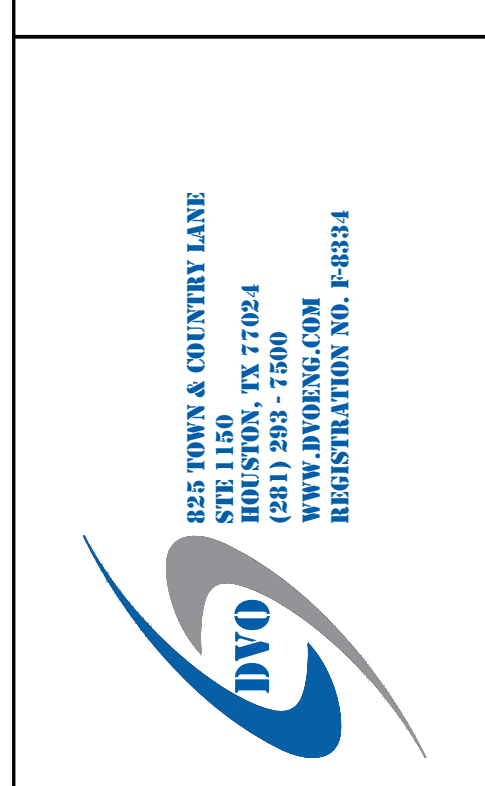
1 MECHANICAL FLOOR PLAN  
1/4" = 1'-0"



# KEYED NOTES:

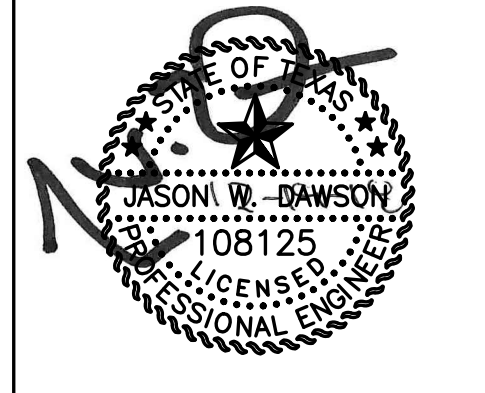
1. 10"Ø EXHAUST DUCT UP TO ROOF CAP VENT ON ROOF.
2. PROVIDE EXHAUST FAN WITH BACKDRAFT DAMPER.
3. 10X10 HOOD EXHAUST DUCT WITH ACCESS DOOR FOR CLEANING UP TO KEF-2 ON ROOF.
4. 24X16 HOOD EXHAUST DUCT WITH ACCESS DOOR FOR CLEANING UP TO KEF-1 ON ROOF. PROVIDE WITH 2-LAYERS OF 3M FIRE BARRIER DUCT WRAP 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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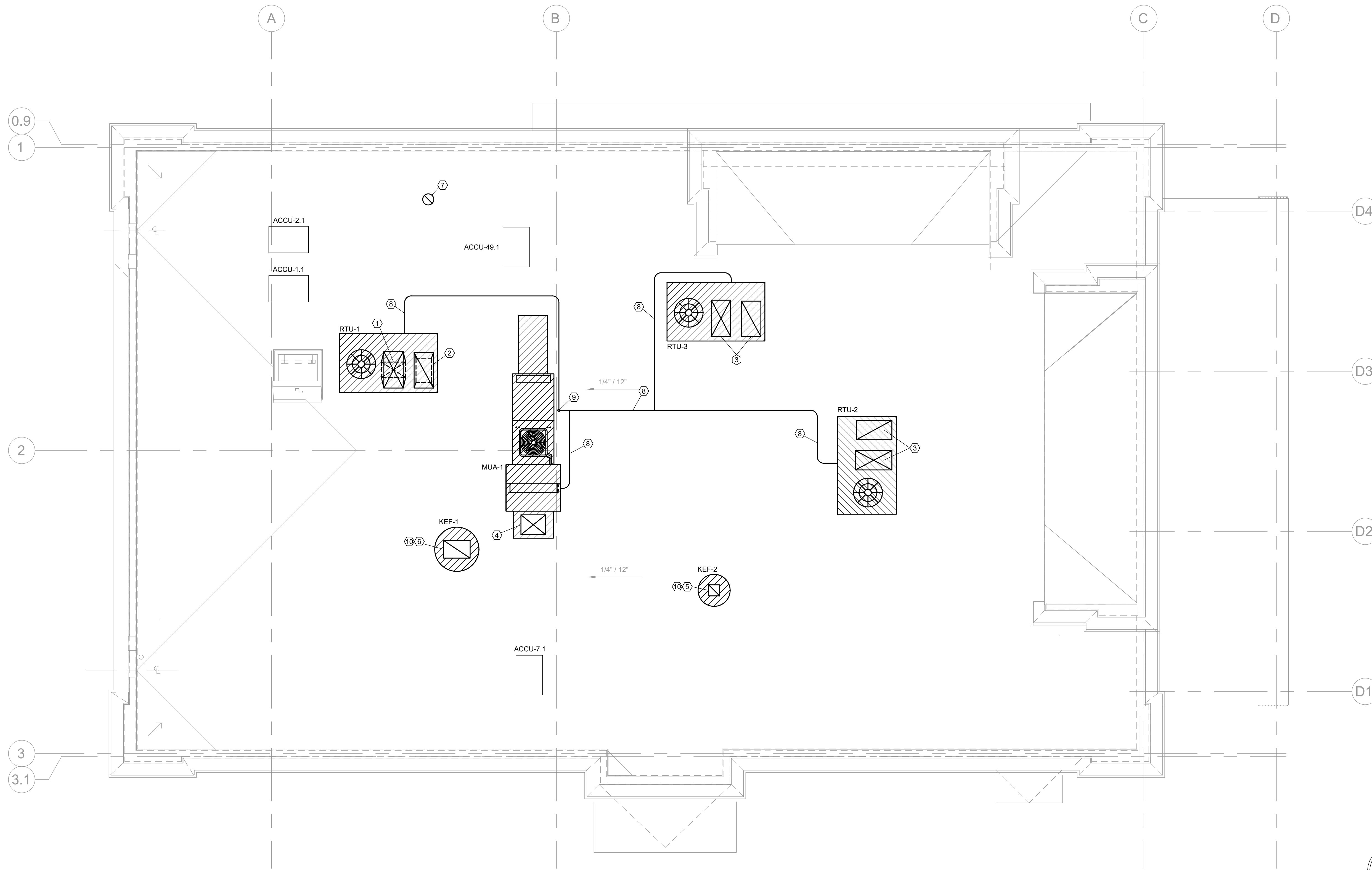
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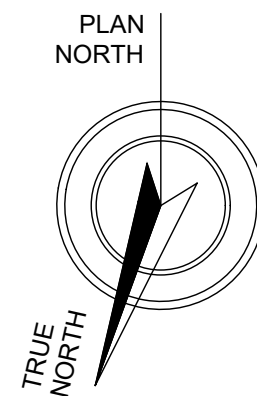
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**MECHANICAL FLOOR PLAN**

