SHEET NUMBER	SHEET NAME
M001	MECHANICAL ABBREVIATIONS & SYMBOLS
M101	MECHANICAL FLOOR PLAN
M102	MECHANICAL REFRIGERATION PIPING AND LAYOUT PLAN
M150	MECHANICAL ROOF PLAN
M501	MECHANICAL DETAILS
M502	MECHANICAL DETAILS
M590	MECHANICAL SPECIFICATIONS
M591	MECHANICAL SPECIFICATIONS
M592	MECHANICAL SPECIFICATIONS
M601	MECHANICAL SCHEDULES
M701	CAPTIVEAIRE DRAWINGS
M702	CAPTIVEAIRE DRAWINGS
M703	CAPTIVEAIRE DRAWINGS
M704	CAPTIVEAIRE DRAWINGS
M705	CAPTIVEAIRE DRAWINGS
M706	CAPTIVEAIRE DRAWINGS
M707	CAPTIVEAIRE DRAWINGS
M708	CAPTIVEAIRE DRAWINGS
M709	CAPTIVEAIRE DRAWINGS

- *TENANT OR TENANT CONTRACTOR SHALL SUPPLY LANDLORD THE FOLLOWING INFORMATION ON THE HVAC UNIT(S) UPON PROJECT COMPETITION:*
  - *MAKE*
  - *MODEL*
  - *SERIAL*
  - *TONNAGE*
  - *YEAR MANUFACTURED*
  - *ALL WARRANTY INFORMATION*

  IF HAVC UNITS ARE REPLACED AND OR RELOCATED, OLD HAVAC UNIT(S) AND THE CURB(S) MUST BE REMOVED AND THE ROOF MEMBRANE RESTORED BY LANDLORD REQUIRED, ROOFER.
- *LANDLORD REQUIRED CONTRACTOR SHALL PERFORM FIRE ALARM AND SPRINKLER WORK.*

1

RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED			INSTALLED			REMARKS
	GENERAL CONTRACTOR	OWNER	LANDLORD	GENERAL CONTRACTOR	OWNER	LANDLORD	
DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING							
23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION							
23.1.1 HVAC DUCTWORK SYSTEM IDENTIFICATION	X			X			
23.1.2 PIPING SYSTEM IDENTIFICATION	X			X			
23.1.3 UTILITY SHUT OFF IDENTIFICATION IN KITCHEN	X			X			
23.1.4 VALVE TAGS AND CHART	X			X			
23.1.5 HVAC DAMPER IDENTIFICATION	X			X			
23.2 ROOF CURBS							
23.2.1 EXHAUST FAN CURBS	X			X			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.2 ROOFTOP UNIT CURBS	X			X			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.3 CONDENSING UNIT CURBS	X			X			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.4 MAKE UP AIR AND DOAS UNIT CURBS	X			X			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.5 KITCHEN EXHAUST FAN CURBS	X			X			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.3 HVAC DUCTWORK SYSTEM COMPONENTS							
23.3.1 HVAC DUCTWORK	X			X			
23.3.2 INSULATION AND FIRE WRAP	X			X			GENERAL CONTACTOR SCOPE OF WORK TO INCLUDE TENANT FIT OUT FROM LANDLORD POINT OF CONNECTION
23.3.3 DAMPERS	X			X			
23.3.4 SMOKE DETECTORS	X			X			
23.3.5 SUPPLY, RETURN, AND EXHAUST GRILLS AND REGISTERS	X			X			
23.4 MECHANICAL PIPING SYSTEM COMPONENTS							
23.4.1 WALK-IN COOLER AND FREEZER REFRIGERATION		X			X		WALK-IN COOLER AND FREEZER SUPPLIED BY VENDOR NO. 103 GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE PIPING INSTALLATION AND FINAL CONNECTION
23.4.2 REFRIGERATION FOR OTHER HVAC EQUIPMENT		X			X		
23.4.3 CHILLED WATER	X			X			
23.4.4 CONDENSER WATER	X			X			
23.4.5 HEATING HOT WATER	X			X			
23.4.6 VALVES AND ACCESSORIES (E.G. AIR VENTS)	X			X			
23.5 HVAC EQUIPMENT							GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING FOR ALL ROOFTOP EQUIPMENT
23.5.1 SUPPLY FAN	X			X			
23.5.2 TOILET EXHAUST FAN	X			X			
23.5.3 KITCHEN EXHAUST FAN		X		X			SUPPLIED BY VENDOR NO. 102
23.5.4 DUCTED AND NON-DUCTED HEATING AND COOLING UNITS	X			X			
23.5.5 MAKE UP AIR AND DOAS UNITS	X			X			SUPPLIED BY VENDOR NO. 102
23.5.6 ELECTRIC PATIO HEATERS	X			X			
23.5.7 HVAC CONDENSING UNITS	X			X			
23.5.8 REFRIGERATION CONDENSING UNITS		X		X			
23.5.9 RGF PHI SYSTEM	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 7 VENDOR SUBSTITUTION IS NOT PERMITTED
23.6 KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM							
23.6.1 HOOD CONTROL PANEL		X		X			SUPPLIED BY VENDOR NO. 102
23.6.2 KITCHEN EXHAUST HOOD		X		X			SUPPLIED BY VENDOR NO. 102
23.6.3 STRUCTURAL SUPPORT	X			X			
23.6.4 ELECTRICAL AND CONTROL WIRING	X			X			
23.6.5 ANSUL OR TANK FIRE SUPPRESSION SYSTEM		X		X			SUPPLIED BY VENDOR NO. 102 GENERAL CONTRACTOR TO COORDINATE AND FACILITATE SYSTEM SIGN-OFF
23.6.6 ANSUL OR TANK WIRING AND UTILITIES CONNECTION	X			X			
23.6.7 ANSUL OR TANK GAS VALVE		X		X			SUPPLIED BY VENDOR NO. 102
23.7 COMMISSIONING ACTIVITIES							
23.7.1 GREASE EXHAUST WATER LEAKAGE TEST	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 6 VENDOR SUBSTITUTION IS NOT PERMITTED
23.7.2 TESTING AIR BALANCE (TAB) REPORT	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 7 VENDOR SUBSTITUTION IS NOT PERMITTED

SYMBOLS

HEATING–VENTILATING–AIR CONDITIONING

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	STEAM (LOW PRESSURE) STEAM (MEDIUM PRESSURE) STEAM (HIGH PRESSURE)		AUTOMATIC CONTROL VALVE		SUPPLY OR FRESH AIR DUCT (SA OR FA)
	CONDENSATE (LOW PRESSURE) CONDENSATE (MEDIUM PRESSURE) CONDENSATE (HIGH PRESSURE)		PRESSURE REGULATING VALVE (PRV)		RETURN OR EXHAUST DUCT (RA OR EA)
HWS	HOT WATER SUPPLY (HEATING)	OR	SAFETY RELIEF VALVE	ST	SOUND TRAP
HWR	HOT WATER RETURN (HEATING)		BLOW OFF VALVE	CFM SIZE	SUPPLY REGISTER OR GRILLE (R OR G)
EG	ETHYLENE GLYCOL SUPPLY	#/HR	F AND T TRAP (CAP. #/HR)	CFM SIZE	RETURN REGISTER OR GRILLE (R OR G)
EG	ETHYLENE GLYCOL RETURN		THERMOSTATIC TRAP	CFM SIZE	FRESH AIR INTAKE (FA)
CWS	CHILLED WATER SUPPLY	S.P.	STATIC PRESSURE		ROUND CEILING DIFFUSER (SUPPLY)
CWR	CHILLED WATER RETURN		CIRCUIT SETTER FLOW CONTROL VALVE		ROUND CEILING DIFFUSER (SUPPLY AND RETURN)
D	CONDENSATE OR VACUUM PUMP DISCHARGE		AIR BLEEDER VALVE (RADIANT PANEL)		SQUARE CEILING DIFFUSER (SUPPLY)
H	HUMIDIFICATION LINE		AIR ELIMINATOR		SQUARE CEILING DIFFUSER (SUPPLY AND RETURN)
FOS	FUEL OIL SUPPLY		AUTOMATIC BALANCING VALVE		SQUARE CEILING DIFFUSER THREE WAY THROW
FOR	FUEL OIL RETURN		SOLENOID VALVE (REFRIGERANT)		SQUARE CEILING DIFFUSER TWO WAY THROW
FOV	FUEL OIL VENT		THERMOSTATIC EXPANSION VALVE (REFR.)		GRAVITY DAMPER
G	GAS LINE		BACK PRESSURE VALVE	MD	MOTORIZED DAMPER
RL	REFRIGERANT LIQUID LINE		SIGHT GLASS	FD	FIRE DAMPER
RS	REFRIGERANT SUCTION LINE		ROUND DUCT RISER	SD	SMOKE DAMPER
RD	REFRIGERANT HOT GAS DISCHARGE LINE	FC–1	FAN COIL UNIT AND MARK	FD,SD	FIRE AND SMOKE DAMPER
C	CONDENSER WATER	UH–1	UNIT HEATER–PROPELLER TYPE & MARK	BD	BASEBOARD DIFFUSER
CR	CONDENSER WATER RETURN	CUH–1	CABINET UNIT HEATER & MARK	1	HEATING RISER NUMBER
BBO	BOILER BLOW OFF	FT–1 MBH	FIN TUBE, MARK AND CAPACITY	1	EXHAUST FAN RISER NUMBER
ES	EXHAUST STEAM	C–1	CONVECTOR AND MARK	BR	BASEBOARD RADIATION
	CONCENTRIC REDUCER	UV–1	UNIT VENTILATOR AND MARK	S	REMOTE SENSOR
	ECCENTRIC REDUCER	9/6	RECTANGULAR DUCT FIRST FIGURE IS SIDE SHOWN	T	THERMOSTAT
	UNION	SIZE 16"ø	ROUND DUCT		
	STRAINER		CANVAS CONNECTION		
	EXPANSION JOINT	ELEV PLAN VD	VOLUME DAMPER (ELEV AND PLAN)		
	THERMOMETER		TURNING VANES		
	PRESSURE GAGE		EXTRACTOR		

NOT ALL ITEMS SHOWN WITHIN THE SYMBOLS LEGENDS ARE USED WITHIN THE DRAWINGS.

SUBMITTAL MATRIX

GENERAL CONTRACTORS TO ALSO REVIEW ARCHITECTRUAL SPECIFICATIONS AS NOTED IN PLANS IN PLAN SECTION 700 OF THE ARCHITECTURAL PACKAGE FOR REQUIRED SUBMITTALS THAT MIGHT NOT BE LISTED BELOW.

SUBMITTAL DECRIPTION	Required Review Time (Business Days)	Architect of Record	Shake Shack	Physical Sample Required	Submittal for Record	Submittal for Record Only
Anchor Bolts Shops	5	X			X	
ATAS–Detailed Shop DWGS(Submitted by Owner Vendor to Owner/AOR prior to const.)	5	X				X
Concrete Mix Design	5	X			X	
Construction Prefunctional Checklists	5	X				X
Decorative Metal Shop Drawings	5	X				
Diffusers, Grills & Registers	5	X			X	
Doors, Frames & Hardware	7	X			X	
Ductwork Layout (if there are signifcant changes in field)	5	X			X	
Electrical Distribution Equipment	5	X				
Elevator & Vertical Transportation Shop Drawings	5	X				X
Epoxy Floor	5	X				X
Fire Alarm Shop Drawings & Device Cut Sheets	5	x			X	
Fire Sprinkler Shop Drawings, Hydraulic Calculations & Device Cut Sheets	5	x				X
HVAC Equipment(if Carrier – Submitted by Owner Vendor to Owner/AOR prior to const.)	5	x			X	
Light Fixtures(Submitted by Owner Vendor to Owner/AOR prior to construction)	5	X			X	
MEP Tests, Start–Up, and Programming Reports	5	X			X	
Millwork – Material Submittals (if differs from spec)	5	X	X	X		
Millwork – Shop Drawings (custom items & design features only)	5	X				
Restroom Partitions	5	X			X	
Plumbing Fixtures	5	X			X	
Railing Shop Drawings	5	X				X
Rebar	5	X			X	
Stair Shop Drawings	5	X				X
Structural Steel Shop Drawings	7	X			X	
Storefront – product data Submittal (if different from specified)	5	X				
Storefront – Shop Drawings	5	X				
Tile (if differs from spec)	5	X			X	
Window Film	5	X				

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REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E–59866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA #: 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

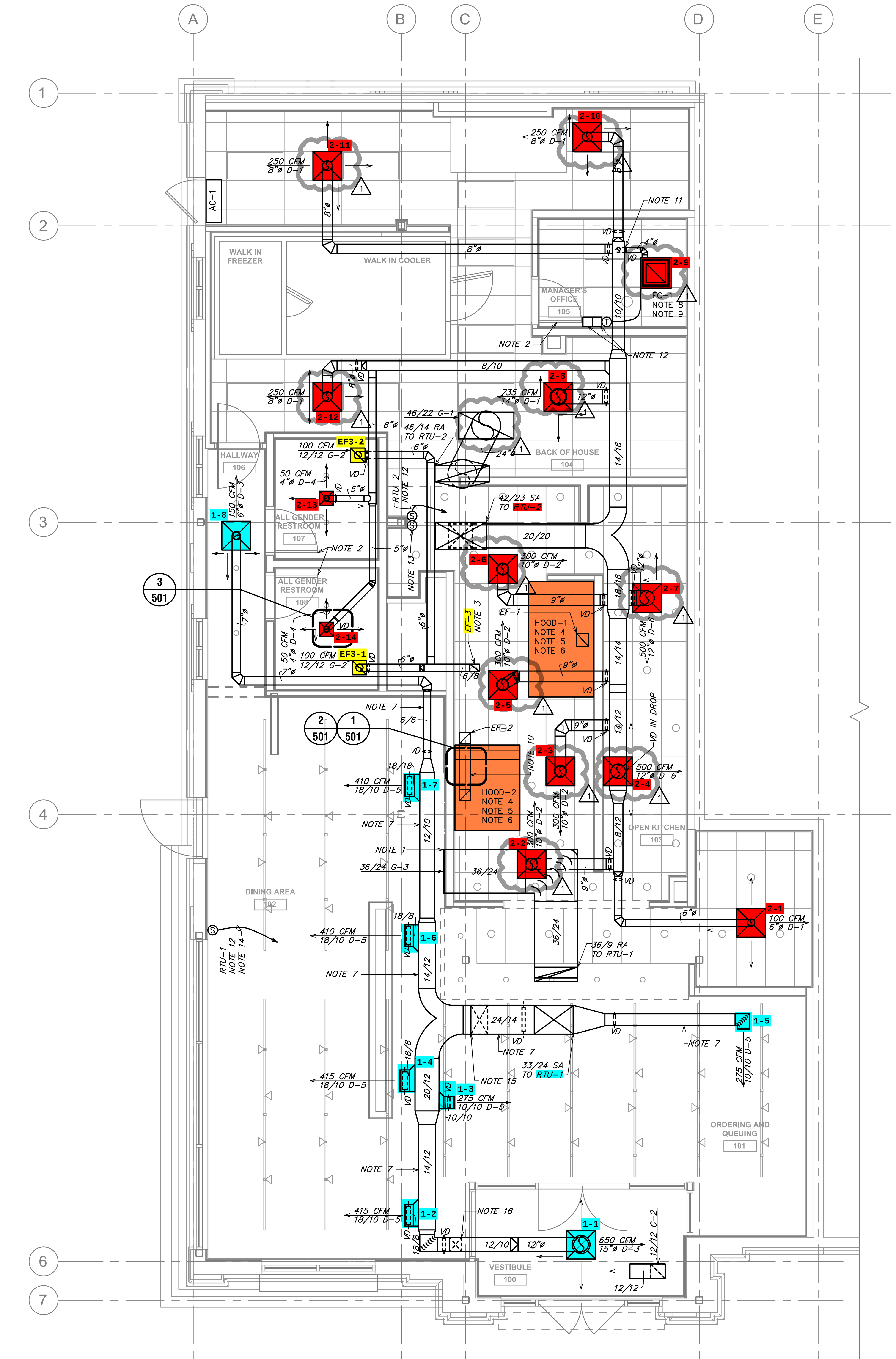
SHEET NAME: **MECHANICAL ABBREVIATIONS AND SYMBOL LEGEND**

DATE: 04/25/25 PROJECT NO.: 40189

DRAWN: RAS SCALE: AS NOTED

SHEET NO.: **M001**

SE JOB#: 250116



1 **MECHANICAL FLOOR PLAN**

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

GENERAL NOTES:

A. EXISTING CONDITIONS ARE BASED ON RECORD DRAWINGS PROVIDED BY THE OWNER. CONTRACTOR SHALL ADJUST TO ACTUAL FIELD CONDITIONS AT NO ADDITIONAL EXPENSE TO THE PROJECT.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO SUBMITTING THE BID. NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR ANY EXTRAS DUE TO THE CONTRACTOR'S FAILURE TO VISIT THE PROJECT SITE PRIOR TO SUBMITTING THE BID. ANY DISCREPANCIES SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER FOR RESOLUTION.

C. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS.

D. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH DEMOLITION WORK PRIOR TO BIDDING AND START OF WORK. CONTRACTOR IS RESPONSIBLE TO DEMOLISH ALL EXISTING AS REQUIRED FOR INSTALLATION/CONSTRUCTION OF NEW WORK.

E. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.

F. MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.

G. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS AND COOPERATE WITH THE OTHER TRADES SO THAT THE INSTALLATION OF ALL EQUIPMENT MAY BE PROPERLY COORDINATED.

H. ALL EQUIPMENT FURNISHED SHALL FIT THE SPACE AVAILABLE WITH CONNECTIONS IN THE REQUIRED LOCATIONS AND WITH ADEQUATE SPACE FOR OPERATING AND SERVICING. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATE THE INTENT OF THE INSTALLATION WHILE THE SPECIFICATIONS AND EQUIPMENT LIST DENOTE THE TYPE AND QUALITY OF MATERIAL AND WORKMANSHIP TO BE USED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, THE HIGHER AND/OR MORE COSTLY STANDARD WILL APPLY. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ENGINEER WHOSE DECISION SHALL BE FINAL. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY IN THIS REGARD ON BEHALF OF THE CONTRACTOR AFTER AWARD OF THE CONTRACT.

I. COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.

J. THE CONTRACTOR SHALL INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT AS REQUIRED TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE CEILING HEIGHTS AND HEADROOM AND MAKE ALL EQUIPMENT REQUIRING MAINTENANCE OR REPAIR ACCESSIBLE.

K. ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.

L. DO NOT ATTACH ANYTHING TO DECK ABOVE. ATTACH TO STRUCTURE (i.e. BEAMS, JOISTS) ONLY. DUCT HANGERS SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL CODE. ALL CONNECTIONS TO JOISTS SHALL BE MADE AT THE TOP CORD.

M. ALL DUCT DIMENSIONS INDICATED ARE CLEAR INSIDE DIMENSIONS. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER OR WRAPPED WITH 1-1/2" THICK FIRE RETARDANT FIBERGLASS WITH A REINFORCED ALUMINUM FOIL JACKET AND SHALL BE APPROVED FOR USE BY SMACNA AND NAIMA. RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.

N. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK VISIBLE TO THE PUBLIC SHALL BE INTERNALLY LINED AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT WRAP INSULATION IS NOT PERMITTED IN THESE AREAS.

O. ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE.

P. REFRIGERANT PIPING SHALL BE SIZED PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.

Q. TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY RUNS AND/OR OTHER IMPROVEMENTS LOCATED ON THE PREMISES PRIOR TO BIDDING. TENANT'S CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ALL COSTS RELATING TO THE RELOCATION OF, DAMAGE TO, REPAIR OF ANY EXISTING UTILITY RUNS AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.

R. ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.

S. ROOF MOUNTED EQUIPMENT SHALL BE LABELED WITH THE TENANT NAME AND SPACE NUMBER WITH 3" HIGH WEATHER PROOF LETTERS.

T. ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 96 AND ASTM E 2336 REQUIREMENTS.

U. GREASE DUCT LEAKAGE TESTING MUST BE PERFORMED PRIOR TO CONCEALMENT OF THE DUCTWORK.

V. MECHANICAL CONTRACTOR SHALL PROVIDE TENANT WITH A WRITTEN ONE (1) YEAR MANUFACTURER'S WARRANTY ON ALL HVAC EQUIPMENT PROVIDED AND / OR INSTALLED. THE WARRANTY SHALL INCLUDE ALL LABOR, MATERIALS AND THREE (3) ROUTINE SERVICES INCLUDING FILTER CHANGES DURING A ONE (1) YEAR PERIOD.

X. AT THE COMPLETION OF CONSTRUCTION AN NEBB, AABC OR TABB CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. PRIOR TO SCHEDULING BALANCING, COORDINATE WITH LANDLORD'S FIELD REPRESENTATIVE FOR THE VENDOR LISTED BELOW. IF APPROVED, THE BALANCING SHALL BE COMPLETED BY NATION TAB. CONTACT WILL TURNBOURH AT WILL@NATIONALTAB.COM OR 314-954-6244.

Y. PARTS OF THE BASE BUILDING SYSTEMS THAT FALL INTO LEASE LINE SHALL REMAIN UNDISTURBED UNLESS NOTED OTHERWISE.

Z. PROVIDE ALL NECESSARY WIRING, RELAYS, DETECTORS, COMPONENTS, ETC., FOR FIRE ALARM OR CONTROL SYSTEM INTERLOCK IF APPLICABLE. VERIFY WITH BUILDING PERSONNEL BEFORE BID.

HVAC NOTES:

1. MOUNT RETURN GRILL AS HIGH AS CONDITIONS ALLOW. COORDINATE FINAL INSTALLATION LOCATION WITH ARCHITECT AND CONSTRUCTION MANAGER. COORDINATE FINAL FINISH WITH ARCHITECT.
2. CONTRACTOR SHALL UNDERCUT DOOR 3/4".
3. PROVIDE /8 EXHAUST AIR DUCT UP TO EF-4 ON ROOF.
4. NEW CAPTIVEAIRE GREASE EXHAUST HOOD TO BE FURNISHED BY OWNER FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. SEE CAPTIVEAIRE SHEETS FOR ADDITIONAL INFORMATION. BALANCE HOOD EXHAUST AS NOTED ON CAPTIVEAIRE SHEETS. VERIFY ALL MANUFACTURER AND CODE REQUIRED CLEARANCES ARE MAINTAINED. NOTIFY ARCHITECT IF ANY CONFLICTS OCCUR.
5. TRANSITION FROM HOOD EXHAUST AND EXTEND KITCHEN HOOD GREASE EXHAUST DUCTWORK COLLAR AS INDICATED ON PLANS UP TO CORRESPONDING GREASE EXHAUST FAN ON ROOF. SEE SHEET M150 FOR CONTINUATION. GREASE DUCT SHALL BE WRAPPED WITH TWO (2) LAYERS OF THERMAL CERAMICS FAST WRAP XL, 1 1/2" THICK WITH 3" PERIMETER AND LONGITUDINAL OVERLAPS OR EQUIVALENT U.L. LISTED GREASE DUCT WRAP FOR ZERO CLEARANCE TO COMBUSTIBLES. REFER TO SHEET M501, DETAIL 1, FOR ADDITIONAL INFORMATION. TYPICAL.
6. HOOD MANUFACTURER TO PROVIDE A "KIT" TO FASTEN THE BOTTOM FLANGE OF THE HOOD TO THE WALL, WITH ONE FASTENER PER STUD WALL. SIL-BOND RTV 4500 ALUMINUM SILICONE SEALANT OR APPROVED SIMILAR, TO BE APPLIED BY GENERAL CONTRACTOR /HOOD INSTALLER FOR ANY REMAINING SMALL GAPS. HOOD FASTENING "KIT" DETAIL TO BE INCLUDED IN MANUFACTURER DRAWINGS. REFERENCE SHEET M501, DETAIL 9, FOR ADDITIONAL INFORMATION.
7. DUCTWORK TO BE TO BE INSTALLED AS HIGH AS CONDITIONS ALLOW. COORDINATE ROUTING AND MOUNTING HEIGHT WITH LIGHTING FIXTURES. NOTIFY THE ARCHITECT OF ANY CONFLICTS AND COORDINATE WITH THE CONSTRUCTION MANAGER.
8. PROVIDE NEW FC UNIT AS NOTED ON PLANS AND AS SCHEDULED ON SHEET M601.
9. PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO FC-1 IN KITCHEN OFFICE. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
10. PROVIDE CLEANOUTS ON GREASE DUCTWORK AS REQUIRED BY CODE. REFERENCE SHEET M501, DETAIL 2 FOR ADDITIONAL INFORMATION. TYPICAL OF GREASE EXHAUST DUCTWORK.
11. BALANCE THE DAMPER TO PROVIDE A MAXIMUM OF 40 CFM OF OUTDOOR AIR.
12. COORDINATE WITH CAPTIVEAIRE ON REMOTE SENSORS AND COMFORT CONTROLS PACKAGE THAT IS TO BE INSTALLED IN THE OFFICE. VERIFY CONTROLS ARE A FULLY DIGITAL 7 DAY PROGRAMMABLE TYPE THERMOSTAT WITH REMOTE SENSING CAPABILITIES, AUTO CHANGE OVER AND AUTO SET BACK. MOUNT SENSOR AND CONTROLS AT 48" ABOVE FINISHED FLOOR. UNITS SERVING THE SAME TEMPERATURE ZONE SHALL BE INTERLOCKED TO PREVENT SIMULTANEOUS HEATING AND COOLING. LOCATE REMOTE TEMPERATURE SENSORS AS INDICATED ON PLAN. COORDINATE LOCATION WITH CONSTRUCTION MANAGER AND WALL GRAPHICS LAYOUT. REFERENCE CAPTIVEAIRE SHEETS FOR ADDITIONAL INFORMATION.
13. MOUNT TEMPERATURE CAPTIVEAIRE ROOM TEMPERATURE SENSOR FURNISHED WITH KITCHEN HOODS ON WALL AS INDICATED ON THE PLANS AND AS SPECIFIED BY THE MANUFACTURER.
14. PROVIDE WITH INSULATED BACK PAN.
15. DUCTWORK TO BE ROUTED BELOW BEAM.
16. DUCTWORK TO BE ROUTED ABOVE BEAM.

