GENERAL NOTES:

1. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD PRIOR TO CONSTRUCTION, AND REPORT TO ENGINEER ALL ERRORS, DISCREPANCIES, OMISSIONS, DEFECTS, OR UNUSUAL CONDITIONS BEFORE COMMENCING CONSTRUCTION.
2. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE APPLICABLE RULES AND REGULATIONS ALL GOVERNING AGENCIES INCLUDING BUT NOT LIMITED TO THE INTERNATIONAL MECHANICAL CODE 2018 AND ACTIVITY HAVING JURISDICTION.
3. CONTRACTOR TO SECURE ALL NECESSARY PERMITS REQUIRED FOR THE STIPULATED WORK PRIOR TO COMMENCING WITH CONSTRUCTION OR DEMOLITION. UPON REVIEW OF THE CONTRACT DRAWINGS, AND PRIOR TO SUBMISSION OF BID PROPOSAL. THE CONTRACTOR SHALL BE INFORM THE ARCHITECT AND/OR ENGINEER IN WRITING OF ANY DISCREPANCIES OR REQUEST CLARIFICATION'S IF NECESSARY CONCERNING THE INTENT OF THE PLANS AND SPECIFICATIONS TO PROVIDE A COMPLETE WORKING INSTALLATION. LATER CLAIMS BY THE CONTRACTOR FOR EXTRA LABOR, EQUIPMENT OR MATERIALS SHOULD SUCH PROCEDURE NOT BE FOLLOWED, WILL NOT BE RECOGNIZED.
4. THE CONTRACTOR SHALL VISIT THE PREMISES TO EXAMINE CAREFULLY THE AREAS AFFECTED BY THIS WORK AND TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS AND WITH ANY DIFFICULTIES THAT MAY ATTEND THE EXECUTION OF THIS WORK. THE CONTRACTOR SHALL PERFORM THIS PRIOR TO SUBMISSION OF HIS BID PROPOSAL. SUBMISSION OF HIS BID PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH EXAMINATION HAS BEEN MADE AND LATE CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED DUE TO DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE.
5. ALL CONTRACTORS, WORKMEN, AND AGENTS WORKING AT OR VISITING THE SITE SHALL BE COVERED BY ALL NECESSARY STATUTORY INSURANCE INCLUDING LIABILITY, WORKMEN'S COMPENSATION, DISABILITY, ETC..
6. ALL WORK SHALL BE PERFORMED IN A NEAT, CLEAN, ORDERLY MANNER AND THE SITE KEPT CLEAN FROM DUST AND DEBRIS AT ALL TIMES.
7. IT IS THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE ALL WORK WITH ALL NEW AND EXISTING WORK OF ALL OTHER TRADES. THE SHOP DRAWINGS PREPARED BY THIS CONTRACTOR SHALL INDICATE SPACE ALLOWANCES BELOW CEILING FOR ALL WORK OF ALL OTHER TRADES (CABLE TRAYS, CONDUITS, SPRINKLERS PIPES, ALL DOMESTIC SERVICES) AND SHALL BE SIGNED OFF BY ALL OTHER CONTRACTORS.
8. CONTRACTOR SHALL SUPPLY AND INSTALL MISCELLANEOUS STEEL FOR EQUIPMENT AND PIPING SUPPORTS.
9. PROVIDE PROPER PROVISION FOR EXPANSION AND CONTRACTION IN ALL PORTIONS OF PIPEWORK, TO PREVENT UNDUE STRAINS ON PIPING OR APPARATUS CONNECTED THEREWITH. PROVIDE DOUBLE SWINGS AT OFFSETS WHEREVER POSSIBLE, TO TAKE UP EXPANSION.
10. APPROVED BOLTED, GASKET, FLANGES (SCREWED OR WELDED) SHALL BE INSTALLED AT ALL APPARATUS AND APPURTENANCES, AND WHEREVER ELSE REQUIRED TO PERMIT EASY CONNECTION AND DISCONNECTION.
11. ALL PIPING CONNECTIONS TO COILS AND EQUIPMENT SHALL BE MADE WITH OFFSETS PROVIDED WITH SCREWED OR WELDED BOLTED FLANGES SO ARRANGED THAT THE EQUIPMENT CAN BE SERVICED OR REMOVED WITHOUT DISMANTLING THE PIPING.
12. CUT AND CONNECT NEW SHEETMETAL AND PIPING INTO EXISTING. WHEN INSTALLATION OF NEW WORK REQUIRES.
13. PROVIDE SHUTDOWNS, DRAINING AND REFILLING, RECONNECTIONS AND STARTUPS OF NEW AND EXISTING SYSTEMS. COORDINATE ALL SYSTEM SHUTDOWNS WITH THE FACILITY ENGINEERS AND MANAGEMENT.
14. WHEN CONFLICTS OCCUR IN THE SPECIFICATIONS OR ON THE DRAWINGS, OR BETWEEN EITHER, THE ITEMS OF GREATER QUANTITY OR HIGHER COST SHALL BE PROVIDED.
15. IF ANY COILS OR OTHER APPARATUS ARE STRATIFIED OR AIR BOUND (BY VACUUM OR PRESSURE), THEY SHALL BE REPIPED WITH NEW APPROVED AND NECESSARY FITTINGS, AIR VENTS, OR VACUUM BREAKERS AT NO EXTRA COST. IF CONNECTIONS ARE CONCEALED IN FURRING, FLOORS, OR CEILINGS, THIS TRADE SHALL BEAR ALL EXPENSES OF TEARING UP AND REFINISHING CONSTRUCTION AND FINISH, LEAVING SAME IN AS GOOD CONDITION AS BEFORE IT WAS DISTURBED.
16. DUCT SIZES ARE ACTUAL SHEETMETAL SIZES AND DO NOT INCLUDE 1" DUCT LINER. INCREASE DUCTWORK SIZE ACCORDINGLY.
17. PROVIDE REDUCER FITTINGS FOR CHANGE IN PIPE SIZE AND FOR FINAL CONNECTION AT EQUIPMENT AND AS REQUIRED TO PERMIT DRAINAGE AND VENTING.
18. PROVIDE AS REQUIRED MANUAL AIR VENTS, DRAINS AND RELIEF VALVES.
19. PROVIDE SHUT–OFF VALVES AT EACH BRANCH TAKE–OFF FROM EACH MAIN.
20. PROVIDE VALVED AND CAPPED CONNECTIONS FOR DRAINAGE AT ALL LOW POINTS OF PIPING SYSTEM.
21. MINIMUM PITCH SHALL BE SUFFICIENT TO INSURE ADEQUATE VENTING OR DRAINAGE.
22. ALL DUCTWORK AND PIPING IS SHOWN DIAGRAMMATICALLY AND DOES NOT SHOW ALL OFFSETS, DROPS AND RISERS OF RUNS. PROVIDE TRANSITION PIECES AT CROSSOVERS, UNDER BEAMS, OVER/UNDER PIPES, AS REQUIRED TO ACCOMMODATE DUCTS WITHIN SPACE AVAILABLE, PROVIDING EQUIVALENT DUCT SIZE TO THE SIZE SHOWN. COORDINATE CLOSELY WITH OTHER TRADES TO REDUCE NECESSITY OF TRANSITIONS TO A MINIMUM. NO ADDITIONAL COST WILL BE PAID FOR ANY REQUIRED TRANSITIONS. THIS CONTRACTOR SHALL ALSO ALLOW IN HIS PRICING FOR THE REMOVAL AND MOUNTING OF NEW PIPING TO AVOID EXISTING CONDITIONS. EXACT LOCATIONS SHALL BE SUBJECT TO APPROVAL OF ARCHITECT AND ENGINEER. INSTALL ALL DUCTWORK AND PIPING TIGHT TO THE BEAMS.
23. ALL EQUIPMENT SHALL BE INSTALLED IN ACCESSIBLE LOCATIONS TO PERMIT SERVICING AND REMOVAL.
24. PROVIDE ACCESS DOORS IN DUCTWORK WHERE INDICATED ON DRAWINGS OR AS REQUIRED FOR ACCESS TO SYSTEM COMPONENTS INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
    A. AUTOMATIC DAMPERS, FIRE DAMPERS, FIRE SMOKE DAMPERS AND SMOKE DETECTORS, FANS.
    B. SERVICES AND INSTRUMENTS.
25. PROVIDE UNION OR FLANGED CONNECTIONS AT EACH PIECE OF EQUIPMENT AND ON BOTH SIDES OF CONTROL VALVES.
26. PROVIDE CHECK VALVES ON EACH CONDENSATE DRAIN LINE.
29. CONTRACTOR SHALL VERIFY ON–SITE ALL CONDITIONS AND MEASUREMENTS.
30. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
31. UNLESS SPECIFICALLY STATED OTHERWISE, CONTRACTOR SHALL FOLLOW MANUFACTURERS' DIRECTIONS, INSTRUCTIONS AND RECOMMENDATIONS FOR ALL INSTALLATIONS, MATERIALS, AND PROCESSES USED IN THIS CONTRACT.
32. PROVIDE FLEXIBLE DUCT CONNECTIONS ON ALL DUCTS CONNECTING TO FANS AND/OR AIR HANDLING UNITS.
33. ALL CONDENSATE DRAIN LINES FROM EACH UNIT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET, WITH 'P' TRAP, AND TERMINATE AT THE NEAREST DRAIN OR SLOP SINK.
34. ALL SQUARE ELBOWS ON DUCTWORK ARE TO HAVE DOUBLE THICK TURNING VANES.
35. WHERE DUCTS PENETRATE WALLS, SEAL OPENINGS TO PREVENT AIR TRANSFER BETWEEN SPACES.

