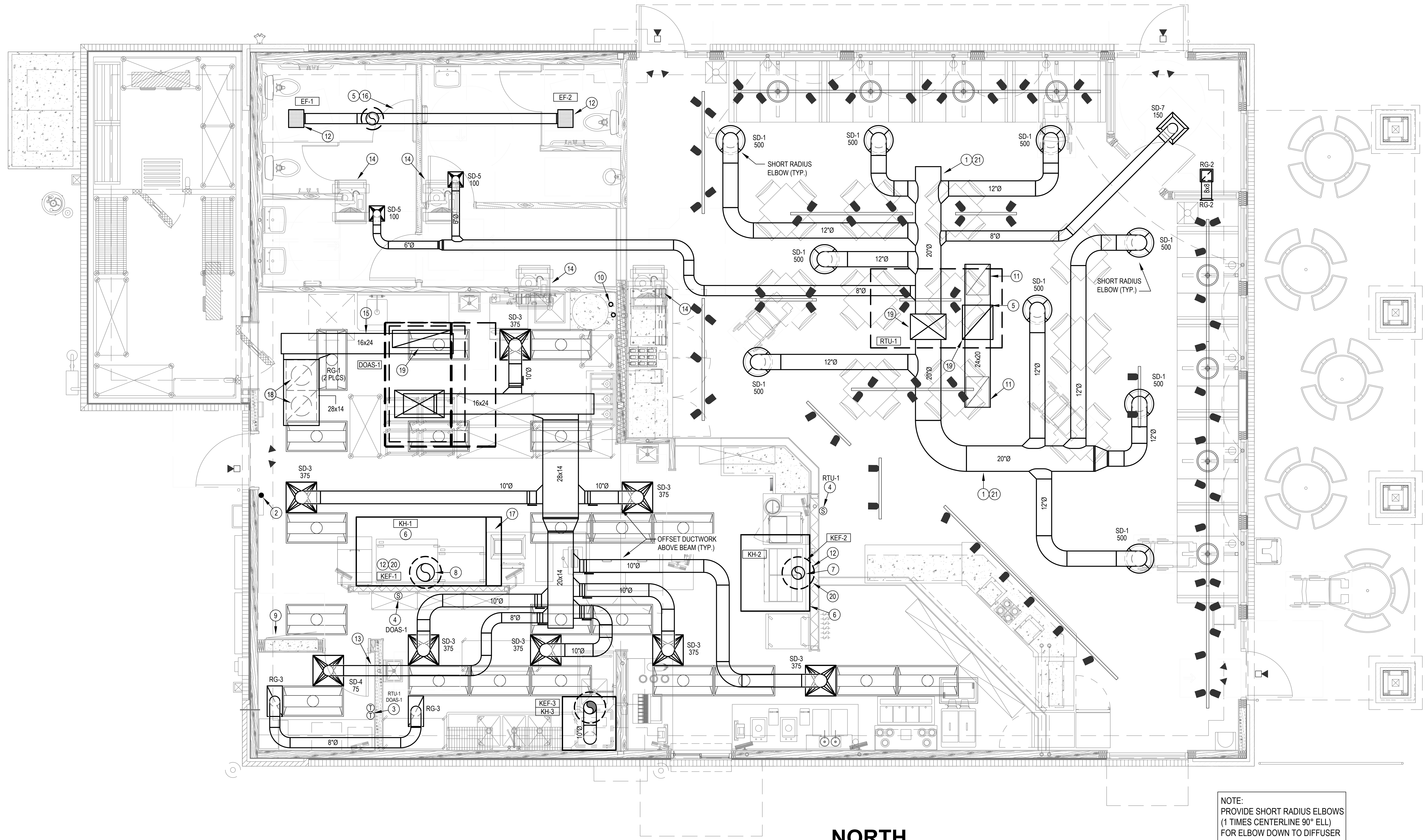


A

MECHANICAL PLAN

SCALE: ¼" = 1'-0"

NORTH

SPECIFICATION SECTION 230593 TESTING, ADJUSTING, AND BALANCE REQUIRES AN INDEPENDENT TAB CONTRACTOR (NEBB OR AABC) TO TEST ALL EQUIPMENT TO ENSURE COMPLIANCE WITH DRAWINGS. OWNER'S REPRESENTATIVE SHALL RECEIVE REPORT / VERIFICATION.

NOTE:
PROVIDE SHORT RADIUS ELBOWS (1 TIMES CENTERLINE 90° ELL) FOR ELBOW DOWN TO DIFFUSER ON EXPOSED DUCTWORK IN DINING ROOM. DIFFUSER SHALL BE MINIMUM OF 9'-0" A.F.F. SEE DETAIL.

NOTE:
REMOTE SENSORS WIRE TO THERMOSTAT. HUMIDITY SENSORS WIRE UP TO THE PRODIGY CONTROL PANEL. REFER TO HUMIDITY SENSOR INSTALLATION INSTRUCTIONS. HUMIDITY LEVEL IS CONTROL ON THE PRODIGY PANEL. SET HUMIDITY LEVEL AT 50-55%. CONTACT NA TECH SUPPORT GROUP AT 1-800-367-6285 FOR QUESTIONS.

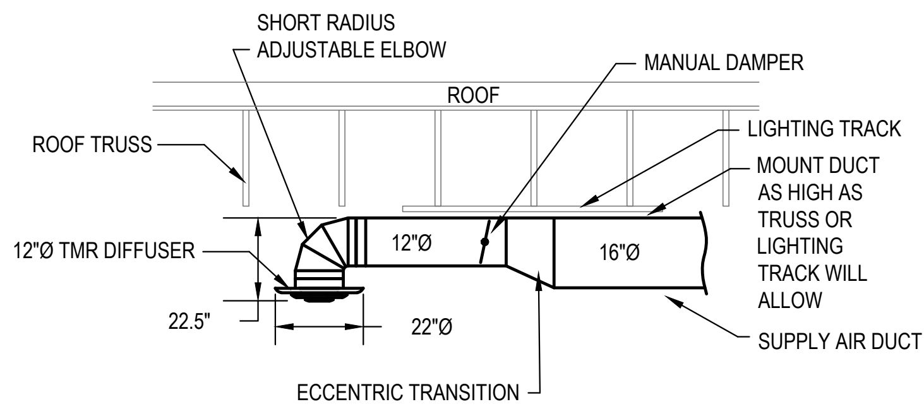
NOTE:
RESTAURANT TECHNOLOGIES INC. TO PROVIDE AND INSTALL AUTOMIST GREASE DUCT / HOOD CLEANING SYSTEM.

MECHANICAL LEGEND

HVAC:		HVAC:		HVAC:		MISC. SYMBOLS:	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
A-9x9 200	SUPPLY AIR DIFFUSER MARK - SIZE AIRFLOW CFM		ELBOW ROUND DUCT		ECCENTRIC TRANSITION	CH-1	EQUIPMENT IDENTIFICATION
C-22x10	RETURN AIR GRILLE MARK - SIZE		ROUND DUCT DROP / DOWN	UP DN	DUCT OFFSET - RISE OR DROP	①	PLAN NOTE
C-22x10	RETURN AIR GRILLE WITH SOUND BOOT MARK - SIZE		ROUND DUCT RISE / UP		FLEX DUCT (5'-0" MAX. LENGTH)	AFF	ABOVE FINISHED FLOOR
	SIDE WALL REGISTER / GRILLE		FLEXIBLE CONNECTION	OBD	OPPOSED BLADE DAMPER	SA	SUPPLY AIR
	SUPPLY AIR DUCT RISE / UP	22x12	DUCT SIZE / DIMENSIONS FIRST SIZE TOP DIMENSION	PBD	PARALLEL BLADE DAMPER	RA	RETURN AIR
	SUPPLY DUCT DROP / DOWN		45° HIGH EFFICIENCY TAKE-OFF	Ⓣ	THERMOSTAT / SENSOR	EA	EXHAUST AIR
	RETURN OR EXHAUST DUCT RISE / UP		45° HIGH EFFICIENCY TAKE-OFF WITH LOCKING QUAD. DAMPER	Ⓗ	HUMIDISTAT / SENSOR	OSA	OUTSIDE AIR
	RETURN OR EXHAUST DUCT DROP / DOWN		CONCENTRIC TRANSITION	(FS)	FIRE SMOKE DAMPER	RAG	RETURN AIR GRILLE
	ELBOW WITH TURNING VANES		RECT. TO ROUND TRANSITION	(FD)	FIRE DAMPER		

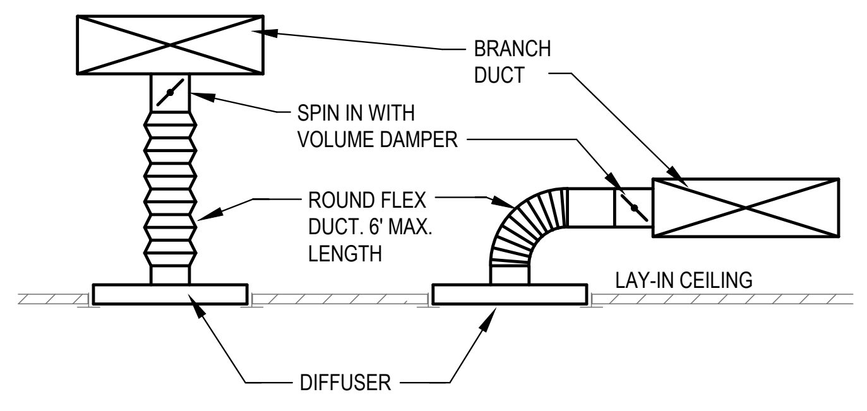
OUTDOOR AIR CALCULATION

UNIT	AREA (SQFT)	OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 SQFT	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, (RP) CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, (RA) CFM/SQFT	EXHAUST AIRFLOW RATE CFM/SQFT	BREATHING ZONE OUTDOOR AIRFLOW (VBZ)	ZONE AIR DISTRIBUTION EFFECTIVENESS (EZ)	ZONE OUTDOOR AIRFLOW (CFM)
RTU-1	1130	DINING RM	70	7.5	0.18		- - -	0.8	802
	226	CORRIDORS	0	0	0.06		- - -	0.8	14
								TOTAL	816



DINING ROOM DIFFUSER DETAIL

SCALE: NONE



DIFFUSER DETAIL

SCALE: NONE

GENERAL NOTES:

1. DUCT SYSTEMS SERVING REMOVAL OF GREASE LADEN AIR (TYPE 1 HOOD) SHALL BE CONSTRUCTED AND INSTALLED SO THAT GREASE WILL NOT ACCUMULATE IN DUCTWORK. DUCTWORK SHALL SLOPE AT 2% TOWARD HOOD OR GREASE RESERVOIR. PROVIDE DUCT CLEAN OUTS AT ALL CHANGES OF DIRECTION WITH GREASE TIGHT ACCESS DOORS.
2. DUCTWORK SERVING KITCHEN AND WORK ROOM AREAS SHALL NOT BE LINED. DUCTWORK SERVING THESE AREAS SHALL UTILIZE EXTERNAL DUCT WRAP INSULATION.
3. MAINTAIN MINIMUM 10'-0" CLEARANCE BETWEEN OUTDOOR AIR INTAKES AND EXHAUST FAN/VENT TERMINATIONS.
4. KITCHEN HOODS ARE PROVIDED BY KITCHEN EQUIPMENT SUPPLIER AND INSTALLED BY MECHANICAL CONTRACTOR.
5. REFER TO HOOD MANUFACTURER SHOP DRAWINGS FOR HOOD SUPPORT INFORMATION.
6. CEILING SPACE IS LIMITED. COORDINATE WORK WITH OTHER TRADES.
7. EXPOSED DUCTWORK SHALL BE CLEAN AND FREE OF DEFECTS.
8. EXPOSED DUCTWORK SHALL BE CONSTRUCTED OF PAINT LOCK SHEETMETAL AND PAINTED AS DIRECTED BY ARCHITECT.

PLAN NOTES:

① COORDINATE DUCT ROUTING BELOW CEILING WITH LIGHTING.

② LOCATION OF MANUAL PULL STATION. INSTALL PER MANUFACTURER INSTRUCTIONS.

③ LOCATION OF RTU THERMOSTATS. LABEL THERMOSTATS WITH RTU NUMBER. LABELS BY M.C.

④ LOCATION OF RTU TEMPERATURE SENSORS MOUNTED 7'-0" AFF.

⑤ COORDINATE DUCT BETWEEN STRUCTURAL TRUSSES WITH SIZES SHOWN.

⑥ EXHAUST HOOD PROVIDED BY OTHERS. INSTALLED BY MECHANICAL CONTRACTOR. INSTALL PER MANUFACTURERS INSTRUCTIONS.

⑦ TRANSITION AND CONNECT 10"Ø GREASE DUCT TO EXHAUST HOOD AS SHOWN. ROUTE DUCT UP AND CONNECT TO EXHAUST FAN. OFFSET AS REQUIRED TO AVOID ROOF STRUCTURE AND TO MAINTAIN 10'-0" CLEARANCE FROM ALL OUTSIDE AIR INTAKES AND 5'-0" FROM PARAPET WALLS. REFER TO DETAIL ON SHEET M-2. ALL GREASE DUCT SHALL BE INSTALLED WITH DUCT WRAP AND ACCESS DOORS AS DETAILED AND PER MANUFACTURER INSTRUCTIONS. SEE CAPTIVE AIRE DRAWING.

⑧ TRANSITION AND CONNECT 14"Ø GREASE DUCT TO EXHAUST HOOD AS SHOWN. ROUTE DUCT UP AND CONNECT TO EXHAUST FAN. OFFSET AS REQUIRED TO AVOID ROOF STRUCTURE AND TO MAINTAIN 10'-0" CLEARANCE FROM ALL OUTSIDE AIR INTAKES AND 5'-0" FROM PARAPET WALLS. REFER TO DETAIL ON SHEET M-2. ALL GREASE DUCT SHALL BE INSTALLED WITH DUCT WRAP AND ACCESS DOORS AS DETAILED AND PER MANUFACTURER INSTRUCTIONS. SEE CAPTIVE AIRE DRAWING.

⑨ COORDINATE DUCT ROUTING WITH ELECTRICAL GEAR. DO NOT ROUTE DUCTWORK ABOVE ELECTRICAL GEAR.

⑩ COMBUSTION AIR AND VENT PIPING THROUGH ROOF. PROVIDE TERMINATION PER MANUFACTURER'S RECOMMENDATIONS. EXTEND TO WATER HEATER. COORDINATE REQUIREMENTS WITH HEATER PROVIDED BY KITCHEN EQUIPMENT SUPPLIER.

⑪ RETURN AIR DUCT LOCATED BETWEEN ROOF TRUSSES. OPEN DUCTWORK UP TOWARD STRUCTURE. COVER OPENING WITH ¾" EXPANDED WITH MESH.

⑫ SUPPORT EXHAUST FAN FROM STRUCTURE AS REQUIRED BY THE MANUFACTURER.

⑬ ROUTE DUCT AS HIGH AS POSSIBLE OVER OFFICE AREA TO ALLOW FOR ROUTING OF CABLES.

⑭ MOUNT CONDENSING UNIT ON ROOF AS DETAILED AND AS REQUIRED BY THE MANUFACTURER. CONNECT REFRIGERANT PIPING PER MANUFACTURER RECOMMENDATIONS. SEE ARCHITECTURAL PLANS FOR MOUNTING DETAIL.

⑮ ROUTE RETURN AIR DUCT THROUGH OR BETWEEN ROOF TRUSSES.

⑯ ROUTE 10"Ø EXHAUST DUCT UP THROUGH ROOF TO ROOF CAP. VERIFY 10' CLEARANCE FROM ALL OUTSIDE AIR INTAKES.

⑰ HOOD SHALL BE PROVIDED WITH FACTORY PRE-WIRE PACKAGE AND A PRE-ENGINEERED UL-300 FIRE SUPPRESSION SYSTEM. SYSTEM SHALL BE PROPERLY SIZED FOR THE HOOD, DUCT PLENUM AND ALL EQUIPMENT BELOW (VERIFY EXACT REQUIREMENTS WITH KITCHEN EQUIPMENT SUPPLIER). HOOD EXHAUST, MAKE-UP AND LIGHTS SHALL BE SWITCHED FROM CONTROL PANEL THAT IS INTEGRAL TO FRONT OF UTILITY CABINET. UTILITY CABINET SHALL SERVE ALL HOODS.

⑱ PROVIDE LOCKING QUADRANT DAMPER AND SQUARE TO ROUND TRANSITION FOR DUCT CONNECTION TO RETURN GRILLE.

⑲ COORDINATE DUCT DROP BETWEEN STRUCTURAL TRUSSES WITH SIZES SHOWN. TRANSITION RETURN AIR DUCT TO FIT BETWEEN STRUCTURE.

⑳ PROVIDE CAPTIVE AIRE WBE WINDBAND EXTENSION FOR KEF-1 AND KEF-2.

(21) EXPOSED DUCTWORK SHALL BE DUAL WALL AND OF PAINTLOCK CONSTRUCTION. PAINT AS PER DIRECTION OF ARCHITECT (TYP.).

BAKER DESIGN GROUP, PA
RODGER W BAKER ARCHITECT, AIA NCARB
135 N. Main St. Wichita KS 67202 316.267.7142
rodger@bakerdesigngroupa.com

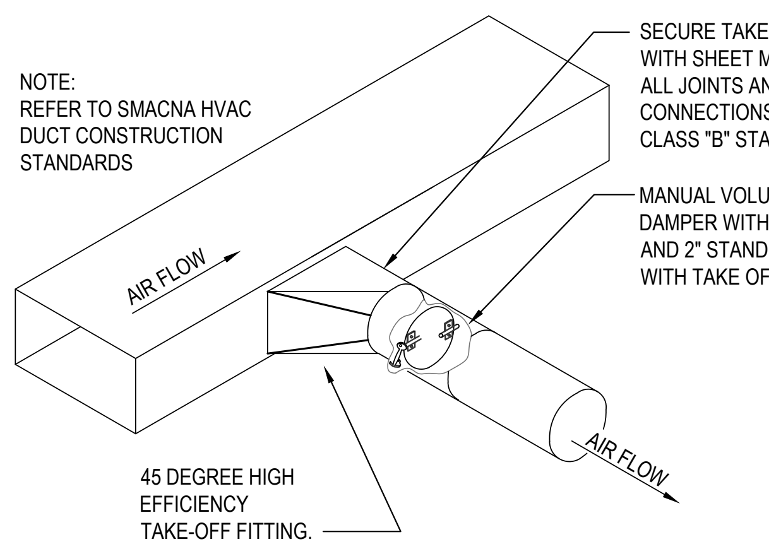
FREDDY'S FROZEN CUSTARD
711 S. RIDGE ROAD
MIDDLETOWN, DELAWARE

No. 28940
2.28.24

MECHANICAL PLAN

DATE
10/26/23
02/28/24

DRAWN BY:
MW
CHECKED BY:
MW
SHEET NO.
M1



NOTE:
REFER TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS

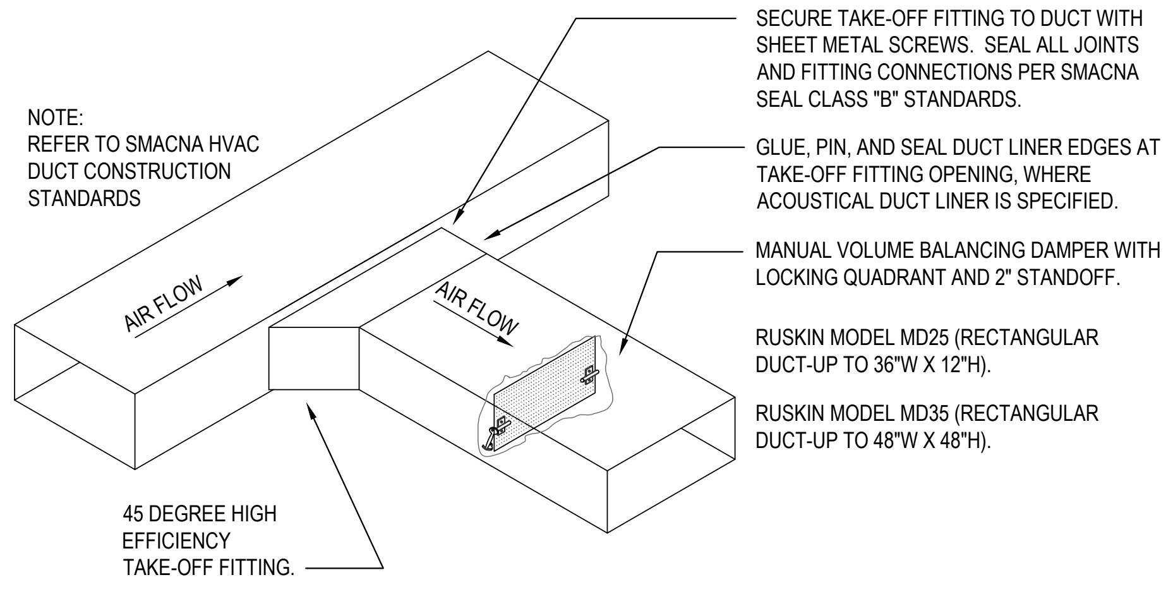
SECURE TAKE-OFF FITTING TO DUCT WITH SHEET METAL SCREWS. SEAL ALL JOINTS AND FITTING CONNECTIONS PER SMACNA SEAL CLASS "B" STANDARDS.

MANUAL VOLUME BALANCING DAMPER WITH LOCKING QUADRANT AND 2" STANDOFF - FURNISHED WITH TAKE OFF.

45 DEGREE HIGH EFFICIENCY TAKE-OFF FITTING.

1 ROUND DUCT TAKE-OFF

NO SCALE



NOTE:
REFER TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS

SECURE TAKE-OFF FITTING TO DUCT WITH SHEET METAL SCREWS. SEAL ALL JOINTS AND FITTING CONNECTIONS PER SMACNA SEAL CLASS "B" STANDARDS.

GLUE, PIN, AND SEAL DUCT LINER EDGES AT TAKE-OFF FITTING OPENING, WHERE ACOUSTICAL DUCT LINER IS SPECIFIED.

MANUAL VOLUME BALANCING DAMPER WITH LOCKING QUADRANT AND 2" STANDOFF.

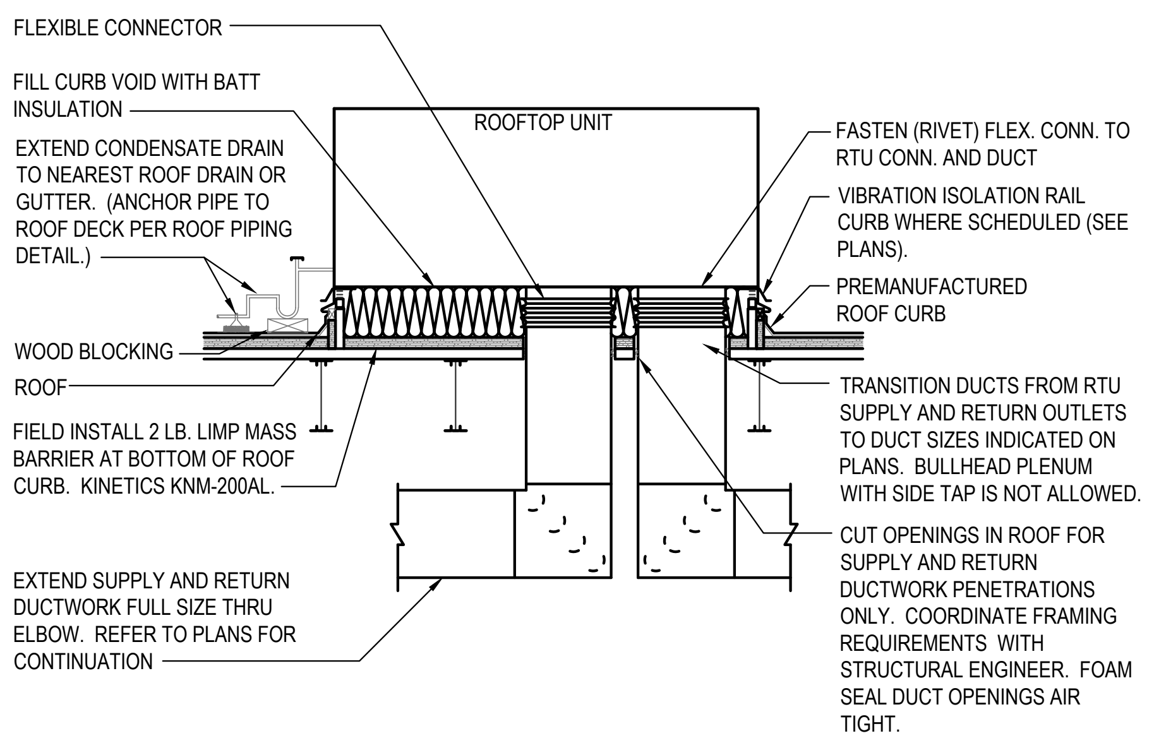
RUSKIN MODEL MD25 (RECTANGULAR DUCT-UP TO 36"W X 12"H).