Sheet No.:  
**M2.11**



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.

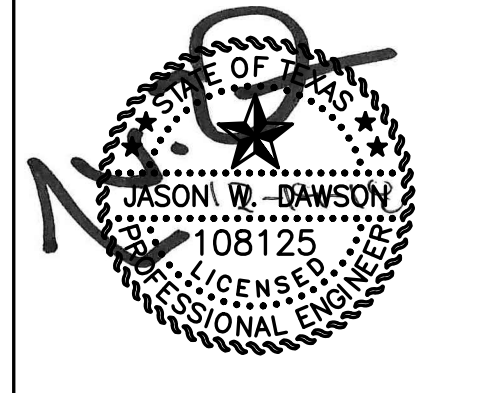
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**MECHANICAL  
ROOF PLAN**

Sheet No.:  
**M2.50**

## ROOFTOP A/C UNIT SCHEDULE

MARK	DX COOLING COIL				SUPPLY FAN		VOLTS PHASE	MCA	MOCF	N.G. HEAT MBH IN / OUT	WEIGHT LBS.	REFRIG.	SEER / EER	MANUFACTURER
	SUPPLY CFM	OA CFM	TOTAL BTUH	SENSIBLE BTUH	MOTOR POWER KW	STATIC PRESS								
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.

- SELECT RTU AT 105 F DB AMBIENT FOR ROOF MOUNT APPLICATIONS AND 95 F DB AMBIENT FOR GRADE MOUNT APPLICATIONS, ARI CONDITIONS.
- FILTERS AS SPECIFIED.
- FURNISH RTU WITH FACTORY CURB, ELECTRONIC PROGRAMMABLE THERMOSTAT, 120 VOLT GFI RECEPTACLE.
- BALANCE UNITS FOR CFM SHOWN ON MECHANICAL FLOOR PLANS.
- ROOM CONDITIONS: COOLING 75 F, 55% RH HEATING 70F
- PROVIDE WITH CONDENSER COIL HAIL GUARDS.
- 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

- ALL FANS TO HAVE DISCONNECT SWITCHES.
- PROVIDE SPEED CONTROLLERS ON ALL DIRECT DRIVE FANS. LOCATE WITH FAN.
- RESTROOM EXHAUST FAN APPLICATIONS TO BE INTERLOCKED WITH LIGHTS.
- 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

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

DIFFUSER/GRILLE MARK  
 NECK SIZE  
 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
	OUTSIDE AIR	485
RTU-3 - DINING / HALLWAY / RESTROOMS	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 = 0.0103 LBS / CUBIC FOOT  
 1.012 CUBIC FEET  
 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 = 0.0213 LBS / CUBIC FOOT  
 638 CUBIC FEET  
 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 FLOW 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 1 MOTORIZED DAMPERS. THE DAMPERS SHALL HAVE AN AIR LEAKAGE RATE NOT GREATER THAN 4 CFM / FT<sup>2</sup> 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 / FT<sup>2</sup> WHERE NOT LESS THAN 24 INCHES IN EITHER DIMENSION AND 40 CFM / FT<sup>2</sup> 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.

