

1/2" DIA. ALL THREAD ROD CONNECTED TO ROOF JOIST THROUGH ANOTHER HANGING ANGLE

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

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

HANGING ANGLE DETAILS

HOOD STYLE / MODEL	450 DEGREES cfm/ft.	600 DEGREES cfm/ft.	700 DEGREES cfm/ft.
CANOPY ND-2	150	200	250
CANOPY ND-2 w/ END PANELS	105	140	175
SLOPED SND-2	228	294	-
ISLAND ND-2MI	269	300	350
ISLAND ND-2I	346	422	475

ETL HOOD LISTING DETAIL

EXHAUST CFM = LENGTH OF HOOD X CFM/LINEAL FT. (LOAD)
 SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED
 TOTAL DUCT AREA (sq. in.) = 144 X CFM² (FRM)²

DUCT LENGTH = TOTAL DUCT AREA / DUCT WIDTH

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

CALCULATIONS UTILIZED

CAPTIVE-AIRE HOODS BUILT IN COMPLIANCE WITH:

ETL ETL-110001
 #3054804-002
 Listed under ETL File number 3054804-001/002

BUILDING CODES

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

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

CLEARANCE TO COMBUSTIBLES

INSTALLATION

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

BALANCE

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

ADDITIONAL

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

GENERAL NOTES

1. FILTER COLLECTION EFFICIENCY

2. VERIFY CEILING HEIGHT

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

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted

Approved with NO Exception Taken

Revise and Resubmit

SIGNATURE _____

Your Title _____ Date _____

FILTER DETAIL

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

FOR QUESTIONS, CALL THE
 Maryland Office
 REGION 32
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 EMAIL: arturo.meza@captiveaire.com

PATENT NUMBERS
 AC-PSP (UNITED STATES) - US PATENT 7963830 B2.
 AC-PSP WALL (CANADA) - CA PATENT 2820509.
 AC-PSP ISLAND (CANADA) - CA PATENT 2520330.

HOOD INFORMATION - JOB#6867976

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S)				MUA CFM	AC CFM	HOOD CONSTRUCTION	HOOD CONFIG			
										WIDTH	LENG	HEIGHT	DIA				CFM	VEL	SP	END TO END
1	33	6030 ND-2-ACPSP-F	CAPTIVEAIRE	10' 7"	600 DEG	I	HEAVY	225	2381		4"	16"	2381	1705	-0.825"	1976	728	430 SS WHERE EXPOSED	ALONE	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S)				LIGHT(S)			UTILITY CABINET(S)				FIRE SYSTEM PIPING	HOOD HANGING WEIGHT			
		TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	FIRE SYSTEM TYPE			SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY
1	33	CAPTRATE SOLO FILTER	7	20"	16"	85% SEE FILTER SPEC	6	L55 SERIES E26	NO	LEFT	12"x60"x30"	TANK FS	4.04.0	DCV-1111	1 LIGHT 1 FAN	YES	1165 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	33	FIELD WRAPPER 10.00" HIGH FRONT. RIGHT END STANDOFF (FINISHED) 1" WIDE 60" LONG INSULATED. INSULATION FOR BACK OF HOOD. LEFT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS. RIGHT WALL AS END PANEL.

PERFORATED SUPPLY PLENUM(S)

HOOD NO	TAG	POS	LENGTH	WIDTH	HEIGHT	TYPE	RISER(S)				
							WIDTH	LENG	DIA	CFM	SP
1	33	Front	140"	24"	6"	MUA	12"	28"		658	0.165"
							12"	28"		658	0.165"
							12"	28"		658	0.165"
							6"	28"		364	0.090"
					AC	6"	28"		364	0.090"	

GREASE DUCT & CHIMNEY SPECIFICATIONS:
 PROVIDE GREASE DUCT EQUAL TO CAPTIVEAIRE SYSTEMS MODEL "DW" ROUND 20 GAUGE 430 STAINLESS STEEL DUCTWORK. MODEL "DW" IS LISTED TO UL-1978 AND IS INSTALLED USING "V" CLAMP LOCKING CONNECTIONS SEALED WITH 3M FIRE BARRIER 2000 PLUS. MODEL "DW" DOES NOT REQUIRE WELDING PROVIDING IT HAS BEEN INSTALLED PER THE MANUFACTURES INSTALLATION GUIDE.
 PROVIDE RATED ACCESS DOORS AT EVERY CHANGE IN DIRECTION AND EVERY 12' ON CENTER. PER MANUFACTURES LISTING MODEL "DW" HORIZONTAL RUNS LESS THAN 75 FT. CAN BE SLOPED 1/16" PER 12", HORIZONTAL RUNS MORE THAN 75 FT. CAN BE SLOPED 3/16" PER 12".
 DUCT SHOULD BE SLOPED AS MUCH AS POSSIBLE TO REDUCE THE CHANCE OF GREASE ACCUMULATION IN HORIZONTAL RUNS.
 IF THE DUCT OR CHIMNEY IS WITHIN 18 INCHES OF COMBUSTIBLE MATERIAL, PROVIDE UL-2221 OR UL-103 HT LISTED DOUBLE WALL GREASE DUCT OR DOUBLE WALL CHIMNEY EQUAL TO CAPTIVEAIRE SYSTEMS MODEL "DW- 2R, 2R TYPE HT, 3R, OR 3Z" ROUND 20 GAUGE 430 STAINLESS INNER DUCT INSULATED WITH A 24 GAUGE 430 STAINLESS OUTER SHELL.

CAPTIVEAIRE SYSTEMS RECOMMENDS THE USE OF LISTED, PRE-FABRICATED ROUND GREASE EXHAUST DUCT TO REDUCE STATIC PRESSURE IN THE SYSTEM, MINIMIZE INSTALLATION AND INSPECTION TIMES, AND ENSURE DUCT IS LIQUID TIGHT

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.

HVAC DISTRIBUTION NOTE

IT IS RECOMMENDED NOT TO INSTALL HIGH VELOCITY DIFFUSERS OR HVAC RETURNS WITHIN TEN (10) FEET OF THE EXHAUST HOOD. PERFORATED DIFFUSERS ARE RECOMMENDED.

EXHAUST HOOD DETAILS

CAPTIVEAIRE

REVISIONS

DESCRIPTION	DATE

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 PHONE: (800) 988 - 0881 FAX: 912275931 EMAIL: arturo.meza@captiveaire.com

Cava - Warwick, RI
 989 Centerville Road,
 Warwick, RI, 02886

DATE: 6/19/2024
 DWG.#: 6867976
 DRAWN BY: AM-32
 NTS
 SCALE:
 MASTER DRAWING

PROJECT NUMBER:
 CAV112

ISSUE	DATE
PERMIT SET	09.24.2024
REVISION 1	11.01.2024
REVISION 2	12.12.2024
CONSTRUCTION SET	02.18.2025

SHEET NO.
 1

CAPTIVEAIRE HOOD DRAWINGS FOR REFERENCE ONLY

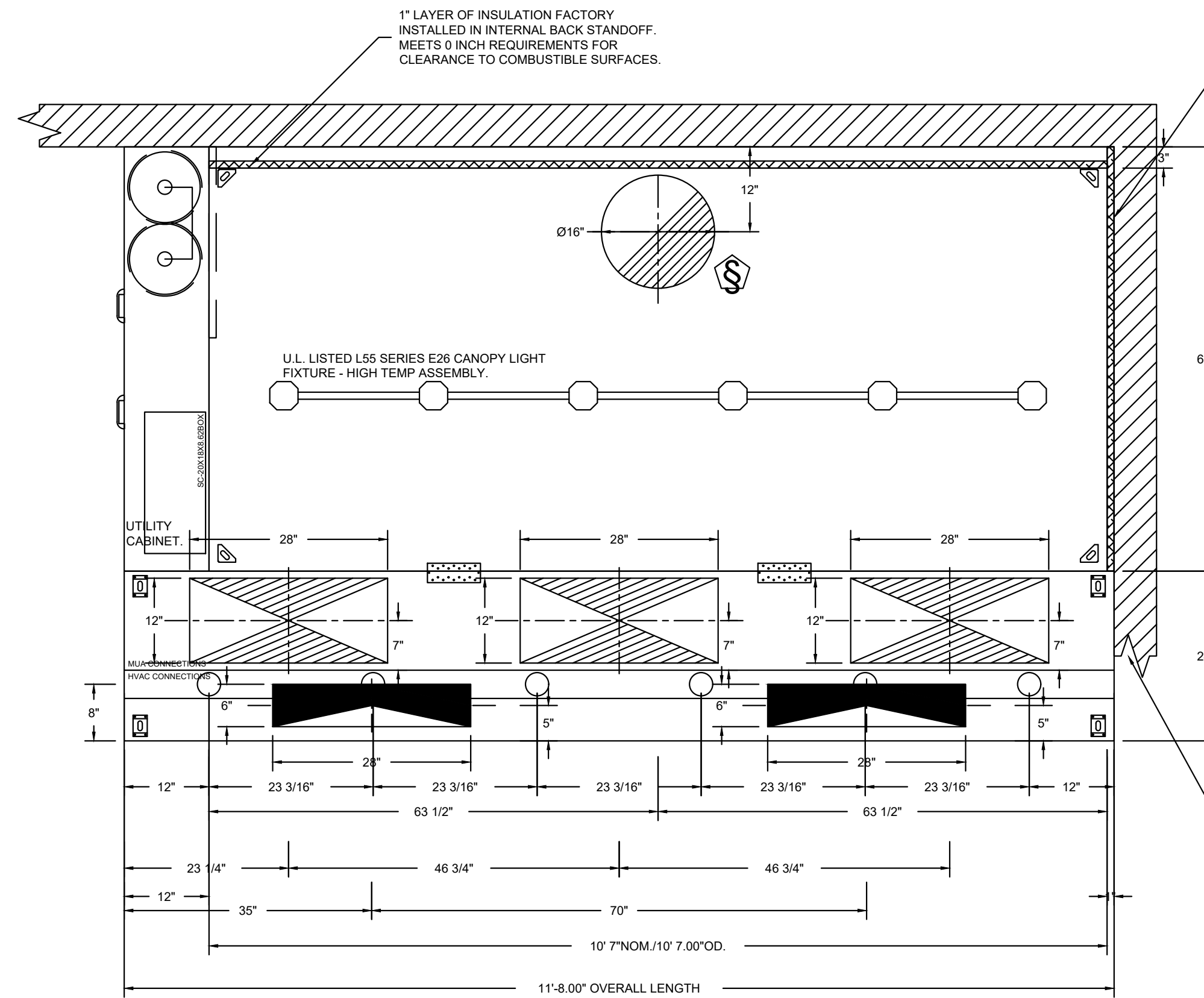
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 FOR CAVA
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 14 Ridge Square NW #500, WASHINGTON, DC 20016

H1.1



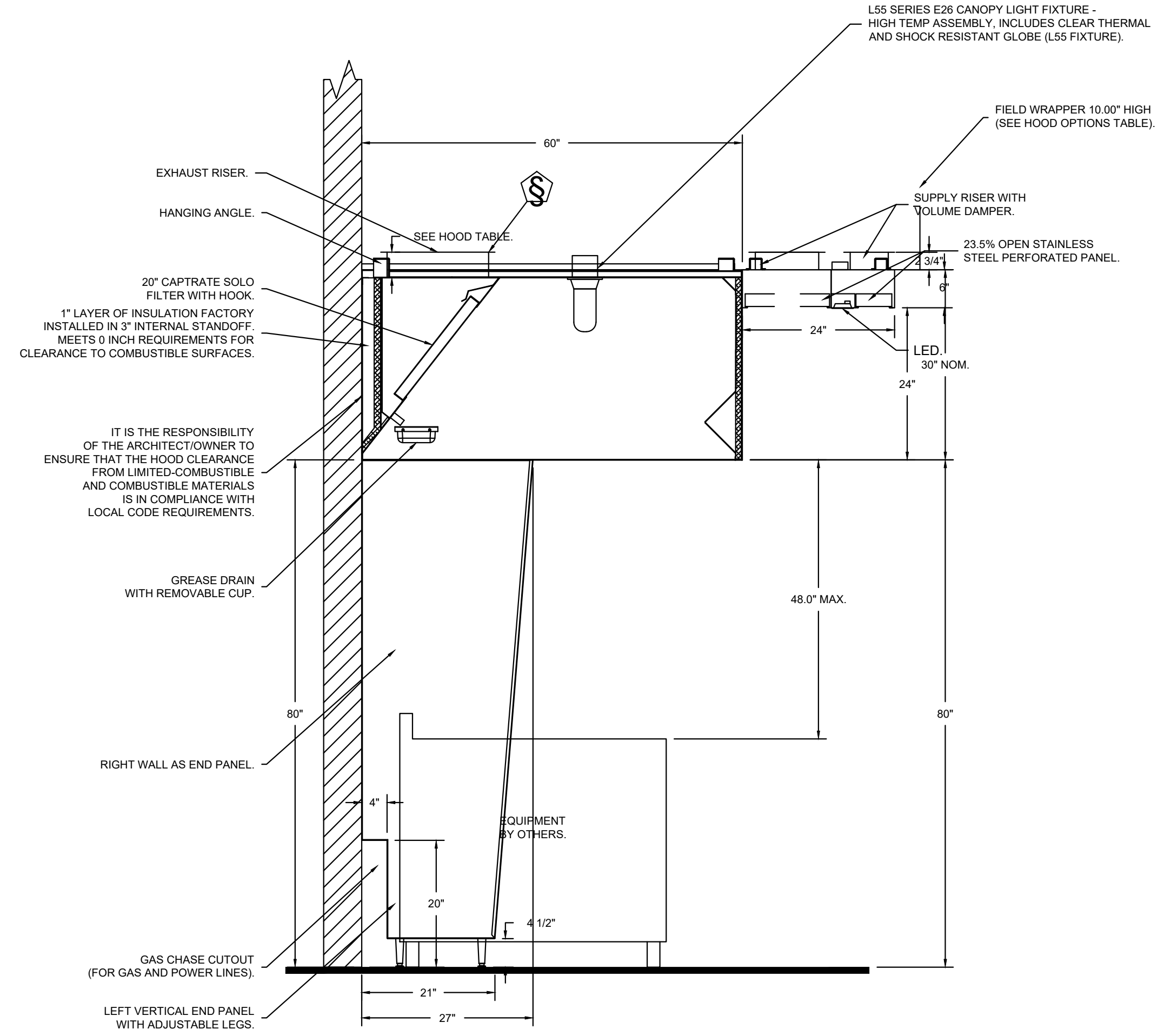
PLAN VIEW - HOOD #1 (33)
10' 7.00\"/>

ACPSP SHIPS LOOSE FOR FIELD INSTALLATION

1\"/>

INSTALLER MUST CONFIRM HOOD IS INSTALLED SUCH THAT THE SPECIFIED WALL, ACTING AS AN END PANEL, IS MATED TIGHT TO THE CORRECT END OF HOOD TO ACHIEVE A REDUCED MINIMUM EXHAUST CFM LISTING. NON-COMPLIANCE WILL NULLIFY THE ETL LISTING. VOID THE MANUFACTURER'S WARRANTY, AND HOLD THE CONTRACTOR LIABLE FOR ANY AND ALL LOSSES, COSTS, AND EXPENSES RELATED TO THE NON-COMFORMANCE OF THE MANUFACTURER'S SPECIFIED INSTRUCTION. THE WALL ACTING AS AN END PANEL MUST EXTEND NO LESS THAN 20\"/>

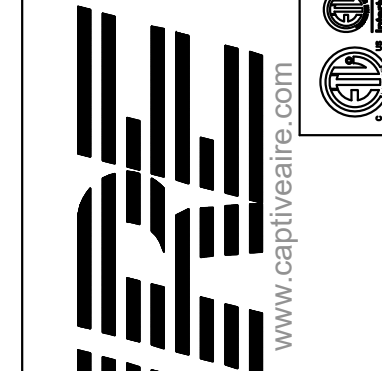
LIGHTING FOR ACPSP JOB # 6867976 - HOOD #1 INPUT: 120V AC, 1 PHASE, 50/60HZ, 3.5 WATTS PER LIGHT. TO CONTROL LIGHTS WITH HOOD LIGHT SWITCH, WIRE PER HOOD ELECTRICAL CONTROL PANEL SCHEMATIC. TO CONTROL LIGHTS WITH BUILDING LIGHT SWITCH, WIRE BLACK AND WHITE WIRE TO A 120VAC SERVICE. END TO END ACPSPS REQUIRE 120VAC FIELD WIRING FROM J-BOX TO J-BOX. REPLACE LIGHTS WITH LED LIGHTS ONLY.



SECTION VIEW - MODEL 6030ND-2-ACPSP-F
HOOD - #1 (33)

IT IS THE RESPONSIBILITY OF THE ARCHITECT/OWNER TO ENSURE THAT THE HOOD CLEARANCE FROM LIMITED-COMBUSTIBLE AND COMBUSTIBLE MATERIALS IS IN COMPLIANCE WITH LOCAL CODE REQUIREMENTS.

REVISIONS	
DESCRIPTION	DATE



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DATE: 6/19/2024
DWG.#: 6867976
DRAWN BY: AM-32
SCALE: NTS
MASTER DRAWING

SHEET NO.
2

CAPTIVE AIR HOOD DRAWINGS FOR REFERENCE ONLY

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CONSTRUCTION SET

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ISSUE	DATE
PERMIT SET	09.24.2024
REVISION 1	11.01.2024
REVISION 2	12.12.2024
CONSTRUCTION SET	02.18.2025

CAPTIVE AIR HOOD DRAWINGS FOR REFERENCE ONLY

SHEET:
H1.2

FIRE SYSTEM INFORMATION – JOB#6867976

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0	40	37	FIRE CABINET LEFT	LEFT, HOOD 1

NOTES

- FIELD PIPE DROPS AS SHOWN
- PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- FIELD INSTALLED DROP: FACTORY WILL PROVIDE QTY 2 60IN LONG PIECES OF CHROME PLATED PIPING SHIPPED LOOSE TO BE FIELD-INSTALLED.
- SHIP LOOSE DROP: FACTORY WILL PROVIDE THE EXACT CHROME PIPE LENGTH NEEDED SHIPPED LOOSE TO BE FIELD-INSTALLED.
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELIVING, SALAMANDERS, ETC.
- OVERLAPPING COVERAGE SHALL NOT BE USED ON ANY APPLIANCE WITH AN OBSTRUCTION.
- IF APPLICABLE, EXTENDED PRE-PIPED DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6" ABOVE THE TOP OF THE HOOD.

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

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

- OL-F NOZZLE PART NUMBER REPLACES 3070-3/8H-10-SS

JOB #: 6867976.
JOB NAME: CAVA - WARWICK, RI.