RUSKIN MODEL MD35 (RECTANGULAR DUCT-UP TO 48"W X 48"H).

45 DEGREE HIGH EFFICIENCY TAKE-OFF FITTING.

2 RECTANGULAR DUCT TAKE-OFF

NO SCALE



FLEXIBLE CONNECTOR

FILL CURB VOID WITH BATT INSULATION

EXTEND CONDENSATE DRAIN TO NEAREST ROOF DRAIN OR GUTTER. (ANCHOR PIPE TO ROOF DECK PER ROOF PIPING DETAIL.)

FIELD INSTALL 2 LB. LIMP MASS BARRIER AT BOTTOM OF ROOF CURB. KINETICS KNM-200AL.

EXTEND SUPPLY AND RETURN DUCTWORK FULL SIZE THRU ELBOW. REFER TO PLANS FOR CONTINUATION

FASTEN (RIVET) FLEX. CONN. TO RTU CONN. AND DUCT

VIBRATION ISOLATION RAIL CURB WHERE SCHEDULED (SEE PLANS).

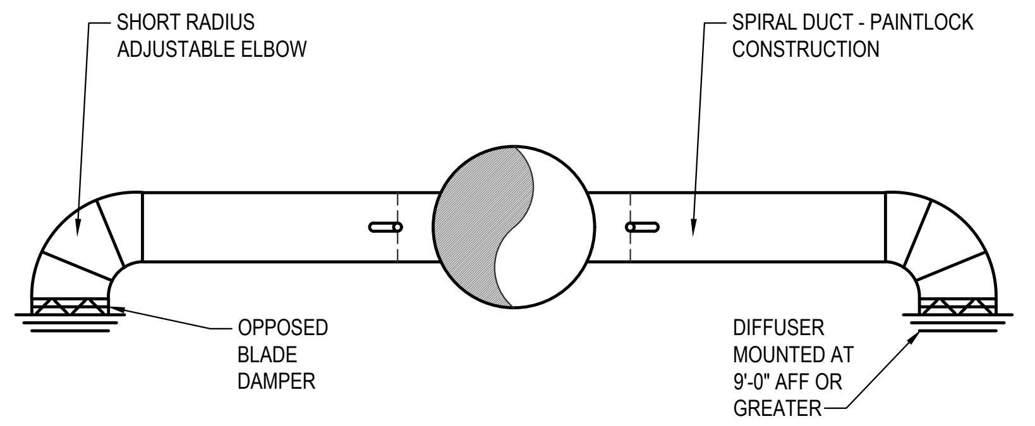
PREMANUFACTURED ROOF CURB

TRANSITION DUCTS FROM RTU SUPPLY AND RETURN OUTLETS TO DUCT SIZES INDICATED ON PLANS. BULLHEAD PLENUM WITH SIDE TAP IS NOT ALLOWED.

CUT OPENINGS IN ROOF FOR SUPPLY AND RETURN DUCTWORK PENETRATIONS ONLY. COORDINATE FRAMING REQUIREMENTS WITH STRUCTURAL ENGINEER. FOAM SEAL DUCT OPENINGS AIR TIGHT.

3 DOWNFLOW ROOF TOP UNIT DETAIL

NO SCALE

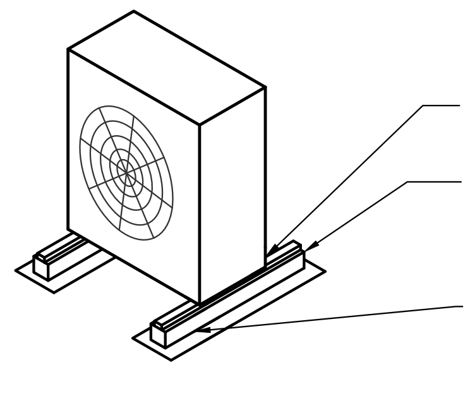


4 DINING ROOM DIFFUSER DETAIL

NO SCALE

NOTES:

1. PROVIDE MANUFACTURERS RECOMMENDED CLEARANCES BETWEEN CU & HP UNITS.
2. PROVIDE ADDITIONAL SUPPORTS AS REQUIRED IF UNITS ARE NOT SAME WIDTH.
3. PAINT EXPOSED INSULATION WITH MANUFACTURER RECOMMENDED ULTRAVIOLET PROTECTIVE COATING.



SECURE CONDENSING UNIT TO MOUNTING BLOCK.

MIFAB C6 (MINIMUM 19.2" LONG) ROOF SUPPORTS. ROUTE SUPPORTS PERPENDICULAR TO ROOF STRUCTURAL MEMBERS.

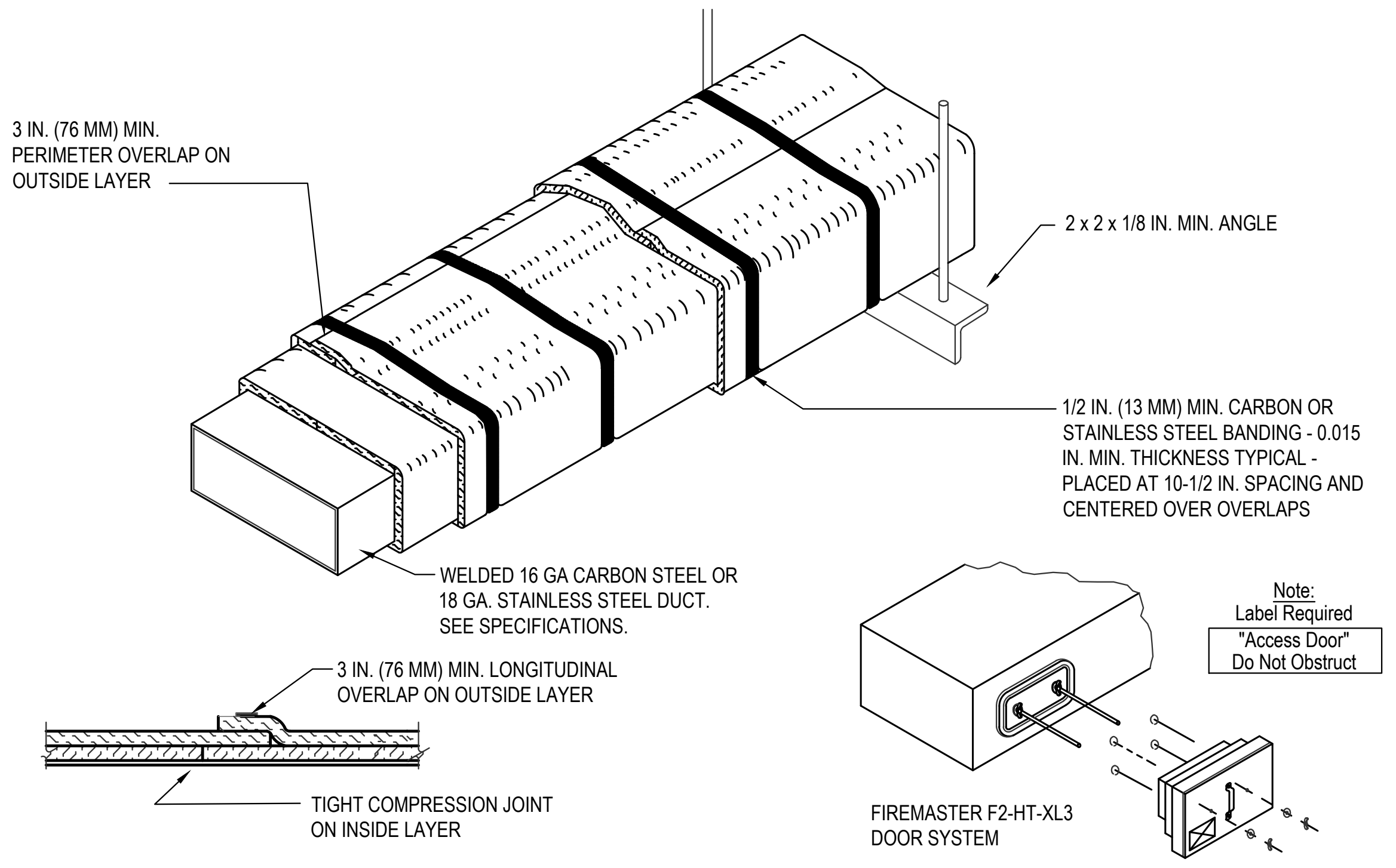
SET SUPPORTS ON ADDITIONAL MEMBRANE IN MASTIC (APPROVED BY ROOF MEMBRANE MANUFACTURER)

5 ROOF CONDENSING UNIT MOUNTING

NO SCALE CONDENSER ON ROOF

NOTES:

1. THERMAL CERAMICS FIREMASTER FASTWRAP XL OR PYROSCAT XL HAS BEEN TESTED IN ACCORDANCE WITH ASTM E2336 TO PROVIDE ZERO CLEARANCE TO COMBUSTIBLES AND MEETS THE REQUIREMENTS FOR ONE OR TWO HOUR ENCLOSURES. THROUGH PENETRATIONS FIRESTOP SYSTEMS ARE TESTED IN ACCORDANCE WITH EITHER ASTM E 814 OR UL 1479. ICC-ES APPROVAL PER REPORT ESR 2213 OR ESR 2832. UNDERWRITER'S LABORATORIES (UL) LISTINGS SHOW COMPLIANCE TO UL 1479 FOR THROUGH PENETRATION FIRESTOP SYSTEMS.
2. COMPLIANT TO THE FOLLOWING CODES: NFPA 96 2003 AND 2006 INTERNATIONAL MECHANICAL CODES 2006 UNIFORM MECHANICAL CODE.
3. INSULATION APPLIED IN TWO LAYERS WITH TIGHT COMPRESSION JOINT ON INSIDE LAYER AND 3 INCH MINIMUM OVERLAPS ON BOTH PERIMETER AND LONGITUDINAL OVERLAPS ON OUTSIDE LAYER.
4. GREASE EXHAUST DUCT RUNS FROM THE HOOD EXHAUST CONNECTION UP TO THE EXHAUST FAN ON THE ROOF WITH MINIMAL TURNS OR BENDS AND MAINTAINING MINIMUM 1/4 UNIT VERTICAL RISE PER 12 UNITS HORIZONTAL RUN. NFPA 96 COMPLIANT ACCESS DOORS LOCATED AS REQUIRED BY CODE.
5. THERMAL CERAMICS FIREMASTER ACCESS DOORS AS SPECIFIED IN ICC-ES BUILDING CODE REPORTS ESR 2213 OR ESR 2832.
6. ROOF MOUNTED EXHAUST FAN IS MOUNTED ON A HINGED BASE WHICH ALLOWS ACCESS TO THE DUCT FROM THE ROOF.
7. SUPPORT HANGER SYSTEMS DO NOT NEED TO BE WRAPPED PROVIDED THE HANGER RODS ARE AT LEAST A MINIMUM OF 3/8 IN. DIAMETER. USE MINIMUM 2 X 2 X 1/8 IN. STEEL ANGLE OR SMACNA EQUIVALENT SUPPORT SYSTEM.
8. THERMAL CERAMICS DUCT ENCLOSURE SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
9. THERMAL CERAMICS DUCT WRAP SHALL BE INSTALLED ON THE DUCT FROM THE HOOD CONNECTION TO THE CONNECTION TO THE FAN.



3 IN. (76 MM) MIN. PERIMETER OVERLAP ON OUTSIDE LAYER

2 x 2 x 1/8 IN. MIN. ANGLE

1/2 IN. (13 MM) MIN. CARBON OR STAINLESS STEEL BANDING - 0.015 IN. MIN. THICKNESS TYPICAL - PLACED AT 10-1/2 IN. SPACING AND CENTERED OVER OVERLAPS

WELDED 16 GA CARBON STEEL OR 18 GA. STAINLESS STEEL DUCT. SEE SPECIFICATIONS.

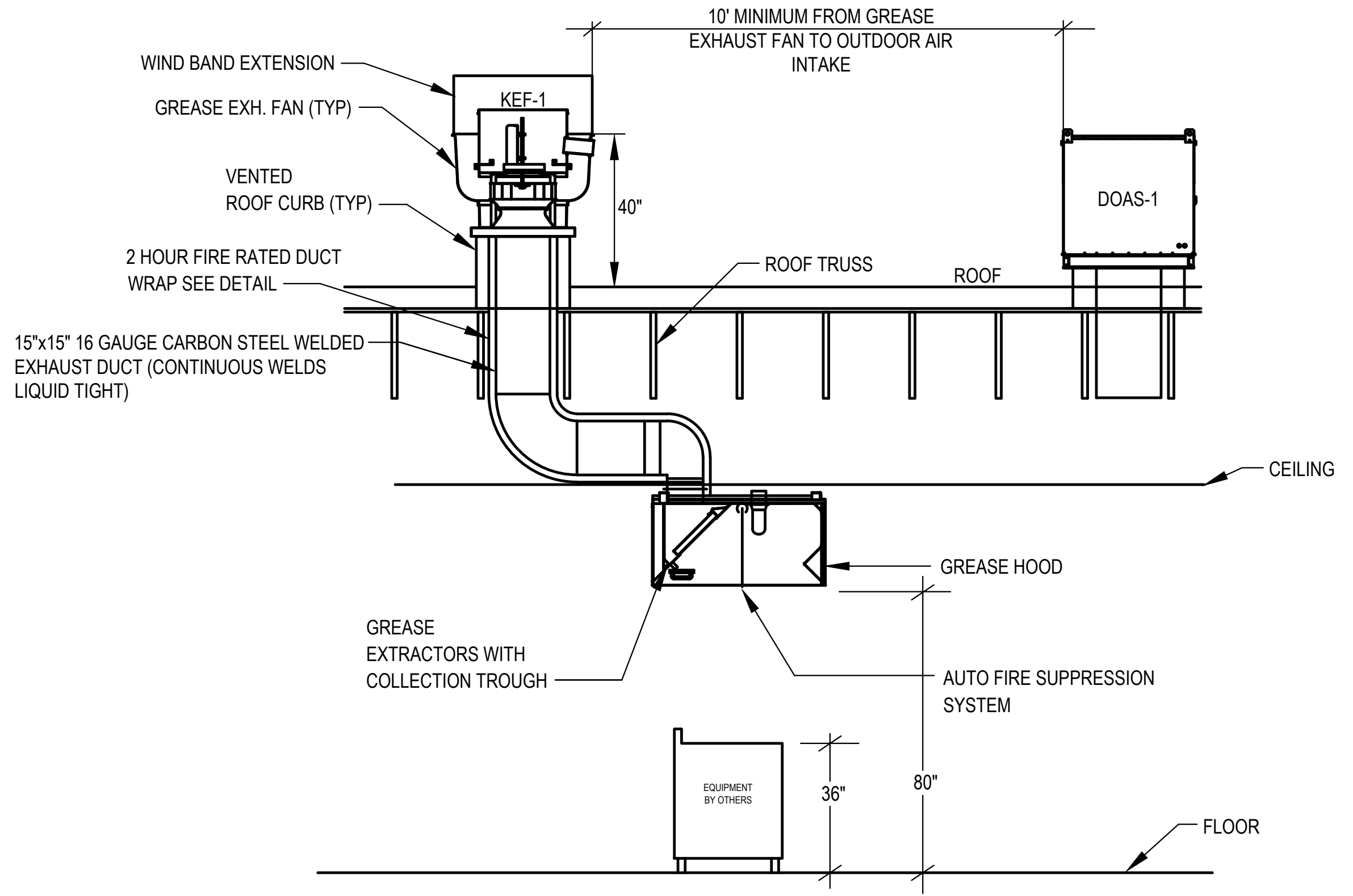
3 IN. (76 MM) MIN. LONGITUDINAL OVERLAP ON OUTSIDE LAYER

TIGHT COMPRESSION JOINT ON INSIDE LAYER

FIREMASTER F2-HT-XL3 DOOR SYSTEM

6 COMMERCIAL KITCHEN GREASE DUCT SYSTEM

NO SCALE



7 GREASE HOOD DETAIL

NO SCALE

ROOFTOP UNIT SCHEDULE

MARK	MFGR	MODEL NO.	NOM. TONS	EVAP. CFM	EXT. STATIC P. IN. WG. (NOTE 2)	COOLING				HEATING (GAS)		ELECTRICAL				MINIMUM OUTDOOR AIR (CFM)	TOTAL WEIGHT (LBS)	EER	REFRIG.	NOTES
						TOTAL MBH	SENS. MBH	AMB.	EVAP. EAT DB/WB	MBH INPUT	MBH OUTPUT	VOLT/Ø/HZ	BLOWER MOTOR	MIN. MCA (AMPS)	MIN. MOCP (AMPS)					
RTU-1	LENNOX	LGH150	12.5	4,850	1.0	134.2	113.5	100	80/67	260 / 169	205 / 135.2	208/3/60	5 HP	71	90	1000	1,650	12.8	R-410a	1,2,3,4,5,6

ALTERNATE RTU MANUFACTURER

MARK	MFGR	MODEL NO.	NOM. TONS	EVAP. CFM	EXT. STATIC P. IN. WG. (NOTE 2)	COOLING				HEATING (GAS)		ELECTRICAL				MINIMUM OUTDOOR AIR (CFM)	TOTAL WEIGHT (LBS)	EER	REFRIG.	NOTES
						TOTAL BTUH	SENS. BTUH	AMB.	EVAP. EAT DB/WB	BTUH INPUT	BTUH OUTPUT	VOLT/Ø/HZ	BLOWER MOTOR	MIN. MCA (AMPS)	MIN. MOCP (AMPS)					
RTU-1	TRANE	YHD150G3R	12.5	4,850	1.0	146.74	98.91	95	80/67	250,000	200,000	208/3/60	3 HP	67	80	1000	2,500	12.1	R-410a	1,2,3,4,5,6

NOTES:

1. PROVIDE LOW LEAK OUTDOOR AIR ECONOMIZER WITH DRY BULB CONTROL, FAULT DETECTION AND DIAGNOSTIC MODULE. PROVIDE UNIT WITH HOT GAS REHEAT WITH 75° L.A.T., TIME DELAY ON COMPRESSOR RE-START, CRANKCASE HEATER, BAROMETRIC RELIEF DAMPER, CONDENSATE DRAIN PAN FLOAT SWITCH, AND COMPRESSOR LOCK-OUT WITH AMBIENT BELOW 55 °F FOR EACH UNIT. OUTDOOR AIR DAMPER TO FULLY CLOSE W/ FAN SHUTDOWN FOR ALL UNITS. PROVIDE UNIT WITH 2-SPEED FAN CONTROL.
2. EXTERNAL STATIC PRESSURE LISTED REPRESENTS STATIC PRESSURE REQUIRED FOR DUCTWORK AND DIFFUSERS OUTSIDE THE HVAC UNIT COMPLETELY INDEPENDENT OF ANY PRESSURE DROP THROUGH THE HVAC EQUIPMENT INCLUDING BUT NOT LIMITED TO FILTERS, COILS AND ECONOMIZERS. THE FAN AND MOTOR SHALL BE SIZED APPROPRIATELY TO MEET THIS DEFINITION OF EXTERNAL STATIC PRESSURE.
3. PROVIDE COMMERCIAL 7-DAY PROGRAMMABLE HEAT/COOL/AUTO CHANGEOVER THERMOSTAT WITH REMOTE TEMPERATURE AND HUMIDITY SENSORS AND ECONOMIZER OUTPUT FOR EACH UNIT. ECONOMIZER/OUTDOOR AIR DAMPER IS TO CLOSE DURING UNOCCUPIED HOURS. THERMOSTAT SHALL BE HONEYWELL VISIONPRO (OR EQUAL) WITH HUMIDITY CONTROL.
4. PROVIDE 18" HIGH (AT LOWEST POINT) PRE-FABRICATED INSULATED ROOF CURB WITH SLOPE TO MATCH SLOPE OF ROOF FOR EACH UNIT.
5. PROVIDE HAIL GUARDS FOR EACH UNIT.
6. DISCONNECT AND RETURN AIR SMOKE DETECTOR TO BE FACTORY INSTALLED. MECHANICAL CONTRACTOR TO COORDINATE UNIT MOCP WITH ELECTRICAL CONTRACTOR.

SEE SHEET M4 & M5 FOR OWNER PROVIDED, MECHANICAL CONTRACTOR INSTALLED DOAS UNIT INFORMATION.

NATIONAL ACCOUNT INFORMATION

FREDDY'S FROZEN CUSTARD HAS NATIONAL ACCOUNT AGREEMENTS FOR ROOF TOP UNITS WITH LENNOX AND TRANE.
NO ALTERNATE MANUFACTURERS ARE ALLOWED.

FOR LENNOX EQUIPMENT CONTACT:
DAVE EBNER, LENNOX INDUSTRIES NATIONAL ACCOUNT MANAGER, (612) 860-5933, Dave.Ebner@Lennoxind.com

FOR TRANE EQUIPMENT EQUAL TO THE UNITS SPECIFIED CONTACT:
TOM ROOD OR PAUL MINOCK, TRANE ACCOUNT MANAGER - NATIONAL ACCOUNTS, (800) 729-9115, TOM.ROOD@TRANE.COM, PMINOCK@TRANE.COM

DIFFUSER SCHEDULE

MARK	MFGR	MODEL	NECK SIZE	FACE SIZE	FINISH	REMARKS
SD-1	TITUS	TMR	12"Ø	22"Ø	WHITE	WITH OPPOSED BLADE DAMPER, FIELD PREP FOR PAINTING
SD-2	TITUS	PAS/3	8"Ø	24x24	WHITE	
SD-3	TITUS	PAS/3	10"Ø	24"x24"	WHITE	
SD-4	TITUS	T3SQ4	8"Ø	24"x24"	WHITE	THERMAL VAV DIFFUSER
SD-5	TITUS	TMS/3	6"Ø	12"x12"	WHITE	WITH OPPOSED BLADE DAMPER AND TRM KIT
SD-6	TITUS	TMS/3	8"Ø	24"x24"	WHITE	WITH OPPOSED BLADE DAMPER AND TRM KIT
SD-7	TITUS	TMS/3	8"Ø	12"x12"	WHITE	WITH OPPOSED BLADE DAMPER AND TRM KIT
RG-1	AMER. LOUVER CO.	STRATUS	20"x20"	24"x24"	WHITE	SEE NOTE 1.
RG-2	TITUS	350RL	8"x8"	-	WHITE	
RG-3	TITUS	50F	10x22	24X12	WHITE	

NOTES: 1. RETURN GRILL TO BE PLASTIC FILTER RETURN, FILTER TO BE AMERICAN AIR FILTER (AAF) FRONTLINE GREEN 1", WITH AAF AMERIFRAME SIZE 20x20x1.