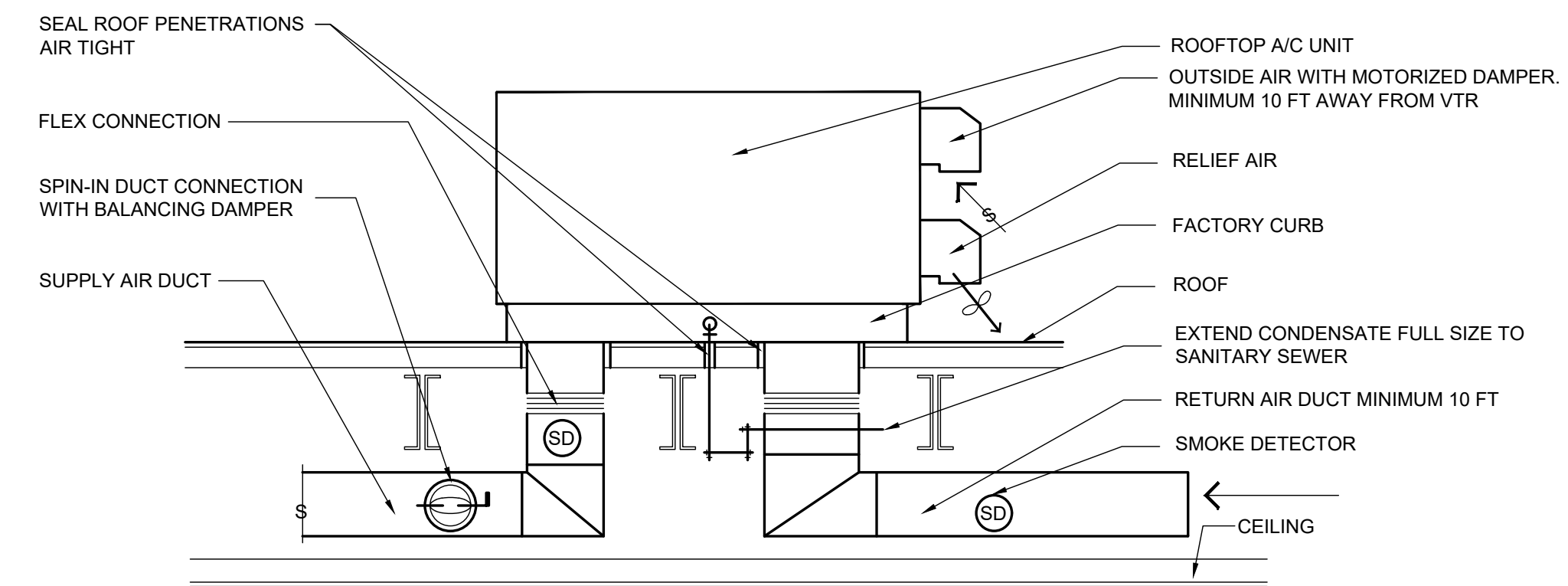
ALL SUPPLY AND RETURN AIR DUCTS LOCATED IN UNCONDITIONED ATTICS, UNCONDITIONED SPACES INCLUDING MECHANICAL ROOMS, UNCONDITIONED PLENUMS, OUTSIDE OF THE ENVELOPE OR OUTSIDE THE BUILDING SHALL BE INSULATED USING R-8 INSULATION AND COMPLY WITH THE 2015 INTERNATIONAL ENERGY CONSERVATION CODE. ALL SUPPLY AND RETURN DUCTS LOCATED IN A CONDITIONED SPACE OR CONDITION PLENUM SHALL BE INSULATED USING R-8 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

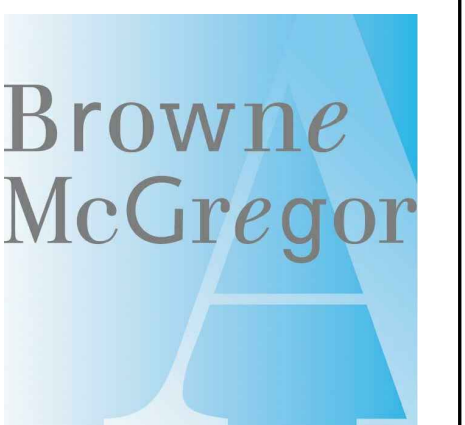
SCALE: NTS

- UNIT TO MEET 2015 IECC REQUIREMENTS AND ALL LOCAL CODES.
- PROVIDE UNITS WITH BAROMETRIC RELIEF DAMPERS
- SECURE RTU TO CURB WITH FACTORY CONNECTORS, PER LOCAL CODE.
- 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		NOMINAL PIPE OR TUBE SIZE (INCHES)				
	CONDUCTIVITY BTU-IN. / (H·FT <sup>2</sup> ·°F)	MEAN RATING TEMPERATURE, °F	< 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		
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**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**

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**HOOD INFORMATION - Job#2900399**