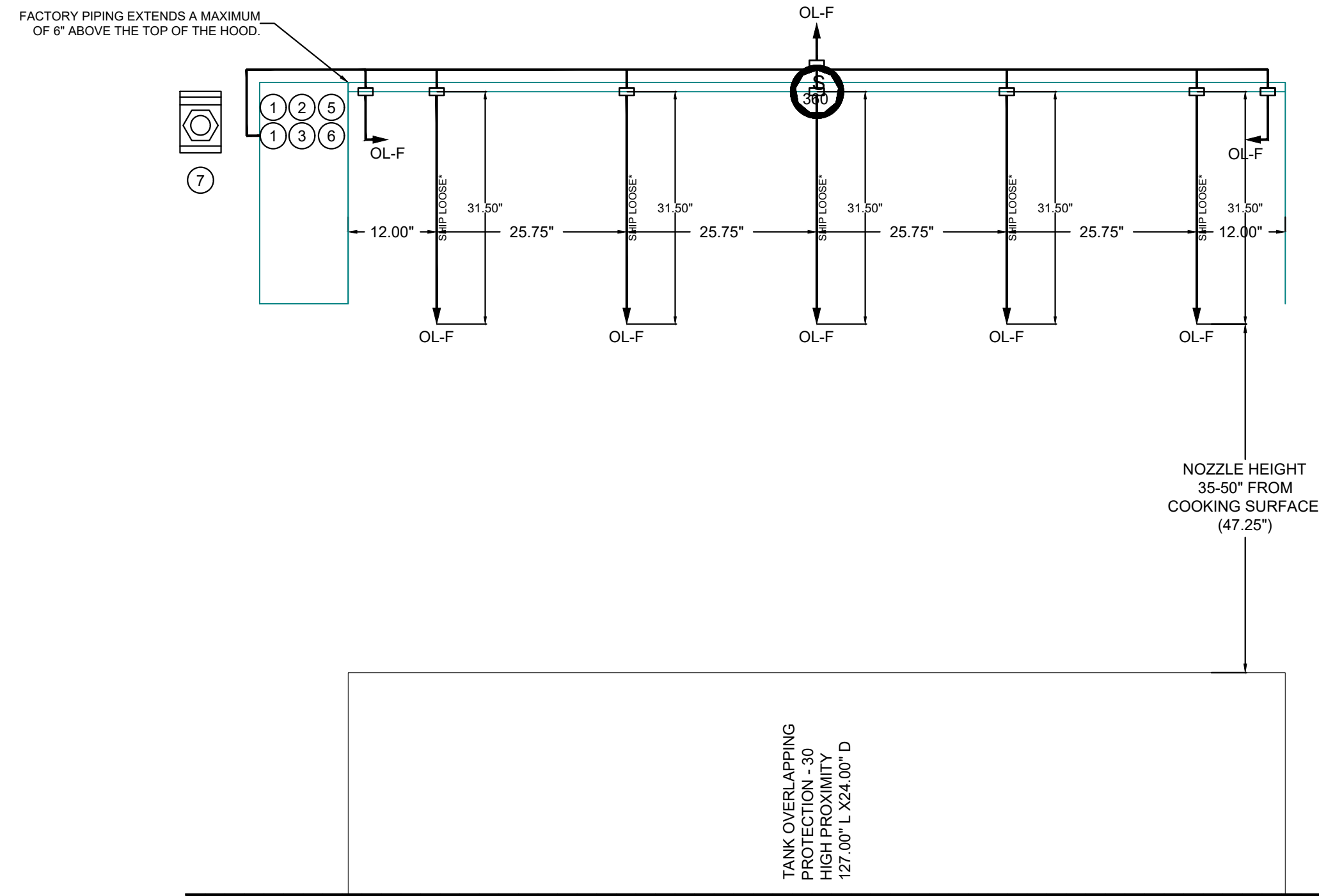
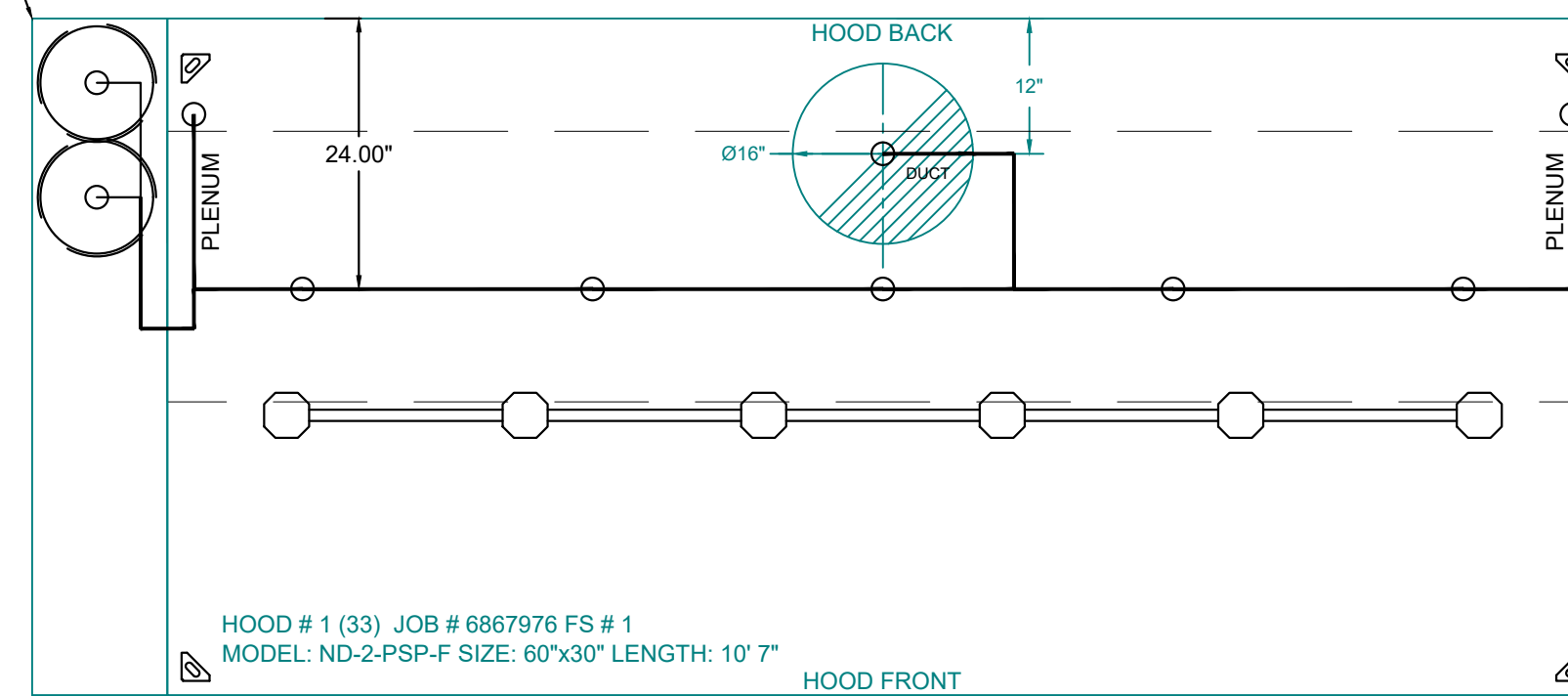
SYSTEM SIZE: TANK-SP-2 DESIGN FP: 37. MAXIMUM FP: 40.
HOOD # 1 10' 7.00" LONG x 60" WIDE x 30" HIGH.
RISER # 1 SIZE: 16" DIA.
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.

- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

LEGEND – FIRE CABINET TANK SYSTEM

- | | |
|---|---------------------------------|
| 1 | 4 GALLON TANK. |
| 2 | PRIMARY ACTUATOR RELEASE. |
| 3 | SECONDARY ACTUATOR RELEASE. |
| 4 | PRESSURE SUPERVISION SWITCH. |
| 5 | PRIMARY HOSE ASSEMBLY. |
| 6 | SECONDARY HOSE ASSEMBLY. |
| 7 | REMOTE MANUAL ACTUATION DEVICE. |

- SYSTEM REQUIRES A MINIMUM OF 7 FT OF EQUIVALENT PIPE LENGTH BETWEEN TANK AND NEAREST APPLIANCE NOZZLE FOR MOST APPLIANCES. EACH 90 DEGREE ELBOW ADDS 1.3 FT OF EQUIVALENT LENGTH. SEE MANUAL FOR DETAILS



CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted

Approved with NO Exception Taken

Revise and Resubmit

SIGNATURE _____

Your Title _____ Date _____

VERIFY MAKE/MODEL OF ALL COOKING APPLIANCES BENEATH HOOD PRIOR TO FABRICATION. CHANGES TO COOKING EQUIPMENT SPECIFICATION MAY RESULT IN ADDITIONAL FIRE SUPPRESSION SYSTEM INSTALLATION CHARGES.

SPECIFICATIONS

ELECTRIC WET CHEMICAL (CAS-EWC) SPECIFICATION

THE CORE ELECTRIC WET CHEMICAL (EWC) FIRE SUPPRESSION SYSTEM IS A HYBRID FIRE SUPPRESSION SYSTEM FOR USE IN COMMERCIAL KITCHENS.

THE CORE EWC MICROPROCESSOR-BASED CONTROL BOARD, PCBCORE BOARD, IS ETL LISTED UNDER REPORT NUMBER 101196419NYM-001 TO THE UL STANDARD 864 AND CAN/ULC-S527-11. THE COREPCB IS DESIGNED TO CONTROL A 24VDC-BASED, LISTED UL 300 WET CHEMICAL RESTAURANT FIRE SUPPRESSION SYSTEM. THE COREPCB CONTROLS PROVIDE ALL NECESSARY MONITORING, TIMING AND SUPERVISION FUNCTIONS REQUIRED FOR THE RELIABLE OPERATION OF THE WET CHEMICAL FIRE SUPPRESSION SYSTEM. ALL DEVICES THAT ARE CRITICAL FOR PROPER OPERATION ARE SUPERVISED AND INCLUDE AN ELECTRIC THERMAL DETECTOR(S) AND MANUAL PULL STATION(S)/MANUAL ACTUATION DEVICE(S). THE COREPCB CONTROL BOARD ALSO SUPERVISES FAULTS WITHIN THE SYSTEM AND WILL ALERT THE USER OF SPECIFIC CONDITION.

THE SYSTEM IS CAPABLE OF AUTOMATIC DETECTION AND ACTIVATION AND/OR REMOTE MANUAL ACTIVATION. THE DETECTION PORTION OF THE FIRE SUPPRESSION SYSTEM ALLOWS FOR AUTOMATIC DETECTION BY MEANS OF AN ELECTRIC THERMAL DETECTOR(S) LOCATED IN THE HOOD DUCT CONNECTION(S). A PULL STATION/MANUAL ACTUATION DEVICE IS ALSO PROVIDED TO ALLOW FOR MANUAL ACTIVATION OF THE FIRE SYSTEM.

WITH THE ELECTRIC THERMAL DETECTION, A BATTERY BACKUP SYSTEM IS PROVIDED. THE BACKUP BATTERY SYSTEM POWERS THE COREPCB BOARD CONTROLS INCLUDING THE AUTOMATIC DETECTION, PULL STATION/MANUAL ACTUATION DEVICE CIRCUITS, AS WELL AS SUPERVISES THOSE DEVICES AND ANY AUXILIARY SUPERVISORY EQUIPMENT IN THE EVENT OF A LOSS OF POWER TO THE BUILDING.

UPON A FIRE CONDITION, THE ELECTRIC THERMAL DETECTOR CONTACTS WILL CLOSE AND SEND A SUPERVISED SIGNAL TO THE COREPCB BOARD. THE COREPCB BOARD THEN SENDS A SIGNAL TO THE 24VDC REGULATED RELEASE SOLENOID, WHICH WILL SIGNAL PRESSURIZED AGENT TAKES TO PROPEL THE WET CHEMICAL AGENT INTO THE DISTRIBUTION LINES TOWARDS THE DISCHARGE NOZZLES.

FIRE SUPPRESSION SYSTEM DETAILS

REVISIONS	
DESCRIPTION	DATE

CAPTIVE www.captivefire.com

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DATE: 6/19/2024

DWG.#: 6867976

DRAWN BY: AM-32

SCALE: NTS

MASTER DRAWING

SHEET NO. 3

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CAPTIVE FIRE HOOD DRAWINGS FOR REFERENCE ONLY

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PROJECT NUMBER: CAV112

ISSUE	DATE
PERMIT SET	09.24.2024
REVISION 1	11.01.2024
REVISION 2	12.12.2024
CONSTRUCTION SET	02.18.2025

CAPTIVE FIRE HOOD DRAWINGS FOR REFERENCE ONLY

SHEET: **H1.3**

EXHAUST FAN INFORMATION - JOB#6867976

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	EF-1	1	DU85HFA	CAPTIVEAIRE	2381	1.000	1572	TEAO-ECM	1.000	0.6960	1	115	11.6	753 FPM	94	17.2

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	EF-1	1	GREASE BOX
		1	ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION
2	MUA-1	1	2 YEAR PARTS WARRANTY
		1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	TOTAL CFM MONITORING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	SHIP LOOSE GAS STRAINER 3/4"
		1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED
		1	2" MERV 13 FILTERS FOR RTU1 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU1 (QTY. 4)
		1	RTU1 DOWN DISCHARGE
		1	RTU1 CURB DUCT HANGER
		1	120V FIRE INPUT
		1	RTU1 NO RETURN - 100% OA - MPU
		1	RTU FIXED 100% OA INTAKE CONTROL
		1	5 TON MODULATING COOLING OPTION, 208/230V, R410A REFRIGERANT, VARIABLE SPEED COMPRESSOR, DL ECM CONDENSING FAN
		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	UNIT MOUNTED VFD CONFIGURED FOR DCV
		1	LOAD REACTOR MOUNTED IN FAN
1	IBT ONLY REHEAT		
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	EF-1	YES						

CURB ASSEMBLIES

NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	#1	EF-1	41 LBS	CURB	23.000"W X 23.000"L X 24.000"H 0.250:12.000 PITCH ALONG LENGTH, RIGHT VENTED HINGED.
2	#2	MUA-1	103 LBS	CURB	41.000"W X 71.000"L X 20.000"H INSULATED.

HMI SCHEDULE				
UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #2	HMI #1 - UNIT	MOUNTED IN UNIT	NOT AVERAGED	55

CUSTOMER APPROVAL TO MANUFACTURE:

Approved as Noted

Approved with NO Exception Taken

Revise and Resubmit

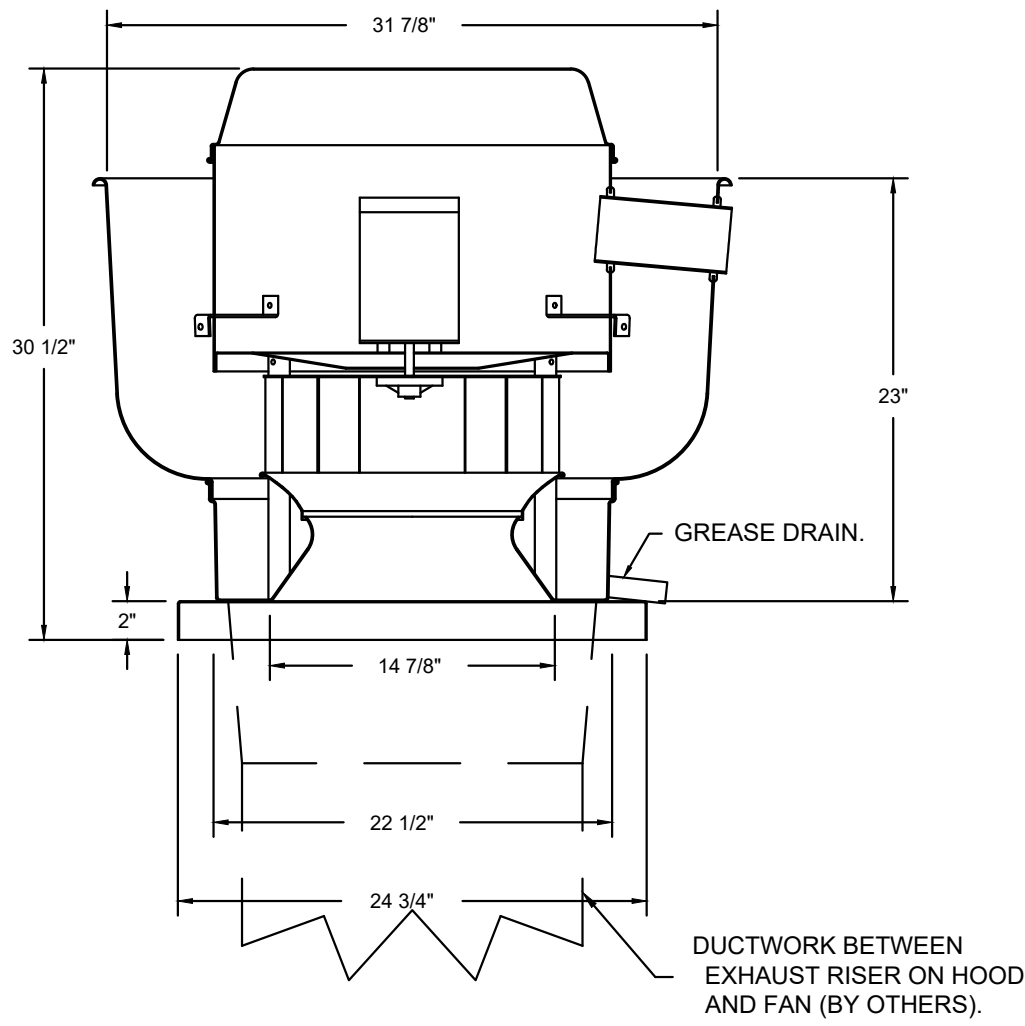
SIGNATURE _____ Date _____

Your Title _____

NOTES

DRAWING CONTAINS IMPORTANT INFORMATION FOR COORDINATION WITH M/E/P ENGINEER

FAN #1 DU85HFA - EXHAUST FAN (EF-1)



FEATURES:

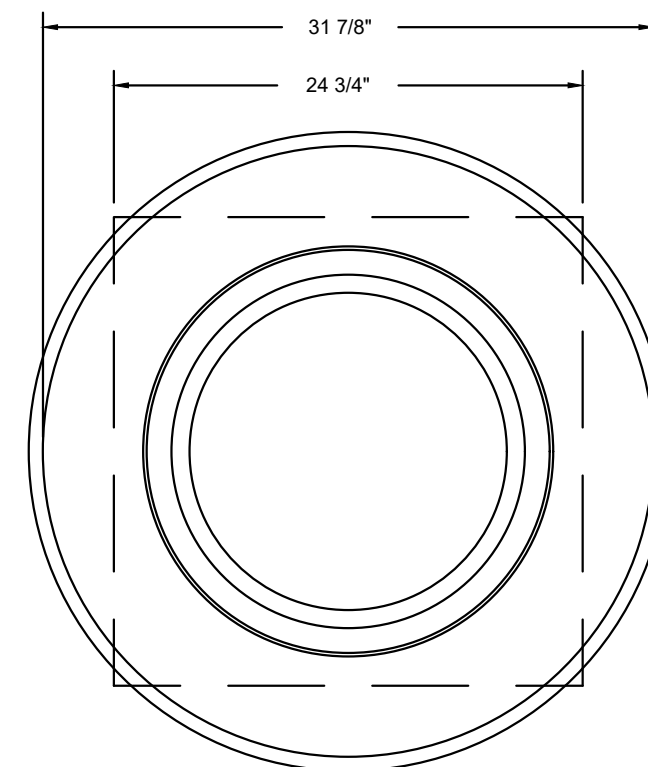
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT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

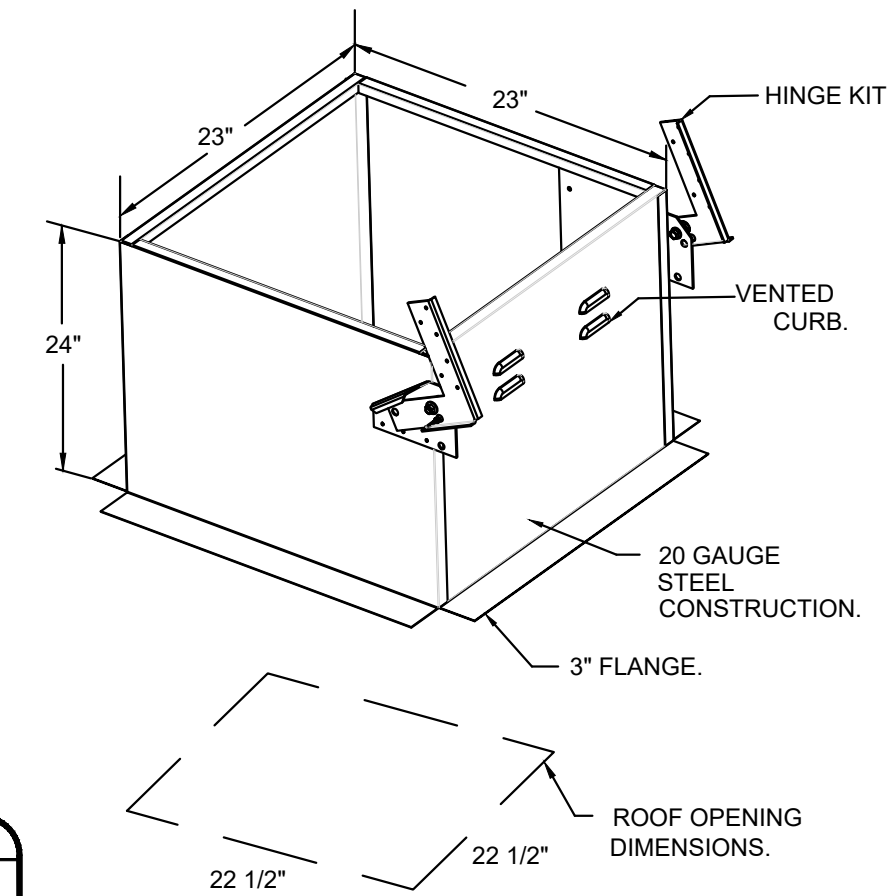
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

OPTIONS

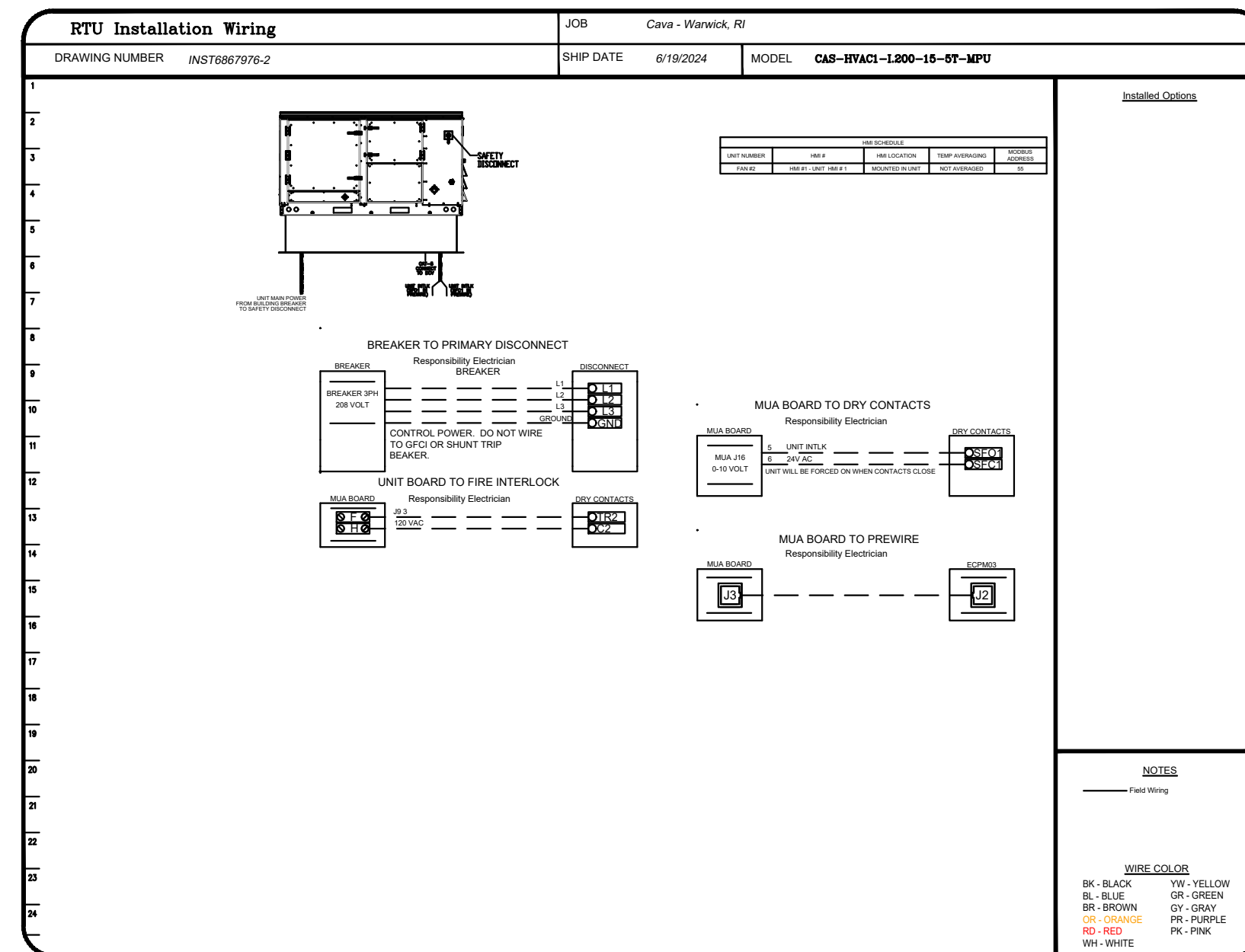
- GREASE BOX.
- ECM WIRING PACKAGE - PWM SIGNAL FROM ECPM03 PREWIRE (TELCO MOTOR), CCW ROTATION.
- 2 YEAR PARTS WARRANTY.