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REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

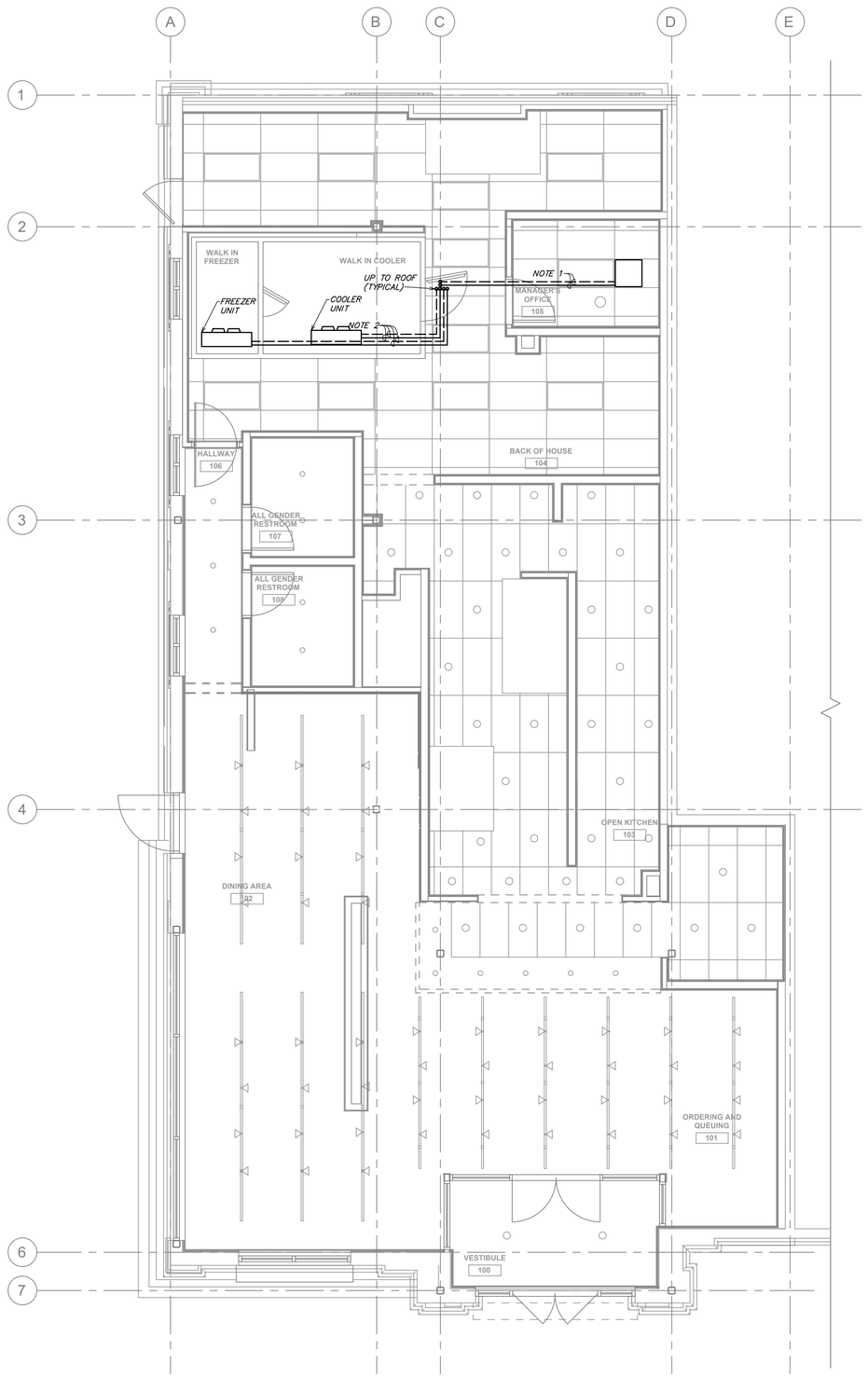
STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA #: 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME: **MECHANICAL FLOOR PLAN**

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED
SHEET NO.: **M101**

SE JOB#: 250116



1 **MECHANICAL REFRIGERATION PIPING AND LAYOUT PLAN**
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

A. EXISTING CONDITIONS ARE BASED ON RECORD DRAWINGS PROVIDED BY THE OWNER. CONTRACTOR SHALL ADJUST TO ACTUAL FIELD CONDITIONS AT NO ADDITIONAL EXPENSE TO THE PROJECT.
B. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO SUBMITTING THE BID. NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR ANY EXTRAS DUE TO THE CONTRACTOR'S FAILURE TO VISIT THE PROJECT SITE PRIOR TO SUBMITTING THE BID. ANY DISCREPANCIES SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER FOR RESOLUTION.
C. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS.
D. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH DEMOLITION WORK PRIOR TO BIDDING AND START OF WORK. CONTRACTOR IS RESPONSIBLE TO DEMOLISH ALL EXISTING AS REQUIRED FOR INSTALLATION/CONSTRUCTION OF NEW WORK.
E. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.
F. MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.
G. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS AND COOPERATE WITH THE OTHER TRADES SO THAT THE INSTALLATION OF ALL EQUIPMENT MAY BE PROPERLY COORDINATED.
H. ALL EQUIPMENT FURNISHED SHALL FIT THE SPACE AVAILABLE WITH CONNECTIONS IN THE REQUIRED LOCATIONS AND WITH ADEQUATE SPACE FOR OPERATING AND SERVICING. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATE THE INTENT OF THE INSTALLATION WHILE THE SPECIFICATIONS AND EQUIPMENT LIST DENOTE THE TYPE AND QUALITY OF MATERIAL AND WORKMANSHIP TO BE USED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, THE HIGHER AND/OR MORE COSTLY STANDARD WILL APPLY. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ENGINEER WHOSE DECISION SHALL BE FINAL. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY IN THIS REGARD ON BEHALF OF THE CONTRACTOR AFTER AWARD OF THE CONTRACT.
I. COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.
J. THE CONTRACTOR SHALL INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT AS REQUIRED TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE CEILING HEIGHTS AND HEADROOM AND MAKE ALL EQUIPMENT REQUIRING MAINTENANCE OR REPAIR ACCESSIBLE.
K. ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.
L. DO NOT ATTACH ANYTHING TO DECK ABOVE. ATTACH TO STRUCTURE (i.e. BEAMS, JOISTS) ONLY. DUCT HANGERS SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL CODE. ALL CONNECTIONS TO JOISTS SHALL BE MADE AT THE TOP CORD.
M. ALL DUCT DIMENSIONS INDICATED ARE CLEAR INSIDE DIMENSIONS. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER OR WRAPPED WITH 1-1/2" THICK FIRE RETARDANT FIBERGLASS WITH A REINFORCED ALUMINUM FOIL JACKET AND SHALL BE APPROVED FOR USE BY SMACNA AND NAIMA. RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.
N. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK VISIBLE TO THE PUBLIC SHALL BE INTERNALLY LINED AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT WRAP INSULATION IS NOT PERMITTED IN THESE AREAS.
O. ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE.
P. REFRIGERANT PIPING SHALL BE SIZED PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
Q. TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY RUNS AND/OR OTHER IMPROVEMENTS LOCATED ON THE PREMISES PRIOR TO BIDDING. TENANT'S CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ALL COSTS RELATING TO THE RELOCATION OF, DAMAGE TO, REPAIR OF ANY EXISTING UTILITY RUNS AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.
R. ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.
S. ROOF MOUNTED EQUIPMENT SHALL BE LABELED WITH THE TENANT NAME AND SPACE NUMBER WITH 3" HIGH WEATHER PROOF LETTERS.
T. ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 96 AND ASTM E 2336 REQUIREMENTS.
U. GREASE DUCT LEAKAGE TESTING MUST BE PERFORMED PRIOR TO CONCEALMENT OF THE DUCTWORK.
V. MECHANICAL CONTRACTOR SHALL PROVIDE TENANT WITH A WRITTEN ONE (1) YEAR MANUFACTURER'S WARRANTY ON ALL HVAC EQUIPMENT PROVIDED AND / OR INSTALLED. THE WARRANTY SHALL INCLUDE ALL LABOR, MATERIALS AND THREE (3) ROUTINE SERVICES INCLUDING FILTER CHANGES DURING A ONE (1) YEAR PERIOD.
X. AT THE COMPLETION OF CONSTRUCTION AN NEBB, AABC OR TABB CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. PRIOR TO SCHEDULING BALANCING, COORDINATE WITH LANDLORD'S FIELD REPRESENTATIVE FOR THE VENDOR LISTED BELOW. IF APPROVED, THE BALANCING SHALL BE COMPLETED BY NATION TAB. CONTACT WILL TURNBOURH AT WILL@NATIONALTAB.COM OR 314-954-6244.
Y. PARTS OF THE BASE BUILDING SYSTEMS THAT FALL INTO LEASE LINE SHALL REMAIN UNDISTURBED UNLESS NOTED OTHERWISE.
Z. PROVIDE ALL NECESSARY WIRING, RELAYS, DETECTORS, COMPONENTS, ETC., FOR FIRE ALARM OR CONTROL SYSTEM INTERLOCK IF APPLICABLE. VERIFY WITH BUILDING PERSONNEL BEFORE BID.

HVAC NOTES:

1. PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO FC-1 IN KITCHEN OFFICE AS NOTED ON PLANS. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE. ADJUST ROUTING AS NECESSARY IN FIELD FOR ANY OBSTACLES. COORDINATE EXACT LOCATION AND ROUTING WITH CONSTRUCTION MANAGER.
2. KITCHEN EQUIPMENT CONTRACTOR TO PROVIDE REFRIGERANT LINES FROM CONDENSING UNIT ON ROOF TO KITCHEN EQUIPMENT AS NOTED ON PLANS. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE. ADJUST ROUTING AS NECESSARY IN FIELD FOR ANY OBSTACLES. COORDINATE EXACT LOCATION AND ROUTING WITH CONSTRUCTION MANAGER.

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REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
REGISTERED PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

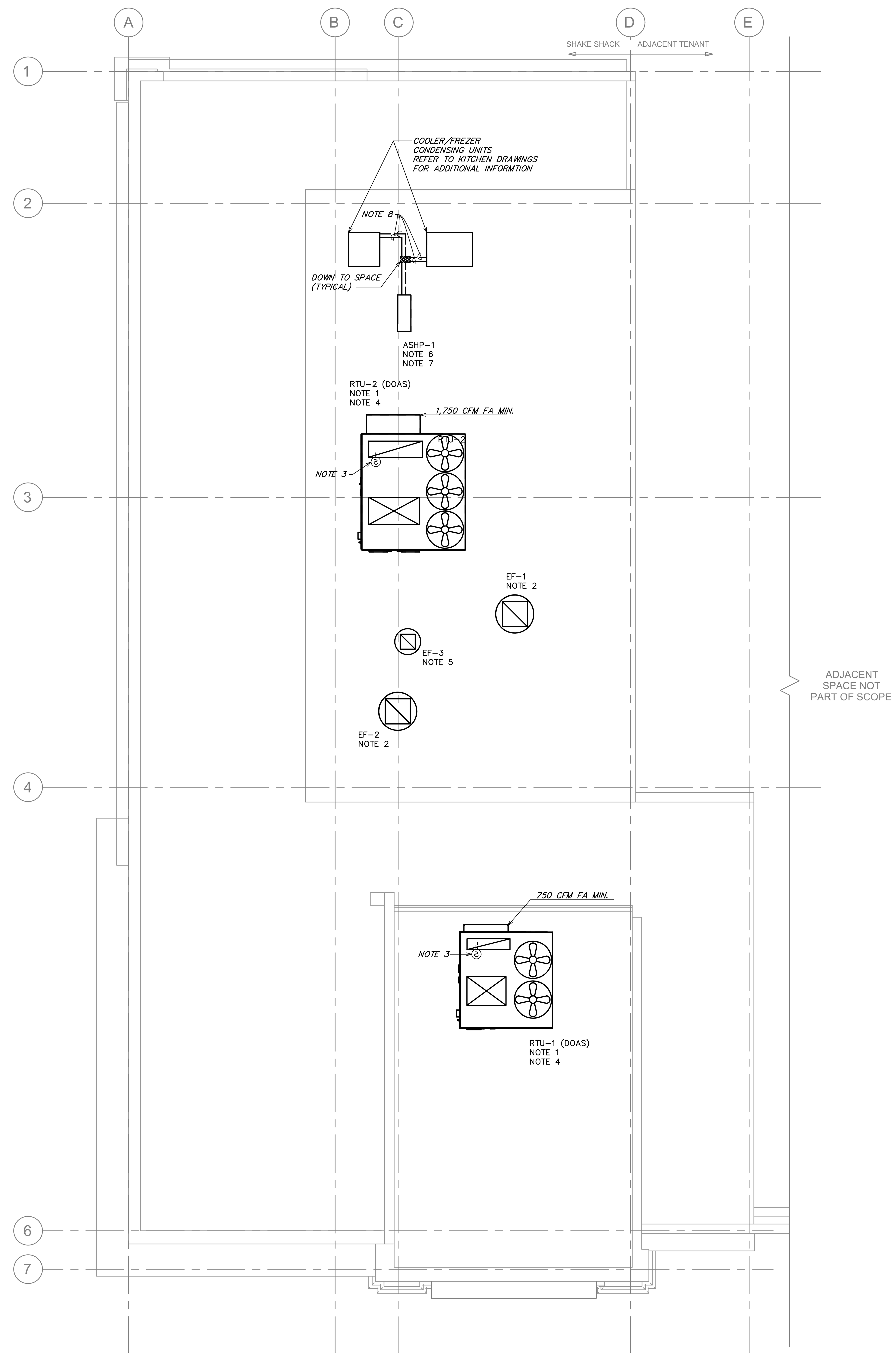
FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL REFRIGERATION PIPING AND LAYOUT PLAN

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M102

SE JOB# 250115



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

GENERAL NOTES:

A. EXISTING CONDITIONS ARE BASED ON RECORD DRAWINGS PROVIDED BY THE OWNER. CONTRACTOR SHALL ADJUST TO ACTUAL FIELD CONDITIONS AT NO ADDITIONAL EXPENSE TO THE PROJECT.
B. CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL EXISTING CONDITIONS PRIOR TO SUBMITTING THE BID. NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR ANY EXTRAS DUE TO THE CONTRACTOR'S FAILURE TO VISIT THE PROJECT SITE PRIOR TO SUBMITTING THE BID. ANY DISCREPANCIES SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER FOR RESOLUTION.
C. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS.
D. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH DEMOLITION WORK PRIOR TO BIDDING AND START OF WORK. CONTRACTOR IS RESPONSIBLE TO DEMOLISH ALL EXISTING AS REQUIRED FOR INSTALLATION/CONSTRUCTION OF NEW WORK.
E. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.
F. MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.
G. ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS AND COOPERATE WITH THE OTHER TRADES SO THAT THE INSTALLATION OF ALL EQUIPMENT MAY BE PROPERLY COORDINATED.
H. ALL EQUIPMENT FURNISHED SHALL FIT THE SPACE AVAILABLE WITH CONNECTIONS IN THE REQUIRED LOCATIONS AND WITH ADEQUATE SPACE FOR OPERATING AND SERVICING. THE DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATE THE INTENT OF THE INSTALLATION WHILE THE SPECIFICATIONS AND EQUIPMENT LIST DENOTE THE TYPE AND QUALITY OF MATERIAL AND WORKMANSHIP TO BE USED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, THE HIGHER AND/OR MORE COSTLY STANDARD WILL APPLY. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ENGINEER WHOSE DECISION SHALL BE FINAL. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY IN THIS REGARD ON BEHALF OF THE CONTRACTOR AFTER AWARD OF THE CONTRACT.
I. COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.
J. THE CONTRACTOR SHALL INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT AS REQUIRED TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE CEILING HEIGHTS AND HEADROOM AND MAKE ALL EQUIPMENT REQUIRING MAINTENANCE OR REPAIR ACCESSIBLE.
K. ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.
L. DO NOT ATTACH ANYTHING TO DECK ABOVE. ATTACH TO STRUCTURE (i.e. BEAMS, JOISTS) ONLY. DUCT HANGERS SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL CODE. ALL CONNECTIONS TO JOISTS SHALL BE MADE AT THE TOP CORD.
M. ALL DUCT DIMENSIONS INDICATED ARE CLEAR INSIDE DIMENSIONS. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER OR WRAPPED WITH 1-1/2" THICK FIRE RETARDANT FIBERGLASS WITH A REINFORCED ALUMINUM FOIL JACKET AND SHALL BE APPROVED FOR USE BY SMACNA AND NAIMA. RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.
N. ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK VISIBLE TO THE PUBLIC SHALL BE INTERNALLY LINED AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT WRAP INSULATION IS NOT PERMITTED IN THESE AREAS.
O. ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE.
P. REFRIGERANT PIPING SHALL BE SIZED PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
Q. TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY RUNS AND/OR OTHER IMPROVEMENTS LOCATED ON THE PREMISES PRIOR TO BIDDING. TENANT'S CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ALL COSTS RELATING TO THE RELOCATION OF, DAMAGE TO, REPAIR OF ANY EXISTING UTILITY RUNS AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.
R. ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.
S. ROOF MOUNTED EQUIPMENT SHALL BE LABELED WITH THE TENANT NAME AND SPACE NUMBER WITH 3" HIGH WEATHER PROOF LETTERS.
T. ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 96 AND ASTM E 2336 REQUIREMENTS.
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X. AT THE COMPLETION OF CONSTRUCTION AN NEBB, AABC OR TABB CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. PRIOR TO SCHEDULING BALANCING, COORDINATE WITH LANDLORD'S FIELD REPRESENTATIVE FOR THE VENDOR LISTED BELOW. IF APPROVED, THE BALANCING SHALL BE COMPLETED BY NATION TAB. CONTACT WILL TURNBOURH AT WILL@NATIONALTAB.COM OR 314-954-6244.
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Z. PROVIDE ALL NECESSARY WIRING, RELAYS, DETECTORS, COMPONENTS, ETC., FOR FIRE ALARM OR CONTROL SYSTEM INTERLOCK IF APPLICABLE. VERIFY WITH BUILDING PERSONNEL BEFORE BID.

HVAC NOTES:

1. NEW CAPTIVEAIRE RTU TO BE FURNISHED AND BY OWNER FOR INSTALLATION BY MECHANICAL CONTRACTOR. SEE CAPTIVEAIRE SHEETS FOR ADDITIONAL INFORMATION. FIELD VERIFY EXACT LOCATION.
2. NEW CAPTIVEAIRE GREASE EXHAUST FAN TO BE FURNISHED BY OWNER FOR INSTALLATION BY MECHANICAL CONTRACTOR. SEE CAPTIVEAIRE SHEETS FOR ADDITIONAL INFORMATION. CONTRACTOR SHALL FIELD VERIFY THAT THE LOCATION SHOWN IS A MINIMUM OF 10'-0" FROM ANY OUTDOOR AIR INTAKE.
3. DUCT SMOKE DETECTOR ON RETURN SIDE DUCT AND SHUTDOWN RELAY SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. ALL WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR.
4. RFG ENVIRONMENTAL GROUP, INC. AIR PURIFICATION SYSTEM TO BE PROVIDED BY NTAB. REFER TO RESPONSIBILITY MATRIX ON SHEET M001 FOR ADDITIONAL INFORMATION, SHEET M601 FOR SCHEDULE, AND SHEET M592 FOR SPECIFICATIONS.
5. PROVIDE NEW EXHAUST FAN AS NOTED ON PLANS AND SCHEDULED ON SHEET M601. THE CONTRACTOR SHALL FIELD VERIFY THAT THE LOCATION SHOWN IS A MINIMUM OF 10'-0" FROM ANY OUTDOOR AIR INTAKE
6. PROVIDE ASHP AS NOTED ON PLANS AND SCHEDULED ON SHEET M601.
7. PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO FC-1 IN KITCHEN OFFICE. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE.
8. KITCHEN EQUIPMENT CONTRACTOR TO PROVIDE REFRIGERANT LINES FROM CONDENSING UNIT ON ROOF TO KITCHEN EQUIPMENT AS NOTED ON PLANS. LINES SHALL BE SIZED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. PROVIDE ALL ACCESSORIES AS REQUIRED BY MANUFACTURER FOR COMPLETE WORKING SYSTEM, INCLUDING ANY ACCESSORIES ASSOCIATED WITH LONG LENGTH APPLICATIONS WHERE APPLICABLE. ADJUST ROUTING AS NECESSARY IN FIELD FOR ANY OBSTACLES. COORDINATE EXACT LOCATION AND ROUTING WITH CONSTRUCTION MANAGER AND LANDLORD.

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REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA #: 03180

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SHEET NAME:
MECHANICAL ROOF PLAN

DATE:	PROJECT NO.:
04/25/25	40189
DRAWN: RAS	SCALE: AS NOTED

SHEET NO.:
M150

SE JOB#: 250116

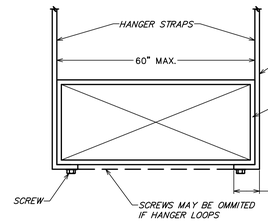
MAXIMUM HALF OF DUCT PERIMETER	PAIR AT 10 FT. SPACING		PAIR AT 8 FT. SPACING		PAIR AT 5 FT. SPACING		PAIR AT 4 FT. SPACING	
	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD
$\frac{P}{2}$ = 30"	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	12 GA. (.106")	1" x 22 GA.	12 GA. (.106")
$\frac{P}{2}$ = 72"	1" x 18 GA.	3/8"	1" x 20 GA.	1/4"	1" x 22 GA.	1/4"	1" x 22 GA.	1/4"
$\frac{P}{2}$ = 96"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"	1" x 20 GA.	3/8"	1" x 22 GA.	1/4"
$\frac{P}{2}$ = 120"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"	1" x 20 GA.	1/4"
$\frac{P}{2}$ = 168"	1 1/2" x 16 GA.	1/2"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 18 GA.	3/8"
$\frac{P}{2}$ = 192"	---	1/2"	1 1/2" x 16 GA.	1/2"	1" x 16 GA.	3/8"	1" x 16 GA.	3/8"
$\frac{P}{2}$ = 193" UP	SPECIAL ANALYSIS REQUIRED							

WHEN STRAPS ARE LAP JOINED USE THESE MINIMUM FASTENERS:	SINGLE HANGER MAXIMUM ALLOWABLE LOAD	
	STRAP	WIRE OR ROD (DIA.)
1" x 18, 20, 22 GA. – TWO #10 OR ONE 1/4" BOLT 1" x 16 GA. – TWO 1/4" DIA. 1" x 16 GA. – TWO 3/8" DIA. PLACE FASTENERS IN SERIES, NOT SIDE BY SIDE.	1" x 22 GA. – 260 LBS. 1" x 20 GA. – 320 LBS. 1" x 18 GA. – 420 LBS. 1" x 16 GA. – 700 LBS. 1 1/2" x 16 GA. – 1100 LBS.	0.106" – 80 LBS. 0.135" – 120 LBS. 0.162" – 160 LBS. 1/4" – 270 LBS. 3/8" – 680 LBS. 1/2" – 1250 LBS. 5/8" – 2000 LBS. 3/4" – 3000 LBS.

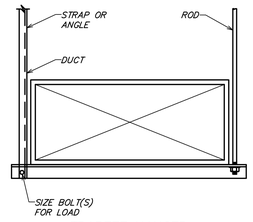
NOTES:
1. DIMENSIONS OTHER THAN GAUGE ARE IN INCHES.
2. TABLES ALLOW FOR DUCT WEIGHT, 1 LB./SF INSULATION WEIGHT AND NORMAL REINFORCEMENT AND TRAPEZE WEIGHT, BUT NO EXTERNAL LOADS.
3. STRAPS ARE GALVANIZED STEEL; OTHER MATERIALS ARE UNCOATED STEEL.
4. ALLOWABLE LOADS FOR P/2 ASSUME THAT DUCTS ARE 16 GA. MAXIMUM, EXCEPT THAT WHEN MAXIMUM DUCT DIMENSION (W) IS OVER 60" THEN P/2 MAXIMUM IS 1.25 W.
5. 12, 10 OR 8 GA. WIRE IS STEEL OF BLACK ANNEALED, BRIGHT BASIC OR GALVANIZED TYPE.
6. DUCTS SHALL BE SUPPORTED AT INTERVALS NOT EXCEEDING 10 FEET.