MECHANICAL SYMBOLS AND ABBREVIATIONS

		OPENING ABOVE HUNG CEILING
	S.A.	SUPPLY AIR UP OR IN SECTION
	R.A.	RETURN, EXHAUST, OR OUTSIDE AIR UP OR IN SECTION
		RECTANGULAR TO OVAL TRANSITION
	A.L.	DUCT LINER–DUCT DIMENSIONS FOR NET FREE AREA
24x12		RECTANGULAR DUCT (DIMENSIONS REPRESENT NET FREE AREA)
		ROUND ELBOW
	VD	VOLUME DAMPER
N (XXX)	C.D.	NEW CEILING MOUNTED SQUARE SUPPLY AIR DIFFUSER (XXX INDICATES TOTAL CFM)
E(XXX)	C.D.	TO BE RABALANCED TO CFM INDICATED
E		EXISTING CEILING RETURN GRILLE TO REMAIN
	R.G.	CEILING MOUNTED RETURN GRILLE
	FC	FLEXIBLE CONNECTION
	A.D.	ACCESS DOOR
R		RISE IN DUCTWORK
D		DROP IN DUCTWORK
		CONNECT NEW TO EXISTING
		EXISTING DUCTWORK OR EQUIPMENT TO REMAIN
		EXISTING DUCTWORK OR EQUIPMENT TO BE REMOVED
		NEW DUCTWORK OR EQUIPMENT
	MD	MOTORIZED DAMPER
		CAPPED OUTLETS
Ts		TEMPERATURE SENSOR (NON ADJUSTABLE)
H		HUMIDISTAT
	COD	CABLE OPERATED DAMPER
T		THERMOSTAT
(E)		EXISTING WORK
		GLOBE VALVE
		GATE VALVE
		CHECK VALVE
		DIRECTION OF FLOW
		PIPE UP
		PIPE DOWN
WMS		WIRE MESH SCREEN
	BDD	BACK DRAFT DAMPER
SD		DUCT SMOKE DETECTOR
	MD	MOTORIZED DAMPER
U		UNDERCUT DOOR
	FD	FIRE DAMPER
		LINEAR DIFFUSER WITH PLENUM BOX

DEMOLITION, REMOVAL AND RELOCATION NOTES

A. REMOVAL, TEMPORARY CONNECTIONS AND RELOCATION OF CERTAIN EXISTING WORK WILL BE NECESSARY FOR THE INSTALLATION OF THE NEW SYSTEMS. ALL EXISTING CONDITIONS ARE NOT TO BE COMPLETELY DETAILED ON THE DRAWINGS. THE CONTRACTOR SHALL SURVEY THE SITE AND MAKE ALL NECESSARY CHANGES REQUIRED BASED ON EXISTING CONDITIONS FOR PROPER INSTALLATION OF NEW WORK.

B. DISCONNECT, REMOVE AND/OR RELOCATE EXISTING MATERIAL, EQUIPMENT, AND OTHER WORK AS NOTED OR REQUIRED FOR PROPER INSTALLATION OF NEW SYSTEM.

C. EQUIPMENT REQUIRED TO BE TEMPORARILY DISCONNECTED AND RELOCATED SHALL BE CAREFULLY REMOVED, STORED, CLEANED, REINSTALLED, RECONNECTED, AND MADE OPERATIONAL.

D. ALL EXISTING WORK NOT INDICATED FOR DEMOLITION SHALL BE PROTECTED FROM DAMAGE. WHERE EXISTING WORK TO REMAIN IS DAMAGED OR DISTURBED, THE CONTRACTOR SHALL REPAIR OR REPLACE TO OWNER'S AND BUILDING MANAGER'S SATISFACTION AT NO COST TO THE OWNER OR BUILDING MANAGEMENT.

E. ALL NECESSARY CUTTING AND PATCHING TO ACCOMMODATE THE NEW HVAC WORK SHALL BE PERFORMED BY THIS CONTRACTOR AND COORDINATED WITH GENERAL CONTRACTOR. RESTORE ALL ITEMS TO MATCH EXISTING CONDITIONS.

F. ALL EXISTING MATERIAL AND EQUIPMENT TO BE REMOVED UNDER THIS CONTRACT WILL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE LEGALLY DISPOSED OF BY THIS CONTRACTOR AS DIRECTED BY THE ARCHITECT OR OWNER. REFRIGERATION CONTAINED IN EXISTING EQUIPMENT TO BE REMOVED SHALL BE RECLAIMED OR LEGALLY DISPOSED OF IN ACCORDANCE WITH EPA REQUIREMENTS AND ASHRAE.

G. PROVIDE FOR LEGAL REMOVAL AND DISPOSAL OF ALL RUBBISH AND DEBRIS FROM THE BUILDING AND SITE. COORDINATE ALL DEMOLITION AND REMOVALS WITH GENERAL CONTRACTOR.

COMMISSIONING

THIS PROJECT REQUIRES SYSTEM COMMISSIONING AS PER THE REQUIREMENTS OF IECC 2018. TOTAL CAPACITY OF SERVICE WATER HEATING AND SPACE HEATING EXCEEDS 600,000 BTU/H HEATING.

HVAC DRAWING LIST

COMcheck Software Version 4.1.5.5

Mechanical Compliance Certificate

Project Information

Energy Code: 2020 New York City Energy Conservation Code, Appendix CA (modified 90.1-2016)
Project Title: Chabad
Location: New York, New York
Climate Zone: 4a
Project Type: New Construction

Construction Site: Owner/Agent: Designer/Contractor:

Additional Efficiency Package(s)

Credits: 1.0 Required 0.0 Proposed

Mechanical Systems List

Quantity — System Type & Description

1 CU-1 (Single Zone):
VRF Condensing Unit, Air Cooled Heat Pump
Heating Mode: Capacity = 80 kBtu/h,
Proposed Efficiency = 4.05 COP, Required Efficiency = 3.30 COP
Cooling Mode: Capacity = 72 kBtu/h,
Proposed Efficiency = 12.20 EER, Required Efficiency: 11.00 EER + 14.6 IEER
Fan System: None

1 AC-1 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 18 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-2 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 8 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-3 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-4 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 8 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-5 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 15 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 CU-2 (Single Zone):
VRF Condensing Unit, Air Cooled Heat Pump
Heating Mode: Capacity = 80 kBtu/h,
Proposed Efficiency = 4.05 COP, Required Efficiency = 3.30 COP
Cooling Mode: Capacity = 72 kBtu/h,
Proposed Efficiency = 12.20 EER, Required Efficiency: 11.00 EER + 14.6 IEER
Fan System: None

Quantity — System Type & Description

1 AC-6 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-7 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-8 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-9 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-10 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 AC-11 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 CU-3 (Single Zone):
VRF Condensing Unit, Air Cooled w/ Heat Recovery Heat Pump
Heating Mode: Capacity = 18 kBtu/h,
Proposed Efficiency = 10.00 HSPF, Required Efficiency = 7.70 HSPF
Cooling Mode: Capacity = 22 kBtu/h,
Proposed Efficiency = 20.20 SEER, Required Efficiency: 13.00 SEER
Fan System: None

1 AC-12 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 18 kBtu/h
No minimum efficiency requirement applies
Fan System: None

1 RTU-1 (Single Zone):
Heating: 1 each - Duct Furnace, Gas, Capacity = 250 kBtu/h
Proposed Efficiency = 81.00% Ec, Required Efficiency: 80.00 % Ec
Cooling: 1 each - Single Package DX Unit, Capacity = 144 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 10.80 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: None

1 RTU-3 (Single Zone):
Heating: 1 each - Duct Furnace, Gas, Capacity = 250 kBtu/h
Proposed Efficiency = 81.00% Ec, Required Efficiency: 80.00 % Ec
Cooling: 1 each - Single Package DX Unit, Capacity = 147 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 10.80 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: None

1 RTU-5 (Single Zone):
Heating: 1 each - Duct Furnace, Gas, Capacity = 250 kBtu/h
Proposed Efficiency = 81.00% Ec, Required Efficiency: 80.00 % Ec
Cooling: 1 each - Single Package DX Unit, Capacity = 147 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 10.80 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: None

1 RTU-8 (Single Zone):
Cooling: 1 each - Single Package DX Unit, Capacity = 56 kBtu/h, Air-Cooled Condenser, Air Economizer

Quantity — System Type & Description

Proposed Efficiency = 17.20 SEER, Required Efficiency: 14.00 SEER
Fan System: None

1 CU-4 (Single Zone):
VRF Condensing Unit, Air Cooled Heat Pump
Heating Mode: Capacity = 34 kBtu/h,
Proposed Efficiency = 10.80 HSPF, Required Efficiency = 7.70 HSPF
Cooling Mode: Capacity = 30 kBtu/h,
Proposed Efficiency = 19.10 SEER, Required Efficiency: 13.00 SEER
Fan System: None

1 AC-13 (Single Zone):
Cooling: 1 each - VRF Zone Fan Unit, Capacity = 30 kBtu/h
No minimum efficiency requirement applies
Fan System: None

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2020 New York City Energy Conservation Code, Appendix CA (modified 90.1-2016) requirements in COMcheck Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

ELLA MALKIN — Name - Title
E. Malkin — Signature
2025-08-15 — Date

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Project:
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30 WALL STREET
BINGHAMTON, NY 13901

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04	95% CD SET	01/20/25
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01	ISSUED FOR REVIEW	10/05/23

