

GENERAL NOTES:

- 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.
- 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.
- ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS. 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.
- ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.
- MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.
- 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.
- 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.
- COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.
- 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.
- ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.
- 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 CORNER.
- 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 SMOKE AND HEAT RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.
- ALL SUPPLY AND UNTEMPERED OUTDOOR AIR DUCTWORK VISIBLE TO THE PUBLIC SHALL BE INTERIALLY LINED AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT WRAP INSULATION IS NOT PERMITTED IN THESE AREAS.
- EXPOSED SPIRAL DUCT TO BE GALVANIZED FINISH, FREE FROM SCRATCHES, DENTS OR BLEMISHES AND TO BE PAINTED TO MATCH THE SURROUNDING AREA. DUCT SHALL BE INTERNALLY LINED AND SEALED WITH DUCT SEALER COMPLETELY CONCEALED WITHIN THE DUCT JOINT. NO EXPOSED SEALER OR TAPE WILL BE ACCEPTED.
- ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE. THE JOIST SPACE.
- PROVIDE REMOTE VOLUME DAMPER CONTROL MANUFACTURED BY YOUNG REGULATOR OR UNITED ENERTCH FOR DAMPERS LOCATED ABOVE INACCESSIBLE CEILING. LOCATE CONTROLLER ABOVE ACCESSIBLE CEILING.
- 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.
- TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY READINGS AND OTHER INFORMATION 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 UTILITIES AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.
- ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.
- ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 96 AND ALL OTHER REQUIREMENTS.
- GREASE DUCT LEAKAGE TESTING MUST BE PERFORMED PRIOR TO CONCEALMENT OF THE DUCTWORK.
- 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.
- AT THE COMPLETION OF CONSTRUCTION AN NEBB, AABC OR TABE CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. THE BALANCING MUST BE COMPLETED BY AN INDEPENDENT, THIRD PARTY CONTRACTOR WITH NO TIES TO THE INSTALLING CONTRACTORS.

HVAC NOTES:

- NEW CAPTIVEAIRE GREASE EXHAUST HOOD TO BE FURNISHED BY OWNER FOR INSTALLATION BY THE MECHANICAL CONTRACTOR. SEE CAPTIVEAIRE SHEETS M501 THROUGH M507 FOR ADDITIONAL INFORMATION. BALANCE HOOD EXHAUST COLLARS AS NOTED ON THE HOOD SCHEDULE.
- TRANSITION FROM HOOD EXHAUST COLLAR AS INDICATED ON PLANS AND EXTEND 8/8 KITCHEN HOOD GREASE EXHAUST DUCTWORK UP TO 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 DETAIL ON SHEET M501 FOR ADDITIONAL INFORMATION.
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- PROVIDE 8/8 EXHAUST AIR DUCT UP TO EF-5 ON ROOF.
- CONTRACTOR SHALL UNDERCUT DOOR 3/4".
- PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO ACU-1 IN ROOM 105. 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.
- PROVIDE NEW FULLY DIGITAL 7 DAY PROGRAMMABLE TYPE THERMOSTAT WITH REMOTE SENSING CAPABILITIES, AUTO CHANGE OVER AND AUTO SET BACK. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE REMOTE TEMPERATURE SENSORS AS INDICATED ON PLAN. COORDINATE LOCATION WITH WALL GRAPHICS LAYOUT.
- 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.
- ROUTE EXPOSED SUPPLY DUCT AS HIGH AS STRUCTURE ALLOWS. COORDINATE INSTALLATION WITH LIGHTING FIXTURES. TYPICAL OF EXPOSED DUCTWORK. PROVIDE NEW ACU AS NOTED ON PLANS AND AS SCHEDULED ON SHEET M501.
- PROVIDE CLEANOUTS ON GREASE EXHAUST DUCTWORK AS REQUIRED BY CODE. REFERENCE SHEET M501, DETAIL 5, FOR ADDITIONAL INFORMATION.
- FURNISH ELECTRIC UNIT HEATERS AS SCHEDULED ON SHEET M501. UNITS ARE TO BE INSTALLED BY THE ELECTRICAL CONTRACTOR. REFERENCE ELECTRICAL PLANS FOR ADDITIONAL INFORMATION.
- PROVIDE REMOTE VOLUME DAMPER AS INDICATED ON PLANS. REFERENCE SHEET M502, DETAIL 5, FOR ADDITIONAL INFORMATION.
- BALANCE DAMPER TO PROVIDE 30 CFM.
- WINDOW TO BE EQUIPPED WITH INTEGRAL AIR CURTAINS AND AUTOMATIC CLOSING. REFER TO ARCHITECTURAL SHEETS FOR ADDITIONAL INFORMATION.
- GREASE DUCTWORK CORNERS TO BE INSTALLED WITH 1.5X WIDTH RADIUS. NOTIFY ARCHITECT AND ENGINEER IF CONFLICT OCCURS.
- COORDINATE WITH CAPTIVEAIRE ON COMFORT CONTROLS PACKAGE THAT IS TO BE INSTALLED IN THE OFFICE.

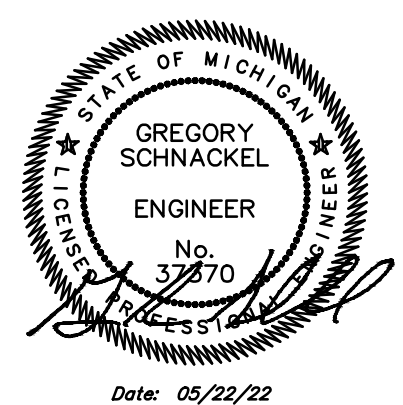
STORE NO: 1355

SHAKE SHACK
 STERLING HEIGHTS
 50 STERLING HEIGHTS, MI

REVISION

NO.	DATE	DESCRIPTION
A	03/18/21	REVISION A
B	04/14/21	REVISION B
C	08/13/22	CITY CREW/REGIENEC
1	03/18/22	IFC
2	04/22/22	REVISION 1
3	05/04/22	REVISION 2

STATUS: IFC SET

PRELIMINARY:

 GREGORY SCHNACKEL
 ENGINEER
 3710
 Date: 05/22/22

FIELD VERIFICATION:
 The contractor shall verify all figured dimensions and conditions on the project site and notify Zebra Architecture, PLLC of any discrepancies, omissions, or omissions. Discrepancies shall be reported to the engineer for resolution. No field change orders shall be issued without the written consent of Zebra Architecture, PLLC.

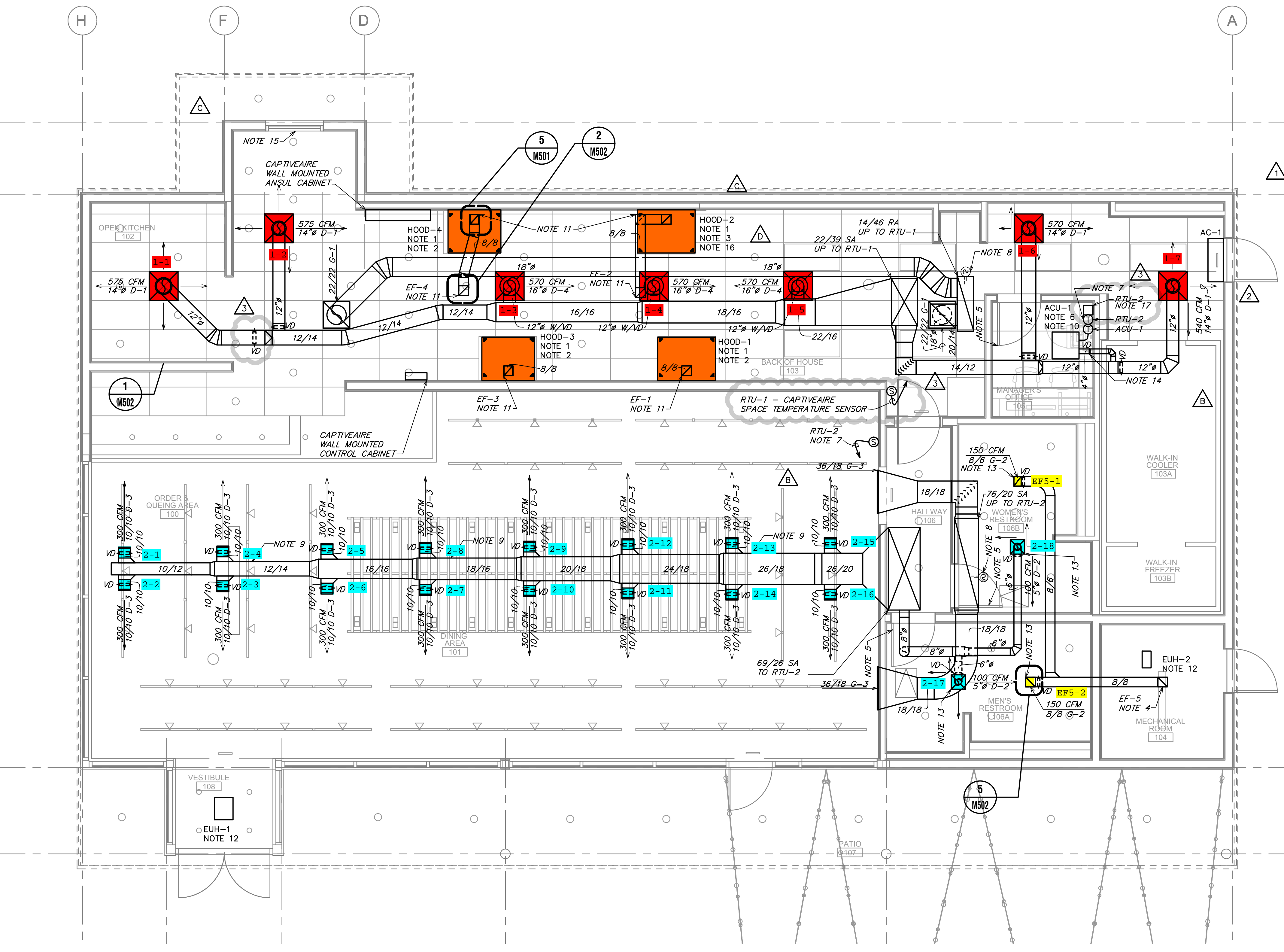
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SHEET NAME:
 MECHANICAL FLOOR PLAN

DATE: 03/01/21 **PROJECT NO:** 33128

DRAWN: RAS **SCALE:** As indicated

SHEET NO: M101



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

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

RESPONSIBILITY MATRIX							
THIS SCHEDULE IS PROVIDED FOR QUICK REFERENCE ONLY. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR ALL WORK DESCRIBED IN THE CONSTRUCTION DOCUMENTS. CONFLICTS BETWEEN THIS SCHEDULE AND THE REST OF THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ARCHITECT'S ATTENTION PRIOR TO BEGINNING WORK.							
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 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 CONTRACTOR 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. 27 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							
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. 26
23.5.4 DUCTED AND NON-DUCTED HEATING AND COOLING UNITS	X			X			
23.5.5 MAKE UP AIR UNITS		X		X			SUPPLIED BY VENDOR NO. 26
23.5.6 ELECTRIC PATIO HEATERS	X			X			
23.5.7 CONDENSING UNITS	X			X			
23.5.8 RGF PHI SYSTEM	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 12 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. 26
23.6.2 KITCHEN EXHAUST HOOD		X		X			SUPPLIED BY VENDOR NO. 26
23.6.3 STRUCTURAL SUPPORT	X			X			
23.6.4 ELECTRICAL AND CONTROL WIRING	X			X			
23.6.5 ANSUL SYSTEM		X		X			SUPPLIED BY VENDOR NO. 26 GENERAL CONTRACTOR TO COORDINATE AND FACILITATE SYSTEM SIGN-OFF
23.6.6 ANSUL WIRING AND UTILITIES CONNECTION	X			X			
23.6.7 ANSUL GAS VALVE		X		X			SUPPLIED BY VENDOR NO. 26
23.7 COMMISSIONING ACTIVITIES							
23.7.1 GREASE EXHAUST WATER LEAKAGE TEST	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 10 VENDOR SUBSTITUTION IS NOT PERMITTED
23.7.2 TESTING AIR BALANCE (TAB) REPORT	X			X			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 12 VENDOR SUBSTITUTION IS NOT PERMITTED

SYMBOLS	
HEATING-VENTILATING-AIR CONDITIONING	
SYMBOL	DESCRIPTION
	THERMOSTAT
	REMOTE SENSOR
	SUPPLY DIFFUSER
	RETURN OR EXHAUST GRILLE
	SUPPLY OR FRESH AIR DUCT (SA OR FA)
	RETURN OR EXHAUST AIR DUCT (RA OR EA)
	RECTANGULAR DUCT FIRST FIGURE IS SIDE SHOWN
	ROUND DUCT
	VOLUME DAMPER (ELEV AND PLAN)
	TURNING VANES
	SUPPLY REGISTER OR GRILLE (R OR G)
	RETURN REGISTER OR GRILLE (R OR G)
	FRESH AIR INTAKE (FA)
	SQUARE CEILING DIFFUSER (SUPPLY)
	CONDENSATE OR VACUUM PUMP DISCHARGE
	GAS LINE
	REFRIGERANT LIQUID LINE
	REFRIGERANT SUCTION LINE
	MOTORIZED DAMPER

zebra
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 SCOTTSDALE, ARIZONA 85254
 PHONE: 480.912.1169 zbr.global

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 SE 2088 20047

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1355

SHAKE SHACK
 STERLING HEIGHTS
 3800 W. 130TH STREET
 STERLING HEIGHTS, MI

REVISION		
A	DATE	DESCRIPTION
A	03/18/21	REVISION A
B	04/14/21	REVISION B
C	08/13/21	CITY COMMENTS
1	03/16/22	IFC
2	04/22/22	REVISION 1
B	05/04/22	REVISION 2

STATUS:
IFC SET

PRELIMINARY:

 GREGORY SCHRACKEL
 ENGINEER
 No. 37870
 Date: 05/22/22

FIELD VERIFICATION:
 The contractor shall verify all figured dimensions and location of the project site and verify Zebra Architecture, P.L.L.C. of any discrepancies, errors, or omissions or discrepancies before beginning or fabricating any work. Do not make these drawings.

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SHEET NAME:
MECHANICAL ABBREVIATIONS & SYMBOLS

DATE: 03/01/21 PROJECT NO: 33128
 DRAWN: RAS SCALE: As indicated

SHEET NO:
M001

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- HVAC NOTES**
- PROVIDE REFRIGERANT LINES FROM ASH-1 ON ROOF TO ACU-1 ABOVE KITCHEN OFFICE SPACE 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.
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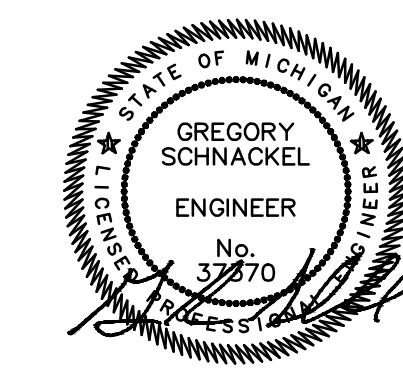
STORE NO: 1355

SHAKE SHACK
 STERILISING HEIGHTS
 5000 WILSON BLVD
 STERILISING HEIGHTS, WI

REVISION	
DATE	DESCRIPTION
03/18/21	REVISION A
04/14/21	REVISION B
08/13/21	CITY COMMENTS
03/16/22	IFC
04/22/22	REVISION 1
05/04/22	REVISION 2

STATUS: IFC SET

PRELIMINARY:



Gregory Schnackel
 ENGINEER
 37870
 Date: 05/22/22

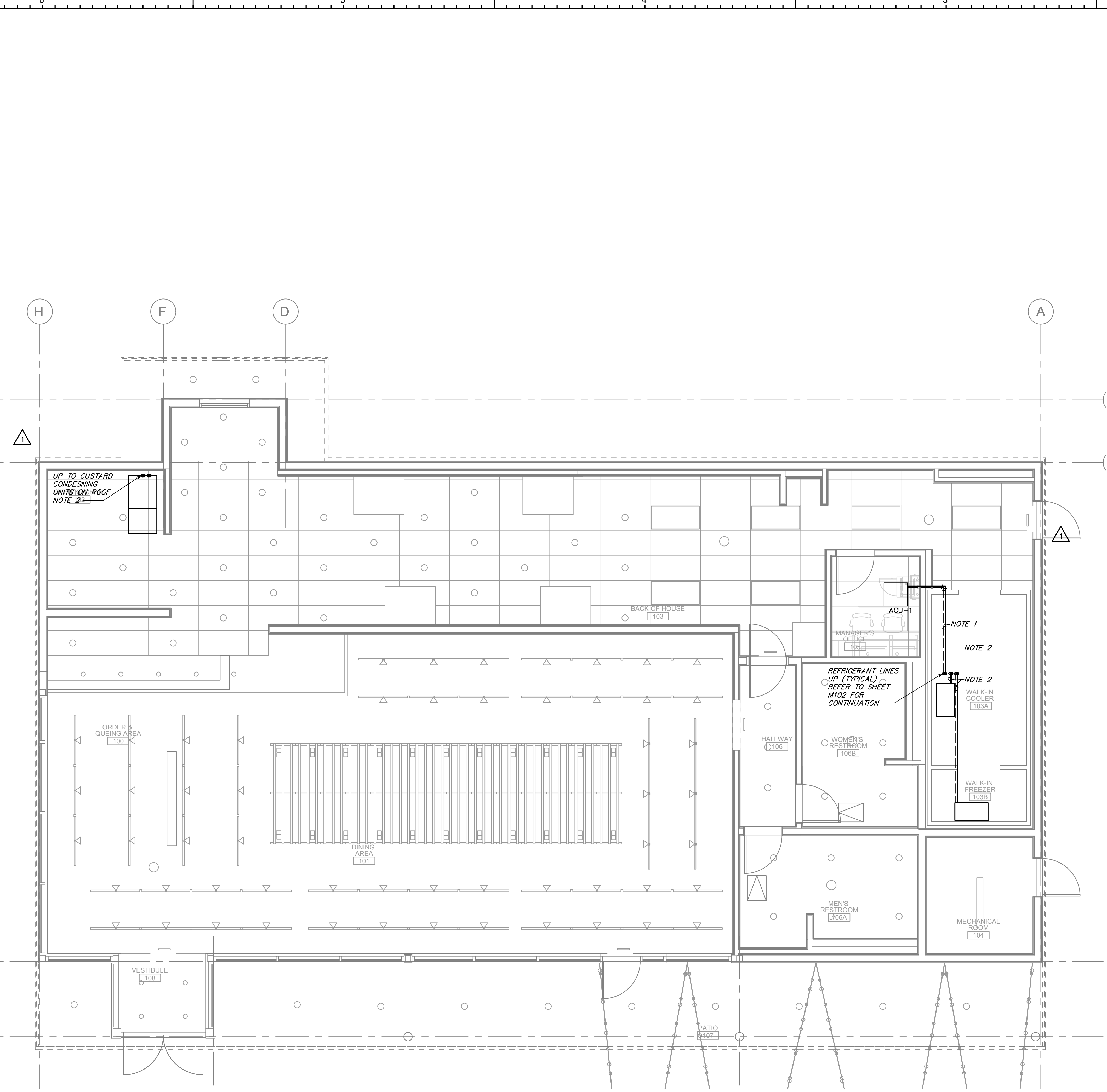
FIELD VERIFICATION:
 The contractor shall verify all figured dimensions and location of the project site and verify Zebra Architecture, P.L.L.C. of any dimensions, elevations, or conditions of discrepancies before beginning or fabricating any work. Do not scale from drawings.