BUILDING AIR BALANCE SCHEDULE

MARK	SPACE OR AREA	EXHAUST AIR CFM	OUTSIDE AIR CFM	RETURN AIR CFM	SUPPLY AIR CFM	REMARKS
RTU-1	DINING	--	1,000	4,850	4,850	--
DOAS-1	COOKLINE / OFFICE / COUNTER	--	2,900	0	2,900	--
KEF-1	RANGE - KITCHEN HOOD	1,700	--	--	--	--
KEF-2	FRYERS - KITCHEN HOOD	775	--	--	--	--
KEF-3	DISHWASHER - KITCHEN HOOD	525	--	--	--	--
EF-1	WOMEN'S RESTROOM	75	--	--	--	--
EF-2	MEN'S RESTROOM	150	--	--	--	--
TOTALS	BUILDING TOTALS	3,225	3,900	4,850	7,500	NOTE: AREA IS 675 CFM POSITIVE

EXHAUST FAN SCHEDULE

MARK	MFGR	MODEL	CFM	EXTERNAL STATIC P. IN. WG.	RPM	ELECTRICAL		FAN TYPE	REMARKS
						VOLT/Ø/HZ	PWR		
EF-1	COOK	GC-146	75	0.25	900	120/1/60	30.3W	CEILING EXH.	-
EF-2	COOK	GC-186	150	0.25	820	120/1/60	63.3W	CEILING EXH.	-

NOTES:

1. PROVIDE CEILING GRILLE, INTEGRAL BACK DRAFT DAMPER, DISCONNECT SWITCH, AND VARIABLE SPEED CONTROLLER.
2. FANS SHALL NOT EXCEED SCHEDULED RPM.

PUMP SCHEDULE

MARK	SERVICE	GPM	HEAD	EFFICIENCY	MOTOR			PIPE INCHES		FLOW	STARTER BY	REMARKS
					HP	RPM	ELECTRICAL	SUCTION	DISCHARGE			
RP-1	DOMESTIC HW	10	6	-	$\frac{1}{6}$	3250	115/60/1	-	-	CONST	-	①

REMARKS:

① SELECTION BASED ON BELL & GOSSETT INLINE PUMP MODEL PL-30. ALL BRONZE CONSTRUCTION.

BAKER DESIGN GROUP, PA
RODGER W BAKER ARCHITECT, AIA NCARB
135 N. Main St. Wichita KS 67202 316.267.7142
rodger@bakerdesigngrouppa.com

FREDDY'S FROZEN CUSTARD
711 S. RIDGE ROAD
MIDDLETOWN, DELAWARE

No. 28940
10.26.23

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RODGER W. BAKER, AIA

MECHANICAL DETAILS

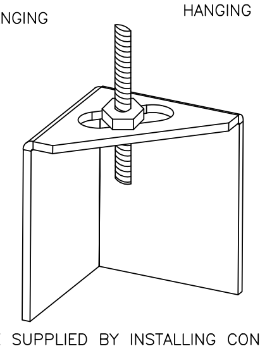
DATE
10/26/23

DRAWN BY:
MW

CHECKED BY:
MW

SHEET NO.
M2

ND-2 HANGING ANGLE DETAIL



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

HANGING ANGLE LOCATIONS

HOOD STYLE	DIM FROM REAR	DIM FROM FRONT (24"H)	DIM FROM FRONT (30"H)
CANOPY ND2	4.166"	2.246"	2.246"
ND2-PSP-F	4.166"	2.246"	2.246"
BACKSHELF BD-2	4.166"	2.246	–
VHB/VHB-G	36"X36"	42"X42"	48"X48"
FRONT/BACK DIMS BY SIZE	2.246"	2.246"	2.246"

CALCULATIONS UTILIZED

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

SUPPLY CFM=EXHAUST CFM X PERCENTAGE REQUIRED

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

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

*CAPTIVE-AIRE DUCT CONNECTION SIZES ARE CALCULATED USING AN EXHAUST VELOCITY OF 1500-1800 FPM AND A SUPPLY VELOCITY OF 300-400 FPM.

BUILDING CODES

CAPTIVE-AIRE HOODS ARE BUILT IN COMPLIANCE WITH:

LISTED
#3054804-001
& #3054804-002

STANDARD 710

SANITATION LISTED
Intertek

BUILT IN ACCORDANCE WITH NFPA No. 96

Listed under ETL File number 3054804-001/002

CLEARANCE TO COMBUSTIBLES

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

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

GENERAL NOTES

INSTALLATION

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

BALANCE

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

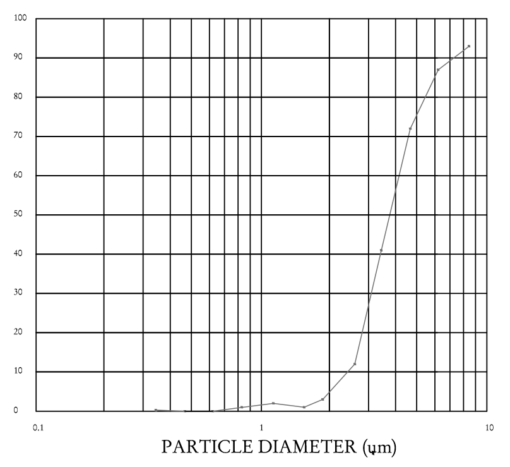
ADDITIONAL

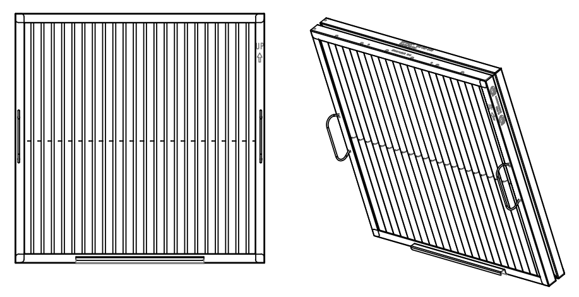
14. WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
15. SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

FILTER DETAIL

FILTER COLLECTION EFFICIENCY

2" Captrate® Grease-Stop® Solo Filter





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

HOOD INFORMATION – JOB#6196250

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S) WIDTH	LENG	HEIGHT	DIA	CFM	VEL	SP	HOOD CONSTRUCTION	HOOD CONFIG END TO END	ROW
1	ITEM 33A	5424 ND-2	CAPTIVEAIRE	8' 0"	450 DEG	I	MEDIUM	200	1600			4"	14"	1600	1497	-0.734"	430 SS WHERE EXPOSED	ALONE	FRONT
2	ITEM 33B	5424 ND-2	CAPTIVEAIRE	5' 0"	450 DEG	I	MEDIUM	155	775			4"	10"	775	1421	-0.436"	430 SS WHERE EXPOSED	ALONE	ALONE
3	ITEM 75	4224 VHB-G	CAPTIVEAIRE	3' 6"	700 DEG	II	N/A	150	525			4"	10"	525	963	-0.069"	304 SS 100%	ALONE	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S) TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	LIGHT(S) QTY	TYPE	WIRE GUARD	UTILITY CABINET(S) LOCATION	SIZE	FIRE SYSTEM TYPE	FIRE SYSTEM SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WEIGHT
1	ITEM 33A	CAPTRATE SOLO FILTER	5	16"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	LEFT	12"x54"x24"			DCV-2111	1 LIGHT 1 FAN	NO	598 LBS
2	ITEM 33B	CAPTRATE SOLO FILTER	3	16"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO							NO	357 LBS
3	ITEM 75						0									NO	161 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	ITEM 33A	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		INSULATION FOR TOP OF HOOD.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 3IN DBL.
2	ITEM 33B	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT END PANEL 27" TOP WIDTH, 24" BOTTOM WIDTH, 39.5" HIGH 430 SS.
		LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		INSULATION FOR TOP OF HOOD.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 6IN PLEN.
3	ITEM 75	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.

PATENT NUMBERS

EXHAUST HOODS ND-2/BD-2/SND-2 (CANADA) - CA PATENT 2520435 C.

SPECIFICATION: CAPTRATE GREASE-STOP SOLO FILTER

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

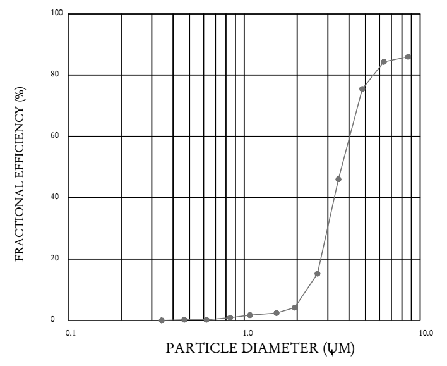
FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNEL(S).

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

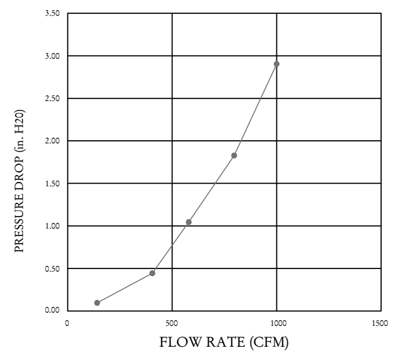
GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 85% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 1.0 INCHES OF WATER GAUGE.

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

EFFICIENCY VS. PARTICLE DIAMETER



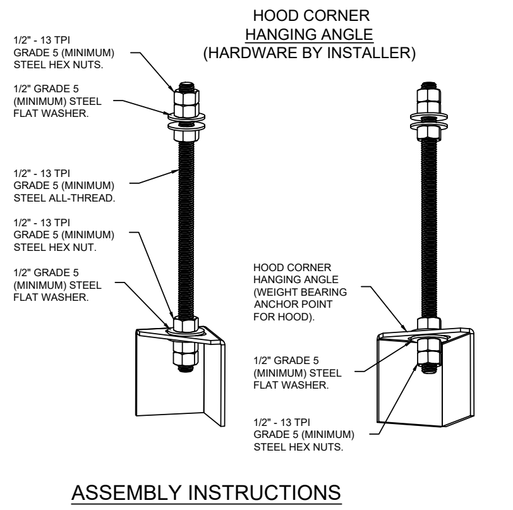
PRESSURE DROP VS. FLOW RATE



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

BUILT IN ACCORDANCE WITH NFPA No. 96

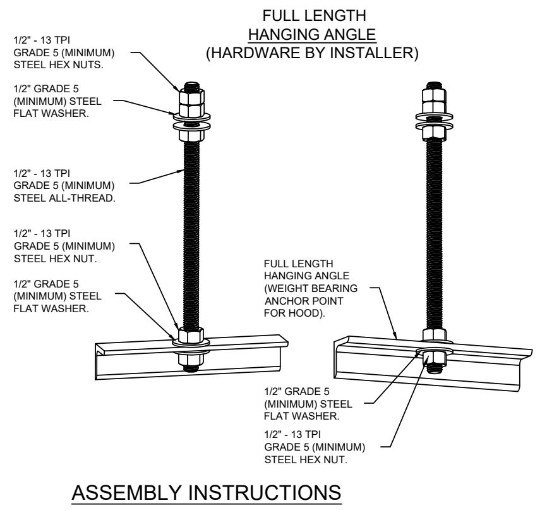
HOOD CORNER
HANGING ANGLE
(HARDWARE BY INSTALLER)



ASSEMBLY INSTRUCTIONS

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

FULL LENGTH
HANGING ANGLE
(HARDWARE BY INSTALLER)



ASSEMBLY INSTRUCTIONS

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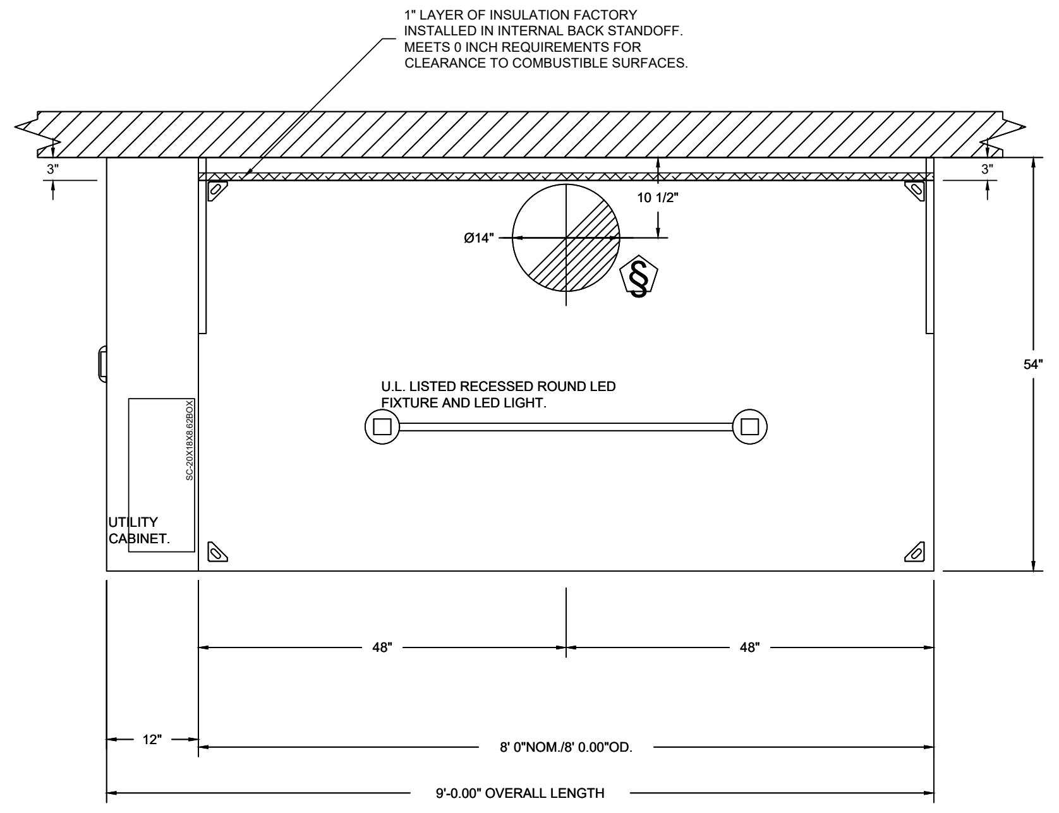
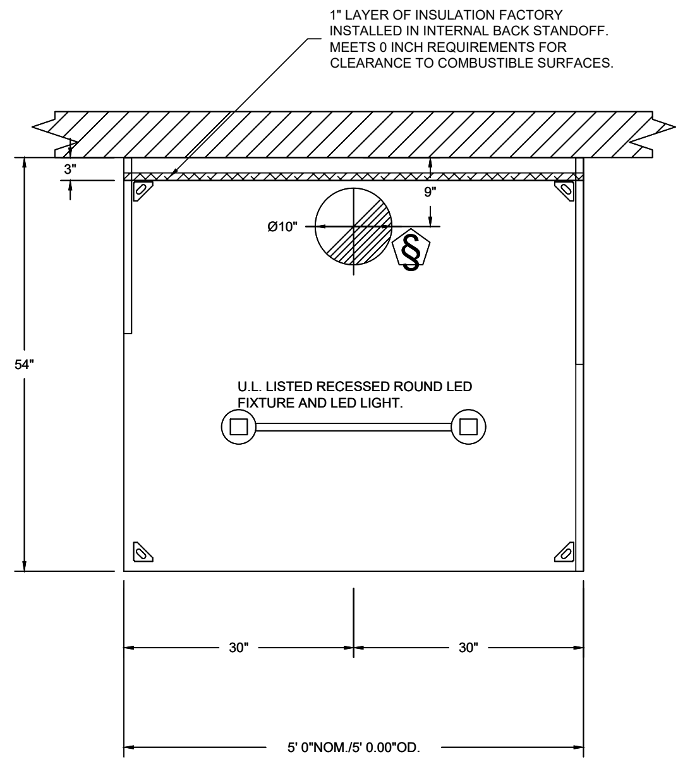
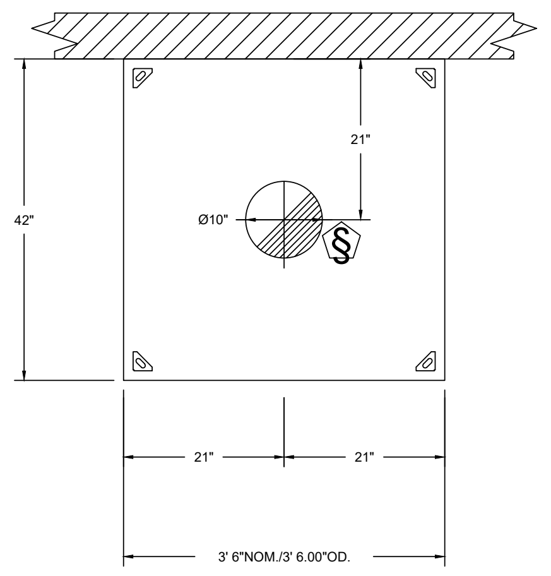


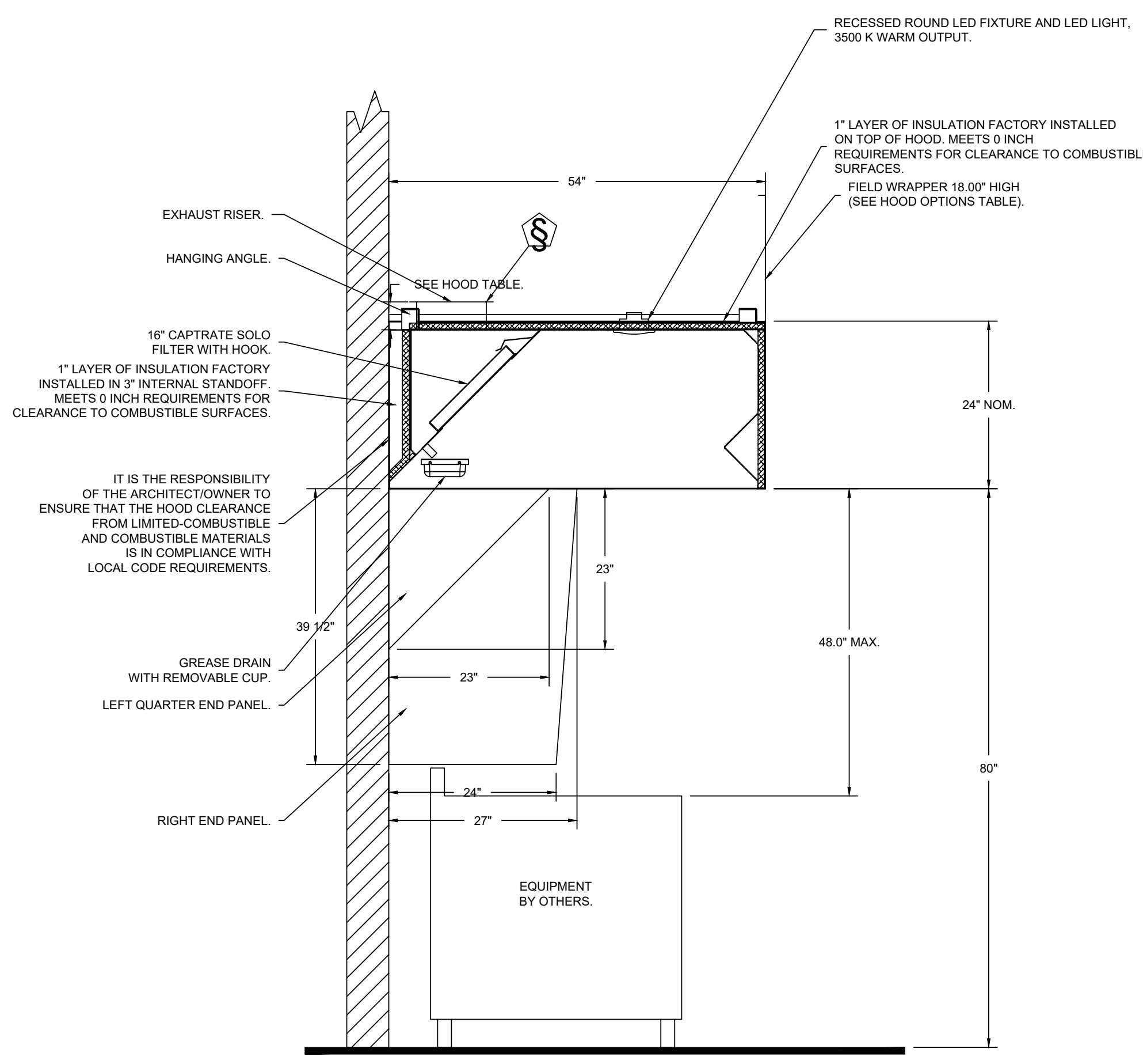
PLAN VIEW – HOOD #1 (ITEM 33A)
8' 0.00" LONG 5424ND-2



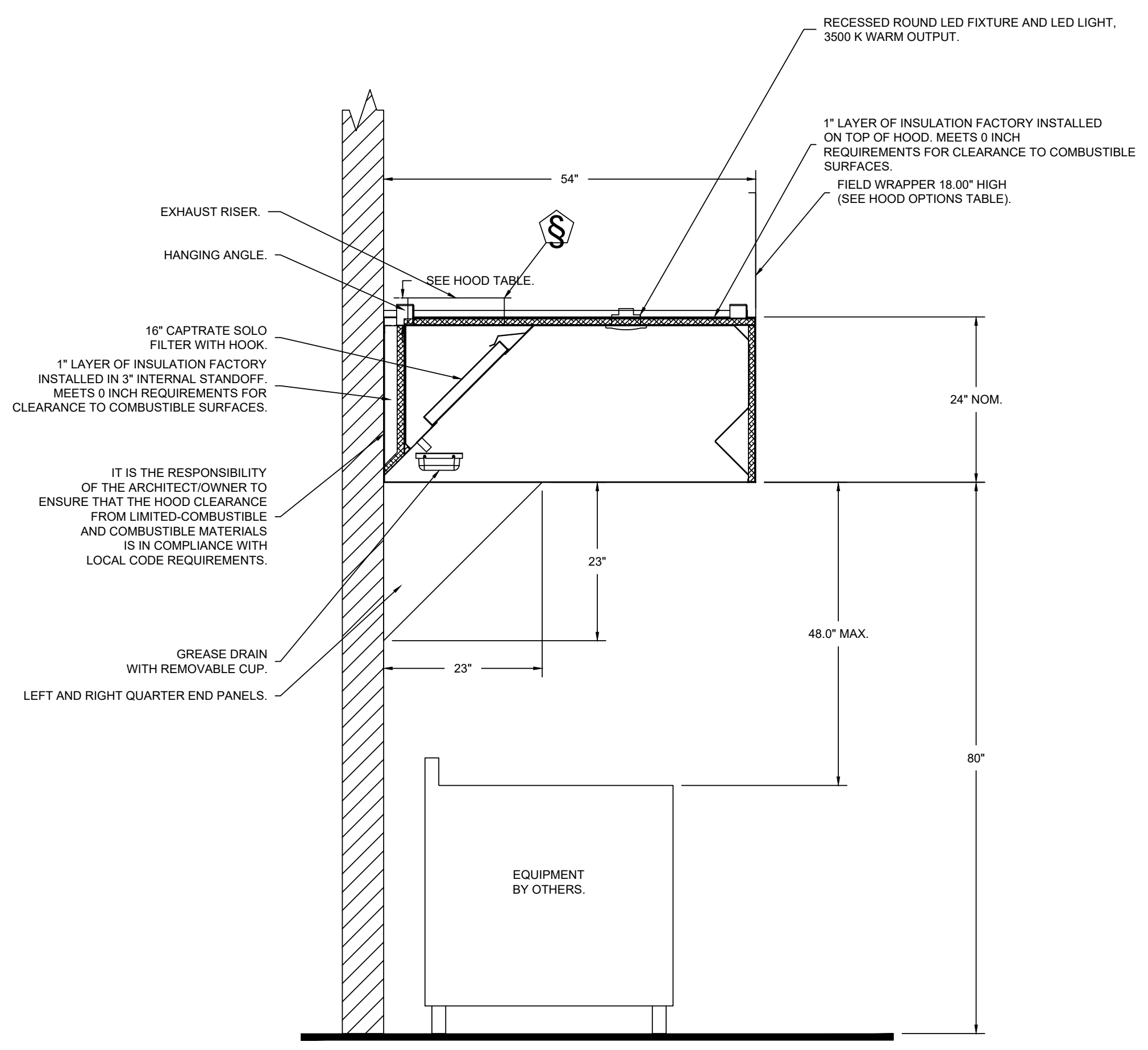
PLAN VIEW – HOOD #2 (ITEM 33B)
5' 0.00" LONG 5424ND-2