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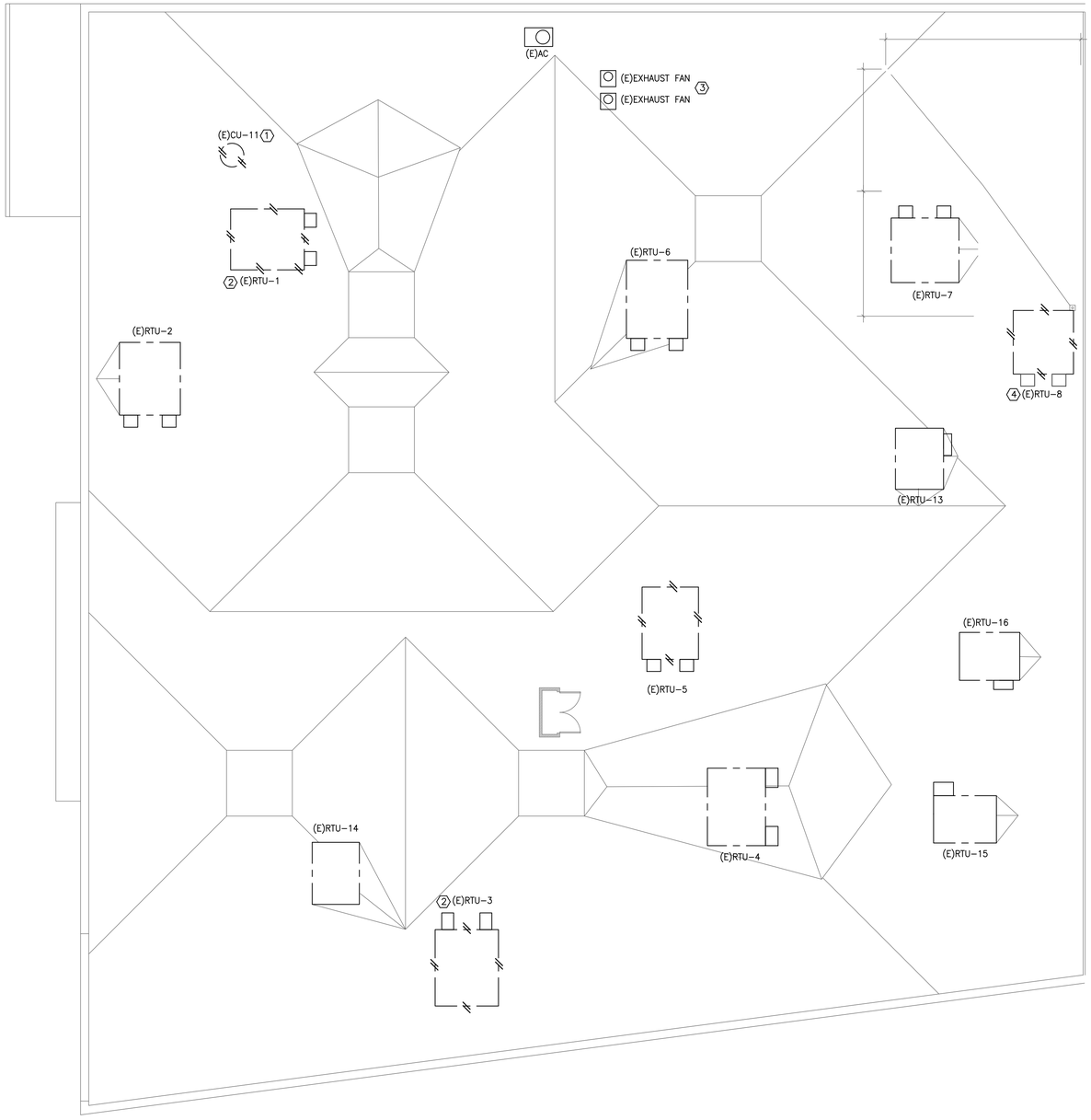
Sheet Title:
HVAC NOTES AND SYMBOLS

Drawing No.:
M-001



KEYED-IN NOTES:

1. EXISTING UNIT TO BE REMOVED IN ITS ENTIRETY WITH ALL RELATED INDOOR UNIT, DUCTWORK, CONTROLS, PIPING, AIR OUTLETS ETC.
2. EXISTING ROOFTOP UNIT TO BE REMOVED IN ITS ENTIRETY WITH CONTROLS, PIPING, AIR OUTLETS ETC. GAS LINE SHALL BE DISCONNECTED AND CAPPED FOR FUTURE USE. ALL RELATED SUPPLY DUCTWORK IN FIRST FLOOR SHALL BE REMOVED BACK TO THE SECOND FLOOR SLAB AND UTILIZED FOR NEW CONNECTION. EXISTING DUCT RISERS WILL BE REUSED FOR NEW DISTRIBUTION.
3. CONTRACTOR SHALL VERIFY FIRST FLOOR FAN IN FIELD. EXISTING TOILET EXHAUST FAN FOR FIRST FLOOR SHALL BE REMOVED IN ITS ENTIRETY WITH CONTROLS, DUCTWORK, AIR OUTLETS, ETC.
4. EXISTING ROOFTOP UNIT TO BE REMOVED IN ITS ENTIRETY WITH CONTROLS, PIPING, AIR OUTLETS ETC. GAS LINE SHALL BE DISCONNECTED AND CAPPED FOR FUTURE USE. ALL RELATED SUPPLY AND RETURN DUCTWORK SHALL BE REMOVED IN ITS ENTIRETY. EXISTING DUCT RISERS WILL BE REUSED FOR NEW DUCTWORK AND REFRIGERANT PIPING DISTRIBUTION.

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ROOF HVAC DEMOLITION PLAN

Drawing No.:
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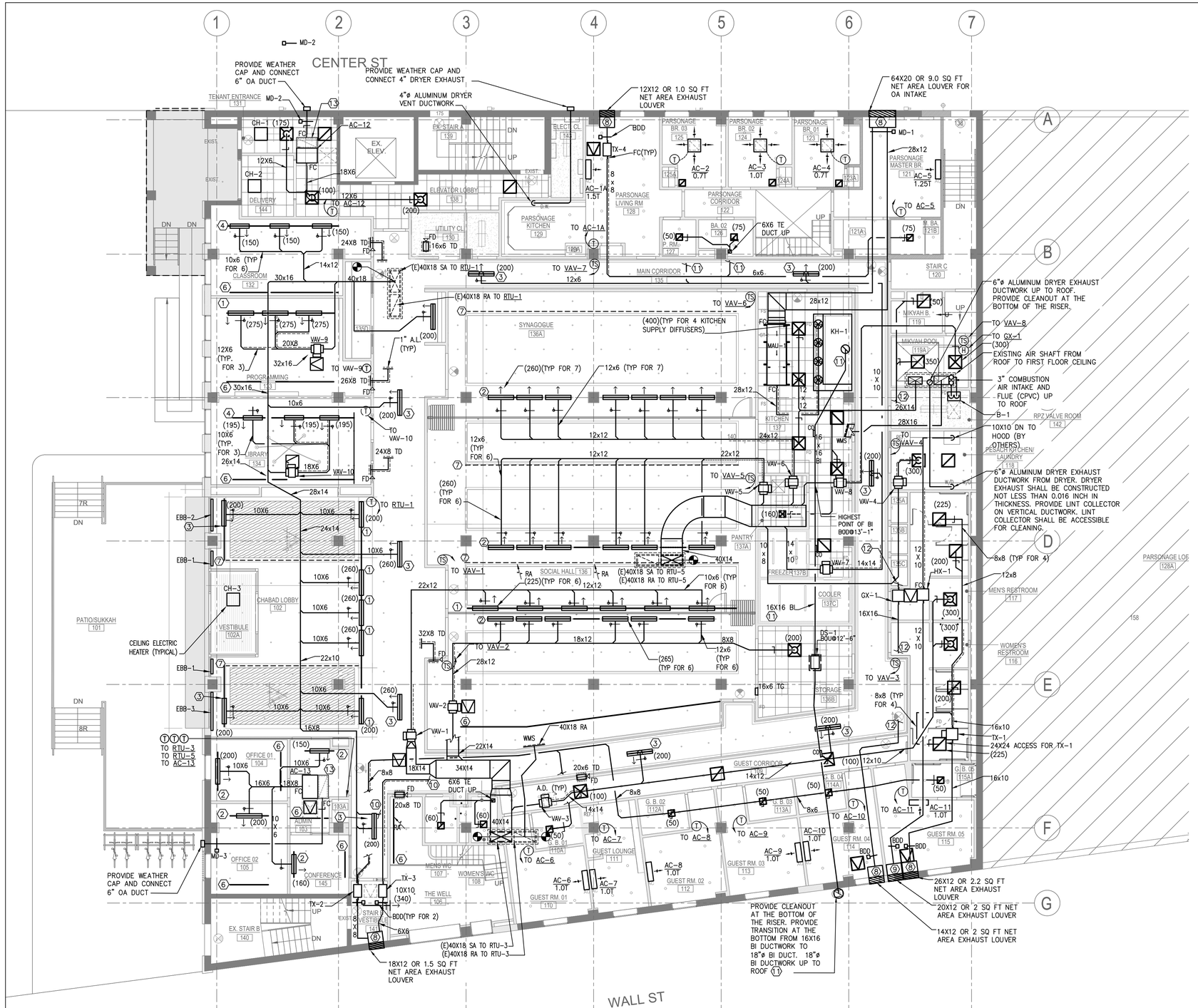

1 FIRST FLOOR HVAC PLAN
1/8"=1'-0"

2 PARSONAGE LOFT HVAC PART PLAN
1/8"=1'-0"

3 POSITIVITY SPACE LOFT HVAC PART PLAN
1/8"=1'-0"

GENERAL NOTES:

1–PROVIDE 1" ACOUSTICAL LINING AND WIRE MESH SCREENS FOR ALL TRANSFER DUCTS.
2–ALL COLLAR CONNECTIONS TO MAKE UP AIR PLENUM SHALL HAVE VOLUME DAMPER.
3–COORDINATE EXACT LOCATION AND HEIGHT OF THERMOSTATS, TEMPERATURE SENSORS WITH ARCHITECT. MATCH COLOR WITH FINISH FLOOR, COORDINATE WITH ARCHITECT.
4–ALL 90 DEGREE DUCTWORK TURNS SHALL BE PROVIDED VIA TURNING VANES.