7 RECTANGULAR DUCT HANGER TABLE

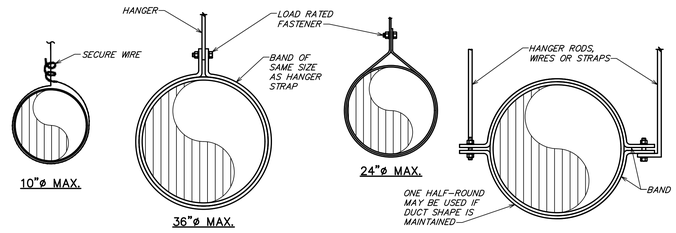
NOT TO SCALE



STRAP HANGER

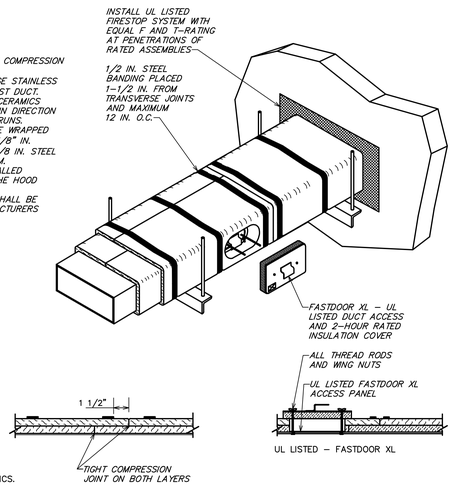


TRAPEZE HANGER



NOTE: HANGERS MUST NOT DEFORM DUCT SHAPE

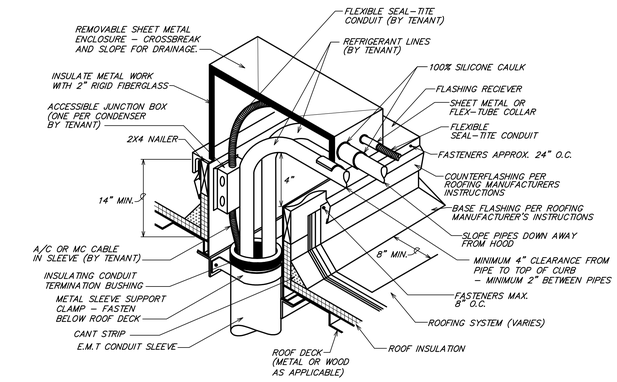
NOTES:
1. THERMAL CERAMICS FIREMASTER FASTWRAP XL IS TESTED TO ASTM E2336 AND UL LISTED PER HNKT.G18 TO PROVIDE ZERO CLEARANCE TO COMBUSTIBLES AND TO PROVIDE A 1 OR 2 HOUR EXPOSURE. THROUGH PENETRATIONS FIRESTOP SYSTEMS ARE TESTED IN ACCORDANCE WITH ASTM E 814 (UL 1479). UL EVALUATION REPORT UL ER14229-01.
2. COMPLIANT TO THE FOLLOWING CODES:
   NFPA 96
   INTERNATIONAL MECHANICAL CODES
   UNIFORM MECHANICAL CODE
   CALIFORNIA MECHANICAL CODE
3. INSULATION APPLIED IN TWO LAYERS WITH TIGHT COMPRESSION JOINT ON BOTH LAYERS AT ALL JOINTS.
4. MINIMUM 16 GAUGE CARBON STEEL (OR 18 GAUGE STAINLESS STEEL) RECTANGULAR OR ROUND GREASE EXHAUST DUCT.
5. INSTALL UL LISTED AND LIQUID TIGHT THERMAL CERAMICS FASTDOOR XL ACCESS DOORS AT ALL CHANGES IN DIRECTION AND AT MINIMUM EVERY 20 FT ON HORIZONTAL RUNS.
6. SUPPORT HANGER SYSTEMS DO NOT NEED TO BE WRAPPED PROVIDED THE HANGER RODS ARE MINIMUM OF 3/8" IN. DIAMETER AND SUPPORTS ARE MINIMUM 2 2 X 1/8 IN. STEEL ANGLE OR SMACNA EQUIVALENT SUPPORT SYSTEM.
7. THERMAL CERAMICS DUCT WRAP SHALL BE INSTALLED DIRECTLY ONTO THE DUCT AND APPLIED FROM THE HOOD CONNECTION TO THE CONNECTION OF THE FAN.
8. THERMAL CERAMICS DUCT ENCLOSURE SYSTEM SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND UL LISTINGS.



** DETAIL COURTESY OF MORGAN THERMAL CERAMICS.

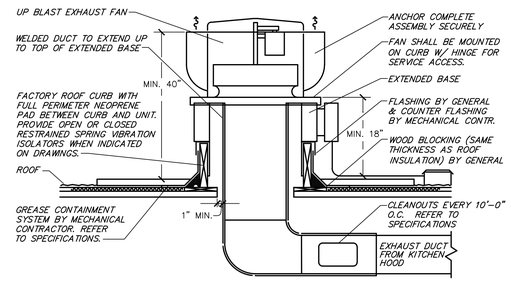
4 DUCT HANGER DETAIL

NOT TO SCALE



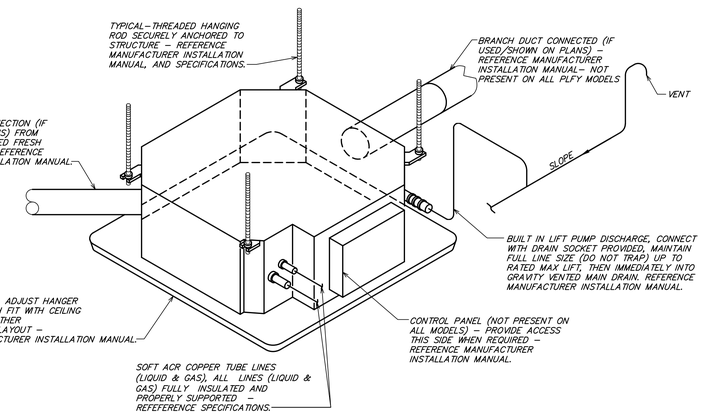
1 FIREMASTER FASTWRAP XL DETAIL

NOT TO SCALE



2 KITCHEN HOOD EXHAUST FAN

NOT TO SCALE



8 CASSETTE UNIT

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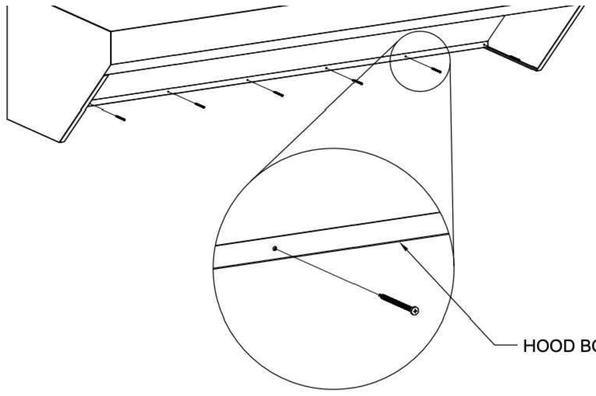
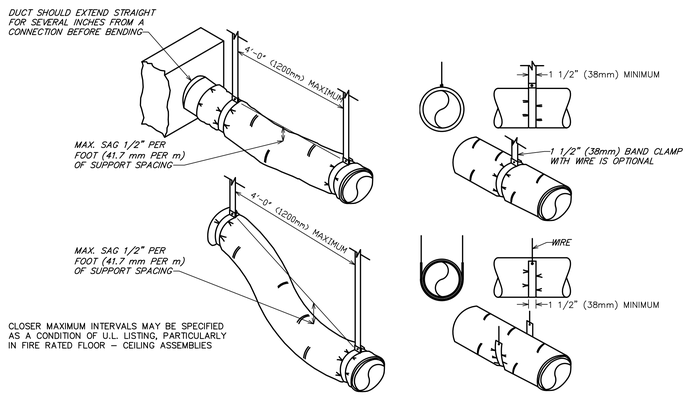


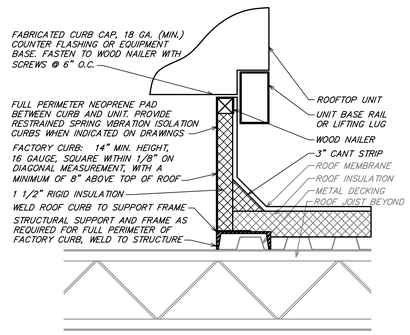
9 HOOD FASTENING DETAIL

NOT TO SCALE



6 FLEXIBLE DUCT SUPPORTS

NOT TO SCALE



NOTES:
1. CUT AND PATCH EXISTING ROOFING AS REQUIRED FOR NEW CURB INSTALLATION.
2. CURB SHALL BE SHIMMED LEVEL. PROVIDE TAPERED ROOF CURB IF REQUIRED.
3. SECURELY INSTALL CURB TO ROOF STRUCTURE; USE FASTENERS AS REQUIRED BY ROOF CONSTRUCTION.

3 ROOF CURB DETAIL

NOT TO SCALE

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OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO – GREGORY R. SCHNACKEL – E-59866 – PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL DETAILS

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

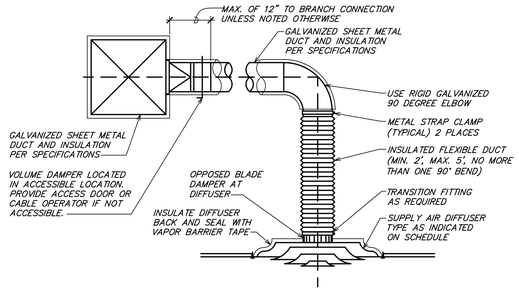
SHEET NO.:
M501

SE JOB#: 240116

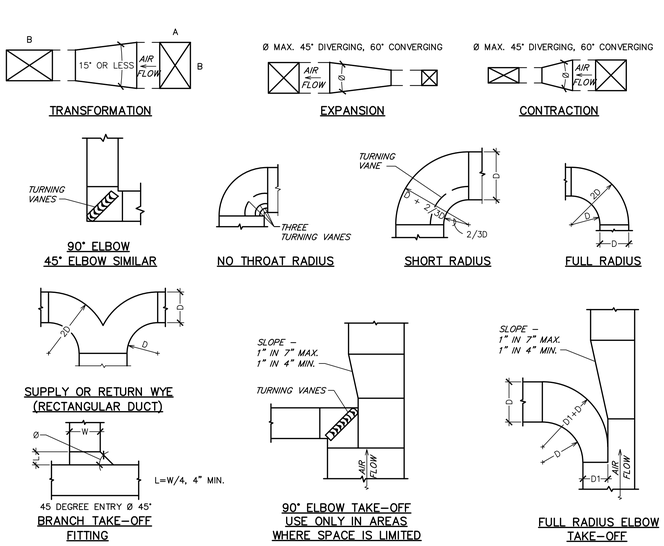
DIA.	WIRE DIA.	ROD	STRAP
10" DN	ONE 12 GA.	1/4"	1" x 22 GA.
11–18"	TWO 12 GA. OR ONE 8 GA.	1/4"	1" x 22 GA.
19–24"	TWO 10 GA.	1/4"	1" x 22 GA.
25–36"	TWO 8 GA.	3/8"	1" x 20 GA.
37–50"	–	TWO 3/8"	TWO 1" x 20 GA.
51–60"	–	TWO 3/8"	TWO 1" x 18 GA.
61–84"	–	TWO 3/8"	TWO 1" x 16 GA.
85–96"	–	TWO 1/2"	TWO 1 1/2" x 16 GA.

NOTES:
1. STRAPS ARE GALVANIZED STEEL; RODS ARE UNCOATED OR GALVANIZED STEEL; WIRE IS BLACK ANNEALED, BRIGHT BASIC OR GALVANIZED STEEL. ALL ARE ALTERNATIVES.
2. TABLE ALLOWS FOR CONVENTIONAL WALL THICKNESS, AND JOINT SYSTEMS PLUS ONE LB/SF OF INSULATION WEIGHT. IF HEAVIER DUCTS ARE TO BE INSTALLED, ADJUST HANGER SIZES TO BE WITHIN THEIR LOAD LIMITS.

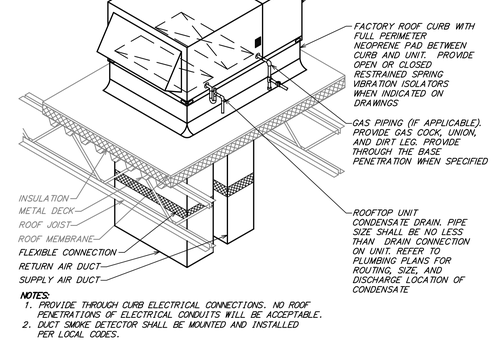
10 ROUND DUCT HANGER TABLE
NOT TO SCALE



8 TYPICAL DIFFUSER CONNECTION
NOT TO SCALE



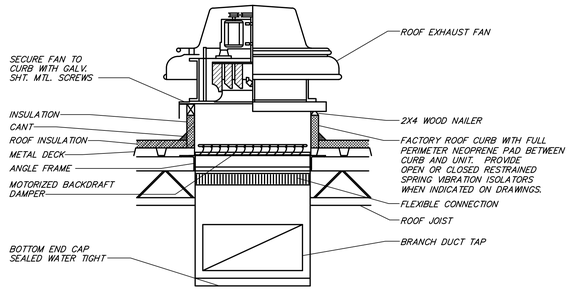
5 DUCTWORK DETAILS
NOT TO SCALE



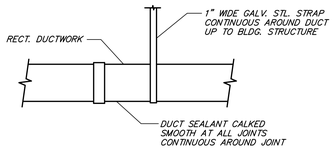
11 CURB FLASHING DETAIL
NOT TO SCALE

NOTES:
1. PROVIDE THROUGH CURB ELECTRICAL CONNECTIONS. NO ROOF PENETRATIONS OF ELECTRICAL CONDUITS WILL BE ACCEPTABLE.
2. DUCT SMOKE DETECTOR SHALL BE MOUNTED AND INSTALLED PER LOCAL CODES.

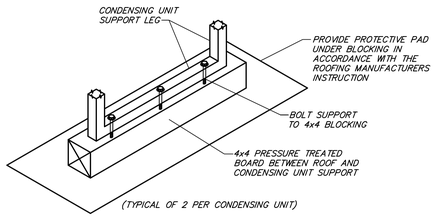
9 TYPICAL ROOF TOP UNIT DETAIL
NOT TO SCALE



6 ROOF EXHAUST FAN DETAIL
NOT TO SCALE

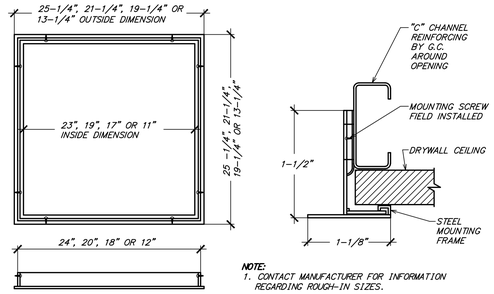


12 EXPOSED RECTANGULAR DUCT SUPPORT DETAIL
NOT TO SCALE



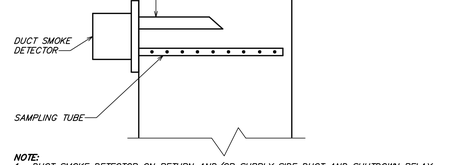
7 CONDENSING UNIT SUPPORT DETAIL
NOT TO SCALE

1 TYPICAL ROUND DUCT FITTINGS
NOT TO SCALE



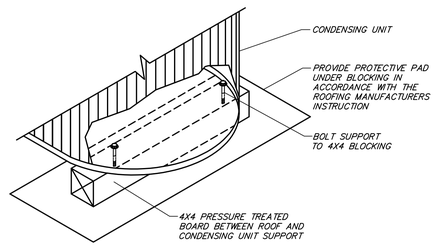
NOTE:
1. CONTACT MANUFACTURER FOR INFORMATION REGARDING ROUGH–IN SIZES.

2 TYPICAL DRYWALL MOUNTING FRAME DETAIL
NOT TO SCALE



NOTE:
1. DUCT SMOKE DETECTOR ON RETURN AND/OR SUPPLY SIDE DUCT AND SHUTDOWN RELAY SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. ALL WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR.

3 DUCT SMOKE DETECTOR DETAIL
NOT TO SCALE



(TYPICAL OF 2 PER CONDENSING UNIT)

4 CONDENSING UNIT SUPPORT DETAIL
NOT TO SCALE

zebra
ZEBRA ARCHITECTURE, PLLC
14614 N KIERLAND BLVD., SUITE N300
SCOTTSDALE, ARIZONA 85254
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STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E–59866
REGISTERED PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

SHEET NAME: **MECHANICAL DETAILS**

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.: **M502**

SE JOB# 250110

SPECIFICATIONS TABLE OF CONTENTS

SECTION 230000 – HVAC GENERAL CONDITIONS

PART 1 GENERAL

1.01 APPLICABILITY
A. This section supplements all sections of the Specifications for Division 23 and shall apply to all phases of work hereinafter specified, shown on the Drawings, or required to provide a complete installation of approved HVAC systems.

1.02 DEFINITIONS
A. "Work" is hereby defined as, "The construction and services required by the Contract Documents whether completed or partially completed and includes all labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The work may constitute the whole or a part of the project."
B. "Furnish" is hereby defined as, "To supply and deliver, unload, and inspect for damage."
C. "Install" is hereby defined as, "To unpack, assemble, erect, apply, place, finish, cure, protect, clean, connect, and place into operation into the work."
D. "Provide" is hereby defined as, "To furnish and install."
E. "Connect" is hereby defined as, "To bring service to the equipment and make final attachment including necessary ductwork, piping, wiring, etc."
F. "Concealed" is hereby defined as, "Hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces, or buried."
G. "Exposed" is hereby defined as, "Not installed underground nor concealed as defined by the Specifications."
H. "Drawings" is hereby defined as, "All plans, details, equipment schedules, diagrams, sketches, etc. issued for the construction of the work."

1.03 CODES AND STANDARDS
A. Perform work in accordance with the applicable Building Code, Electrical Code, Fire Code, Mechanical Code, Plumbing Code, Energy Code, and all other applicable codes, amendments, and ordinances. Also perform all work in accordance with the Americans with Disabilities Act (ADA) and the Authority Having Jurisdiction (AHJ) including Fire Marshal(s).
B. Perform work in accordance with Landlord requirements, including any Tenant Criteria Manuals and Lease Exhibits, where applicable.
C. Perform work in accordance with the applicable utility companies serving the project. Make all arrangements with the utility companies for proper coordination of the work.
D. Recognized Standards: Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these Specifications shall conform to the latest publications or standard rules of Underwriters Laboratories, Inc. (U.L.), American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and National Electrical Code (NEC), National Fire Protection Association (NFPA), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
E. The Contract Documents shall take precedence where the Contract Documents exceed code, Landlord, utility, or recognized standards requirements.

1.04 PERMITS AND FEES
A. Permits, licenses, fees, inspections and arrangements required for the work under this Contract shall be obtained by the Contractor at his expense, unless otherwise indicated.

1.05 CONTRACT DRAWINGS
A. The Contractor is responsible to obtain, fully understand, and coordinate the work with the complete set of Contract Documents. Any required corrections, including all associated costs, arising from issues caused by the Contractor's failure to understand and/or coordinate the work with the complete set of Contract Documents are the Contractor's sole responsibility.
B. Work under these sections is diagrammatic unless indicated otherwise and is intended to convey the scope of work and indicate the general arrangement of ductwork, piping, equipment, and accessories. Follow these drawings in laying out the work and verify spaces for the installation of these materials and equipment. Wherever a question exists as to the exact intended location of ductwork, piping, or equipment, obtain instructions from the Architect before proceeding with the work.
C. Notify the Architect for resolution if a discrepancy is discovered within the Contract Documents. Failure of the Contractor to notify the Architect of discrepancies shall result in the resolution becoming the Contractor's responsibility and subject to the Architect's review and possible rejection. Should the Architect reject a discrepancy resolution of which they were not notified, the Contractor is fully responsible to correct the installation, including all associated costs, until approval of the installation is given by the Architect.

1.06 EXISTING CONDITIONS
A. Verify all existing conditions prior to beginning work.
B. Any existing conditions indicated in the Contract Documents are based on information drawings provided by others and possibly limited field verification. The Contractor shall adjust for actual field conditions at no additional expense to the Owner.
C. The Contractor shall visit the project site, review existing conditions against the Contract Documents, and familiarize himself with the work prior to bidding and start of the work. By signing the Contract, the Contractor acknowledges the site visit has been completed and the existing conditions are accepted.
D. The Contractor shall notify the Architect of major discrepancies in writing so the appropriate modifications to the design can be made without delay to the project. The Contractor assumes full responsibility of adjusting for discrepancies of which the Architect is not informed.

1.07 SUBMITTALS
A. Shop Drawings:
1. Furnish the following submittals to the Architect for review by the Engineer:
a. Provide product data and shop drawings for vibration isolation.
b. Provide balancing firm qualifications and final test report for Testing, Adjusting, and Balancing.
c. Provide product data for duct insulation.
d. Provide product data for grease duct fireproofing (if specified).
e. Provide product data for HVAC piping insulation.
f. Provide product data for refrigerant piping.
g. Provide product data and shop drawings for HVAC ductwork.
h. Provide product data for air duct accessories.
i. Provide product data and shop drawings for HVAC power ventilators.
j. Provide product data and shop drawings for air outlets and inlets.
k. Provide product data and shop drawings for condensing units and heat pumps.
l. Provide product data and shop drawings for air handling and fan coil units.
2. Submittals other than those listed above will not be reviewed and will be returned stating as such.
3. Shop drawings shall be prepared by a manufacturer's representative, and shall contain names of the manufacturer and cut sheets of equipment to be used on the project. Use manufacturer's specification sheets identified by number indicated on drawings or schedules. Indicate catalog number on the cut sheets. As applicable, provide construction data, weight and dimensional data, voltage ratings, performance data, listing data, pump curves, fan curves and sound data as part of the shop drawing submittal.
4. Submittals are reviewed only for general compliance with the Contract Documents. Dimensions, quantities and details are not checked during submittal review. Review of the submittals does not relieve the Contractor of the responsibility for providing all materials, equipment and accessories necessary for a complete and operational system meeting the requirements of the project and the intent of the Contract Documents. The responsibility for coordination of substituted materials and equipment lies solely with the substituting Contractor.
5. Electrical Characteristics: Verify that proper power supply is available prior to ordering equipment. Verify proper voltage, phase and current rating of power supply and inform Engineer of any deviations prior to order, connection of equipment or start-up. Responsibility for verification of proper power supply voltage and any product returns or damage resulting from incorrect connections shall rest with this Contractor.
B. Test Reports: Provide Testing, Adjusting, and Balancing (TAB) and Commissioning reports to the Architect for review by the Engineer. All other reports shall be provided to the Owner.

1.08 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.
B. Installer Qualifications: Company specializing in performing the work of this section, with minimum five years experience.
C. Products:
1. Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
D. All equipment and components shall be free of all rust/corrosion or any visible damage. All items not complying with this requirement shall be replaced without any change in the Contract amount.
E. Equipment performance and accessories shall be as scheduled on the Drawings and specified herein. Inclusion in both locations is not a prerequisite to inclusion in the Contract. Equipment and accessories specified in either location shall be included in the Contract. Provide all necessary accessories and connections as required for a complete, functional system, including all required components reasonably inferred to as necessary although such components may or may not be specifically indicated in the Contract Documents.
F. Code or utility company requirements shall supersede any conflicting requirements of this section.

1.09 DELIVERY, STORAGE, AND HANDLING
A. Rooftop Equipment: Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.
B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.
C. Protect dampers and accessories from damage to operating linkages, blades and finishes.
D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
E. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.10 WARRANTY AND GUARANTEE
A. Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
B. Provide one year manufacturer warranty for pumps.
C. Provide three year manufacturers warranty for solid state ignition modules.
D. Provide five year manufacturers warranty for compressors, heat exchangers, condensing units, and electronic air cleaners.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS
A. The manufacturers listed are listed to set minimum standards for quality, design, and functionality. The products of other manufacturers may be submitted, at the Contractor's option, during shop drawing review unless indicated otherwise. The products of other manufacturers shall meet or exceed all requirements of the Contract Documents. The Contractor accepts all responsibility for costs and coordination issues arising out of the substitution of materials or equipment, and the coordination of such substitutions with all other contractors and subcontractors.
B. The Contractor may use any of the following ductwork, piping or insulation materials at his option, provided the selected material meets with the approval of all State, local authorities and any utility company requirements. Verification of compliance of the selected material is the sole responsibility of the installing Contractor.

PART 3 EXECUTION

3.01 COORDINATION OF WORK
A. Examine the Contract Documents as a whole for the work of other trades. Coordinate all work accordingly.
B. Promptly report to the Architect any delay or difficulties encountered in the installation of the work, which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.
C. Plan, lay out, and coordinate the work with all trades well enough in advance so that it proceeds with a minimum of interference to work that has not been completed and work that is in progress. Inform all trades of openings required for the work and provide all special frames, sleeves, and anchor bolts required. The HVAC system layout may be altered to suit the conditions with engineer approval, prior to the installation of any work and without additional cost to the Owner. Conflicts arising from lack of coordination shall be this Contractor's responsibility.
D. Perform all work in conformity with the Contract Documents and afford other trades reasonable opportunity for the execution of their work. Properly connect and coordinate this work with the work of other trades at such time and in such a manner as not to delay or interfere with their work.
E. All roofing penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this Project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.
F. All temperature control wiring, thermostat wiring, damper interlock wiring, control panel interlock wiring and miscellaneous low voltage wiring associated with the equipment furnished or installed under this contract shall be furnished and installed by the mechanical contractor or his sub-contractor. All wiring installed under this contract shall be in full compliance with the National Electrical Code, all State and local codes and requirements of the Electrical Specifications for this project.

3.02 EXAMINATION
A. Verify field measurements are as indicated on the Drawings.
B. Verify all equipment locations prior to rough-in. Maintain adequate equipment service clearance per manufacturer and code.
C. Verify routing of all ductwork and piping in field prior to fabrication or installation. Verify adequate clearance with structure, light fixtures, and ceiling heights.
D. Verify that proper fuel and power supply is available for connection.

3.03 INTERFACE WITH OTHER PRODUCTS
A. Install all ductwork, pipe, equipment, and accessories to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

3.04 FIELD QUALITY CONTROL
A. Provide tests as necessary to establish the adequacy, quality, safety, completed status, and suitable operation of each system. Tests shall be conducted under the supervision of the Architect.

3.05 CLEANING AND REPAIR
A. Clean fire suppression parts to remove harmful materials.
B. Clean exposed surfaces of all ductwork pipe, equipment, and accessories of all dirt, debris, splatter, and other deleterious materials. Follow the manufacturer's recommendations for cleaning as applicable.
C. Repair or replace damaged ductwork, pipe, equipment, and accessories, as directed by and to the satisfaction of the Architect, where marring or disfigurement has occurred. All pipe, equipment, and accessories shall be new.

3.06 PROJECT CLOSEOUT
A. Project Record Documents: At project closeout, provide one printed copy and one electronic copy of the project record documents to the Owner. Record documents will not be reviewed by the Engineer.
B. Record Drawings: Information contained on project record drawings shall include, as a minimum:
1. Actual locations of all equipment, ductwork, air inlets/outlets, accessories, etc.
2. Actual routing of ductwork with sizes and elevations.
3. Actual locations of control devices including valves and volume dampers.
C. Operation and Maintenance Data: Provide descriptive literature, maintenance and operation data for all hvac equipment, control systems, accessories, and materials used. Include maintenance procedures, intervals, and parts list of each item installed under this contract. Include all manufacturer's guarantees and warranties.
D. Maintenance Materials: At project closeout, furnish to the Owner the following:
1. One set of replacement filters for all hvac equipment.
2. The maintenance contract for the hvac system, if applicable.
E. Test Reports: Submit to the Owner all testing reports.

END OF SECTION

SECTION 230548 – VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Vibration isolators.
B. Equipment:
1. Fans, axial and centrifugal
2. Condensing units and air source heat pumps
3. Furnaces and fan coil units
4. Packaged roof top equipment

1.02 SUBMITTALS
A. Product Data: Provide schedule of vibration isolator type with location and load on each.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Isolation Technology, Inc.; Kinetics Noise Control, Inc.; Mason Industries.