TOP VIEW



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.
SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE.



KITCHEN FAN DETAILS

REVISIONS

DESCRIPTION	DATE

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Cava - Warwick, RI
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DATE: 6/19/2024

DWG.#: 6867976

DRAWN BY: AM-32

SCALE: NTS

MASTER DRAWING

SHEET NO. 4

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PROJECT NUMBER: CAV112

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REVISION 2	12.12.2024
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DOAS/RTU FAN SCHEDULE - JOB#6867976


FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	FAN INFORMATION										ELECTRICAL INFORMATION								COOLING INFORMATION								REHEAT INFORMATION				GAS HEAT INFORMATION				NOTES	
				MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLT	MCA	MOC	OUTSIDE AIR DB	OUTSIDE AIR WB	MIXED AIR DB	MIXED AIR WB	LEAVING AIR DB	LEAVING AIR WB	DP	TOTAL CAPACITY	SENS.	IEER	ISMRE	DISCHARGE DB	DISCHARGE WB	CAPACITY DESIRED	CAPACITY MAX	MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE			
2	MUA-1	1	CAS-HVAC1-I.200-15-5T-MPU	CAPTIVEAIRE	15P-1	0	1976	1976	1189	0.500	2.00	3	208	28.4A	30A	80.3°F	75.6°F	80.3°F	75.6°F	67.8°F	66.4°F	66.4°F	66.8°F	66.4°F	66.4°F	66.8°F	66.4°F	66.4°F	66.8°F	66.4°F	66.4°F	0.2 MBH	35.7 LBS/HR	NATURAL	179940	145751	62°F	7 IN. W.C. - 14 IN. W.C.	1,2,3,4,5,6,7,8,9,10,11,12,13,14

NOTES:

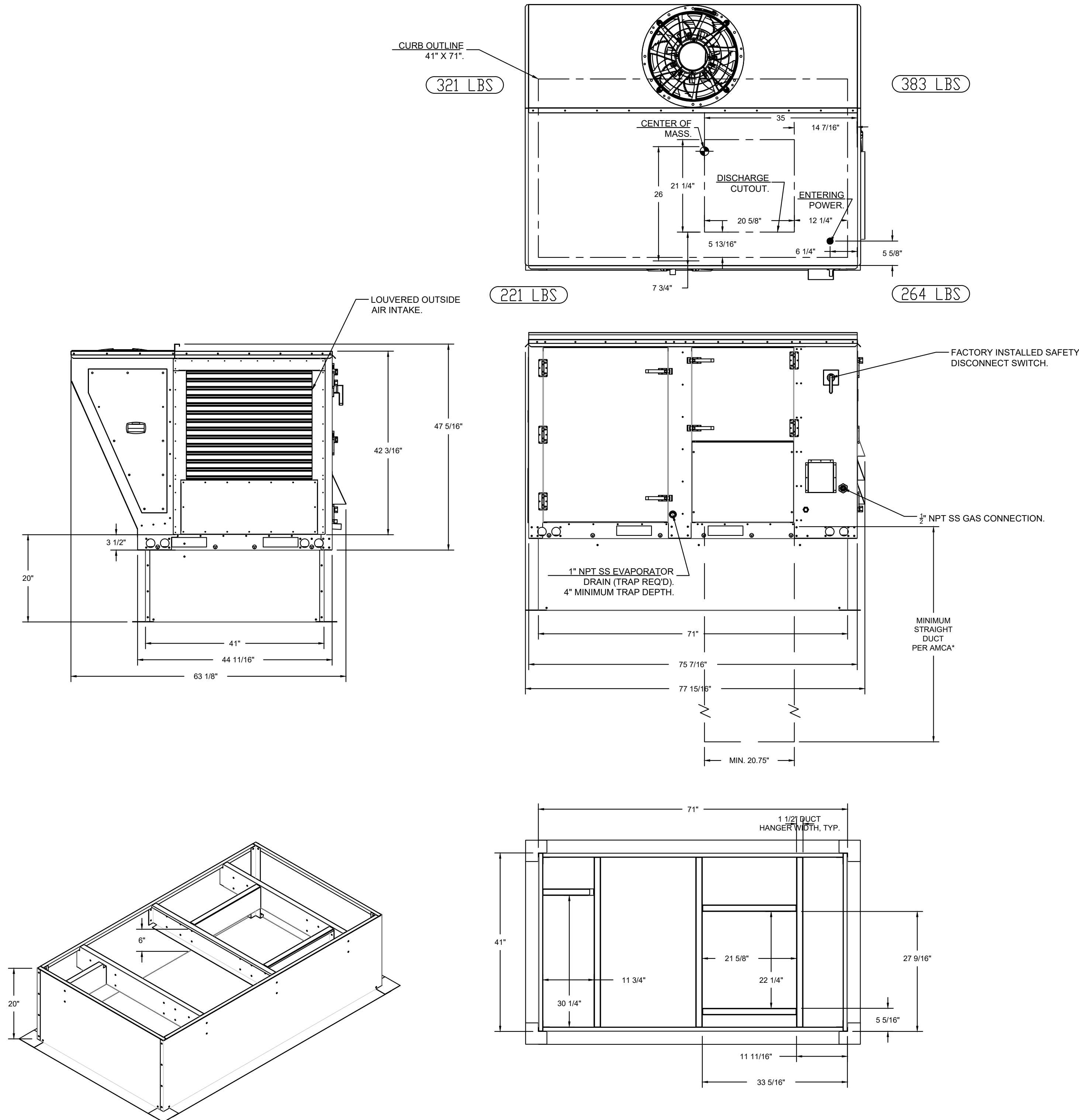
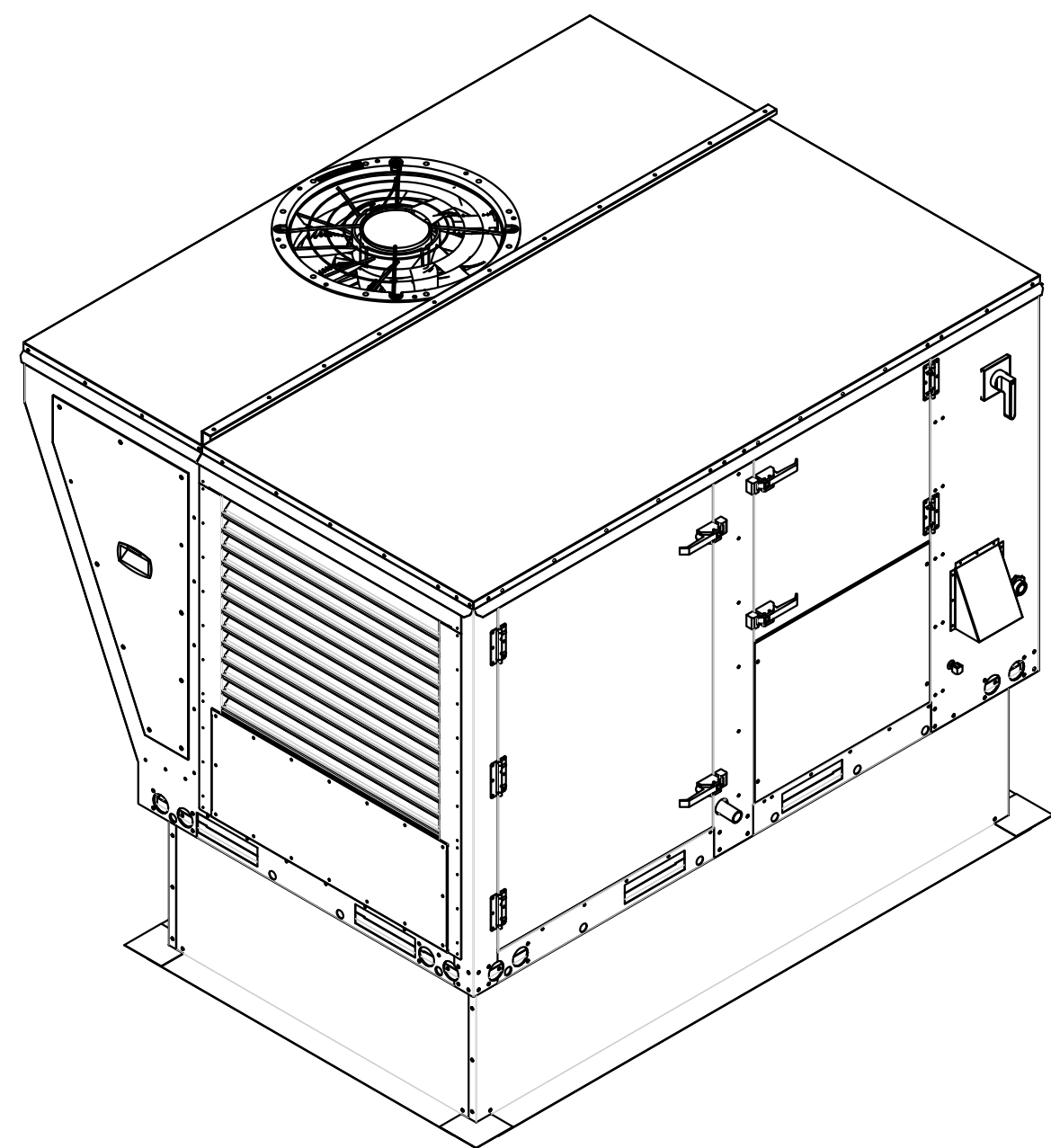
1. INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL
2. DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE
3. INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER
4. REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE 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. 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
11. SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE
12. FULLY MODULATING HOT GAS REHEAT
13. 1" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-4.3 INSULATION-MINIMUM 24GA EXTERIOR W/ 18GA BASE
14. DOWN DISCHARGE NO RETURN

FAN #2 CAS-HVAC1-I.200-15-5T-MPU - HEATER (MUA-1)

NOTES:

1. DO NOT OBSTRUCT OUTSIDE AIR INLET, OUTSIDE AIR COIL OR OUTSIDE AIR FAN.
2.  DENOTES CORNER WEIGHT.
3. ROOF OPENING MUST BE 2" SMALLER THAN CURB DIMENSIONS IN BOTH DIRECTIONS.
4. CONNECTION FROM BREAKER TO UNITS SAFETY DISCONNECT SWITCH TO BE COPPER WIRE ONLY.

*NOTE: SUPPLY DUCT MUST BE INSTALLED TO MEET SMACNA STANDARDS. A MINIMUM STRAIGHT DUCT LENGTH MUST BE MAINTAINED DOWNSTREAM OF UNIT DISCHARGE AS OUTLINED IN AMCA PUBLICATION 201. WHEN USING RECTANGULAR DUCTWORK, ELBOWS MUST BE RADIUS THROAT, RADIUS BACK WITH TURNING VANES. FLEXIBLE DUCTWORK AND SQUARE THROAT/SQUARE BACK ELBOWS SHOULD NOT BE USED. ANY TRANSITION AND/OR TURNS IN THE DUCTWORK WILL CAUSE SYSTEM EFFECT. SYSTEM EFFECT WILL DRASTICALLY INCREASE STATIC PRESSURE AND REDUCE AIRFLOW. DO NOT RELY ON UNIT TO SUPPORT DUCT IN ANY WAY. FAILURE TO PROPERLY SIZE DUCTWORK MAY CAUSE SYSTEM EFFECTS AND REDUCE PERFORMANCE OF THE EQUIPMENT. SUGGESTED STRAIGHT DUCT SIZE IS 20.75" x 21.5".



REVISIONS	
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 SCALE:
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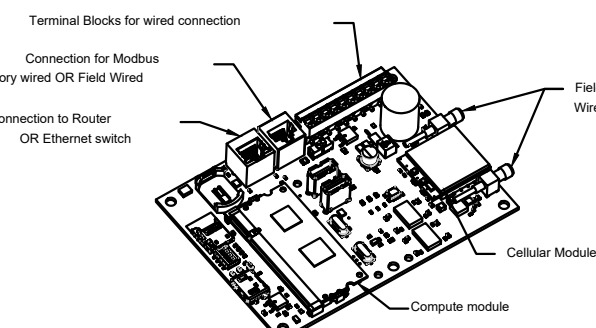
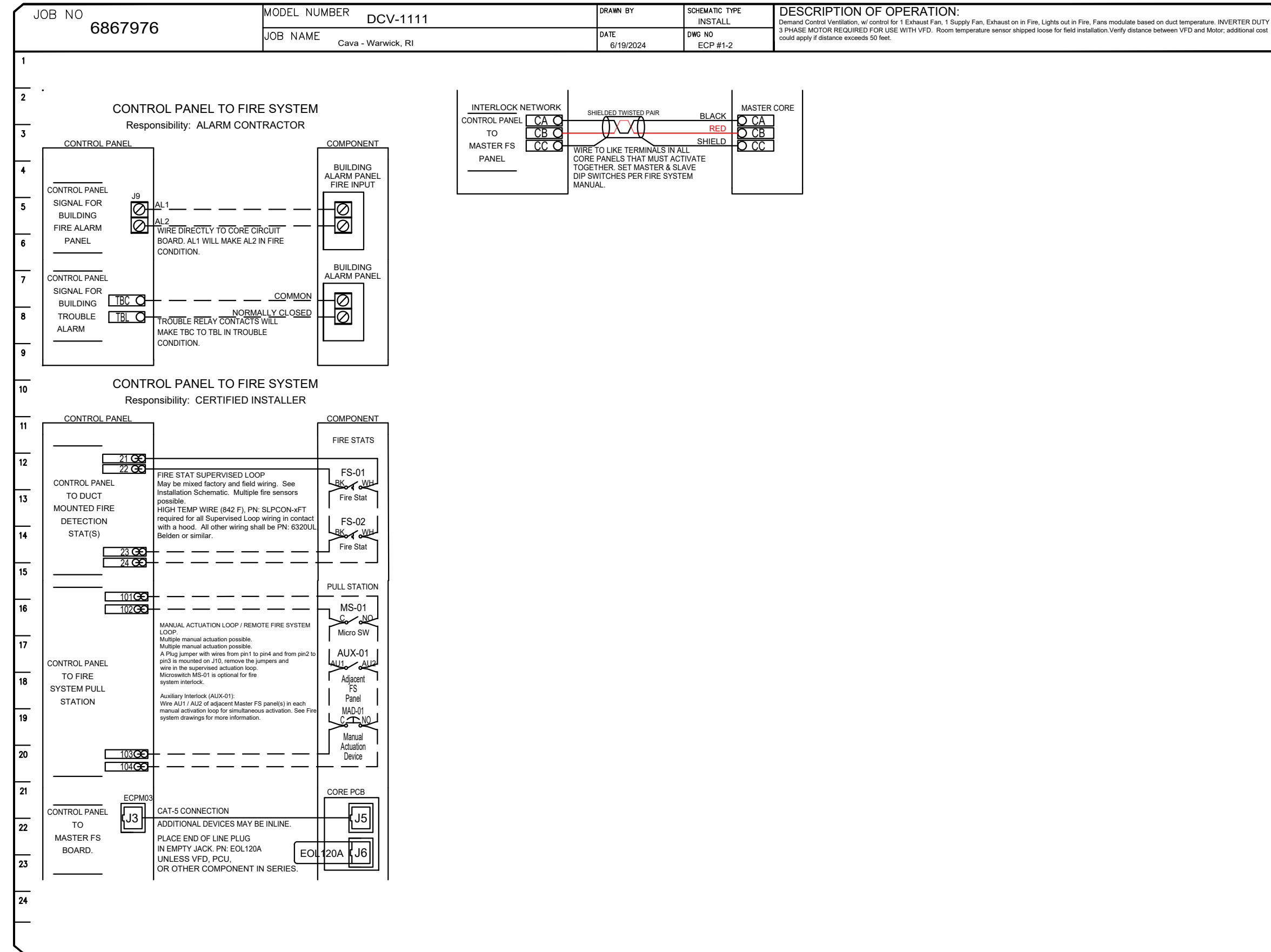
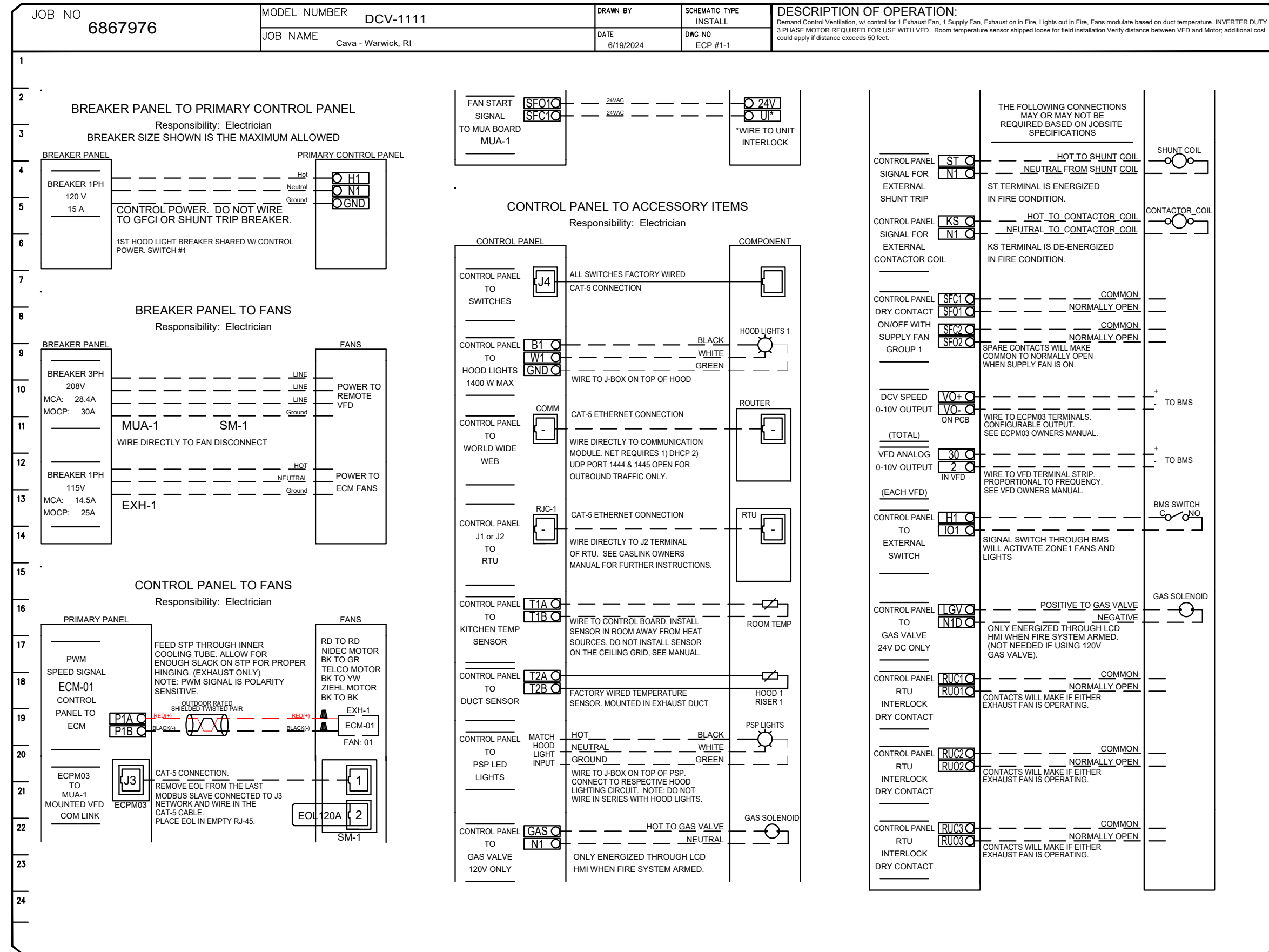
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SHEET:
H1.5

ELECTRICAL PACKAGE -- JOB#6867976

NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	HP	VOLT	FLA	
1		DCV-1111	UTILITY CABINET LEFT	UTILITY CABINET LEFT HOOD # 1	1 LIGHT 1 FAN	SMART CONTROLS DCV	EF-1	EXHAUST	1	1,000	115	11.6
							MUA-1	SUPPLY	3	2,000	208	6.1



CASlink Monitor and Control

Hood control panel to support communications to cloud-based Building Management System. Hood Control Panel to allow cloud-based Building Management System to monitor real time parameters outlined as MONITOR in the points list. Hood Control Panel to allow cloud-based Building Management System to control parameters outlined as CONTROL in the points list. Hood Control Panel to allow cloud-based Building Management System to implement SYSTEM ECONOMIZER control strategies for fully integrated Building Management.