KEYED - IN NOTES

(1) 1–1/2" SLOT, 1 SLOT TITUS MODEL FL–15 CONTINOUS HIGH THROW LINEAR SUPPLY AIR DIFFUSER WITH 48"LX8"HX8"W PLENUM BOX AND 1/2" A.L. PROVIDE WITH CORD OPERATED DAMPERS (TYPICAL FOR ALL). TRIM, TAPE AND SPACKLE BY G.C. SEE DETAILS FOR INFORMATION.

(2) 1–1/2" SLOT, 1 SLOT TITUS MODEL FL–15 HIGH THROW LINEAR SUPPLY AIR DIFFUSER WITH 48"LX8"HX8"W PLENUM BOX AND 1/2" A.L. PROVIDE WITH CORD OPERATED DAMPERS (TYPICAL FOR ALL). TRIM, TAPE AND SPACKLE BY G.C. SEE DETAILS FOR INFORMATION.

(3) 1–1/2" SLOT, 1 SLOT TITUS MODEL FL–15 JET THROW LINEAR SUPPLY AIR DIFFUSER WITH 48"LX8"HX8"W PLENUM BOX AND 1/2" A.L. PROVIDE WITH CORD OPERATED DAMPERS (TYPICAL FOR ALL). TRIM, TAPE AND SPACKLE BY G.C. SEE DETAILS FOR INFORMATION.

(4) 1–1/2" SLOT, 1 SLOT TITUS MODEL FL–15 CONTINOUS HIGH THROW LINEAR SUPPLY AIR DIFFUSER WITH 36"LX8"HX8"W CUSTOM BOX AND 1/2" A.L. PROVIDE WITH CORD OPERATED DAMPERS (TYPICAL FOR ALL). TRIM, TAPE AND SPACKLE BY G.C. SEE DETAILS FOR INFORMATION.

(5) GREASE EXHAUST DUCTWORK: BLACK IRON WITH LIQUID TIGHT WELDS OR PREFABRICATED KITCHECN EXHAUST DUCTWORK APPROVED BY NYS. REFER TO CHART ON DWG M–801 (SECTION 2.8 B) FOR GAUGE. PROVIDE 12"X12" CLEANOUT DOORS AT EVERY 20 FEET AND AT EVERY CHANGE OF DUCT DIRECTION. CLEANOUT DOORS LOCATED AT SIDES, 2" ABOVE THE BOTTOM OF DUCT, NOT LESS THAN 1" BELOW TOP OF DUCT. CLEANOUT DOORS MUST NOT BE OBSTRUCTED. CLEANOUT DOORS SHALL BE THE SAME GAGE WITH BLACK IRON DUCT GAGE, BLACK IRON TIGHT–FITTED. PROVIDE DUCTWORK APPROVED FIRE WRAP INSULATION. PROVIDE MINIMUM ONE–FOURTH UNIT SLOPE IN 12 UNIT HORIZONTAL. NO DAMPERS ARE ALLOWED.

(6) 1–1/2" SLOT, 1 SLOT TITUS MODEL FL–15 LINEAR RETURN DIFFUSER. TRIM, TAPE AND SPACKLE BY G.C. SEE DETAILS FOR INFORMATION.

(7) 2" SLOT, 1 SLOT ARCHITECTURAL RETURN SLOT. FOR MORE INFORMATION , SEE ARCHITECTURAL DRAWINGS.

(8) FULL LOUVER HEIGHT AND 20" DEEP PLENUM BOX WITH R–8 INSULATION.

(9) FULL LOUVER HEIGHT AND 20" DEEP PLENUM BOX WITH R–8 INSULATION. PLENUM BOX SHALL MEET WITH DUCTWORK SPECIFICATION AND BE STAINLESS STEEL FOR HOOD EXHAUST.

(10) SEE POSITIVITY SPACE HVAC PART PLAN FOR CONTINUATION.

(11) SEE PERSONAGE LOFT HVAC PART PLAN FOR CONTINUATION

(12) 16X6 GX DUCTWORK, PROVIDE ACOUSTICAL LINING 7 FT UPSTREAM OF THE FAN.

(13) PROVIDE 24" DEEP MIXING PLENUM BOX WITH A.L. WIDTH AN HEIGHT TO MATCH UNIT'S RETURN OPENING. PROVID FULL SIZE OPENING WITH WMS AT TOP OF PLENUM FOR RETURN AIR.

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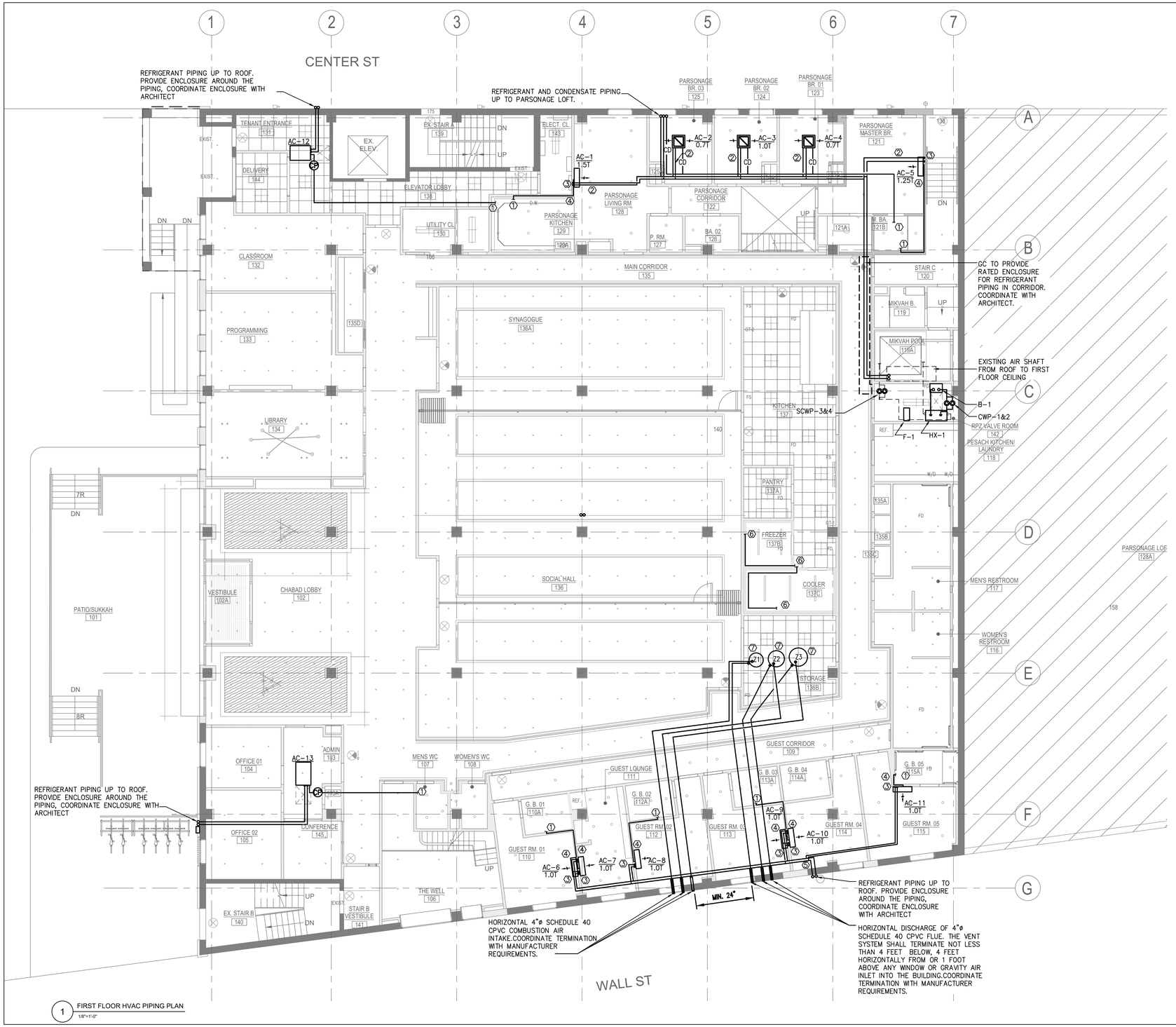
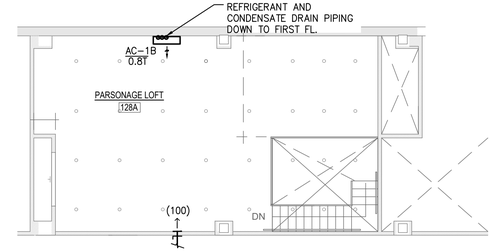
FIRST FLOOR HVAC PLAN

Drawing No.:
M-200

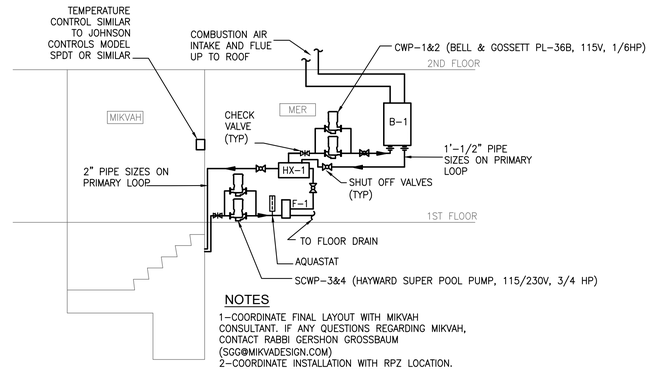


1 FIRST FLOOR HVAC PIPING PLAN
1/8"=1'-0"



SEE FIRST FLOOR HVAC PLAN FOR CONTINUATION

2 PARSONAGE LOFT HVAC PIPING PART PLAN
1/8"=1'-0"



NOTES

1–COORDINATE FINAL LAYOUT WITH MIKVAH CONSULTANT. IF ANY QUESTIONS REGARDING MIKVAH, CONTACT RABBI GERSHON GROSSBAUM (SGG@MIKVADESIGN.COM)
2–COORDINATE INSTALLATION WITH RPZ LOCATION. BOILER SHALL BE HUNG FROM THE WALL. HEAT EXCHANGER, FILTER AND PUMPS SHALL BE INSTALLED ON CONCRETE PADS.