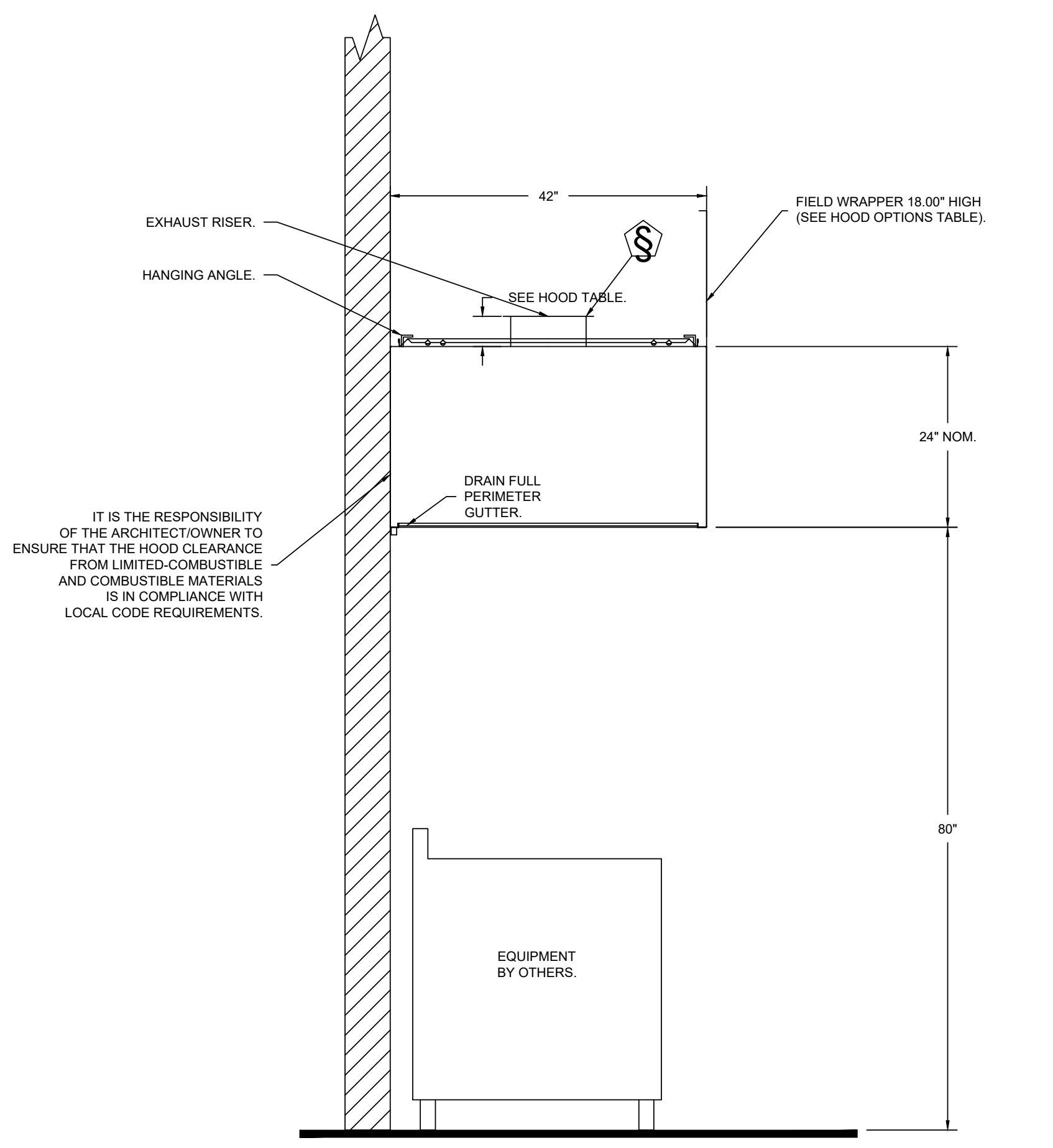
PLAN VIEW – HOOD #3 (ITEM 75)
3' 6.00" LONG 4224VHB-G



SECTION VIEW – MODEL 5424ND-2
HOOD – #2 (ITEM 33B)



SECTION VIEW – MODEL 5424ND-2
HOOD – #1 (ITEM 33A)



SECTION VIEW – MODEL 4224VHB-G
HOOD – #3 (ITEM 75)

FOR QUESTIONS, CALL THE:
KANSAS CITY REGIONAL OFFICE
1126 SWIFT STREET, KANSAS CITY, MO 64116
PHONE: (816) 221-8575
FAX: (816) 221-8311

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted ☐
Approved with NO Exception Taken ☐
Revise and Resubmit ☐
SIGNATURE ______
Your Title ______ Date ______ ______

*** NOTE ***

ALL WALLS AND STRUCTURES THAT COME WITHIN 18" OF HOOD MUST BE METAL STUDS AND SHEETROCK. WOOD STUDS OR ANY OTHER COMBUSTIBLE MATERIAL WITHIN 18" OF HOOD NO ALLOWED.

*** NOTE ***

HOOD MANUFACTURER RECOMMENDS NO RETURNS OR 4-WAY DIFFUSERS WITHIN 10 FEET OF HOOD IN ALL DIRECTION.

*** NOTE ***

MAKEUP AIR SHALL BE DELIVERED INTO SPACE IN MANNER THAT WILL NOT DISRUPT HOODS ABILITY TO CAPTURE AND CONTAIN.

REVISIONS

DESCRIPTION:	DATE:
△	
△	
△	
△	

www.captiveaire.com

HBT Foodservice

104 W 9th St Suite 204, Kansas City, MO, 64105 PHONE: (816) 221-8575 FAX: (816) 221-8311 EMAIL: reg98@captiveaire.com

Freddy's - Middletown, DE

MIDDLETOWN, DE, 19709

DATE: 8/30/2023

DWG.#:
6196250

DRAWN BY: michael.co

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

MASTER DRAWING

SHEET NO.
1

FREDDY'S FROZEN CUSTARD
711 S. RIDGE ROAD
MIDDLETOWN, DELAWARE

BAKER DESIGN GROUP, PA
RODGER W BAKER ARCHITECT, AIA NCARB
135 N. Main St. Wichita KS 67202 316.267.7142
rodger@bakerdesigngroupa.com

No. 28940
10.26.23

THE DESIGN AND DETAILS DISCLOSED HEREIN ARE THE EXCLUSIVE PROPERTY OF RODGER W. BAKER, AIA AND SHALL NOT BE COPIED OR REPRODUCED IN WHOLE OR IN PART WITHOUT HIS PRIOR WRITTEN CONSENT.

RODGER W. BAKER, AIA

DATE
10/26/23

DRAWN BY:
MW

CHECKED BY:
MW

SHEET NO.
M3

EXHAUST FAN INFORMATION – JOB#6196250

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SONES
1	ITEM 74.1	1	CASRE18DD	CAPTIVEAIRE	1600	1.400	1105	ODP,PREMIUM	1.000	0.6270	3	208	3.8	928 FPM	282	15.7
2	ITEM 74.2	1	DU50HFA	CAPTIVEAIRE	775	1.250	1532	TEAO-ECM	0.500	0.3950	1	115	6.3	295 FPM	102	16.4
3	ITEM 75.1	1	DU33HFA	CAPTIVEAIRE	525	0.800	1500	TEAO-ECM	0.333	0.2000	1	115	4.3	260 FPM	68	15.6

DOAS/RTU FAN SCHEDULE – JOB#6196250

FAN INFORMATION											ELECTRICAL INFORMATION					COOLING INFORMATION											REHEAT INFORMATION					GAS HEAT INFORMATION				
FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLT	MCA	MOCP	OUTSIDE AIR		MIXED AIR		LEAVING AIR			CAPACITY		IEER	ISMRE	DISCHARGE		CAPACITY		MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE
																DB	WB	DB	WB	DB	WB	DP	TOTAL	SENS.			DB	WB	DESIRED	MAX						
4	ITEM 74.3	1	CASRTU3-I.300-18-20T	CAPTIVEAIRE	18P-3	0	2650	2650	2574	0.500	2.00	3	208	79.1A	80A	81.7°F	77.0°F	81.7°F	77.0°F	49.5°F	45.0°F	40.5°F	264.0 MBH	92.2 MBH	18.2	6.0	70.0°F	54.1°F	61.3 MBH	129.6 MBH	155.0 LBS/HR	NATURAL	251293	203547	64°F	7 IN. W.C. - 14 IN. W.C.

NOTES:
1. INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL
2. DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE
3. INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER
4. REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE
5. EC MOTOR CONDENSING FANS
6. ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE
7. SUCTION LINE ACCUMULATOR
8. FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER
9. AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT)
10. 2" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-13 INSULATION-MINIMUM 20GA EXTERIOR W/ 14GA BASE
11. 81% EFFICIENT FURNACE, WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 6:1 TURNDOWN WITH NG AND 5:1 TURNDOWN WITH LP
12. SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE
13. FULLY MODULATING HOT GAS REHEAT
14. HAIL GUARD FOR CONDENSING COIL
15. DOWN DISCHARGE/DOWN RETURN

NOTES
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	ITEM 74.1	1	UTILITY SET GREASE CUP
		1	RE18 - DISCHARGE EXTENSION ASSEMBLY WITH HARDWARE
		1	2 YEAR PARTS WARRANTY
2	ITEM 74.2	1	GREASE BOX
		1	UPBLAST FAN WHEEL ACCESS PORT
		1	36" TALL STRAIGHT WIND BAND EXTENSION 13 (SHIPS LOOSE)
		1	GUY LINE EYE BOLTS - USED FOR 3 GUY LINE TIE OFF POINTS
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPMO3 PREWIRE (TELCO MOTOR), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
3	ITEM 75.1	1	SCR-11 BIRD SCREEN
		1	I 15-BDD DAMPER
		1	ECM WIRING PACKAGE - MANUAL OR 0-10VDC REFERENCE SPEED CONTROL -RTC- (TELCO MOTOR), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
4	ITEM 74.3	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	SHIP LOOSE GAS STRAINER 1"
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU. 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #28, #47, "MA", OR "E2" PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED
		1	RTU3 DOWN DISCHARGE
		1	2" MERV 13 FILTERS FOR RTU3 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU3 (QTY. 4)
		1	OVERHEAT STAT
		1	OCCUPIED SCHEDULING
		1	RTU3 CURB DUCT HANGER
		1	24VAC FIRE INPUT
		1	RTU3 DOWN RETURN
		1	RTU RETURN MOUNTED SMOKE DETECTOR AND SAMPLING TUBE - FACTORY INSTALLED
		1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI
		1	20 TON MODULATING COOLING OPTION, 208/230V. R410A REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	20 TON MODULATING REHEAT OPTION - DISCHARGE DEWPOINT CONTROL
		1	RTU INTAKE/RETURN DAMPER - MANUAL CONTROL VIA HMI
		1	RTU3 HAIL GUARD
		1	UNIT MOUNTED VFD CONFIGURED FOR DCV
		1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIRE SERVICE CONTRACT, 25 YEAR STAINLESS STEEL FURNACE PARTS WARRANTY (SEE ADDITIONAL DETAILS)

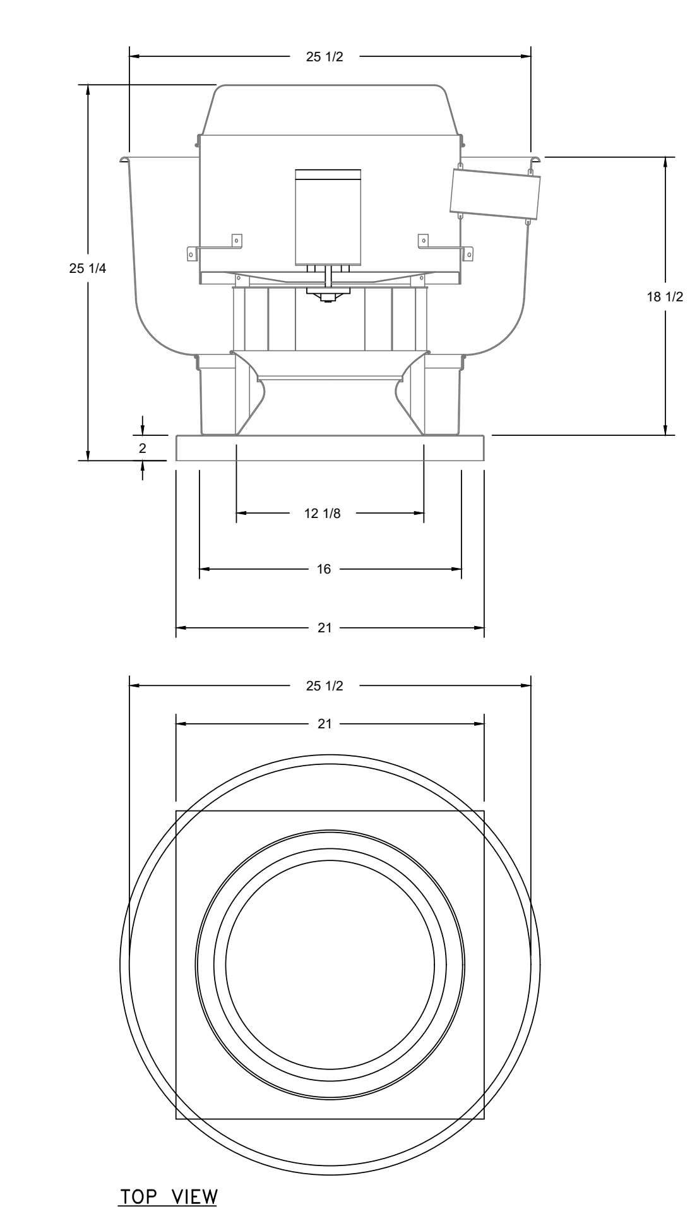
FAN ACCESSORIES

FAN UNIT NO	TAG	EXHAUST			SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	ITEM 74.1	YES						
2	ITEM 74.2	YES						
3	ITEM 75.1		YES					

CURB ASSEMBLIES

NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	ITEM 74.1	30 LBS	CURB	26.500"W X 26.500"L X 24.000"H VENTED.
2	# 2	ITEM 74.2	31 LBS	CURB	19.500"W X 19.500"L X 20.000"H VENTED HINGED.
3	# 3	ITEM 75.1	27 LBS	CURB	19.500"W X 19.500"L X 20.000"H VENTED.
4	# 4	ITEM 74.3	104 LBS	CURB	59.500"W X 91.000"L X 14.000"H INSULATED.

FAN #4 DU33HFA - EXHAUST FAN (ITEM 74.4)

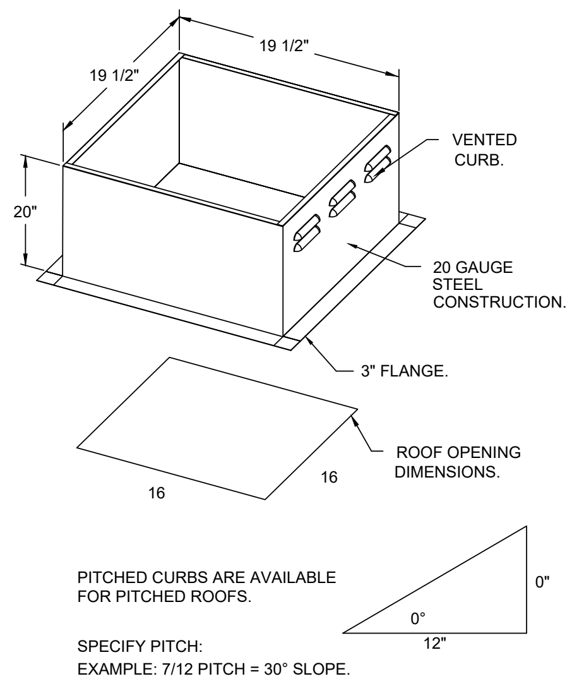


FEATURES:

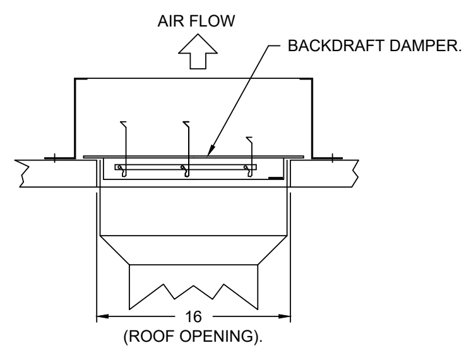
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- UL705.
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- NEMA 3R SAFETY DISCONNECT SWITCH.

OPTIONS

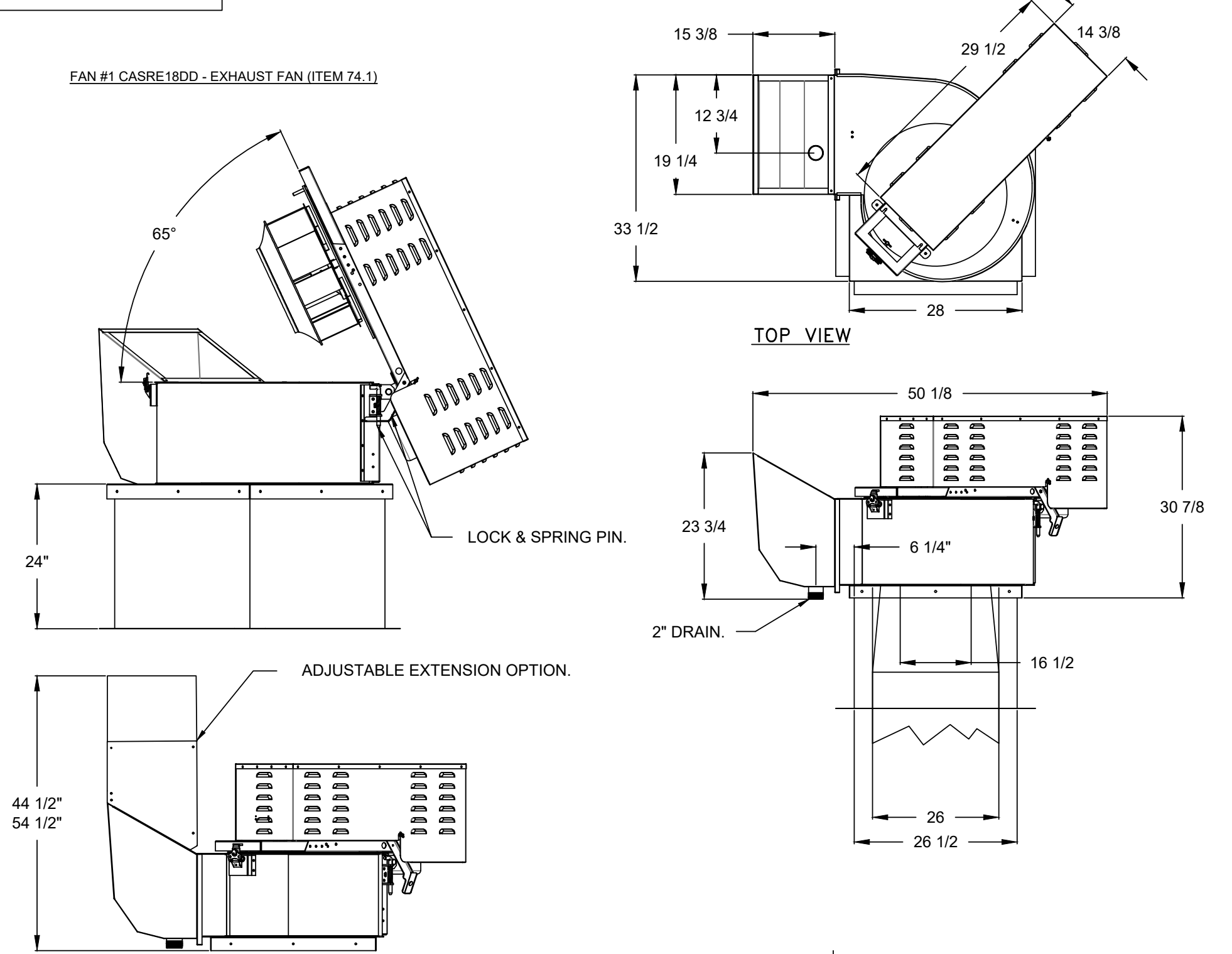
ECM WIRING PACKAGE - EXHAUST -
MANUAL OR 0-10VDC REFERENCE SPEED
CONTROL -MSC- (TELCO), CCW ROTATION.
I 15-BDD DAMPER.
SCR-11 BIRD SCREEN.
2 YEAR PARTS WARRANTY.

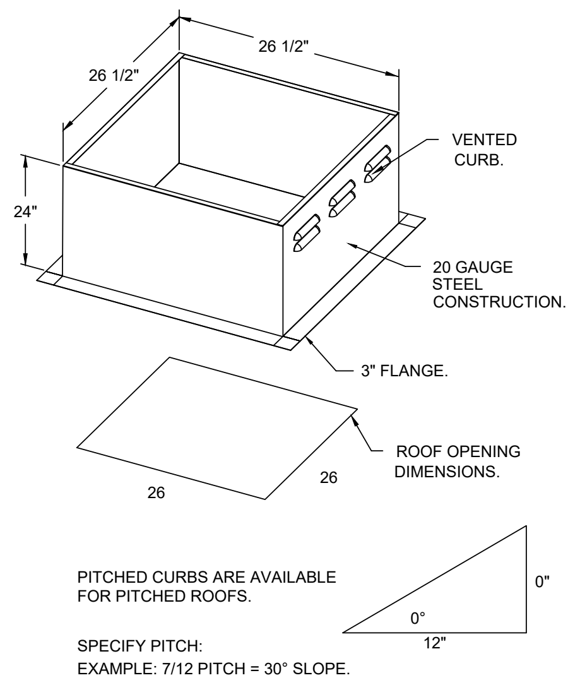


BACKDRAFT DAMPER INSTALLATION



FAN #1 CASRE18DD - EXHAUST FAN (ITEM 74.1)





FEATURES:

- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL762 AND ULC-S645.
- HIGH HEAT OPERATION DIRECT DRIVE 300°F (149°C).
- HEAT SLINGER.
- GREASE CLASSIFICATION TESTING.
- TILT OUT WHEEL.
- LOCKING PIN FOR POWER PACK.
- MOTOR WEATHER COVER.
- INTERLOCKED DISCONNECT SWITCH.
- NEMA 4X SAFETY DISCONNECT SWITCH.