MONITORING AND CONTROL POINTS LIST

DCV Packages	Function	SC Packages	Function
Room Temperature	MONITOR	Room Temperature(s)	MONITOR
Duct Temperature(s)	MONITOR	Duct Temperature(s)	MONITOR
MUA Discharge Temperature	MONITOR	MUA Discharge Temperature	MONITOR
Kitchen RTU Discharge Temperature	MONITOR	Kitchen RTU Discharge Temperature	MONITOR
Fan Speed	MONITOR	Controller Fan(s)	MONITOR
Fan Amperage	MONITOR	Fan Fan(s)	MONITOR
Fan Power	MONITOR	Fan Status	MONITOR
VFD Fan(s)	MONITOR	PCU Fan(s)	MONITOR
Controller Fan(s)	MONITOR	PCU Filter Clog Percentages	MONITOR
Fan Fan(s)	MONITOR	Fire Condition	MONITOR
Fan Status	MONITOR	CO2 Fire System	MONITOR
PCU Fan(s)	MONITOR	Building Pressure	MONITOR
PCU Filter Clog Percentages	MONITOR	Fans Status(s)	MONITOR & CONTROL
Fire Condition	MONITOR	Light Status(s)	MONITOR & CONTROL
CO2 Fire System	MONITOR	Flush Button	MONITOR & CONTROL
Building Pressure	MONITOR		
Prep Time Button	MONITOR & CONTROL		
Fans Button	MONITOR & CONTROL		
Light Button	MONITOR & CONTROL		
Flush Button	MONITOR & CONTROL		

REVISIONS

DESCRIPTION	DATE

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DRAWN BY: AM-32

SCALE: NTS

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SHEET: H1.6

ABBREVIATIONS

[A]	EXISTING TO BE ABANDONED	FPI	FINS PER INCH
[D]	EXISTING TO BE DEMOLISHED	GC	GENERAL TRADES CONTRACTOR
[E]	EXISTING TO REMAIN	ID	INNER DIAMETER
[F]	FUTURE	LAT	LEAVING AIR TEMPERATURE
[R]	EXISTING TO BE RELOCATED	LWT	LEAVING WATER TEMPERATURE
AAV	AUTOMATIC AIR VENT	MAU	MAKEUP AIR UNIT
AFF	ABOVE FINISHED FLOOR	MC	MECHANICAL CONTRACTOR
AHJ	AUTHORITY HAVING JURISDICTION	MFR	MANUFACTURER
AMB	AMBIENT	N/A	NOT APPLICABLE
APD	AIR PRESSURE DROP	NC	NORMALLY CLOSED
BAS	BUILDING AUTOMATIC SYSTEM	NO	NORMALLY OPEN
BFP	BACKFLOW PREVENTER	NTS	NOT TO SCALE
BLDG	BUILDING	OA	OUTSIDE AIR
BOB	BOTTOM OF BEAM	OD	OUTSIDE DIAMETER
BOD	BOTTOM OF DUCT	PD	PRESSURE DROP
BOP	BOTTOM OF PIPE	PRV	PRESSURE REDUCING VALVE
BOS	BOTTOM OF STRUCTURE	RA	RETURN AIR
CL	CENTER LINE	REL	RELIEF AIR
DB	DRY BULB	RTU	ROOFTOP UNIT
DIA	DIAMETER	SA	SUPPLY AIR
DN	DOWN	SCC	SENSIBLE COOLING CAPACITY
EA	EXHAUST AIR	SP	STATIC PRESSURE
EAT	ENTERING AIR TEMPERATURE	TCP	TEMPERATURE CONTROL PANEL
EC	ELECTRICAL CONTRACTOR	TSP	TOTAL STATIC PRESSURE
EF	EXHAUST FAN	TYP	TYPICAL
EFF	EFFICIENCY	UNO	UNLESS NOTED OTHERWISE
EG	ETHYLENE GLYCOL	VFD	VARIABLE FREQUENCY DRIVE
ESP	EXTERNAL STATIC PRESSURE	WB	WET BULB
EWT	ENTERING WATER TEMPERATURE	WG	WATER GAUGE
EXH	EXHAUST	WPD	WATER PRESSURE DROP

MECHANICAL LEGEND

	SUPPLY DUCT UP		PIPING DOWN
	SUPPLY DUCT DOWN		PIPING UP
	RETURN DUCT UP		TURNING VANES
	RETURN DUCT DOWN		VOLUME DAMPER
	FIRE DAMPER		CONDENSATE DRAIN
	SMOKE DAMPER		MOTORIZED DAMPER
	COMB. FIRE/SMOKE DAMPER		REMOTE ANNUNCIATOR
	BACKDRAFT DAMPER		REMOTE TEMP. SENSOR
	SMOKE DETECTOR		THERMOSTAT
	SPIN-IN WITH VOLUME DAMPER		HUMIDISTAT
	45° RETURN DUCT TAP WITH VOL. DAMPER		FLEX DUCT
	DIFFUSER		LINEAR DIFFUSER WITH FLEX CONNECTION
	DIFFUSER WITH FLEX CONNECTION		ROUND DUCT UP
	GRILLE/REGISTER		ROUND DUCT DOWN
	SIDEWALL GRILLE/ REGISTER/ DIFFUSER		REDUCER

GENERAL NOTES:

- A. ALL WORK TO BE PERFORMED TO MEET ALL STATE, CITY & LOCAL CODE REQUIREMENTS.
- B. ALL WALL PATCHING TO BE BY GC.
- C. MC IS TO COORDINATE WITH OTHER TRADES BEFORE INSTALLING DUCTWORK. IF THE MC FAILS TO COORDINATE WITH OTHER TRADES AND THE WORK MUST BE ALTERED THE MC WILL CHANGE IT AT HIS OWN EXPENSE.
- D. COORDINATE THE EXACT LOCATION OF ALL GRILLES, REGISTERS & DIFFUSER WITH ARCHITECTURAL REFLECTED CEILING PLAN.
- E. MECHANICAL CONTRACTOR IS TO VISIT THE SITE PRIOR TO SUBMITTING A BID & INCLUDE IN THE BID ANY ITEMS NECESSARY FOR A COMPLETE & OPERATIONAL SYSTEM.
- F. DRAWINGS ARE SCHEMATIC IN NATURE & MC IS TO INCLUDE ANY ITEMS REQUIRED FOR A COMPLETE & OPERATIONAL SYSTEM WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS.
- G. MC TO FURNISH ALL PERMITS REQUIRED FOR HIS PORTION OF THE WORK.
- H. MC TO COORDINATE WITH ELECTRICAL CONTRACTOR CONCERNING ELECTRICAL REQUIREMENTS BEFORE ORDERING ANY EQUIPMENT.
- I. CONTRACTOR IS RESPONSIBLE FOR ADHERING TO THE ENTIRETY OF THIS DRAWING SET, INCLUDING BUT NOT LIMITED TO: PLANS, ELEVATIONS, DETAILS, SCHEDULES, AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL DRAWINGS OF OTHER TRADES, INCLUDING BUT NOT LIMITED TO, ARCHITECTURAL, PLUMBING, ELECTRICAL, CIVIL, AND STRUCTURAL.
- J. ALL CUTTING AND PATCHING OF ROOF IS TO BE BY GC.

SEQUENCE OF OPERATION

- A. PROVIDE STAND ALONE OR APPLICATION SPECIFIC CONTROLLERS AS REQUIRED TO PERFORM THE FOLLOWING SEQUENCES OF OPERATIONS.
- B. **PACKAGED ROOFTOP UNITS**
 1. UNIT SHALL CONSIST OF SUPPLY AIR FAN, FILTERS, DX COOLING COIL, GAS-FIRED HEAT SECTION, AND A 7-DAY PROGRAMMABLE THERMOSTAT.
 2. PROVIDE AN OVERRIDE SWITCH TO OPERATE THE UNIT DURING UNOCCUPIED HOURS. THIS SWITCH SHALL BE PART OF THE PROGRAMMABLE THERMOSTAT. OVERRIDE SWITCH ALLOWS THE UNIT TO OPERATE FOR TWO HOURS (ADJUSTABLE).
 3. OCCUPIED MODE: BASED ON THE ROOFTOP UNITS HOURS OF OCCUPANCY, START THE UNIT AT THE BEGINNING OF OCCUPANCY AND SHUT DOWN THE UNIT AT THE END OF OCCUPANCY (NOTE: OUTSIDE AIR DAMPER WITHIN THE RTU SHALL OPEN AND THEN THE RTU SHALL START). THE UNIT SHALL START EARLIER AS DETERMINED BY THE PROGRAM FOR EARLY WARM-UP OR COOL DOWN. ON A SYSTEM STARTUP, THE RTU FAN SHALL START AND RUN CONTINUOUSLY AND THE INTERNAL FACTORY CONTROLS SHALL BE ENABLED. BASED ON THE SPACE TEMPERATURE SENSOR, THE UNIT SHALL CYCLE THE HEATING/COOLING TO MAINTAIN THE SPACE TEMPERATURE SETPOINT (COOLING 75 DEGREE F, HEATING 70 DEGREE F)
 - 3.1. ECONOMIZER MODE: WHEN ENTHALPY OF OA IS BELOW 28 BTU/LB. ECONOMIZER MODE SHALL BE ENABLED. ECONOMIZER MODE SHALL LINEARLY MODULATE OUTDOOR AIR CFM FROM MINIMUM OA CFM TO 100% BASED ON ENTHALPY READINGS.
 - 3.2. HUMIDITY CONTROL (WHEN NEEDED BASED ON CLIMATE): UPON DETECTION OF RELATIVE HUMIDITY ABOVE 55%, THE UNIT SHALL CYCLE INTO DEHUMIDIFICATION MODE IF NOT ALREADY IN COOLING.
 4. UNOCCUPIED MODE: THE RTU INTERNAL OA DAMPERS SHALL REMAINED CLOSED WHEN THE BUILDING IS NOT OCCUPIED. THE RTU SHALL STOP HEATING/COOLING AND THE FAN SHALL STOP. IF THE SPACE TEMPERATURE FALLS BELOW 56 DEGREE F (ADJUSTABLE), THE UNIT SHALL START AND HEAT UNTIL THE SPACE TEMPERATURE IS 60 DEGREE F (ADJUSTABLE) AND THEN SHUTDOWN. IF THE SPACE TEMPERATURE RISES ABOVE 85 DEGREE F (ADJUSTABLE), THE UNIT SHALL START AND COOL UNTIL THE SPACE TEMPERATURE IS 80 DEGREE F (ADJUSTABLE) AND THEN SHUTDOWN.
 5. UPON DETECTION OF SMOKE BY UNIT SMOKE DETECTOR BOTH RTUS SHALL SHUT DOWN AND AN ALARM SHALL BE SENT TO THE FIRE ALARM CONTROL PANEL (WHERE APPLICABLE). LOCAL REMOTE ANNUNCIATORS SHALL ALSO BE ACTIVATED.
- C. **KITCHEN HOOD EXHAUST FAN (KEF-1)**
 1. THE KITCHEN HOOD EXHAUST FAN SHALL BE ENABLED WHEN ANY COOKING APPLIANCE LOCATED UNDER ITS RESPECTIVE HOOD, IS IN USE.
- D. **MAKE UP AIR UNIT**
 1. THE MAKE UP AIR UNIT SHALL BE ENABLED WHEN THE KITCHEN HOOD EXHAUST FAN (KEF-1) IS ENERGIZED, THE INTERNAL MOTORIZED DAMPER WITHIN MAU-1 SHALL OPEN AND THE FAN SHALL RUN. IF OA IS LESS THAN 65° (ADJ.), THE MAU-1 GAS-FIRED HEAT SECTION SHALL BE ENABLED TO MAINTAIN A MINIMUM OF 65°.
 2. WHEN KEF-1 IS OFF, MAU-1 SHALL BE DE-ENERGIZED AND THE INTERNAL MOTORIZED DAMPED SHALL CLOSE.
- E. **ANSUL SYSTEM ACTIVATION**
 1. UPON ACTIVATION OF ANSUL SYSTEM, SHUT DOWN MAU-1, RTU-1 AND RTU-2. PROVIDE REALS CONTACTS, INTERLOCKS, TRANSFORMERS AND ALL ASSOCIATED WIRING TO ACCOMPLISH SEQUENCE. MAU-1 IS ALREADY PREWIRED TO SHUT DOWN IN HOOD CONTROL PANEL. MECHANICAL CONTRACTOR SHALL INTERLOCK RTU-1 AND RTU-2 TO ALSO SHUT DOWN.



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GENERAL INFORMATION
MECHANICAL

SHEET:
M000



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

GENERAL NOTES:

- DO NOT PENETRATE KITCHEN EXHAUST HOODS OR DUCTWORK WITH ANY TYPE OF FASTENING ASSEMBLY (I.E. SCREWS, RIVETS).
- IF NOT PAINTED, ALL DUCTWORK SHALL HAVE GASKET A SEAL.
- EXPOSED DUCTWORK IN THE DINING AREA SHALL BE MADE OF ELECTRO-GALVANIZED STEEL (PAINTLOCK). SEE MECHANICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- GC TO PROVIDE ACCESS PANELS IN HARD LID CEILINGS FOR ACCESS TO DUCT MOUNTED SMOKE DETECTORS, SENSOR, BALANCING DAMPERS, ETC. LOCATION OF ACCESS PANEL TO BE CENTERED IN LINE WITH LIGHT FIXTURES AND DIFFUSERS. COORDINATE ACCESS PANEL LOCATIONS WITH ARCHITECTURAL SHEETS.

CODED NOTES: (#)

- MOUNT REGISTER AT 15° ANGLE ON SIDE OF DUCT. ADJUST DIFFUSER BLADES TO 45° PATTERN. BALANCE AIR SCOOP TO CFM INDICATED.
- MOUNT RETURN GRILLE (G2) TIGHT TO BOTTOM OF STRUCTURE.
- ROUTE 10"x10" EXHAUST DUCT UP THROUGH ROOF ABOVE AND CONNECT TO EXHAUST FAN. REFER TO SHEET M201 FOR CONTINUATION. SEAL WEATHER TIGHT.
- INSTALL LED TOUCHSCREEN 24/7 PROGRAMMABLE THERMOSTAT (WITH CONTROLS LOCKED BY CODE) MOUNTED AT 48" AFF. COORDINATE EXACT LOCATION WITH OWNER.
- ROUTE 16" Ø CUSTOM FABRICATED TYPE 1 KITCHEN EXHAUST DUCT FROM EXHAUST HOOD, UP THROUGH ROOF ABOVE AND CONNECT TO KITCHEN EXHAUST FAN. REFER TO SHEET M201 FOR CONTINUATION. COORDINATE WITH KES AND CAPTIVE AIRE DRAWINGS. SEAL WEATHER TIGHT. CONTRACTOR SHALL PROVIDE CLEANOUT EVERY 20' AND AT EVERY CHANGE OF DIRECTION IN TYPE 1 EXHAUST DUCT.
- REMOTE TEMPERATURE AVERAGING SENSOR MOUNTED AT 48" AFF FOR RTU-2. WIRE BACK TO THERMOSTAT AT MANAGERS DESK.
- REMOTE TEMPERATURE SENSOR MOUNTED WITHIN RETURN DUCT FOR RTU-1. WIRE BACK TO THERMOSTAT AT MANAGERS DESK.
- PROVIDE AUDIO/VISUAL REMOTE SMOKE DETECTOR ANNUNCIATOR WITH REMOTE KEY OPERATED RESET FOR SMOKE DETECTOR MOUNTED AT 48" AFF. ALIGN ANNUNCIATOR WITH THERMOSTAT SENSOR WHERE APPLICABLE.
- TYPE 1 GREASE EXHAUST HOOD. REFER TO KES AND CAPTIVE AIRE DRAWINGS FOR ADDITIONAL INFORMATION.
- ROUTE 18"x18" MAKE UP AIR DUCT UP THROUGH ROOF ABOVE AND CONNECT TO MAKE UP AIR UNIT. REFER TO SHEET M201 FOR CONTINUATION. COORDINATE WITH KES AND CAPTIVE AIRE DRAWINGS. SEAL WEATHER TIGHT.
- ROUTE 26"x18" SUPPLY AND RETURN AIR DUCT UP THROUGH ROOF ABOVE AND CONNECT TO ROOF TOP UNIT. REFER TO SHEET M201 FOR CONTINUATION. SEAL WEATHER TIGHT.
- MOUNT SPIRAL DUCT TIGHT TO BOTTOM OF STRUCTURE.
- PROVIDE DUCT MOUNTED SMOKE DETECTOR IN RETURN AIR DUCT. UPON DETECTION OF SMOKE UNIT SHALL DE-ENERGIZE.
- ROUTE 24"x8" SUPPLY AIR DUCT DOWN FROM CEILING SPACE AND CONNECT TO SUPPLY AIR PLENUM ON HOOD. PROVIDE BALANCING DAMPER AND BALANCE TO 390 CFM. REFER TO KES AND CAPTIVE AIRE DRAWINGS FOR ADDITIONAL INFORMATION.
- ROUTE 28"x12" MAKEUP AIR DUCT DOWN FROM CEILING SPACE AND CONNECT TO MAKE UP AIR PLENUM ON HOOD. PROVIDE BALANCING DAMPER AND BALANCE TO 673 CFM. REFER TO KES AND CAPTIVE AIRE DRAWINGS FOR ADDITIONAL INFORMATION.
- PROVIDE AIR CURTAIN ABOVE ENTRANCE DOOR. INSTALL PER MANUFACTURES RECOMMENDATIONS.
- ROUTE 3" COMBUSTION AIR AND FLUE DOWN FROM CEILING SPACE AND CONNECT TO WATER HEATER. INSTALLATION SHALL BE PER MANUFACTURERS RECOMMENDATIONS.
- EXTEND 3" COMBUSTION AIR AND FLUE IN CEILING SPACE. FIELD VERIFY EXACT ROUTING.
- EXTEND 3" COMBUSTION AIR AND FLUE UP TO CONCENTRIC VENT THROUGH ROOF ABOVE. REFER TO SHEET M201 FOR ADDITIONAL INFORMATION.
- PROVIDE BERNER DTU03-2026A AIR CURTAIN ABOVE OPENING IN DRIVER THROUGH WINDOW. INSTALL PER MANUFACTURERS RECOMMENDATIONS. VERIFY EXACT LOCATION WITH GC AND OWNER.
- REMOTE BALANCING DAMPER, TYPICAL FOR BALANCING DAMPERS IN HARD CEILING APPLICATIONS.
- PROVIDE CO2 MEASUREMENT SPECIALISTS RAD-0102-6 REMOTE CO2 STORAGE SAFETY ALARM (OR EQUAL). INSTALL PER MANUFACTURERS RECOMMENDATIONS.