KEYED - IN NOTES

1. 1" CD TO FUNNEL DRAIN UNDER SINK. SEE PLUMBING DRAWINGS FOR LOCATION. INSTALL CONDENSATE DRAIN PIPING INSIDE THE WALL.
2. PROVIDE REFRIGERANT PIPE BETWEEN (CU–1) AND AIR HANDLING UNITS. ALL REFRIGERANT PIPE SIZES SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE PIPE ROUTING IN FIELD WITH OTHER TRADES AND EXISTING CONDITIONS AND NEW INTERIOR LAYOUT.
3. DROP AND CONCEAL REFRIGERANT PIPING INSIDE THE WALL FOR WALL MOUNTED AC UNIT INSTALLATION.
4. CONDENSATE DRAIN PIPIN SHALL BE INSTALLED AND ROUTED TO THE DISCHARGE POINT INSIDE THE WALL.
5. PROVIDE REFRIGERANT PIPE BETWEEN (CU–2) AND AIR HANDLING UNITS. ALL REFRIGERANT PIPE SIZES SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS. COORDINATE PIPE ROUTING IN FIELD WITH OTHER TRADES AND EXISTING CONDITIONS AND NEW INTERIOR LAYOUT.
6. CONTRACTOR TO PROVIDE 1" CONDENSATE DRAIN FROM REFRIGERATION EVAPORATORS AND SPILL INTO NEAREST FLOOR DRAIN. INSULATE AND SEAL THE DRAIN LINE WHERE IT PASSED THROUGH THE WALL. FREEZER COMPARTMENT DRAIN LINES MUST HAVE HEAT TAPE WRAPPED AROUND THE COPPER DRAIN LINE AND SHALL HAVE INSULATION TUBING. DO NOT LOCATE ANY P–TRAPS WTHIN THE FREEZER SPACE. PROVIDE FUNNEL ABOVE THE FLOOR DRAIN TO PREVENT SPLASHING OF WATER.
7. PROVIDE NEUTRALIZER KIT FOR WATER HEATERS. THE VENT SHALL BE INSTALLED WITH SLOPE (AT LEAST ¼" DROP PER LINEAR FOOT) DOWNWARD TOWARD THE WATER HEATER TO ALLOW PROPER DRAINAGE OF ACCUMULATED CONDENSATION. THE LOWEST POINT OF THE VENTING SYSTEM SHALL ALSO HAVE A MEANS FOR COLLECTION AND DISPOSAL OF CONDENSATE. SPILL 1" CD TO FLOOR DRAIN IN STORAGE ROOM.

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Project:
CHABAD DOWNTOWN

30 WALL STREET
BINGHAMTON, NY 13901

No:	Description:	Date:
	Revisions:	
06	100% CD SET / BID AND PERMIT	08/19/25
05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
02	ISSUED FOR PROGRESS	12/01/23
01	ISSUED FOR REVIEW	10/05/23

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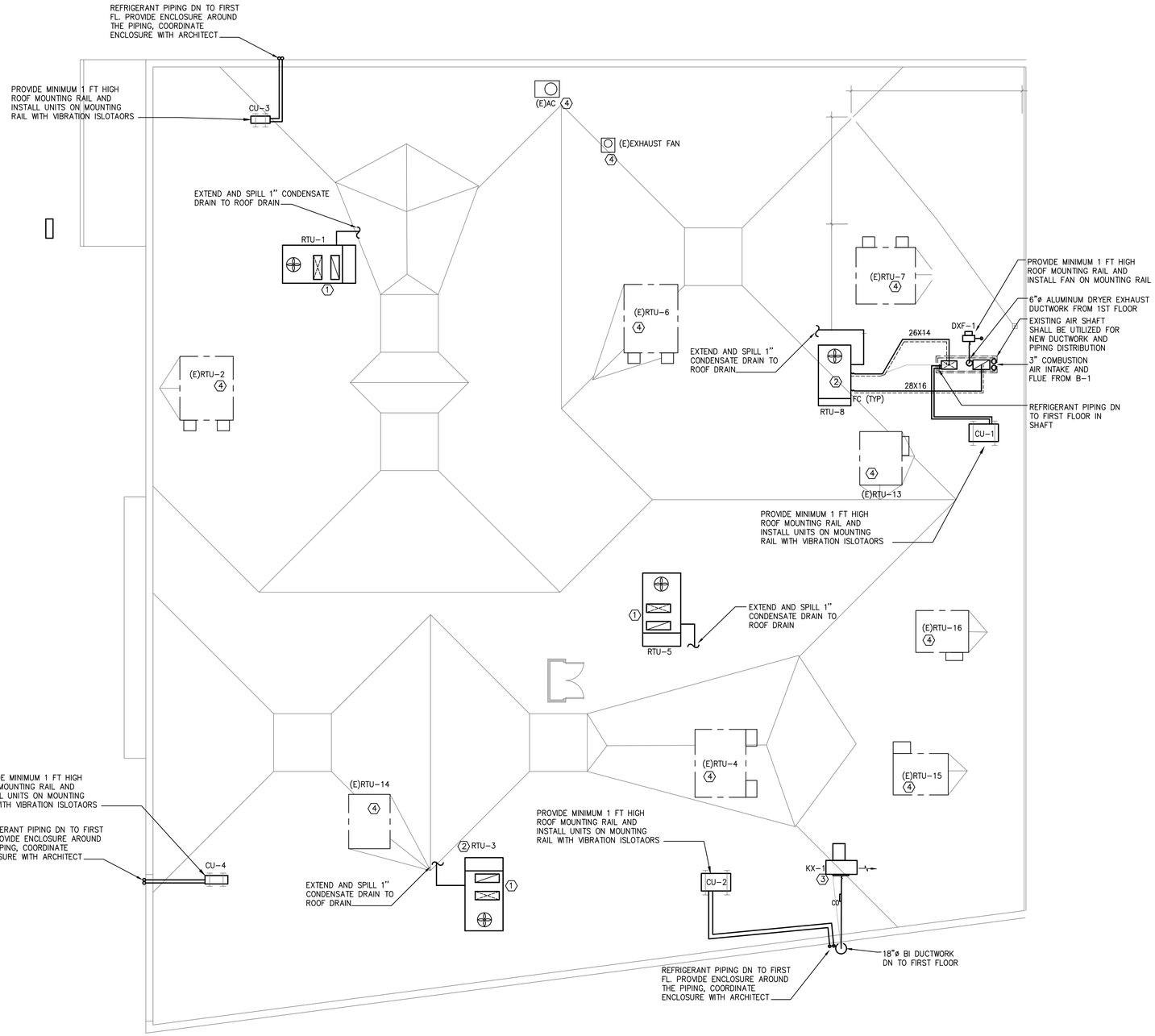
Sheet Title:
FIRST FLOOR HVAC PIPING PLAN

Drawing No.:
M-201



GENERAL NOTES:

1–ALL ROOFING WORK SHALL BE DONE BY ROOFING CONTRACTOR.

2–PROVIDE 1" ACOUSTICAL LINING ON SUPPLY AND RETURN DUCTWORK 15FT DOWNSTREAM OF RTU UNITS.

3–ALL 90 DEGREE DUCTWORK TURNS SHALL BE PROVIDED VIA TURNING VANES.

KEYED–IN NOTES:

(1) CONTRACTOR SHALL PROVIDE NEW CURB OR PROVIDE UNIT WITH ROOF CURB ADAPTER. CONTRACTOR TO COORDINATE WITH TRANE FOR EXISTING ROOF CURB DIMENSIONS, ETC. CONTRACTOR SHALL CONNECT NEW SUPPLY AND RETURN OPENING WITH EXISTING SUPPLY AND RETURN RISER.

(2) CONTRACTOR SHALL PROVIDE NEW STEEL DUNNAGE FOR NEW ROOFTOP UNIT AND COORDINATE WITH STRUCTURAL ENGINEER.

(3) CONTRACTOR SHALL PROVIDE NEW EQUIPMENT ROOF CURBS AS REQUIRED TO SUPPORT FAN. EXHAUST DUCTWORK TERMINATION SHALL BE MINIMUM 40 INCHES ABOVE ROOF. THE EXHAUST FLOW SHALL BE DIRECTED AWAY FROM THE SURFACE OF THE ROOF AND SHALL BE 10 FT AWAY FROM ANY OUTSIDE AIR INTAKE OPENING.

(4) THE ENTIRE ROOF SURFACE WILL BE RAISED TO ACCOMMODATE NEW ROOF INSULATION. CONTRACTOR TO RESET EXISTING UNITS ON EXISTING ROOF CURB AS REQUIRED OR PROVIDE NEW CURB AS NEEDED. PROVIDE ALTERNATE PRICING FOR THIS SCOPE OF WORK.