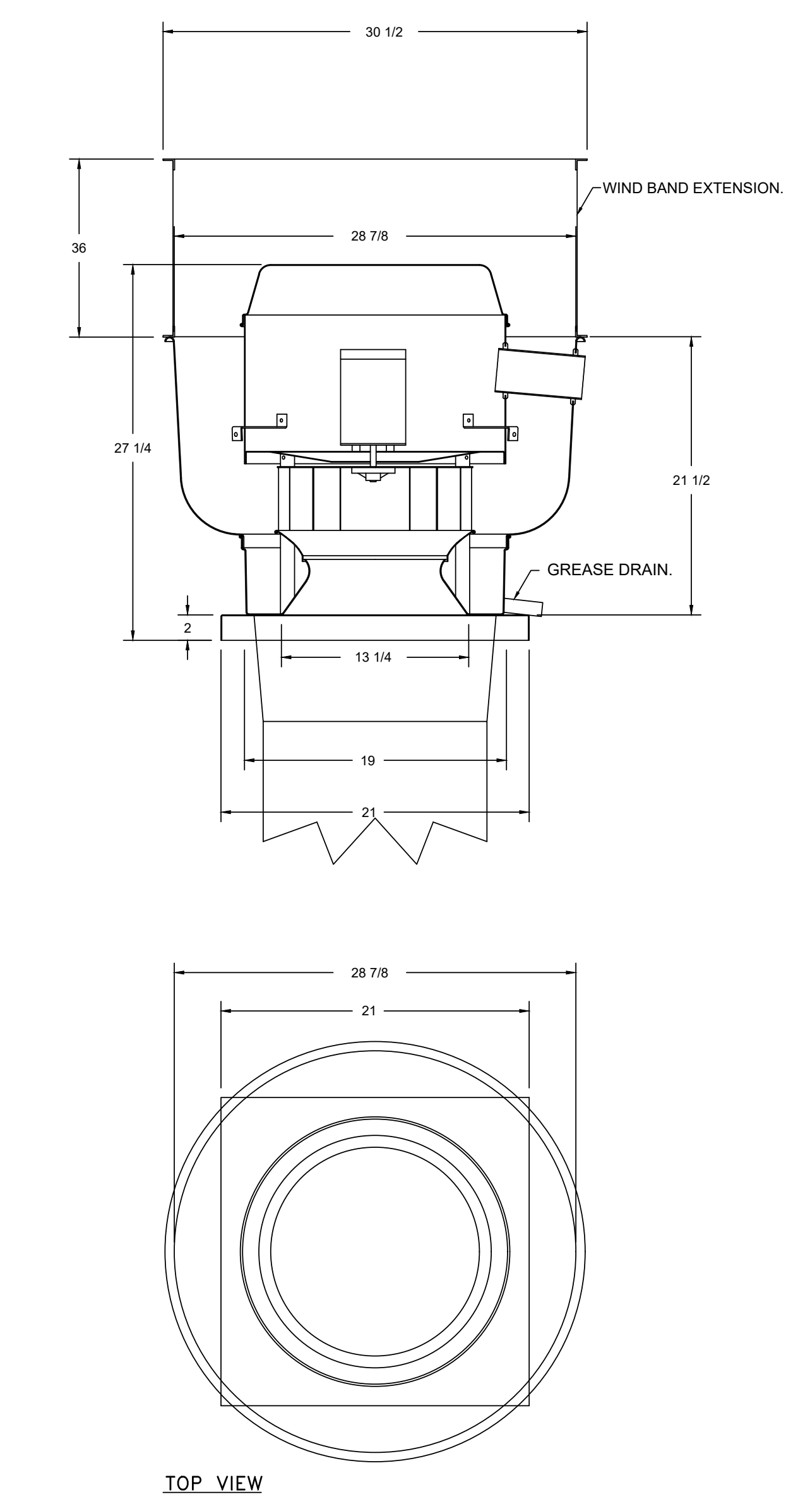
NORMAL TEMPERATURE TEST DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

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

OPTIONS

UTILITY SET GREASE CUP.
RE18 - DISCHARGE EXTENSION ASSEMBLY
WITH HARDWARE.
2 YEAR PARTS WARRANTY.

FAN #2 DU50HFA - EXHAUST FAN (ITEM 74.2)



FEATURES:

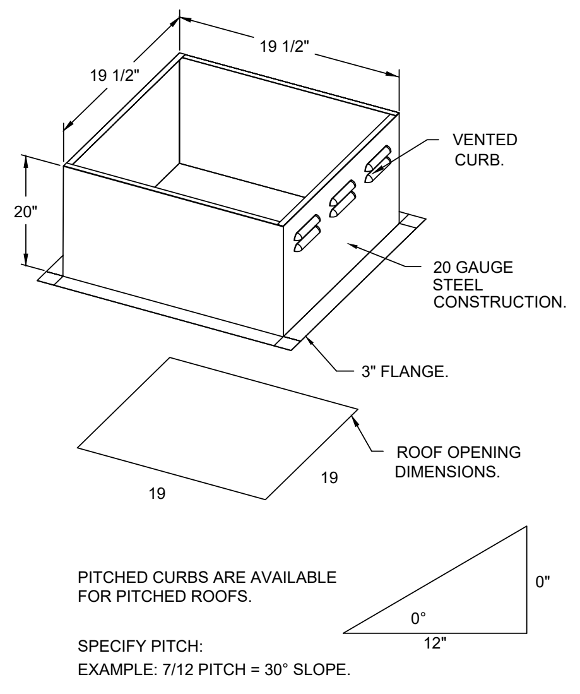
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT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

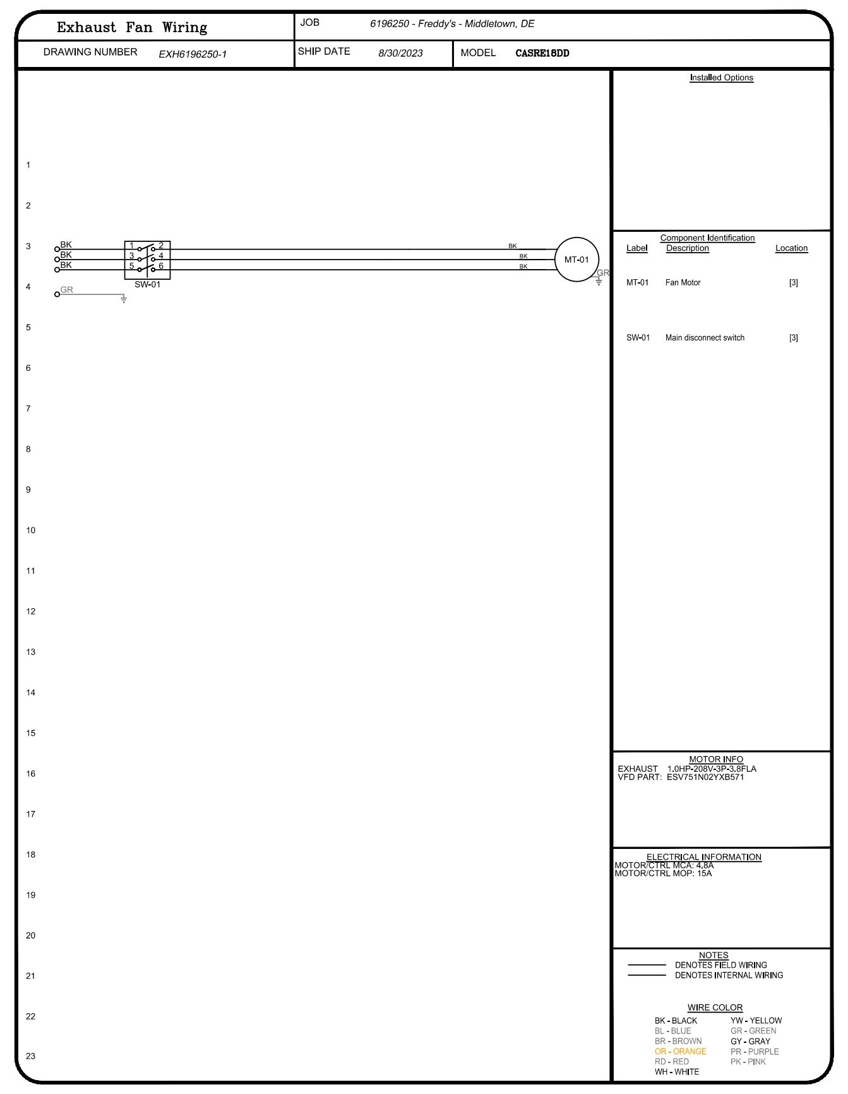
NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

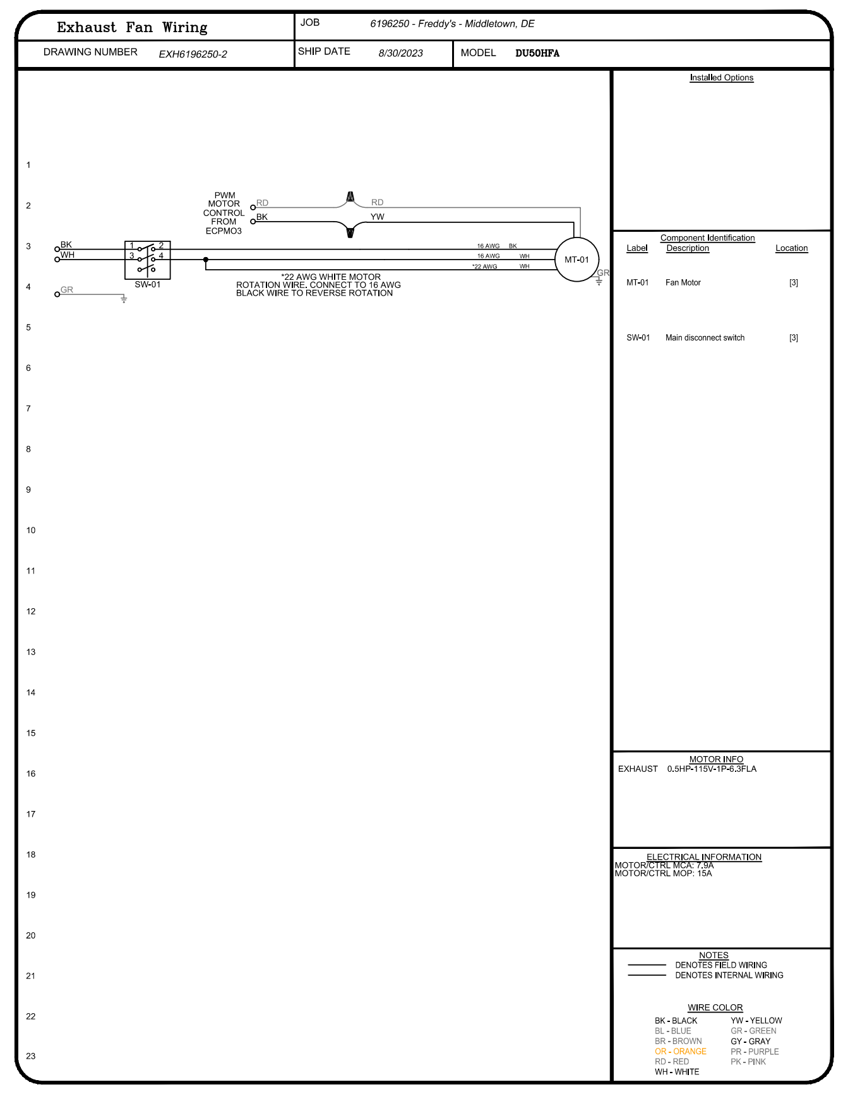
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

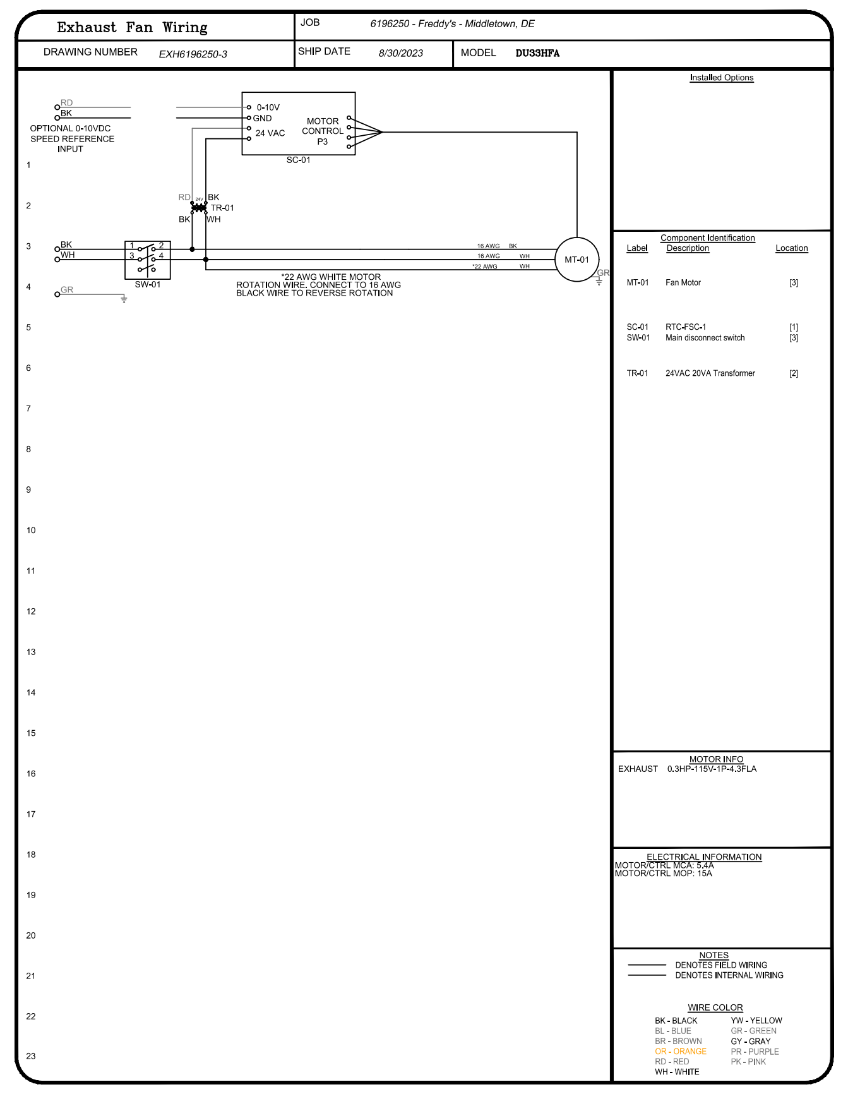
OPTIONS

GREASE BOX.
UPBLAST FAN WHEEL ACCESS PORT.
36" TALL STRAIGHT WIND BAND EXTENSION
13 (SHIPS LOOSE).
GUY LINE EYE BOLTS - USED FOR 3 GUY
LINE TIE OFF POINTS.
ECM WIRING PACKAGE - PWM SIGNAL FROM
ECPMO3 PREWIRE (TELCO MOTOR), CCW
ROTATION.
2 YEAR PARTS WARRANTY.









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HBT Foodservice

www.captiveaire.com

104 W 9th St Suite 204, Kansas City, MO, 64105 PHONE: (816) 221-8575 FAX: (816) 221-8311 EMAIL: reg98@captiveaire.com

Freddy's - Middletown, DE

MIDDLETOWN, DE, 19709

DATE: 8/30/2023

DWG.#:
6196250

DRAWN BY: michael.co

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

MASTER DRAWING

SHEET NO.
3

BAKER DESIGN GROUP, PA
RODGER W BAKER ARCHITECT, AIA NCARB
135 N. Main St. Wichita KS 67202 316.267.7142
rodger@bakerdesigngrouppa.com

FREDDY'S FROZEN CUSTARD
711 S. RIDGE ROAD
MIDDLETOWN, DELAWARE

No. 28940
10.26.23

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RODGER W. BAKER, AIA

DATE
10/26/23

DRAWN BY:
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CHECKED BY:
MW

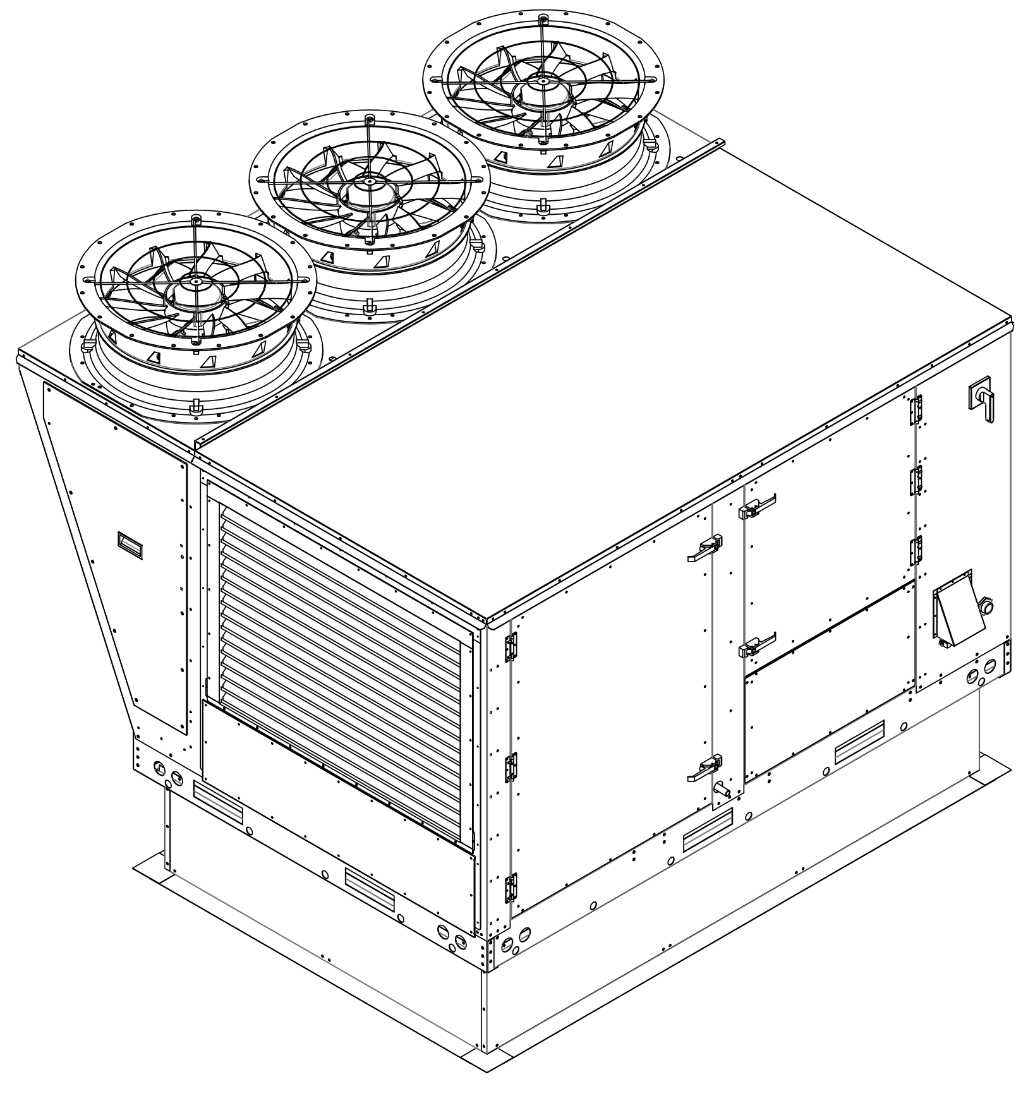
SHEET NO.
M4

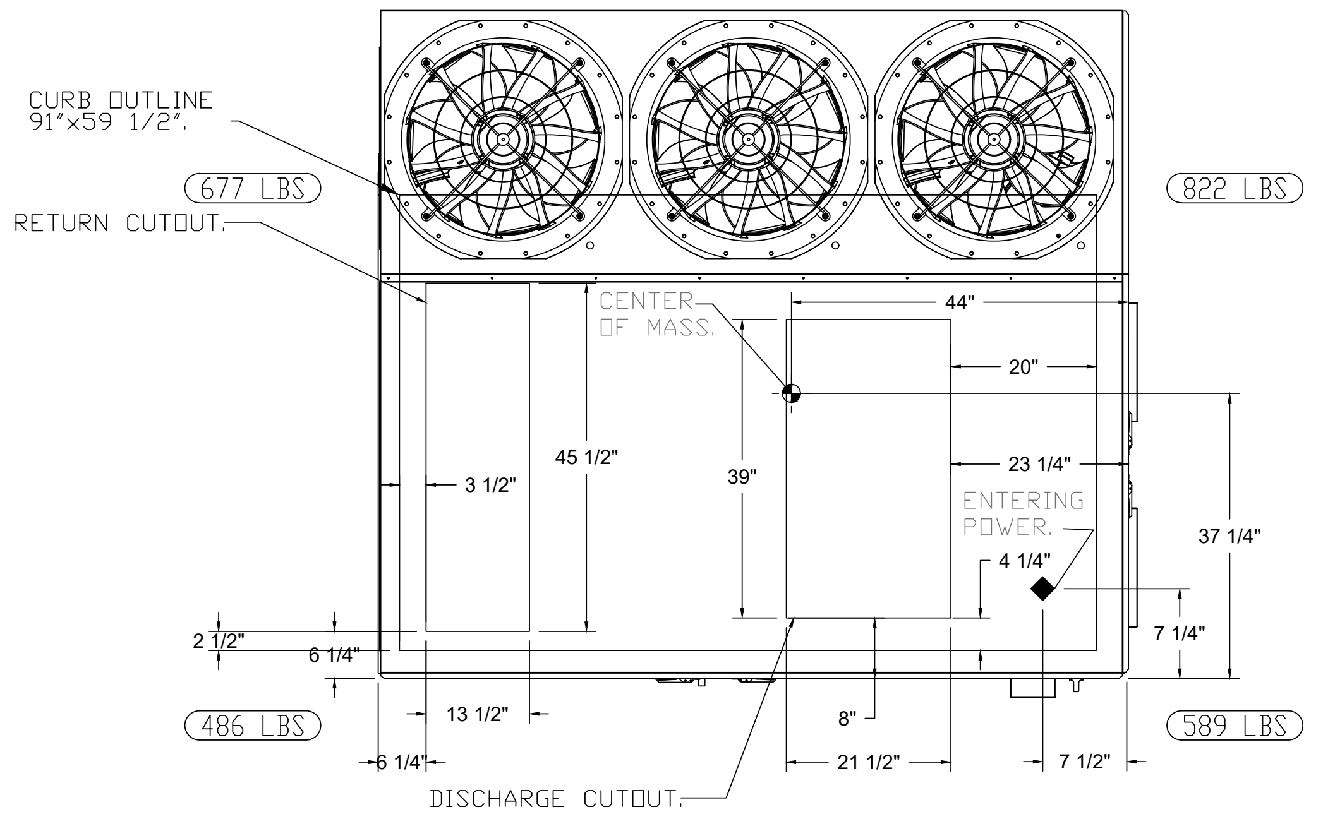
FAN #4 CASRTU3-I.300-18-20T - HEATER (ITEM 74.3)

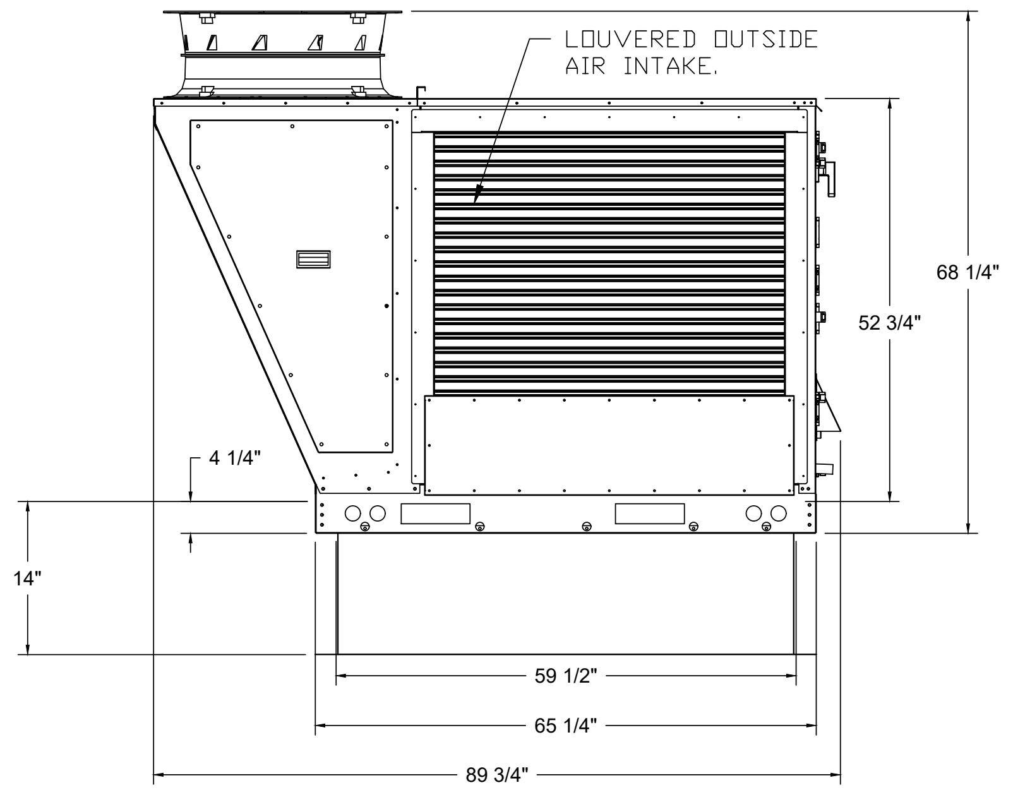
NOTES:

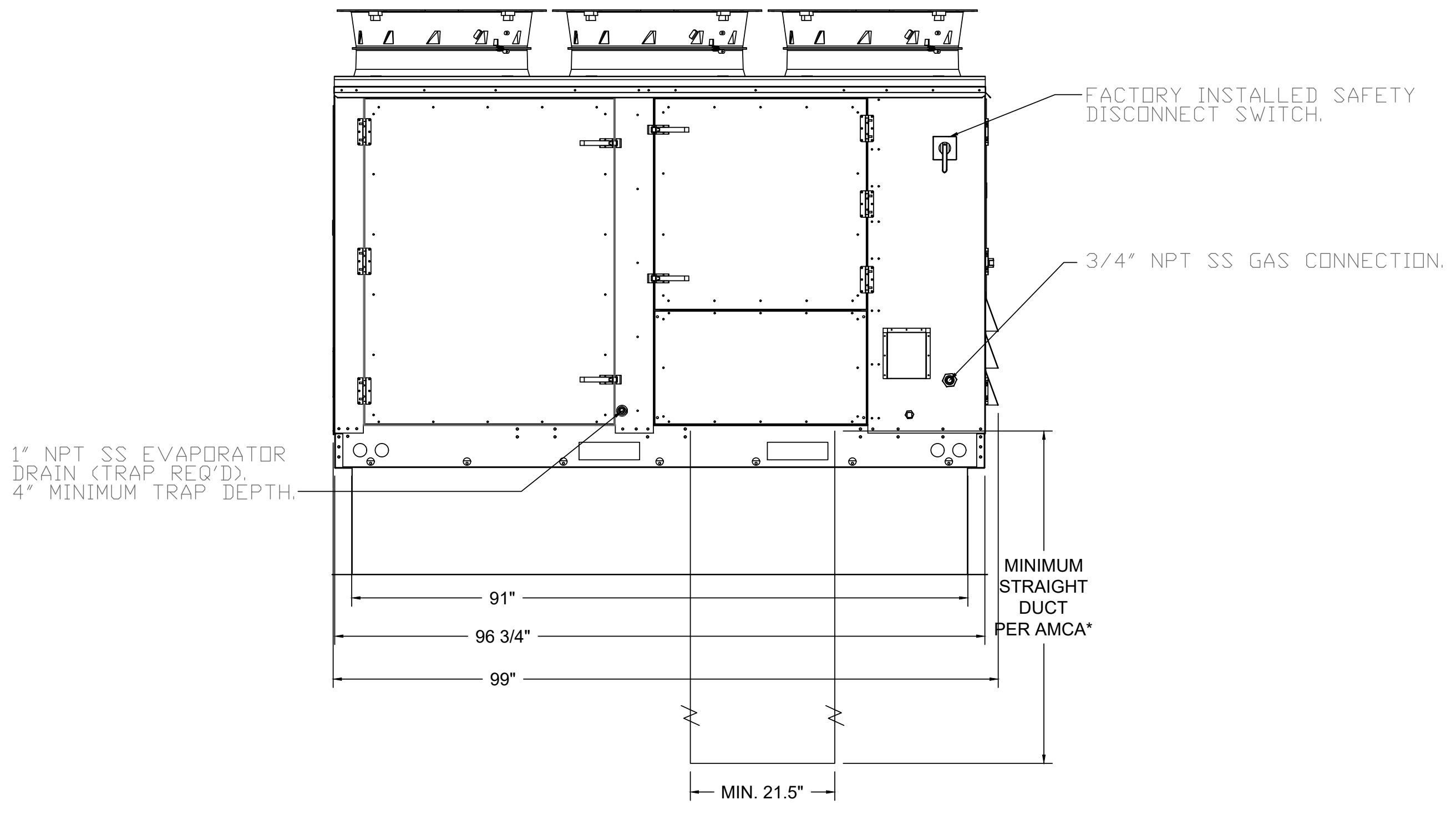
1. DO NOT OBSTRUCT OUTSIDE AIR INLET, OUTSIDE AIR COIL OR OUTSIDE AIR FAN.
2. ⬭ DENOTES CORNER WEIGHT.
3. ROOF OPENING MUST BE 2" SMALLER THAN CURB DIMENSIONS IN BOTH DIRECTIONS.

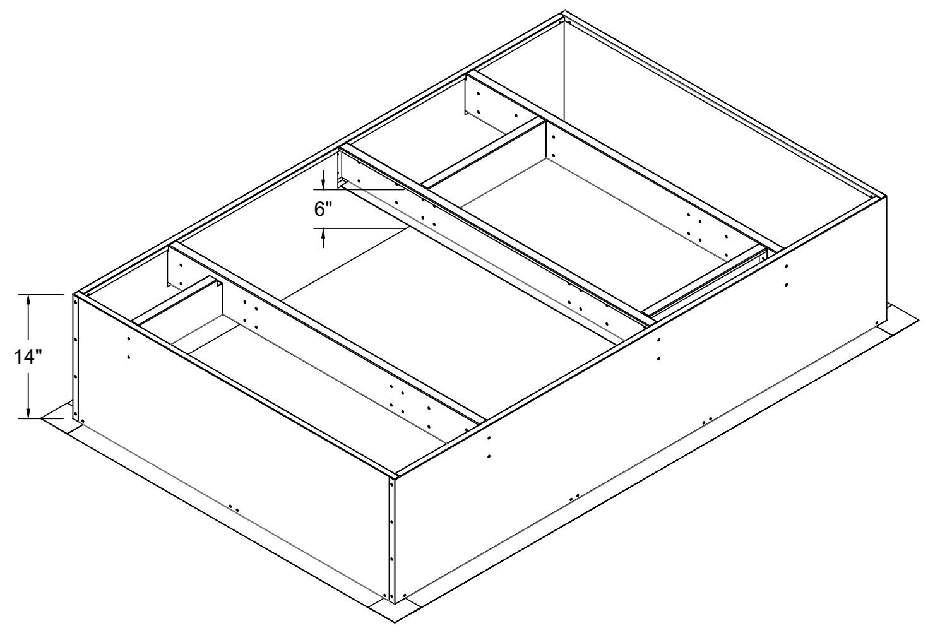
*NOTE: SUPPLY DUCT MUST BE INSTALLED TO MEET SMACNA STANDARDS. A MINIMUM STRAIGHT DUCT LENGTH MUST BE MAINTAINED DOWNSTREAM OF UNIT DISCHARGE AS OUTLINED IN AMCA PUBLICATION 201. WHEN USING RECTANGULAR DUCTWORK, ELBOWS MUST BE RADIUS THROAT, RADIUS BACK WITH TURNING VANES. FLEXIBLE DUCTWORK AND SQUARE THROAT/SQUARE BACK ELBOWS SHOULD NOT BE USED. ANY TRANSITION AND/OR TURNS IN THE DUCTWORK WILL CAUSE SYSTEM EFFECT. SYSTEM EFFECT WILL DRASTICALLY INCREASE STATIC PRESSURE AND REDUCE AIRFLOW. DO NOT RELY ON UNIT TO SUPPORT DUCT IN ANY WAY. FAILURE TO PROPERLY SIZE DUCTWORK MAY CAUSE SYSTEM EFFECTS AND REDUCE PERFORMANCE OF THE EQUIPMENT.
SUGGESTED STRAIGHT DUCT SIZE IS 21.5" x 39".

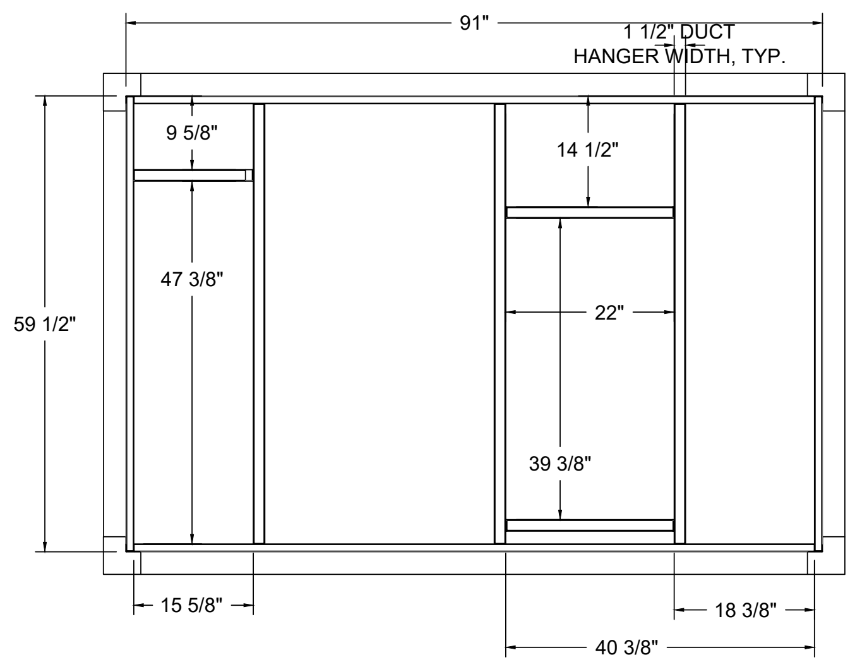


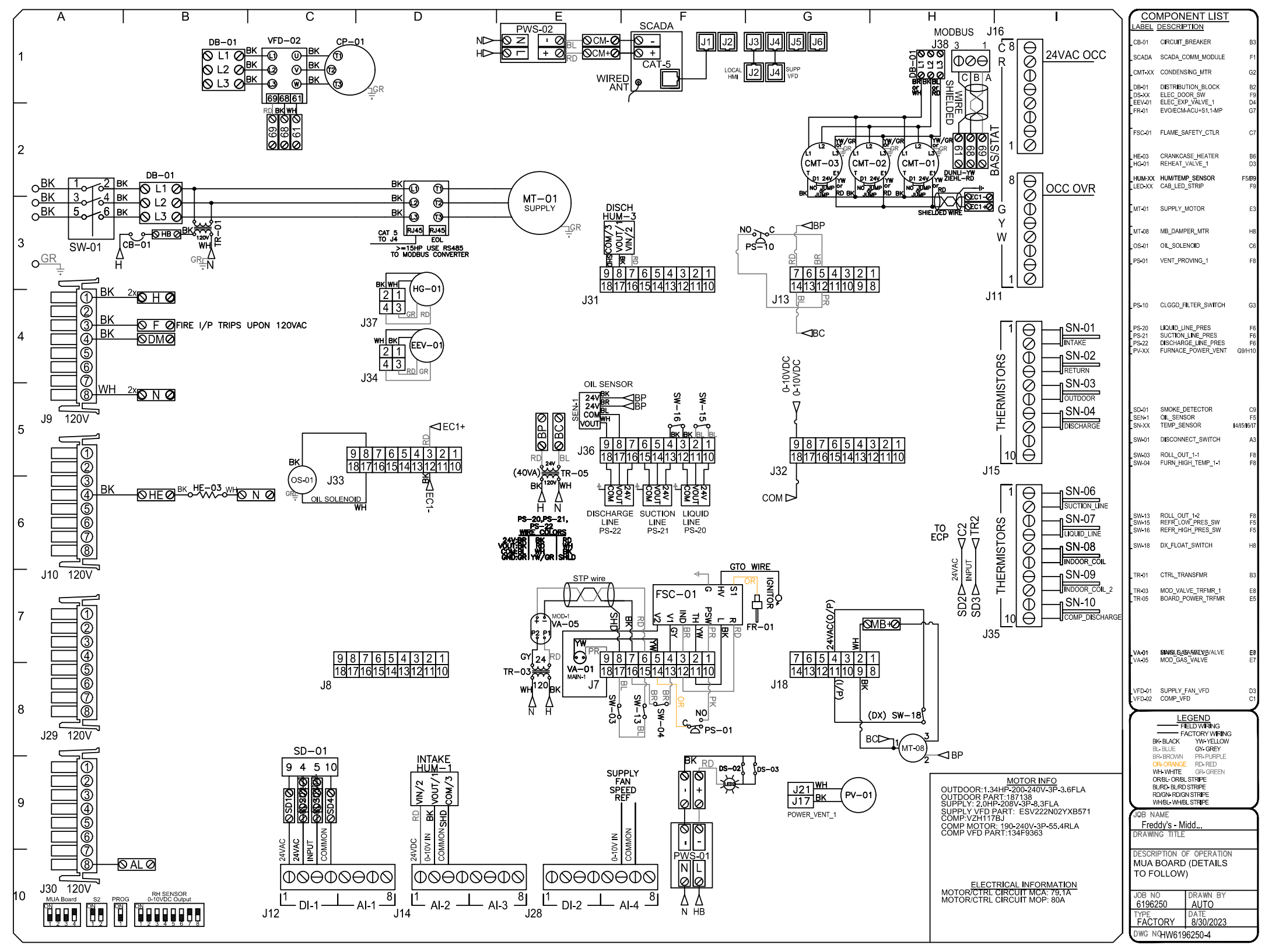


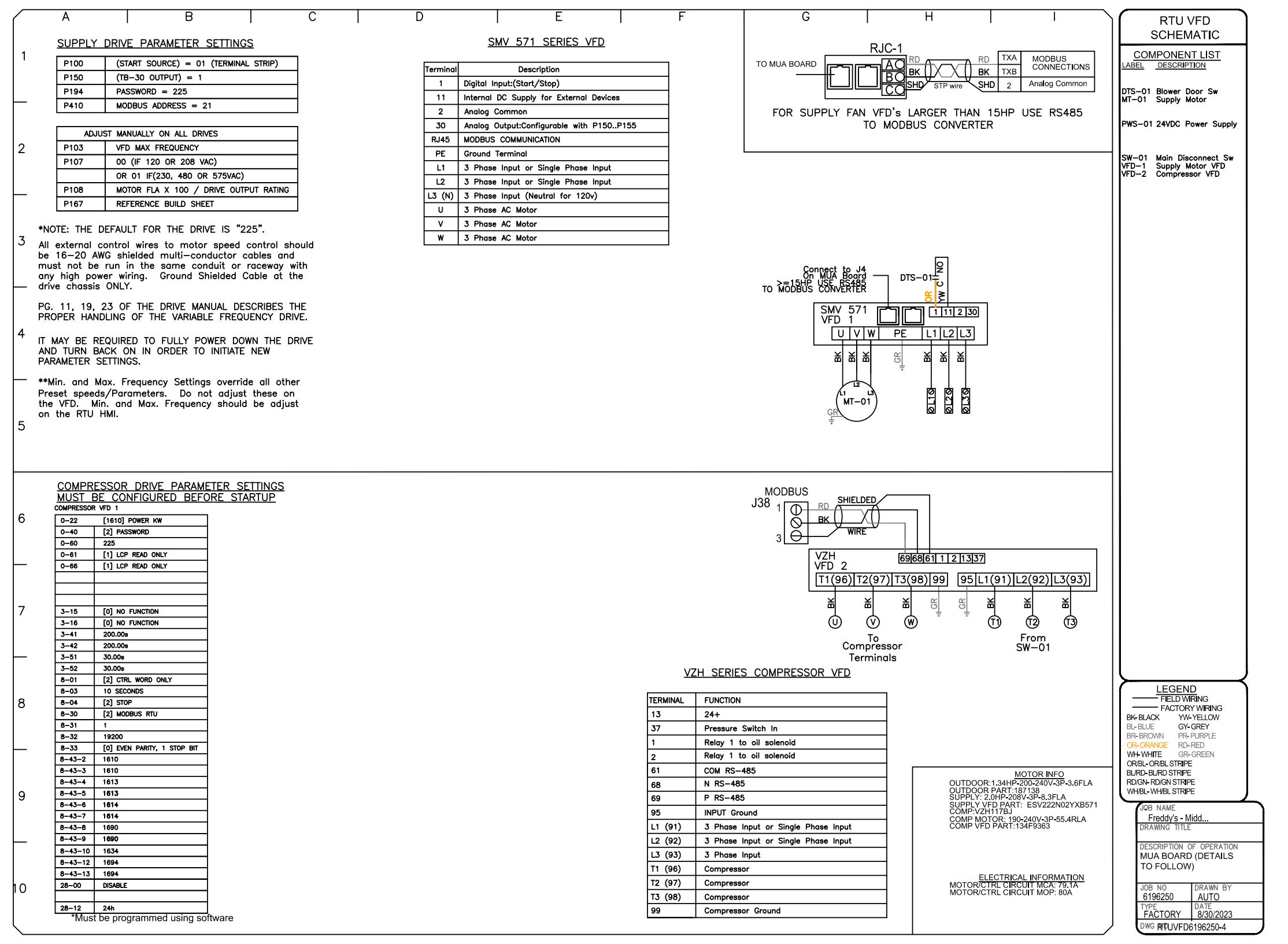


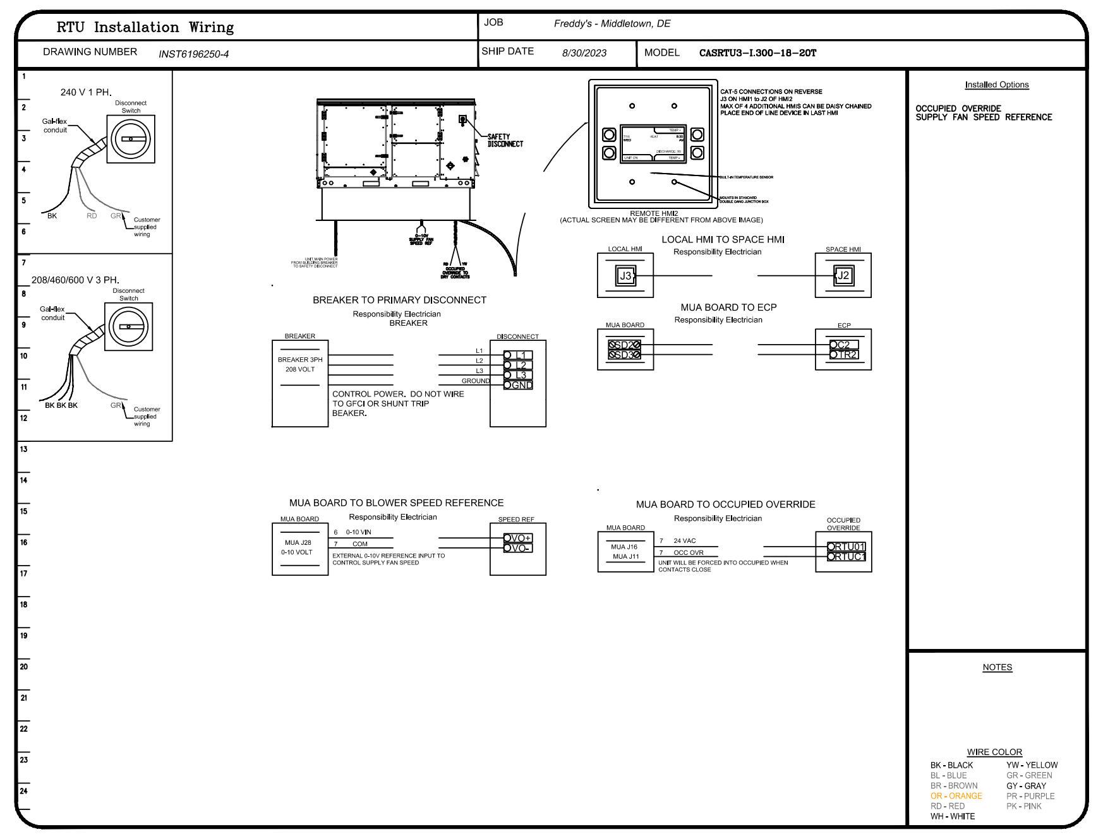












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RODGER W. BAKER, AIA

DATE
10/26/23

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MW
CHECKED BY:
MW
SHEET NO.
M5

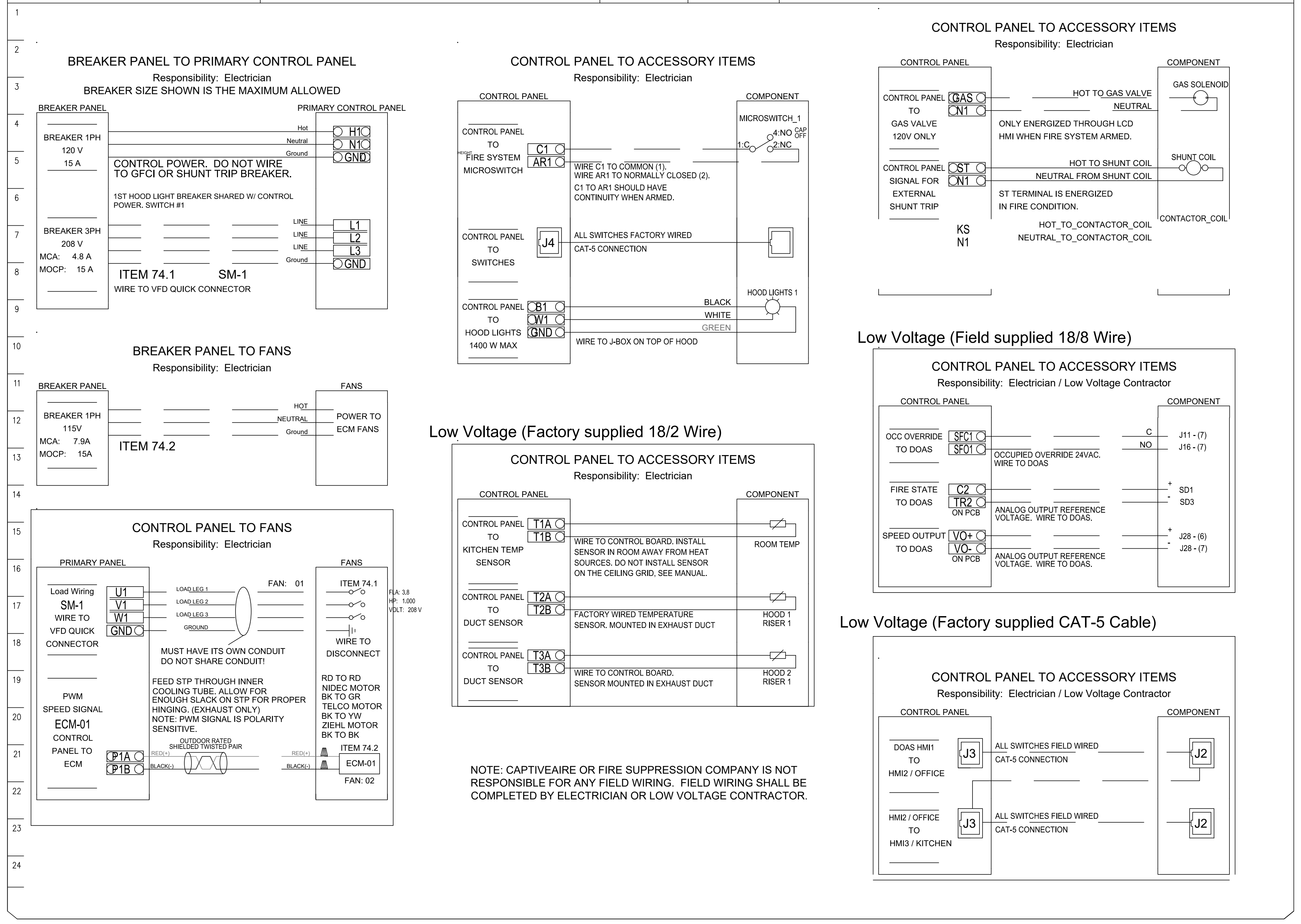
ELECTRICAL PACKAGE – JOB#6196250

NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	☐	HP	VOLT	FLA
1	ECP-1	DCV-2111	UTILITY CABINET LEFT	UTILITY CABINET LEFT	1 LIGHT	SMART CONTROLS DCV	ITEM 74.1	EXHAUST	3	1.000	208	3.8
				HOOD # 1	1 FAN		ITEM 74.2	EXHAUST	1	0.500	115	6.3
							ITEM 74.3	SUPPLY	3	2.000	208	8.3