HOOD NO.	TAG	MODEL	LENGTH	MAX. COOKING TEMP.	EXHAUST FLOW (CFM)	WIDTH	DEPTH	DIAMETER	CFM	S.P.	TOTAL SUPPLY CFM	HOOD CONSTRUCTION	HOOD CONFIG.	PATENT NUMBERS
1	HD-1	4824	6' 10.00"	450 Deg.	1292	10"	12"	4"	1292	-0.662"	1034	430 SS	ALDNE FRONT	AC-PSP (United States) - US Patent 7943630 B2 AC-PSP (Canada) - CA Patent 2882509 AC-PSP (Island (Canada)) - CA Patent 2520330
2	HD-2	4824	6' 10.00"	450 Deg.	1292	10"	12"	4"	1292	-0.662"	1034	430 SS	Where Exposed ALDNE BACK	
3	HD-3	5424	5' 0.00"	450 Deg.	775	9"	8"	4"	775	-0.470"	666	430 SS	Where Exposed ALDNE ALDNE	

**HOOD INFORMATION**

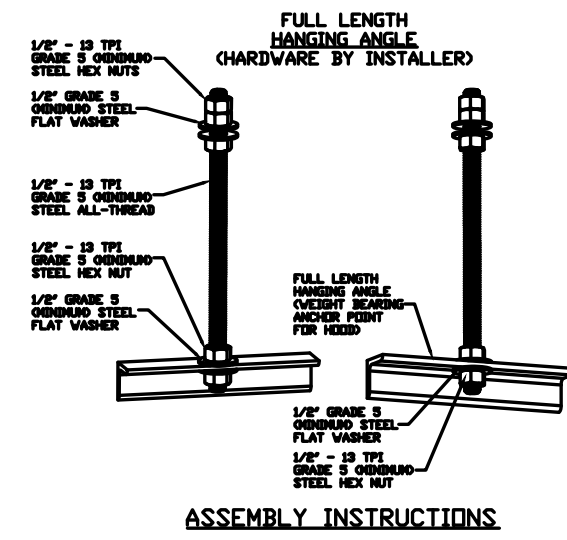
HOOD NO.	TAG	TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 9 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	TYPE	FIRE SYSTEM	ELECTRICAL	SWITCHES	FIRE SYSTEM	HOOD HANGING WTHT	
1	HD-1	Captivate Solo Filter	5	16"	16"	93% See Filter Spec.	2	L55 Series E26	ND								ND	372 LBS
2	HD-2	Captivate Solo Filter	5	16"	16"	93% See Filter Spec.	2	L55 Series E26	ND								ND	372 LBS
3	HD-3	Captivate Solo Filter	3	16"	16"	93% See Filter Spec.	2	L55 Series E26	ND	Left	12"x54"x24"			SC-E11101FP	1 Light 1 Fan	ND	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 27" Top Width, 29" Bottom Width, 29" High 430 SS RIGHT VERTICAL END PANEL 27" Top Width, 27" Bottom Width, 80" High Insulated 430 SS

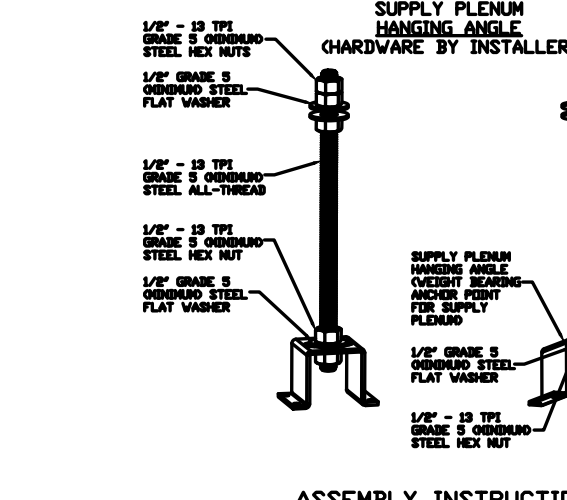
**PERFORATED SUPPLY PLENUM(S)**

HOOD NO.	TAG	POS.	LENGTH	WIDTH	HEIGHT	TYPE	WIDTH	LENGTH	DIAM.	CFM	S.P.
1	HD-1	Front	82"	14"	6"	MJA	12"	258	0.085"		
						MJA	12"	258	0.085"		
						MJA	12"	258	0.085"		
2	HD-2	Front	82"	14"	6"	MJA	12"	258	0.085"		
						MJA	12"	258	0.085"		
						MJA	12"	258	0.085"		
3	HD-3	Front	72"	12"	6"	MJA	10"	166	0.053"		
						MJA	10"	166	0.053"		
						MJA	10"	166	0.053"		



**ASSEMBLY INSTRUCTIONS**

HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 OXIDIZING ALL-THREAD, SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 OXIDIZING STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 OXIDIZING 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.