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SHEET NAME:
MECHANICAL REFRIGERANT PIPING LAYOUT PLAN

DATE: 03/01/21 PROJECT NO: 33128
 DRAWN: RAS SCALE: As indicated

SHEET NO:
M102



1 MECHANICAL REFRIGERANT PIPING LAYOUT PLAN
 SCALE: 1/4" = 1'-0"

SHAKE SHACK
 STERILIZATION HEIGHTS
 STERILIZATION HEIGHTS
 STERILIZATION HEIGHTS, INC.

MECHANICAL ROOF PLAN

REVISION

NO.	DATE	DESCRIPTION
A	03/18/21	REVISION 1
B	04/14/21	REVISION 2
C	08/13/21	CITY COMMENTS
1	03/16/22	IFC
2	04/22/22	REVISION 1
B	05/04/22	REVISION 2

STATUS:
IFC SET

PRELIMINARY:


 GREGORY SCHNACKEL
 ENGINEER
 37870
 Date: 05/22/22

FIELD VERIFICATION:
 The contractor shall verify all figured dimensions and location on the project site and notify Zebra Architecture, P.L.L.C. of any discrepancies either by email or in person. Discrepancies shall be resolved before beginning or fabricating any work. Do not begin fabricating.

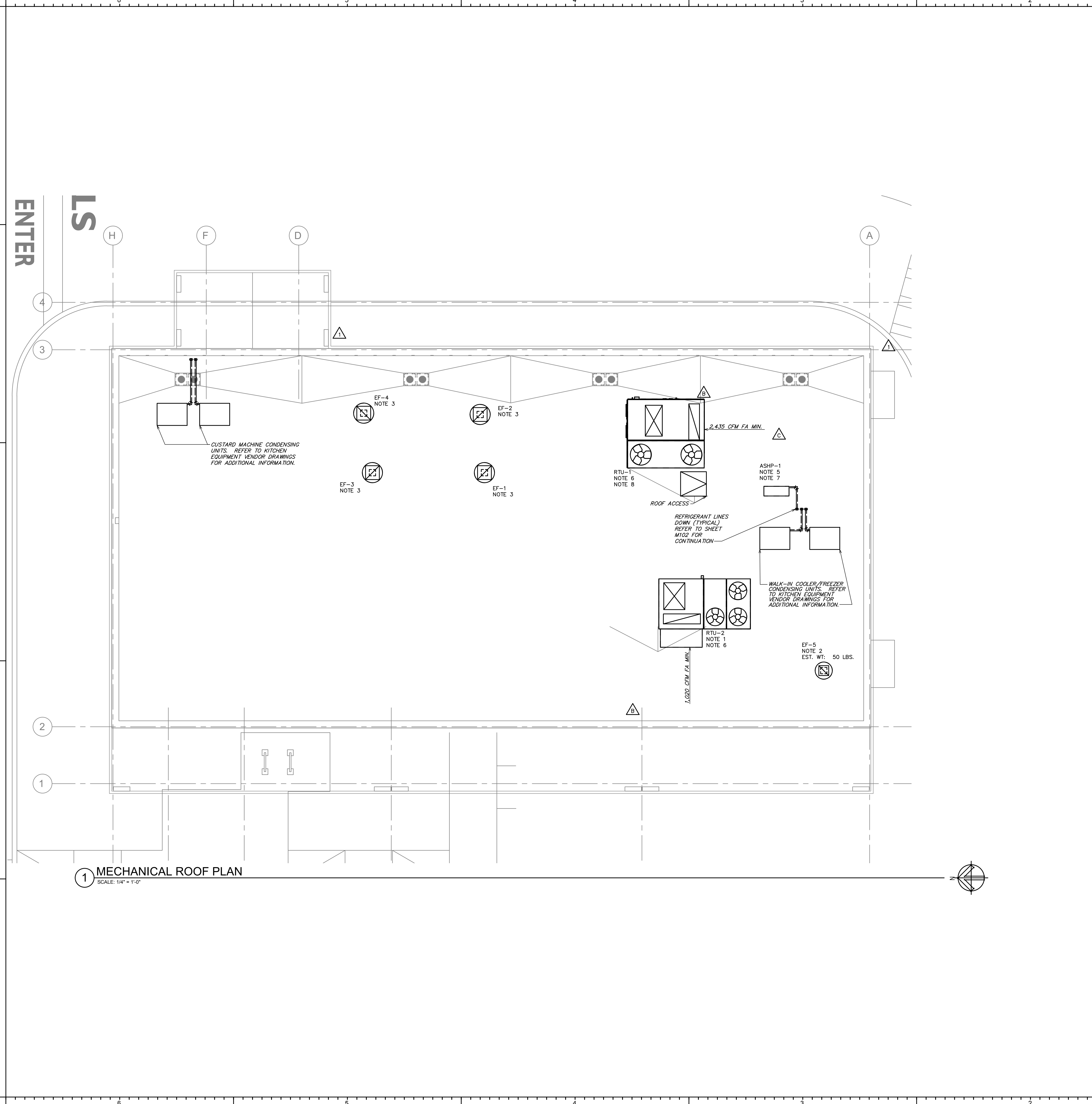
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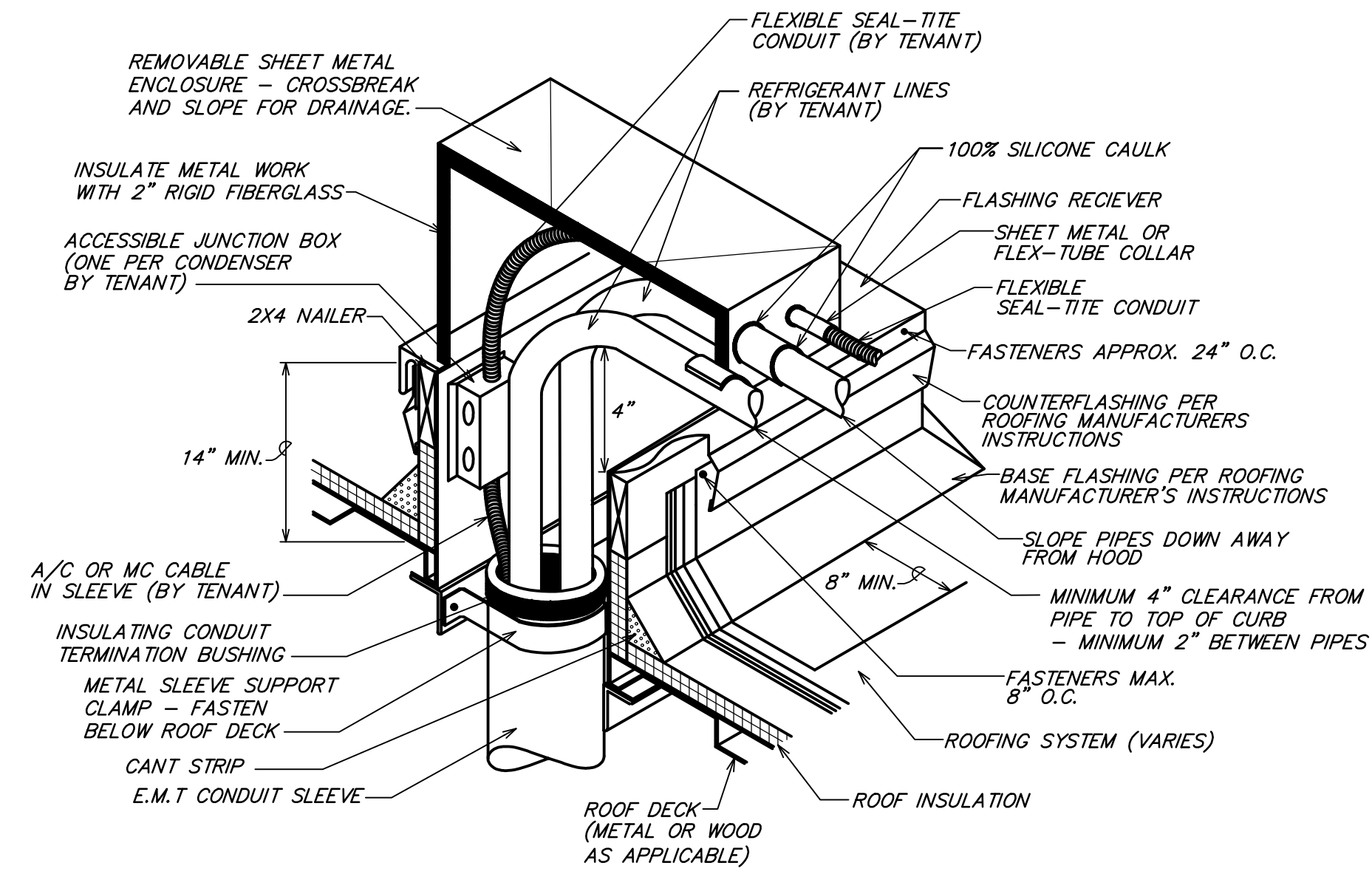
SHEET NAME:
MECHANICAL ROOF PLAN

DATE: 03/01/21 PROJECT NO: 33128
 DRAWN: RAS SCALE: As indicated

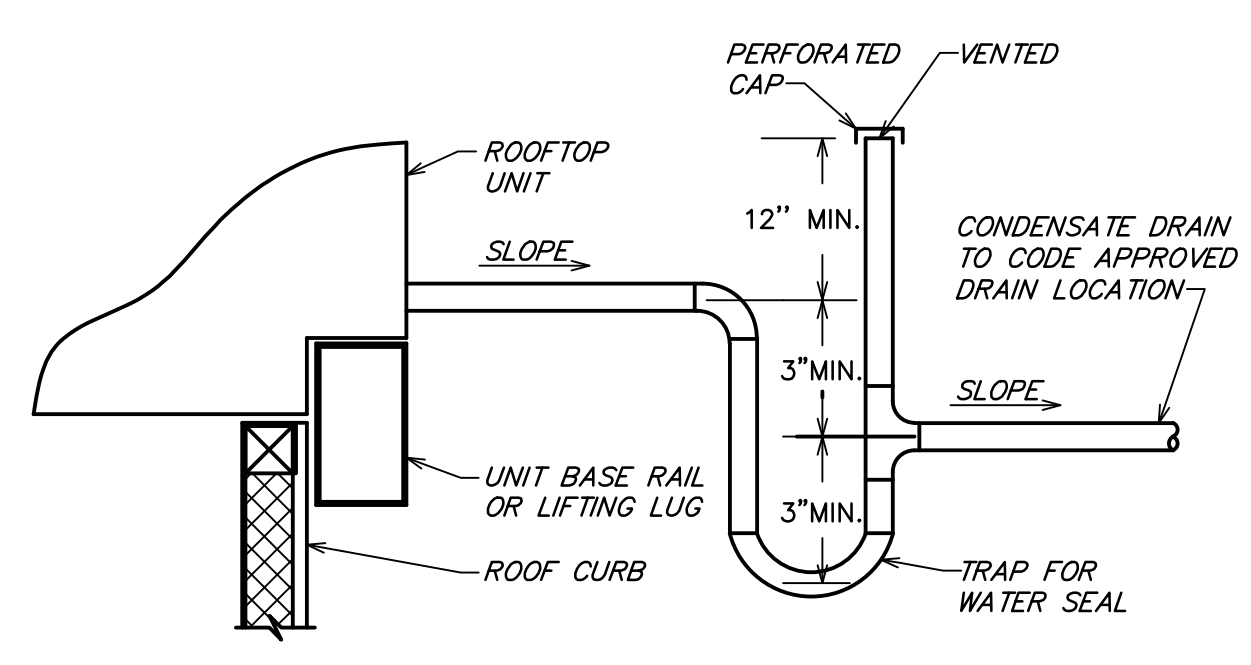
SHEET NO:
M150

- GENERAL NOTES:**
- 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.
 - 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.
 - ALL CONTRACTORS SHALL REVIEW A COMPLETE SET OF CONSTRUCTION DOCUMENTS. 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.
 - ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE GOVERNMENT AND LOCAL CODES.
 - MECHANICAL CONTRACTOR SHALL FIELD COORDINATE WITH ELECTRICAL CONTRACTOR FOR ALL POWER REQUIREMENTS.
 - 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.
 - 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 DEFINE 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.
 - COORDINATE DUCT ROUTING AND HEIGHTS WITH GENERAL CONTRACTOR. VERIFY ALL CLEARANCES BEFORE STARTING WORK.
 - 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.
 - ALL DUCT CONNECTIONS TO HVAC EQUIPMENT MUST BE MADE WITH FLEXIBLE CONNECTORS.
 - 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 COR.
 - 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 SHAWNA AND NAIMA. RETURN AIR TRANSFER DUCTS AND RETURN DUCTWORK WITHIN 10 FEET OF THE UNIT FAN SHALL BE LINED WITH 1" ACOUSTICAL DUCT LINER.
 - 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.
 - EXPOSED SPIRAL DUCT TO BE GALVANIZED FINISH, FREE FROM SCRATCHES, DENTS OR BLEMISHES AND PAINTED TO MATCH THE SURROUNDING AREA. DUCT SHALL BE INTERNALLY LINED AND SEALED WITH DUCT SEALER COMPLETELY CONCEALED WITHIN THE DUCT JOINT. NO EXPOSED SEALER OR TAPE WILL BE ACCEPTED.
 - ALL EXPOSED DUCTWORK SHALL BE INSTALLED TIGHT TO THE BOTTOM OF THE STRUCTURE. THRU JOIST SPACE.
 - PROVIDE REMOTE VOLUME DAMPER CONTROL MANUFACTURED BY YOUNG REGULATOR OR UNITED ENRICHED FOR DAMPERS LOCATED ABOVE INACCESSIBLE CEILINGS. LOCATE CONTROLLER ABOVE ACCESSIBLE CEILING LOCATION.
 - 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.
 - TENANT'S CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF ALL UTILITY RISERS AND/OR OTHER DEVICES 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 RISERS AND/OR IMPROVEMENTS WHICH ARE DAMAGED AS A RESULT OF TENANT'S WORK IN OR AROUND THE PREMISES.
 - ALL ROOFING WORK SHALL BE PERFORMED BY LANDLORD'S APPROVED ROOFING CONTRACTOR AT TENANT'S EXPENSE, IF REQUIRED IN LEASE OR TENANT CRITERIA MANUAL.
 - ALL GREASE EXHAUST DUCTWORK SHALL BE PROVIDED WITH 3" FOIL FACED THERMAL-CERAMIC INSULATION FOR GREASE DUCTS. INSULATION SHALL MEET NFPA 98 AND ASTM E 2338 REQUIREMENTS.
 - GREASE DUCT LEAKAGE TESTING MUST BE PERFORMED PRIOR TO CONCEALMENT OF THE DUCTWORK.
 - 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.
 - AT THE COMPLETION OF CONSTRUCTION AN NEBB, AIB, OR TABS CERTIFIED AIR BALANCE REPORT SHALL BE SUBMITTED TO THE ENGINEER AND LANDLORD. THE BALANCING MUST BE COMPLETED BY AN INDEPENDENT, THIRD PARTY CONTRACTOR WITH NO TIES TO THE INSTALLING CONTRACTORS.
- HVAC NOTES:**
- PROVIDE NEW RTU AS NOTED ON PLANS AND AS SCHEDULED ON SHEET M601. FIELD VERIFY EXACT LOCATION.
 - 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.
 - NEW CAPTIVE/GREASE EXHAUST FAN TO BE PROVIDED BY OWNER FOR INSTALLATION BY MECHANICAL CONTRACTOR. SEE CAPTIVE/GREASE SHEETS M701 THROUGH M7-08 FOR ADDITIONAL INFORMATION. CONTRACTOR SHALL FIELD VERIFY THAT THE LOCATION SHOWN IS A MINIMUM OF 10'-0" FROM ANY OUTDOOR AIR INTAKE.
 - NOT USED.
 - PROVIDE REFRIGERANT LINES FROM ASHP-1 ON ROOF TO ACU-1 IN ROOM 105. 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.
 - REG PH1-PKG14-24V UV SYSTEM TO BE PROVIDED AND INSTALLED BY NTAB. REFER TO RESPONSIBILITY MATRIX ON SHEET M001 FOR ADDITIONAL INFORMATION. SHEET M601 FOR SCHEDULE, AND SHEET M591 FOR SPECIFICATIONS.
 - PROVIDE ASHP AS NOTED ON PLANS AND SCHEDULED ON SHEET M601.
 - NEW CAPTIVE/GREASE DAS RTU TO BE PROVIDED BY OWNER FOR INSTALLATION BY MECHANICAL CONTRACTOR. SEE CAPTIVE/GREASE SHEETS M701 THROUGH M708 FOR ADDITIONAL INFORMATION. CONTRACTOR SHALL FIELD VERIFY THAT THE LOCATION SHOWN IS A MINIMUM OF 10'-0" FROM ANY EXHAUST OR FLUE DISCHARGE.