JOB NO **FREDDY'S**	MODEL NUMBER DCV-2011	DRAWN BY	SCHEMATIC TYPE INSTALL
	JOB NAME Freddy's - Wiring Diagram	DATE 9/23/2021	DWG NO ECP #1-1

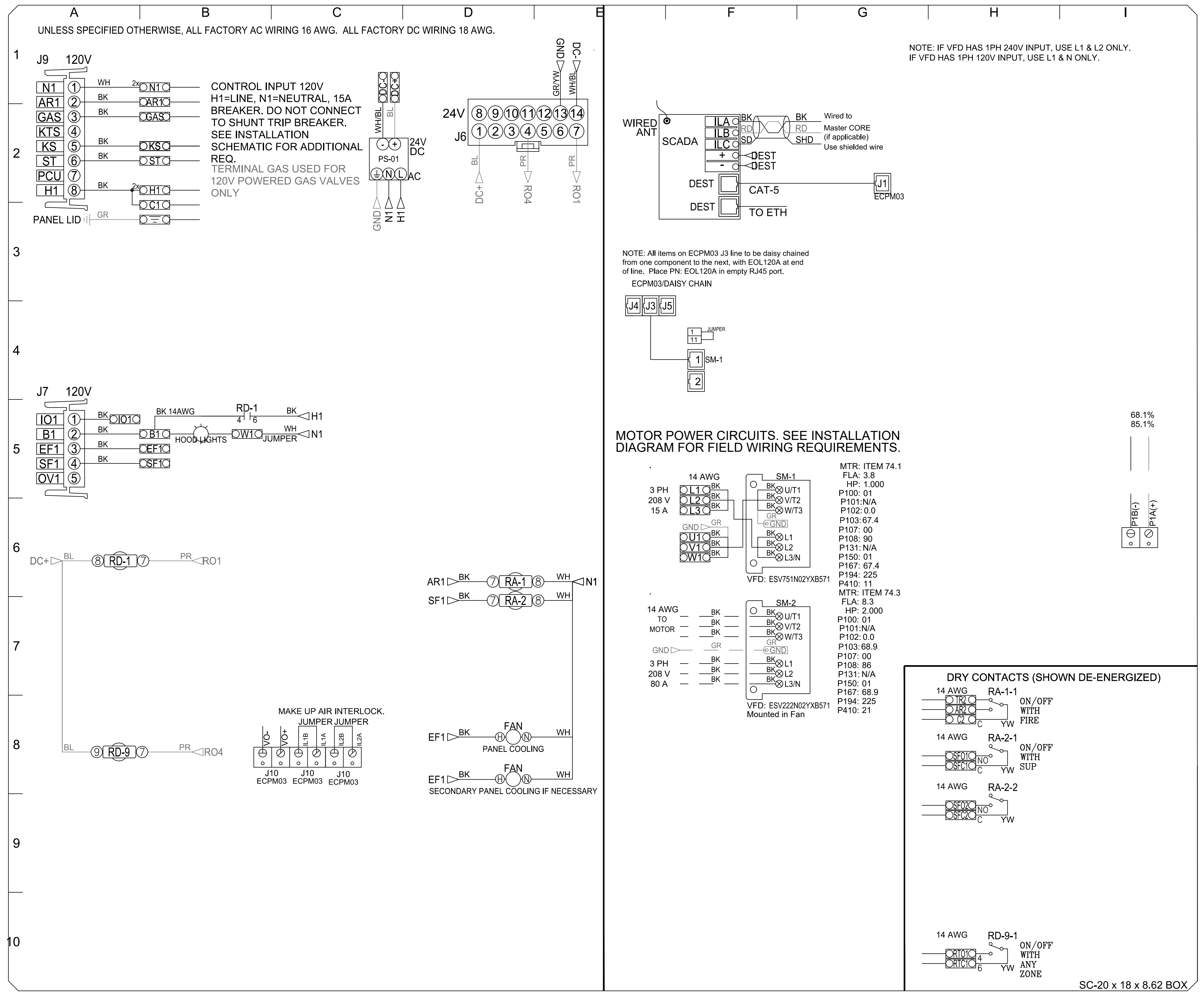
DESCRIPTION OF OPERATION:

Demand Control Ventilation, w/ control for 2 Exhaust Fans, Exhaust on in Fire, Lights out in Fire, Fans modulate based on duct temperature. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD. Room temperature sensor shipped loose for field installation.Verify distance between VFD and Motor; additional cost could apply if distance exceeds 50 feet.



NOTE: CAPTIVEAIRE OR FIRE SUPPRESSION COMPANY IS NOT RESPONSIBLE FOR ANY FIELD WIRING. FIELD WIRING SHALL BE COMPLETED BY ELECTRICIAN OR LOW VOLTAGE CONTRACTOR.

UNLESS SPECIFIED OTHERWISE, ALL FACTORY AC WIRING 16 AWG. ALL FACTORY DC WIRING 18 AWG.



FACTORY WIRING SCHEMATIC CIRCUIT BOARDS ECPM03

RA-x 120 VAC RELAY			RD-x 24 VDC RELAY		
NO	4	3	NO	4	3
NC	2	1	NC	2	1
COIL	8	7	COIL	8	7
COM	6	5	COM	6	5

COMPONENT LIST

LABEL	DESCRIPTION
ST-X	Starter PN: varies
OL-X	Overload PN: varies
C-X	Contactor PN: varies
PS-1	Power Sup. 24VDC PN: MDP18-24A-1C
RA-x	120V Relay DPDT PN: 34.110.0184.0
RD-x	24VDC Light Relay PN: 34.110.0188.0
TS-x	Duct Thermostat PN: A/CP-PO-T4"-EXPL
SCADA	SCADA Module PN:

LEGEND

——— FIELD WIRING
——— FACTORY WIRING

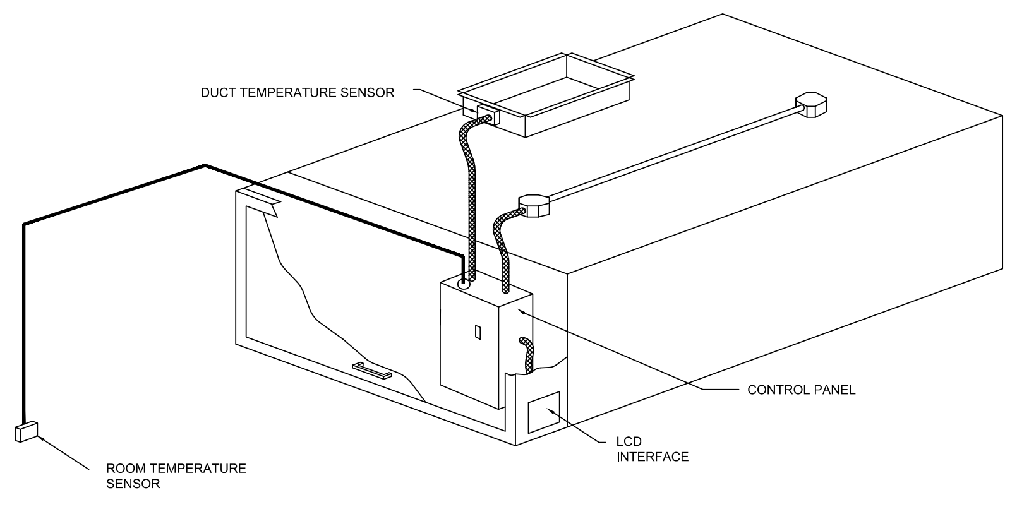
BK- BLACK	YW- YELLOW
BL- BLUE	GY- GREY
BR- BROWN	PR- PURPLE
OR- ORANGE	RD- RED
WH- WHITE	GR- GREEN
OR/BL- OR/BL STRIPE	
BL/RD- BL/RD STRIPE	
RD/GN- RD/GN STRIPE	
WH/BL- WH/BL STRIPE	

JOB NAME Freddy's - Middl...
DRAWING TITLE DCV-2111
DESCRIPTION OF OPERATION
Demand Control Ventilation, w/ control for 2 Exhaust Fans, 1 Supply Fan, Exhaust on in Fire, Lights out in Fire, Fans modulate based on duct temperature. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD. Room temperature sensor shipped loose for field installation.Verify distance between VFD and Motor; additional cost could apply if distance exceeds 50 feet.

JOB NO 6196250	DRAWN BY
TYPE FACTORY	DATE 8/30/2023
DWG NO ECP #1-2	

Demand Control Ventilation Hood Control Panel Specifications:

- Controls shall be listed by ETL (UL 508A) and shall comply with demand ventilation system turndown requirements outlined in IECC 403.2.8 (2015).
- The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.
- Temperature probe(s) located in the exhaust duct riser(s) shall be constructed of stainless steel.
- A digital controller shall be provided to activate the hood exhaust fans dynamically based on a fixed differential between the ambient and duct temperatures sensors. This function shall meet the requirements of IMC 507.1.1.
- A digital controller shall provide adjustable hysteresis settings to prevent cycling of the fans after the cooking appliances have been turned off and/or the heat in the exhaust system is reduced.
- A digital controller shall provide an adjustable minimum fan run-time setting to prevent fan cycling.
- Variable Frequency Drives (VFDs) shall be provided for fans as required. The digital controller shall modulate the VFDs between a minimum setpoint and a maximum setpoint on demand. The duct temperature sensor input(s) to the digital controller shall be used to calculate the speed reference signal.
- The VFD speed range of operation shall be from 0% to 100% for the system, with the actual minimum speed set as required to meet minimum ventilation requirements.
- An internal algorithm to the digital controller shall modulate supply fan VFD speed proportional to all exhaust fans that are located in the same fan group as the supply fan.
- The system shall operate in PREP MODE during light cooking load or COOL DOWN MODE when sufficient heat remains underneath the hood system after cooking operations have completed. Operation during either of these periods will disable the supply fans and provide an exhaust fan speed that is equal to the minimum ventilation requirement.
- A digital controller shall disable the supply fan(s), activate the exhaust fan(s), activate the appliance shunt trip, and disable an electric gas valve automatically when fire condition is detected on a covered hood.
- A digital controller shall allow for external BMS fan control via Dry Contact (external control shall not override fan operation logic as required by code).
- An LCD interface shall be provided with the following features:
  a. On/Off push button fan & light switch activation
  b. Integrated gas valve reset for electronic gas valves (no reset relay required)
  c. VFD Fault display with audible & visual alarm notification
  d. Duct temperature sensor failure detection with audible & visual alarm notification
  e. Mis-wired duct temperature sensor detection with audible & visual alarm notification
  f. A single low voltage Cat-5 RJ45 wiring connection
  g. An energy savings indicator that utilizes measured kWh from the VFDs

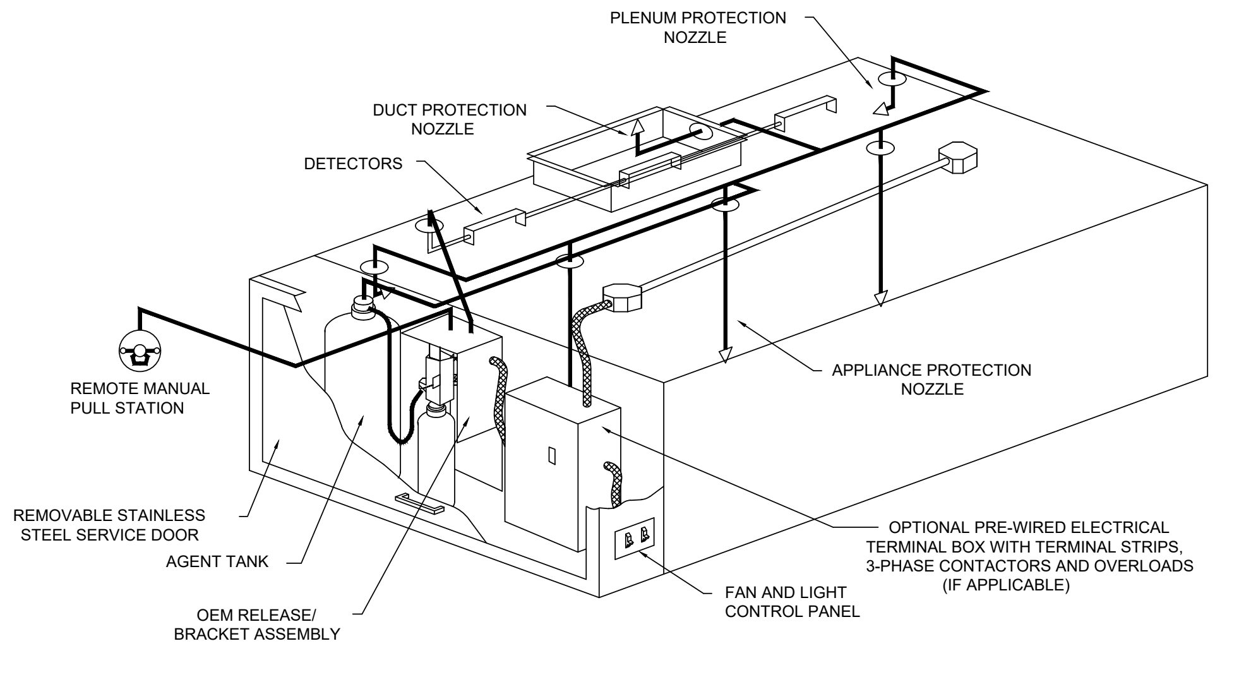


TYPICAL HOOD CONTROL PANEL INSTALLATION

Sequence of Operations:

The hood control panel is capable of operating in one or more of the following states at any given time:

- Automatic: The system operates based on the differential between room temperature and the temperature at the hood cavity or exhaust duct collar. Fans activate at a configurable temperature differential threshold. Depending on the job configuration each fan zone can be configured as static or dynamic. These terms refer to whether a variable motor (such as EC Motors or VFD driven motors) modulate with temperature. If the panel is equipped with variable speed fans and the zone is defined as "dynamic", these will modulate within a user-defined range based on the temperature differential. Panels equipped with variable speed fans and a fan zone defined as "static", fans will run at a set speed calculated for the drive. Demand control ventilation systems are capable of modulating exhaust and make up air fan speeds per the requirements outlined in IECC 403.2.8.
- Manual: The system operates based on human input from an HMI.
- Schedule: A weekly schedule can be set to run fans for a specified period throughout the day. There are three occupied times per day to allow for the user to set up a time that is suitable to their needs. Any time that is within the defined occupied time, the system will run at modulation mode and follow the fan procedure algorithm based on temperature during this time. During unoccupied time, the system will have an extra offset to prevent unintended activation of the system during a time where the system is not being occupied.
- Other: The system operates based on the input from an external source (DDC, BMS or hard-wired interlock)



TYPICAL ANSUL R-102 SYSTEM LAYOUT

SPECIFICATIONS

THE RESTAURANT FIRE SUPPRESSION SYSTEM SHALL BE THE PRE-ENGINEERED TYPE WITH A FIXED NOZZLE AGENT DISTRIBUTION NETWORK. IT SHALL BE LISTED WITH UNDERWRITERS LABORATORIES, INC. (UL)

THE SYSTEM SHALL BE CAPABLE OF AUTOMATIC DETECTION AND ACTUATION WITH LOCAL OR REMOTE MANUAL ACTUATION. ACCESSORIES SHALL BE AVAILABLE FOR MECHANICAL OR ELECTRICAL GAS LINE SHUT-OFF APPLICATIONS.

THE EXTINGUISHING AGENT SHALL BE A POTASSIUM CARBONATE, POTASSIUM ACETATE-BASED FORMULATION DESIGNED FOR FLAME KNOCKDOWN AND SECUREMENT OF GREASE RELATED FIRES. IT SHALL BE AVAILABLE IN PLASTIC CONTAINERS WITH INSTRUCTIONS FOR LIQUID AGENT HANDLING AND USAGE.

THE REGULATED RELEASE MECHANISM SHALL BE COMPATIBLE WITH A FUSIBLE LINK DETECTION SYSTEM. THE FUSIBLE LINK SHALL BE SELECTED AND INSTALLED ACCORDING TO THE OPERATING TEMPERATURE IN THE VENTILATING SYSTEM. THE FUSIBLE LINK SHALL BE SUPPORTED BY A DETECTOR BRACKET/ LINKAGE ASSEMBLY.

REVISIONS

	DESCRIPTION	DATE:
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RODGER W. BAKER, AIA

DATE
10/26/23

DRAWN BY:
MW
CHECKED BY:
MW
SHEET NO.
M6

Mechanical Specifications

Table of Contents

Division 23 - Mechanical

230000 - Heating & Ventilating, and Air Conditioning, General

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section 23000 pertains to heating, ventilating, and air conditioning (HVAC) work. This section applies to and governs all HVAC sections.

B. Refer to other divisions for continuation of exterior work.

1.2 PERMITS, FEES, CODES, ORDINANCES, AND REGULATIONS

A. Obtain and pay for all permits, inspections and connection fees required by governing bodies in connection with the work. Deliver certificates of inspection to the owner.

B. All work shall comply with governing codes, ordinances, and regulations of the city, county, and state having jurisdiction, and the national electrical code, mechanical code, and requirements of the Board of Health.

1.3 QUALITY ASSURANCE

A. Industry standards and codes: Unless modified by these specifications, the design, manufacture, testing, and method of installing all materials, apparatus and equipment shall conform to the following:

1. ARI Code for Refrigeration Apparatus.
2. ANSI B9.1 Safety Code for Mechanical Refrigeration.
3. Standards of National Fire Protection Association.
4. SMACNA.
5. ASHRAE.

1.4 SUBMITTALS

A. Product data: Submit on all materials, products, and equipment unless otherwise specified or acknowledged in writing.

B. Samples: Submit when specified or requested.

C. Operation and maintenance manuals: Submit copies of O and M manuals to Architect.

1.5 JOB CONDITIONS

A. Protect materials, apparatus, and equip0ment from damage, moisture, dirt, debris, and work of other trades.

B. Use of paper, cardboard, or other flimsy material will not be permitted. Replace damaged protective materials immediately. Do not install damaged materials and equipment; remove from the site.

1.6 RECORDED DOCUMENTS

A. Furnish owner with one set of accurately marked blue-line copies of the drawings, indicating all changes from the contract drawings and all work and controls as installed.

1.7 GUARANTEE AND SERVICE

A. Where extended guarantees are called for herein, furnish three (3) copies to be inserted in operation and maintenance manuals.

B. All preventative maintenance and normal service will be performed by the owner's maintenance personnel after final acceptance of the work. This shall not alter the contractor's guarantee of the work in any way.

C. All labels shall be securely affixed.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment shall be new. Systems shall be provided complete, and each system as a whole, and in all its parts, shall function correctly up to the specified capacity. Should a system, or any part thereof fail to meet performance requirements by the owner, necessary replacements, alterations, or repairs, as required by the owner, shall be made to bring performance up to specified requirements of building construction and finished damaged or marred by such replacements, alterations, or repairs shall be restored to prior conditions, at no additional cost to the owner.

B. Where multiple items of equipment of materials are required, they shall be the product of a single manufacturer.

C. Before ordering any equipment, the size of all equipment shall be checked to easily fit spaces allotted on the drawings.

D. Inserts, pipe sleeves, supports, and anchorage of air conditioning equipment shall be provided as specified herein. Where such items are to set or embedded in concrete, masonry, or similar work, the items shall be furnished and layout made at the proper time for the setting or embedment thereof so as to cause no delay in the work.

E. Piping assemblies of equipment show on the drawings are diagrammatic. All piping and appurtenances required for the proper operation of all equipment shall be provided.

2.2 MANUFACTURER'S NAMES AND CATALOG NUMBERS

A. Specific references have been made to one or more manufacturer's names and model or catalog numbers.

B. This does not indicate that the material and equipment specified is necessarily an "off the shelf" item; requirements for specific finishes, materials, or other modifications may introduce variances from manufacturer's standards. Contractor shall ascertain that such modifications are fully considered.

2.3 DIAGRAMS, NAMEPLATES, AND LABELS

A. Each major component of equipment shall have the manufacturer's names, address, and catalog number on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be accepted.

B. All pieces of equipment, valves, starters, disconnects, and all pneumatic and electrical control instruments and apparatus shall be identified with 1/16"-thick black laminated plastic nameplates, with 3/16"-high white laminated letters. Similar and like equipment shall be designated with numerical suffix (Example: Thermostat, T-1). The nameplate identifications shall coincide with items appearing on diagrams.

C. Provide a label for the mechanical system stating:

"Installation by (Name, Address, and Phone Number of Contractor)"

D. Letters shall be 1/4"-high and located on a conspicuous place in the mechanical room.

PART 3 - EXECUTION

3.1 INSTALLATION AND WORKMANSHIP

A. The work shall be performed by qualified mechanics and all materials, apparatus, and equipment shall be installed in neat, workmanlike matter. Any material, apparatus, or equipment which, in the opinion of the owner, is improperly installed shall be removed and the reinstalled in an approved manner at no additional cost to the owner.

B. The work shall be coordinated with the work of other trades. Where the work is dependent upon work of other trades or work already in place, such other work and work in place shall be examined and shall be in proper condition and state of completion before continuing the installation.

C. The installation of the system shall, in general, be in accordance with the drawings with regards to location of equipment, ducts, pipes, and the like. Piping ductwork indicated shall be followed as accurately as actual construction will permit and any deviations wherefrom shall be called to the attention of the architect-engineer. Where necessary, as determined by the architect-engineer, contractor shall furnish drawings showing proposed changes.

3.2 EARTHWORK AND DEWATERING

A. Perform in accordance with Division 2.

3.3 CUTTING AND PATCHING

A. Layout openings for cutting by other trades as required.

B. Cutting of steel, concrete, or any other structural part must be approved in writing by owner prior to cutting.

3.4 WATERPROOFING

A. Do not cut or penetrate waterproofed surfaces, or waterproofing membranes, without first making arrangements for repair by a method approved by architect-engineer.

B. Copies of certificates of inspection.

C. Guarantees, including extended guarantees.

3.5 ELECTRICAL WORK

A. Power wiring from panels to motor controllers and from controller to motors is specified in Division 16.

B. Motor starters not specified to be provided with the motors at the factory area specified in Division 16.

C. Submit wiring diagrams for approval and provide approved diagrams so that the electrical work may be properly accomplished.

D. Electrical control wiring for connection of temperature controllers, push buttons, interlocks in motor controllers, and like items is specified in the control section (s) in this division. Furnish all equipment with complete internal control wiring.

E. Electrical work specified in this division shall conform to applicable provisions of Division 16. All control wiring shall be in conduit.

F. Provide motors conforming to characteristics shown on electrical drawings.

3.6 SUPPORTS FOR PIPING AND EQUIPMENT

A. Support for piping shall be supported from structural members and not from metal deck and slab assemblies.

3.7 ACCESS DOORS (ACCESS PANELS)

A. Provide access required for maintenance, adjustment, removal, and repair of valves, controls, dampers, equipment, and like items furnished here-under.

B. Provide access doors where required. Panels shall be located to make all items easily accessible.

3.8 CLEAN UP

A. Refer to general conditions for cleaning-up.

B. Clean all materials and equipment of dir, dust, paint, spots and stains, soil marks, and other foreign matter.

3.9 FINAL INSPECTION

A. Notice to the architect-engineer that the work is ready for final inspection. The contractor shall:

1. Submit test and balance report and complete requirements as noted.
2. Submit letter from control manufacturer certifying that controls have been checked for operation and calibration, and that system is operating as intended.

B. Contractor shall furnish necessary mechanics to operate system, make necessary adjustments and assist with final inspection.

3.10 INSTRUCTION OF OWNER'S OPERATING PERSONNEL

A. The contractor shall include the cost of the services of qualified instructor(s) to instruct the owner's operating personnel in the operation, adjustment, care, and maintenance of all HVAC equipment and systems.

B. Instruction shall be performed at a time approved by the owner and after all HVAC equipment and systems are installed, complete, adjusted, and operating to specified requirements, contractor shall notify the architect-engineer when instructions will be given.

C. Qualifications of instructors shall be subject to approval of the owner and equipment manufacturer.

D. Additional requirements concerning operation and maintenance of mechanical equipment and systems may be specified in other sections.