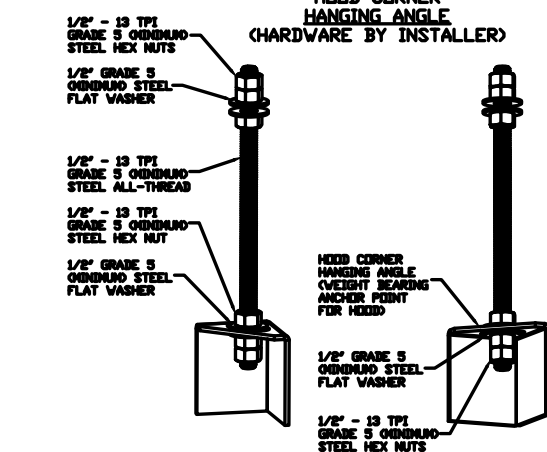


**ASSEMBLY INSTRUCTIONS**

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

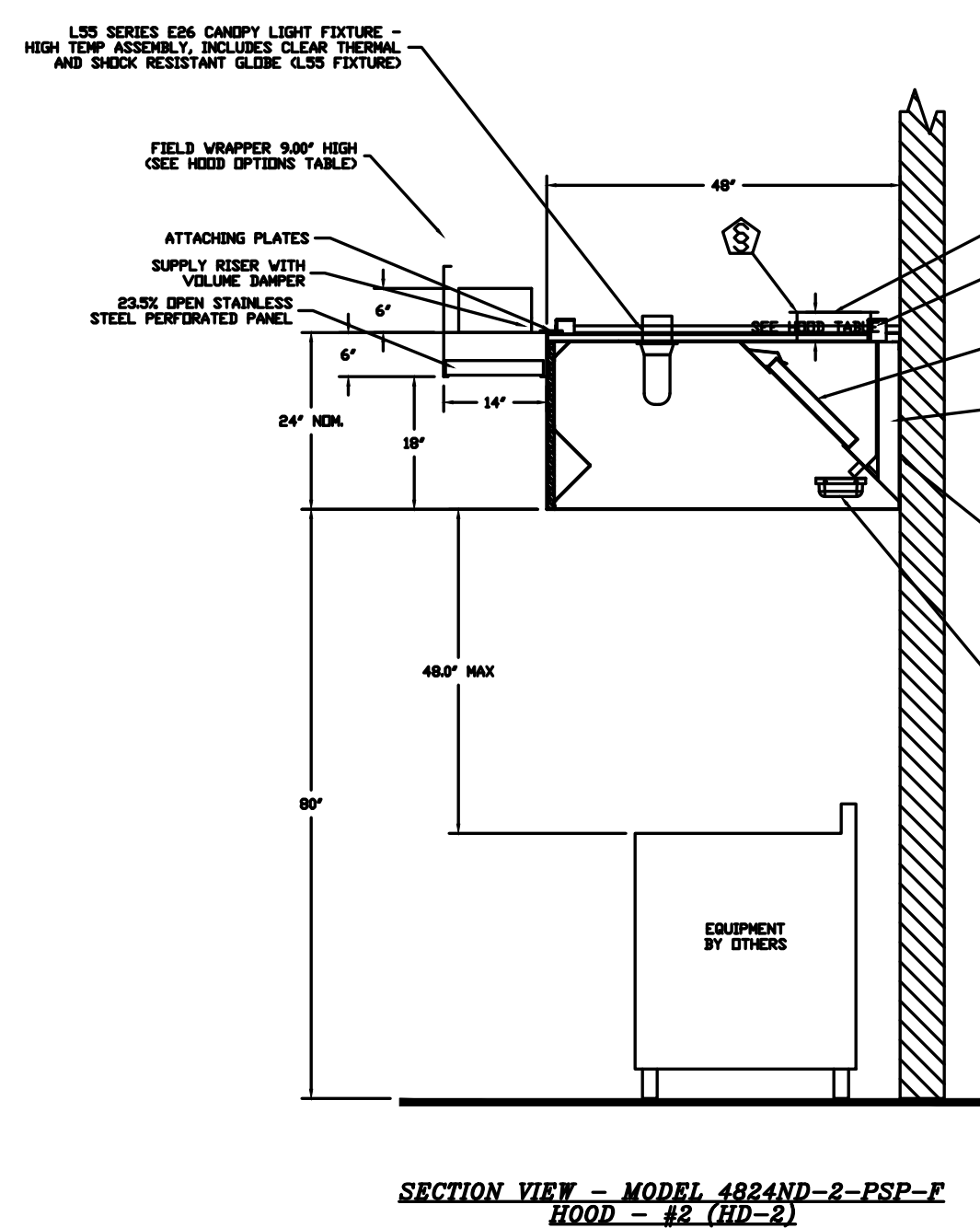
**PATENT NUMBERS**

AC-PSP (United States) - US Patent 7943630 B2  
AC-PSP (Canada) - CA Patent 2882509  
AC-PSP (Island (Canada)) - CA Patent 2520330