CONSTRUCTION SET

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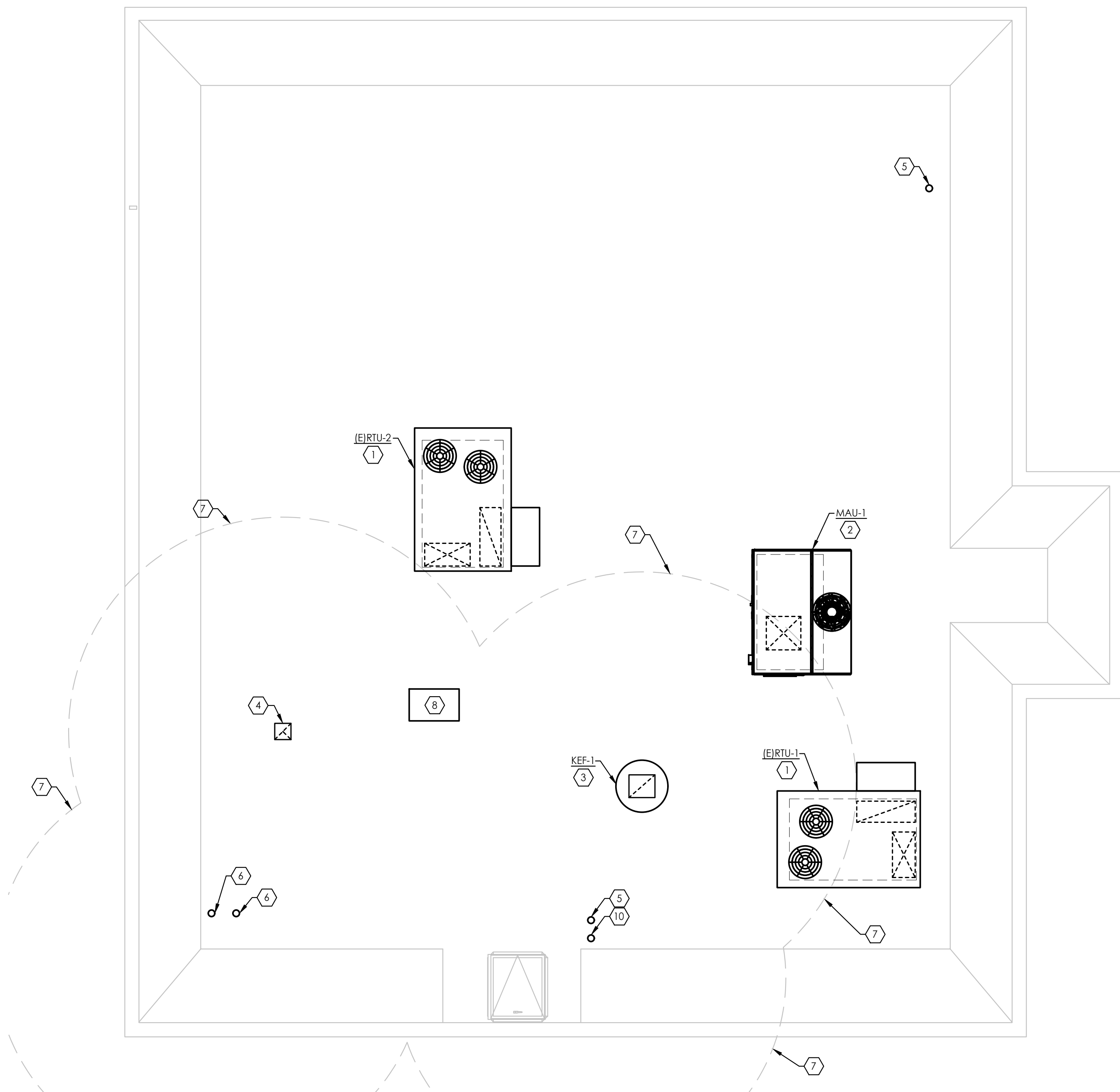
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CAV112

ISSUE	DATE
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REVISION 1	11.01.2024
REVISION 2	12.12.2024
CONSTRUCTION SET	02.18.2025

MECHANICAL PLAN

SHEET:

M101



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

GENERAL NOTES:

- DO NOT PENETRATE KITCHEN EXHAUST HOODS OR DUCTWORK WITH ANY TYPE OF FASTENING ASSEMBLY (I.E. SCREWS, RIVETS).
- IF NOT PAINTED, ALL DUCTWORK SHALL HAVE GASKET A SEAL.
- EXPOSED DUCTWORK IN THE DINING AREA SHALL BE MADE OF ELECTRO-GALVANIZED STEEL (PAINTLOCK). SEE MECHANICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION.

CODED NOTES: #

- ROOFTOP UNIT PROVIDED AND INSTALLED BY LANDLORD.
- INSTALL MAKE-UP AIR UNIT ON MANUFACTURERS ROOF CURB. CONTRACTOR SHALL CUT, PATCH, FLASH, AND AND COUNTER FLASH AROUND ROOF CURB TO MAINTAIN ANY APPLICABLE ROOF WARRANTY.
- INSTALL HOOD EXHAUST FAN ON MANUFACTURERS ROOF CURB. ENSURE LOCATION IS A MINIMUM OF 10' - 0" FROM ANY OUTSIDE AIR INTAKES. CONTRACTOR SHALL CUT, PATCH, FLASH, AND AND COUNTER FLASH AROUND ROOF CURB TO MAINTAIN ANY APPLICABLE ROOF WARRANTY.
- INSTALL 10"x10" EXHAUST DUCT WITH GOOSENECK AND BIRDSCREEN. ENSURE LOCATION IS A MINIMUM OF 10' - 0" FROM ANY OUTSIDE AIR INTAKES. CONTRACTOR SHALL CUT, PATCH, FLASH, AND AND COUNTER FLASH AROUND ROOF PENETRATION TO MAINTAIN ANY APPLICABLE ROOF WARRANTY.
- 4" VENT THROUGH ROOF. CONTRACTOR SHALL ENSURE LOCATION IS A MINIMUM OF 10' - 0" FROM ANY OUTSIDE AIR INTAKES.
- COMBINATION AIR INTAKE AND FLUE EXHAUST FOR WATER HEATER. INSTALL PER MANUFACTURERS RECOMMENDATIONS. CONTRACTOR SHALL ENSURE LOCATION IS A MINIMUM OF 10' - 0" FROM ANY OUTSIDE AIR INTAKES.
- ENSURE TO MAINTAIN 10'-0" CLEARANCE TO OUTSIDE AIR INTAKES.
- GC TO INSTALL WALK-IN COOLER CONDENSER ON ROOF PER MANUFACTURER'S RECOMMENDATIONS.
- 3" VENT THROUGH ROOF FOR GRAVITY GREASE INTERCEPTOR. CONTRACTOR SHALL ENSURE LOCATION IS A MINIMUM OF 10' - 0" FROM ANY OUTSIDE AIR INTAKES.

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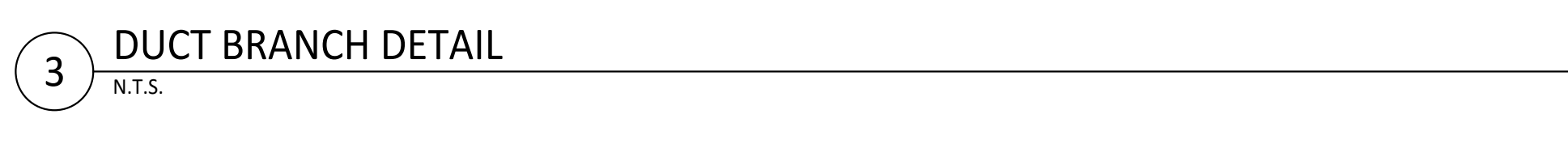
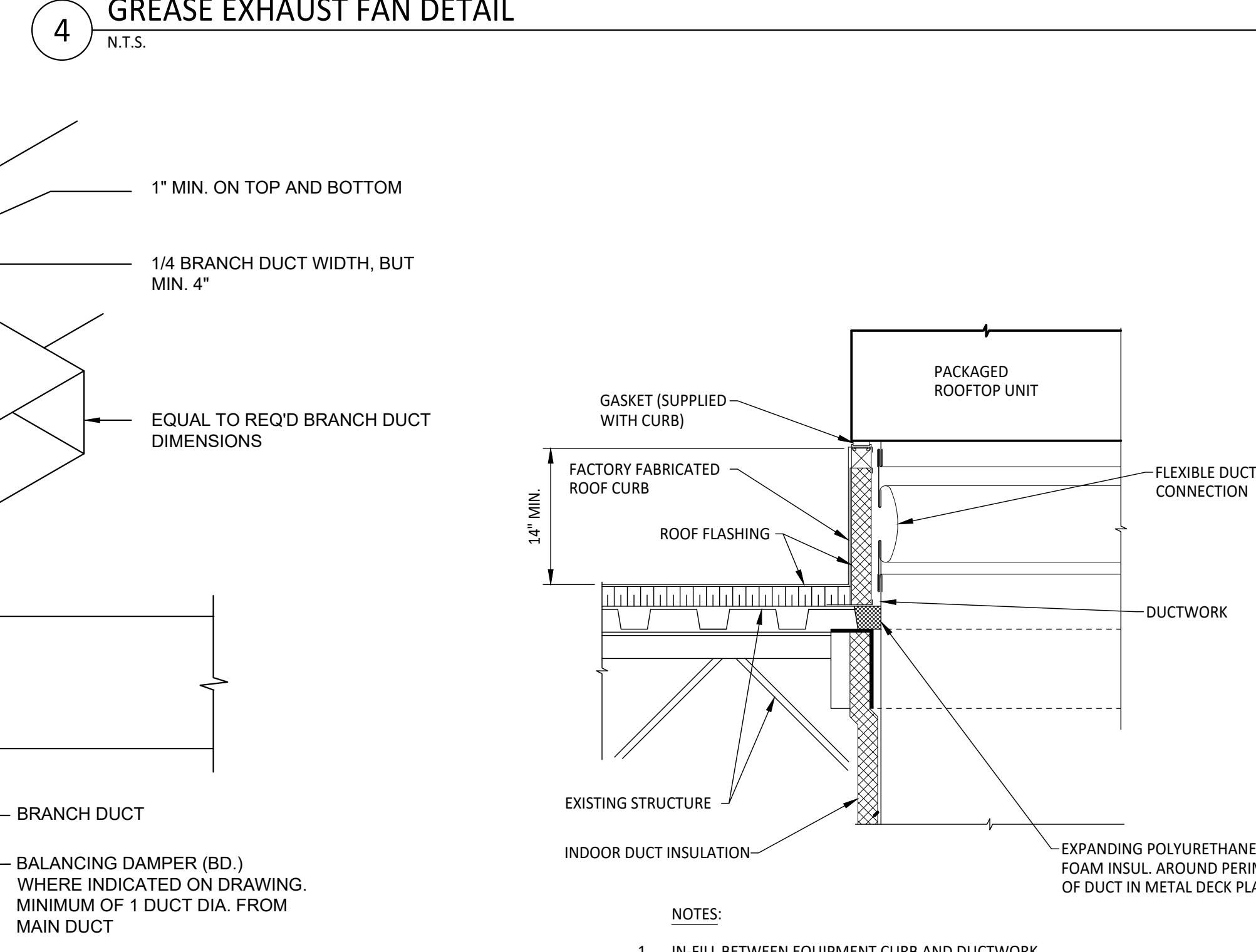
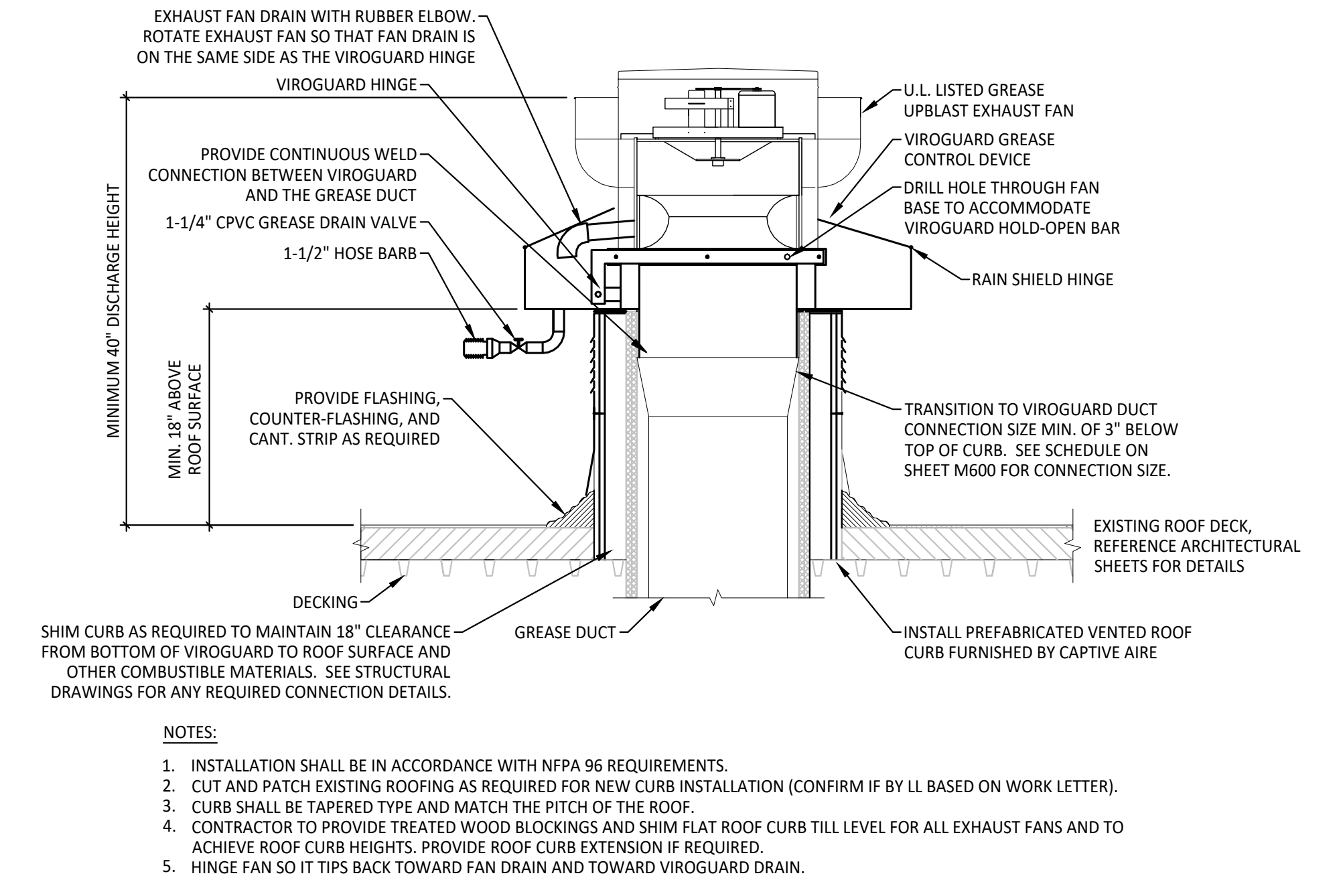
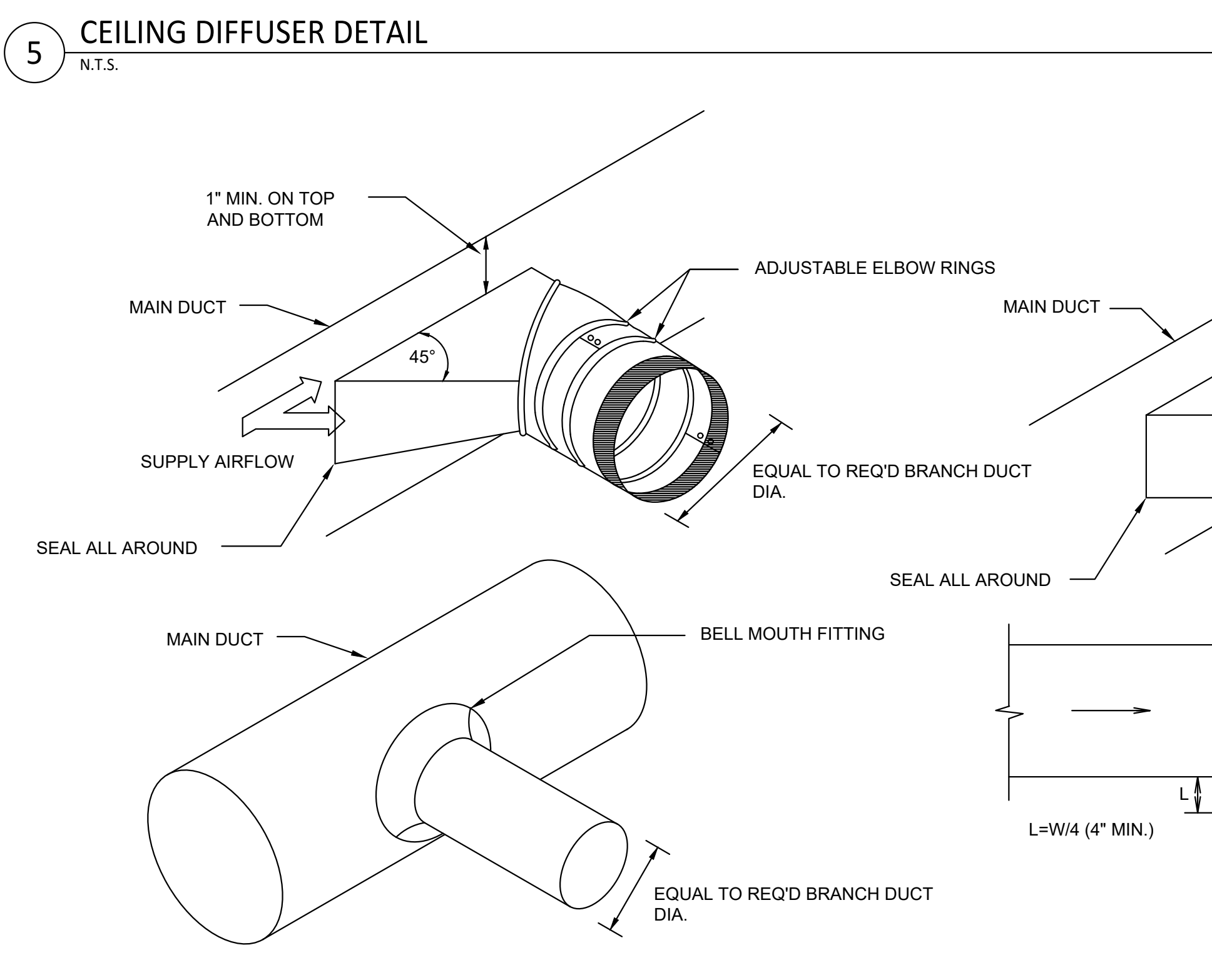
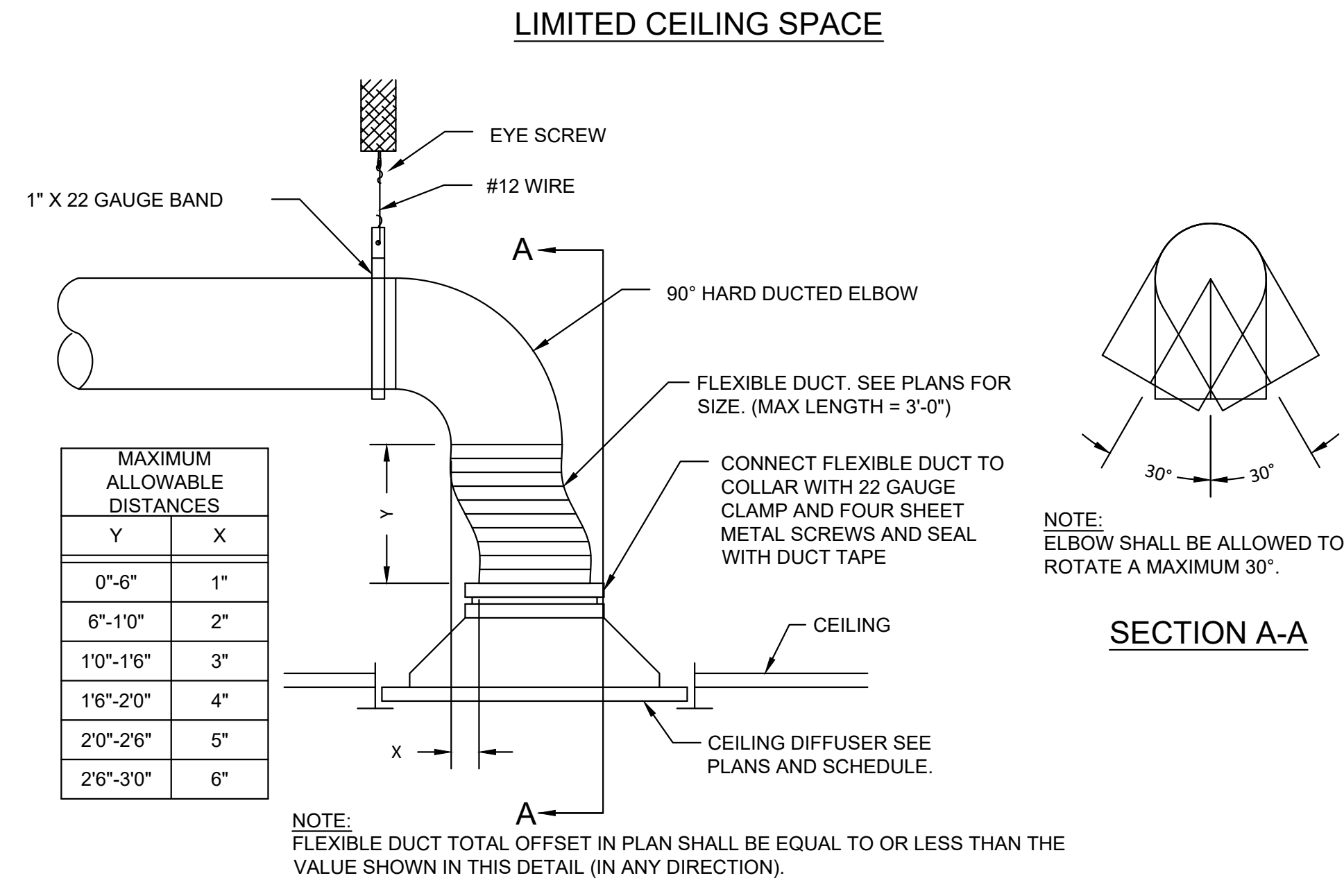
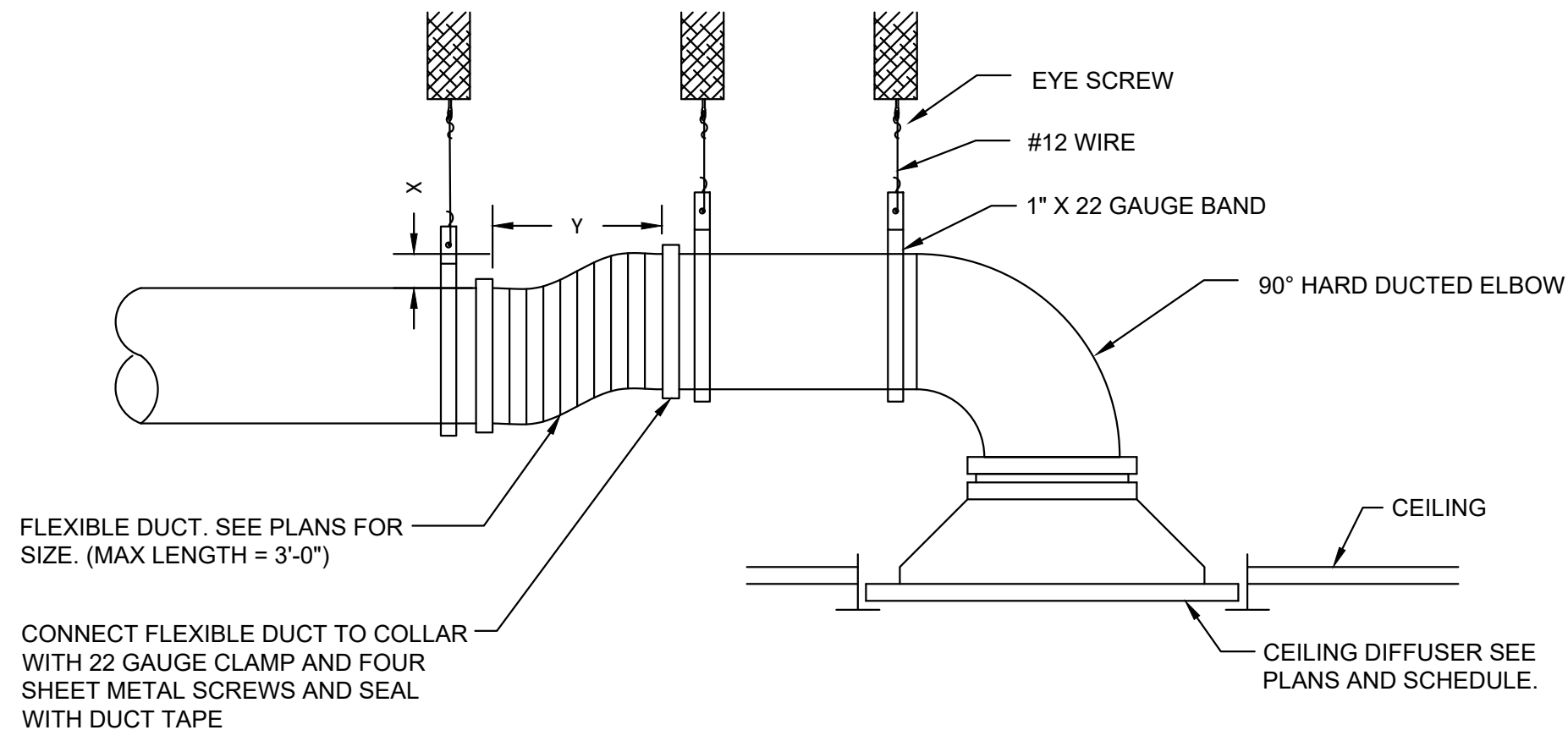
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MECHANICAL ROOF PLAN