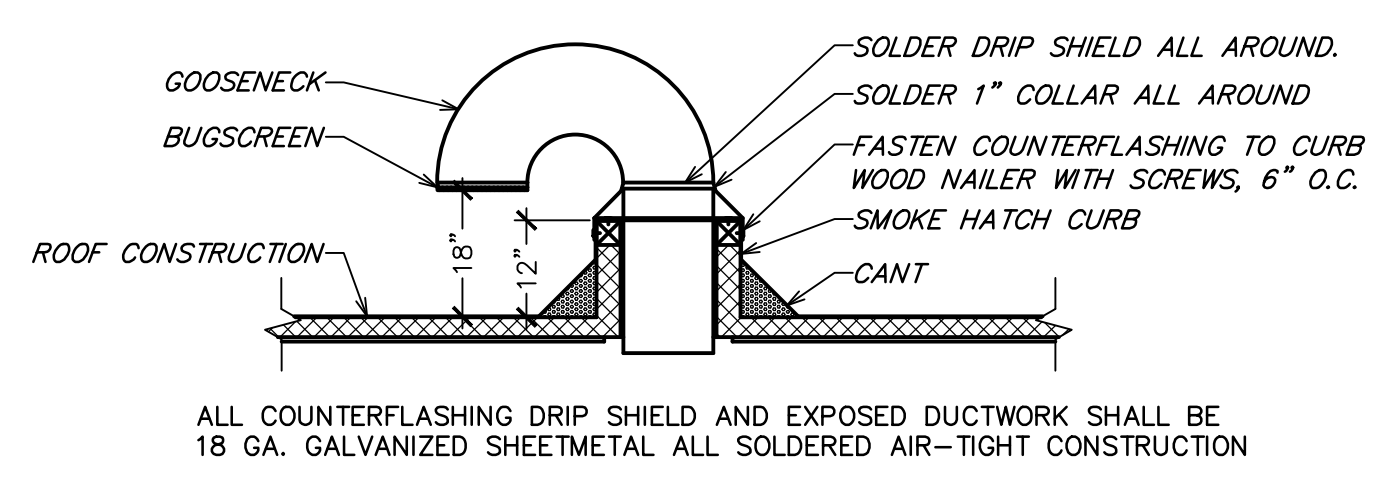




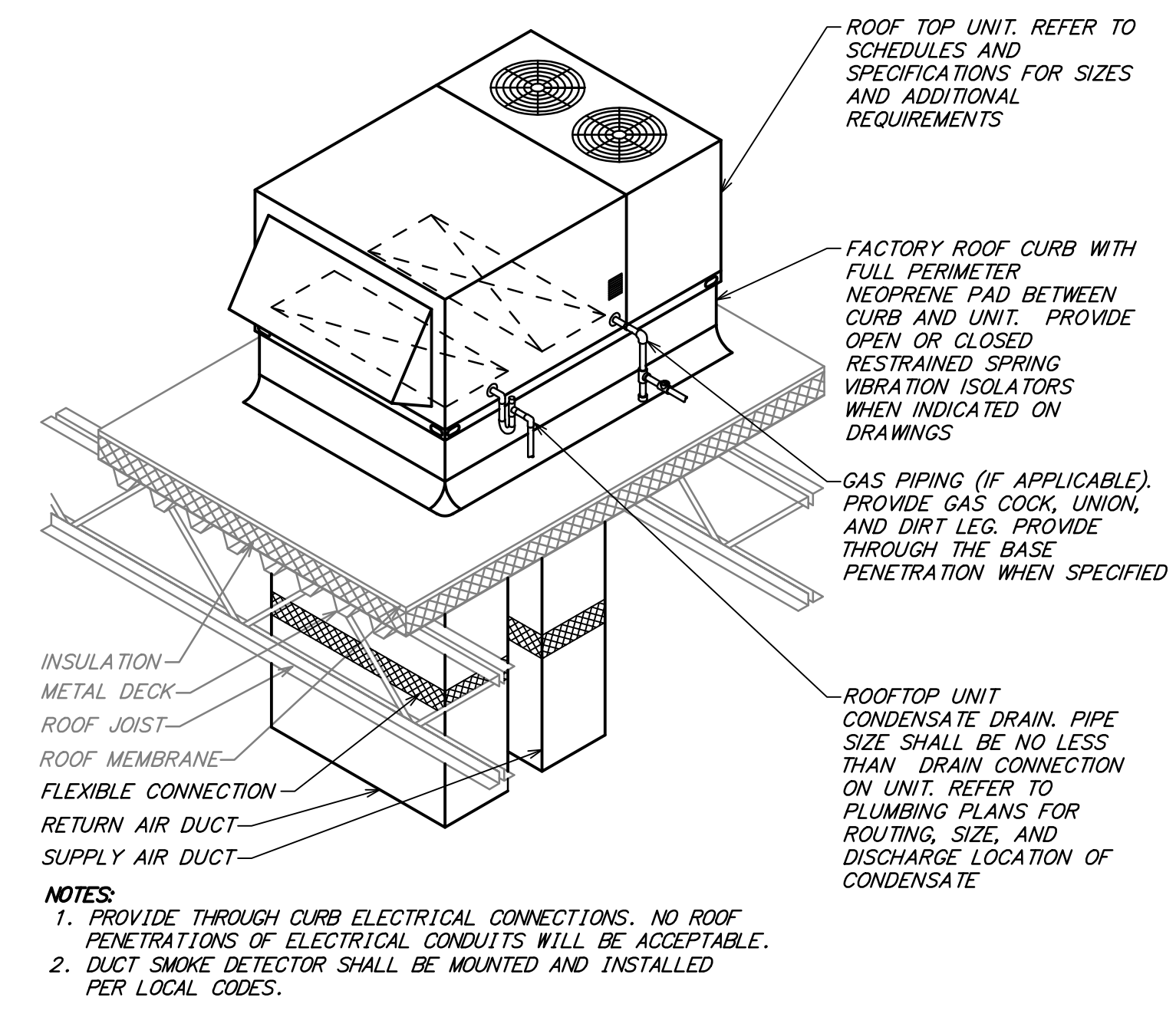
7 CONDENSER REFRIGERANT LINE PIPING AND POWER THROUGH ROOF DECK
NOT TO SCALE



8 ROOF TOP UNIT CONDENSATE DETAIL
NOT TO SCALE



9 GOOSENECK WEATHERHOOD DETAIL
NOT TO SCALE

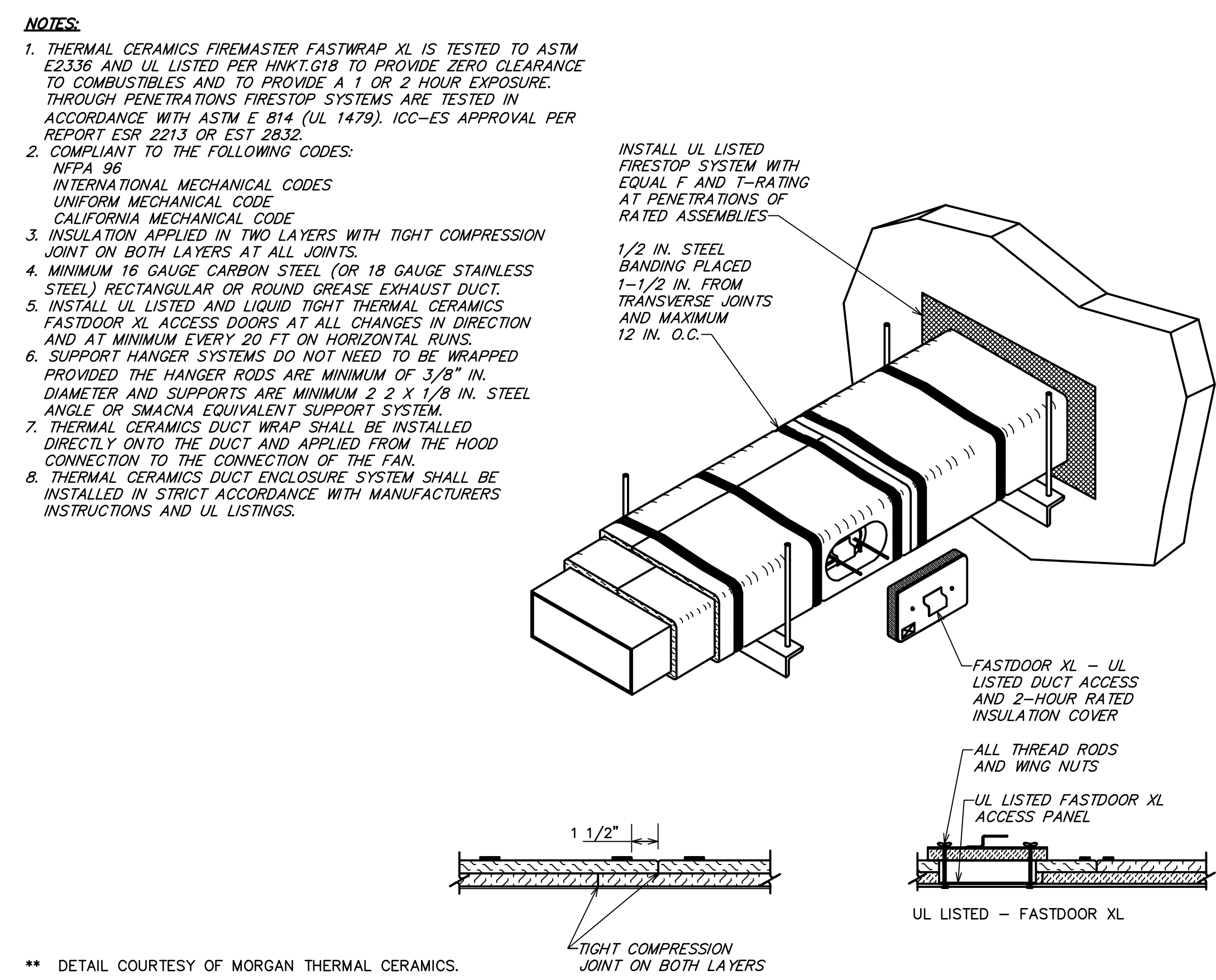


10 TYPICAL ROOF TOP UNIT DETAIL
NOT TO SCALE

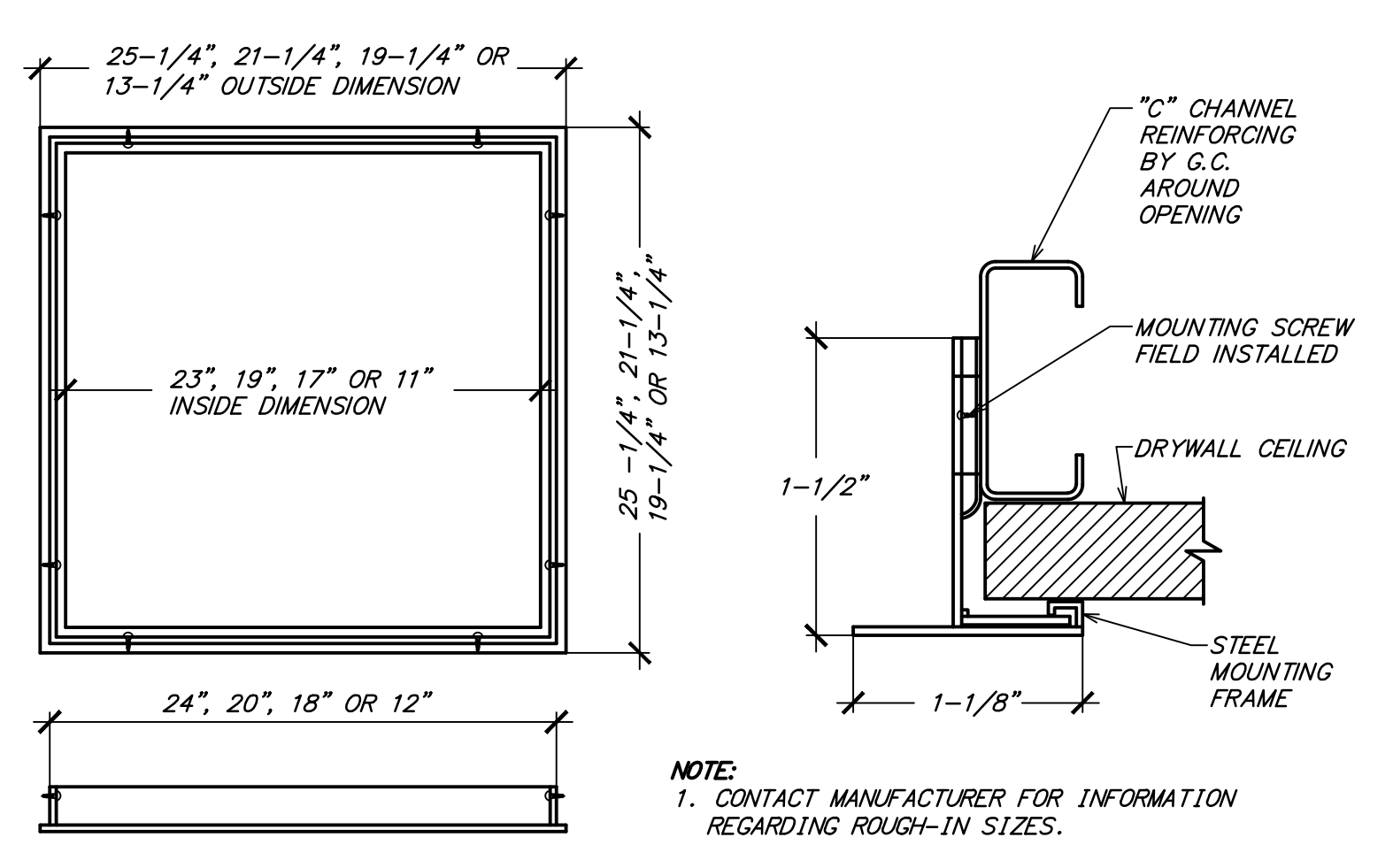
MAXIMUM HALF OF DUCT PERIMETER	PAIR AT 10 FT. SPACING		PAIR AT 8 FT. SPACING		PAIR AT 5 FT. SPACING		PAIR AT 4 FT. SPACING	
	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD
P/2 = 30"	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	10 GA. (.135")	1" x 22 GA.	12 GA. (.106")	1" x 22 GA.	12 GA. (.106")
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"
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"
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"
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"
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"
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 22 GA. - 260 LBS.	0.106" - 80 LBS.
1" x 16 GA. - TWO 1/4" DIA.	1" x 20 GA. - 320 LBS.	0.135" - 120 LBS.
1" x 16 GA. - TWO 3/8" DIA.	1" x 18 GA. - 420 LBS.	0.162" - 160 LBS.
1 1/2" x 16 GA. - 700 LBS.	1" x 16 GA. - 1100 LBS.	1/4" - 270 LBS.
		3/8" - 680 LBS.
		1/2" - 1250 LBS.
		5/8" - 2000 LBS.
		3/4" - 3000 LBS.

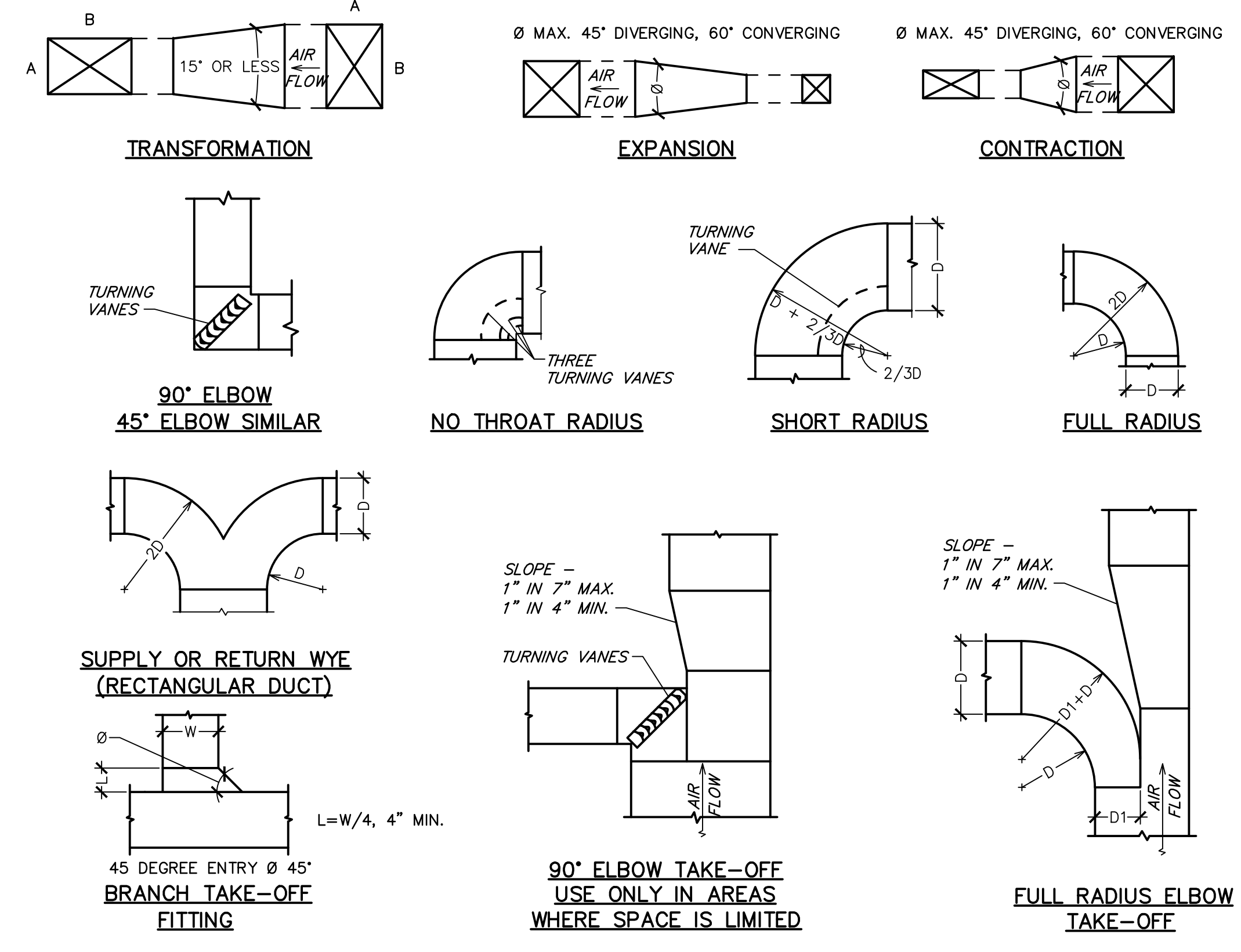
4 RECTANGULAR DUCT HANGER TABLE
NOT TO SCALE