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Sheet Title:
ROOF HVAC PLAN

Drawing No.:
M-202

HVAC ROOFTOP UNIT SCHEDULE

GENERAL				FAN DATA					COOLING COIL DATA						HEATING DATA (NAT.GAS)				ELECTRICAL DATA						
MARK	MANUFACTURER	MODEL No.	SERVICE	CFM	MIN. O.A.	RPM	E.S.P.	H.P.	TOTAL MBH	SENS. MBH	EDB °F	EWB °F	LDB °F	LWB °F	INPUT, MBH	OUTPUT, MBH	EAT °F	LAT °F	VOLTS	Ph	MCA	MOP	PROPOSED EER + IEER (SEER)	REQUIRED EER + IEER (SEER)	NET UNIT WEIGHT (LBS)
RTU–1	TRANE	YHJ150B3S0H	FIRST FLOOR	5000	800	1764	1.5	4.6	144.7	121.7	77.8	63.4	56.9	54.4	250.00	202.50	60.4	96.9	208	3	67	90	10.8	10.8	1373
RTU–3	TRANE	YHJ150A3S0M	FIRST FLOOR	4350	700	1655	1.6	4.6	147.7	101.4	78.0	65.5	57.3	54.8	250.00	202.50	60.4	96.9	208	3	64	90	10.8	10.8	1373
RTU–5	TRANE	YHJ150A3S0M	FIRST FLOOR	4700	700	1655	1.6	4.6	147.7	101.4	78.0	65.5	57.3	54.8	250.00	202.50	60.4	96.9	208	3	64	90	10.8	10.8	1373
RTU–8	TRANE	THC067E3R0A	FIRST FLOOR	1600	200	1023	1.0	1.0	56.1	37.6	77.3	65.5	56.1	54.2	–	–	–	–	208	3	33	45	17.20	14.0	953

NOTES:

1) REFER TO ROOF PLAN (M–202) FOR UNIT SUPPORT SUPPORT – BY HVAC CONTRACTOR.
2) UNIT SHALL HAVE MICROPROCESSOR AND ALL CONTROLS REQUIRED TO MAKE UNIT A FULLY FUNCTIONING STAND–ALONE SYSTEM E.I.: MOTORIZED OUTSIDE AIR DAMPER, DIFFERENTIAL ENTHALPY CONTROLLER FOR ECONOMIZER OPERATION, AUTOMATIC PROGRAMMABLE, ZONE SENSOR WITH NIGHT SET–BACK OPERATION, ETC. UNIT CONTROLS SHALL BE ABLE TO PERFORM THE FOLLOWING FUNCTIONS: COOLING, HEATING, ECONOMIZER WITH POWERED EXHAUST, NIGHT SET–BACK DURING WINTER CYCLE (SET SPACE SENSOR AT 55'F FOR NIGHT OPERATION).
3) UNIT MANUFACTURER SHALL PROVIDE UNIT WITH DISCONNECT SWITCH.
4) PROVIDE WITH 100% INTEGRATED ECONOMIZER
5) PROVIDE WITH 100% POWER EXHAUST.
6) PROVIDE UNIT WITH 2" STANDARD FILTER
7) PROVIDE UNITS WITH POWERED 15A GFCI RECEPTACLE OUTLET FOR SERVICING OF THE UNIT. THE RECEPTACLE SHALL BE CONNECTED TO THE LINE SIDE OF THE EQUIPMENT DISCONNECTING MEANS.
8) HVAC/BALANCING CONTRACTOR SHALL ADJUST MOTORIZED OUTSIDE AIR DAMPER TO PROVIDE INDICATED OUTSIDE AIR.
9) THE SUPPLY FAN MOTOR TYPE FOR RTU–3 AND RTU–5 SHALL BE MULTIPLE ZONE VAV. CONTRACTOR TO PROVIDE DUCT PRESSURE SENSOR ON SUPPLY DUCTWORK OF THE RTU–3 AND RTU–5 TO HAVE A PROPER VAV OPERATION. THE SUPPLY FAN MOTOR TYPE FOR RTU–1 AND RTU–8 SHALL BE CONSTANT VOLUME.
10) THERMOSTATS FOR THE ROOFTOP UNITS SHALL HAVE INTERNET CONNECTION TO ACCESS THRU COMPUTER OR PHONE.

VRF AIR–COOLED CONDENSING UNIT SCHEDULE

MARK	LOCATION	TOTAL COOLING (MBH)	TOTAL HEATING (MBH)	REFRIGERANT TYPE	FAN			COMPRESSOR		ELECTRICAL DATA			PROPOSED EER + IEER (SEER)	REQUIRED EER + IEER (SEER)	PROPOSED COP (HSPF)	REQUIED COP (HSPF)	MANUFACTURER AND MODEL NUMBER	NET UNIT WEIGHT (LBS)	REMARKS
					QTY	TYPE	TOTAL AIRFLOW (CFM)	QTY	TYPE	VOLTS/HZ/PH	MCA	MOP							
CU–1	ROOF	72	80	R410A	1	DIRECT	6,000	1	INVERTER SCROLL	208/60/3	32	50	12.2	11.00	4.05	3.30COP	MITSUBISHI PUHY–EP72TNU–A1	512	1,2,3,4
CU–2	ROOF	72	80	R410A	1	DIRECT	6,000	1	INVERTER SCROLL	208/60/3	32	50	12.2	11.0	4.05	3.30COP	MITSUBISHI PUHY–EP72TNU–A1	512	1,2,3,4
CU–3	ROOF	18	22	R410A	1	DIRECT	512	1	INVERTER SCROLL	208/60/3	11	28	–	–	3.8	–	MITSUBISHI PUZ–A18NKA7	60	1,2,3,4
CU–4	ROOF	30	34	R410A	1	DIRECT	742	1	INVERTER SCROLL	208/60/3	19	26	19.0	–	3.76	–	MITSUBISHI PUZ–A30NHA7	69	1,2,3,4

NOTES:
1) PROVIDE CONTROL SYSTEM, WIRING, DEVICES AS PER MANUFACTURER DIAGRAMS AND REQUIREMENTS.
2) COORDINATE POWER REQUIREMENTS WITH ELECTRICAL CONTRACTOR.
3) ALL CONTROL WIRING – BY HVAC CONTRACTOR.
4) PROVIDE DISCONNECT SWITCHES. (BY ELECTRICAL CONTRACTOR)

FAN SCHEDULE

GENERAL				FAN DATA					MOTOR		DRIVE TYPE	NET UNIT WEIGHT (LBS)	REMARKS
MARK	MANUFACTURER	MODEL No.	LOCATION	FAN TYPE	MAX. SONES	AIR FLOW RATE (CFM)	EXT. S.P. IN H_2O	MAX. RPM	MOTOR SIZE	VOLT/ PHASE			
TX–1	GREENHECK	BSQ–130HP–3	RESTROOMS	INLINE	11.6	850	1.0	1616	1/3HP	115/1	BELT	78	1,2,3,4
TX–2	GREENHECK	SQ–98–VG	RESTROOMS	INLINE	9.9	250	0.7	1435	1/4HP	115/1	DIRECT	40	1,2,3,4
TX–3	GREENHECK	SQ–97–VG	RESTROOMS	INLINE	10.1	120	0.6	1418	1/4HP	115/1	DIRECT	40	1,2,3,4
TX–4	GREENHECK	SQ–97–VG	RESTROOMS	INLINE	13.0	200	0.6	1626	1/4HP	115/1	DIRECT	40	1,2,3,4
KX–1	GREENHECK	USF–16	KITCHEN	UTILITY	–	2750	1.6	1750	1 1/2HP	208/3	BELT	208	3,5,7,8,9
HX–1	GREENHECK	SQ–130–VG	KITCHEN	INLINE	7.3	600	0.6	1221	1HP	208/3	DIRECT	71	1,3,6
DXF–1	LFS SYSTEM	DEF–004	ROOF	ROOF	–	230	1.0	1950	1/2 HP	120/1	DIRECT	35	10,11
GX–1	GREENHECK	SQ–97–VG	MIKVAH	INLINE	8.5	400	0.6	1607	1/6HP	115/1	DIRECT	50	1,3,4,12

NOTES:
1. SUPPORT FROM BUILDING STRUCTURE WITH VIBRATION ISOLATION RODS.
2. FAN SHALL BE ON TIME CLOCK.
3. PROVIDE WITH DISCONNECT SWITCH.
4. PROVIDE WITH BACKDRAFT DAMPER.
5. PROVIDE STRUCTURAL SUPPORTS AND PLATFORM FOR UTILITY TYPE FAN. INSTALL WITH SPRING VIBRATION ISOLATORS.
6. CONTRACTOR TO PROVIDE HOA CONTROLLER AS VG SPEED OPTION TO ALLOW FOR 0–10 VDC INPUT SIGNAL TO MODULATE FAN SPEED BASED ON HOOD SPEED REFERENCE (160CFM, 250CFM, 395CFM, 600CFM).
7. FAN SHALL BE UL LISTED FOR KITCHEN GREASE EXHAUST OPERATION.
8. PROVIDE ALUMINUM DRIP PAN UNDER FAN.
9. ALL WIRING BETWEEN KX, MAU FAN AND HOOD CONTROL PANEL BY ELECTRICAL CONTRACTOR.
10. FAN SHALL BE PROVIDED WITH VARIABLE SPEED MOTOR.
11. PROVIDE L150 PRESSURE CONTROL AND PRESSURE SENSOR ON MAIN DUCTWORK AS NEEDED FOR MODULATING EXHAUST SYSTEM. CONTACT CHIMNEY DESIGN SOLUTIONS AT (800) 685–7077
12. GENERAL EXHAUST FAN SHALL BE CONTROLLED BY HUMIDISTAT IN MIKVAH.

VAV UNIT SCHEDULE – TRANE CO.