SHEET:

M201



3 DUCT BRANCH DETAIL
N.T.S.

4 GREASE EXHAUST FAN DETAIL
N.T.S.

2 PACKAGED ROOFTOP UNIT DETAIL
N.T.S.

1 CONDENSATE DRAIN DETAIL
N.T.S.

ROOFTOP AIR HANDLING UNIT SCHEDULE (PROVIDED BY LANDLORD)																				
OUTSIDE AIR CONDITIONS - SUMMER DB/WB: 90.5/76.6°F, WINTER DB: 16.6°F.																				
UNIT TAG	MANUF.	MODEL	TONS	AIR FLOW				HEATING (MBH)				COOLING (MBH)			COOLING DESIGN		ELECTRIC		WEIGHT (LBS)	NOTES
				CFM	OA MIN	ESP.	MOTOR HP	INPUT	OUTPUT	STAGES	AFUE %	TOTAL	SENS.	EER/SEER	AMBIENT (95°F)	MCA/MOCP	VOLT			
(E)RTU-1	CARRIER	48HCD09	8.5	3,400	300	1.0	3	125/90	103/73	2	82	103.6	81.0	12.0	80db/67wb	45/50	208/3/60	1,300	1,2,3	
(E)RTU-2	CARRIER	48HCD12	10	4,000	685	1.0	3	180/120	148/98	2	82	119.8	92.5	11.5	80db/67wb	58/70	208/3/60	1,350	1,2,3	

NOTES:
1. PROVIDE WITH 14" CURB. FIELD VERIFY EXACT REQUIREMENTS.
2. INCLUDE WITH ENTHAPLY CONTROLLED 100% MODULATING ECONOMIZER, HUMIDIMIZER, POWERED EXHAUST, SMOKE DETECTOR IN RETURN AIR DUCT.
3. PROVIDE WITH HONEYWELL VISIONPRO 8000 TOUCHSCREEN PROGRAMMABLE THERMOSTAT, MODEL TH8320. INTERLOCK WITH REMOTE TEMPERATURE SENSOR.

MAKEUP AIR UNIT SCHEDULE																		
THIS EQUIPMENT HAS BEEN SELECTED AND APPROVED BY CAPTIVEAIRE. ALL INFORMATION PERTINENT TO THIS UNIT SHALL BE THE SOLE RESPONSIBILITY OF CAPTIVEAIRE.																		
UNIT TAG	MODEL	TONS	AIR FLOW				HEATING (MBH)			COOLING (MBH)			COOLING DESIGN		ELECTRICAL		WEIGHT (LBS)	NOTES
			CFM	OA MIN	ESP.	MOTOR HP	INPUT	OUTPUT	AFUE %	TOTAL	SENS.	EER/SEER	AMBIENT (95°F)	MCA/MOCP	VOLT			
MUA-1	CAS-HVAC1-1.200-15-5T-MPU	5	1,976	1,976	0.4	2	180	146	92	66.0	26.4	14.0	80db/67wb	28.4/30	208/3/60	1,285	1	

NOTES: 1. REFER TO KES AND CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION.

KITCHEN HOOD SCHEDULE									
THIS EQUIPMENT HAS BEEN SELECTED AND APPROVED BY CAPTIVEAIRE. ALL INFORMATION PERTINENT TO THESE UNITS SHALL BE THE SOLE RESPONSIBILITY OF CAPTIVEAIRE.									
TAG	MODEL	HOOD LENGTH	MAX. COOKING TEMP.	TOTAL EXHAUST CFM	QTY.	LIGHTS TYPE	MISC.		COMMENTS
							FIRE SUPP. SYSTEM	HANGING WEIGHT (LBS.)	
H-1	6030 ND-2-ACPSP-F	11' - 1"	600°	2381	6	RECESSED ROUND	YES	1308	1

NOTES: 1. REFER TO KES AND CAPTIVEAIRE DRAWINGS FOR ACCESSORY INFORMATION.

EXHAUST FAN SCHEDULE												
BASED ON GREENHECK U.N.O.												
UNIT DATA				PERFORMANCE DATA					MOTOR DATA			
TAG	MODEL	FUNCTION	FAN TYPE	CFM	ESP	DAMPER	BELT OR DIRECT	SONES RATING	HP	VOLT	PH	COMMENTS
KEF-1	DU180HFA	HOOD EXHAUST	UPBLAST	2381	1	--	BELT	13.9	1.00	120	1	1,2
EF-2	SP-A290	RESTROOM EXHAUST	CEILING	125	0.3	BDD	DIRECT	5.3	0.03	120	1	3
EF-3	SP-A290	RESTROOM EXHAUST	CEILING	125	0.3	BDD	DIRECT	5.3	0.03	120	1	3

NOTES:
1. FAN SHALL BE INTERLOCKED WITH HOOD CONTROLS. REFER TO KES AND CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION.
2. PROVIDE FAN WITH ENVIROMATIC VIROGUARD HOOD EXHAUST FAN ROOFTOP CONTAINMENT SYSTEM.
3. FAN SHALL OPERATE ON RESTROOM OCCUPANCY SENSOR, FAN SHALL TURN OFF 1 MINUTE AFTER RESTROOM IS UNOCCUPIED.

GRILLES, REGISTERS, AND DIFFUSERS SCHEDULE									
BASED ON TITUS U.N.O.									
UNIT DATA				PERFORMANCE DATA					
TAG	FUNCTION	MODEL	FACE SIZE	FRAME TYPE	MATERIAL	FINISH	BALANCE DAMPER	MAX N.C.	COMMENTS
D1	SUPPLY	PAS	24" x 24"	LAY-IN	STEEL	WHITE	-	25	1,2
D2	SUPPLY	OMNI	12" x 12"	SURFACE	STEEL	WHITE	-	25	1,4
R1	SUPPLY	S300FS	20" x 6"	DUCT	ALUMINUM	WHITE	AIR SCOOP	25	DUCT SIZE 18" x 6", NOTE 3
L1	SUPPLY	FL-20-22	48" x 4.75"	SURFACE	ALUMINUM	WHITE	-	25	1 SLOT, 2" SLOT WIDTH
G1	RETURN	350RL	24" x 24"	LAY-IN	STEEL	WHITE	-	25	
G2	RETURN	350FS	48" x 24"	SURFACE	STEEL	WHITE	-	25	

NOTES:
1. SUPPLY DIFFUSERS TO BE INSULATED VIA FACTORY SYSTEM.
2. WITH NO INTERNAL DEFLECTOR.
3. COORDINATE PAINT COLOR (PT-104) WITH ARCHITECTURAL SHEETS.
4. INCLUDE WITH BALANCING DAMPER IN NECK.

VENTILATION SCHEDULE													
BASED ON IMC 2015 AND ASHRAE 62.1 - 2010													
SPACE DATA				PEOPLE VENTILATION			AREA VENTILATION			TOTAL			
ROOM	NO.	NAME	RTU	PEOPLE	CFM	AREA	CFM	CFM	CFM	CFM	CFM	CFM	
DINING	100-103	DINING	RTU-2	44	7.5	330	1169	0.18	210	540	RTU-2		
HALL	109	CORRIDOR	RTU-2	0	0	0	69	0.06	4	4			
RESTROOM	110-111	RESTROOM	RTU-2	0	0	0	102	0	0	0			
										545	0.8	681	685

SPACE NAME	ROOM NUMBER	CATEGORY	RTU SERVED BY	OCC.	CFM PER PERSON	CFM TOTAL (PEOPLE)	AREA (SF)	CFM REQUIRED PER SF	CFM TOTAL (AREA)	TOTAL VENTILATION	RTU-1		
BACK OF HOUSE	108	KITCHEN	RTU-1	3	7.5	22.5	345	0.12	41	64			
OFFICE	107	OFFICE	RTU-1	1	5	5	57	0.06	3	8			
KITCHEN	104-106	KITCHEN	RTU-1	9	7.5	67.5	418	0.12	50	118	SYSTEM EFFICIENCY	CORRECTED OA	OA PROVIDED
										190	0.8	237	300

AIR BALANCE SCHEDULE					
COMPONENT	SUPPLY CFM	RETURN CFM	OUTDOOR AIR CFM	EXHAUST CFM	BUILDING PRESSURE
RTU-1	3400	3100	300	-	
RTU-2	4000	3315	685	-	
MAU-1	1976	-	1976	-	
KEF-1	-	-	-	2381	
EF-2	-	-	-	125	
EF-3	-	-	-	125	
TOTAL	9376	6415	2961	2631	330 CFM

AIR CURTAIN SCHEDULE									
UNIT TAG	MANUF.	MODEL	NOZZLE WIDTH	SERVICE	CFM	MOTOR HP	VOLT	WEIGHT (LBS)	NOTES
AC-1	BERNER	AE08-E-1036E	36"	ENTRANCE	951	(1) 1/5	208/1/60	52	1,2
AC-2	BERNER	AE08-E-1072E	72"	ENTRANCE	1,780	(1) 1/5	208/1/60	95	1,2
AC-3	BERNER	AE08-E-1072E	42"	ENTRANCE	1,134	(1) 1/5	208/1/60	58	1,2

NOTES:
1. PROVIDE WITH INTEGRAL DISCONNECT SWITCH AND WALL MOUNTING BRACKET.
2. FINISH TO MATCH STOREFRONT.

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MECHANICAL SCHEDULES

SHEET:

M501

SPECIFICATIONS - DIVISION 23 - HVAC

SECTION 230500 - GENERAL MECHANICAL REQUIREMENTS:

HVAC SUBCONTRACTOR SHALL PROVIDE AT BID TIME A BID TO PROVIDE PREVENTATIVE MAINTENANCE SERVICES FOR ONE YEAR.

FURNISH TO THE OWNER ALL OPERATING & MAINTENANCE MANUALS, RECORD DRAWINGS, TEST & BALANCE REPORT. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER REPRESENTATIVES FOR EMPLOYEE TRAINING REQUIREMENTS FOR ALL EQUIPMENT.

MECHANICAL CONTRACTOR SHALL SUBMIT COMPLIANCE CHECKLIST TO BUILDING OFFICIAL UPON SUBSTANTIAL COMPLETION OF PROJECT. PROVIDE EQUIPMENT INDICATED ON THE DRAWINGS, AND AS REQUIRED FOR A COMPLETE FUNCTIONING SYSTEM.

DEFINITIONS:
FURNISH MEANS TO SUPPLY AND DELIVER TO PROJECT SITE, READY FOR INSTALLATION.
INSTALL MEANS TO PLACE IN POSITION AND MAKE CONNECTIONS FOR SERVICE OR USE.
PROVIDE MEANS TO FURNISH AND INSTALL, COMPLETE AND READY FOR INTENDED USE.

WARRANTY:
PROVIDE LABOR AND MATERIALS TO REPAIR OR REPLACE DEFECTIVE PARTS AND MATERIALS AS REQUIRED FOR ONE YEAR AFTER SUBSTANTIAL COMPLETION OR OWNER ACCEPTANCE OF THE COMPLETED PROJECT. PROVIDE A SEPARATE LINE ITEM DEDUCT AMOUNT ON THE PROPOSAL FORM TO DELETE WARRANTY SERVICE, AT THE OWNER'S OPTION. CONTRACTOR SHALL INCLUDE ONE YEAR WARRANTY ON OWNER FURNISHED EQUIPMENT. CONTRACTOR SHALL INCLUDE COSTS FOR RECEIVING, HANDLING, STORAGE, AND HOISTING OF OWNER FURNISHED EQUIPMENT.

COORDINATION:
COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS. REQUIREMENTS OF THE OWNER, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

DUCT DIMENSIONS:
UNLESS OTHERWISE NOTED, DUCT DIMENSIONS ON THE DRAWINGS ARE INSIDE CLEAR DIMENSIONS.

MAKE-UP AIR UNIT:
UNIT SHALL HAVE AN INTEGRAL DISCHARGE THERMOSTAT LINKED TO THE INTERNAL CONTROLS. THE HEATER SHALL BE SET TO MAINTAIN DUCT SUPPLY TEMPERATURE AT NO LESS THAN 65 DEG. F. (ADJ.).
HIGH LIMIT SWITCH SET TO 180 DEG. F.
INTAKE AIR SENSOR SET TO 10 DEG. F. (ADJ.) LOWER THAN DISCHARGE AIR SENSOR.

TEMPERATURE CONTROLS:
PROVIDE PROGRAMMABLE THERMOSTATS WITH REMOTE TEMPERATURE SENSORS AND REMOTE HUMIDISTS COMPATIBLE WITH ROOFTOP UNIT. CONTROL WIRING SHALL BE INSTALLED IN CONDUIT. THERMOSTAT SHALL MEET SETPOINT ADJUSTMENT FOR LINE CURVED MODE: HEATING DOWN TO 55 DEGREES AND COOLING UP TO 85 DEGREES. PROVIDE INTERLOCK CONTROL WIRING BETWEEN HOOD EXHAUST FANS AND ROOFTOP UNITS.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. SUBMITTALS:

1. CERTIFIED TAB REPORTS.
 2. TAB FIRM QUALIFICATIONS: NBC CERTIFIED.
 3. TAB REPORT FORMS: STANDARD TAB CONTRACTOR'S FORMS APPROVED BY ARCHITECT.
- PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

1. EXAMINE THE CONTRACT DOCUMENTS TO BECOME FAMILIAR WITH PROJECT REQUIREMENTS AND TO DISCOVER CONDITIONS IN SYSTEMS' DESIGNS THAT MAY PRECLUDE PROPER TAB OF SYSTEMS AND EQUIPMENT.
2. EXAMINE THE APPROVED SUBMITTALS FOR HVAC SYSTEMS AND EQUIPMENT.
3. EXAMINE SYSTEMS FOR INSTALLED BALANCING DEVICES, SUCH AS TEST PORTS, GAGE COCKS, THERMOMETER WELLS, FLOW-CONTROL DEVICES, BALANCING VALVES AND FITTINGS, AND MANUAL VOLUME DAMPERS. VERIFY THAT LOCATIONS OF THESE BALANCING DEVICES ARE ACCESSIBLE.
4. EXAMINE SYSTEM AND EQUIPMENT INSTALLATIONS AND VERIFY THAT FIELD QUALITY-CONTROL TESTING, CLEANING, AND ADJUSTING SPECIFIED IN INDIVIDUAL SECTIONS HAVE BEEN PERFORMED.
5. EXAMINE HVAC EQUIPMENT AND FILTERS AND VERIFY THAT BEARINGS ARE GREASED, BELTS ARE ALIGNED AND TIGHT, AND EQUIPMENT WITH FUNCTIONING CONTROLS IS READY FOR OPERATION.
6. EXAMINE TERMINAL UNITS, SUCH AS VARIABLE-AIR-VOLUME BOXES, AND VERIFY THAT THEY ARE ACCESSIBLE AND THEIR CONTROLS ARE CONNECTED AND FUNCTIONING.
7. EXAMINE AUTOMATIC TEMPERATURE SYSTEM COMPONENTS TO VERIFY THE FOLLOWING:
 1. DAMPERS, VALVES, AND OTHER CONTROLLED DEVICES ARE OPERATED BY THE INTENDED CONTROLLER.
 2. DAMPERS AND VALVES ARE IN THE POSITION INDICATED BY THE CONTROLLER.
 3. INTEGRITY OF DAMPERS AND VALVES FOR FREE AND FULL OPERATION AND FOR TIGHTNESS OF FULLY CLOSED AND FULLY OPEN POSITIONS. THIS INCLUDES DAMPERS IN MULTIZONE UNITS, MIXING BOXES, AND VARIABLE-AIR-VOLUME TERMINALS.
 4. AUTOMATIC MODULATING AND SHUTOFF VALVES, INCLUDING TWO-WAY VALVES AND THREE-WAY MIXING AND DIVERTING VALVES, ARE PROPERLY CONNECTED.
 5. THERMOSTATS AND HUMIDISTS ARE LOCATED TO AVOID ADVERSE EFFECTS OF SUNLIGHT, DRAFTS, AND COLD WALLS.
 6. SENSORS ARE LOCATED TO SENSE ONLY THE INTENDED CONDITIONS.
 7. SEQUENCE OF OPERATION FOR CONTROL MODES IS ACCORDING TO THE CONTRACT DOCUMENTS.
 8. CONTROLLER SET POINTS ARE SET AT INDICATED VALUES.
 9. INTERLOCKED SYSTEMS ARE OPERATING.
 10. CHANGEOVER FROM HEATING TO COOLING MODE OCCURS ACCORDING TO INDICATED VALUES.
8. REPORT DEFICIENCIES DISCOVERED BEFORE AND DURING PERFORMANCE OF TEST AND BALANCE PROCEDURES.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

1. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM ACCORDING TO THE PROCEDURES CONTAINED IN AABC'S "NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE", NBC, ASHRAE 111, NEBB'S "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, AND BALANCING OF ENVIRONMENTAL SYSTEMS" OR SMACNA'S "HVAC SYSTEMS - TESTING, ADJUSTING, AND BALANCING" AND IN THIS SECTION.
2. CUT INSULATION, DUCTS, PIPES, AND EQUIPMENT CABINETS FOR INSTALLATION OF TEST PROBES TO THE MINIMUM EXTENT NECESSARY FOR TAB PROCEDURES. AFTER TESTING AND BALANCING, PATCH PROBE HOLES IN DUCTS WITH SAME MATERIAL AND THICKNESS AS USED TO CONSTRUCT DUCTS. INSTALL AND JOIN NEW INSULATION THAT MATCHES REMOVED MATERIALS. RESTORE INSULATION, COVERINGS, VAPOR BARRIER, AND FINISH.
3. MARK EQUIPMENT AND BALANCING DEVICES, INCLUDING DAMPER-CONTROL POSITIONS, VALVE POSITION INDICATORS, FAN-SPEED-CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, WITH PAINT OR OTHER SUITABLE, PERMANENT IDENTIFICATION MATERIAL TO SHOW FINAL SETTINGS.
4. GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS
 1. PREPARE SCHEMATIC DIAGRAMS OF SYSTEMS "AS-BUILT" DUCT LAYOUTS.
 2. FOR VARIABLE-AIR-VOLUME SYSTEMS, DEVELOP A PLAN TO SIMULATE DIVERSITY.
 3. DETERMINE THE BEST LOCATIONS IN MAIN AND BRANCH DUCTS FOR ACCURATE DUCT AIRFLOW MEASUREMENTS.
 4. VERIFY THAT MOTOR STARTERS ARE EQUIPPED WITH PROPERLY SIZED THERMAL PROTECTION.
 5. CHECK FOR AIRFLOW BLOCKAGES.