2.02 VIBRATION ISOLATORS
A. Spring Hanger:
1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators or rubber hanger with threaded insert.
3. Misalignment: Capable of 20 degree hanger rod misalignment.
4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
B. Neoprene Pad Isolators:
1. Rubber or neoprene waffle pads.
a. Hardness: 30 durometer.
b. Thickness: Minimum 1/2 inch.
c. Maximum Loading: 50 psi.
d. Rib Height: Maximum 0.7 times width.
2. Configuration: Single layer.
C. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.
D. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Provide flexible connections on all piping and ductwork connections to equipment. Refer to other sections of this Specification for the acceptable types of flexible connectors to be used.
C. Selection of type, thickness and deflection of vibration isolation shall be by the vibration control manufacturer based on the specific equipment type and size, as scheduled on the Drawings and indicated below.

3.02 SCHEDULES
A. Equipment Isolation Schedule: (Minimum deflection as sized by the isolation equipment manufacturer.)
1. Fans, axial and centrifugal.
a. Small fans up to 22" diameter wheel:
1. Rubber Mount or Hanger
2. Condensing units and air source heat pumps.
a. Slab on grade:
1. Base: Concrete Housekeeping Pad.
2. Isolation: Neoprene Pad, Rubber Mount or Glass Fiber Pad.
b. Above grade floor or roof structures:
1. Base: Plastic or Fiber Cement Pad.
2. Isolation: Neoprene Pad, Rubber Mount or Glass Fiber Pad.
3. Furnaces and fan coil units.
a. Floor mounted (all locations):
1. Base: Concrete Housekeeping Pad.
2. Isolation: Neoprene Pad, Rubber Mount or Glass Fiber Pad.
b. Suspended:
1. Isolation: Rubber or Spring Hanger.
4. Packaged roof top equipment.
a. Above grade roof structures:
1. Base: Roof Curb.
2. Isolation: Full perimeter Neoprene Pad between curb and units. Provide restrained spring vibration isolation curbs when indicated on the Drawings.

END OF SECTION

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Testing, adjustment, and balancing of air systems.
1. Air handling units; Packaged heating and/or cooling equipment; Fans. (Exhaust and supply); Coils; Terminal equipment; Air inlets and outlets. (Diffusers, grilles, louvers, etc.)
B. Measurement of final operating condition of HVAC systems.
C. Independent agency requirements.

1.02 SUBMITTALS
A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract. Provide TAB Agency qualifications.
B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Submit to the Construction Manager within two weeks after completion of testing, adjusting, and balancing.
2. Provide reports in bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat and equipment locations.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Include the following on the title page of each report:
a. Name, address and telephone number of Testing, Adjusting, and Balancing Agency.
b. Project: Name; location; Engineer; Contractor, Report date.

1.03 WARRANTY
A. The Balancing Contractor shall be prepared to return to the site at no additional cost to re-adjust air quantities as required to provide uniform temperatures, eliminate drafts and objectionable noises during the first year of occupancy, including one full heating and one full cooling season, after the acceptance of the final balancing report.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS
A. Perform total system balance in accordance with one of the following:
1. AABC MN-1, AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the Project.
C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this Section with a minimum of five years experience.
2. Certified by one of the following:
a. AABC, Associated Air Balance Council; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
3. The TAB Agency must be a completely independent, third party balancing contractor with no financial, common owners or other ties to the installing contractors.
E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 ADJUSTMENT TOLERANCES
A. Air Handling Systems; Air Outlets and Inlets; Hydronic Systems: Adjust to within plus or minus 15 percent of design.

3.03 RECORDING AND ADJUSTING
A. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
B. Mark on the Drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

3.04 AIR SYSTEM PROCEDURE
A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters. Do not use diffuser, grille or register integral dampers for balancing adjustments unless the plans do not indicate duct mounted devices.
F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required at no additional expense to the Owner. Vary branch air quantities by damper regulation.
G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions in all operating modes as indicated in the sequence of control.
I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
J. Where modulating dampers are provided, take measurements and balance at extreme conditions and at all intermediate operating conditions specified in the sequence of control. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

3.05 SCOPE
A. Equipment Requiring Testing, Adjusting, and Balancing (if present on the project):
1. HVAC Pumps; Boilers; All Air Handling Equipment; All Packaged Heating and/or Cooling Equipment; All Coil; All Heat Exchangers; Terminal Heat Transfer Units; Air Terminal Units; Air Inlets and Outlets

3.06 MINIMUM DATA TO BE REPORTED
A. Report (as applicable to the project):
1. Summary Comments:
a. Design versus final performance
b. Notable characteristics of system
c. Summary of outdoor and exhaust flows to indicate amount of building pressurization
d. Nomenclature used throughout report and test conditions.
B. Electric Motors and drives:
1. Manufacturer; Model/Frame; HP/BHP; Phase, voltage, amperage; nameplate, actual, no load; RPM; Service factor; Sheave Make/Size/Bore.
2. V-Belt Drives: Identification/location; Required driven RPM; Driven sheave, diameter and RPM; Belt, size and quantity;
C. Cooling and Heating Coils:
1. Identification/number; Manufacturer
2. Air flow, design and actual
3. Air pressure drop, design and actual
4. Entering and leaving air DB and WB temperature, design and actual
5. Water flow, design and actual (if applicable)
6. Water pressure drop, design and actual (if applicable)
7. Entering and leaving water temperature, design and actual (if applicable)
D. Air Moving Equipment:
1. Manufacturer; Model number; Serial number; Arrangement/Class/Discharge
2. Air flow, specified and actual
3. Inlet; Discharge; Total static pressure (total external), specified and actual
E. Air Distribution Tests:
1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

SECTION 230713 – DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Duct insulation.
B. Duct liner.
C. Insulation jackets.
D. Supply, return or exhaust ducts in ceiling spaces.
E. Supply, return or exhaust ducts in interior unconditioned areas.
F. Supply, return or exhaust ducts in exposed locations.

1.02 FIELD CONDITIONS
A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION
A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.
B. Manufacturer: Knauf Fiber Glass; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.

2.02 GLASS FIBER, FLEXIBLE
A. Insulation: ASTM C 553; flexible, noncombustible blanket.
1. 'K' value: 0.31 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
B. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.
C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
D. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
E. Tie Wire: Annealed steel, 16 gage.

2.03 DUCT LINER
A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.
1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.
3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficients:
a. 1/2 inch Thickness: 0.30.
b. 1 inch Thickness: 0.45.
c. 1-1/2 inches Thickness: 0.60.
d. 2 inch Thickness: 0.70.
B. Adhesive: Waterproof, fire-retardant type.
C. Liner Fasteners: Galvanized steel, self-adhesive pad or impact applied with integral, or press-on head.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and NAIMA National Insulation Standards.
B. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
C. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
D. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
E. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards – Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.02 SCHEDULES
A. The Contractor may use any of the following insulating materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected insulating material and thickness with all State and local codes and utility company requirements is the sole responsibility of the installing Contractor.
B. Supply air ducts in ceiling spaces:
1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.
2. Flexible Glass Fiber Duct Liner Insulation: 1 inches thick.
C. Supply, return or exhaust air ducts in crawl spaces, attics or other unconditioned areas:
1. Flexible Glass Fiber Duct Insulation: 3 inches thick.
D. Supply air ducts exposed in finished areas:
1. Flexible Glass Fiber Duct Liner Insulation: 1 inches thick.
E. Return or exhaust air ducts exposed in finished areas: None.

END OF SECTION

SECTION 230713.13 – GREASE DUCT FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Fire resistant duct wrap for kitchen hood exhaust ventilation ducts (grease ducts).
B. Firestopping at duct penetrations through fire rated walls and floors.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Acceptable Manufacturer: 3M Fire Protection Products, Inc.; Unifrax FyreWrap; Morgan Thermal Ceramics.

2.02 MATERIALS
A. Grease Duct Fireproofing: Material applied directly to metal ducts and achieving two-hour fire rated separation when tested in accordance with UL 2221 or ASTM E2336 by independent testing agency.
1. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0, when tested in accordance with ASTM E 84, both blanket and foil.
2. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
3. Flexibility: Capable of being formed around corners and shapes by hand.
4. Surface: Foil or other damage resistant surface; fiber not exposed after installation.
5. Accommodation For Duct Access Doors and Panels: Capable of being installed to achieve fire rating without impeding access.
6. Acceptable Product: 3M Fire Barrier Duct Wrap; fire resistant inorganic blanket encapsulated with scrim-reinforced foil facing.
B. Fasteners: Non-combustible; use one or both of the following to attach fireproofing to ducts:
1. Banding: Steel or stainless steel, 1/2 inch wide, minimum, and 0.015 inch thick, minimum; with steel banding clips.
2. Insulation Pins: Copper-coated steel impalement pins, minimum 12 gage, for welded attachment, with galvanized steel self-locking washers, 1-1/2 inch square or diameter; or equivalent sized cup-head pins.
C. Access Panel Hardware: Galvanized threaded rods, sleeves, washers, and wing nuts as specified in manufacturer's instructions.
D. Tape: Aluminum foil tape for sealing exposed fiber edges and repairing tears in facing.
E. Firestopping: Material tested in conjunction with fireproofing, in accordance with ASTM E 814, to achieve fire rated penetration seal at duct penetrations through fire rated assemblies.
1. Fire Rating: Same or greater than rating of penetrated assembly.
2. Acceptable Products: 3M Fire Barrier 1000 N/S, 1003 S/L, and 2000+ Silicone Sealants, as required by tested assembly.

PART 3 EXECUTION

3.01 EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION
A. Install in strict accordance with manufacturer's instructions and as indicated on the Drawings.
B. Perform all required regulatory duct leakage and weld tests in the presence of the code official, including but not limited to light tests and smoke tests, to demonstrate the integrity of the duct construction prior to the installation of any insulation that prevents visual inspection of the ductwork on all sides.
C. Install fireproofing on entire surface of ducts indicated, except where Contract Documents explicitly indicate 3-sided or 2-sided installation.
D. At penetrations of ducts through fire rated assemblies (walls, floors, roofs), extend fireproofing through the opening and seal annular space between fireproofing and edge of opening with firestopping.
E. Fasten fireproofing to ducts using either banding or insulation pins welded directly to surface of duct; do not use adhesives.
F. Install fireproofing on supports and hangers unless hanger rods are at least 3/8 inch in diameter, spaced not more than 60 inches on center along length of duct, and horizontal supports are at least 2 by 2 by 1/4 inch steel angle or equivalent SMACNA support system.
G. Access Panels: Do not block access; install fireproofing so that panel can be removed and reinstalled without damaging fireproofing.
H. Seal all cut edges and ends and repair tears in facing using aluminum foil tape.

END OF SECTION

SECTION 230719 – HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Cooling condensate drain piping insulation.
B. Refrigerant piping insulation.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION
A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.
B. The Contractor may use any of the following insulating/jacketing materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected insulating/jacketing material is the sole responsibility of the installing Contractor.

2.02 GLASS FIBER
A. Manufacturers: Knauf Insulation; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.
B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.
C. Insulation: ASTM C 547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.
1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 650 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.
D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.
E. Vapor Barrier Lap Adhesive: Compatible with insulation.
F. Insulating Cement/Mastic: ASTM C 195; hydraulic setting on mineral wool.
G. Fibrous Glass Fabric:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 lb/cu ft density.
3. Weave: 5x5.
H. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.
I. Insulating Cement: ASTM C 449/C 449M.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION
A. Manufacturer: Armacell International.
B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3; use molded tubular material wherever possible.
1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.
C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS
A. PVC Plastic.
1. Manufacturers: Knauf Fiber Glass; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.
B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: -40 degrees F.
b. Maximum Service Temperature of 180 degrees F.
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E 96/E 96M.
d. Thickness: 30 mil.
e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install in accordance with NAIMA National Insulation Standards.
C. Inserts and Shields:
1. Application: Piping 2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
E. Exposed Piping: Locate insulation and cover seams in least visible locations.

3.02 SCHEDULE
A. Cooling Systems:
1. Cold Condensate Drains:
a. Glass Fiber Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 1/2 inch.
b. Flexible Elastomeric Cellular Foam Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 1/2 inch.
B. Refrigerant Suction:
a. Glass Fiber Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 3/4 inch.
b. Flexible Elastomeric Cellular Foam Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 3/4 inch.
C. Refrigerant Hot Gas:
a. Glass Fiber Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 1/2 inch.
b. Flexible Elastomeric Cellular Foam Insulation:
1. Pipe Size Range: All Sizes.
a. Thickness: 1/2 inch.

END OF SECTION

SECTION 230800 – COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY
A. See Section 01 9113 – General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.
B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

SE JOB#: 256116

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REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA #: 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SPECIFICATIONS

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M590

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Pre–functional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:

1. Control system.
2. Major and minor equipment items.
3. Piping systems and equipment.
4. Ductwork and accessories.
5. Terminal units.
6. Sound control devices.
7. Vibration control devices.
8. Variable frequency drives.
9. Special Ventilation: Hoods, pressurization, exhaust, etc.
10. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
11. Indoor Air Quality Procedures: The Commissioning Authority will coordinate; Contractor will execute; see Section 01 5719.

E. The Pre–functional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

A. Section 23 0993 – Sequence of Operations for HVAC Controls.

B. Section 23 0593 – Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 – The HVAC Commissioning Process; 2012.

1.04 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. DRAFT Pre–functional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:

1. System name.
2. List of devices.
3. Step–by–step procedures for testing each controller after installation, including:
   a. Process of verifying proper hardware and wiring installation.
   b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
   c. Process of performing operational checks of each controlled component.
   d. Plan and process for calibrating valve and damper actuators and all sensors.
   e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has "passed" and is operating within the contract parameters.
5. Description of the instrumentation required for testing.
6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

C. Startup Reports, Pre–functional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:

1. Specific step–by–step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
2. Full as–built set of control drawings.
3. Full as–built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
   a. Floor.
   b. Room number.
   c. Room name.
   d. Air handler unit ID.
   e. Reference drawing number.
   f. Air terminal unit tag ID.
   g. Heating and/or cooling valve tag ID.
   h. Minimum air flow rate.
   i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as–built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as–built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
   a. Sequences of operation.
   b. Control drawings.
   c. Points lists.
   d. Controller and/or module data.
   e. Thermostats and timers.
   f. Sensors and DP switches.
   g. Valves and valve actuators.
   h. Dampers and damper actuators.
   i. Program setups (software program printouts).

E. Project Record Documents:

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air–flow stations on project record drawings.

F. Draft Training Plan:

1. Follow the recommendations of ASHRAE Guideline 1.1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals:

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

H. Submittals are reviewed only for general compliance with the Contract Documents. Dimensions, quantities and details are not checked during submittal review. Review of the submittals does not relieve the Contractor of the responsibility for providing all materials, equipment and accessories necessary for a complete and operational system meeting the requirements of the project and the intent of the Contract Documents. The responsibility for coordination of substituted materials and equipment lies solely with the substituting Contractor.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment–Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Pre–functional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start–up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with the Contract Documents.

3.02 INSPECTING AND TESTING – GENERAL

A. Submit startup plans, startup reports, and Pre–functional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two–way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. Verify proper operational of Normally Open or Normally closed positions of all valves/dampers by means of normal operating mode tests plus removal of power to confirm proper closure or opening upon failure of power or control signal.
7. Perform valve/damper leakage testing on all dampers by applying normal operating pressure with the valve/damper in the closed position and measure either the delta T across coils or airflow through dampers to confirm compliance with specification requirements for dampers and zero leakage for valves.
8. If actual valve/damper position does not reasonably correspond, replace actuator.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Pre–functional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

A. Pre–functional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with the Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
2. Perform all trend logging specified in Pre–functional Checklists and Functional Test procedures.

E. Functionally Test integral or stand–alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.
2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:

1. That all specified functions and features are set up, debugged and fully operable.
2. That scheduling features are fully functional and setup, including holidays.
3. That all graphic screens and value readouts are completed.
4. Correct date and time setting in central computer.
5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
6. Functionality of field panels using local operator keypads and local ports (plug–ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
7. Power failure and battery backup and power–up restart functions.
8. Global commands features.
9. Security and access codes.
10. Occupant over–rides (manual, telephone, key, keypad, etc.).
11. O&M schedules and alarms.
12. Occupancy sensors and controls.
13. "After hours" use tracking and billing.
14. Communications to remote sites.
15. Fire alarm interlocks and response.
16. Fire protection and suppression systems interfaces.
17. Security system interlocks.
18. That points that are monitored only, having no control function, are reporting properly to the control system.
19. All control strategies and sequences not tested during controlled equipment testing.
20. Trend logging and graphing features that are specified.
21. Other integrated tests specified in the Contract Documents
22. That control system features that are included but not specified to be setup are actually installed.

H. Perform and submit trend logging on the following using the control system, for minimum period of 5 days including one weekend, if the control points are monitored by the control system:

1. Duty cycling, if specified.
2. Demand limiting, including over–ride of limiting.
3. Sequential staging ON of equipment; optionally demonstrate manually.
4. Optimum start–stop functions.
5. Miscellaneous equipment current or status for duty cycling and demand limiting.
6. Equipment or building kW or current for demand limiting.
7. Equipment optimum start/stop functions.

I. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.

B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

A. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

B. These demonstrations are in addition to, and not a substitute for, Pre–functional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

C. Provide classroom and hands–on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Return for follow up training not less than 30 days after initial training and not more than 6 months after initial training.

D. Provide professional digital video recording of all instruction sessions and deliver two copies on DVD's to the Owner for future reference.

E. TAB Review: Instruct Owner's personnel for minimum eight hours, after completion of TAB, on the following:

1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 – Basic Control System: Provide minimum of 16 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
   a. This training may be held on–site or at the manufacturer's facility.
   b. If held off–site, the training may occur prior to final completion of the system installation.
   c. For off–site training, Contractor shall pay expenses of up to two attendees.
2. Phase 2 – Integrating with HVAC Systems: Provide minimum of 16 hours of on–site, hands–on training after completion of Functional Testing. Include instruction on:
   a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
   b. Security levels, alarms, system start–up, shut–down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
   c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
   d. Every display screen, allowing time for questions.
   e. Use of keypad or plug–in laptop computer at the zone level.
   f. Use of remote access to the system via phone lines or networks.
   g. Setting up and changing an air terminal unit controller.
   h. Graphics generation.
   i. Point database entry and modifications.
   j. Understanding DDC field panel operating programming, when applicable.
3. Phase 3 – Post–Occupancy: Six months after occupancy conduct minimum of 16 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 230993 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. This Section provides the intended sequence of operation for each piece of controlled equipment. Other Sections of this Specification indicate the requirements for direct digital control systems, energy management systems, packaged factory controls or conventional analog control systems. Equipment, devices, and system components required for control systems are specified in other Sections. Wherever the sequences contained herein indicate control by a thermostat or EMS sensor/controller, the Temperature Control Contractor shall furnish EMS sensor/controllers for digital control systems or a thermostat for conventional analog control systems as specified in other sections of this Specification.

C. Sequence of operation for:

1. Fan coil units.
   a. Heat pump heating/cooling.
   b. Automatic changeover.
   c. Variable speed supply fan.
   d. Freeze protection.
2. Exhaust fans.
   a. General duty building exhaust fans
   b. Specific duty exhaust fans.
3. Control of package HVAC equipment containing factory mounted controls.
   a. Single Zone Systems.
4. Heat pump systems.
   a. Heat pump unit controls.

1.02 RELATED REQUIREMENTS

A. Section 23 0913 – Instrumentation and Control Devices for HVAC.

1.03 SYSTEM DESCRIPTION

A. Equipment performance, controls and accessories shall be as scheduled on the Drawings and specified herein. Inclusion in both locations is not a prerequisite to inclusion in the Contract. Equipment, controls and accessories specified in either location shall be included in the Contract. Provide all necessary controls, accessories and connections as required for a complete, functional system for all systems indicated on the Drawings.

B. All wiring of control systems including connections to controlled devices external to the control systems shall be included in the temperature controls contract as a part of the Mechanical Contract. The Electrical Contractor will only furnish power connections to devices at the locations indicated on the Electrical Drawings. Review the Electrical Drawings for locations where power connections will be provided. This Contractor shall provide all additional necessary power and control wiring for a complete and functional system.

C. Provide all conduit and electrical wiring where required. Wiring shall be installed in conduit wherever wiring is concealed in inaccessible areas of ceilings, walls, attics and floors. Conduit shall be installed in all locations required by applicable local and national codes. Other locations may be installed utilizing plenum rated cabling without conduit, provided that all cabling is neatly and adequately supported independent of all other systems, equipment, ductwork, etc. Where cable trays exist, all wiring shall utilize the cable tray path, except at direct run outs to equipment or control connections.

D. All control settings and set points shall be individually adjustable. Set points specified in this Section shall be used as a guide for initial setup and may require subsequent adjustment to achieve the desired system functionality and performance.

1.04 SUBMITTALS

A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the Contract Documents.
3. Include at least the following sequences:
   a. Start–up.
   b. Warm–up mode.
   c. Normal operating mode.
   d. Unoccupied mode.
   e. Shutdown.
   f. Capacity control sequences and equipment staging.
   g. Temperature and pressure control, such as setbacks, setups, resets, etc.
   h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
   i. Effects of power or equipment failure with all standby component functions.
   j. Sequences for all alarms and emergency shut downs.
   k. Seasonal operational differences and recommendations.
   l. Interactions and interlocks with other systems.
4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

1. Label with settings, adjustable range of control and limits.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include all monitoring, control and virtual points specified in elsewhere.
6. Include a key to all abbreviations.

C. Points List: Submit list of all control points indicating at least the following for each point.

1. Name of controlled system.
2. Point abbreviation.
3. Point description; such as dry bulb temperature, airflow, etc.
4. Display unit.
5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.

D. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.05 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Code or utility company requirements shall supersede any conflicting requirements of this Section.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 FAN COIL UNITS

A. Time Schedule: Control fan coil units based on the programmed time schedule as determined by the Owner's operating personnel. Provide occupied/unoccupied mode control with night setback of temperatures, where applicable.

B. Supply fan shall run continuously during the occupied period and cycle during the unoccupied period based on a demand for heating or cooling.

C. Dual temperature thermostat or EMS sensor/controller set at 75 degrees F (24 degrees C) maintains constant space temperature during the occupied mode and 10 degrees F (6 degrees C) warmer/cooler during the unoccupied mode by cycling refrigeration compressors and operating reversing valve on a call for heating.

D. Provide automatic change over from heating to cooling based on room demand.

E. Automatic Start Capabilities: Controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.

F. Freeze Protection: Stop fans and close outside air dampers and open heating coil valves (if any) to 100% open if temperature ahead of coils is below 37 degrees F (3 degrees C); signal alarm. (Except pre–heat coils.)

3.02 EXHAUST FANS

A. General building exhaust fans

1. Time Schedule: Start and stop exhaust fan based on the programmed time schedule as determined by the Owner's operating personnel.

B. Specific purpose exhaust fans shall be interlocked with the respective equipment as indicated on the Drawings. Provide necessary sensors and relays to allow control system to accurately sense equipment operation and activate fan systems accordingly. Interlock make up air units/fans and air handling systems providing make up air for exhaust systems as required to provide 100% make up air to all operating exhaust fans.

3.03 CONTROL OF PACKAGED HVAC EQUIPMENT CONTAINING FACTORY MOUNTED CONTROLS.

A. Single Zone Systems

1. Time Schedule: Control HVAC equipment based on the programmed time schedule as determined by the Owner's operating personnel. Provide occupied/unoccupied mode control with adjustable night setback of temperatures, where applicable.
2. Maintain the integrity of the packaged control equipment and sequences. The packaged unit controls shall operate such functions as the economizer operations, burner modulation, high limit and low limit safeties, etc. All set point, occupancy, staging and shut–down capabilities shall be controlled by the temperature control system.
3. The control system shall monitor and indicate at the operators console the status of the unit including:
   a. System on/off status.
   b. System on/off command status.
   c. Supply fan status.
   d. Return fan status (if present).
   e. Exhaust fan status (if present).
   f. System operating mode (heating/cooling/ventilation).
   g. Discharge air temperature.
   h. Discharge air temperature setpoint (where applicable).
   i. Mixed air temperature.
   j. Outdoor air temperature and humidity.
   k. Return air temperature and humidity.
   l. Space temperature (where applicable).
   m. Space temperature setpoint (where applicable).
   n. Compressor status, individually by compressor.
4. Control system shall be able to control any of the following functions:
   a. Turn the system on or off.
   b. Control the number of stages of heating or cooling to be utilized based on room or duct temperature conditions.
   c. Change occupied or unoccupied temperature setpoints.
   d. Change equipment operating mode (heating/cooling/off).
   e. Modify occupancy schedules by unit.

3.04 HEAT PUMP SYSTEMS

A. Heat Pump Unit Controls: Control system for the individual heat pump units shall be furnished by the equipment manufacturer. The program clock or energy management functions listed below must be integrated with the packaged controls furnished by the heat pump manufacturer. During the occupied mode as indicated by the program clock or EMS controller, the unit shall provide heating and cooling functions as specified by the unit manufacturer. During the unoccupied mode, the unit shall provide heating only at the night setback temperature as set by the room set/back thermostat or EMS sensor/controller. Heat pump control (heat, cool, occupied or unoccupied) shall be individually addressable for each heat pump unit. Heat pump supply fans shall run continuously during the occupied mode. This feature shall be individually programmable for each heat pump.

END OF SECTION

SECTION 232300 – REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Filter–driers.

E. Expansion valves.

1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.
2. If receiver is provided, install in liquid line leaving receiver.
3. Use line size on leaving side of liquid solenoid valves.

D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut–off valve and expansion valve.

E. Filter–Driers:

1. Use a filter–drier immediately ahead of liquid–line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use a filter–drier on suction line just ahead of compressor.

1.03 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

C. Welders Certification: In accordance with ASME (BPV IX).

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tube: ASTM B 280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B 88 (ASTM B 88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.
2. Joints: Flared.

C. Pipe Supports and Anchors:

1. Conform to ASME B31.5, ASTM F 708, MSS SP–58, MSS SP–69, and MSS SP–89.

2.02 REFRIGERANT

A. Provide refrigerant as specified by the manufacturer of the refrigeration equipment.

2.03 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:

1. Henry Technologies; Parker Hannifin/Refrigeration and Air Conditioning; Sporlan Valve Company.

B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.04 FILTER–DRIERS

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; Parker Hannifin/Refrigeration and Air Conditioning; Sporlan Valve Company.