MARK	SERVICE	MANUFACTURER/ MODEL NO.	PRIMARY AIR CFM		INLET DIA.	ELECTRICAL COIL		REMARKS
			MAX	MIN		BTU/H	KW	
VAV–1	1ST FLOOR	TRANE VCCF–12	1350	625	12	–	–	1–7
VAV–2	1ST FLOOR	TRANE VCCF–14	1790	895	16	–	–	1–7
VAV–3	1ST FLOOR	TRANE VCCF–12	1200	1200	14	–	–	1–7
VAV–4	1ST FLOOR	TRANE VCCF–6	300	150	8	–	–	1–7
VAV–5	1ST FLOOR	TRANE VCCF–12	1560	780	14	–	–	1–7
VAV–6	1ST FLOOR	TRANE VCCF–12	1820	910	14	–	–	1–7
VAV–7	1ST FLOOR	TRANE VCCF–12	700	700	12	–	–	1–7
VAV–8	1ST FLOOR	TRANE VCCF–12	300	300	8	–	–	1–7
VAV–9	1ST FLOOR	TRANE VCCF–14	825	450	14	–	–	1–7
VAV–10	1ST FLOOR	TRANE VCCF–10	585	300	10	–	–	1–7

NOTES:
1) MIN. LENGTH OF A.L. DOWNSTREAM OF BOX 7'–0".
2) ELECTRICAL: 120 V/1PH/60HZ, COORDINATE WITH ELECTRICAL CONTRACTOR.
3) ALL CONTROLS, TRANSFORMERS, ETC. SHALL BE INSTALLED BY MANUFACTURER AND SHIPPED FULLY ASSEMBLED.
4) ALL BOXES TO BE DOUBLE WALL CONSTRUCTION.
5) HVAC CONTRACTOR SHALL COORDINATE WITH TRANE FOR RIGHT HAND OR LEFT HAND CONTROL/ACCESS REQUIREMENTS.
6) ALL BOXES SHALL BE FACTORY SHRINK WRAPPED FOR PROTECTION.
7) UNITS TO BE PROVIDED WITH POWER DISCONNECT SWITCH BY MANUFACTURER'S.
8) VAV–3, VAV–7 AND VAV–8 SHALL BE USED FOR CONSTANT AIR VOLUME BOX, NOT TO EXCEED MAXIMUM BALANCED CFM WHEN OTHER VAV BOXES ARE GETTING CLOSED.

VRF INDOOR UNIT SCHEDULE

SYSTEM	MARK	TOTAL AIRFLOW (CFM)	MIN OA (CFM)	ESP IN.WG	FILTER TYPE	COOLING CAPACITY (MBH)	HEATING CAPACITY (MBH)	ELECTRICAL DATA				MANUFACTURER AND MODEL NUMBER	NET UNIT WEIGHT (LBS)
								VOLTS/HZ/PH	MCA	FLA	MOP		
CU–1	AC–1A	438	–	–	WASHABLE	18	20	208/60/1	0.24	0.13	15	MITSUBISHI PKFY–P18NLMU–ER1.TH	28.4
	AC–1B	237	–	–	WASHABLE	8	9	208/60/1	0.2	0.19	15	MITSUBISHI PKFY–P08NLMU–E	24.5
	AC–2	315	–	–	WASHABLE	8	9	208/60/1	0.28	0.22	15	MITSUBISHI PLFY–P08NFMU–ER1.TH	30
	AC–3	390	–	–	WASHABLE	12	13.5	208/60/1	0.29	–	15	MITSUBISHI PLFY–P12NFMU–ER1.TH	30
	AC–4	315	–	–	WASHABLE	8	9	208/60/1	0.28	0.22	15	MITSUBISHI PLFY–P08NFMU–ER1.TH	30
	AC–5	353	–	–	WASHABLE	15	17	208/60/1	0.24	–	15	MITSUBISHI PKFY–P15NLMU–ER1.TH	30
CU–2	AC–6	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
	AC–7	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
	AC–8	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
	AC–9	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
	AC–10	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
	AC–11	297	–	–	WASHABLE	12	13.5	208/60/1	0.24	0.19	15	MITSUBISHI PKFY–P12NLMU–ER1.TH	30
CU–3	AC–12	512	90	–	WASHABLE	18	22	208/60/1	2.25	1.8	28	MITSUBISHI PEAD–A18AA9	60
CU–4	AC–13	742	100	–	WASHABLE	30	34	208/60/1	2.73	2.18	26	MITSUBISHI PEAD–A30AA7	69

NOTES:
1) PROVIDE DISCONNECT SWITCHES. (BY ELECTRICAL CONTRACTOR)
2) HVAC CONTRACTOR SHALL PROVIDE REFRIGERANT PIPING, BRANCH JOINT PIPES, ACCESSORIES, ETC, AS REQUIRED AS PER MANUFACTURER RECOMMENDATIONS.
3) REFRIGERANT PIPING SIZES FOR ALL UNITS SHALL BE COORDINATED WITH MANUFACTURER'S RECOMMENDATION.
4) PROVIDE MANUFACTURERS STANDARD WASHABLE FILTERS.
5) PROVIDE COMPLETE SYSTEM PROGRAMMING.
6) SUPPORT CASETTE UNITS AND HORIZONTAL CEILING UNIT FROM BUILDING STRUCTURE WITH VIBRATION ISOLATION AND THREADED RODS.
7) SUPPORT WALL MOUNTED AC UNITS AS PER MANUFACTURER INSTALLATION DETAILS.
8) PROVIDE CASETTE UNITS WITH INTERNAL CONDENSATE PUMPS.
9) INTERLOCK AC–12 OPERATION WITH MD–2.
10) INTERLOCK AC–13 OPERATION WITH MD–3.

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Sheet Title:
HVAC SCHEDULES-I

Drawing No.:
M-600

MAKE-UP AIR UNIT SCHEDULE

DESIGNATION	SERVES	MANUFACTURER	MODEL #	CFM	RPM	ESP	ELECTRICAL DATA				BURNER DATA – NATURAL GAS			WEIGHT LBS.
							HP	VOLTS/PHASE	MCA	MOCP	TEMP RISE	MBH INPUT	MBH OUTPUT	
MAU–1	FIRST FL. KITCHEN EXH. HOODS	ECON–AIR	EA2–D.250–20D	2200	1240	1.0	1.5	208V./3ø	8.3	15	71	172.6	158.8	787

NOTES:
1. PROVIDE WITH CONTROL CENTER, FREEZE PROTECTION, HEAT INLET AIR SENSOR, DIRTY FILTER SWITCH.
2. FURNISH UNIT WITH DISCHARGE AIR TEMPERATURE CONTROLLER AND OUTDOOR THERMOSTAT.
   SET LEAVING AIR TEMPERATURE THERMOSTAT AT 55°F.
   SET OUTDOOR THERMOSTAT TO LOCK OUT HEAT WHEN AMBIENT TEMPERATURE IS ABOVE 55°F.
3. PROVIDE WITH ELECTRONIC FULLY MODULATING GAS CONTROL WITH DUCT THERMOSTAT.
4. ALL WIRING BETWEEN FAN, VFD AND HOOD CONTROL PANEL BY ELECTRICAL CONTRACTOR.
5. NATURAL GAS DIRECT–FIRED, FULLY MODULATING BURNER.
6. SAFETY DISCONNECT SWITCH BY ELECTRICAL CONTRACTOR.
7. OPERATING GAS MANIFOLD PRESSURE IS BETWEEN 7"–14" W.C.
8. PROVIDE WITH MERV8 FILTERS.
9. PROVIDE WITH GAS PRESSURE REGULATING VALVE
10. INTERLOCK MAU OPERATION WITH MD–1.

KITCHEN EXHAUST HOOD SCHEDULE (FOR REFERENCE ONLY)

MARK	MANUFACTURER	HOOD TYPE	MODEL	HOOD DIMENSIONS (IN.)			HOOD CONSTR.	EXHAUST						SUPPLY					GREASE FILTRATION DETAILS				TOTAL WEIGHT LBS.	REMARKS
				LENGTH	WIDTH	HEIGHT		TOTAL CFM	COLLAR(S)					MUA CFM	COLLAR(S)				TYPE	QTY	SIZE (IN.)			
									HEIGHT	DIA	LENGTH	CFM	S.P.		HEIGHT	DIA	LENGTH	CFM			L	H		
KH–1	ECON–AIR	I	5424 EX–2–PSP–F	144	18	6	430 SS 100%	2750	4"	16"	–	2750	–0.718	2200	6"	16"	–	2200	CAPTRATE SOLO FILTER	2	20	20	647	1,2,3,4,5,6,7

NOTES
1. UL 710 LISTED W/ OUT EXHAUST FIRE DAMPER – UL #R25625
2. HOOD TO BE FURNISHED BY KITCHEN EQUIPMENT CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR.
3. WET TYPE FIRE EXTINGUISHING SYSTEM SHALL BE IN COMPLETE CONFORMANCE WITH NFPA96, AND LOCAL STANDARDS – TO BE PROVIDED BY FIRE SUPPRESSION CONTRACTOR.
4. HOOD SHALL HAVE FACTORY FITTED CONDENSATE BAFFLES, GUTTER AND DRAIN
5. FACTORY MOUNTED EXHAUST COLLAR(S)
6. ROUTE 3/4" COPPER CONDENSATE DRAIN LINE TO FLOOR DRAIN – BY MECHANICAL CONTRACTOR.
7. KITCHEN EQUIPMENT SUPPLIER SHALL PROVIDE CONTROL PANEL. PANEL SHALL BE FACTORY PREWIRED AND TESTED FOR MUA FAN; KX FAN; SHUNT TRIP; FIRE SUPRESSSION SYSTEM; GAS SHUT OFF VALVE; MANUAL PULL STATION; ETC.