6. CHECK CONDENSATE DRAINS FOR PROPER CONNECTIONS AND FUNCTIONING.
7. CHECK FOR PROPER SEALING OF AIR-HANDLING UNIT COMPONENTS.
8. CHECK FOR PROPER SEALING OF AIR DUCT SYSTEM.

3.4 TOLERANCES

1. SET HVAC SYSTEM AIRFLOW AND WATER FLOW RATES WITHIN THE FOLLOWING TOLERANCES:
 1. SUPPLY, RETURN, AND EXHAUST FANS AND EQUIPMENT WITH FANS: PLUS OR MINUS 5 PERCENT.
 2. AIR OUTLETS AND INLETS: PLUS OR MINUS 10 PERCENT.

END OF SECTION

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

1. QUALITY ASSURANCE: LABELED WITH MAXIMUM FLAME-SPREAD INDEX OF 25 AND MAXIMUM SMOKE-DEVELOPED INDEX OF 50 ACCORDING TO ASTM E 84.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

1. SURFACE-BURNING CHARACTERISTICS:
 1. INDOOR INSULATION AND RELATED MATERIALS: TO BE FACTORY LABELED DESIGNATING MAXIMUM FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE-DEVELOPED INDEX OF 50 OR LESS ACCORDING TO ASTM E 84.
2. INSULATION MATERIALS
 1. FLEXIBLE ELASTOMERIC: CLOSED-CELL SPONGE-OR EXPANDED-RUBBER MATERIALS. COMPLY WITH ASTM C 534, TYPE I FOR TUBULAR MATERIALS AND TYPE II FOR SHEET MATERIALS.
 2. MINERAL-FIBER BLANKET INSULATION: COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE I.
 1. FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II.
 2. FSK TAPE: FOIL-FACE, VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE; COMPLYING WITH ASTM C 1136.
 3. MINERAL-FIBER, PIPE AND TANK INSULATION: COMPLYING WITH ASTM C 1393, TYPE II OR TYPE IIIA CATEGORY 2, OR WITH PROPERTIES SIMILAR TO ASTM C 612, TYPE IB; AND HAVING FACTORY-APPLIED ASJ JACKET. NOMINAL DENSITY IS 2.5 LB/CU. FT. OR MORE. THERMAL CONDUCTIVITY [K-VALUE] AT 100 DEG F IS 0.29 BTU X IN./H X SQ. FT. X DEG F OR LESS.
 1. ASJ: WHITE, KRAFT-PAPER, FIBERGLASS-REINFORCED SCRIM WITH ALUMINUM-FOIL BACKING; COMPLYING WITH ASTM C 1136, TYPE I.
 2. ASJ TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE, COMPLYING WITH ASTM C 1136.
 4. FLEXIBLE ELASTOMERIC ADHESIVE: COMPLY WITH MIL-A-24179A, TYPE II, CLASS I.
 5. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.
 6. VAPOR-BARRIER MASTIC: WATER BASED; SUITABLE FOR INDOOR AND OUTDOOR USE ON BELOW AMBIENT SERVICES; COMPLY WITH MIL-PRF-19545C, TYPE II.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

1. COMPLY WITH REQUIREMENTS OF THE MIDWEST INSULATION CONTRACTORS ASSOCIATION'S "NATIONAL COMMERCIAL & INDUSTRIAL INSULATION STANDARDS" FOR INSULATION INSTALLATION ON PIPES AND EQUIPMENT.
2. INSULATION INSTALLATION AT INTERIOR WALL AND PARTITION PENETRATIONS (THAT ARE NOT FIRE RATED): INSTALL INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS.
3. INSULATION INSTALLATION AT FIRE-RATED WALL, PARTITION, AND FLOOR PENETRATIONS: INSTALL INSULATION CONTINUOUSLY THROUGH PENETRATIONS. SEAL PENETRATIONS. COMPLY WITH REQUIREMENTS IN SECTION 078400.
4. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION:
 1. SEAL LONGITUDINAL SEAMS AND END JOINTS WITH ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.
 2. INSULATION INSTALLATION ON PIPE FITTINGS AND ELBOWS: INSTALL MITERED SECTIONS OF PIPE INSULATION. SECURE INSULATION MATERIALS AND SEAL SEAMS WITH ADHESIVE TO ELIMINATE OPENINGS IN INSULATION THAT ALLOW PASSAGE OF AIR TO SURFACE BEING INSULATED.
5. MINERAL-FIBER INSULATION INSTALLATION:
 1. INSULATION INSTALLATION ON STRAIGHT PIPES AND TUBES: WHERE VAPOR BARRIERS ARE INDICATED, SEAL LONGITUDINAL SEAMS, END JOINTS, AND PROTRUSIONS WITH VAPOR-BARRIER MASTIC AND JOINT SEALANT.
 2. FOR INSULATION WITH FACTORY-APPLIED JACKETS ON ABOVE AMBIENT SURFACES, SECURE LAPS WITH OUTWARD CLINCHED STAPLES AT 6 INCHES O.C.
 3. FOR INSULATION WITH FACTORY-APPLIED JACKETS ON BELOW AMBIENT SURFACES, DO NOT STAPLE LONGITUDINAL TABS BUT SECURE TABS WITH ADDITIONAL ADHESIVE AS RECOMMENDED BY INSULATION MATERIAL MANUFACTURER AND SEAL WITH VAPOR-BARRIER MASTIC AND FLASHING SEALANT.
 4. BLANKET INSULATION INSTALLATION ON DUCTS AND PLENUMS: SECURE WITH ADHESIVE AND INSULATION PINS.
 5. FOR DUCTS AND PLENUMS WITH SURFACE TEMPERATURES BELOW AMBIENT, INSTALL A CONTINUOUS UNBROKEN VAPOR BARRIER.
6. PLENUMS AND DUCTS REQUIRING INSULATION:
 1. CONCEALED SUPPLY AIR.
 2. CONCEALED AND EXPOSED OUTDOOR AIR.
 3. CONCEALED AND EXPOSED RETURN AIR LOCATED IN NONCONDITIONED SPACE.

3.2 DUCT AND PLENUM INSULATION SCHEDULE

RETAIN "ONE OF" OPTION IN PARAGRAPHS IN THIS ARTICLE TO ALLOW CONTRACTOR TO SELECT PIPING MATERIALS FROM THOSE RETAINED.

1. CONCEALED DUCT INSULATION SHALL BE 1-1/2" THICK MINERAL-FIBER BLANKET WITH A 1.5-LB/CU. FT. NOMINAL DENSITY.

3.3 HVAC PIPING INSULATION SCHEDULE

1. CONDENSATE PIPING: INSULATION SHALL BE 1" THICK FLEXIBLE ELASTOMERIC.
2. REFRIGERANT PIPING: INSULATION SHALL BE 1" THICK FLEXIBLE ELASTOMERIC.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 2 - PRODUCTS

2.1 TUBES AND FITTINGS

1. COPPER TUBE: ASTM B 88, TYPE K OR TYPE L, ANNEALED OR DRAWN-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED OR SOLDERED JOINTS.
 2. WROUGHT-COPPER FITTINGS AND UNIONS: ASME B16.22.
 3. SOLDER FILLER METALS: ASTM B 32. USE 95-5 TIN ANTIMONY OR ALLOY HB SOLDER TO JOIN COPPER SOCKET FITTINGS ON COPPER PIPE.
 4. BRAZING FILLER METALS: AWS A5.8.
 - 2.2 VALVES AND SPECIALTIES
 1. AS REQUIRED BY THE KITCHEN EQUIPMENT MANUFACTURER.
- PART 3 - EXECUTION

3.1 INSTALLATION

1. INSTALL REFRIGERANT PIPING AND CHARGE WITH REFRIGERANT ACCORDING TO ASHRAE 15.
2. INSTALL REFRIGERANT PIPING AS REQUIRED BY THE KITCHEN EQUIPMENT MANUFACTURER.

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

1. COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."
2. STRUCTURAL PERFORMANCE: DUCT HANGERS AND SUPPORTS SHALL WITHSTAND THE EFFECTS OF GRAVITY LOADS AND STRESSES WITHIN LIMITS AND UNDER CONDITIONS DESCRIBED IN SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE".
3. COMPLY WITH NFPA 96 FOR DUCTS CONNECTED TO COMMERCIAL KITCHEN HOODS.
- 2.2 DUCTS
 1. ELECTROGALVANIZED-STEEL SHEET: ASTM A 679
 1. PAINTLOK/PAINTLOCK OR EQUAL.
 2. GENERAL DUCTWORK SHALL BE GALVANIZED STEEL, ASTM A653/A653M, CONSTRUCTED TO THE GAUGE AND CORRESPONDING REINFORCING SCHEDULE AS INDICATED IN THE LATEST EDITION OF SMACNA.
3. TYPE 1 KITCHEN EXHAUST DUCTWORK
 1. FACTORY-BUILT COMMERCIAL KITCHEN GREASE DUCT:
 1. INSTALL REDUCED CLEARANCE, ROUND, DOUBLE-WALL GREASE DUCT AS SPECIFIED MEETING UL 1978 REQUIREMENTS. REFER TO KITCHEN EQUIPMENT SUPPLIER DRAWINGS FOR REQUIREMENTS.
 2. DUCTWORK AND FITTINGS FURNISHED BY OWNER FOR INSTALLATION BY THIS CONTRACTOR.
 3. NO FIRE WRAP SHALL BE REQUIRED FOR THIS INSTALLATION.
4. TYPE 2 KITCHEN EXHAUST DUCTWORK: 18 GAUGE ALUMINUM OR STAINLESS STEEL. SEAMS SHALL BE CONTINUOUSLY WELDED LIQUID TIGHT.
5. JOINT AND SEAM TAPE, AND SEALANT: COMPLY WITH UL 181A. PROVIDE POLYMERIC RUBBER TYPE SEALANT FOR USE ON BOTH INTERIOR LOCATED DUCTWORK AND DUCTWORK EXPOSED TO OUTDOOR CONDITIONS. SEALER SHALL HAVE HIGH BONDING STRENGTH FOR SURE, FIRST TIME SEALING OF JOINTS IN LOW, MEDIUM, AND HIGH PRESSURE DUCT SYSTEMS. SEALER SHALL BE HIGH IN SOLID CONTENT, PROVIDE A TWO PART TAPE SEALING SYSTEM, CONSISTING OF WOVEN FIBER TAPE IMPREGNATED WITH A GYPSUM MINERAL COMPOUND, AND A MODIFIED ACRYLIC/SILICONE ACTIVATOR THAT REACTS EXOTHERMICALLY WITH THE TAPE. TWO PART TAPE SEALING SYSTEM MUST BE RATED FOR BOTH INDOOR AND OUTDOOR APPLICATION. TAPE SHALL NOT CONTAIN ASBESTOS.
6. METAL DUCT FABRICATION: COMPLY WITH SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."

2.3 ACCESSORIES

1. VOLUME DAMPERS AND CONTROL DAMPERS: SINGLE-BLADE AND MULTIPLE OPPOSED-BLADE DAMPERS, STANDARD LEAKAGE RATING, HEAVY DUTY, AND SUITABLE FOR HORIZONTAL OR VERTICAL APPLICATIONS; FACTORY FABRICATED AND COMPLETE WITH REQUIRED HARDWARE AND ACCESSORIES.
2. ROUND VOLUME DAMPERS: PROVIDE MINIMUM 20 GAUGE GALVANIZED STEEL FRAME AND BLADES, MINIMUM 3/8" SQUARE STEEL AXLE, MOLDED SYNTHETIC BEARINGS, WITH LOCKING POSITION REGULATOR. REGULATOR SHALL BE POSITIONED WITH SHEET METAL BRACKET BEYOND DUCT COVERING, WHERE POSITIONING REGULATOR IS NOT ACCESSIBLE. PROVIDE COUPLING AND EXTENSION ROD WITH REGULATOR FOR CEILING OR WALL INSTALLATION, AS REQUIRED.
3. RECTANGULAR VOLUME DAMPERS: PROVIDE MINIMUM 16 GAUGE GALVANIZED STEEL CHANNEL FRAME, 16 GAUGE GALVANIZED STEEL BLADES, MINIMUM 1/2" HEXAGONAL AXLE, BOLDED SYNTHETIC BEARINGS, WITH 3/8" SQUARE PLATED STEEL CONTROL SHAFT. LINKAGES SHALL BE CONCEALED IN THE FRAME. OPERATING SHAFT SHALL EXTEND BEYOND FRAME AND DUCT TO A LOCKING QUADRANT WITH ADJUSTABLE LEVER. MAXIMUM BLADE WIDTH SHALL NOT EXCEED 6".
4. FLEXIBLE DUCT CONNECTORS: FLAME-RETARDED OR NONCOMBUSTIBLE FABRICS, COATINGS, AND ADHESIVES COMPLYING WITH UL 181, CLASS 1, CONNECTOR TO BE 30 OUNCE, NEOPRENE COATED, FIBERGLASS FABRIC.
5. FLEXIBLE DUCTS: FACTORY ASSEMBLED, UL 181, CLASS 1, WITH 1-1/2-INCH THICK (R-5 MIN.), 1 PCF FIBERGLASS INSULATION AND REINFORCED OUTER PROTECTIVE COVER/VAPOR BARRIER. FLEXIBLE DUCT SHALL MEET NFPA 90A WITH FLAME SPREAD UNDER 25, SMOKE DEVELOPED UNDER 50, AND SHALL BE RATED FOR MINIMUM 2-INCH WG PRESSURE AND 0 TO 250°F TEMPERATURE. PROVIDE SCREW-OPERATED METAL ADJUSTABLE CLAMPING DEVICES, USE TWIST-LOCK CONICAL TAP COLLARS AT CONNECTIONS INTO SHEET METAL DUCTWORK. MAXIMUM EXTENDED LENGTH OF FLEXIBLE DUCT SHALL NOT EXCEED 5 FEET.
6. TURNING VANES: PROVIDE FABRICATED TURNING VANES AND VANE RUNNERS, CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS". PROVIDE TURNING VANES CONSTRUCTED OF CURVED BLADES, SUPPORTED WITH BARS PERPENDICULAR TO BLADES, AND SET INTO SIDE STRIPS SUITABLE FOR MOUNTING IN DUCTWORK. FOLLOW SMACNA GUIDELINES FOR SPACING SUPPORT, AND CONSTRUCTION. ALL BLADES SHALL BE DOUBLE THICKNESS AIRFOIL TYPE.
7. BIRD SCREENS AND FRAMES: PROVIDE BIRD SCREENS THAT CONFORM TO ASTM E 2016, NO. 2 MESH, ALUMINUM OR STAINLESS STEEL. PROVIDE "MEDIUM-LIGHT" RATED ALUMINUM SCREENS. PROVIDE "LIGHT" RATES STAINLESS STEEL SCREENS.
8. DUCT-MOUNTED ACCESS DOORS: FABRICATE ACCESS PANELS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE"; FIGURES 2-10, "DUCT ACCESS DOORS AND PANELS," AND 2-11, "ACCESS PANELS - ROUND DUCT."

PART 3 - EXECUTION

3.1 INSTALLATION

1. INSTALL DUCTWORK, ACCESSORIES, AND SUPPORTS ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE" UNLESS OTHERWISE INDICATED.
2. SEAL DUCTS TO THE FOLLOWING SEAL CLASSES ACCORDING TO SMACNA'S "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE": 1-INCH WG, SEAL CLASS A.
3. AVOID PASSING THROUGH OR ABOVE ELECTRICAL EQUIPMENT SPACES AND ENCLOSURES.
4. CLEAN DUCT SYSTEMS BEFORE TESTING, ADJUSTING, AND BALANCING.
- 3.2 DUCTWORK SCHEDULE
 1. EXPOSED DUCTWORK IN ARCHITECTURALLY FINISHED SPACES- ELECTRO-GALVANIZED STEEL SHEET.
 2. CONCEALED DUCTWORK AND DUCTWORK IN UNFINISHED ARCHITECTURAL SPACES- GALVANIZED STEEL.

END OF SECTION

SECTION 233423 - HVAC EXHAUST FANS

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

1. PRODUCTS SHALL BE LICENSED TO USE THE AMCA-CERTIFIED RATINGS SCALE.
2. EXHAUST FANS SHALL COMPLY WITH UL 705, TYPE 1 FANS SHALL ALSO COMPLY WITH UL 762.
3. TYPE 1 FANS TO BE DESIGNED FOR HIGH HEAT OPERATION AT 300°F.
4. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
- 2.2 CENTRIFUGAL VENTILATORS
 1. HOUSING: REMOVABLE, SPUN-ALUMINUM, DOME TOP AND OUTLET BAFFLE; SQUARE, ONE-PIECE, ALUMINUM BASE WITH VENTURI INLET CONE.
 1. UPBLAST UNITS: ALUMINUM DISCHARGE BAFFLE TO DIRECT DISCHARGE AIR UPWARD, WITH RAIN AND SNOW DRAINS.
 2. FAN WHEELS: ALUMINUM HUB AND WHEEL WITH BACKWARD-INCLINED BLADES.

C. BELT-DRIVEN DRIVE ASSEMBLY: RESILIENTLY MOUNTED TO HOUSING.

1. FAN SHAFT: TURNED, GROUND, AND POLISHED STEEL; KEYS TO WHEEL HUB.
 2. SHAFT BEARINGS: PERMANENTLY LUBRICATED, PERMANENTLY SEALED, SELF-ALIGNING BALL BEARINGS.
 3. PULLEYS: CAST-IRON, ADJUSTABLE-PITCH MOTOR PULLEY.
 4. FAN AND MOTOR ISOLATED FROM EXHAUST AIRSTREAM.
- D. ACCESSORIES:
1. DISCONNECT SWITCH: NON-FUSIBLE TYPE, WITH THERMAL-OVERLOAD PROTECTION, FACTORY WIRED THROUGH AN INTERNAL ALUMINUM CONDUIT.
 2. BIRD SCREENS: REMOVABLE, 1/2-INCH MESH, ALUMINUM OR BRASS WIRE.
 3. DAMPERS: COUNTERBALANCED, PARALLEL-BLADE, BACKDRAFT DAMPERS MOUNTED IN CURB BASE; FACTORY SET TO CLOSE WHEN FAN STOPS.
 4. MOTORIZED DAMPERS: PARALLEL-BLADE DAMPERS MOUNTED IN CURB BASE WITH ELECTRIC ACTUATOR; WIRED TO CLOSE WHEN FAN STOPS.
- E. ROOF CURBS: 20 GAUGE GALVANIZED STEEL; MITERED AND WELDED CORNERS; 1-1/2-INCH THICK, RIGID, FIBERGLASS INSULATION ADHERED TO INSIDE WALLS; AND 1-1/2-INCH WOOD NAILER. SIZE AS REQUIRED TO SUIT ROOF OPENING AND FAN BASE.
1. CONFIGURATION: SELF-FLASHING WITHOUT A CANT STRIP, WITH MOUNTING FLANGE.
 2. OVERALL HEIGHT: 12 INCHES FOR GENERAL EXHAUST FANS; 20 INCHES FOR KITCHEN EXHAUST FANS.
 3. MOUNTING: MANUFACTURE CURB FOR ROOF SLOPE.
 4. MOUNTING PEDESTAL: GALVANIZED STEEL WITH REMOVABLE ACCESS PANEL.
 5. TYPE 1 ROOF CURBS TO BE VENTED TYPE.
 6. TYPE 1 AND TYPE 2 ROOF CURBS TO BE HINGED TYPE.
- F. CAPACITIES AND CHARACTERISTICS:
1. SEE SCHEDULE.
- G. MOTORS
- A.A. COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, ENCLOSURE TYPE, AND EFFICIENCY REQUIREMENTS FOR MOTORS.
- 1.1. MOTOR SIZES: MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.
 - A.B. ENCLOSURE TYPE: TOTALLY ENCLOSED, FAN COOLED.