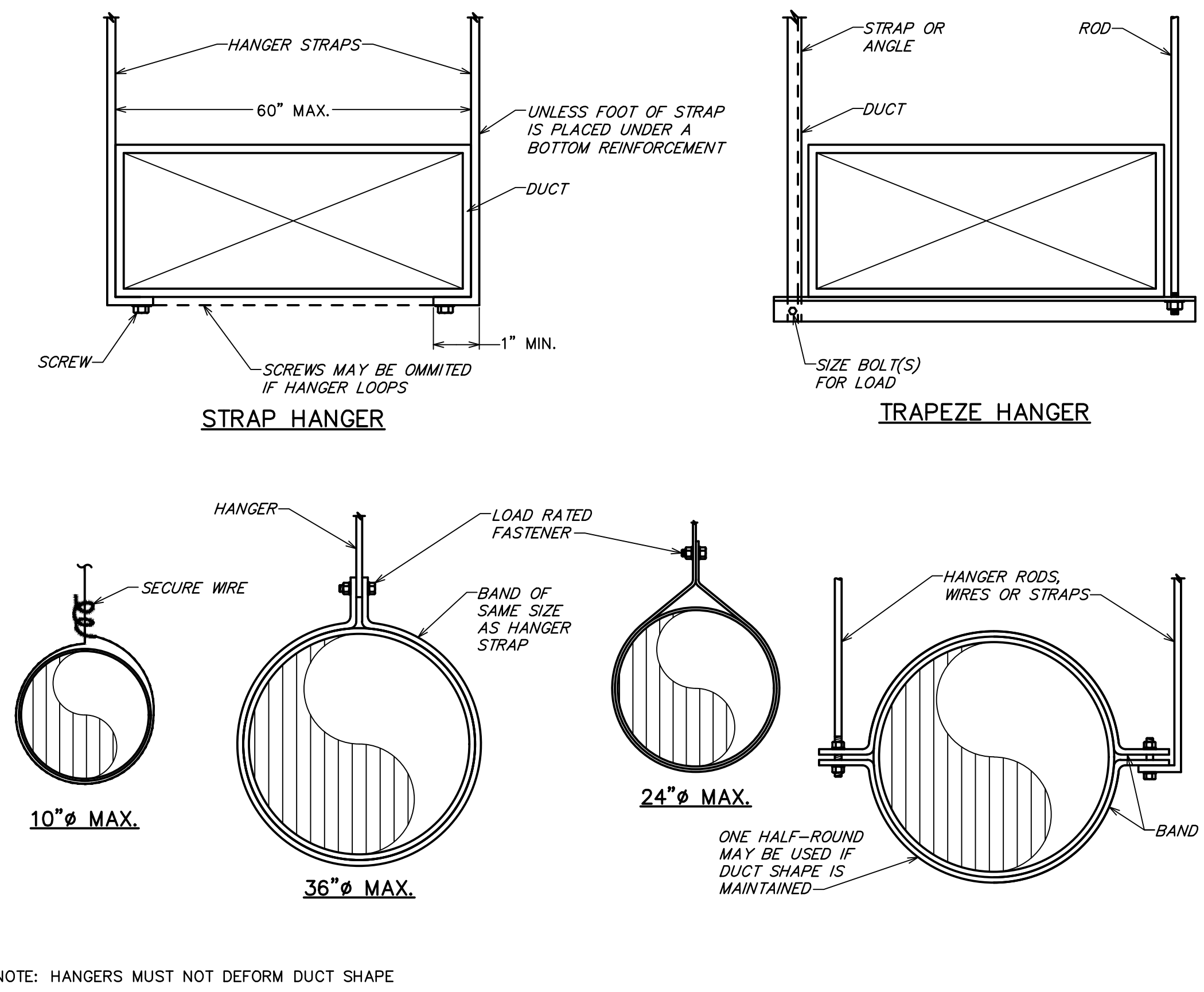
5 FIREMASTER FASTWRAP XL DETAIL
NOT TO SCALE



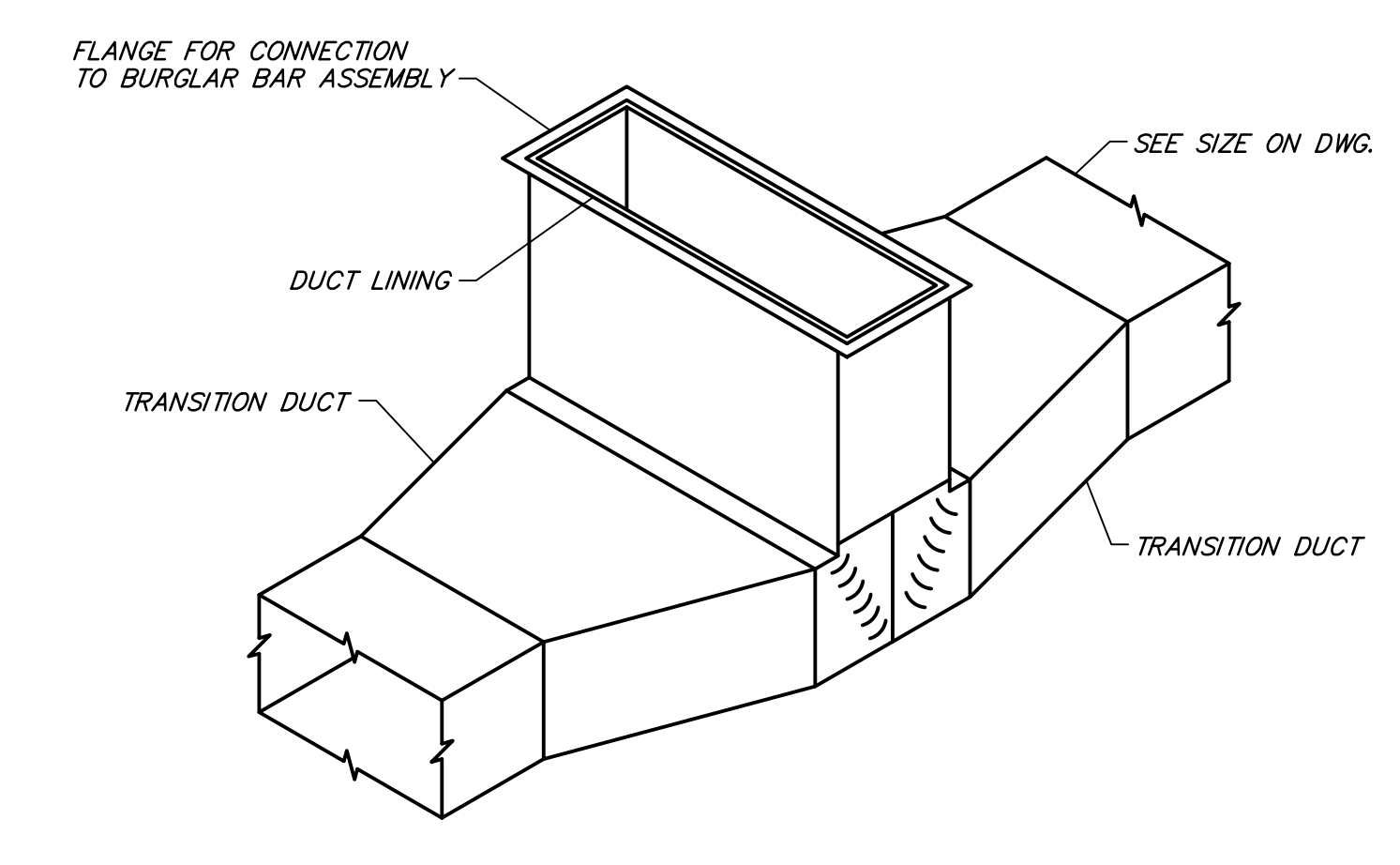
6 TYPICAL DRYWALL MOUNTING FRAME DETAIL
NOT TO SCALE



1 DUCTWORK DETAILS
NOT TO SCALE



2 DUCT HANGER DETAIL
NOT TO SCALE



3 TYPICAL ROOF TOP UNIT TEE CONNECTION
NOT TO SCALE

zebra
ZEBRA ARCHITECTURE, P.L.L.C.
1464 N KIERNAND BLVD, SUITE N300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 zbr.global

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EST. 2008 200427

STORE NO: 1355

SHAKE SHACK
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3800 W. 130TH STREET
STERLING HEIGHTS, MI

REVISION

NO.	DATE	DESCRIPTION
A	03/18/21	REVISION A
B	04/14/21	REVISION B
C	08/13/21	CITY COMMENTS
1	03/16/22	IFC
2	04/22/22	REVISION 1
3	05/04/22	REVISION 2

STATUS: IFC SET

PRELIMINARY:

DATE: 05/22/22

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and conditions at the project site and notify Zebra Architecture, P.L.L.C. of any discrepancies, omissions or omissions of discrepancies before beginning or fabricating any work. Do not begin fabrication.

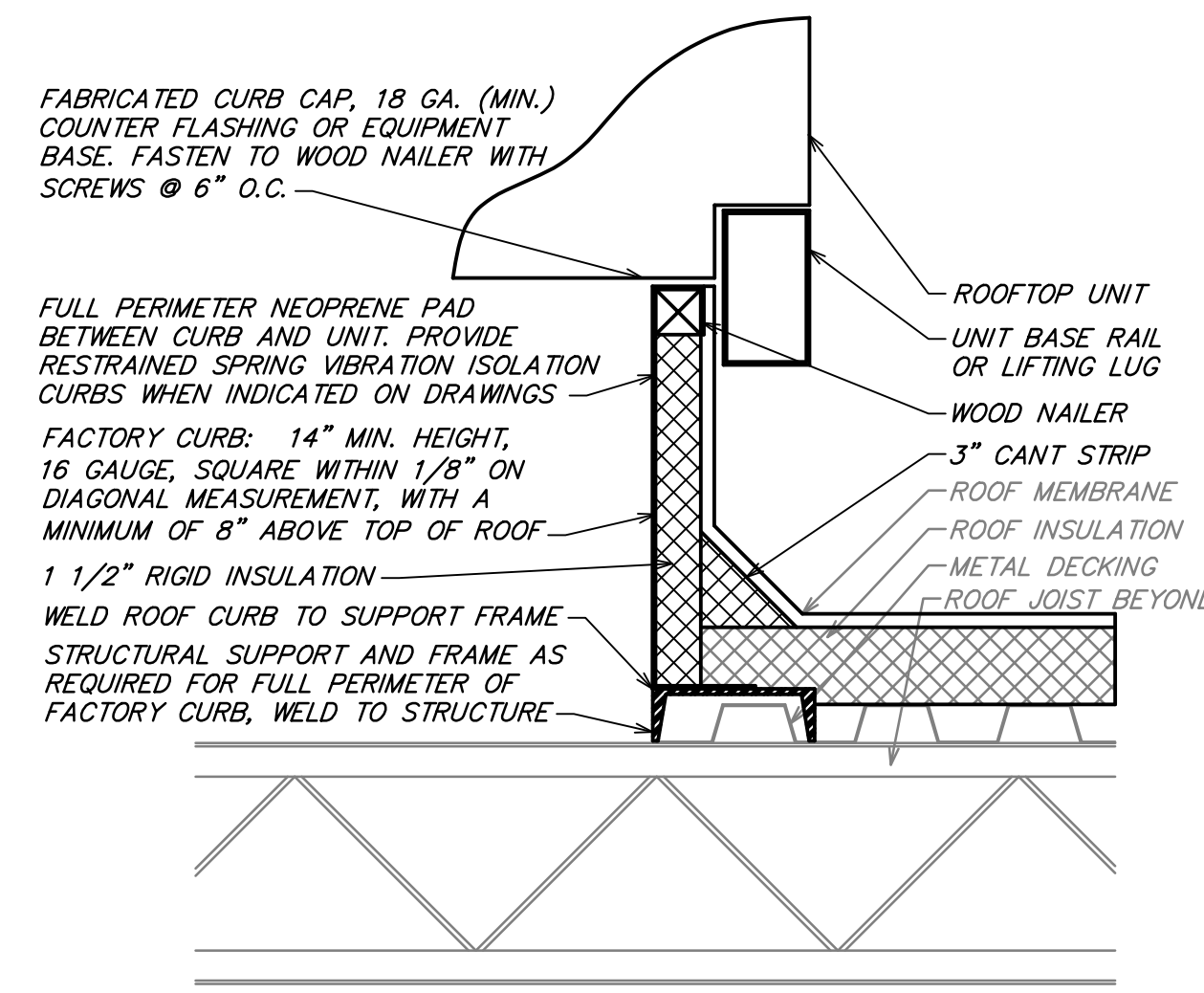
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SHEET NAME: MECHANICAL DETAILS

DATE: 03/01/21 PROJECT NO: 33128

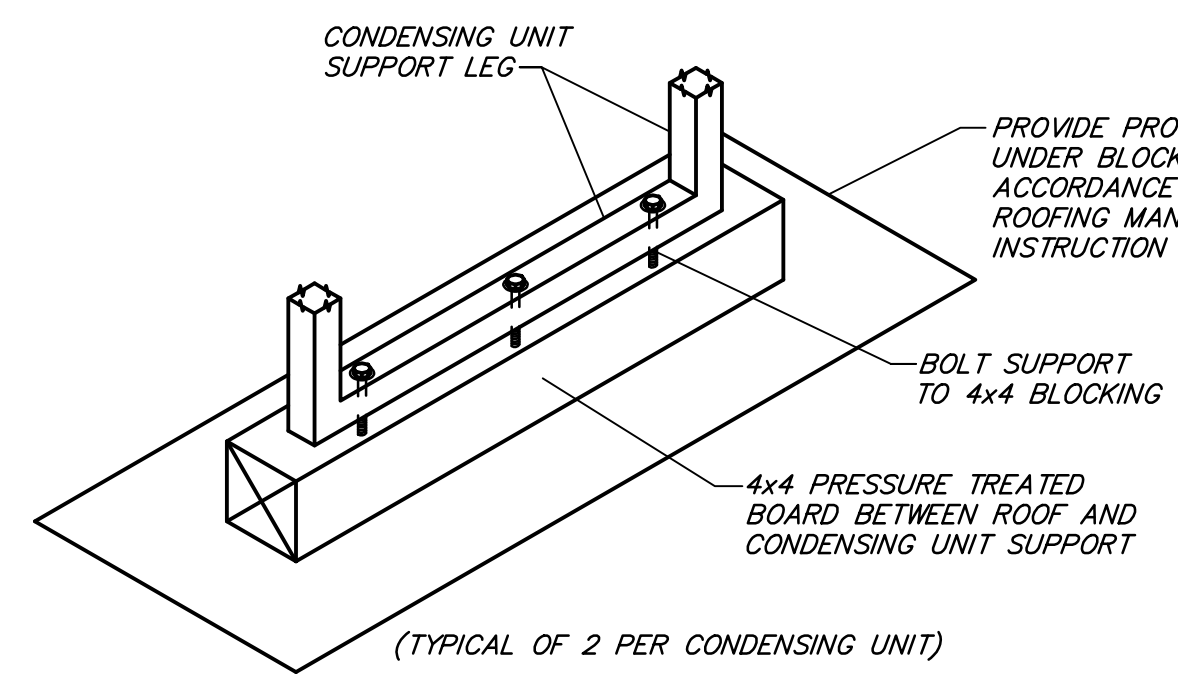
DRAWN: RAS SCALE: As indicated

SHEET NO: M501

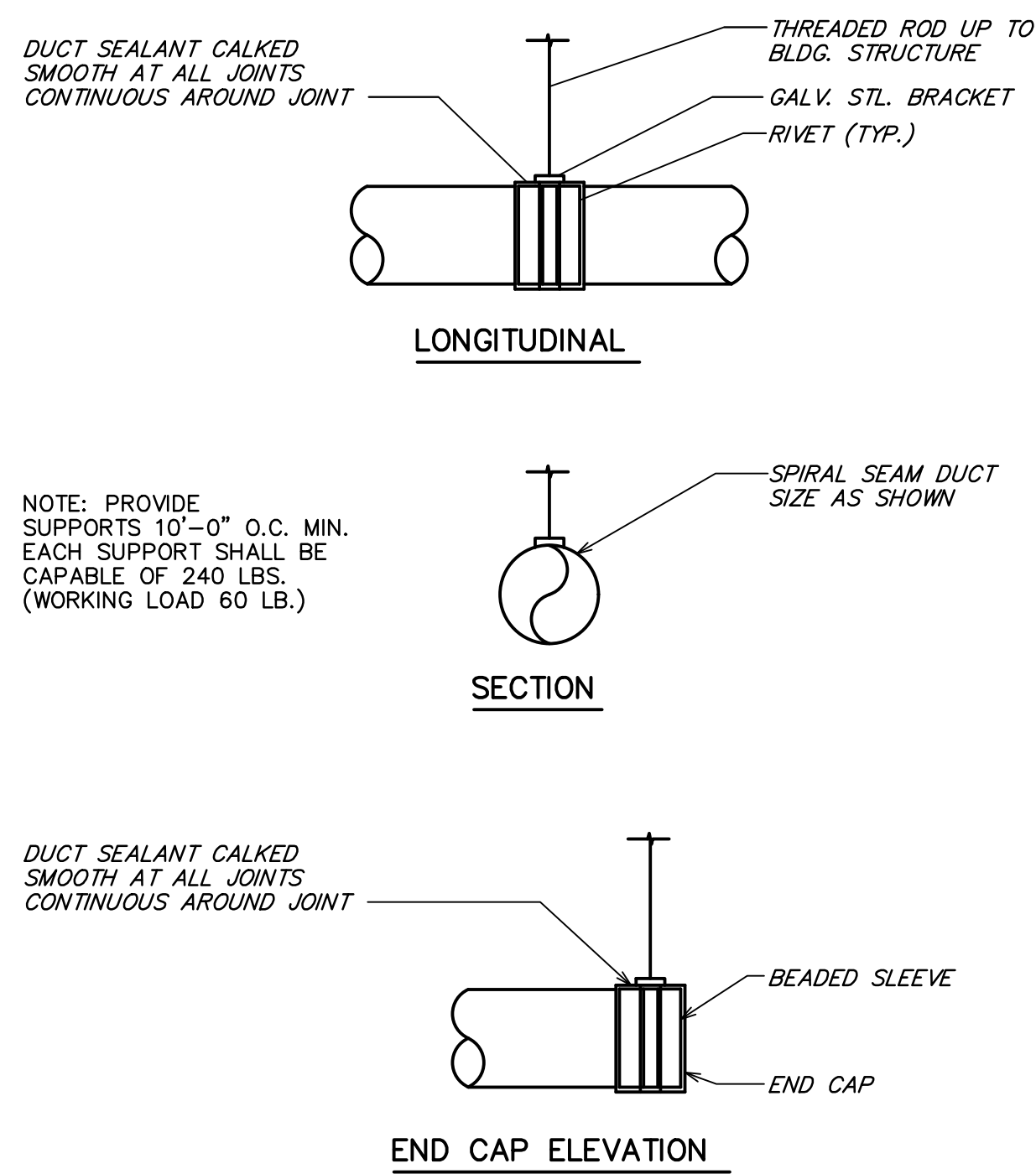


NOTES:
 1. CUT AND PATCH EXISTING ROOFING AS REQUIRED FOR NEW CURB INSTALLATION.
 2. CURB SHALL BE SHIMMED LEVEL, PROVIDE TAPERED ROOF CURB IF REQUIRED.
 3. SECURELY INSTALL CURB TO ROOF STRUCTURE; USE FASTENERS AS REQUIRED BY ROOF CONSTRUCTION.