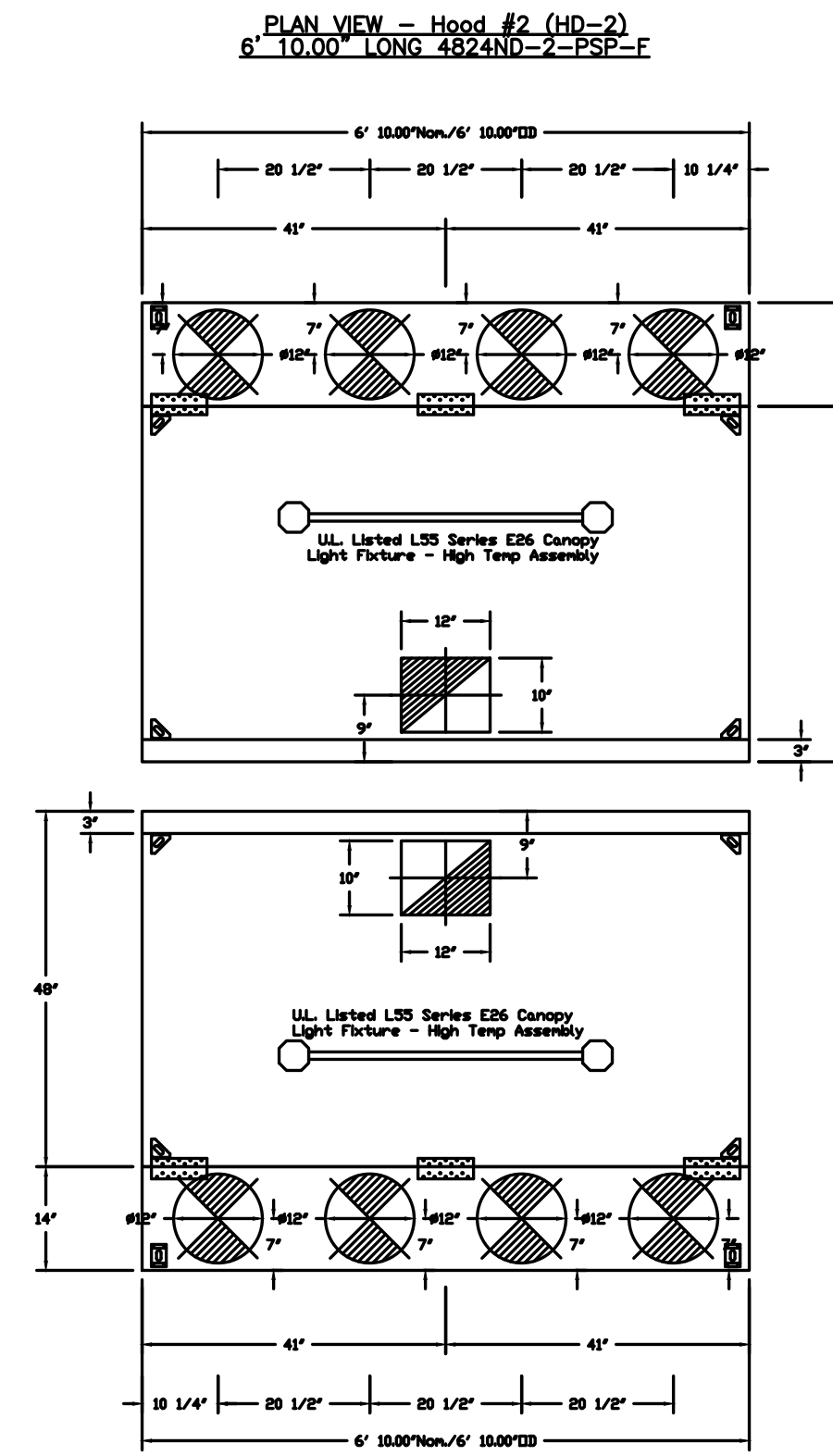


**ASSEMBLY INSTRUCTIONS**

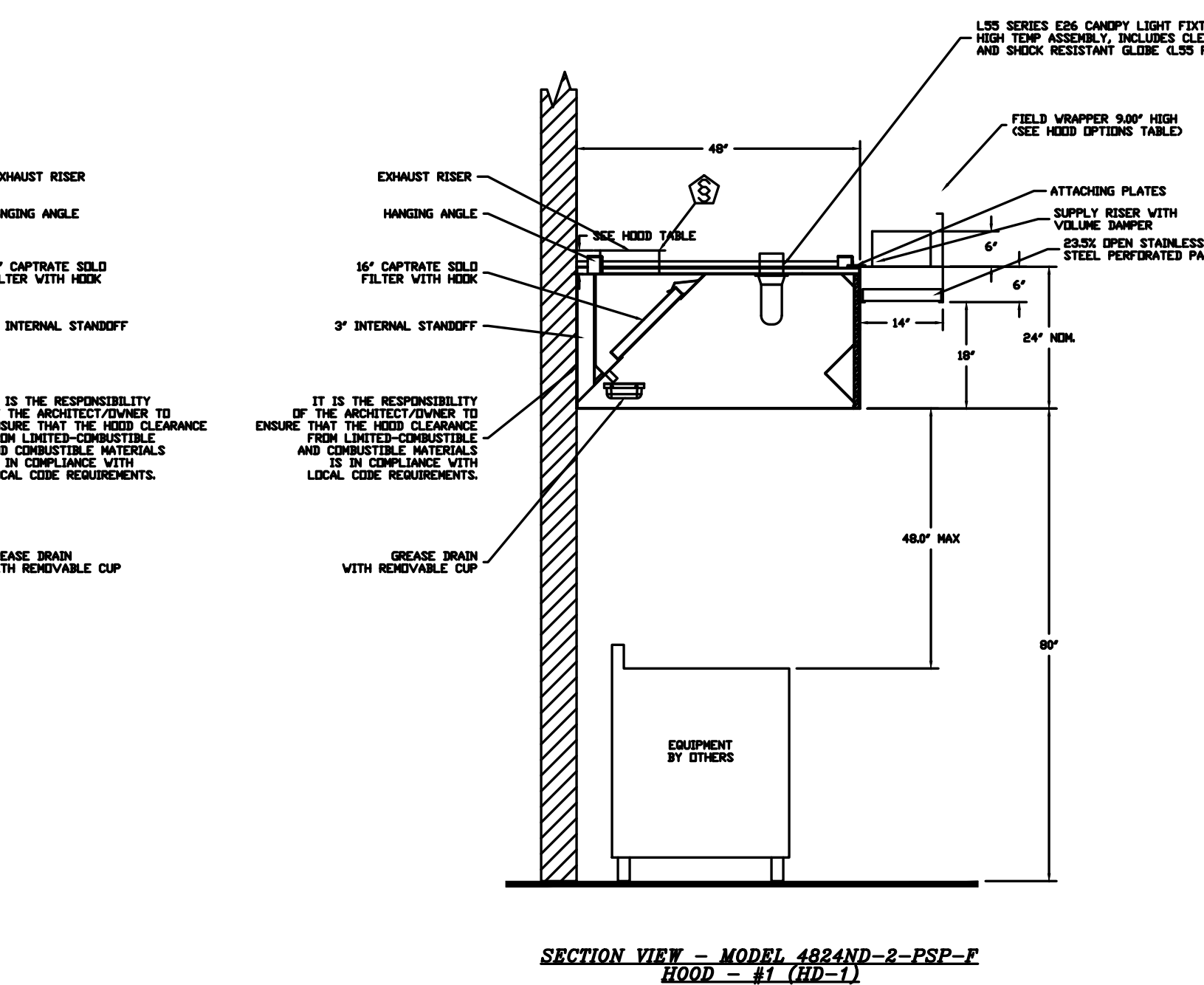
HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 OXIDIZING ALL-THREAD, SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 OXIDIZING STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 