PART 3 - EXECUTION

3.1 INSTALLATION

1. INSTALL UNITS WITH CLEARANCES FOR SERVICE AND MAINTENANCE.
2. ROOF-MOUNTED UNITS: INSTALL ROOF CURB ON ROOF STRUCTURE, ACCORDING TO ARI GUIDELINE B. INSTALL AND SECURE ROOF-MOUNTED FANS ON CURBS, AND COORDINATE ROOF PENETRATIONS AND FLASHING WITH ROOF CONSTRUCTION.

END OF SECTION

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS, AND GRILLES:

1. REFER TO SCHEDULES FOR FINISH TYPE, COLOR, MATERIAL, AND MOUNTING.

PART 3 - EXECUTION

3.1 INSTALLATION

1. INSTALL DIFFUSERS, REGISTERS, AND GRILLES LEVEL AND PLUMB.
 2. CEILING-MOUNTED OUTLETS AND INLETS: DRAWINGS INDICATE GENERAL ARRANGEMENT OF DUCTS, FITTINGS, AND ACCESSORIES. MAKE FINAL LOCATIONS WHERE INDICATED, AS MUCH AS PRACTICAL. FOR UNITS INSTALLED IN LAY-IN CEILING PANELS, LOCATE UNITS IN THE CENTER OF PANEL UNLESS OTHERWISE INDICATED. WHERE ARCHITECTURAL FEATURES OR OTHER ITEMS CONFLICT WITH INSTALLATION, NOTIFY ARCHITECT FOR A DETERMINATION OF FINAL LOCATION.
 3. AFTER INSTALLATION, ADJUST DIFFUSERS, REGISTERS, AND GRILLES TO AIR PATTERNS INDICATED, OR AS DIRECTED, BEFORE STARTING AIR BALANCING.
2. END OF SECTION

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CONSTRUCTION
SET

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MECHANICAL SPECIFICATIONS

SHEET:

M701

SPECIFICATIONS - DIVISION 23 - HVAC (CONTINUED)

SECTION 237339 - DIRECT-FIRED MAKE-UP AIR UNIT

PART 2 - PRODUCTS

2.1 PACKAGED UNITS

- A. FACTORY-ASSEMBLED, PREWIRED, SELF-CONTAINED UNIT CONSISTING OF CABINET, SUPPLY FAN, CONTROLS, FILTERS, AND DIRECT-FIRED GAS FURNACE TO BE INSTALLED OUTSIDE THE BUILDING.

2.2 CABINET

- A. CABINET: GALVANIZED-STEEL PANELS WITH LIFTING LUGS. CABINET SHALL BE FULLY WEATHERIZED FOR OUTDOOR INSTALLATION. HEAT-RESISTANT, BAKED-ENAMEL FINISH. VERTICAL-PATTERN, GALVANIZED-STEEL DISCHARGE PLENUM WITH DIFFUSERS INCORPORATING INDIVIDUALLY ADJUSTABLE VANES.

- B. ROOF CURB: FULL-PERIMETER CURB OF SHEET METAL, MINIMUM 20 INCHES HIGH, WITH WOOD NAILER, NEOPRENE SEALING STRIP, AND WELDED Z-BAR FLASHING.

- C. OUTDOOR-AIR INTAKE: GALVANIZED-STEEL HOOD WITH RAIN BAFFLES, BIRD SCREEN, AND FINISH TO MATCH CABINET; AND SIZED TO SUPPLY 100 PERCENT OUTDOOR AIR. GALVANIZED-STEEL, OPPOSED-BLADE MOTORIZED DAMPERS WITH VINYL BLADE SEALS AND STAINLESS-STEEL JAMB SEAL.

- D. FILTERS: COMPLY WITH NFPA 90A; 1 INCH THICK.

2.3 SUPPLY-AIR FAN

- A. FAN: CENTRIFUGAL, RATED ACCORDING TO AMCA 210; STATICALLY AND DYNAMICALLY BALANCED, GALVANIZED STEEL; MOUNTED ON SOLID-STEEL SHAFT.

- B. MOTOR: TOTALLY ENCLOSED, SINGLE SPEED MOTOR.

- C. DRIVE: V-BELT DRIVE WITH MATCHING FAN PULLEY AND ADJUSTABLE MOTOR SHEAVES AND BELT ASSEMBLY.

- D. GAS PRESSURE GAUGE: 2-1/2 INCH DIAMETER AND 1/4 INCH THREAD SIZE.

2.4 DIRECT-FIRED GAS FURNACE

- A. DESCRIPTION: FACTORY ASSEMBLED, PIPED, AND WIRING; AND COMPLYING WITH ANSI Z83.4, ANSI Z83.18, AND NFPA 54. CAST-IRON BURNER WITH STAINLESS-STEEL MIXING PLATES. SINGLE-STAGE CONTROL VALVE. FUEL: NATURAL GAS.

- B. SAFETY CONTROLS: AIRFLOW PROVING SWITCH; HIGH-TEMPERATURE LIMIT; SAFETY LOCKOUT; REDUNDANT, AUTOMATIC, MAIN GAS VALVES; ELECTRIC PILOT VALVE; MODULATING TEMPERATURE CONTROL VALVE; MAIN AND PILOT GAS REGULATORS; MAIN AND PILOT MANUAL SHUTOFF VALVES; MAIN AND PILOT PRESSURE TAPS; AND HIGH-LOW GAS PRESSURE SWITCHES TO COMPLY WITH ANSI STANDARDS.

2.5 CONTROLS

- A. FACTORY-WIRED, FUSE-PROTECTED CONTROL TRANSFORMER, CONNECTION FOR POWER SUPPLY AND FIELD-WIRED UNIT TO REMOTE CONTROL PANEL.

- 1. FAN CONTROL: INTERLOCK FAN TO START WITH EXHAUST FAN(S) AND WITH RTU COOLING CYCLE.

- 2. OUTDOOR-AIR DAMPER CONTROL: OUTDOOR-AIR DAMPER OPENS WHEN SUPPLY FAN STARTS, AND CLOSES WHEN FAN STOPS.

- 3. TEMPERATURE CONTROL: OPERATES GAS VALVE TO MAINTAIN SUPPLY-AIR TEMPERATURE.

2.6 INSTALLATION

- A. INSTALL GAS-FIRED UNITS ACCORDING TO NFPA 54.

- B. INSTALL ROOF CURB ON ROOF STRUCTURE, ACCORDING TO ARI GUIDELINE B OR NRCA'S "LOW-SLOPE MEMBRANE ROOFING CONSTRUCTION DETAILS MANUAL."

- C. CONNECT GAS PIPING WITH SHUTOFF VALVE AND UNION AND WITH SUFFICIENT CLEARANCE FOR BURNER REMOVAL AND SERVICE.

- D. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF DUCTS. CONNECT SUPPLY DUCTS TO DIRECT-FIRED MAU WITH FLEXIBLE DUCT CONNECTORS; FLEXIBLE DUCT CONNECTORS ARE SPECIFIED IN SECTION 233100 "HVAC DUCTS AND CASINGS."

END OF SECTION

SECTION 237413 - PACKAGED ROOFTOP UNITS

1.1 SUMMARY

- A. THIS SECTION INCLUDES PACKAGED, ROOFTOP UNITS WITH THE FOLLOWING COMPONENTS AND ACCESSORIES:

- 1. DIRECT-EXPANSION COOLING.
- 2. HUMIDITY CONTROL WITH HOT-GAS REHEAT (OPTIONAL)
- 3. GAS FURNACE.
- 4. ECONOMIZER OUTDOOR-AND RETURN-AIR DAMPER SECTION.
- 5. INTEGRAL SPACE TEMPERATURE CONTROLS.
- 6. ROOF CURBS.

1.2 SECTION REQUIREMENTS

A. SUBMITTALS:

- 1. PRODUCT DATA: INCLUDE MANUFACTURER'S TECHNICAL DATA FOR EACH RTU, INCLUDING RATED CAPACITIES, DIMENSIONS, REQUIRED CLEARANCES, CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.

PART 2 - PRODUCTS

2.1 CASING

- A. GENERAL FABRICATION REQUIREMENTS FOR CASINGS: FORMED AND REINFORCED 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. CASING THICKNESS: 16 GAUGE THICK.

- C. CASING INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A.

- 1. MATERIALS: ASTM C 1071, TYPE I.

- 2. THICKNESS: 1/2 INCH

- 3. LINER MATERIALS SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.

- 4. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.

- D. UNIT SHALL HAVE A THRU-THE-BASE GAS AND ELECTRICAL CONNECTIONS.

2.2 FANS

OPTION A OR B:

- A. DIRECT-DRIVEN SUPPLY-AIR FANS: DOUBLE WIDTH, BACKWARD INCLINED, CENTRIFUGAL; WITH PERMANENTLY LUBRICATED, 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: DIRECT DRIVE, PROPELLER, MOUNTED ON SHAFT OF PERMANENTLY LUBRICATED MOTOR WITH THERMAL OVERLOAD PROTECTION.

- D. POWER EXHAUST: FORWARD CURVED, SHAFT MOUNTED ON PERMANENTLY LUBRICATED MOTOR.

2.3 COILS

A. SUPPLY-AIR REFRIGERANT COIL:

- 1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED 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. CATHODIC EPOXY COATING.

- 4. CONDENSATE DRAIN PAN: GALVANIZED STEEL WITH CORROSION-RESISTANT COATING FORMED WITH FITCH AND DRAIN CONNECTIONS.

B. OUTDOOR-AIR REFRIGERANT COIL:

- 1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED 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. CATHODIC EPOXY COATING.

C. HOT-GAS REHEAT REFRIGERANT COIL (OPTIONAL):

- 1. ALUMINUM-PLATE FIN AND SEAMLESS INTERNALLY GROOVED 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. CATHODIC EPOXY COATING.

2.4 REFRIGERANT CIRCUIT COMPONENTS

A. NUMBER OF REFRIGERANT CIRCUITS: TWO

- 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.

- 9. LOW-AMBIENT KIT HIGH-PRESSURE SENSOR.

- 10. HOT-GAS REHEAT SOLENOID VALVE WITH A REPLACEABLE MAGNETIC COIL.

2.5 AIR FILTRATION

- A. PROVIDE 2" THROW-AWAY FIBERGLASS FILTERS.

2.6 GAS FURNACE

- A. BURNERS: IN-SHOT TYPE CONSTRUCTED OF ALUMINUM-COATED STEEL.

- 1. FUEL: NATURAL GAS.

- 2. IGNITION: DIRECT SPARK IGNITION (DSI).

- VERIFY AVAILABILITY OF HIGH-ALTITUDE FEATURE WITH MANUFACTURERS.

- 3. HIGH-ALTITUDE KIT: FOR PROJECT ELEVATIONS MORE THAN 2,000 FEET ABOVE SEA LEVEL.

- B. HEAT-EXCHANGER AND DRAIN PAN: STAINLESS STEEL.

- C. INDUCED DRAFT COMBUSTION BLOWER.

D. SAFETY CONTROLS:

- 1. GAS CONTROL VALVE: TWO STAGE.

- 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.

2.7 DAMPERS

- A. OUTDOOR AND RETURN AIR MIXING DAMPERS: PARALLEL OR OPPOSED-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, WITH BIRD SCREEN AND HOOD.

2.8 ELECTRICAL POWER CONNECTION

- A. PROVIDE FOR SINGLE CONNECTION OF POWER TO UNIT WITH UNIT-MOUNTED DISCONNECT SWITCH ACCESSIBLE FROM OUTSIDE UNIT AND CONTROL-CIRCUIT TRANSFORMER WITH BUILT-IN OVERCURRENT PROTECTION.

2.9 CONTROLS

A. 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. AUTOMATIC CHANGEOVER.

- e. ADJUSTABLE DEADBAND.

- f. EXPOSED SET POINT.

- g. EXPOSED INDICATION.

- h. DEGREE F INDICATION.

- i. UNOCCUPIED-PERIOD-OVERRIDE PUSH BUTTON.

- j. DATA ENTRY AND ACCESS PORT TO INPUT TEMPERATURE AND HUMIDITY SET POINTS, OCCUPIED AND UNOCCUPIED PERIODS, AND OUTPUT ROOM TEMPERATURE AND HUMIDITY, SUPPLY-AIR TEMPERATURE, OPERATING MODE, AND STATUS.

- 3. WALL-MOUNTED HUMIDISTAT OR SENSOR WITH THE FOLLOWING FEATURES:

- a. EXPOSED SET POINT.

- b. EXPOSED INDICATION.

- 4. REMOTE WALL-MOUNTED ANNUNCIATOR PANEL WITH KEYED ACCESS FOR EACH UNIT:

- a. LIGHTS TO INDICATE POWER ON, UNIT ALARM OR FAILURE, SMOKE DETECTION.

B. DDC CONTROLLER:

- 1. CONTROLLER SHALL HAVE VOLATILE-MEMORY BACKUP.

2. SAFETY CONTROL OPERATION:

- a. SMOKE DETECTORS: STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SMOKE IS DETECTED. PROVIDE ADDITIONAL CONTACTS FOR ALARM INTERFACE TO FIRE ALARM CONTROL PANEL.

- b. FIRE ALARM CONTROL PANEL INTERFACE WHERE APPLICABLE.

- c. LOW-DISCHARGE TEMPERATURE: STOP FAN AND CLOSE OUTDOOR-AIR DAMPER IF SUPPLY AIR TEMPERATURE IS LESS THAN 40°F.

- RETAIN FIRST SUBPARAGRAPH BELOW FOR AIR-TO-AIR HEAT-PUMP FEATURE.

- d. DEFROST CONTROL FOR CONDENSER COIL: PRESSURE DIFFERENTIAL SWITCH TO INITIATE DEFROST SEQUENCE.

- 3. UNIT SHALL BE CAPABLE OF DIRECT COMMUNICATION WITH GENERIC OPEN PROTOCOL SUCH AS BACNET MS/TP, LON/TALK, OR MODBUS. THIS WILL ALLOW THE UNIT TO INTEGRATE WITH A FACILITY ENERGY MANAGEMENT SYSTEM.

- 4. SCHEDULED OPERATION: OCCUPIED AND UNOCCUPIED PERIODS ON SEVEN-DAY CLOCK WITH A MINIMUM OF FOUR PROGRAMMABLE PERIODS PER DAY.

5. UNOCCUPIED PERIOD:

- a. HEATING SETBACK: 10°F.

- b. COOLING SETBACK: SYSTEM OFF.

- c. OVERRIDE OPERATION: TWO HOURS.

6. SUPPLY FAN OPERATION:

- a. OCCUPIED PERIODS: RUN FAN CONTINUOUSLY.

- b. UNOCCUPIED PERIODS: CYCLE FAN TO MAINTAIN SETBACK TEMPERATURE.

7. REFRIGERANT CIRCUIT OPERATION:

- a. OCCUPIED PERIODS: CYCLE OR STAGE COMPRESSORS, AND OPERATE HOT-GAS BYPASS TO MATCH COMPRESSOR OUTPUT TO COOLING LOAD TO MAINTAIN ROOM TEMPERATURE AND HUMIDITY. CYCLE CONDENSER FANS TO MAINTAIN MAXIMUM HOT-GAS PRESSURE. OPERATE LOW-AMBIENT CONTROL KIT TO

- MAINTAIN MINIMUM HOT-GAS PRESSURE.

- b. UNOCCUPIED PERIODS: CYCLE COMPRESSORS AND CONDENSER FANS FOR HEATING TO MAINTAIN SETBACK TEMPERATURE.

8. HOT-GAS REHEAT-COIL OPERATION (OPTIONAL):

- a. OCCUPIED PERIODS: HUMIDISTAT OPENS HOT-GAS VALVE TO PROVIDE HOT-GAS REHEAT, AND CYCLES COMPRESSOR.

- b. UNOCCUPIED PERIODS: REHEAT NOT REQUIRED.

9. GAS FURNACE OPERATION:

- a. OCCUPIED PERIODS: STAGE BURNER TO MAINTAIN ROOM TEMPERATURE.

- b. UNOCCUPIED PERIODS: CYCLE BURNER TO MAINTAIN SETBACK TEMPERATURE.

10. FIXED MINIMUM OUTDOOR-AIR DAMPER OPERATION:

- a. OCCUPIED PERIODS: OPEN TO 25 PERCENT.

- b. UNOCCUPIED PERIODS: CLOSE THE OUTDOOR-AIR DAMPER.

11. ECONOMIZER OUTDOOR-AIR DAMPER OPERATION:

- a. OCCUPIED PERIODS: OPEN TO 25 PERCENT FIXED MINIMUM INTAKE, AND MAXIMUM 100 PERCENT OF THE FAN CAPACITY TO COMPLY WITH ASHRAE CYCLE II. CONTROLLER SHALL PERMIT AIR-SIDE ECONOMIZER OPERATION WHEN OUTDOOR AIR IS LESS THAN 60 °F. 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.

2.10 ACCESSORIES

- A. DUPLEX, 115-V, GROUND-FAULT-INTERRUPTER OUTLET WITH 15-A OVERCURRENT PROTECTION. INCLUDE TRANSFORMER IF REQUIRED.

- B. LOW-AMBIENT KIT STAGED DOWN TO 0°F.

- C. FILTER DIFFERENTIAL PRESSURE SWITCH WITH SENSOR TUBING ON EITHER SIDE OF FILTER. SET FOR FINAL FILTER PRESSURE LOSS.

- D. HAIL GUARDS OF GALVANIZED STEEL, PAINTED TO MATCH CASING.

- E. DUCT MOUNTED SMOKE DETECTOR IN RETURN AIR STREAM CAPABLE OF SHUTTING DOWN THE UNIT IN THE PRESENCE OF SMOKE DETECTION.

2.11 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 SHALL HAVE AIR-STREAM SURFACE INSULATED WITH A MINIMUM 1/2-IN. THICK, MINIMUM 1 1/2 LB DENSITY, FLEXIBLE FIBERGLASS INSULATION BONDED WITH A PHENOLIC BINDER, NEOPRENE COATED ON THE AIR SIDE.

- d. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.

- B. CURB HEIGHT: 14 INCHES TYPICAL UNO. PROVIDE 24 INCH CURB IN AREAS WITH EXPECTED HEAVY SNOWFALL.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF RTUS.

- B. EXAMINE ROUGHING-IN FOR RTUS TO VERIFY ACTUAL LOCATIONS OF PIPING AND DUCT CONNECTIONS BEFORE EQUIPMENT INSTALLATION.

- C. EXAMINE ROOFS FOR SUITABLE CONDITIONS WHERE RTUS WILL BE INSTALLED.

- D. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 INSTALLATION

- A. ROOF CURB: INSTALL ON ROOF STRUCTURE, LEVEL AND SECURE. INSTALL RTUS ON CURBS AND COORDINATE ROOF PENETRATIONS AND FLASHING WITH ROOF CONSTRUCTION. RTUS TO UPPER CURB RAIL, AND SECURE CURB BASE TO ROOF FRAMING OR CONCRETE BASE WITH ANCHOR BOLTS.

3.3 CONNECTIONS

- A. 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.

3.4 COORDINATION

- A. CONTRACTOR TO COORDINATE WITH KITCHEN EQUIPMENT SUPPLIER TO ENSURE THAT THE RTUS ARE COORDINATED WITH THE KITCHEN EQUIPMENT, PARTICULARLY THE EXHAUST HOODS AND THE MAKE-UP AIR UNIT, TO PROPERLY PRESSURIZE THE BUILDING/SPACE.

- B. CONTRACTOR TO ENSURE THAT ALL THERMOSTATS AND SENSORS ARE COMPATIBLE WITH THE RTU CONTROLS.

3.5 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. OPERATIONAL TEST: AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, START UNITS TO CONFIRM PROPER MOTOR ROTATION AND UNIT OPERATION.

- 3. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.

- D. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.

3.6 STARTUP SERVICE

- A. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO PERFORM STARTUP SERVICE.

- B. COMPLETE INSTALLATION AND STARTUP CHECKS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS AND DO THE FOLLOWING:

- 1. INSPECT FOR VISIBLE DAMAGE TO UNIT CASING, FURNACE COMBUSTION CHAMBER, COMPRESSOR, COILS, AND FANS.

- 2. VERIFY THAT LABELS ARE CLEARLY VISIBLE. CLEARANCES HAVE BEEN PROVIDED FOR SERVICING, CONTROLS ARE CONNECTED AND OPERABLE, AND FILTERS ARE INSTALLED