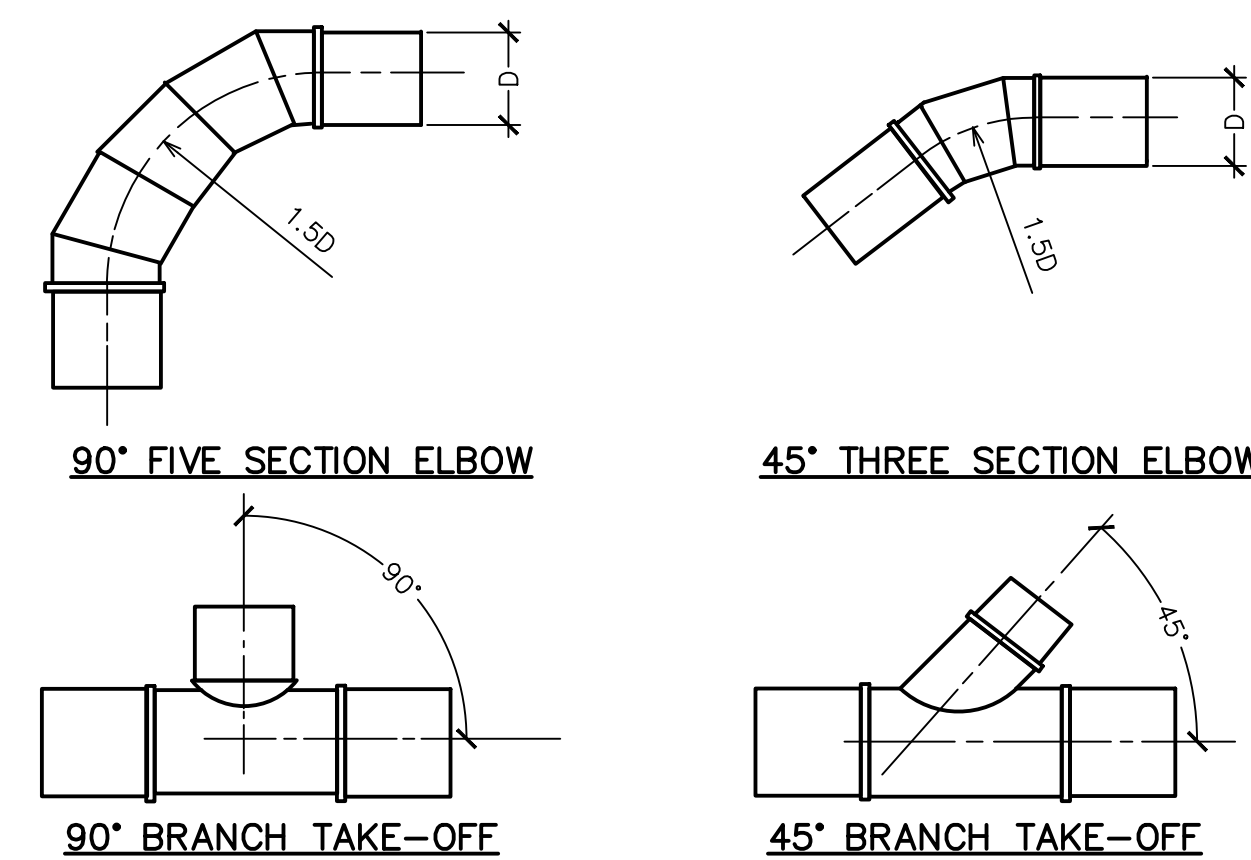
13 ROOF CURB DETAIL
 NOT TO SCALE



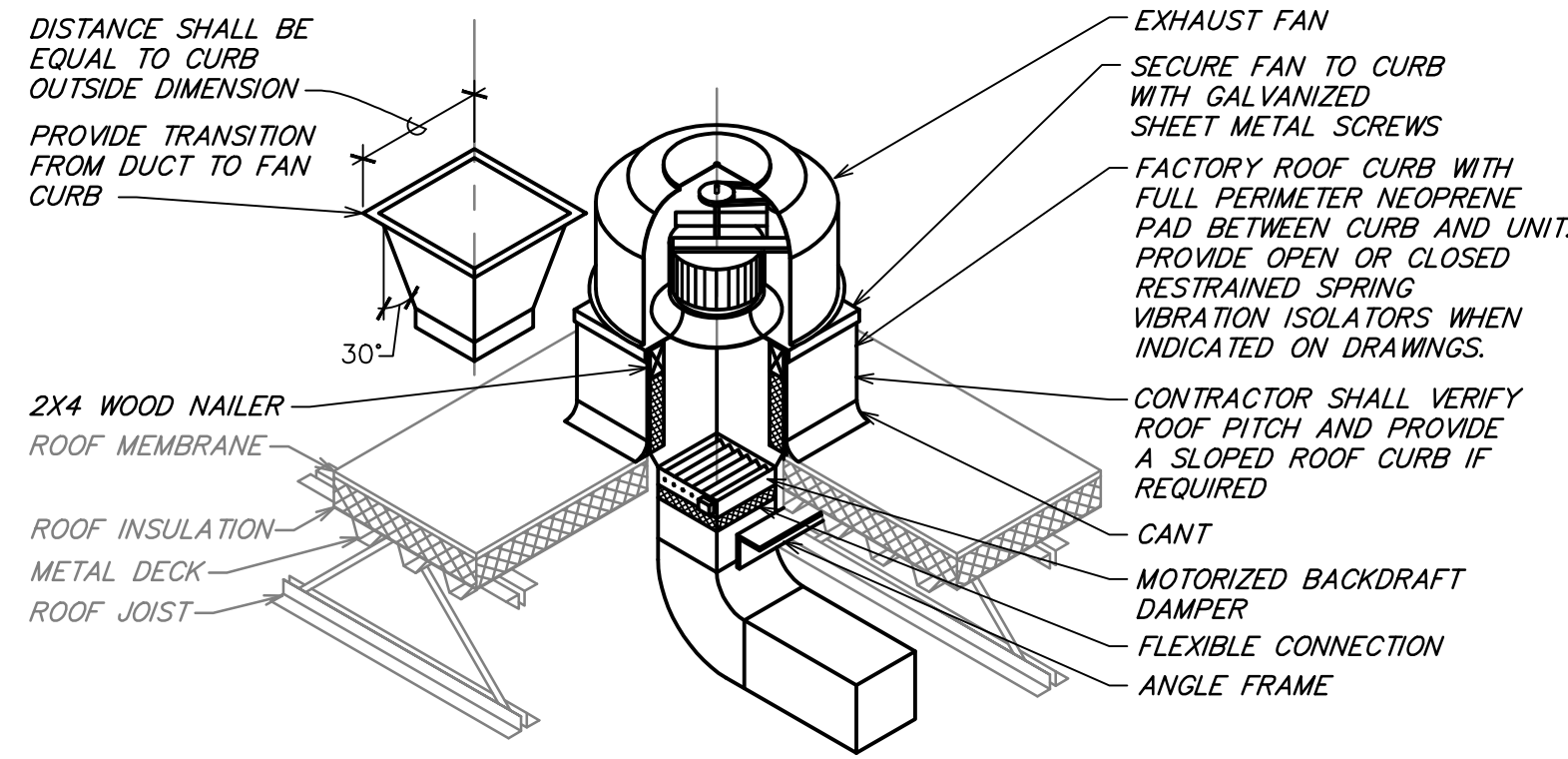
10 CONDENSING UNIT SUPPORT DETAIL
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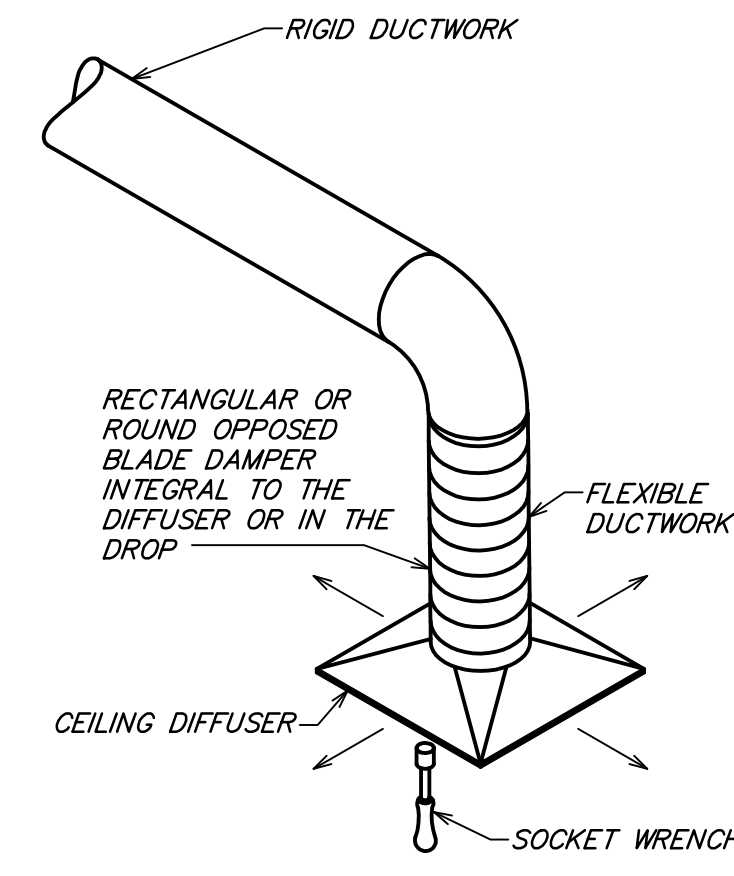
11 EXPOSED ROUND DUCT SUPPORT DETAIL
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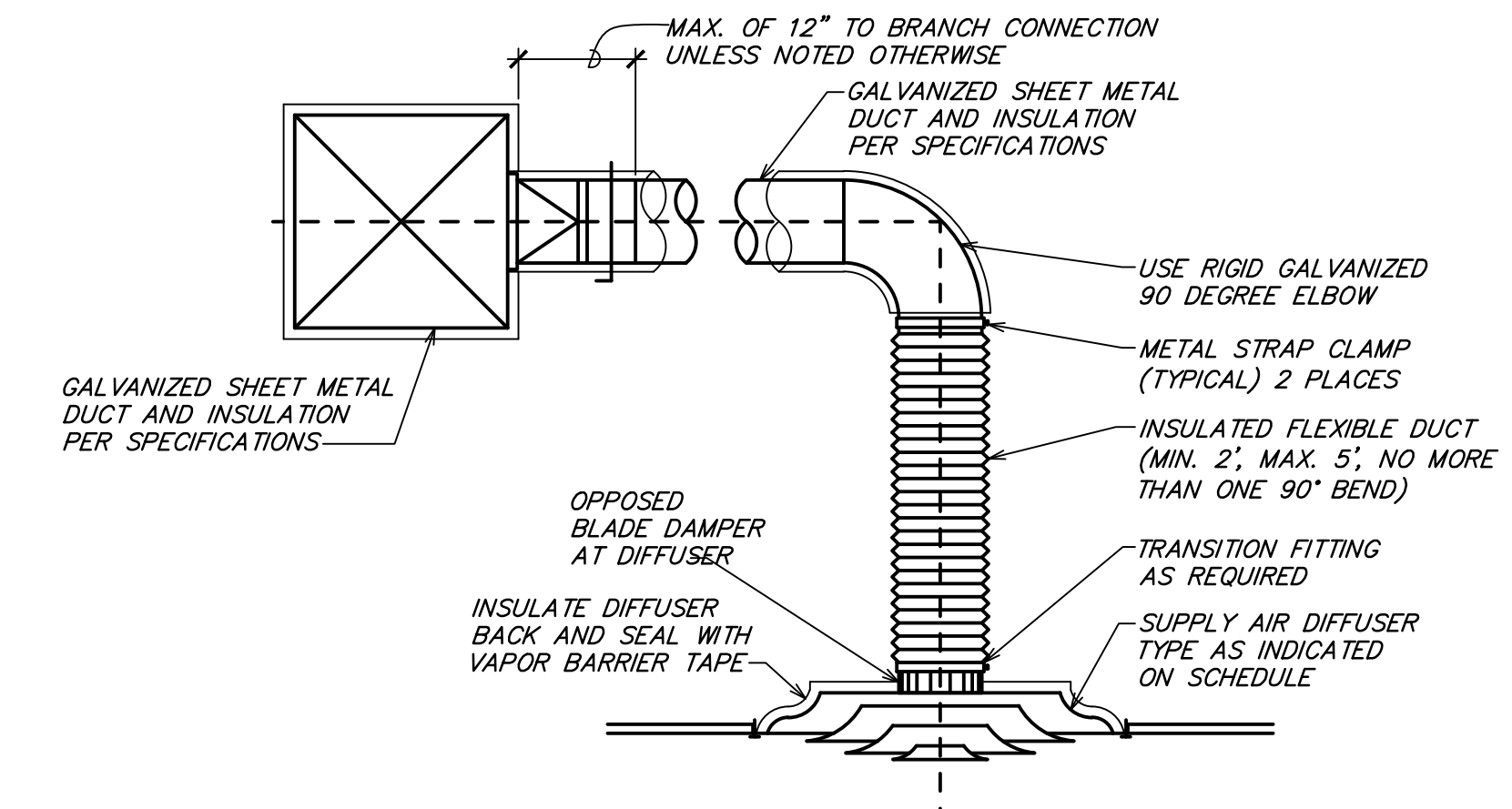
12 TYPICAL ROUND DUCT FITTINGS
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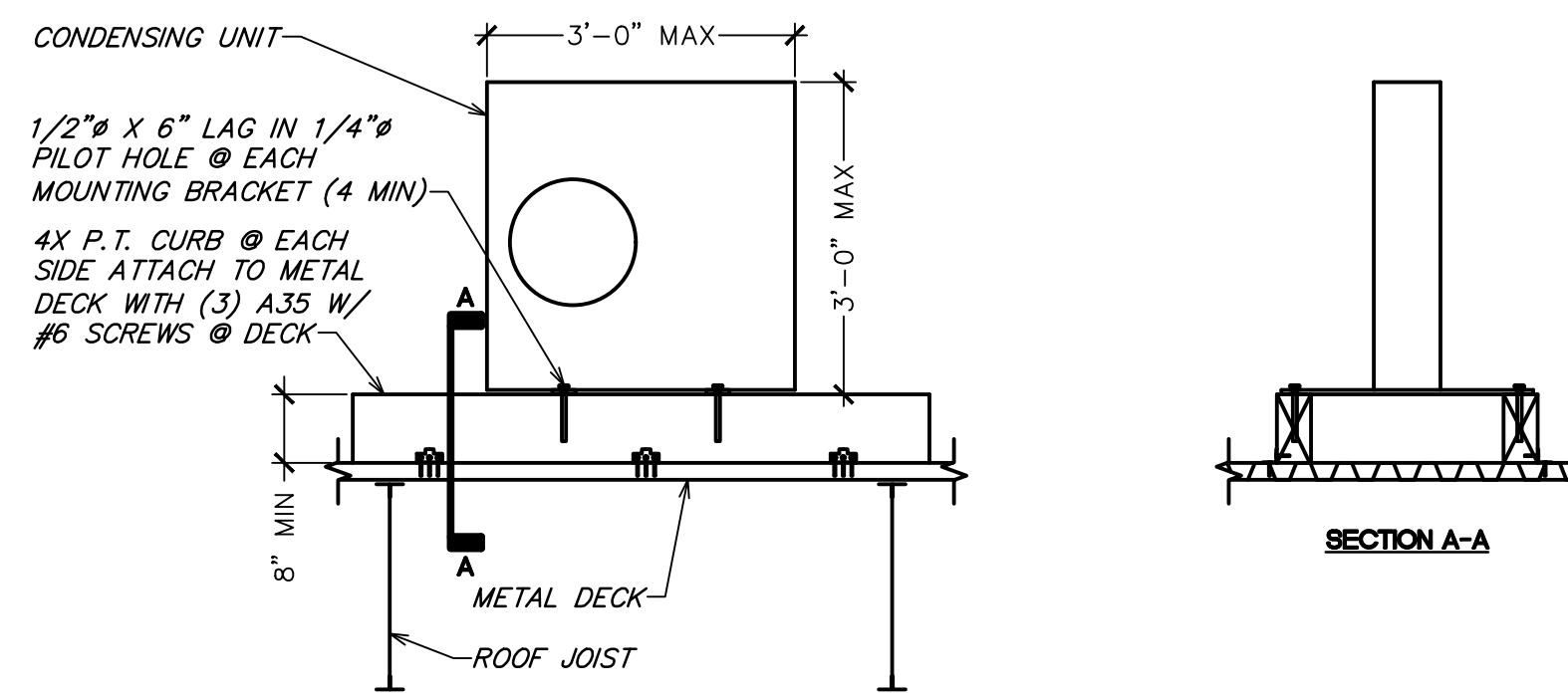
9 ROOF EXHAUST FAN DETAIL
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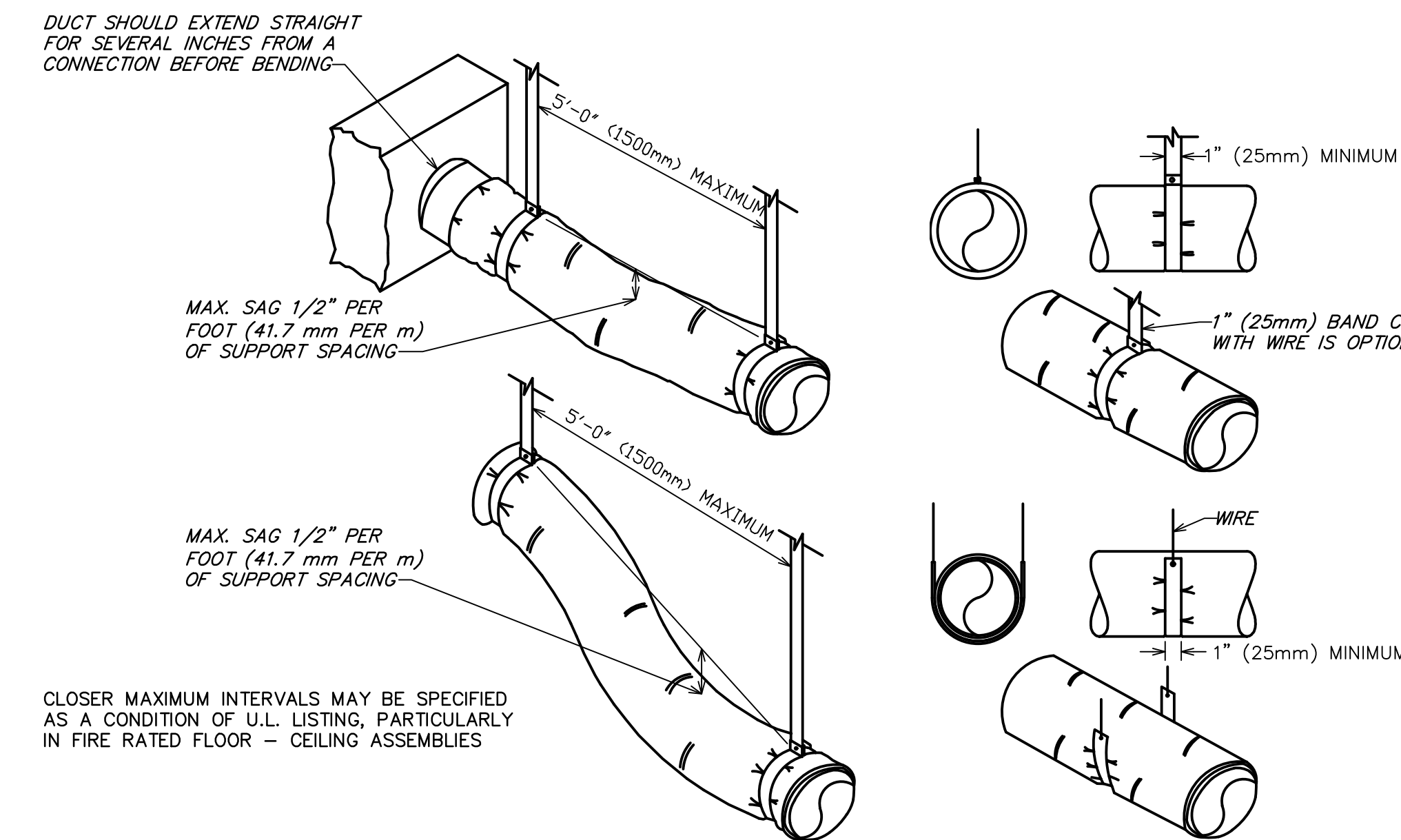
5 REMOTE VOLUME DAMPER CONTROLLER
 NOT TO SCALE