OXIDIZING HEX NUTS AS SHOWN. MUST USE DOUBLED HEX NUT CONFIGURATION BENEATH HOOD HANGING ANGLES AND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



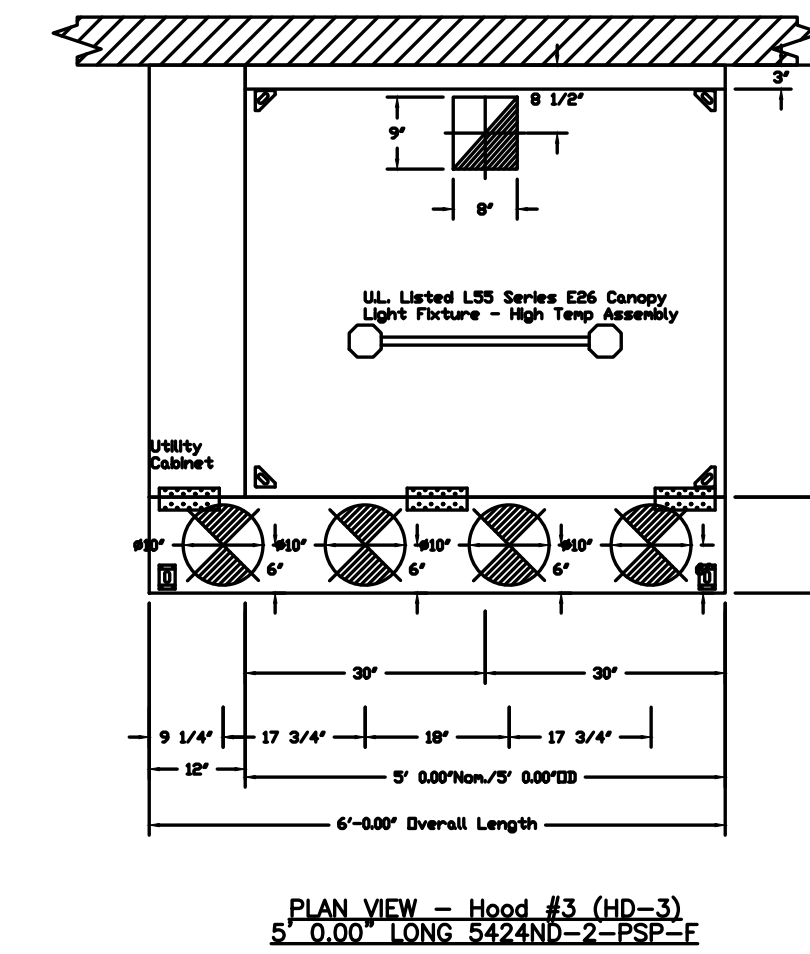
**SECTION VIEW - MODEL 4824ND-2-PSP-F HOOD - #2 (HD-2)**