B. Performance:

1. Flow Capacity – Liquid Line: As required by capacities indicated on the Drawings, minimum, rated in accordance with ARI 710.
2. Flow Capacity – Suction Line: As required by capacities indicated on the Drawings, minimum, rated in accordance with ARI 730.
3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
4. Design Working Pressure: 350 psi, minimum.

C. Cores: Molded or loose–fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.
2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

2.05 EXPANSION VALVES

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; Parker Hannifin/Refrigeration and Air Conditioning; Sporlan Valve Company.

B. Angle or Straight Through Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non–replaceable capillary tube and remote sensing bulb.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. All roofing penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this Project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

C. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

D. Fully charge completed system with refrigerant after testing.

3.02 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

END OF SECTION

SECTION 233100 – HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Round spiral ductwork.

D. Kitchen hood ductwork, Type 1 grease hoods.

E. Duct cleaning.

1.02 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts, only after approval of the Engineer. Sizes shown on design drawings are air dimensions. Contractor may increase duct size without engineer approval, provided all ceiling and shaft clearances can be maintained. Additional charges for increased duct size will not be accepted by the owner.

B. Report all conflicts with structure or other obstructions, prior to fabrication of any ductwork. Suitable adjustments in the sizes of ducts shall be accommodated without any additional expense to the Owner.

1.03 SUBMITTALS

A. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems. No ductwork shall be fabricated until engineer approved shop drawings have been received by the Contractor. Identify on ductwork shop drawings any deviations in sizes or shapes made necessary by the obstructions of other trades.

B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) – HVAC Air Duct Leakage Test Manual.

1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

B. Code or utility company requirements shall supersede any conflicting requirements of this Section.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Ducts: Hot–dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

B. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold–rolled commercial steel.

C. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003–H14. Aluminum Connectors and Bar Stock: Alloy 6061–T651 or of equivalent strength.

D. Insulated Flexible Ducts:

1. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected ductwork material is the sole responsibility of the installing Contractor.
2. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: –10 degrees F to 160 degrees F.
   d. Minimum R–Value: 4.2 or greater as required by the applicable energy codes.
3. Black polymer film supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   a. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: –20 degrees F to 175 degrees F.
   d. Minimum R–Value: 4.2 or greater as required by the applicable energy codes.
4. Multiple layers of aluminum laminate supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   a. Pressure Rating: 10 inches WG positive and 1.0 inches negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: –20 degrees F to 210 degrees F.
   d. Minimum R–Value: 4.2 or greater as required by the applicable energy codes.
5. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
   a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: –20 degrees F to 210 degrees F.
   d. Minimum R–Value: 4.2 or greater as required by the applicable energy codes.
6. UL 181, Class 0, interlocking spiral of aluminum foil; fiberglass insulation; aluminized vapor barrier film.
   a. Pressure Rating: 8 inches WG positive or negative.
   b. Maximum Velocity: 5000 fpm.
   c. Temperature Range: –20 degrees F to 250 degrees F.
   d. Minimum R–Value: 4.2 or greater as required by the applicable energy codes.

E. Joint Sealers and Sealants: Non–hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. VOC Content: Not more than 250 g/L, excluding water.
3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
4. For Use With Flexible Ducts: UL labeled.
5. Ductwork Exposed to the Weather: Hard cast VersaGrip 102, (VG–102), UL 181–AM compliant duct joint sealer, as manufactured by Carlisle, with fiberglass scrim tape reinforcement on all seams and joints, lateral and longitudinal.

F. Hanger Rod: ASTM A 36/A 36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.02 DUCTWORK FABRICATION

A. Fabricate, support and seal in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1–1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank–out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.03 DUCT MANUFACTURERS

A. Metal–Fab, Inc.; SEMCO Incorporated; United McGill Corporation.

2.04 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Round Spiral Ducts: Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.

C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1 inch thick fiberglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.

D. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.05 KITCHEN HOOD EXHAUST DUCTWORK, TYPE 1

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and NFPA 96.

B. Construct of 16 gage carbon steel or 18 gage stainless steel, using continuous external welded joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine drawings for the Architectural, Structural, Electrical and all other trades prior to preparation of ductwork shop drawings and prior to the fabrication of any ductwork.

B. Resolve any conflicts encountered with the Engineer prior to fabrication.

C. Identify on ductwork shop drawings any deviations in sizes or shapes made necessary by the obstructions of other trades.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible.

D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

H. Connect flexible ducts to metal ducts with draw bands.

I. Support flexible duct runs every five feet in the horizontal direction to avoid dips and sags.

J. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

SE JOB#: 250116

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zebra

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REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

GREGORY R. SCHNACKEL
E–59866
Date: 07/10/25
COA #: 03180

FIELD VERIFICATION:

The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SPECIFICATIONS

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M591

K. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp. Longer duct lengths are acceptable if depicted on the design drawings and allowed per local code. A maximum of one 90 degree bend, or equivalent, will be allowed in flexible duct runs.
L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
M. All exposed ducts in finished areas must be completely free from all dents or imperfections in the galvanized coating and shall be sealed CAREFULLY AND NEATLY with duct sealer completely contained within the joint. Duct wrap will not be permitted in exposed locations.
N. Kitchen hood exhaust, Type 1: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.
O. For all hood systems, perform all required regulatory duct leakage and weld tests in the presence of the code official, including but not limited to light tests and smoke tests, to demonstrate the integrity of the duct construction prior to the installation of any insulation that prevents visual inspection of the ductwork on all sides.
P. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.
Q. All roofing penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this Project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

3.03 CLEANING
A. Clean duct system and force air at high velocity through duct to remove accumulated dust or clean with high power vacuum machines. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.04 SCHEDULES
A. Ductwork Material:
B. The Contractor may use any of the following ductwork materials, at his option, provided the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor.
1. Low Velocity Supply (Heating Systems): Galvanized Steel, Aluminum.
2. Low Velocity Supply (System with Cooling Coils): Galvanized Steel, Aluminum.
3. Return and Relief: Galvanized Steel, Aluminum.
4. General Exhaust: Galvanized Steel, Aluminum.
5. Outside Air Intake: Galvanized Steel.
6. Kitchen Hood Exhaust, Type 1: Carbon Steel, Stainless Steel, Constructed per NFPA 96.
C. Ductwork Pressure Class:
1. Low Velocity Supply (Heating Systems): Scheduled System ESP+0.25", round up to next higher pressure class.
2. Low Velocity Supply (Systems with Cooling): Scheduled System ESP +0.5", round up to next higher pressure class.
3. Return and Relief: 1 inch.
4. General Exhaust: Scheduled System ESP +1.0", round up to next higher pressure class.
5. Outside Air Intake: 1 inch.
6. Kitchen Hood Exhaust: See drawings for maximum fan static pressure plus 50% additional.

END OF SECTION

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Air turning devices/extractors.
B. Volume control dampers.
C. Flexible duct connections.
D. Duct access doors.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS
A. Manufacturers: Krueger; Ruskin Company; Titus.
B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.02 VOLUME CONTROL DAMPERS
A. Manufacturers: Louvers & Dampers, Inc.; Nailor Industries Inc.; Ruskin Company; Prefco Inc.
B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated.
C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
F. The contractor shall provide either a mechanical or electrical cable operated system wherever dampers are located in non-accessible areas.
1. Mechanical cable operator system shall be similar and equal to Young Regulator Company, "Bowden Cable Control" system including damper, flexible cable with casing and concealed ceiling regulator control.
2. Electrically operated damper control system shall be similar and equal to United Enertech Corporation, "Power Balance" system including motor operated damper, RJ-11 plenum rated cabling and flush ceiling or wall mounted RJ-11 jack in remote plate. Include one hand held battery pack operator pack to be delivered to the Owner upon completion of the balancing.

2.03 FLEXIBLE DUCT CONNECTIONS
A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated.
B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
a. Net Fabric Width: Approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.04 DUCT ACCESS DOORS
A. Manufacturers: Acudor Products Inc.; Nailor Industries Inc.; Ruskin Company; SEMCO Incorporated.
B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated.
C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
D. Access doors with sheet metal screw fasteners are not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards – Metal and Flexible. Duct construction and pressure class.
B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
C. Locate all dampers and control elements in accessible areas wherever possible to avoid access doors. Provide ceiling access doors for access to all dampers and control elements located above inaccessible ceiling areas. Provide minimum 12 x 12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. Do not locate dampers closer than 5 feet or 10 duct diameters from the air terminal device, whichever is greater.
F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

AIR PURIFICATION DEVICES

Model: PHI-PKG14-24V Specifications

LISTING: UL 1598:2008 (3rd Edition)
FACTORY UV-PHI CELL
INSTALLATION: RTU PACKAGED UNIT / BLOWER CABINET

PART 1 GENERAL

1.01 SUMMARY
A. This section includes hydro-peroxide, Super-Oxide Ions, & Hydroxide Ion's delivered via PHI technology through packaged heating and cooling units capable of supplying 3,000 to 8,000 CFM of supply air to the indoor space.

1.02 QUALITY ASSURANCE
A. All models shall be UL listed and comply with safety standards UL 1598:2008 (3rd Edition) and CSA Standard C22.2 No. 250.0:2008.

1.03 WARRANTY
A. All units shall be provided with the following standard warranties:
1. 2-year or 18,000 hours from initial startup. National TAB provided service plan. The phi cell & UV light replacement 18,000 hour replacements are provide/installed at no cost if National TAB is providing Renew-Cx Service after initial installation.
B. This warranty shall not apply if:
1. The equipment is not installed by a qualified installer per the manufacturer's installation instructions shipped with the product.
2. The equipment is misused or neglected, or not maintained per the manufacturer's maintenance instructions.
3. The equipment is not operated within its published capacity.
4. The invoice is not paid within the terms of the sales agreement.

PART 2 PRODUCTS

2.01 GENERAL
A. MULTI-ZONE one piece packaged PHI Unit-Air Purification System.

2.02 HOUSING
A. Unit(s) shall be constructed of aluminum structural pop-rivets. All metal shall be CNC bent for precise assembly.
1. Quad Metallic Target
2. UV-C bulb
3. Electronic Enclosure (24VAC input power Jack)
4. Magnetic mounting feet for easy placement and installation in the Blower Cabinet.

END OF SECTION

SECTION 233423 – HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Roof exhausters.
B. Kitchen range hood exhausters.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Greenheck; Loren Cook Company; PennBarry; CaptiveAire.

2.02 POWER VENTILATORS – GENERAL
A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
C. Fabrication: Conform to AMCA 99.
D. UL Compliance: UL listed and labeled, designed, manufactured, and tested as suitable for the purpose specified and indicated.

2.03 ROOF EXHAUSTERS AND VENTILATORS
A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
B. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness at fan location) self-flashing of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
D. Backdraft Damper: Motor actuated (or gravity damper if depicted on design drawings), aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.
F. Kitchen hood exhausters shall be upblast with grease tray, ventilated double wall curb and hinged curb adapter base for cleaning. Hood exhausters shall comply with requirements of NFPA 96.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Provide sheaves required for final air balance at no additional expense to the owner.
C. Secure roof and wall exhausters with cadmium plated steel lag screws to roof curb or structure.
D. Extend ducts to roof and wall exhausters into roof curb or wall structure. Counterflash duct to roof or wall opening.
E. Install backdraft dampers (gravity or motorized as depicted on design drawings) on inlet to roof and wall exhausters.
F. All roofing penetrations shall be flashed and weather sealed by the roofing manufacturer's authorized roofing contractor at this Contractor's expense. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system applicable to this project. The use of an unauthorized roofing contractor may result in removal and replacement of the penetration systems at this Contractor's expense.

END OF SECTION

SECTION 233700 – AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Rectangular ceiling diffusers.
B. Perforated face ceiling diffusers.
C. Grid core exhaust and return grilles.
D. Wall registers and grilles.

1.02 SUBMITTALS
A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, accessories, and noise level.

1.03 QUALITY ASSURANCE
A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
B. Test and rate louver performance in accordance with AMCA 500–L.
C. Code requirements shall supersede any conflicting requirements of this Section.

1.04 QUALIFICATIONS
A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Titus; Krueger; Price Industries; Nailor Industries Inc.; Hart & Cooley; Ruskin, Greenheck.

2.02 RECTANGULAR CEILING DIFFUSERS
A. Type: Square, adjustable pattern, stamped, multi-core, or architectural plaque diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 PERFORATED FACE CEILING DIFFUSERS
A. Type: Perforated face with removable face.
B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame. (To allow lift-out removal of the diffuser without removal of the plaster frame.)
C. Fabrication: Steel with steel frame and baked enamel off-white finish.
D. Accessories: Opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.04 GRID CORE EXHAUST AND RETURN GRILLES
A. Type: Fixed grilles of 1/2 x 1/2 x 1 inch louvers.
B. Fabrication: Aluminum with factory off-white enamel finish.
C. Frame: 1–1/4 inch margin with countersunk screw mounting.
D. Frame: Channel lay-in frame for suspended grid ceilings where face size exceeds 18 x 18 inch.
E. Damper (if specified on drawings): Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.05 WALL SUPPLY REGISTERS/GRILLES
A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
B. Frame: 1–1/4 inch margin with countersunk screw mounting and gasket.
C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory off-white enamel finish.
D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.
E. Rough Service: Provide front pivoted or welded in place blades, securely fastened to be immobile.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
C. Install diffusers to ductwork with air tight connection.
D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 237413 – PACKAGED OUTDOOR ROOF TOP UNITS – GAS FIRED

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Packaged roof top units.
B. Thermostat controls.
C. Roof mounting curb and base.
D. Economizer.
E. Power exhaust.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Carrier Corporation; Trane Inc.; Lennox Industries; York; AAON Incorporated.

2.02 AIR CONDITIONING UNITS
A. General: Roof mounted units having gas burner and electric refrigeration.
B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, dry bulb economizer and power exhaust fan where indicated on the Drawings, condenser coil and condenser fan.
C. Electrical Characteristics: As scheduled on the Drawings.
D. Disconnect Switch: Factory mount disconnect switch on equipment.

2.03 FABRICATION
A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners or doors with piano hinges with locking handles. Structural members shall be minimum 18 gage, with access doors or panels of minimum 20 gage.
B. Insulation: one inch thick neoprene coated glass fiber with edges protected from erosion.
C. Heat Exchangers: Aluminized steel or stainless steel where indicated on the Drawings, of welded construction.
D. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor or direct drive as indicated. Isolate complete fan assembly.
1. Fans for units with a mechanical cooling capacity greater than or equal to 65,000 Btu/h shall have not fewer than two stages of fan control.
E. Air Filters: 2 inch thick disposable media in metal frames.
F. Roof Mounting Curb: Galvanized steel, channel frame, insulated with gaskets, nailer strips. Provide roof curb of adequate height to provide a unit mounting height of 12" or greater above the top of the roof surface with the curb mounted to the building structure. Roof curb height must compensate for the roof insulation thickness to meet this requirement.
G. Vibration Isolation Curb: Only when indicated on the Drawings.

2.04 BURNER
A. Gas Burner: Induced draft or forced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.
B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.
C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive temperature and energize burner when temperature drops to lower safe value.
D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.05 EVAPORATOR COIL
A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.06 COMPRESSOR
A. Provide hermetic or semi-hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.
B. Five minute timed off circuit to delay compressor start.
C. Outdoor thermostat to energize compressor above 35 degrees F ambient.

2.07 CONDENSER COIL
A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

2.08 MIXED AIR CASING
A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fail to closed position. Relief dampers may be gravity balanced.
B. Gaskets: Provide tight fitting dampers with edge gaskets maximum leakage 5 percent at 2 inches pressure differential.
C. Damper Operator: 24 volt with gear train sealed in oil.
D. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.
E. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and above 75 degrees F ambient, or when ambient air temperature exceeds return air temperature.

2.09 INTEGRATED ECONOMIZER:
A. Economizer shall be furnished and installed complete with outside air and relief dampers and controls.
B. Provide low-leakage, opposed blade dampers
1. Meet all leakage requirements of applicable energy code.
C. Economizer shall be capable of introducing up to 100% outdoor air for minimum ventilation as well as free cooling.
D. Damper actuator shall be electronic, fully modulating design.
E. Economizer outdoor hood shall be pre-painted and fully integrated with the unit.
F. Dry Bulb Control: Provide dry bulb sensor capable of measuring temperature of outdoor air and controlling economizer cut-in point at the most economical level. High level cutoff shall be set per applicable energy code.
1. Provide economizer Fault Detection and Diagnostics (FDD).

2.10 POWER EXHAUST:
A. Package shall include exhaust fan(s) and damper for units with economizer to control over-pressurization of building including integral pressure controls.

2.11 WATER LEVEL MONITORING DEVICE:
A. A water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.

2.12

2.13 OPERATING CONTROLS
A. Provide low voltage, adjustable thermostat to control heater stages in sequence with delay between stages, compressor and condenser fan, and supply fan to maintain temperature setting.
1. Include system selector switch (off–heat–auto–cool) and fan control switch (auto–on).
2. The Mechanical Contractor shall provide all control wiring between thermostat and unit control panel and any required remote sensors.
3. Locate thermostat in room as shown.
4. Electric solid state microcomputer based room thermostat, located as indicated. Provide remote sensors when indicated on the Drawings.
a. Room thermostat shall incorporate:
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Automatic Start Capabilities: Controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.
4. Set–up for four separate temperatures per day.
5. Instant override of set point for continuous or timed period from one hour to 31 days.
6. Short cycle protection.
7. Programming based on weekdays, Saturday and Sunday.
8. Switch selection features including imperial or metric display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on–auto.
b. Room thermostat display shall include:
1. Time of day.
2. Actual room temperature.
3. Programmed temperature.
4. Day of week.
5. System mode indication: heating, cooling, auto, off, fan auto, fan on.
6. Stage (heating or cooling) operation.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and NFPA 90A.
B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level. Install roof mounting curb so that it bears on the building structure, not on top of the roof deck or roofing materials. Provide restraints where required by local codes.
C. Provide cooling condensate drain piping (and overflow piping if required) to approved location. Condensate piping shall be Schedule 40 galvanized steel pipe, Type L copper tube, or PVC. Contractor shall verify the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor.
1. Condensate piping located within the building shall be insulated with 1/2 inch thick glass fiber or flexible elastomeric cellular foam insulation. Only metallic piping systems will be allowed in return air plenum ceiling space.

END OF SECTION

SECTION 238127 – SMALL SPLIT–SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Air–source heat pumps.
B. Indoor ductless fan & coil units.
C. Controls:
1. Room thermostats.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Carrier Corporation; Trane Inc.; YORK; Lennox Industries

2.02 SYSTEM DESIGN
A. Split–System Heating and Cooling Units: Self–contained, packaged, matched factory–engineered and assembled, pre–wired indoor and outdoor units; UL listed.
1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line. Size as recommended by the manufacturer. All refrigerant line sizes indicated on the Drawings are approximate and shall be adjusted as required based on the actual equipment provided to meet the manufacturer's recommended line sizing at no additional expense.
B. Performance Requirements:
1. Equipment performance, efficiency and accessories shall be as scheduled on the Drawings and specified herein. Inclusion in both locations is not a prerequisite to inclusion in the Contract. Equipment and accessories specified in either location shall be included in the Contract. Provide all necessary accessories and connections as required for a complete, functional system. Efficiency shall not be less than requirements of the units specified or indicated on the drawings, or the applicable local energy code

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS
A. Indoor Units: Self–contained, packaged, factory assembled, pre–wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.

2.04 OUTDOOR UNITS
A. Outdoor Units: Self–contained, packaged, factory assembled, pre–wired unit consisting of cabinet, with compressor and condenser.
1. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
2. Construction and Ratings: In accordance with ARI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
B. Compressor: ARI 520; hermetic, 3600 rpm, (multi–speed when indicated on the Drawings) resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.
C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.
2. Provide heat pump reversing valves on all heat pump units.
E. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.
2. Low Ambient Kit: On all systems not provided with economizer controls, provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure below 140 psig for operation to 0 degrees F.
F. Mounting Pad: Poured in place concrete, precast concrete or resin composite pad, minimum 4 inches thick, square.

2.05 ACCESSORY EQUIPMENT
A. Room Thermostat: Wall–mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low–voltage; with following features:
1. System selector switch (heat–off–cool) and fan control switch (auto–on).
2. Automatic switching from heating to cooling.
3. Preferential rate control to minimize overshoot and deviation from setpoint.
4. Automatic Start Capabilities: Controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.
5. Set–up for four separate temperatures per day.
6. Instant override of setpoint for continuous or timed period from one hour to 31 days.
7. Short cycle protection.
8. Programming based on every day of the week.
9. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on–auto.
10. Battery replacement without program loss.
11. Thermostat display:
a. Time of day.
b. Actual room temperature.
c. Programmed temperature.
d. Day of week.
e. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
B. Install in accordance with NFPA 90A and NFPA 90B as applicable.
C. Provide cooling condensate drain piping (and overflow piping if required) to approved location. Condensate piping shall be Schedule 40 galvanized steel pipe, Type L copper tube, or PVC pipe (non–plenum applications). Contractor shall verify the selected material meets with the approval of all State, local authorities and utility company requirements. Verification of compliance of the selected piping material is the sole responsibility of the installing Contractor. Only metallic piping systems will be allowed in return air plenum ceiling space.
D. Install refrigeration systems in accordance with ASHRAE Std 15. Provide filter dryer, sight glass and solenoid valve on outdoor units and sight glass and expansion valve on indoor units.
E. All thermostat, humidistat (if required), damper interlock and other low voltage control wiring shall be installed by the Mechanical Contractor. The Electrical Contractor will furnish only the power system connections shown on the Electrical Drawings. All other control and interlock wiring is the responsibility of the Mechanical Contractor.

END OF SECTION

SE JOB#: 250116

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STORE NO.:
OH #1724

REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
REGISTERED PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SPECIFICATIONS

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M592

CODE: 2021 INTERNATIONAL MECHANICAL CODE

SYSTEM 1

ROOM #	NAME	Az AREA (FT2)	TABLE 403.3.1.1 OCCUPANCY CATEGORY	TABLE 403.3.1.1 Rp PEOPLE OA (CFM/PER)	TABLE 403.3.1.1 Ra AREA OA (CFM/FT2)	TABLE 403.3.1.1 OCCUPANT DENSITY (#/1000 FT2)	Pz (#)	Rp*Pz	Ra*Az	Vbz (CFM)	TABLE 403.3.1.1.2 Ez	Voz (CFM)	Vpz MAX SUPPLY (CFM)	Vpzm MIN SUPPLY (CFM)	Zp	CALCULATED TABLE 403.3.1.1.2.3.2 Ev
100	QUEUING AREA	367	SALES	7.5	0.12	15	6	45	44	89	0.80	111	600	600	0.186	0.96
101	DINING AREA	665	DINING ROOMS	7.5	0.18	70	47	353	120	472	0.80	590	1800	1800	0.328	0.82
102	OPEN KITCHEN	220	KITCHEN (COOKING)	7.5	0.12	20	5	38	26	64	0.80	80	1135	1135	0.070	1.00
103	BACK KITCHEN	676	KITCHEN (COOKING)	7.5	0.12	20	14	105	81	186	0.80	233	1655	1655	0.141	1.00
104	MANAGERS OFFICE	73	OFFICE SPACES	5.0	0.06	5	2	10	4	14	0.80	18	350	350	0.051	1.00
105	HALLWAY	70	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	0	0	0.000	1.00
106	UNISEX RESTROOM	79	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	50	50	0.000	1.00
107	UNISEX RESTROOM	62	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	50	50	0.000	1.00
108	DISH	169	KITCHEN (COOKING)	7.5	0.12	20	4	30	20	50	0.80	63	990	990	0.063	1.00
109	COLD LINE	182	KITCHEN (COOKING)	7.5	0.12	20	4	30	22	52	0.80	65	510	510	0.127	1.00
110	VESTIBULE	110	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	600	600	0.000	1.00
111	ORDER	210	SALES	7.5	0.12	15	4	30	25	55	0.80	69	115	115	0.600	0.55
		2,883					86	640	343	983		1229	7855	7855	0.600	0.55

OUTDOOR AIR CALCULATIONS PER EQUATION 4-1:

SYMBOL	VALUE	DESCRIPTION
Ps =	86	SYSTEM POPULATION
SPz =	86	ZONE POPULATION
D =	1.000	OCCUPANT DIVERSITY
Vou =	983	UNCORRECTED OUTDOOR AIR INTAKE
Zp (max) =	0.600	ZONE PRIMARY OUTDOOR AIR FRACTION (MAXIMUM)
Ev =	0.55	SYSTEM VENTILATION EFFICIENCY
SVpz =	7850	ZONE PRIMARY AIRFLOW
Vot =	1,787	CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
Vot =	2,500	DESIGN OUTDOOR AIRFLOW RATE, CFM

1 OUTSIDE AIR CALCULATIONS

RTU/ACU CONTROL MATRIX

SETPOINT/CONTROL	RTU-1 DINING	RTU-2 KITCHEN	FC-1 OFFICE
SETPOINTS			
COOLING - OCCUPIED SETPOINT	75 F	75 F	75 F
COOLING - UNOCCUPIED SETPOINT	80 F	80 F	80 F
HEATING - OCCUPIED SETPOINT	70 F	70 F	70 F
HEATING - UNOCCUPIED SETPOINT	60 F	60 F	60 F
ECONOMIZER UPPER LIMIT SETPOINT	65 F	65 F	NA

ACCESSORIES			
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT	YES	YES	YES
REMOTE TEMPERATURE SENSOR	YES	YES	NO
MOTORIZED OUTDOOR AIR DAMPER	YES	YES	YES
INTEGRATED ECONOMIZER	YES	YES	NO
ECONOMIZER FAULT DETECTION	YES	YES	NO
BAROMETRIC RELIEF	YES	NO	NO
POWERED EXHAUST RELIEF	NO	YES	NO
DEHUMIDIFICATION (HOT GAS REHEAT)	YES	YES	NO

SUPPLY FAN			
ON DURING OCCUPIED MODE	YES	YES	YES
VARIALBE VOLUME - MODULATE FAN SPEED	YES	YES	YES

SAFETIES AND INTERLOCKS			
RETURN AIR SMOKE DETECTOR	YES	YES	NO
LOW LIMIT FREEZESTAT	YES	YES	YES
FIRE ALARM CONTOL PANEL INTERLOCK	YES	YES	YES
KITCHEN EXHAUST SYSTEM INTERLOCK	YES	YES	YES

AIR BALANCE SCHEDULE

EQUIPMENT TAG	SUPPLY AIRFLOW (CFM)	OUTDOOR AIRFLOW (CFM)	RETURN AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	OA/SA (%)	REMARKS
RTU-1	3,000	750	2,250		25%	FOH
RTU-2	4,500	1,750	2,750		39%	DINING
FC-1	350	0	350		0%	OFFICE
EF-1				1,190		HOOD-1
EF-2				860		HOOD-2
EF-3				200		RESTROOMS
TOTAL =	7,850	2,500	5,350	2,250		
RESULTING BUILDING PRESSURIZATION =				250 CFM		
PRESSURIZATION PERCENTAGE =				3.2 %		

CARRIER EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. CONTACT CARRIER CORPORATION FOR PROPOSALS:
KEN REVILLA
CARRIER RETAIL STRATEGIC ACCOUNTS
EMAIL: KEN.REVILLA@CARRIER.COM
PHONE: (954) 218-0070

ROOF TOP UNITS

MARK	COOLING SEN (MBH)	COOLING TOT (MBH)	COOLING COOL (TON)	HEATING IN (MBH)	HEATING OUT (MBH)	SUPPLY AIR (CFM)	EXT. S.P. (IN)	FAN BHP	ELECTRICAL VOLT	ELECTRICAL PH	ELECTRICAL MCA	ELECTRICAL MOCP	WEIGHT (LBS)	SEER /EER	MODEL NUMBER	REMARKS
RTU-1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	CAPTIVEAIRE	[1-2]
RTU-2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	CAPTIVEAIRE	[1-2]

COOLING CAPACITIES ARE BASED ON AHRI STANDARD 210/240 OR 340/360: 80°F DB/ 67°F WB INDOOR ENTERING AIR TEMPERATURE, 95°F DB AIR ENTERING OUTDOOR FAN. SCHEDULED UNIT MAY DIFFER FROM AHRI STANDARD CFM.