1 TYPICAL DIFFUSER CONNECTION
 NOT TO SCALE



6 CONDENSING UNIT ANCHOR DETAIL (METAL)
 NOT TO SCALE

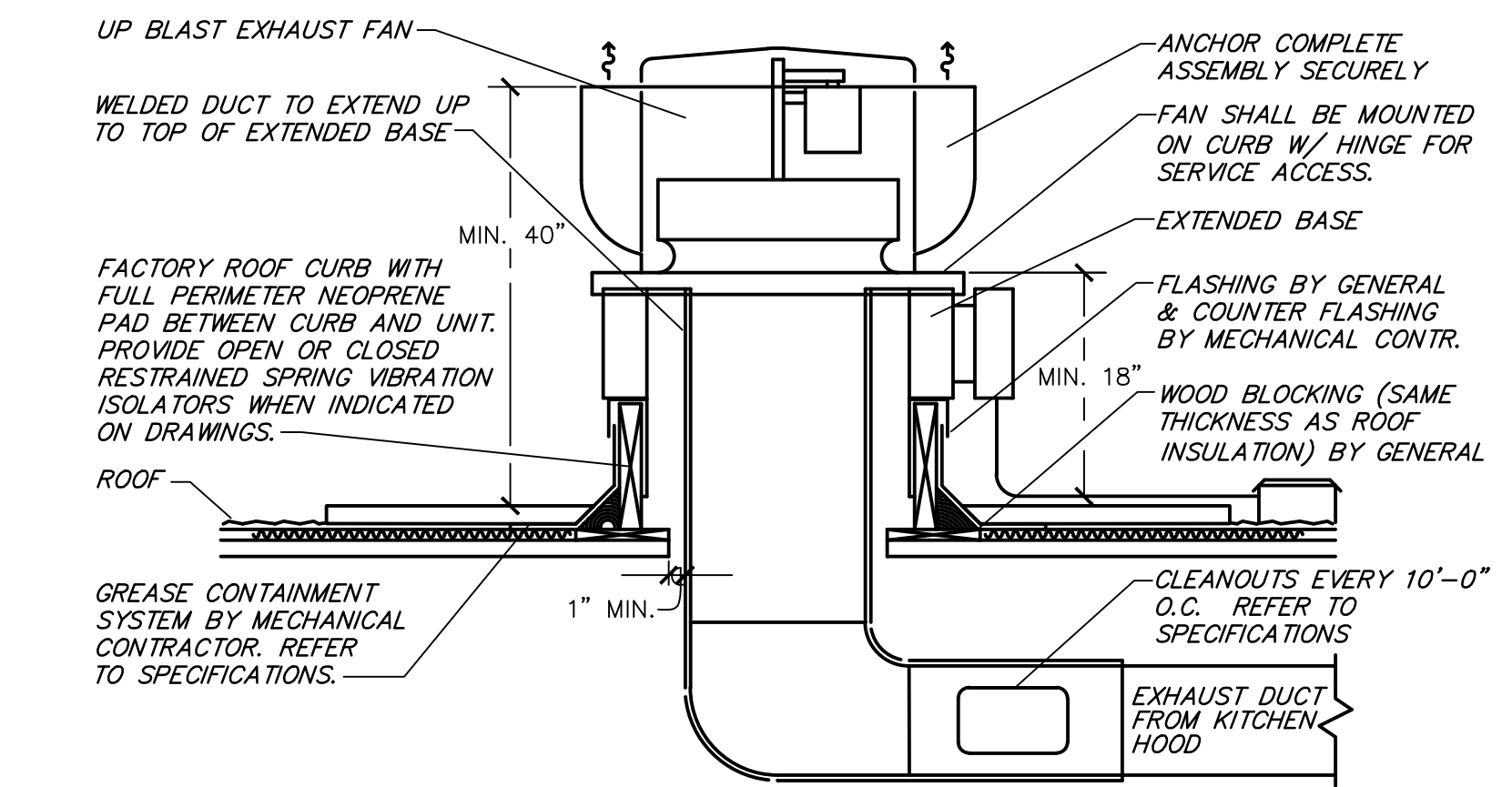


7 FLEXIBLE DUCT SUPPORTS
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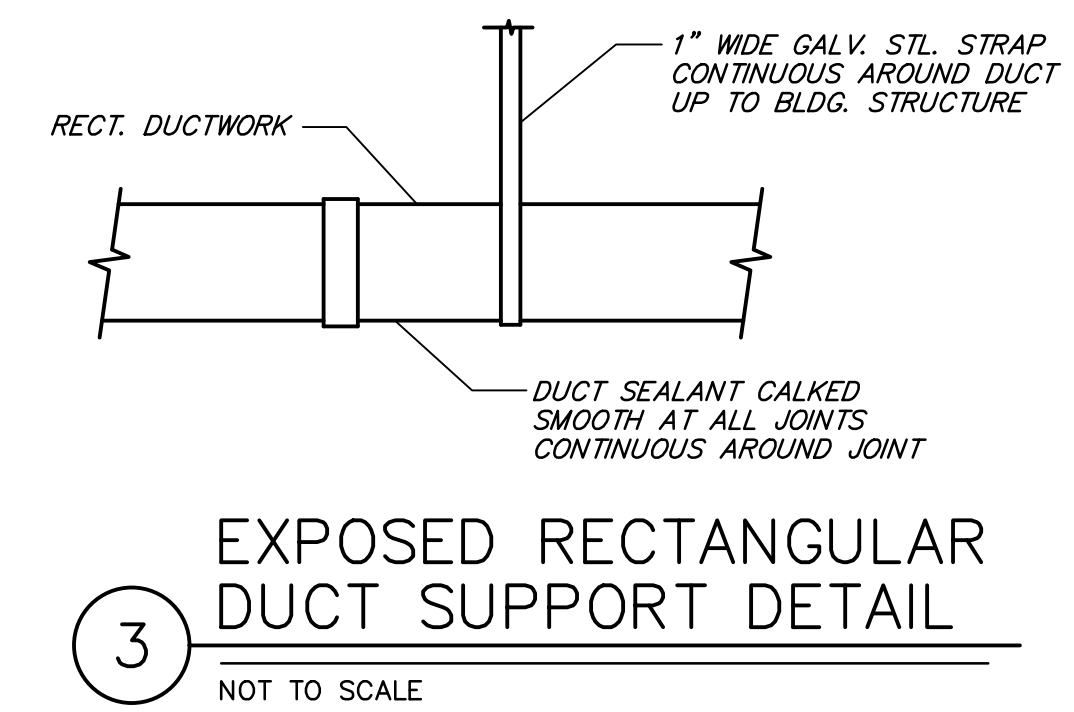
DIA.	WIRE DIA.	ROD	STRAP
10" DN	ONE 12 GA.	1/4"	1" x 22 GA.
11-18"	TWO 12 GA. OR ONE 8 GA.	1/4"	1" x 22 GA.
19-24"	TWO 10 GA.	1/4"	1" x 22 GA.
25-36"	TWO 8 GA.	3/8"	1" x 20 GA.
37-50"	-	TWO 3/8"	TWO 1" x 20 GA.
51-60"	-	TWO 3/8"	TWO 1" x 18 GA.
61-84"	-	TWO 3/8"	TWO 1" x 16 GA.
85-96"	-	TWO 1/2"	TWO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

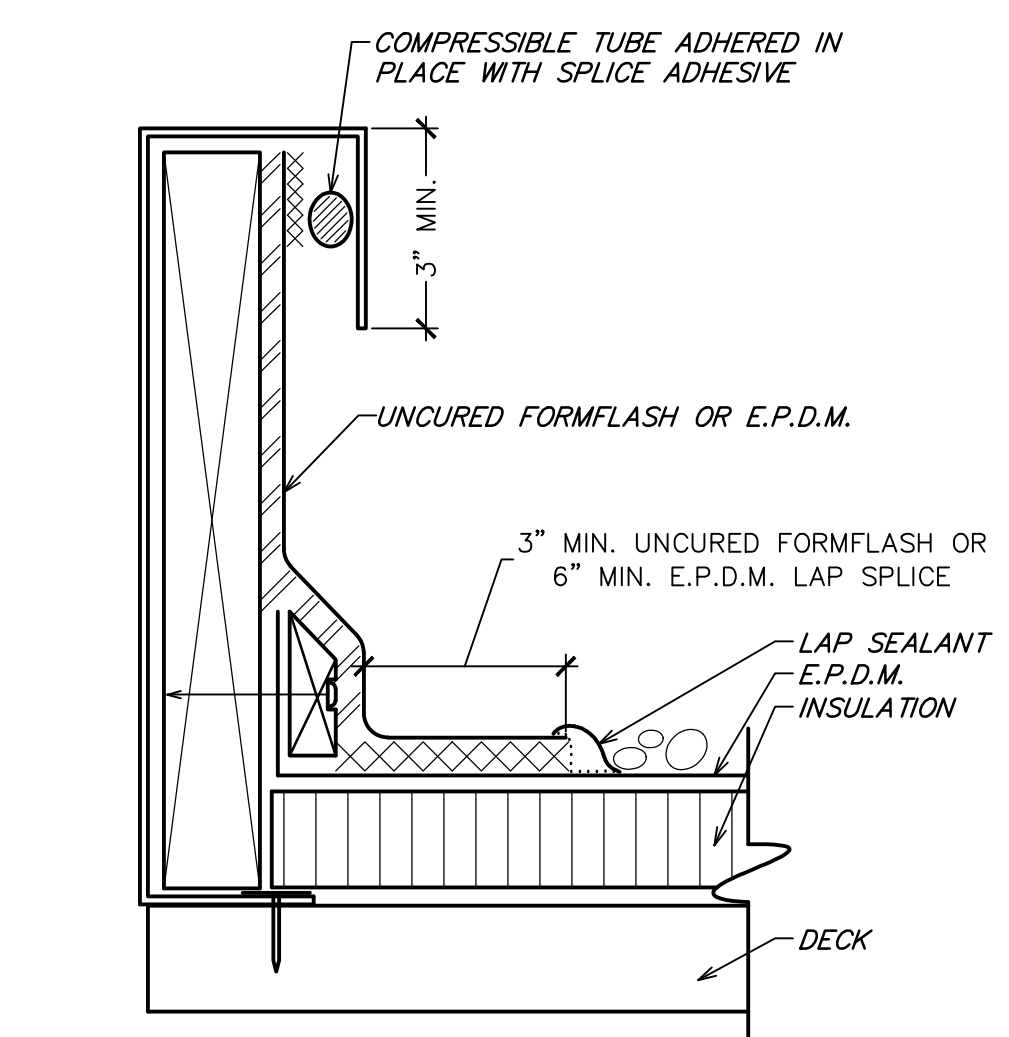
8 ROUND DUCT HANGER TABLE
 NOT TO SCALE



2 KITCHEN HOOD EXHAUST FAN
 NOT TO SCALE



3 EXPOSED RECTANGULAR DUCT SUPPORT DETAIL
 NOT TO SCALE



4 CURB FLASHING DETAIL
 NOT TO SCALE

CONSULTANT LOGO:

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 engineers
 800-581-0963
 www.schnackel.com
 SE 0088 000007

STORE NO:
1355

SHAKE SHACK
 STERLING HEIGHTS
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 STERLING HEIGHTS, MI

REVISION	
DATE	DESCRIPTION
A 03/18/21	REVISION A
B 04/14/21	REVISION B
C 08/13/21	CITY COMMENTS
1 03/16/22	IFC
2 04/22/22	REVISION 1
B 05/04/22	REVISION 2

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 GREGORY SCHMACEL
 ENGINEER
 37870
 Date: 05/22/22

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SHEET NAME:
MECHANICAL DETAILS
 DATE: 03/01/21 PROJECT NO: 33128
 DRAWN: RAS SCALE: As indicated
 SHEET NO:
M502

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

SECTION 230713 – DUCT INSULATION

SECTION 230719 – HVAC PIPING INSULATION

SECTION 230993 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

SECTION 232300 – REFRIGERANT PIPING

SECTION 232300 – HVAC DUCTS AND CASINGS

SECTION 232300 – AIR DUCT ACCESSORIES

SECTION 232300 – HVAC VENTILATORS

SECTION 232300 – AIR OUTLETS AND INLETS

SECTION 232300 – PACKAGED AIR-COOLED REFRIGERATOR COMPRESSOR AND CONDENSER UNITS

SECTION 232313 – MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

SECTION 232313 – PACKAGED OUTDOOR ROOF TOP UNITS – GAS FIRED

SECTION 232317 – SMALL SPLIT-SYSTEM HEATING AND COOLING

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 connect to the equipment and make final attachment including necessary ductwork, piping, wiring, etc."
- F. "Concealed" is hereby defined as, "Hidden from sight in chases, furrows, gables, 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. including."
- 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 work in accordance with the Americans with Disabilities Act (ADA) and the Authority Having Jurisdiction (AHJ) including Fire Marshals(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. Recognize standards: Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these Specifications shall conform to the applicable standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), the 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, utility, or regulatory 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 including drawings and specifications, all associated costs, arising from issues caused by the Contractor's failure to understand and 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 report the discrepancy or discrepancies shall result in the resolution becoming the Contractor's responsibility and subject to the Architect's resolution. Should the Architect reject a discrepancy resolution of which they were not notified, the Contractor is fully responsible for the resolution, including all associated costs, until approval of the installation is given by the Architect.

EXISTING CONDITIONS

- A. Verify all existing conditions prior to beginning work.
- B. Any existing conditions 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 area prior to bidding and start of the work. By signing the Contract, the Contractor acknowledges the site visit has been completed and that he understands the existing conditions of the project.
- D. The Contractor shall notify the Architect of major discrepancies in writing so the appropriate modifications to the Contract Documents can be made. The responsibility for the Contractor assumes full responsibility of adjusting for discrepancies of which the Architect is not informed.
- 1.07 SUBMITTALS
- A. Shop Drawings:
- Provide product data and shop drawings for vibration isolation.
 - Provide vibration firm qualifications and final test report for Testing, Adjusting, and Balancing.
 - Provide product data for duct insulation.
 - Provide product data for grease duct fireproofing (if specified).
 - Provide product data for HVAC piping insulation.
 - Provide product data and shop drawings for HVAC ductwork.
 - Provide product data and shop drawings for condensing units and coils.
 - Provide product data and shop drawings for HVAC power ventilators.
 - Provide product data and shop drawings for air outlets and inlets.
 - Provide product data and shop drawings for condensing units and heat pumps.
 - Provide product data and shop drawings for air handling and fan coil units.
2. Submit all other than those listed above will not be reviewed and will be returned as such.
3. Shop drawings shall be prepared by a manufacturer's representative, and shall contain names of the manufacturer and call out product to be used and on the project. Use manufacturer's specification sheets identified by number and include an electronic copy of the specification sheets. As applicable, provide construction data, weight and dimensional information, finish, surface texture, and shop drawings showing 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 subcontracting Contractor.
5. Electrical Characteristics: Verify that proper power supply is available prior to ordering equipment. Verify proper voltage, phase and correct 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.
6. 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.

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. Product:
- Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
 - 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.
 - Equipment performance and accessories shall be as scheduled on the Drawings and specified herein. Installation in both locations is not a pre-emptive inclusion in the Contract. Equipment and accessories specified in either location shall be included in the Contract. Provide all necessary accessories and materials required for a complete, functional system, including all required components reasonably inferred to be necessary although 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.

DELIVERY, STORAGE, AND HANDLING

- A. Protect 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: Protect insulation from water, 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. Protect 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.