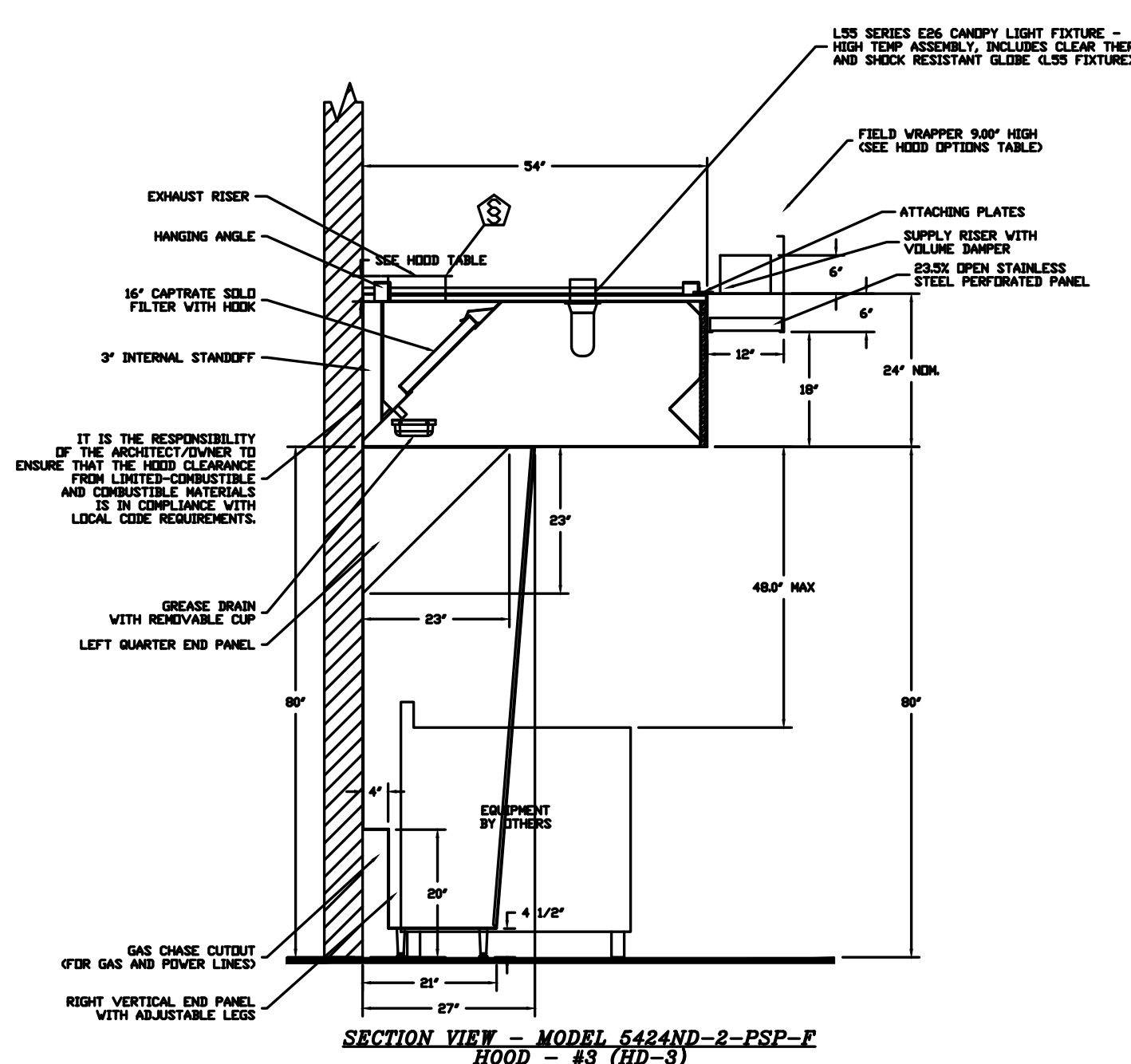
**PLAN VIEW - Hood #1 (HD-1) 6' 10.00\"/>**



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



**PLAN VIEW - Hood #3 (HD-3) 5' 0.00\"/>**



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

**SHEET NO.** 1

**DATE:** 1/25/2017

**DWG. #:** 2300099

**DRAWN BY:**

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

**MASTER DRAWING**

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



**REVISIONS**

NO.	DATE	DESCRIPTION
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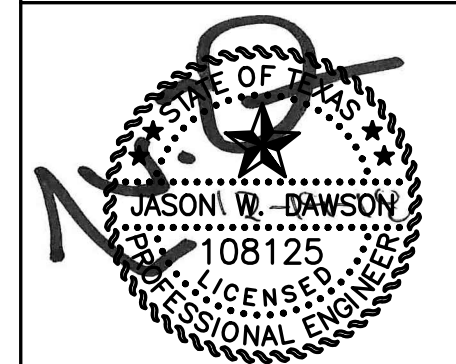
**ISSUES**

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Phase:

Sheet Name  
**MECHANICAL NOTES, DETAILS & SCHEDULES**

Sheet No.:  
**M3.12**

DVO PROJECT - 181189