REMARKS:
1. PROVIDE EQUIPMENT WITH SCCR GREATER THAN THE AVAILABLE FAULT CURRENT AT THE EQUIPMENT OR UPSTREAM PANELBOARD. REFER TO THE ELECTRICAL ONE LINE DIAGRAM AND PANEL SCHEDULES FOR AVAILABLE FAULT CURRENT AT UPSTREAM PANELBOARD.
2. REFERENCE CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION.

AIR CURTAINS

MARK	LENGTH (IN)	AIRFLOW (CFM)	HEATER IN (KW)	HEATER OUT (MBH)	HEATER TEMP RISE (F)	FANS QTY	FANS HP	ELECTRICAL CIRCUIT (QTY)	ELECTRICAL VOLT	ELECTRICAL PH	MANUFACTURER	MODEL NUMBER	REMARKS
AC-1	36.0	1,379	NA	NA	NA	1	1/2	1	115	1	MARS	STD236	[1-4]

REMARKS:
1. PROVIDE AUTOMATIC DOOR SWITCH.
2. PROVIDE UNIT MOUNTED CONTROL PANEL.
3. VERIFY FINAL COLOR/FINISH WITH ARCHITECT.
4. FIELD VERIFY AND PROVIDE MOUNTING BRACKETS AS REQUIRED.

AIR SOURCE HEAT PUMPS

MARK	LOCATION	SERVES	NOMINAL COOL (TONS)	HEATING AT 47F (MBH)	ELECTRICAL VOLT	ELECTRICAL PH	ELECTRICAL MCA	ELECTRICAL MOCP	SEER2	HSPF2	MANUFACTURER	MODEL NUMBER	REMARKS
ASHP-1	ROOF	FC-1	3/4	9.8	208	1	15.0	15	20.5	10.3	CARRIER	38MARBQ09	[1,2]

REMARKS:
1. PROVIDE EQUIPMENT WITH SCCR GREATER THAN THE AVAILABLE FAULT CURRENT AT THE EQUIPMENT OR UPSTREAM PANELBOARD. REFER TO THE ELECTRICAL ONE LINE DIAGRAM AND PANEL SCHEDULES FOR AVAILABLE FAULT CURRENT AT UPSTREAM PANELBOARD.
2. PROVIDE WITH LOW AMBIENT CONTROL.

DUCTLESS SPLIT SYSTEMS

MARK	COOLING NOMINAL (TONS)	COOLING TOT (MBH)	COOLING SEN (MBH)	HEATING OUT (MBH)	SUPPLY AIR (CFM)	FAN (WATT)	ELECTRICAL VOLT	ELECTRICAL PH	ELECTRICAL MCA	ELECTRICAL MOCP	SEER2	CARRIER MODEL NUMBER	REMARKS
FC-1	3/4	11.73	8.79	9.80	350	45	208	1	0.2	N/A	20.5	40MBC009	[1,2]

REMARKS:
1. INDOOR UNIT POWER PROVIDED FROM OUTDOOR UNIT.
2. PROVIDE NEW, WIRED, FULLY DIGITAL, 7 DAY PROGRAMMABLE TYPE THERMOSTAT WITH AUTO CHANGE OVER AND AUTO SET BACK.

DIFFUSERS, GRILLES AND REGISTERS

MARK	SERVICE	LOCATION	CEILING TYPE	MOUNTING TYPE	MANUFACTURER	MODEL NUMBER	REMARKS
D-1	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	TMS XX 24x24 3 26	[1,2,6]
D-2	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	PAR XX 24x24 3 26	[1,2,6]
D-3	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	OMNI XX 24x24 3 26	[1,2,4,6,7]
D-4	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	OMNI XX 12x12 3 26	[1,2,4,6,7]
D-5	SUPPLY	DUCT	NA	SURFACE	TITUS	300RL X X 1 26	[1,5,6]
D-6	SUPPLY	CEILING	AC TILE	LAY-IN	TITUS	TDC XX 3 24x24 2 26	[1,2,6]
G-1	RETURN	CEILING	AC TILE	LAY-IN	TITUS	50F X X 3 26	[1,3,5,6]
G-2	VARIES	CEILING	GYP. BOARD	LAY-IN	TITUS	50F X X 1 26	[1,3-6]
G-3	RETURN	WALL	NA	SURFACE	TITUS	350RL X X 1 26	[1,5,6]

REMARKS:
1. TITUS IS THE BASE OF DESIGN. KRUEGER, PRICE, NAILOR, CARNES ARE EQUAL. NO EXCEPTIONS.
2. SEE PLAN FOR NECK SIZE.
3. PROVIDE 1/2" X 1/2" X 1" CORE.
4. PROVIDE WITH MODEL TRM FRAME.
5. SEE PLAN FOR SIZE.
6. DIFFUSERS/GRILLES SHALL BE FINISHED TO MATCH CEILING/WALL/EXPOSED DUCT COLOR. COORDINATE WITH ARCHITECT.
7. PROVIDE DIFFUSERS AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.

EXHAUST FANS

MARK	LOCATION	SERVICE	AIRFLOW (CFM)	EXTERNAL STATIC (IN H2O)	SONES	MOTOR DATA FAN (HP)	MOTOR DATA VOLT	MOTOR DATA PH	RPM	FEI	MANUFACTURER	MODEL NUMBER	REMARKS
EF-1	ROOF	HOOD-1	--	--	--	--	--	--	--	--	CAPTIVEAIRE	--	4
EF-2	ROOF	HOOD-2	--	--	--	--	--	--	--	--	CAPTIVEAIRE	--	4
EF-3	ROOF	RESTROOMS	200	0.50	7.0	1/8	115	1	1,550	NA	GREENHECK	G-095-D	1-3

REMARKS:
1. PROVIDE SOLID STATE SPEED CONTROL.
2. PROVIDE MOTORIZED BACKDRAFT DAMPER.
3. PROVIDE MINIMUM 12 INCH HEIGHT ROOF CURB.
4. REFERENCE CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION

UV SYSTEMS

UNIT NO.	PLACEMENT	PHI CELL MODEL #	UV/CELL SIZE	RANGE	INDOOR PPM TARGET	SIZE	TRANSFORMER	POWER	IN-VOLT	OUT-VOLT	MCA	WEIGHT (LBS.)
RTU-1	BLOWER CABINET	PHI-PKG14-24V	14"	3,000-8000 CFM	< 0.02 PPM	2.25"W x 19.5"L x 1.75"D	SHIP LOOSE	11W	115 VAC	24 VAC	0.50A	2 LBS
RTU-2	BLOWER CABINET	PHI-PKG14-24V	14"	3,000-8000 CFM	< 0.02 PPM	2.25"W x 19.5"L x 1.75"D	SHIP LOOSE	11W	115 VAC	24 VAC	0.50A	2 LBS

zebra
ZEBRA ARCHITECTURE, PLLC
14614 N KIERLAND BLVD., SUITE N300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 zbr.global

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STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-50866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

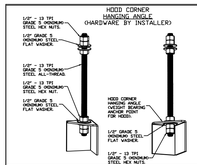
FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SCHEDULES

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M601

SE JOB# 250115



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-2WI	269	300	350
ISLAND ND-2I	346	422	475

ETL HOOD LISTING DETAIL

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

SUPPLY CFM = EXHAUST CFM X PERCENTAGE REQUIRED

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

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

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

CALCULATIONS UTILIZED

CAPTIVE-AIRE HOODS BUILT IN COMPLIANCE WITH:

ETL LISTED & 3054804-001 & 3054804-002

STANDARD 710

BUILT IN ACCORDANCE WITH NFPA No. 96

Listed under ETL File number 3054804-001/002

BUILDING CODES

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

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

CLEARANCE TO COMBUSTIBLES

INSTALLATION

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

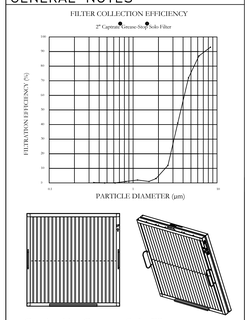
BALANCE

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

ADDITIONAL

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

GENERAL NOTES



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

FILTER DETAIL

FOR QUESTIONS, CALL THE
Eastern PA Mechanical
REGION 108
PHONE: (267) 504 - 4126
EMAIL: reg108@captiveaire.com

HOOD INFORMATION – JOB#7430514

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	Hood (Grill)	5430 ND-2	CAPTIVEAIRE	7' 11"	450 DEG	I	MEDIUM	150	1188	10"	11"	4"		1188	1555	-0.462"	430 SS WHERE EXPOSED	ALONE	ALONE
2	Hood (Fryer)	5430 ND-2	CAPTIVEAIRE	4' 11"	600 DEG	I	HEAVY	175	860	9"	9"	4"		860	1529	-0.494"	430 SS WHERE EXPOSED	ALONE	ALONE

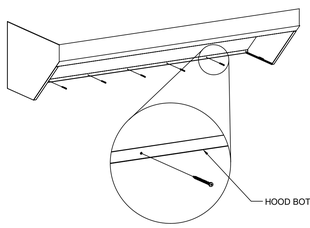
HOOD INFORMATION

HOOD NO	TAG	FILTER(S) TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	LIGHT(S) QTY	TYPE	WIRE GUARD	UTILITY CABINET(S) LOCATION	SIZE	FIRE SYSTEM TYPE	FIRE SYSTEM SIZE	ELECTRICAL MODEL #	SWITCHES QUANTITY	FIRE SYSTEM PIPING	HOOD HANGING WEIGHT
1	Hood (Grill)	CAPTRATE SOLO FILTER	5	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO							YES	484 LBS
2	Hood (Fryer)	CAPTRATE SOLO FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	RIGHT	12"x54"x30"	TANK FS	4.0/4.0/4.0	SC-320110MA	1 LIGHT 1 FAN	YES	748 LBS

HOOD OPTIONS

HOOD NO	TAG	OPTION
1	Hood (Grill)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		LEFT END STANDOFF (FINISHED) 1" WIDE 54" LONG INSULATED.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 6IN PLEN.
		RIGHT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
		GFCI DUPLEX OUTLET, 20A 125V - HOOD FRONT LEFT - HORIZONTAL - DIST FROM END: 3.50 DIST FROM BOTTOM: 4.00.
		LEFT WALL AS END PANEL.
2	Hood (Fryer)	FIELD WRAPPER 12.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 6IN PLEN.

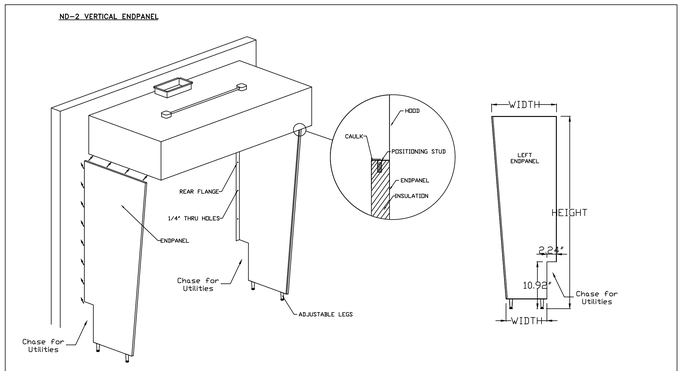
Bottom Flange Securing Detail

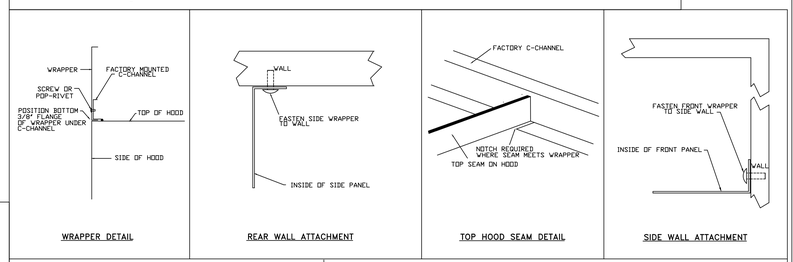


Secure the bottom of the hood to the rear wall using 1404 Evergreen Quik-Fastener. Use a minimum of 1 fastener every 16"on the bottom flange. For walls with metal studs, use a minimum of 1 fastener on the bottom flange at each stud

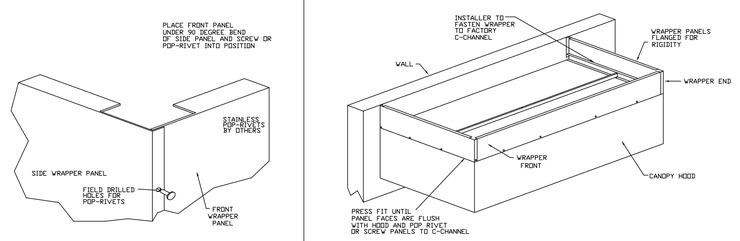
Only Use SIL-BOND RTV 4500 silicone sealent on hood

ND-2 VERTICAL ENDPANEL





WRAPPER DETAIL | REAR WALL ATTACHMENT | TOP HOOD SEAM DETAIL | SIDE WALL ATTACHMENT



FRONT CORNER ASSEMBLY | COMPLETED WRAPPER ASSEMBLY

REVISIONS

	DESCRIPTION	DATE:
△		
△		
△		
△		

CAPTIVEAIRE

225 E City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 504 - 4126 EMAIL: reg108@captiveaire.com

Eastern PA Mechanical

www.captiveaire.com

Shake Shack-1724-Mason,OH\Kitchen\-R1

MASON, OH, 45040

DATE: 3/26/2025

DWG.#: 7430514

DRAWN BY: joe.shilba

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

MASTER DRAWING

SHEET NO. 1

zebra

ZEBRA ARCHITECTURE, PLLC
14614 N KIERLAND BLVD., SUITE N300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 zbr.global

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SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

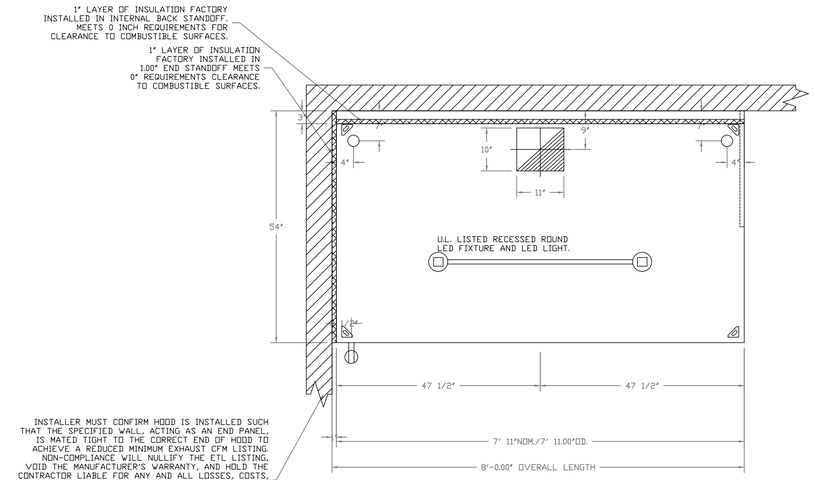
FIELD VERIFICATION:
The contractor shall verify all typical dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME: **CAPTIVEAIRE DRAWINGS**

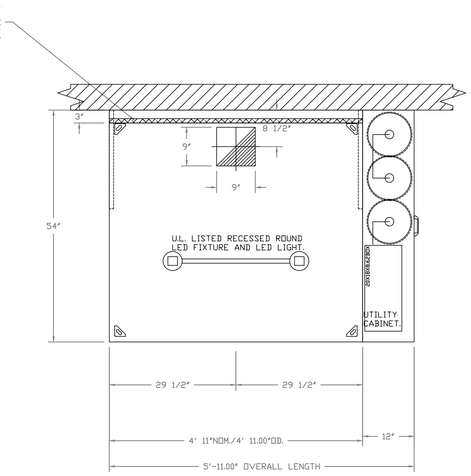
DATE:	PROJECT NO.:
04/25/25	40189
DRAWN: RAS	SCALE: AS NOTED

SHEET NO.: **M701**

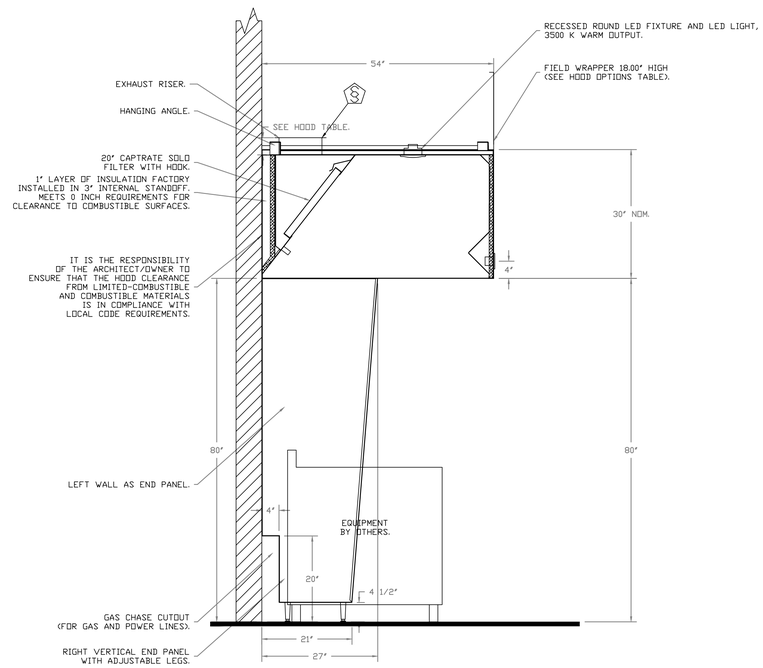
SE JOB#: 268116



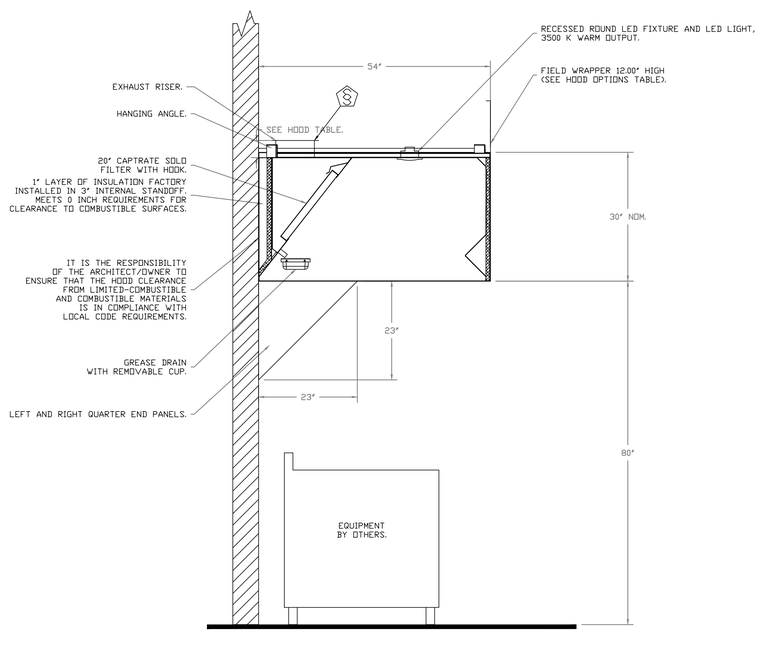
PLAN VIEW – HOOD #1 (Hood (Grill))
7' 11.00" LONG 5430ND-2



PLAN VIEW – HOOD #2 (Hood (Fryer))
4' 11.00" LONG 5430ND-2



SECTION VIEW – MODEL 5430ND-2
HOOD – #1 (Hood (Grill))



SECTION VIEW – MODEL 5430ND-2
HOOD – #2 (Hood (Fryer))

SE JOB#: 250116

REVISIONS

	DESCRIPTION	DATE:
△		
△		
△		
△		

CAPTIVEAIRE
Eastern PA Mechanical
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www.captiveaire.com

Shake Shack-1724-Mason,OH(Kitchen)-R1
MASON, OH, 45040

DATE: 3/26/2025

DWG.#: 7430514

DRAWN BY: joe.shilloa

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

MASTER DRAWING

SHEET NO. 2

zebra
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STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
REGISTERED PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
CAPTIVEAIRE DRAWINGS

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.:
M702

FIRE SYSTEM INFORMATION – JOB#7430514

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0/4.0	60	46	FIRE CABINET RIGHT	RIGHT, HOOD 2

GAS VALVE(S)

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1		SC ELECTRICAL	1.000	CAPTIVEAIRE SYSTEMS

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 SHELVING, 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 PRE-ENGINEERED FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.

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

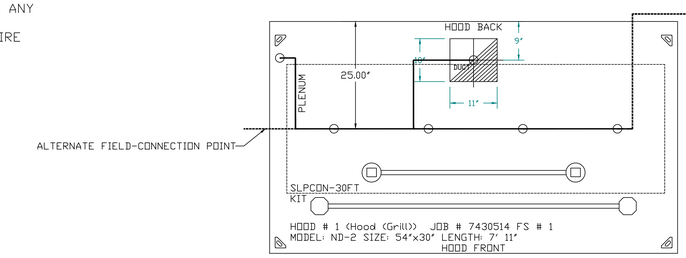
JOB #: 7430514.
JOB NAME: SHAKE SHACK-1724-MASON,OH(KITCHEN)-R1.

SYSTEM SIZE: TANK-SP-3 DESIGN FP: 46. MAXIMUM FP: 60.
HOOD # 1 7' 11.00" LONG x 54" WIDE x 30" HIGH.
RISER # 1 SIZE: 10" x 11".
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.
HOOD # 2 4' 11.00" LONG x 54" WIDE x 30" HIGH.
RISER # 1 SIZE: 9" x 9".
HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.

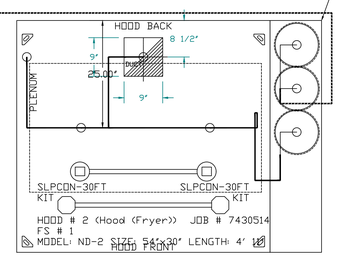
- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

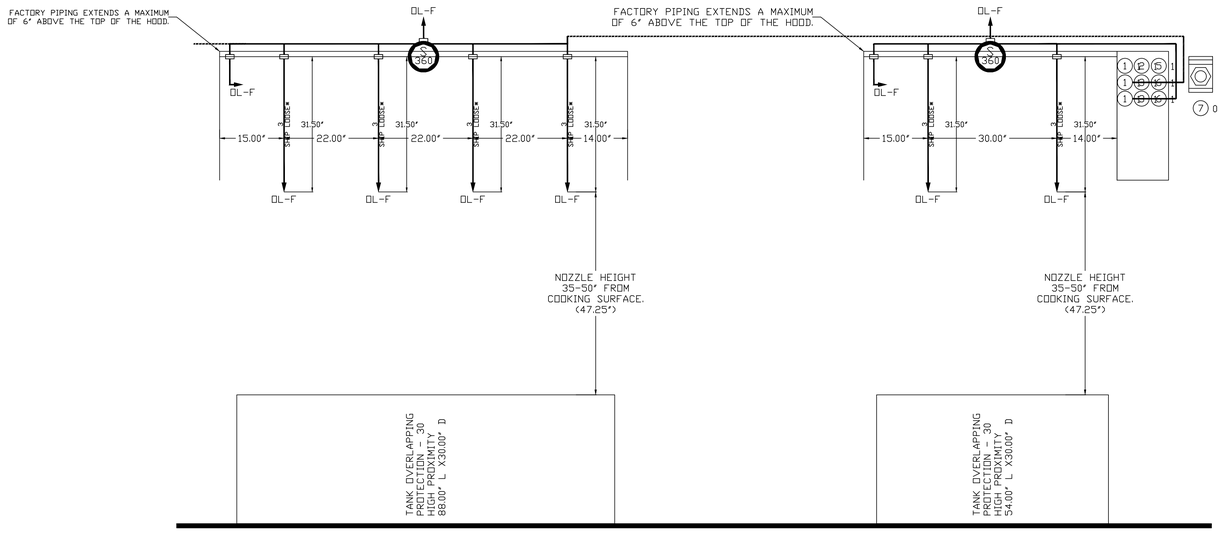
LEGEND – FIRE CABINET TANK SYSTEM

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 13 FT OF EQUIVALENT LENGTH. SEE MANUAL FOR DETAILS.