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 manufacturer warranty for solid state ignition motors.
- D. Provide five year manufacturer 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, of 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 responsibility for costs and coordination issues arising out of the substitution of materials or equipment, and the coordination of such substitution with all other contracting and subcontractors.
- B. The Contractor may use any of the following ductwork, piping or insulation materials of his selection, 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 the installation of the work, which might prevent prompt and proper installation, or make it unobtainable to connect with or receive the work of others. Failure to do so 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 the 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 the 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 weathered by the roofing contractor. This Contractor shall contract with the factory authorized roofing contractor for the specific roofing system application specified in 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 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.
- E. Verify the approval utility companies serving the project.

3.03 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.
- B. Clean fire suppression paths to remove harmful materials.
- C. Clean exposed surfaces of all ductwork, pipe, equipment, and accessories of all debris, splatter, and other deleterious materials. Follow the manufacturer's recommendations for cleaning up equipment, and accessories, as directed by the design conditions in all operating pipes, equipment, and accessories, as directed by and to the satisfaction of the Architect, where marring or disfigurement has occurred. Clean pipes, equipment, and accessories shall be new.

3.06 PROJECT CLOSURE

- A. Project Record Documents: At project closure, 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:
- Actual locations of all equipment, ductwork, air inlets/outlets, accessories, etc.
 - Actual routing of ductwork with sizes and elevations.
 - Actual locations of control devices including valves and volume dampers.
 - 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 warranties and warranties.
 - Maintenance Materials: At project closure, furnish to the Owner the following:
 - Manufacturer's literature and actual.
 - The maintenance contract for the hvac system, if applicable.
- C. 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:
- Condensing units and air source heat pumps
 - Furnaces and fan coil units
- 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:
- Spring: Minimum horizontal stiffness equal to 75 percent vertical stiffness with working deflection between 0.2 and 0.8 of maximum deflection. Color code springs for load carrying capacity.
 - Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators or rubber hanger with threaded insert.
 - Misalignment: Capable of 20 degree hanger rod misalignment.
 - For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- B. Neoprene pad isolators:
- Rubber or neoprene waffle pads.
 - Hardness: 50 durometer.
 - Thickness: Minimum 1/2 inch.
 - Maximum Loading: 50 lbs.
 - Rib Height: Maximum 0.7 times width.
- C. Configuration: Single layer.
- D. Glass Fiber Pads: Neoprene jacketed pre-compressed molad 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 connections.
- C. Selection of type, thickness and deflection of vibration isolation shall be by the Architect and the intent of the Contract Documents. The responsibility for coordination of substituted materials and equipment lies solely with the subcontracting Contractor.

3.02 SCHEDULES

- Equipment Isolation Schedule: (Minimum deflection as sized by the isolation equipment manufacturer)
- Fans, axial and centrifugal.
 - Small fans up to 22" diameter wheel:
 - Base: Concrete Housekeeping Pad.
 - Condensing units and air source heat pumps.
 - Slab on grade.
 - Isolation: Neoprene Pad, Rubber Mount or Glass Fiber Pad.
 - Above grade floor or roof structures:
 - Base: Plastic or Fiber Cement Pad.
 - Furnaces and fan coil units.
 - Floor mounted (all locations):
 - Base: Concrete Housekeeping Pad.
 - Isolation: Neoprene Pad, Rubber Mount or Glass Fiber Pad.

END OF SECTION

SECTION 230993 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Testing, adjustment, and balancing of air systems.
- Air handling units; Packaged heating and/or cooling equipment; Fans (Exhaust and supply); Coils; Terminal equipment; Air inlets and outlets; (Diffusers, grilles, louvers, etc.)
 - Measurement of final operating condition of HVAC systems.
 - Measurement of agency requirements.
- 1.02 SUBMITTALS
- A. Qualifications: Submit name, adjusting and balancing agency and TAB supervisor for approval with 30 days in advance 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.
- Submit to the Construction Manager within two weeks after completion of testing, adjusting, and balancing.
 - Provide reports in bound manuscript, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings showing air outlets and equipment identified to correspond with data sheets, and indicating thermostat and equipment locations.
 - Include entire system including fittings, joints, fanges, fire dampers, flexible connections, and expansion joints.
 - Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std. 111.
 - Name, address and telephone number of Testing, Adjusting, and Balancing Agency.

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:
 - Provide insulation with vapor barrier jacket.
 - Finish with tape and vapor barrier jacket.
 - Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - Insulate entire system including fittings, joints, fanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
 - Provide with or without standard vapor barrier jacket.
 - Insulate fittings and joints. Where an overlap is required, level and seal ends of insulation.

1.03 WARRANTY

- A. The Balancing Contractor shall be prepared to return to the site at no additional cost to the Owner, to correct or re-adjust air quantities as required to provide uniform temperature and airflow throughout the building. The Contractor shall 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:
- ASHRAE Std. 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 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:
- Company specializing in the testing, adjusting, and balancing of systems specified in this Section with a minimum of five years experience.
 - Certified by one of the following:
 - AABC, Associated Air Balance Council; upon completion submit AABC National Performance Guaranty.
 - NEBB, National Environmental Balancing Bureau.
 - TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
 - 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 some 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 for 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 locations in the field 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 and record.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust ductwork to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustment; do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters. Do not use diffusers, grilles or register dampers for balancing adjustments unless the plans do not indicate duct mounted devices.
- F. Verify total system 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 outdoor 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 rates, full heating.

3.05 SCOPE

- A. Equipment Requiring Testing, Adjusting, and Balancing (if present on the project):
- HVAC Pumps; Balers; All Air Handling Equipment; All Packaged Heating and/or Cooling Equipment; All Coils; 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):
- Summary Comments.
 - Design versus final performance.
 - Notable characteristics of system.
 - Summary of outdoor and exhaust flows to indicate amount of building infiltration.
 - Noncompliance used throughout report and test conditions.
- B. Electric Motors and Drives:
- Manufacturer; Model/Frame; HP/BHP; Phase; Volts, amperage; nameplate, actual no load RPM; Service factor; Service Make/Size/Type.
 - V-Belt Drives: Identification/Location; Required drive RPM; Drive sheave, diameter and RPM; Belt, size and quantity.
- C. Cooling and Heating Coils:
- Identification/number; Manufacturer.
 - Air flow, design and actual.
 - Air pressure drop, design and actual.
 - Entering and leaving air DB and WB temperature, design and actual.
 - Water flow, design and actual (if applicable).
 - Water pressure drop, design and actual (if applicable).
- D. Air Moving Equipment:
- Manufacturer; Model number; Serial number; Arrangement/Class/Discharge.
 - Air flow, specified and actual.
 - Static Discharge; Total static pressure (total external), specified and actual.
- E. Air Distribution Tests:
- Air terminal number.
 - Room number/location.
 - Terminal type.
 - Terminal size.
 - Area factor.
 - Design velocity.
 - Design air flow.
 - Test (final) velocity.
 - Test (final) air flow.
 - Percent of design air flow.

END OF SECTION

SECTION 230713 – GREASE DUCT FIREPROOFING

PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Fire resistant duct wrap for kitchen hood exhaust ventilation ducts (grease ducts). Fire rated insulating material and thickness with State and local codes and utility company requirements is the sole responsibility of the installing contractor.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
- A. Acceptable Manufacturer: 3M Fire Protection Products, Inc.; Unifrax FireWrap; Ceram Thermal Ceramics.
- 2.02 MATERIALS
- A. Grease Duct Fireproofing: Material applied directly to metal ducts and achieving minimum fire rating when tested in accordance with UL 2221 or ASTM E2336 by independent testing agency.
- Flame Spread Characteristics: Flame spread index of 0 and smoke developed index of 0, when tested in accordance with ASTM E 84, both blanket and fall.
 - Compatibility: Non-combustible, when tested in accordance with ASTM E 136.
 - Flexibility: Capable of being formed around corners and shrou by hand.
 - Surface: Fall or other damage resistant surface; fiber not exposed after installation.
 - Accommodation For Duct Access Doors and Panels: Capable of being installed in blanketed enclosures and flame-retarded full facing.
 - Acceptable Product: 3M Fire Barrier Duct Wrap; fire resistant inorganic blanket encapsulated and repair.
- B. Fasteners: Non-combustible; use one or both of the following to attach fireproofing to ducts:
- Blanket: 1/2 inch wide, minimum, and 0.015 inch thick, minimum; with steel banding clips.
 - Panel: 1/2 inch wide, minimum, and 0.015 inch thick, minimum; with steel banding clips, minimum 12 gage, for welded attachment, with galvanized steel self-locking washers, 1-1/2 inch square or diameter, or equivalent sized cup-head nuts.
- C. Access Panel Hardware: Galvanized threaded rods, sleeves, washers, and wing nuts as specified in manufacturer's instructions.
- D. Access Panel Sealant: Fire resistant sealant applied to seal access panel in closing.
- E. Fire Rating: Material tested in conjunction with fireproofing and recording tests with ASTM E 814, to achieve fire rated penetration seal at duct penetrations through fire rated assemblies.
- Fire Rating: Same or greater than rating of penetrated assembly.
 - Acceptable Products: 3M Fire Barrier 1000 N/S, 1003 S/L, and 2004+ Silicone sealants, as required by tested agency.

END OF SECTION

SECTION 230719 – HVAC PIPING INSULATION

PART 1 GENERAL

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

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers: Armoval International.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3; use molded tubular material wherever possible.
- Minimum Service Temperature: -40 degrees F.
 - Maximum Service Temperature: 180 degrees F.
 - Moisture Vapor Permeability: 0.02 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
 - Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulating material.

2.04 JACKETS

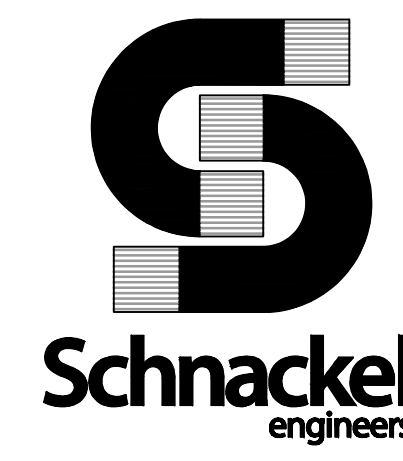
- A. PVC Jacket:
- Manufacturers: Knaflex Fiberglass; Johns Manville Corporation; Owens Corning Corp.; CertainTeed Corporation.
- B. Insulation: ASTM C 547 and ASTM C 795; rigid, molded, noncombustible.
- "K" value: ASTM C 177, 0.24 at 75 degrees F.
 - Maximum service temperature: 850 degrees F.
 - Maximum moisture absorption: 0.2 percent by volume.
- C. Moisture Vapor Permeability: 0.02 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
- Connections: Brush on welding adhesive.
 - Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - Minimum Service Temperature: -40 degrees F.
 - Maximum Service Temperature: 180 degrees F.
 - Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
 - Connections: Brush on welding adhesive.

zebra

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REVISION

NO.	DATE	DESCRIPTION
A	03/18/21	REVISION 1
B	04/16/21	REVISION 2
C	08/13/21	CITY COMMENTS
1	03/16/22	FC
2	04/22/22	REVISION 1
3	05/04/22	REVISION 2

STATUS:

IFC SET

PRELIMINARY:

PRELIMINARY

DATE:

05/22/22

FIELD VERIFICATION:

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 F5 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.
 D. Luminum Connector and Bar Stock: Alloy 6061-T651 or of equivalent strength.

1. Insulated Flexible Ducts:
 A. 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.
 B. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; aluminumized vapor barrier film.
 C. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 D. Maximum Velocity: 4000 fpm.
 E. Temperature Range: -10 degrees F to 160 degrees F.
 F. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.
 G. Black polymer film supported by helically wound spring steel wire; fiberglass insulation; aluminumized vapor barrier film.
 H. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
 I. Maximum Velocity: 4000 fpm.
 J. Temperature Range: -20 degrees F to 175 degrees F.
 K. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.
 L. Multiple layers of aluminum laminate supported by helically wound spring steel wire; fiberglass insulation; aluminumized vapor barrier film.
 M. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 N. Maximum Velocity: 4000 fpm.
 O. Temperature Range: -20 degrees F to 210 degrees F.
 P. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.
 Q. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; aluminumized vapor barrier, and film.
 R. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 S. Maximum Velocity: 4000 fpm.
 T. Temperature Range: -20 degrees F to 210 degrees F.
 U. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.
 V. UL 181, Class 0, interleaving spiral of aluminum foil; fiberglass insulation; aluminumized vapor barrier, and film.
 W. Pressure Rating: 8 inches WG positive or negative.
 X. Maximum Velocity: 5000 fpm.
 Y. Temperature Range: -20 degrees F to 250 degrees F.
 Z. Minimum R-Value: 4.2 or greater as required by the applicable energy codes.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

3.1 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

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

3.2 PRODUCTS
 2.01 AIR TURNING DEVICES/EXTRACTORS
 A. Manufacturers: Krueger; Ruskin Company; Tius.
 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.; Nalor 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 Damper: Fabricate for duct sizes up to 6 x 30 inch.
 D. Multi-Blade Damper: Fabricate for opposed blade sizes up to 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. Use multiple bearing assemblies for larger ducts.
 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, "Power 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 Entertech Corporation, "Power Balance" system including motor operated damper, 1/2" x 11" plenum rated casing and flush ceiling or wall mounted R-11, 1" x 11" jack in remote plate. Include one hand held battery pack operator pack to be delivered to the Owner upon completion of the balancing.

END OF SECTION

SECTION 233400 - AIR PURIFICATION DEVICES

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.
 C. Manufacturers: Acador Products Inc.; Nalor Industries Inc.; Ruskin Company; SEMCO Incorporated.
 D. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
 E. 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.
 F. Less Than 12 inches Square: Secure with sash locks.
 G. 2 Up to 18 inches Square: Provide two hinges and two sash locks.
 H. Duct Access doors with sheet metal screw fasteners are not acceptable.

2.04 DUCT ACCESS DOORS
 1. Fabric: UL listed fire-rated neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 2. Net Fabric Width: Approximately 2 inches wide.
 3. Metal: 24 gauge thick galvanized steel.

2.05 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.
 C. Manufacturers: Acador Products Inc.; Nalor Industries Inc.; Ruskin Company; SEMCO Incorporated.
 D. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
 E. 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.
 F. Less Than 12 inches Square: Secure with sash locks.
 G. 2 Up to 18 inches Square: Provide two hinges and two sash locks.
 H. Duct Access doors with sheet metal screw fasteners are not acceptable.

3.1 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 where possible to avoid access doors. Provide ceiling access doors for access to all dampers and control elements located above ceiling. 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 possible making 30 degree divergence upstream of equipment and 45 degree convergence downstream.
 E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible making 30 degree divergence upstream of equipment and 45 degree convergence downstream.
 F. Fabricate continuously welded round and oval duct fittings two gages heavier than conform with architectural features, symmetry and lighting arrangement.
 G. At fan and motorized equipment associated with ducts, provide flexible duct fabric assemblies to dampers, registers, diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
 H. Point ductwork visible behind air outlets and inlets make block.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

3.02 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.

3.03 INSTALLATION
 A. 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 to accommodate thermometers and controllers.
 E. Provide pilot tube openings where required for testing of systems.
 F. Seal with metal cap with spring device, or rubber isolated hose mounted per manufacturer's instructions.
 G. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
 H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
 I. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
 J. Connect flexible ducts to metal ducts with draw bands.
 K. Support flexible duct runs every five feet in the horizontal direction to avoid dips and sags.
 L. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
 M. 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.
 N. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering duct system.
 O. All exposed ducts in finished areas must be completely free from all dents or imperfections in the optimized 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. If round duct is indicated in exposed locations, it must be spirally. No exposed duct sealer, tape or longitudinal joints will be accepted in exposed finished areas. Line all exposed supply air ductwork.
 P. Kitchen hood exhaust, Type 1: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.
 Q. 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.
 R. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.
 S. 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.

3.04 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. Compliance to clean equipment which may be harmed by clean air with temporary filters, or bypass during cleaning.

3.05 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 233700 - AIR OUTLETS AND INLETS

SECTION 233700 - AIR OUTLETS AND INLETS

3.1 GENERAL
 1.01 SECTION INCLUDES
 A. Rectangular ceiling diffusers.
 B. Grid core exhaust and return grilles.
 C. 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.
 B. Schedule of outlets and inlets showing type, size, location, application, accessories, and noise level.
 C. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
 D. Test and rate lower performance in accordance with AMCA 500-L.
 E. Code requirements shall supersede any conflicting requirements of this Section.

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

2.01 MANUFACTURERS
 A. Tius; Krueger; Price Industries; Nalor Industries Inc.; Hart & Cooley; Ruskin, Greenheck.

2.02 RECTANGULAR CEILING DIFFUSERS
 A. Type: Square, adjustable pattern, stamped, multi-core, or architectural pique diffuse with diffuser.
 B. Manufacturers: Acador Products Inc.; Nalor Industries Inc.; Ruskin Company; SEMCO Incorporated.
 C. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
 D. 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.
 E. Less Than 12 inches Square: Secure with sash locks.
 F. 2 Up to 18 inches Square: Provide two hinges and two sash locks.
 G. Duct Access doors with sheet metal screw fasteners are not acceptable.

2.03 GRID CORE EXHAUST AND RETURN GRILLES
 A. Type: Fixed grilles of 1/2" x 1/2" x 1 inch louvers.
 B. Fabrication: 1-1/4 inch margin with countersunk screw mounting.
 C. Frames: Channel lay-in frame for suspended grid ceilings where face size exceeds 18 x 18 inch.
 D. Dampers: Integral, gang-operated, opposed blade type with removable key operator, operable from face.
 E. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
 F. Fabrication: Steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory finish.
 G. Dampers: Integral, gang-operated opposed blade type with removable key operator, operable from face.
 H. Rough Surface: Provide front pivoted or welded in place blades, securely fastened to be immobile.

END OF SECTION

SECTION 233712 - SMALL SPLIT-SYSTEM HEATING AND COOLING

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS
 A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 B. Evaporator Coil: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping controls, restricted distributor or thermostatic expansion valve.
 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
 2. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 1. Provide minimum 18 inch clearance around indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line. Size as recommended by the manufacturer. All refrigerant line sizes 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 the minimum efficiency requirements as specified or indicated on the drawings, or the applicable local energy code.

END OF SECTION

SECTION 233743 - PACKAGED OUTDOOR ROOF TOP UNITS - GAS FIRED

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS
 A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 B. Evaporator Coil: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping controls, restricted distributor or thermostatic expansion valve.
 1. Construction and Ratings: In accordance with ARI 210/240 and UL listed.
 2. Outdoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, with compressor and condenser.
 1. Provide minimum 18 inch clearance around indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line. Size as recommended by the manufacturer. All refrigerant line sizes 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 the minimum efficiency requirements as specified or indicated on the drawings, or the applicable local energy code.