E. Two (2) copies of acknowledgment of all required instructions to owner's operating personnel, signed by the owner or his authorized representative, shall be submitted prior to submitting application for final payment. An additional copy of this acknowledgment is required in each copy of operation and maintenance manuals required in the section, "Operation & Maintenance Manuals."

END OF SECTION

230001 - Operation & Maintenance Manuals

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish three (3) copies of complete operation and maintenance manuals to the owner, for approval and for the owner, on all equipment and systems. The manuals shall be bound in hard-back, three ring loose-leaf binders.

PART 2 - PRODUCTS

2.1 MANUAL CONTENTS

A. Title sheet with job name, and the names, addresses, and phone numbers of the contractor, subcontractor, control subcontractor, related contractors and material and equipment suppliers.

B. Table of contents.

C. A copy of acknowledgment of instruction to the owner's operating personnel in the operation of all mechanical equipment and systems, signed by the owner or his authorized representative.

D. Typewritten operating instructions for the owner's personnel describing how to stop and start each piece of equipment; how to set the temperature control system for normal operation and normal restarting procedures, caution and warning notices. Record drawings of all systems including electrical and control diagrams.

PART 3 - EXECUTION

3.1 DELIVERY

A. Deliver the manuals to the Architect at substantial completion.

END OF SECTION

230593 - Testing, Adjusting, & Balance

PART 1 - GENERAL

1.1 SPECIAL NOTICE

A. Each contractor shall read all relevant documents, become familiar with the job, scope of work, type of general construction, and the architectural, structural, mechanical, and electrical drawings and specification. Each contractor shall also familiarize himself with the purpose for which these documents have been prepared and shall become cognizant of all the details involved. Each contractor shall coordinate his work with that of others.

B. An independent test and balance contractor shall provide test and balance services. TAB contractor shall be NEBB or AABC certified. TAB contractor shall be National TAB and contracted through the building owner.

1.2 STARTUP TEXT AND ADJUSTMENT

A. Startup, testing, and adjusting this equipment is to put it into final operating condition for the owner's use and benefit. All tests of equipment and systems required to prove compliance with the drawings and specification shall be performed in the presence of the owner's representative.

1.3 GENERAL

A. Inquire about any problems or complaints.

B. Compare mechanical plans to installed system.

C. Document design specifications for report.

D. Ensure all fans are running for balance.

E. Measure initial building pressure.

1.4 INSPECT ROOFTOP EQUIPMENT

A. Inspect units and note any deficiencies.

B. Record unit nameplate data.

C. Check thermostats for proper settings.

D. Check for correct fan rotation (including condenser fans).

E. Check conditions of filters and coils.

F. Check position of outside air dampers.

G. Check gas lines and condensate lines.

H. Check belt tension and pulley alignment.

I. Check disconnect switches and covers.

J. Check any fan noise and vibration.

K. Check heat-cool modes of RTU's.

1.5 TEST AND BALANCE KITCHEN HOOD SYSTEM (WHERE APPLICABLE)

A. Measure supply and exhaust FPM hoods.

B. Observe hood smoke capture with equipment on.

C. Adjust supply and exhaust RPM and supply air damper, as required.

D. Note adjustments made on pulleys.

E. Measure final RPM's.

F. Evaluate duct system design and installation.

G. Ensure that final smoke tests are satisfactory.

1.6 TEST AND BALANCE HEATING/COOLING SYSTEM

A. Measure RTU supply and return airflow values.

B. Check for drafts, hot/cold spots in occupied spaces.

C. Adjust RPM as necessary to achieve design.

D. Check actual motor amps versus motor rated fla.

E. Note adjustments made on pulleys.

F. Measure and record motor RPM.

G. Evaluate duct system design and installation.

H. Ensure slightly positive building pressure.

I. Set and record damper positions.

J. Measure final building pressure.

1.7 FINAL REVIEW

A. Review report and data for completeness.

B. Discuss results and findings with superintendent.

C. Air qualities shall be balance to within +10% of design as a general rule. However, ins come cases, the air quantities may need to be adjusted differently in order to ensure acceptable comfort levels, hood capture performance, positive building pressure, etc. Notify the superintendent of any deficiencies needing immediate attention, the G.C. shall have the mechanical and electrical contractors on call to proptly correct any such problems (i.e. replace burned out motors, failed thermostats, incorrect wiring, bad circuit breakers and starters, dirty filters)

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

230713 - Insulation, Low Pressure Duct

PART 1 - GENERAL

1.1 DESCRIPTION

A. All low pressure duct systems, two (2) inches water gage or less, shall be insulated.

B. All applicable requirements of the section, "HVAC-Insulation, General," shall apply to this section.

1.2 EQUIVALENT MATERIALS

A. Materials other than those specified will be considered for approved equal.

PART 2 - PRODUCTS

2.1 INSULATION

A. Manufacturer's: Schuller (Johns Manville) Microtex - Textra-Fine - Certain-Teed/Saint - Cobain - Owens Corning - Kanuf Fiberglass.

B. Insulate internally low velocity rectangular supply ducts, and return air ducts with fiberglass duct liner with a minimum density of 2.0 pounds per cubic foot and a maximum "k" factor of 0.27 at 75 degrees F mean temperature comply with ASTM C 1071 (type 1). The liner airstream surface coating shall contain and EPA registered, anti-microbial agent so it will not support microbial growth as tested in accordance with ASTM G21 and G22. The liner shall have an NRC not less than the minimum standard listed in ASTM C 1071. Liner for supply ductwork shall be 1"-thick and liner for return ductwork shall be 1"-thick.

C. Insulated internally all rectangular exhaust ducts with 1/2"-thick liner of 2.0 pounds per cubic foot density, as follows: Note: Do not insulate ducts in kitchens.

1. Apply insulation from the fan back down the duct for a distance of 15 feet in all directions. Apply in all branches if multiple branches occur near the fan.
2. Round exhaust ducts shall not be insulated.

D. Coat all exposed edges with Foster's gray no. 30-70 lagtone adhesive.

E. Adhere liner to interior sides of duct with minimum 50% coverage of fire retardant adhesive such as Foster 85-11, Childers, or Minnesota Mining. Equivalent to comply with ASC-A-7001.

F. Use mechanical fastening of Graham Welded Pints, or Stick-Klips on maximum 16" centers at top sections when width exceeds 12" and on sides when height exceeds 24". Pins shall comply with SMACNA MF-1.

G. Apply a brush width of Foster's fire retardant coating gray no. 30-70 lagtone over all joints, visible cut edges, and leading edges of insulation to prevent fiber erosion.

H. Duct sizes on drawings are for dimensions inside of lining and sheet metal size shall be increased accordingly. If adhesive is applied in shop use Foster Spark - FAS 85-11 if applied in field use Foster Spark - FAS adhesive 85-20. Adhesives shall be approved and listed by underwriters laboratory and shall bear the U.L. label.

I. Thickness and classifications of duct liner shall be printed on the face of the liner by the manufacturer.

J. Duct liner shall have and underwriters laboratories fire hazard rating with a flame spread not to exceed 25 and fuel contributed and smoke developed ratings not to exceed 50.

2.2 DUCT INSULATION (EXTERNAL)

A. Manufacturers: Schuller (Johns Manville) - Textra-Fine - Certain-Teed/Saint - E.O. Wood - Owens Corning - Kanuf Fiberglass.

B. Insulated externally all round and oval ducts; all concealed rectangular supply air ducts which are noted or specified to have no duct lining: 1-1/2"-thick and of 0.5 - 0.75 pound density fiberglass ductwrap with a foil-scrim kraft vapor barrier applied with outward-clinching staples. Insulation to have a minimum R-valve of 5.7.

C. Insulation shall be continuous through partitions, coils, etc. Insulate fire damper sleeves to partitions.

D. Exposed round ductwork in dining and lunge area shall be uninsulated.

2.3 GREASE DUCT INSULATION

A. 1 and 2 Hour; zero clearance Applied Fire Protection for Commercial Kitchen Grease Ducts when tested in accordance with ASTM E 2336 - Passes all 5 Acceptance Criteria in Sections 16.1 to 16.5 - Reference ICC-ES Building Code Report ESR 2213 or ESR 2832, also reference UL Listing HNKT G-18.

B. 1 and 2 Hour Applied Fire Protection when tested in accordance with UL 1978; Compliant per Intertek Listing TC/BI 120-01.

C. 1 and 2 Hour F- and T-Rated Through Penetration Firestop when tested in accordance with ASTM E 814 (UL 1479): UL Through Penetration listings; C-AJ-1562; C-AJ-7004; C-AJ-7012; C-AJ-7014; C-AJ-7019; C-AJ-7021; C-AJ-7047; C-AJ-7095; C-AJ-7098; C-AJ-7119; F-A-1093; F-A-1094; F-A-3048; F-C-7036; FC-7037; W-L-7041; W-L-7099; W-L-7121; W-L-7145; W-J-7086.

D. 1 and 2 Hour Applied Fire Protection for Ventilation Air Duct when tested in accordance with ISO 6944-1985 - Reference UL Listings HNLJ V19; HNLJ V29;

E. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Products:
   a. CertainTeed Corp.; FlameChek.
   b. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
   c. Thermal Ceramics; FireMaster XL,
   d. 3M; Fire Barrier Wrap Products.
   e. Unifrax Corporation; FyreWrap.

F. Access Doors (Fire Rated): Thermal Ceramics FastDoor XL (or equal) for duct access to Type 1 commercial kitchen hood exhaust ductwork: Install access openings at each change in direction and at intervals as required by code. Insulation cover system shall be tested and listed by UL (HNKT G18) to provide zero clearance to combustible construction and [1] [2]-hour fire rating per ASTM E 2336. Duct access cover panel shall be tested and listed by UL (YYXS.MH47995) with integral neoprene gasket to provide liquid tight seal and shall have a high temperature gasket and signage "Access Door - Do not Obstruct" compliant to code and NFPA 96. Installation shall be performed by an experienced contractor per manufacturer instructions and applicable UL Listings. Sheet metal and insulation contractors shall coordinate installation of the FastDoor XL and the duct enclosure system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All supply and return air ductwork.

B. Air supply diffuser backs and necks:

1. All supply diffusers backs and necks, shall be insulated with one (1) inch-thick, 3/4 pound density, Manville R-series Smalllite, or approved equal fiberglass blanket insulation, having a conductance (k) no greater than 0.31. Adhere insulation to the duct as specified below.

END OF SECTION

230716 - HVAC Insulation, General

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section governs all HVAC insulation.

1.2 SUBMITTALS

A. Submit product data covering thermal, permeability, and fire performance characteristics of all insulation material, adhesives, and finishes. Data shall be clearly marked to show intended use, thickness, finishes, adhesives, and application techniques.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulation shall not be installed until testing procedures have been complied with all surfaces and have been cleaned free of dirt and grease and are completely dried.

B. Protect adjacent surfaces, equipment and premises from dropping of coatings adhesives and finishes. Remove all excess materials and debris from both exposed and concealed areas so that these areas are completely clean.

C. Remove all excess materials and debris from both exposed and concealed areas so that these areas are completely clean.

D. Insulation shall not be applied until the general construction has progressed sufficiently to ensure against physical or moisture damage to the insulation. Replace any insulation which has become wet.

E. Ductwork hanger rods must be installed and perpendicular before insulation is installed.

F. All joints between insulation blankets, sleeves, etc. shall be sealed and taped with 3"-wide pressure sensitive tape with adhesive applied to overlapping vapor barriers before tape is applied. Tape to be foil faced, reinforced type as recommended by insulation manufacturer to maintain all ratings of insulation. Cloth back generic "duct tape" is not acceptable.

G. Insulation to be secured externally to all ductwork as well as permanently joined to other portions of insulation on the same duct per manufacturer's recommendations.

H. All duct insulation is to U.L. Classified.

END OF SECTION

230900 - Controls, Electric

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work consists of installing controls for the HVAC system as on the drawings.

1.2 SUBMITTALS

A. Provide submittal consisting of complete control diagrams for the system with construction details and engineering data sheet son all system components.

1.3 ELECTRICAL

A. Electrical work and materials associated with the control system shall be installed as work of this section but in accordance with Division 16.

B. Power wiring is specified under Division 16 and show on electrical drawings.

C. Electrical control wiring conduit and fittings associated with the space temperature and humidity control including interlocking with motor controllers, control accessories, and appurtenances are to be provided under this section. Control wiring shall be in conduit.

PART 2 - PRODUCTS

2.1 ELECTRONIC ROOM THERMOSTATS AND REMOTE SENSORS

A. Thermostat shall be as specified in the drawings.

B. Thermostat shall have automatic heating-cooling changeover to control operation of the heating and cooling on rooftop air conditioning units.

2.2 SMOKE DETECTION FAN SHUT-DOWN

A. Smoke detector shall be by integrally installed by the mechanical contractor as specified in the drawings.

B. Remote alarm indicator for duct mounted smoke detectors shall be specified in the drawings.

C. Smoke detector shall be powered as specified in drawings.

PART 3 - EXECUTION

3.1 ELECTRIC ROOM THERMOSTATS

A. Smoke detectors shall be wired as slow voltage circuit. (24v)

B. Thermostats and sensors shall be wired as low voltage circuit.

C. Line voltage wiring shall be by the electrical contractor.

D. Mechanical contractor shall provide and install all wiring and necessary appurtenances to perform all of the temperature control sequences.

END OF SECTION

233113 - Ductwork, Low Pressure, Galvanized Steel

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Ducts shall be constructed and installed in accordance with "HVAC Duct Construction Standards" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)

B. Ductwork shape, size, and location shall be in accordance with plans as closely as possible. Note that duct sizes called out on plans are clear inside dimensions of ductwork. Increase ductwork to accommodate duct liner.

1.2 JOB CONDITIONS

A. Inspect the drawings and verify existing conditions in the field. Report conflicts before starting fabrication.

PART 2 - PRODUCTS

2.1 DUCT MATERIAL

A. Weights and gages shall be in accordance with Table 1 of "HVAC Duct Construction Standards" published by SMACNA as minimum requirements or as per local codes. Duct material shall be galvanized steel.

2.2 SPLITTERS

A. Splitters shall be 18 gage galvanized steel with horizontal and vertical dimensions sufficient to close off air to branch.

B. Provide Ventlok No. 607 end bearings and Ventlok No. 690 damper assembly.

2.3 VOLUME DAMPERS

A. Volume dampers shall be 18 gage galvanized steel; single blade up to 8" x 8", opposed blade on all ducts over 8" x 8".

B. Provide Ventlok No. 607 end bearings and Ventlok No. 641 self-locking regulator.

C. Damper rods shall be 1/2" square bars with blades securely riveted to bar.

2.4 TURNING VANES

A. All square and rectangular elbows shall contain Titus No. AG-225 turning vanes.

2.5 HANGERS

A. In accordance with Chapter IV of SMACNA.

2.6 FLEXIBLE CONNECTIONS

A. Flexible connections shall be provided for each air handling device to prevent transmission of vibrations.

B. Make flexible connection a minimum of 4 inches-wide of Ventglas as made by Vent Fabrics, Inc.

C. Braided copper bridge strap for installation across flexible connections shall be Thompson Lighting Protection, Inc. No. 288.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Split, divide, or turn ducts as necessary to avoid obstructions and, in such cases, provide air stream deflectors and increase size of duct to an equivalent area.

B. Splitters: Rigidly attach splitters to pivot rod and operating linkage. Set damper assembly on raised insulated base on insulated ductwork.

C. Volume dampers: Supply and make-up are ductwork in concealed spaces. Set regulator on raised base on insulated ductwork. Mark end of damper rod to show damper position.

D. Flexible connections: Secure flexible connections to duct and unit with galvanized steel straps holding the material in formed galvanized steel channels. Install braided copper bridge strap across all flexible connections.

E. Test plugs: Provide square head type test plugs as required for insertion of test apparatus. Provide a ring and removable insulation plug where ducts are insulated.

F. Painting: Paint interior of ductwork flat black where visible through grilles and registers.

G. Sealing: Ductwork shall be sealed in accordance with Table 1-2 for "Seal Class B".

3.2 CORRECTIONS

A. Remove all ductwork found to vibrate, chatter, or pulsate and replace with new ductwork.

END OF SECTION

233116 - Ductwork, Low Pressure, Flexible

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide where indicated on the drawings and specified herein, factory fabricated and pre-insulated flexible ducts.

1.2 QUALITY ASSURANCE

A. Flexible ducts, including insulation and sealants, shall conform to the requirements of NFPA 90A and UL Standard 181 for class 1 ducts.

B. Performance data shall be based on test performed in accordance with Air Diffusion Council flexible air duct test code FD72.

PART 2 - PRODUCTS

2.1 LOW PRESSURE FLEXIBLE DUCTWORK

A. Low pressure flexible ductwork shall consist of corrosion resistant spring steel helix bonded to a glass reinforced neoprene sleeve insulated with a minimum of 1 inch-thick, 1 pound density fiberglass insulation which is in turn covered with an outer vapor barrier of fiber reinforced foil-scrim-kraft laminate.

B. Insulation shall have a thermal conductivity (k) no greater than 0.25 at 75 degrees F.

C. Duct for low velocity system connectors shall have a working pressure of not less than 1-1/2 inches of water gage and a maximum operating temperature of not less than 250 degrees F.

2.2 DUCT CONNECTORS

A. Where flexible ducts connect to low pressure ducts to form run-outs to individual outlets, plenums, or low pressure terminals, provide factory fabricated fittings complete with and manuals balancing dampers having locking quadrants. Where low pressure ducts are internally insulated the connector shall be furnished with air extension to project through and protect the insulation for connection to equipment, auxiliary sleeves shall be provided to allow at least 2 inches of surface for clamping of flexible ductwork. Sleeves shall be screwed or bolted to equipment lip frame.

2.3 CLAMPS

A. Provide galvanized spring steel clamps or Panduit straps at connections to duct fittings or devices.

2.4 MANUFACTURER

A. Flexible ductwork and components shall be as manufactured by general environmental corporation or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct connectors to low pressure ducts using manufacturer's template for all holes and secure the connector with sheet metal screws having first applied Foster's 30-02 duct sealant to the adjoining surfaces. Do not pressurize the system for 48 hours.

B. Stretch new duct when removing it from cartons where it may have been shipped in a compressed state.

C. Use the minimum length of flexible duct required to make the specific connection unless specifically noted otherwise on the drawings. The maximum develop length of flex duct is 5'-0".

D. Avoid sharp bends. Use a minimum inside bend radius equal to one (1) times the inside diameter of the duct.

E. Support horizontal duct runs as detailed in the construction documents.

F. Allow the flexible duct to extend straight away from connectors for a few inches prior to initiating all bends.

G. Adhesive and sealants for connection of flexible duct to the rigid duct or terminate as follows:

1. Apply Foster's 30-02 sealant to the inside of the flexible duct to depth of three (3) inches.
2. Repair all damage to vapor barrier with Foster's 35-00 reinforced with 4 inch-wide glass fabric and a second coat of Foster's 35-00.

END OF SECTION

233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Air distribution devices shall be provided to deliver the indicated volume of supply air without exceeding the available throw and with NC rating as follows:

1. Kitchen & Work Areas: NC-35.
2. Dining and Customer Lobby Area: NC-30.

1.2 SUBMITTALS

A. Shop drawings: Indicate locations, spacing air volume, and type of each device.

B. Product data: Manufacturers catalog cuts and product description including air quantity, patter, throw, pressure drop, NC ratings, finish, dimensions, and complete construction details and materials.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES, AND REGISTERS

A. Diffusers, grilles, and registers shall be from one of the following manufacturers:

1. Titus.
2. Krueger.
3. Price.
4. Nailor.

B. For model numbers and type see air distribution schedule on drawing.

C. Diffusers, grilles, and registers shall be of the surface, flush, or lay-in type, color corresponding to the ceiling which they are located.

D. The finish of the diffusers, grille, or register face panel shall be as noted on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install where shown on drawings.

B. Diffusers, registers, and fittings shall be securely attached to finish surfaces, or structural member behind finish surfaces.

C. Lay-in diffusers mounted in acoustical tile ceilings shall be rigidly mounted, above the face panel, to the ceiling suspension system.

END OF SECTION

235400 - Air Distribution Equipment (Exhaust Fans)

PART 1 - GENERAL

1.1 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation
2. Loren Cook Company
3. PennBarry
4. Twin City Fan

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories (see schedules for additional information):

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

END OF SECTION

237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Gas furnace.
3. Economizer outdoor- and return-air damper section.
4. Integral, space temperature controls.
5. Roof curbs.

1.2 DEFINITIONS

A. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

B. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

C. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

D. Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

E. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.3 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigerant system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings; product name or designation or a comparable product by one of the following:

1. Lennox Industries Inc.

2.2 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

1. Exterior Casing Thickness: 0.052 inch-thick.

C. Inner Casing Fabrication Requirements:

1. Inside Casing: Galvanized steel, 0.034-thick.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 1 inch.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of galvanized, polymer, stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple both sides of drain pan.
3. Pan-Top Surface Coating: Corrosion-resistant compound.

2.3 FANS

A. Direct-Driven Supply-Air Fans: Double width, forward curved, backward inclined, plenum, centrifugal; with permanently lubricated, multispeed or ECM motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

B. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

C. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

D. Relief-Air Fan: Propeller, Forward curved, or Backward inclined, shaft mounted on permanently lubricated motor.

E. Fan Motor: Comply with requirements in Section 15058 "Common Motor Requirements."

2.4 COIL

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating or Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

B. Outdoor-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: Refer to drawings and schedule information.

B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: Minimum 90 percent arrestance, and MERV 7.
2. Provide additional set of air filters for installation by contractor prior to final test and balance.

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
3. High-Altitude Kit: For Project elevations more than 2000 feet above sea level.

C. Heat-Exchanger and Drain Pan: Corrosion-resistant aluminized steel.

D. Venting: Gravity vented.

E. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.

F. Safety Controls:

1. Gas Control Valve: Single stage, Two stage, or Modulating as scheduled.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

2.9 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS

A. Control equipment and sequence of operation are specified in Section 15900 "HVAC Instrumentation and Controls."

B. Basic Unit Controls:

1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:
   a. Heat-cool-off switch.
   b. Fan on-auto switch.
   c. Fan-speed switch.
   d. Manual or Automatic changeover.
   e. Adjustable deadband.
   f. Exposed set point.
   g. Exposed indication.
   h. Degree F indication.
   i. Unoccupied-period-override push button.
3. Fixed Minimum Outdoor-Air Damper Operation:
   a. Occupied Periods: Open to minimum position for scheduled ventilation air.
   b. Unoccupied Periods: Close the outdoor-air damper.
4. Economizer Outdoor-Air Damper Operation:
   a. Occupied Periods: Use mixed-air temperature and select between outdoor-air and return-air enthalpy to adjust mixing dampers. During economizer cycle operation, lock out cooling.
   b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
   c. Outdoor-Airflow Monitor: Accuracy maximum plus or minus 5 percent within 15 and 100 percent of total outdoor air. Monitor microprocessor shall adjust for temperature, and output shall range from 4 to 20 mA.

2.11 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Hail guards of galvanized steel, painted to match casing.

2.12 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
   a. Materials: ASTM C 1071, Type I or II.
   b. Thickness: 1-1/2 inches.
2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
   a. Liner Adhesive: Comply with ASTM C 916, Type I.
   b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
   c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
   d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: 14 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction as specified. Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

C. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain, area drain, or as indicated on plans.

D. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 15195 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

E. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 15820 "Duct Accessories."
4. Install return-air duct continuously through roof structure.
5. Install 2# limp mass sound barrier.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.3 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems and clean filter housings. New filters shall be installed prior to final test and balance

END OF SECTION

BAKER DESIGN GROUP, PA
RODGER W BAKER ARCHITECT, AIA NCARB
135 N. Main St. Wichita KS 67202 316.267.7142
rodger@bakerdesigngroupa.com

FREDDY'S FROZEN CUSTARD
711 S. RIDGE ROAD
MIDDLETOWN, DELAWARE

No. 28940
10.26.23

MECHANICAL SPECIFICATIONS

DATE
10/26/23

DRAWN BY:
MW

CHECKED BY:
MW

SHEET NO.
M7