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CAPTIVEAIRE
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Shake Shack-1724-Mason,OH(Kitchen)-R1
MASON, OH, 45040

DATE: 3/26/2025
DWG.#: 7430514
DRAWN BY: joe.shiiba
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 3

zebra
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1	7/11/25	REVISION 1

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SHEET NAME: **CAPTIVEAIRE DRAWINGS**

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.: **M703**

SE JOB# 230116

EXHAUST FAN INFORMATION – JOB#7430514

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SONES
1	KEF(GRILL)	1	DU85HFA	CAPTIVEAIRE	1188	1.500	1424	TEAO-ECM	0.750	0.4970	1	277	3.9	376 FPM	90	12.7
2	KEF(FRYER)	1	DU85HFA	CAPTIVEAIRE	860	1.500	1354	TEAO-ECM	0.750	0.4270	1	277	3.9	272 FPM	90	11.4

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	KEF(GRILL)	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCO), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
2	KEF(FRYER)	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCO), CCW ROTATION
		1	2 YEAR PARTS WARRANTY

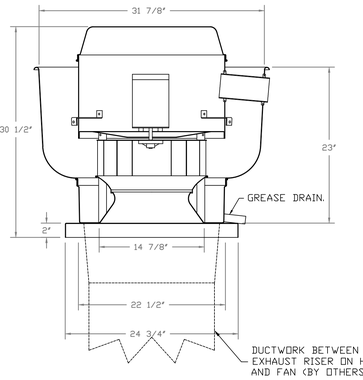
FAN ACCESSORIES

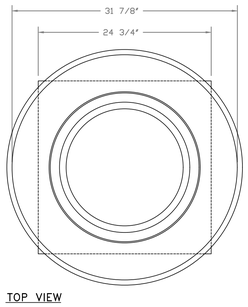
FAN UNIT NO	TAG	EXHAUST			SUPPLY			
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	KEF(GRILL)	YES						
2	KEF(FRYER)	YES						

CURB ASSEMBLIES

NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF-1	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.
2	# 2	KEF(FRYER)	36 LBS	CURB	23.000"W X 23.000"L X 20.000"H HINGED.

FANS #1 (KEF(GRILL)), #2 (KEF(FRYER)) - DU85HFA EXHAUST FAN





TOP VIEW

FEATURES:

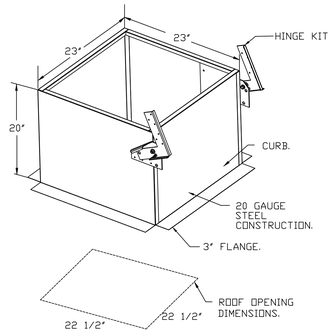
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ULC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT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

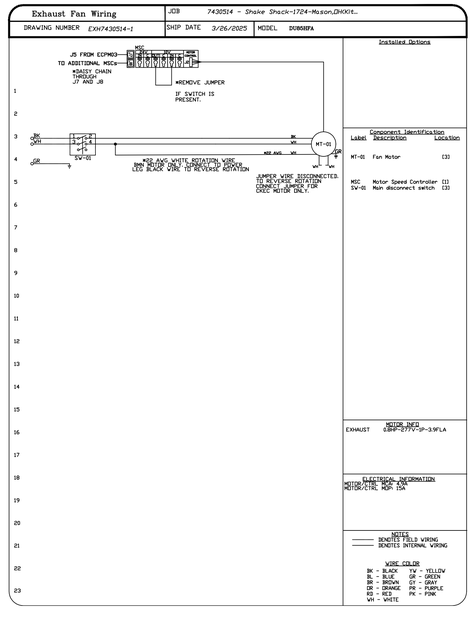
NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

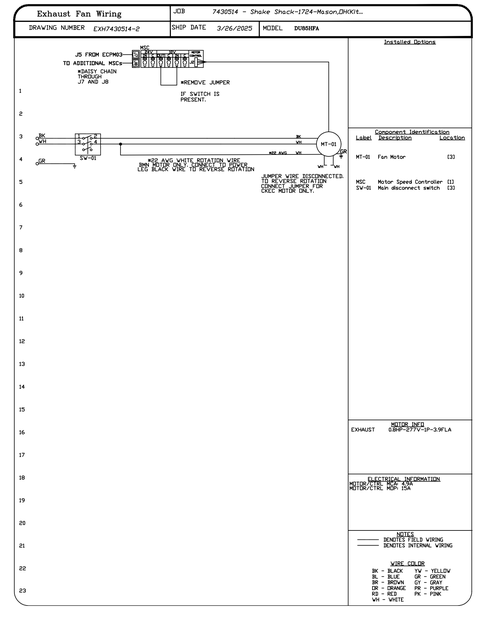
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

OPTIONS

- GREASE BOX.
- FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS.
- ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCO), CCW ROTATION.
- 2 YEAR PARTS WARRANTY.







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Shake Shack-1724-Mason,OH(Kitchen)-R1
MASON, OH, 45040

DATE: 3/26/2025

DWG. #: 7430514

DRAWN BY: joe.shilloa

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

MASTER DRAWING

SHEET NO. 4

STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

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GREGORY R. SCHNACKEL
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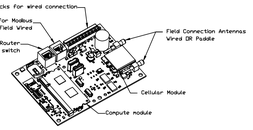
SHEET NAME: **CAPTIVEAIRE DRAWINGS**

DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

SHEET NO.: **M704**

SE JOB#: 208116



ELECTRICAL PACKAGE – JOB#7430514

NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	?	HP	VOLT	FLA
1		SC-320110MA	UTILITY CABINET RIGHT	UTILITY CABINET RIGHT	1 LIGHT	SMART CONTROLS THERMOSTATIC CONTROL W/ RELAY ON/OFF WITH SUPPLY	KEF(Grill)	EXHAUST	1	0.750	277	3.9
				HOOD # 2	1 FAN		KEF(Fryer)	EXHAUST	1	0.750	277	3.9

CASlink Monitor and Control

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

MONITORING AND CONTROL POINTS LIST

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

SC Packages	*Function*
Room Temperature(s)	*MONITOR*
Duct Temperature(s)	*MONITOR*
MUA DIscharge Temperature	*MONITOR*
Kitchen RTU Discharge Temperature	*MONITOR*
Controller Faults	*MONITOR*
Fan Faults	*MONITOR*
Fan Status	*MONITOR*
PCU Faults	*MONITOR*
PCU Filter Clog Percentages	*MONITOR*
Fire Condition	*MONITOR*
CORE Fire System	*MONITOR*
Building Pressures	*MONITOR*
Fans Button(s)	*MONITOR & CONTROL*
Lights Button(s)	*MONITOR & CONTROL*
Wash Button	*MONITOR & CONTROL*

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
7430514	SC-320110MA		INSTALL	3 Phase w/ control for 2 Exhaust Fans, Exhaust on in Fire, Lights out in Fire, Relay On/Off with Supply Fan, Fan(s) On/Off Thermostatically Controlled. Room temperature sensor shipped loose for field installation. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD.
	JOB NAME: Shake Shack-1724-Mason,OH(Kit...	DATE: 3/26/2025	DWG NO: ECP #1-1	

CONTROL POWER. DO NOT WIRE TO GFCI OR SHUNT TRIP BREAKER.
1ST HOOD LIGHT BREAKER SHARED W/ CONTROL POWER. SWITCH #1

ALL SWITCHES FACTORY WIRED
CAT-5 CONNECTION

WIRE TO J-BOX ON TOP OF HOOD

CAT-5 ETHERNET CONNECTION
WIRE DIRECTLY TO COMMUNICATION MODULE. NET REQUIRES 1) DHCP 2) UDP PORT 1444 & 1445 OPEN FOR OUTBOUND TRAFFIC ONLY.

WIRE TO CONTROL BOARD. INSTALL SENSOR IN ROOM AWAY FROM HEAT SOURCES. DO NOT INSTALL SENSOR ON THE CEILING GRID, SEE MANUAL.

FACTORY WIRED TEMPERATURE SENSOR. MOUNTED IN HOOD CAPTURE VOLUME.

WIRE TO CONTROL BOARD. SENSOR MOUNTED IN HOOD CAPTURE VOLUME.

ONLY ENERGIZED THROUGH LCD HMI WHEN FIRE SYSTEM ARMED.

IF MORE THAN ONE MSC IS PRESENT WIRE IN SERIES BY MEANS OF J7 AND J8 CAT-5 JACKS. DO NOT EXCEED 5 MSC BOARDS ON ONE ECPM03 JACK.

THE FOLLOWING CONNECTIONS MAY OR MAY NOT BE REQUIRED BASED ON JOBSITE SPECIFICATIONS

ST TERMINAL IS ENERGIZED IN FIRE CONDITION.

KS TERMINAL IS DE-ENERGIZED IN FIRE CONDITION.

SPARE CONTACTS WILL MAKE COMMON TO NORMALLY OPEN WHEN SUPPLY FAN IS ON.

SIGNAL SWITCH THROUGH BMS WILL ACTIVATE ZONE1 FANS AND LIGHTS

SPARE CONTACTS WILL MAKE COMMON TO NORMALLY OPEN WHEN EXHAUST FAN IS ON.

ONLY ENERGIZED THROUGH LCD HMI WHEN FIRE SYSTEM ARMED. (NOT NEEDED IF USING 120V GAS VALVE).

WIRE DIRECTLY TO CORE CIRCUIT BOARD. AL1 WILL MAKE AL2 IN FIRE CONDITION.

TROUBLE RELAY CONTACTS WILL MAKE TBC TO TBL IN TROUBLE CONDITION.

FIRE STAT SUPERVISED LOOP
May be mixed factory and field wiring. See Installation Schematic. Multiple fire sensors possible. HIGH TEMP WIRE (842 F), PN: SLPCON-xFT required for all Supervised Loop wiring in contact with a hood. All other wiring shall be PN: 6320UL, Belden or similar.

MANUAL ACTUATION LOOP / REMOTE FIRE SYSTEM LOOP.
Multiple manual actuation possible.
Multiple manual actuation possible.
A Plug jumper with wires from pin1 to pin4 and from pin2 to pin3 is mounted on J10, remove the jumpers and wire in the supervised actuation loop.
Microswitch MS-01 is optional for fire system interlock.

Auxiliary Interlock (AUX-01):
Wire AU1 / AU2 of adjacent Master FS panel(s) in each manual activation loop for simultaneous activation. See Fire system drawings for more information.

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
7430514	SC-320110MA		INSTALL	3 Phase w/ control for 2 Exhaust Fans, Exhaust on in Fire, Lights out in Fire, Relay On/Off with Supply Fan, Fan(s) On/Off Thermostatically Controlled. Room temperature sensor shipped loose for field installation. INVERTER DUTY 3 PHASE MOTOR REQUIRED FOR USE WITH VFD.
	JOB NAME: Shake Shack-1724-Mason,OH(Kit...	DATE: 3/26/2025	DWG NO: ECP #1-2	

ADDITIONAL DEVICES MAY BE INLINE.
PLACE END OF LINE PLUG IN EMPTY JACK. PN: EOL120A UNLESS VFD, PCU, OR OTHER COMPONENT IN SERIES.

WIRE TO LIKE TERMINALS IN ALL CORE PANELS THAT MUST ACTIVATE TOGETHER. SET MASTER & SLAVE DIP SWITCHES PER FIRE SYSTEM MANUAL.

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
7430514	SC-320110MA		INSTALL	Fire System #1 TANK FS - 4.0/4.0/4.0.
	JOB NAME: Shake Shack-1724-Mason,OH(Kit...	DATE: 3/26/2025	DWG NO: ECP #1-3	

TANK PROTECTION ELECTRICAL DETAIL

02/10/2021 Rev. 2

FS-1: MASTER

ELECTRICIAN:
1. WIRE MAIN CONTROL PANEL PER INCLUDED SCHEMATIC
2. WIRE ALL FANS PER INCLUDED SCHEMATIC
3. WIRE SHUNT TRIP BREAKER (OPTIONAL)
4. WIRE UDS APPLIANCE KILL SWITCH, IF EQUIPPED (OPTIONAL)
5. WIRE GAS VALVE

ELECTRICAL CONTRACTOR REQUIREMENT

ITEM	CONNECTION IN PANEL	CONNECTION IN DEVICE	VOLTAGE	AMPERAGE	COMMENTS
SHUNT TRIP BREAKER (OPTIONAL)	ST & N1	BREAKER COIL (A1 & A2)	120 VAC	< 4 AMPS	ST TO A1 ON SHUNT BREAKER COIL, AND NEUTRAL TO A2 ON SHUNT TRIP BREAKER COIL
CONTROL PANEL POWER	H1 & N1 + GROUND	CIRCUIT BREAKER	120 VAC	15 AMPS	CONTROL PANEL POWER MUST NOT BE RUN THROUGH SHUNT TRIP BREAKER
UDS APPLIANCE KILL SWITCH (OPTIONAL)	KTS & N1	KTS & N1	120 VAC	< 4 AMPS	KILL SWITCH TERMINALS MUST BE IN SERIES WITH OTHER KILL SWITCHES
REMOTE 120VAC ANSUL AUTOMAN (OPTIONAL)	AU1, AU2	SOLENOID	120 VAC	< 6 AMPS	120V TO AU1, AU2 TO ANSUL ELECTRIC AUTOMAN, ANSUL SOLENOID TO NEUTRAL
GAS VALVE	LGV & N1D (IF 24 VDC) GAS & N1 (IF 120 VAC)	RED/RED/GREEN	24 VDC OR 120 VAC	< 1.0 AMPS	IF 24 VDC - 2 WIRES & GROUND, N1D TO RED, LGV TO RED, AND GREEN TO GROUND IF 120 VAC - 2 WIRES & GROUND GAS TO RED, N1 TO RED, AND GREEN TO GROUND

CONTROL PANEL POWER
-2 WIRES & GROUND
-120 VAC, 15 AMP SERVICE
-WIRE TO H1 AND N1, GROUND
-POWER MUST NOT ORIGINATE FROM SHUNT TRIP BREAKER

SHUNT TRIP BREAKER (OPTIONAL)
-2 WIRES, 120VAC
-ST TO A1 ON SHUNT BREAKER
-NEUTRAL TO A2 ON SHUNT TRIP BREAKER

GAS VALVE POWER
-2 WIRES & GROUND
-24 VDC WIRE TO LGV & N1D
-120 VAC WIRE TO GAS & N1

36 INCHES CLEARANCE REQUIRED IN FRONT OF ALL UTILITY CABINET DOORS
THE PANEL SHALL ALSO BE LOCATED IN AN ACCESSIBLE AREA WHERE THE AUDIBLE AND VISUAL ALARMS CAN BE HEARD AND SEEN

POWER TO ELECTRIC APPLIANCE

GAS VALVE
-STRAINER MUST BE INSTALLED UPSTREAM OF VALVE

NOTE: SEE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR FURTHER INSTRUCTIONS

JOB NO	MODEL NUMBER	DRAWN BY	SCHEMATIC TYPE	DESCRIPTION OF OPERATION:
7430514	SC-320110MA		INSTALL	Fire System #1 TANK FS - 4.0/4.0/4.0.
	JOB NAME: Shake Shack-1724-Mason,OH(Kit...	DATE: 3/26/2025	DWG NO: ECP #1-4	

TANK PROTECTION LOW-VOLTAGE DETAIL

10/01/2023 Rev. 3

FS-1: MASTER

ALARM CONTRACTOR:
1. WIRE MANUAL ACTUATION DEVICE(S), REMOTE FIRESTAT(S), CORE INTERLOCK(S), FIRE SENSOR(S) AND FIRE ALARM CONTACTS
2. COMPLETE FINAL HOOKUP OF SYSTEM
3. VERIFY FINAL FIRE SYSTEM TEST

ALARM CONTRACTOR REQUIREMENT

ITEM	CONNECTION IN PANEL	CONNECTION ON DEVICE	VOLTAGE	AMPERAGE	COMMENTS
MANUAL ACTUATION DEVICE(S)	101 AND 104 102 AND 103	1 & 2	24 VDC	< 1.0 AMPS	WIRE MANUAL ACTUATION DEVICE TERMINAL 1 BETWEEN CORE PANEL TERMINALS 102 AND 103 WIRE MANUAL ACTUATION DEVICE TERMINAL 2 BETWEEN CORE PANEL TERMINALS 101 AND 104 JUMPER 101 TO 104 AND 102 TO 103 IF NO MANUAL ACTUATION DEVICE IS INSTALLED
MANUAL ACTUATION DEVICE COVER	N/A	N/A	N/A	N/A	MANUAL ACTUATION DEVICE COVER MUST BE INSTALLED IF SURFACE MOUNTED, USE COVER EXTENSION STI-6531B
REMOTE FIRESTAT SENSOR(S)	21 AND 24 22 AND 23	BLACK AND WHITE	24 VDC	< 1.0 AMPS	WIRE FIRE SENSOR WHITE WIRES BETWEEN HOOD CORE PANEL TERMINALS 22 AND 23 WIRE FIRE SENSOR BLACK WIRE BETWEEN HOOD CORE PANEL TERMINALS 21 AND 24 HIGH TEMP (842°F) #441601C6.FE9 (WHT) & #441601C6.FE0 (BLK)WIRE OR SIMILAR ONLY IF RAN OF HOOD; OTHERWISE BELDEN #6320UL OR SIMILAR PLENUM RATED WIRE; SEE FIGURE 1
FIRE ALARM CONTACT	AL1, AL2	VARIES	50V MAX (AC/DC)	UP TO 1 AMP	FIRE ALARM RELAY CONTACTS FOR BUILDING FIRE ALARM LOCATED IN THE CORE ELECTRICAL CONTROL PANEL
CORE INTERLOCK(S)	CA, CB, CC	CA, CB, CC	RS-485 COMMUNICATIONS SIGNAL		CORE SYSTEM (1) CA, TO CORE SYSTEM (2) CA. CORE SYSTEM (1) CB, TO CORE SYSTEM (2) CB. CORE SYSTEM (1) CC, TO CORE SYSTEM (2) CC. USE BELDEN# 88760 OR SIMILAR WIRE
TROUBLE CONTACT	TBC, TBL, TOK	VARIES	MAX 120 VAC	UP TO 6 AMPS	WIRE TO TBL & TBC NORMALLY OPEN CONTACT, CLOSES IN TROUBLE CONDITION
CORE COMMUNICATIONS CABLE	RJ-45 Jack	INTERNET CONNECTION	SIGNAL	<1.0 AMPS	TYPICAL CONNECTION CAT5 CABLE TO LOCAL AREA NETWORK VIA ETHERNET SWITCH OR WIRELESS ROUTER WITH VALID INTERNET CONNECTION

FIRE ALARM CONTACT
-2 WIRES WIRED TO NORMALLY OPEN CONTACTS (CLOSES IN FIRE CONDITION)
-CORE CONTROL PANEL AL1 AND AL2
-SEE FIGURE 2

TROUBLE CONTACT
-2 WIRES TO NORMALLY OPEN CONTACTS (CLOSE IN TROUBLE CONDITION)
-CORE PANEL TERMINALS TBL AND TBC
-SEE FIGURE 4

SUPERVISED LOOP
-4 WIRES, 24VDC CONNECT BLACK WIRES BETWEEN 21 AND 24 IN PANEL, CONNECT WHITE (OR RED) WIRES BETWEEN 22 AND 23 IN PANEL
-ADDITIONAL FIRESTATS, WIRED IN SUPERVISED LOOP
-USE HIGH TEMP (842°F) #441601C6.FE9 (WHT) & #441601C6.FE0 (BLK)WIRE ONLY IF RAN OVER TOP OF HOOD; OTHERWISE BELDEN #6320UL OR SIMILAR PLENUM RATED WIRE
-SEE FIGURE 1

36 INCHES CLEARANCE REQUIRED IN FRONT OF ALL UTILITY CABINET DOORS
THE PANEL SHALL ALSO BE LOCATED IN AN ACCESSIBLE AREA WHERE THE AUDIBLE AND VISUAL ALARMS CAN BE HEARD AND SEEN

CORE INTERLOCK
-2 WIRES + SHIELD
-USE BELDEN#88760 OR SIMILAR WIRE
-SEE FIGURE 3

CORE COMMUNICATIONS CABLE
-CAT5 CABLE
MUST BE INSTALLED TO A LOCAL AREA NETWORK WITH VALID INTERNET ACCESS VIA ETHERNET SWITCH OR WIRELESS ROUTER

MANUAL ACTUATION DEVICE 10 TO 20 FEET FROM HOOD LOCATED NEAR POINT OF EGRESS FROM HOOD

MANUAL ACTUATION DEVICE WIRES
-4 WIRES, 24VDC WIRE (TERMINAL 1) BETWEEN 102 AND 103
-WIRE (TERMINAL 2) BETWEEN 101 AND 104
-ADDITIONAL PULL STATIONS WIRED IN SUPERVISED LOOP
-USE BELDEN #6320UL OR SIMILAR WIRE
-SEE FIGURE 1A

42 TO 48 INCHES ABOVE FLOOR LEVEL TO CENTER OF PUSH STATION

MANUAL ACTUATION DEVICE
PART #SS2031ZA-EN
PROTECTIVE COVER MUST BE INSTALLED

ATTENTION: LOW-VOLTAGE DC OR SIGNALING WIRE SHOULD BE ROUTED IN SEPARATE CONDUIT FROM ALL AC SOURCES

NOTE: SEE INSTALLATION, OPERATION, AND MAINTENANCE MANUAL FOR FURTHER INSTRUCTIONS

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Shake Shack-1724-Mason,OH(Kitchen)-R1
MASON, OH, 45040

DATE: 3/26/2025
DWG.#: 7430514
DRAWN BY: joe.shiiba
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 5

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E-59866
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COA #: 03180

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PROJECT NO.: 40189
DRAWN: RAS
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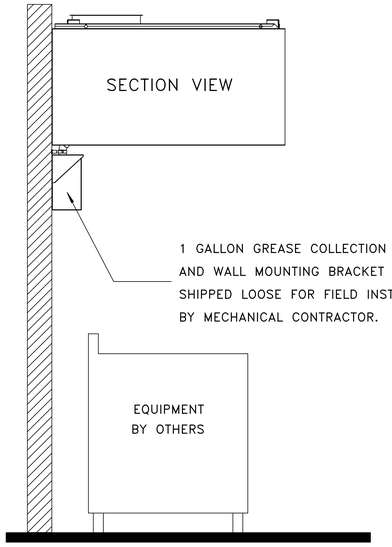
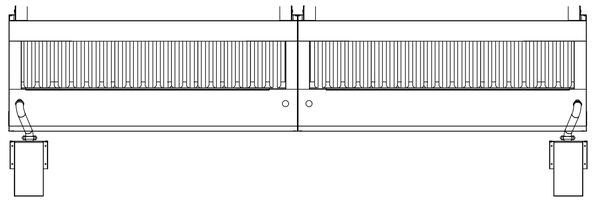
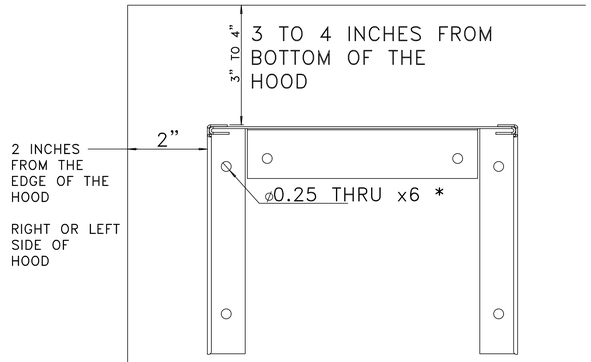
SHEET NO.:
M705

SE JOB#: 250116

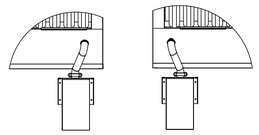


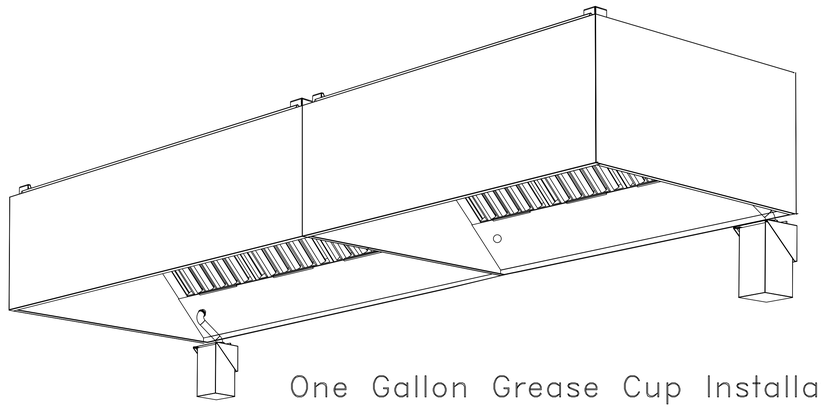




* Mounting hardware not included
**Must be mounted to stud or wall anchor

Left & Right hand Grease Cup Install



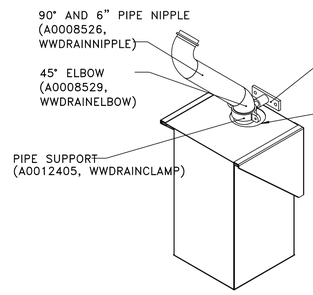


One Gallon Grease Cup Installation

Instructions below outline single, or dual, one gallon grease cup installation for ND–2 hood models.

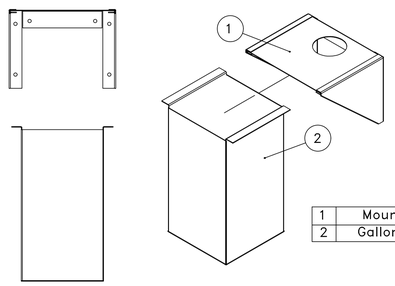
The one gallon grease cup comes as an assembly of stainless steel wall mounting bracket and one gallon cup. The mounting bracket should be installed 2" from the edge of the containment plenum and 3"–4" below the bottom of the hood.

Piping from the hood grease drain should route to the opening of the grease cup, but not into the cup, otherwise the cup will not be able to be removed and emptied.