END OF SECTION

SECTION 233743 - PACKAGED OUTDOOR ROOF TOP UNITS - GAS FIRED

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

2.01 MANUFACTURERS
 A. Carrier Corporation; Trane Inc.; Lennox Industries; York; AAOB 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 pre-wired, 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 type fasteners or doors with piano hinges with locking handles. Structural members shall be minimum 18 gauge, with access doors or panels of minimum 20 gauge.
 B. Insulation: one inch thick neoprene coated glass fiber with edges protected from erosion.
 C. Heat Exchangers: Aluminumized steel or stainless steel where indicated on the drawings.
 D. Supply Fan: Forward curved centrifugal type, resiliantly mounted with V-belt drive. The equipment shall be mounted on a rigid, non-combustible base mounted to the building structure. Roof curb height must compensate for the roof insulation thickness to meet this requirement.
 E. Economizer: 65,000 Btu/h shall have not fewer than two stages of fan control.
 F. Air Filters: 2 inch thick disposable media in metal frames.
 G. Roof Mounting Curb: Galvanized steel, channel frame, insulated with mounting, nailer strips. Provide roof curb of adequate height to provide 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.
 H. 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 spot at maximum permissible setting, de-energizes burner on excessive burner 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, resiliantly 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 time out circuit to reduce compressor start.
 C. Outdoor thermostat to energize compressor above 35 degrees F ambient.
 2.07 CONDENSER COIL
 A. Performance Rating: Determined in accordance with AMCA 210 and bearing the AMCA Performance Rating.
 B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating.
 C. Fabrication: Conform to AMCA 99.
 D. Coils: Cleanable, designed, manufactured, and tested as suitable for the purpose specified and indicated.
 2.03 EXHAUSTERS AND VENTILATORS
 A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 B. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 C. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 D. Fabrication: Conform to AMCA 99.
 E. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 F. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 G. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 H. Fabrication: Conform to AMCA 99.
 I. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 J. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 K. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 L. Fabrication: Conform to AMCA 99.
 M. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 N. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 O. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 P. Fabrication: Conform to AMCA 99.
 Q. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 R. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 S. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 T. Fabrication: Conform to AMCA 99.
 U. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 V. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 W. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 X. Fabrication: Conform to AMCA 99.
 Y. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 Z. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AA. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AB. Fabrication: Conform to AMCA 99.
 AC. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AD. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AE. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AF. Fabrication: Conform to AMCA 99.
 AG. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AH. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AI. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AJ. Fabrication: Conform to AMCA 99.
 AK. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AL. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AM. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AN. Fabrication: Conform to AMCA 99.
 AO. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AP. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AQ. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AR. Fabrication: Conform to AMCA 99.
 AS. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AT. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AU. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AV. Fabrication: Conform to AMCA 99.
 AW. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 AX. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 AY. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 AZ. Fabrication: Conform to AMCA 99.
 BA. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BB. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BC. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BD. Fabrication: Conform to AMCA 99.
 BE. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BF. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BG. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BH. Fabrication: Conform to AMCA 99.
 BI. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BJ. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BK. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BL. Fabrication: Conform to AMCA 99.
 BM. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BN. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BO. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BP. Fabrication: Conform to AMCA 99.
 BQ. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BR. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BS. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BT. Fabrication: Conform to AMCA 99.
 BU. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BV. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BV. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BW. Fabrication: Conform to AMCA 99.
 BU. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BV. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BV. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BW. Fabrication: Conform to AMCA 99.
 BU. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BV. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
 BV. Disconnect Switch: Factory mounted on fan guard, motor power, spring return.
 BW. Fabrication: Conform to AMCA 99.
 BU. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resiliantly mounted motor, 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; motor base to suit fan.
 BV. Roof Curb: 20 inch high above the finished roof surface (compensate for roof insulation thickness) featuring of galvanized steel or aluminum construction with continuously welded seams, built-in cant strips, insulation and curb bottom, and motor isolated nailer strip.
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 BV. Disconnect Switch: Factory

ROOM #	NAME	Az AREA (FT ²)	TABLE 403.3.1.1 OCCUPANCY CATEGORY	TABLE 403.3.1.1 R _p PEOPLE OA (CFM/PER)	TABLE 403.3.1.1 R _a AREA OA (CFM/FT ²)	TABLE 403.3.1.1 OCCUPANT DENSITY (#/1000 FT ²)	P _z (ft)	R ₁₂ (ft)	R ₁₂ (ft)	R ₁₂ (ft)	V _z (CFM)	TABLE 403.3.1.1.2 E _z (CFM)	V _z (CFM)	V _z MAX SUPPLY (CFM)	V _z MIN SUPPLY (CFM)	V _z (CFM)	INTERPOLATED TABLE 403.3.1.1.2.3.2 E _v
100	ORDER & QUEING AREA	463	CORRIDORS	0.0	0.06	0	10	0	28	28	0.80	35	1795	1795	0.019	1.00	
101	DINING AREA	854	CAFETERIA/FAST FOOD DINING	7.5	0.18	100	88	645	154	789	0.80	998	2685	2685	0.334	0.82	
106	HALLWAY	87	CORRIDORS	0.0	0.06	0	0	0	0	0	0.80	0	0	0	0.000	1.00	
106A	MENS RESTROOM	118	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	100	100	0.000	1.00	
106B	WOMENS RESTROOM	110	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	100	100	0.000	1.00	
108	VESTIBULE	37	NO LISTING	0.0	0.00	0	0	0	0	0	0.80	0	0	0	0.000	1.00	
		1,632					166	645	185	830		1037	4980	4980	0.334	0.82	

OUTDOOR AIR CALCULATIONS PER EQUATION 4-1:
 SYMBOL VALUE DESCRIPTION
 P_s = 96 SYSTEM POPULATION
 SP_z = 96 ZONE POPULATION
 D = 1.00 OCCUPANT DIVERSITY
 V_{ou} = 850 UNCORRECTED OUTDOOR AIR INTAKE
 Z_p (max) = 0.334 ZONE PRIMARY OUTDOOR AIR FRACTION (MAXIMUM)
 E_v = 0.82 SYSTEM VENTILATION EFFICIENCY
 SV_z = 5000 ZONE PRIMARY AIRFLOW
 V_{id} = 1,018 CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
 V_{ot} = 1,020 DESIGN OUTDOOR AIRFLOW RATE, CFM

ROOM #	NAME	Az AREA (FT ²)	TABLE 403.3.1.1 OCCUPANCY CATEGORY	TABLE 403.3.1.1 R _p PEOPLE OA (CFM/PER)	TABLE 403.3.1.1 R _a AREA OA (CFM/FT ²)	TABLE 403.3.1.1 OCCUPANT DENSITY (#/1000 FT ²)	P _z (ft)	R ₁₂ (ft)	R ₁₂ (ft)	R ₁₂ (ft)	V _z (CFM)	TABLE 403.3.1.1.2 E _z (CFM)	V _z (CFM)	V _z MAX SUPPLY (CFM)	V _z MIN SUPPLY (CFM)	V _z (CFM)	INTERPOLATED TABLE 403.3.1.1.2.3.2 E _v
102	OPEN KITCHEN	783	NO LISTING	0.0	0.00	0	10	0	0	0	0.80	0	0	0	0	0.000	1.00
103	BACK OF HOUSE	204	NO LISTING	0.0	0.00	0	4	0	0	0	0.80	0	265	265	0.000	1.00	
		987					16	0	0	0		0	8000	8000	0.000	1.00	

OUTDOOR AIR CALCULATIONS PER EQUATION 4-1:
 SYMBOL VALUE DESCRIPTION
 P_s = 16 SYSTEM POPULATION
 SP_z = 16 ZONE POPULATION
 D = 1.00 OCCUPANT DIVERSITY
 V_{ou} = 0 UNCORRECTED OUTDOOR AIR INTAKE
 Z_p (max) = 0.000 ZONE PRIMARY OUTDOOR AIR FRACTION (MAXIMUM)
 E_v = 1.00 SYSTEM VENTILATION EFFICIENCY
 SV_z = 6000 ZONE PRIMARY AIRFLOW
 V_{id} = 0 CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
 V_{ot} = 0 DESIGN OUTDOOR AIRFLOW RATE, CFM

ROOM #	NAME	Az AREA (FT ²)	TABLE 403.3.1.1 OCCUPANCY CATEGORY	TABLE 403.3.1.1 R _p PEOPLE OA (CFM/PER)	TABLE 403.3.1.1 R _a AREA OA (CFM/FT ²)	TABLE 403.3.1.1 OCCUPANT DENSITY (#/1000 FT ²)	P _z (ft)	R ₁₂ (ft)	R ₁₂ (ft)	R ₁₂ (ft)	V _z (CFM)	TABLE 403.3.1.1.2 E _z (CFM)	V _z (CFM)	V _z MAX SUPPLY (CFM)	V _z MIN SUPPLY (CFM)	V _z (CFM)	INTERPOLATED TABLE 403.3.1.1.2.3.2 E _v
105	MANAGERS OFFICE	87	OFFICE SPACES	5.0	0.06	5	2	10	4	14	0.80	18	350	350	0.050	1.00	
		87					2	10	4	14		18	350	350	0.050	1.00	

OUTDOOR AIR CALCULATIONS PER EQUATION 4-1:
 SYMBOL VALUE DESCRIPTION
 P_s = 2 SYSTEM POPULATION
 SP_z = 2 ZONE POPULATION
 D = 1.00 OCCUPANT DIVERSITY
 V_{ou} = 14 UNCORRECTED OUTDOOR AIR INTAKE
 Z_p (max) = 0.050 ZONE PRIMARY OUTDOOR AIR FRACTION (MAXIMUM)
 E_v = 1.00 SYSTEM VENTILATION EFFICIENCY
 SV_z = 350 ZONE PRIMARY AIRFLOW
 V_{id} = 14 CODE REQUIRED OUTDOOR AIRFLOW RATE, CFM
 V_{ot} = 16 DESIGN OUTDOOR AIRFLOW RATE, CFM

1 OUTSIDE AIR CALCULATIONS

DOAS/RTU SEQUENCE OF OPS		
Job Name:	Shake Shack	
Job Number:	Typical	
Application Description:	kitchen conditioning & ventilation	
Sales Channel:	Direct	
Mission critical application?	NO	
Directly controlling other equipment?	NO	
How will unit be enabled/disabled?	ON-BOARD SCHEDULE	
Scheduling enabled?	YES	
	OCCUPIED	UNOCCUPIED
Factory Settings		
Damper Operation	PRESETS	FIXED
Outdoor Air	PARTIAL	0% OA
Blower Operation	CAV	CAV
Blower Mode	ON	AUTO
Tempering Method*	SPACE	SPACE
Heat/Cool Activation	EITHER	SPACE
Dehumidification Activation	EITHER	SPACE
Temp/Humidity Setpoints		
Cooling*	74	78
Heating*	68	65
Dehumidification (DP)*	53	55
IntakeCooling	75 n/a	
IntakeHeating	65 n/a	
IntakeDehumidification (DP)	55 n/a	
MaxDischargeCool	75	80
MaxDischargeHeat	80	80
MinDischargeCool	50	55
MinDischargeHeat	55	55
Scheduling		
M-F, Sa/Su	7a-11:59p	12a-6:59a
Notes		
SFC/SF01 dry contact on hood ECP signals damper preset from min OA (fixed) for hood makeup		

2 DOAS SEQUENCE OF OPERATIONS

SETPOINT/CONTROL	RTU-1 KITCHEN (DOAS)	RTU-2 DINING	ACU-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
HUMIDITY SETPOINT	60%	N/A	N/A
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	NO	NO	NO
POWERED EXHAUST RELIEF	YES	YES	NO
DEHUMIDIFICATION (HOT GAS REHEAT)	NO	NO	NO
SUPPLY FAN			
ON DURING OCCUPIED MODE	YES	YES	YES
CYCLE WITH LOADS DURING OCCUPIED HOURS	YES	YES	YES
VARIABLE 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 CONTROL PANEL INTERLOCK	YES	YES	YES
KITCHEN EXHAUST SYSTEM INTERLOCK	YES	YES	YES

EQUIPMENT TAG	SUPPLY AIRFLOW (CFM)	OUTDOOR AIRFLOW (CFM)	RETURN AIRFLOW (CFM)	EXHAUST AIRFLOW (CFM)	OA/SA (%)	REMARKS
RTU-1	4,000	2,435	1,565		81%	DOAS
RTU-2	5,000	1,020	3,980		20%	
ACU-1	350	15	335		4%	
EF-1				700		HOOD-1
EF-2				700		HOOD-2
EF-3				645		HOOD-3
EF-4				645		HOOD-4
EF-5				300		RESTROOMS
TOTAL	9,350	3,470	5,880	2,990		
RESULTING BUILDING PRESSURIZATION = 480 CFM						
PRESSURIZATION PERCENTAGE = 5.1 %						

CARRIER EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. CONTACT CARRIER CORPORATION FOR PROPOSALS: BOB ECKWEILER, CARRIER RETAIL STRATEGIC ACCOUNTS, EMAIL: BOB.ECKWEILER@CARRIER.UTC.COM, PHONE: (973) 222-6742

MARK	COOLING				HEATING		SUPPLY AIR (CFM)	FAN (WATT)	ELECTRICAL			SEER /EER	CARRIER MODEL NUMBER	REMARKS
	NOMINAL (TONS)	TOT (MBH)	SEN (MBH)	OUT (MBH)	VOLT	PH			MCA	MOCP				
ACU-1	0.8	10.41	8.22	10.55	350	46	208	1	0.2	NA	19.0/13.0	40MBCQ09	(1,2)	

MARK	LOCATION	SERVES	COOLING		HEATING		SUPPLY AIR (CFM)	EXT. S.P. (IN)	FAN BHP	ELECTRICAL			WEIGHT (LBS)	SEER /EER	CARRIER MODEL NUMBER	REMARKS
			SEN (MBH)	OUT (TON)	IN (MBH)	OUT (MBH)				VOLT	PH	MCA				
ASHP-1	ROOF	ACU-1	0.75	10.0	208	1	15.0	15	19.0/13.0/0.0/3.0	80	1,974	1/2.2	48HC14	(1-9)		

MARK	LOCATION	SERVICE	COOLING		HEATING		SUPPLY AIR (CFM)	EXT. S.P. (IN)	FAN BHP	ELECTRICAL			WEIGHT (LBS)	SEER /EER	CARRIER MODEL NUMBER	REMARKS
			SEN (MBH)	OUT (TON)	IN (MBH)	OUT (MBH)				VOLT	PH	MCA				
RTU-1	116.0	150.7	12.5	240.0	195.0	5,000	0.70	2.3	208	3	64.0	80	1,974	1/2.2	48HC14	(1-9)

COOLING CAPACITIES ARE BASED ON AHRI STANDARD 210/240 OR 340/360: 80F DB/ 67F WB INDOOR ENTERING AIR TEMPERATURE, 95F DB AIR ENTERING OUTDOOR FAN. SCHEDULED UNIT MAY DIFFER FROM AHRI STANDARD CFM.
 REMARKS:
 1. PROVIDE EQUIPMENT WITH SCOR 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 FACTORY INSTALLED DISCONNECT, UNPOWERED CONVENIENCE OUTLET, THROUGH THE BASE ELECTRICAL CONNECTION.
 3. PROVIDE WITH 14 INCH HEIGHT ROOF CURB.
 4. PROVIDE WITH DRY BULB ECONOMIZER AND POWER EXHAUST.
 5. ECONOMIZER SHALL INCLUDE FAULT DETECTION DIAGNOSTICS (FDD). DAMPER LEAKAGE SHALL MEET APPLICABLE ENERGY CODE.
 6. PROVIDE WITH CONDENSER COIL HAIL GUARD.
 7. DUCT SMOKE DETECTOR ON THE 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.
 8. UNITS WITH COOLING CAPACITY GREATER THAN OR EQUAL TO 65 MBH SHALL HAVE MULTI-STAGE CAPABILITY PER APPLICABLE ENERGY CODE.
 9. ECONOMIZER SHALL MEET ALL LOCAL ENERGY CODE REQUIREMENTS.
 10. REFERENCE CAPTIVEAIRE DRAWINGS FOR ADDITIONAL INFORMATION.

MARK	LOCATION	SERVICE	AIRFLOW (CFM)	EXTERNAL STATIC (IN H2O)	SONES	MOTOR DATA		RPM	MANUFACTURER	MODEL NUMBER	REMARKS
						FAN (HP)	VOLT PH				
EF-1	ROOF	HOOD 1									4
EF-2	ROOF	HOOD 2									4
EF-3	ROOF	HOOD 2									4
EF-4	ROOF	HOOD 2									4
EF-5	ROOF	RESTROOMS	300	0.50	7.4	1/8	115	1,550	GREENHECK	G-095-D	(1-3)

MARK	LENGTH (IN)	AIRFLOW (CFM)	HEATER		FANS		ELECTRICAL			MANUFACTURER	MODEL NUMBER	REMARKS	
			IN (KW)	OUT (MBH)	TEMP RISE (F)	QTY	HP	CIRCUIT (QTY)	VOLT				PH
AC-1	36.0	1,379	NA	NA	NA	1	1/2	1	208	1	MARS	STD2	(1,2)

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

MARK	BTU PER HOUR	WATTS	VOLTAGE	PHASE	AMPS	MANUFACTURER	CATALOG NUMBER			REMARKS	
							HEATER	FRAME	THERMOSTAT		
EUH-1	13,652 BTU/HR	4,000 W	208V	1	PHASE	19.2A	QMARK	EFF4008	N/A	INTEGRAL	INTEGRAL
EUH-2	17,065 BTU/HR	5,000 W	208V	1	PHASE	24.0A	QMARK	MUH05-81	N/A	INTEGRAL	INTEGRAL

UNIT NO.	PLACEMENT	PHI CELL MODEL #	UV/CELL SIZE	RANGE	INDOOR PPM TARGET	SIZE	TRANSFORMER	POWER	IN-VOLT	OUT-VOLT	MCA	WEIGHT (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

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STERLING HEIGHTS
 SHAKE SHACK
 10000 SHAKE SHACK DRIVE
 STERLING HEIGHTS, MI

REVISION	DATE	DESCRIPTION
A	03/18/21	REVISION A
B	04/14/21	REVISION B
C	08/13/22	CITY CREW/BIONECS
1	03/16/22	IFC
2	04/22/22	REVISION 1
3	05/04/22	REVISION 2

STATUS: IFC SET

PRELIMINARY:

 GREGORY SCHNACKEL
 ENGINE