Support the bottom of the drain pipe using 1.5" adjustable pipe support
Do not allow drain pipe to drop into the grease cup, otherwise cup will catch when removing and cleaning the grease cup

Gallon Grease Cup Assembly



1	Mounting Bracket
2	Gallon Grease Cup

1 GALLON GREASE COLLECTION BOX
AND WALL MOUNTING BRACKET
SHIPPED LOOSE FOR FIELD INSTALLATION
BY MECHANICAL CONTRACTOR.

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SHEET NO.: **M706**

SE JOB#: 250116

DOAS/RTU FAN SCHEDULE – JOB#7430476

FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	ELECTRICAL INFORMATION HP	PHASE	VOLT	MCA	MOCP	COOLING INFORMATION OUTSIDE AIR DB	OUTSIDE AIR WB	MIXED AIR DB	MIXED AIR WB	LEAVING AIR DB	LEAVING AIR WB	LEAVING AIR DP	CAPACITY TOTAL	CAPACITY SENS.	IEER	ISMRE	REHEAT INFORMATION DISCHARGE DB	DISCHARGE WB	CAPACITY DESIRED	CAPACITY MAX	MOISTURE REMOVAL RATE	GAS HEAT INFORMATION GAS TYPE	INPUT BTUs	OUTPUT BTUs	TEMP RISE	REQUIRED INPUT GAS PRESSURE	A2L MINIMUM ROOM VOLUME ROOM AREA (FT2)	AIRFLOW (CFM)	HEIGHT (FT)	NOTES
1	RTU-1 (DINING)	1	CAS-HVAC2-1.150-18-10T	CAPTIVEAIRE	18MF-2-RTU	2250	750	3000	1951	1.000	3.00	3	460	29.9A	30A	90.0°F	74.0°F	78.8°F	66.0°F	50.4°F	50.3°F	50.3°F	139.1 MBH	92.4 MBH	18.6	4.3	70.0°F	61.0°F	64.6 MBH	96 MBH	40.9 LBS/HR	NATURAL	123907	100365	31°F	7 IN. W.C. – 14 IN. W.C.	425.9	767	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19
2	RTU-2 (KITCHEN)	1	CAS-HVAC3-1.250-24-20T	CAPTIVEAIRE	24MF-3-RTU	2750	1750	4500	2732	1.000	5.00	3	460	45.1A	50A	88.6°F	77.6°F	80.3°F	69.3°F	51.4°F	51.4°F	51.5°F	238.1 MBH	135.8 MBH	18.2	6.0	70.0°F	58.8°F	91.8 MBH	129.6 MBH	93.9 LBS/HR	NATURAL	237617	192470	39°F	7 IN. W.C. – 14 IN. W.C.	602.1	1084	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19

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. 15 DEGREE LOW AMBIENT OPERATION
15. HAIL GUARD FOR CONDENSING COIL
16. RTU ECONOMIZER WITH DIFFERENTIAL ENTHALPY CONTROL
17. BAROMETRIC RELIEF DAMPER
18. DOWN DISCHARGE/DOWN RETURN
19. MINIMUM ROOM AREA ASSUMED 7.2' SUPPLY DIFFUSER HEIGHT AND IS CALCULATED PER UL60335-2-40 4TH ED. VALUES BASED ON FACTORY CHARGE. ACTUAL SITE CHARGE MAY DIFFER.

FOR QUESTIONS, CALL THE
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FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	RTU-1 (DINING)	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		1	SHIP LOOSE GAS STRAINER 3/4"
		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	RTU BLOWER DOOR SWITCH
		1	RTU2 DOWN DISCHARGE
		1	2" MERV 13 FILTERS FOR RTU2 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU2 (QTY. 4)
		1	OVERHEAT STAT
		1	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	RTU2 CURB DUCT HANGER
		1	120V FIRE INPUT
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK – ALARM SUPPLIED BY OTHERS
		1	CLOGGED FILTER SWITCH – NOTIFICATION ON HMI
		1	RTU2 CONVENIENCE OUTLET (GFCI), 15 AMP – REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX
		1	RTU ECONOMIZER – DIFFERENTIAL ENTHALPY CONTROL
		1	RTU2 ECONOMIZER BAROMETRIC RELIEF
		1	RTU INTAKE/RETURN DAMPER – MANUAL CONTROL VIA HMI
		1	RTU2 HAIL GUARD
		1	RTU2 DOWN RETURN
		1	VAV PACKAGE W/ MANUAL/DDC CONTROL (571 VFD INCLUDED)
		1	2" METAL MESH FILTERS FOR RTU2 OUTDOOR INTAKE
		1	LOAD REACTOR MOUNTED IN FAN
		1	10 TON MODULATING COOLING OPTION, 460/480V. R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION – DOWN TO 0F AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTUS
		1	10 TON MODULATING REHEAT OPTION – SPACE DEWPOINT CONTROL – R454B
		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)
		1	EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET
2	RTU-2 (KITCHEN)	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		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	RTU BLOWER DOOR SWITCH
		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	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
		1	FREEZESTAT
		1	DISCHARGE FIRESTAT SET TO 240°F
		1	RTU3 CURB DUCT HANGER
		1	120V FIRE INPUT
		1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK – ALARM SUPPLIED BY OTHERS
		1	CLOGGED FILTER SWITCH – NOTIFICATION ON HMI
		1	RTU3 CONVENIENCE OUTLET (GFCI), 15 AMP – REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX
		1	RTU ECONOMIZER – DIFFERENTIAL ENTHALPY CONTROL
		1	RTU3 ECONOMIZER BAROMETRIC RELIEF
		1	RTU INTAKE/RETURN DAMPER – MANUAL CONTROL VIA HMI
		1	RTU3 HAIL GUARD
		1	ZIEHL POWERED EXHAUST FOR RTU3 – MANUAL CONTROL. 3000 CFM MAX AT 0"
		1	RTU3 DOWN RETURN
		1	VAV PACKAGE W/ MANUAL/DDC CONTROL (571 VFD INCLUDED)
		1	LOAD REACTOR MOUNTED IN FAN
		1	2" METAL MESH FILTERS FOR RTU3 OUTDOOR INTAKE
		1	20 TON MODULATING COOLING OPTION, 460/480V. R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION – DOWN TO 0F AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTUS
		1	20 TON MODULATING REHEAT OPTION – SPACE DEWPOINT CONTROL – R454B
		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)
		1	EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET

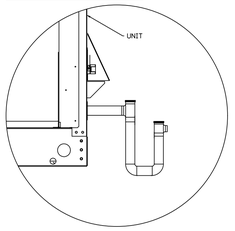
CURB ASSEMBLIES

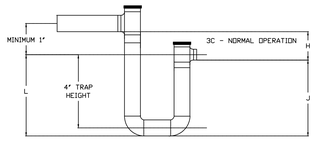
NO	ON FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	RTU-1 (DINING)	90 LBS	CURB	49.500"W X 75.000"L X 14.000"H INSULATED.
2	# 2	RTU-2 (KITCHEN)	104 LBS	CURB	59.500"W X 91.000"L X 14.000"H INSULATED.

HMI SCHEDULE

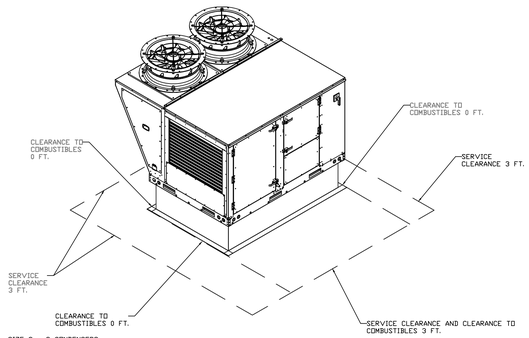
UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #1	HMI #1 – UNIT	IN UNIT	NOT AVERAGED	55
FAN #1	HMI #2 – SPACE	DINING ROOM	AVERAGED	56
FAN #1	HMI #3 – SPACE	MANAGERS OFFICE	NOT AVERAGED	57
FAN #2	HMI #1 – UNIT	IN UNIT	NOT AVERAGED	55
FAN #2	HMI #2 – SPACE	KITCHEN	AVERAGED	56
FAN #2	HMI #3 – SPACE	MANAGERS OFFICE	NOT AVERAGED	57

RTU CONDENSATE DRAIN TRAP DETAIL

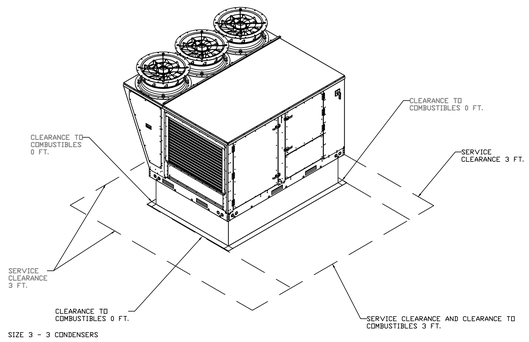




H = (1" FOR EACH 1" OF MAXIMUM NEGATIVE STATIC PRESSURE) + 1"
J = HALF OF H
L = H + J + PIPE DIAMETER + INSULATION



SIZE 2 – 2 CONDENSERS



SIZE 3 – 3 CONDENSERS

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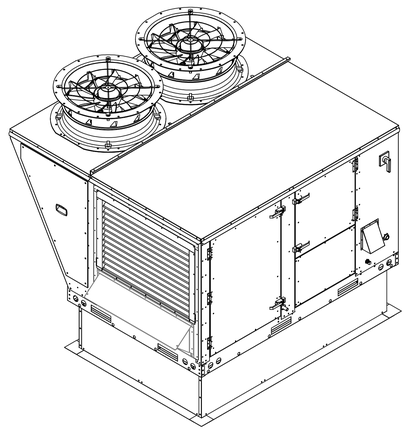
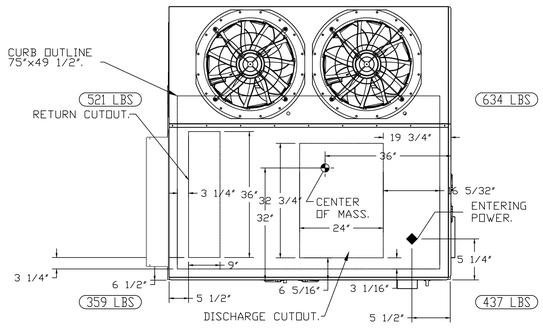
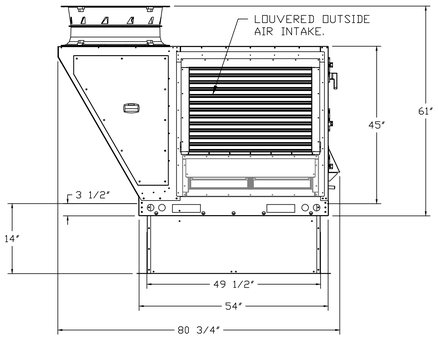
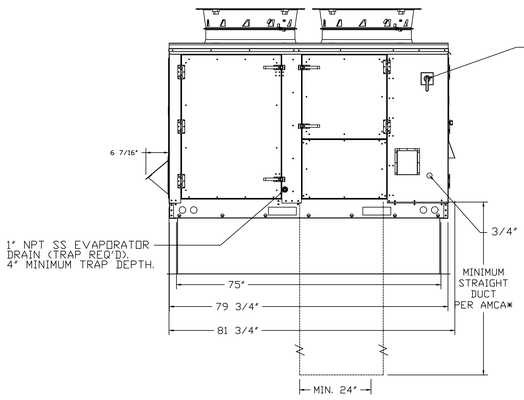
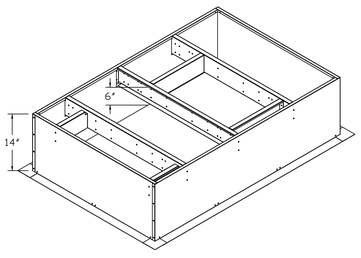
SE JOB#: 250116

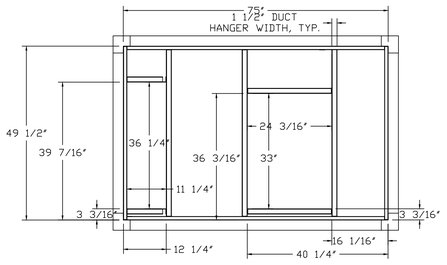


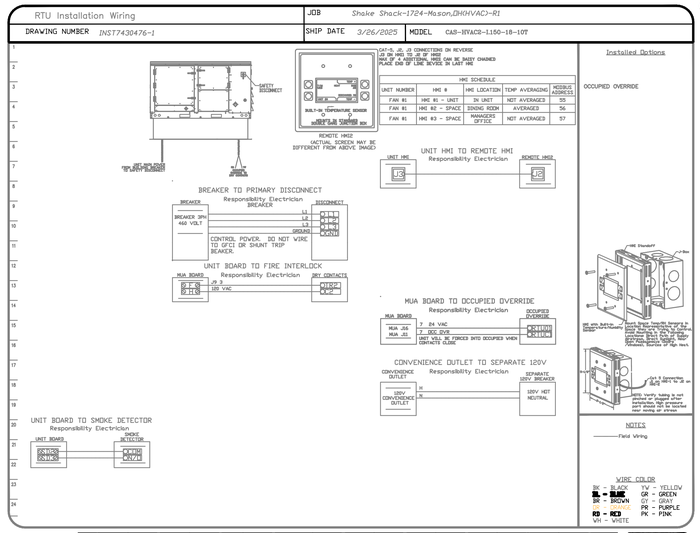


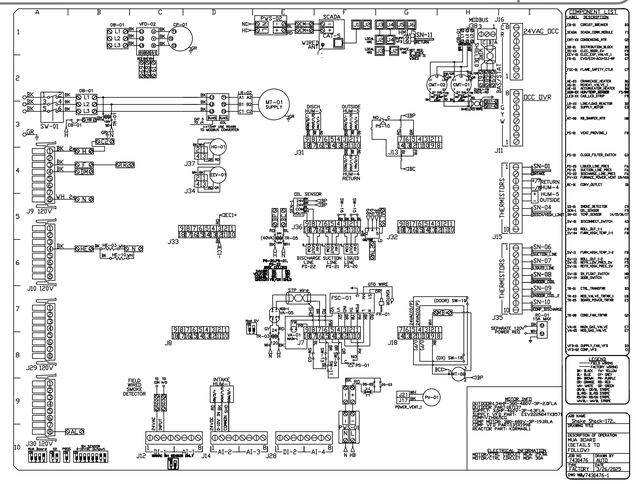












RTU Installation Wiring

JOB	Shake Shack-1724-Mason,OH(HVAC)-R1
DRAWING NUMBER	INST7430476-1
SHIP DATE	3/26/2025
MODEL	CAS-HVAC2-I.150-18-10T

SAFETY DISCONNECT

UNIT MAIN POWER FROM BUILDING BREAKER TO SAFETY DISCONNECT

OCCUPIED OVERRIDE TO DRY CONTACTS

BUILT-IN TEMPERATURE SENSOR

MOUNTS IN STANDARD DOUBLE GANG JUNCTION BOX

REMOTE HMI2
(ACTUAL SCREEN MAY BE DIFFERENT FROM ABOVE IMAGE)

CAT-5, J2, J3 CONNECTIONS ON REVERSE
J3 ON HMI1 TO J2 OF HMI2
MAX OF 4 ADDITIONAL HMIS CAN BE DAISY CHAINED
PLACE END OF LINE DEVICE IN LAST HMI

HMI SCHEDULE

UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #1	HMI #1 - UNIT	IN UNIT	NOT AVERAGED	55
FAN #1	HMI #2 - SPACE	DINING ROOM	AVERAGED	56
FAN #1	HMI #3 - SPACE	MANAGERS OFFICE	NOT AVERAGED	57

UNIT HMI TO REMOTE HMI
Responsibility Electrician
UNIT HMI J3 — REMOTE HMI2 J2

BREAKER TO PRIMARY DISCONNECT
Responsibility Electrician
BREAKER
BREAKER 3PH 460 VOLT — DISCONNECT L1, L2, L3, GROUND (GND)
CONTROL POWER. DO NOT WIRE TO GFCI OR SHUNT TRIP BEAKER.

UNIT BOARD TO FIRE INTERLOCK
Responsibility Electrician
MUA BOARD F, H — J9 3, 120 VAC — DRY CONTACTS TR2, C2

MUA BOARD TO OCCUPIED OVERRIDE
Responsibility Electrician
MUA BOARD MUA J16, MUA J11 — 7 24 VAC, 7 OCC OVR — OCCUPIED OVERRIDE RTU01, RTUC1
UNIT WILL BE FORCED INTO OCCUPIED WHEN CONTACTS CLOSE

CONVENIENCE OUTLET TO SEPARATE 120V
Responsibility Electrician
CONVENIENCE OUTLET: 120V CONVENIENCE OUTLET — H, N — SEPARATE 120V BREAKER: 120V HOT NEUTRAL

UNIT BOARD TO SMOKE DETECTOR
Responsibility Electrician
UNIT BOARD SD2, SD3 — SMOKE DETECTOR COM, N/O

Installed Options

OCCUPIED OVERRIDE

HMI Standoff
J-Box
HMI with Built-in Temperature/Humidity Sensor
Mount Space Temp/RH Sensors in Location Representative of the Space they are Trying to Control. Avoid Mounting in the Following Locations: Direct Path of Supply Airstream, Direct Sunlight, Near Open Passageways (Doors /Windows), Sources of High Heat.
Cat 5 Connection J1 on HMI-1 to J2 on HMI-2
NOTE: Verify tubing is not pinched or plugged after installation. High pressure port should not be located near moving air stream

NOTES
Field Wiring

WIRE COLOR
BK - BLACK
BL - BLUE
BR - BROWN
OR - ORANGE
RD - RED
WH - WHITE
YW - YELLOW
GR - GREEN
GY - GRAY
PR - PURPLE
PK - PINK

FAN #1 CAS-HVAC2-I.150-18MF-10T - HEATER (RTU-1 (DINING))

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.
5. EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET.

*NOTE: INTEGRAL CO2 MONITORING AND CONTROL CAPABILITIES FOR ALL SPACE MOUNTED THERMOSTATS.

REVISIONS

DESCRIPTION	DATE:
△	
△	
△	
△	

CAPTIVEAIRE
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Eastern PA Mechanical
225 E City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 504 - 4126 EMAIL: reg108@captiveaire.com

Shake Shack-1724-Mason,OH(HVAC)-R1
MASON, OH, 45040

DATE: 3/26/2025

DWG.#:
7430476

DRAWN BY: joe.shiiba

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

MASTER DRAWING

SHEET NO.
2

zebra
ZEBRA ARCHITECTURE, PLLC
14614 N KIERLAND BLVD., SUITE N300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 zbr.global

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STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

△	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS:
IFC SET

GREGORY R. SCHNACKEL
E-59866
Date: 07/10/25
COA #: 03180

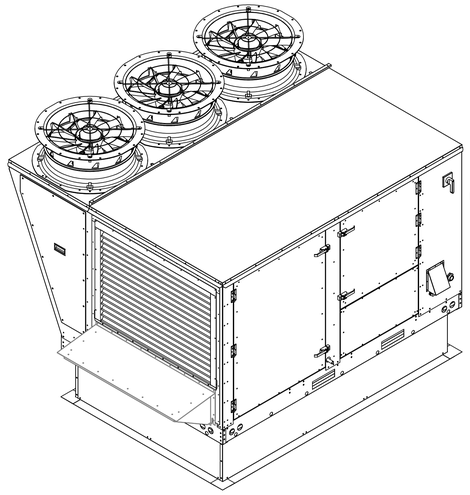
FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Architecture, PLLC of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

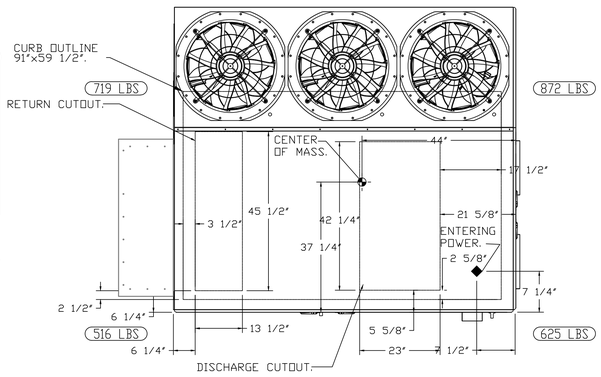
SHEET NAME:
CAPTIVEAIRE DRAWINGS

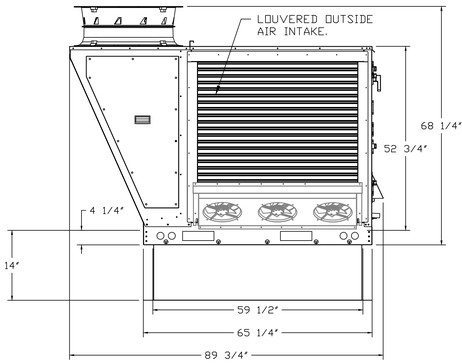
DATE: 04/25/25
PROJECT NO.: 40189
DRAWN: RAS
SCALE: AS NOTED

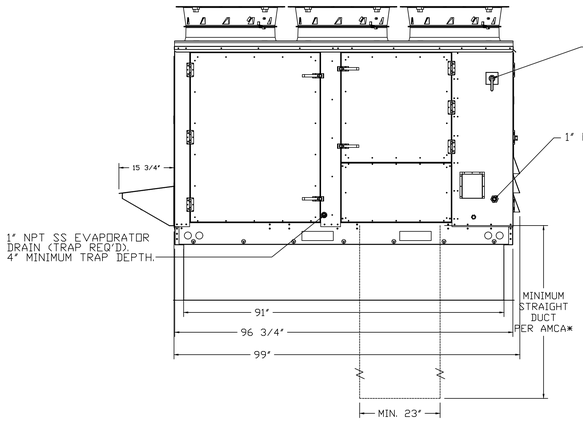
SHEET NO.:
M708

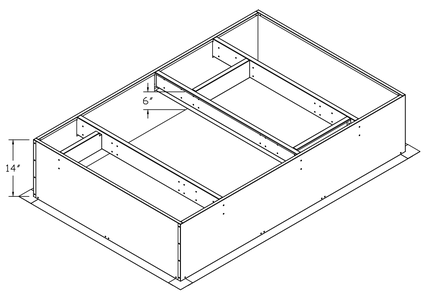
SE JOB#: 250116

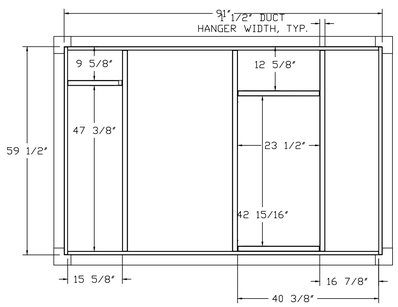


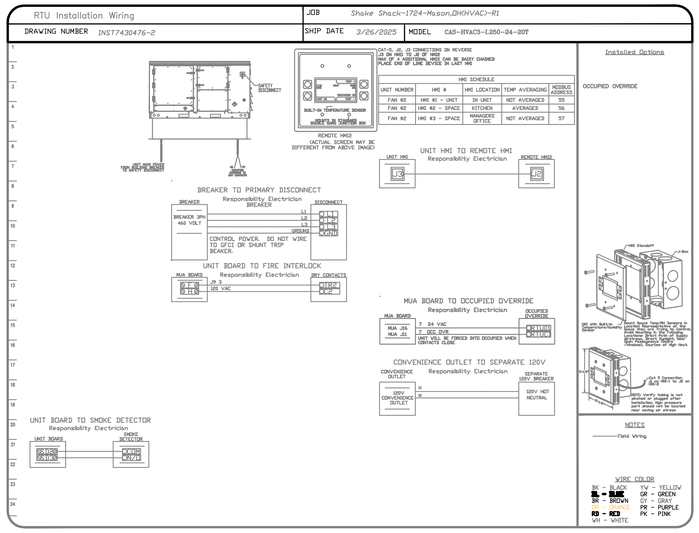


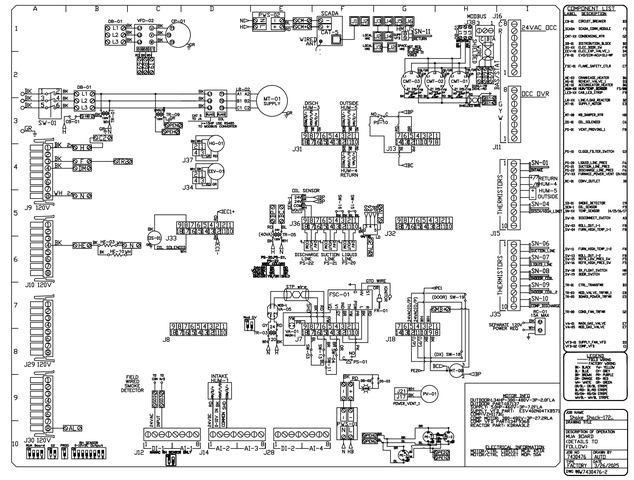












FAN #2 CAS-HVAC3-1.250-24MF-20T - HEATER (RTU-2 (KITCHEN))

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.
5. EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET.

*NOTE: INTEGRAL CO2 MONITORING AND CONTROL CAPABILITIES FOR ALL SPACE MOUNTED THERMOSTATS.

REVISIONS

	DESCRIPTION	DATE:
1		
2		
3		
4		

DATE: 3/26/2025

DWG.#: 7430476

DRAWN BY: joe.shiiba

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

MASTER DRAWING

SHEET NO. 3

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ZEBRA ARCHITECTURE, PLLC
14614 N KIERLAND BLVD., SUITE N300
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STORE NO.:
OH #1724

SHAKE SHACK
MASON
5010 DEERFIELD BLVD, SUITE 39
MASON, OH 45040

REVISIONS

	DATE	DESCRIPTION
1	7/11/25	REVISION 1

STATUS: IFC SET

STATE OF OHIO
GREGORY R. SCHNACKEL
E-59866
REGISTERED PROFESSIONAL ENGINEER
Date: 07/10/25
COA # 03180

FIELD VERIFICATION:
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SHEET NAME: **CAPTIVEAIRE DRAWINGS**

DATE: 04/25/25 | PROJECT NO.: 40189

DRAWN: RAS | SCALE: AS NOTED

SHEET NO.: **M709**

SE-JOB# 230116