AIR DEVICE SCHEDULE (TITUS)

MARK	MODEL	CFM RANGE	NECK SIZE	FACE AREA	REMARKS
SUPPLY REGISTER	300RL	0–200	10 X 6	–	1
SUPPLY REGISTER	300RL	201–450	16 X 6	–	1
EXHAUST/ TRANSFER GRILLE	350RL	VARIES	VARIES	–	2,3
SUPPLY DIFFUSER	OMNI	0–99	6" DIA	12" x 12"	1,2
SUPPLY DIFFUSER	OMNI	100–210	8" DIA	24" x 24"	1,2
SUPPLY DIFFUSER	OMNI	211–330	10" DIA	24" x 24"	1,2
SUPPLY DIFFUSER	OMNI	331–475	12" DIA	24" x 24"	1,2
SUPPLY DIFFUSER	OMNI	476–630	14" DIA	24" x 24"	1,2
SUPPLY DIFFUSER	OMNI	631–850	15" DIA	24" x 24"	1,2
RETURN GRILLE	350RL	–	–	24" x 24"	

NOTES:
1. PROVIDE AIR OUTLETS WITH OPPOSED BLADE DAMPER.
2. ALL DIFFUSERS AND GRILLES AT GWB CEILING SHALL BE INSTALLED IN TITUS RAPID MOUNT FRAME AND SHALL BE USED FOR ACCESS ABOVE H.C.
3. FOR SIZES SEE FLOOR PLAN.

CEILING UNIT HEATER SCHEDULE

CH–1 AND CH–2
INDEECO CDIR SERIES CEILING MOUNTED RECESSED UNIT HEATER.
208/3/60, 3 KW, 9 AMP, 310 CFM, 31 LBS
PROVIDE WITH BUILT IN THERMOSTAT.
PROVIDE WITH DISCONNET SWITCH.
COORDINATE FINISH WITH ARCHITECT
SUPPORT FROM BUILDING STRUCTURE WITH VIBRATION ISOLATORS.

CH–3
INDEECO CDIR SERIES CEILING MOUNTED RECESSED UNIT HEATER.
208/3/60, 5 KW, 14.6 AMP, 310 CFM, 31 LBS
PROVIDE WITH BUILT IN THERMOSTAT.
PROVIDE WITH DISCONNET SWITCH.
COORDINATE FINISH WITH ARCHITECT
SUPPORT FROM BUILDING STRUCTURE WITH VIBRATION ISOLATORS.

ELECTRIC BASEBOARD HEATERS

(EBB–1)
INDEECO, MODEL 906I 28" LENGTH,
ONE ELEMENT, 208V, 1PH, 750W,
2,557 BTU/HR, 250 WATTS/FT.

(EBB–2)
INDEECO, MODEL 906I 60" LENGTH,
ONE ELEMENT, 208V, 1PH, 1250W,
4,262 BTU/HR, 250 WATTS/FT.

(EBB–3)
INDEECO, MODEL 906I 72" LENGTH,
ONE ELEMENT, 208V, 1PH, 1500W,
5,115 BTU/HR, 250 WATTS/FT.

NOTES:
1. FINISH SELECTION BY ARCHITECT.
2. PROVIDE HEATERS WITH DISCONNECT SWITCH AND BUILT IN THERMOSTATS.
3. UNITS SHALL BE MOUNTED ON PEDESTALS.

SEQUENCE OF OPERATIONS

A. GENERAL NOTES
HVAC CONTRACTOR IS RESPONSIBLE TO FURNISH AND INSTALL A COMPLETE TEMPERATURE CONTROL SYSTEM WITH ALL WIRING AND COMPONENTS REQUIRED. PROVIDE FULL START–UP AND COMMISSIONING OF THE EQUIPMENT AND HVAC SYSTEMS.

B. AIR COOLED VRF SYSTEM – HEAT PUMP OPERATION

1. PROVIDE CENTRALIZED CONTROLLER (AE–200). EACH ROOM THERMOSTAT CONTROLS THE ASSOCIATED AIR HANDLING UNIT (AC) TO PROVIDE HEATING OR COOLING TO THE SPACE. THE MAIN CONTROLLER COMMUNICATES WITH EQUIPMENT AND CONTROLS THE AIR COOLED CONDENSING UNIT'S COMPRESSORS OPERATION AND HEAT/COOL MODE. SYSTEM CHANGEOVER FROM COOLING TO HEATING AND VICE VERSA WILL BE TRIGGERED AUTOMATICALLY BASED ON SPACE DEMAND OR MANUALLY BY OWNER/MANAGER.

2. THE AC UNITS WILL BE CONTROLLED BY LOCAL THERMOSTATS. UPON CALL FOR HEATING OR COOLING FROM THERMOSTATS, A SIGNAL SHALL BE SENT TO THE MAIN CONTROLLER TO ENERGIZE THE CONDENSING UNIT.

C. CH–1
HEATER SHALL BE ON DURING WINTER TIME, TO AVOID CONFLICT WITH OPERATION OF AC–12 COOLING MODE

MOTORIZED DAMPERS (MD)

GREENHECK, WITH OPPOSED BLADES,

ACTUATORS AND LINKAGE OUTSIDE OF THE AIR STREAM, MODEL VCD–33.

ACTUATORS SHALL BE BELIMO MOTORS AND OPERATORS.

LOUVERS:

RUSKIN MODEL ELF375D, EXTRUDED ALUMINUM, 4" THICK
WITH STAINLESS STEEL BIRDSCREEN WATER PROOF LOUVER.
POWDER COAT TO MATCH BUILDING STANDARD.

BOILER SCHEDULE

UNIT NO.	LOCATION	MANUFACTURER	MODEL NO.	FUEL	CAPACITY MBH		MOTOR HP BURNER FAN	WATER VOLUME GAL.	OPER. WEIGHT LBS.
					INPUT	OUTPUT			
B–1	RPZ ROOM	NAVIEN	NFB175H	NAT. GAS	175	160	15 AMP 120/1/60	4.5	150

NOTES:
1. SUPPORT FROM THE WALL, PROVIDE REQUIRED KITS.
2. FAN SHALL BE ON TIME CLOCK.
3. PROVIDE WITH DISCONNECT SWITCH.
4. PROVIDE WITH BACKDRAFT DAMPER.

HEAT EXCHANGER SCHEDULE (SHELL AND TUBE)

UNIT NO.	LOCATION	MANUFACTURER	MODEL	PRIMARY WATER			SECONDARY WATER			HEAT EXCHANGER BTU/HR.	NET WEIGHT
				FLOW RATE (GPM)	ENTERING WATER TEMP. (°F)	LEAVING WATER TEMP. (°F)	FLOW RATE (GPM)	ENTERING WATER TEMP. (°F)	LEAVING WATER TEMP. (°F)		
HX–1	RPZ ROOM	BOWMAN	EC100–5113–2C	13	97	67	26	65	95	130,000	10 LBS

NOTES:
1. INSTALL HEAT EXCHANGER ON CONCRETE PAD AS RECOMMENDED BY MANUFACTURER

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Project:
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05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
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01	ISSUED FOR REVIEW	10/05/23

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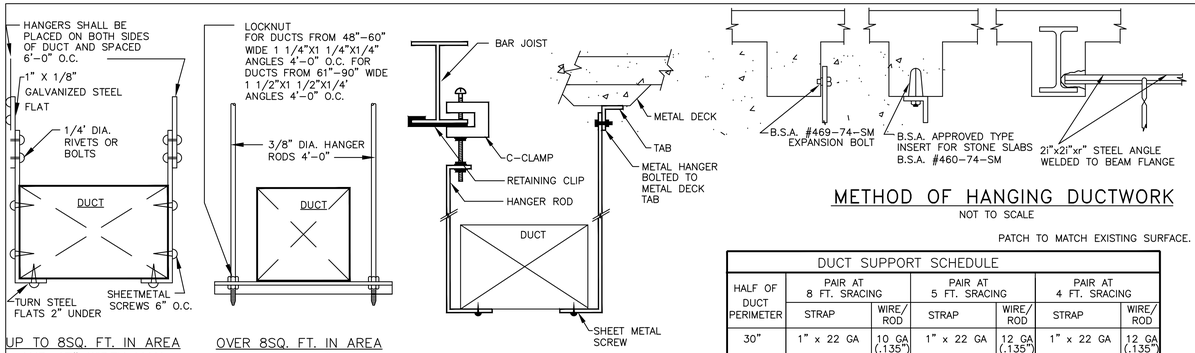
HVAC SCHEDULES-II

Drawing No.:
M-601



UP TO 8SQ. FT. IN AREA AND 47" WIDTH MAX.

OVER 8SQ. FT. IN AREA AND OVER 47" WIDE

METHOD OF HANGING DUCTWORK

NOT TO SCALE

NOTES:

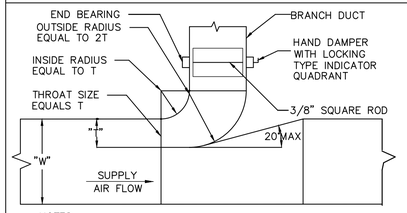
1. HANGERS SHALL BE OF METAL NOT LESS THAN 1/16" FOR DUCTS 2 SQ.FT. & LESS, AND NOT LESS THAN 1/8" FOR DUCTS LARGER THAN 2 SQ.FT.
2. WHERE CROSS-SECTIONAL AREA OF DUCT EXCEEDS 8 SQ.FT., HANGERS SHALL BE SPACED NOT MORE THAN 4 FT. ON CENTERS.
3. C-CLAMP FOR DUCTS UP TO 36" MAXIMUM DIMENSION.

PATCH TO MATCH EXISTING SURFACE.

DUCT SUPPORT SCHEDULE						
HALF OF DUCT PERIMETER	PAIR AT 8 FT. SRACING		PAIR AT 5 FT. SRACING		PAIR AT 4 FT. SRACING	
	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD
30"	1" x 22 GA	10 GA (.135")	1" x 22 GA	12 GA (.135")	1" x 22 GA	12 GA (.135")
72"	1" x 20 GA	1/4"	1" x 22 GA	1/4"	1" x 22 GA	1/4"
96"	1" x 18 GA	3/8"	1" x 20 GA	3/8"	1" x 22 GA	1/4"
120"	1" x 16 GA	3/8"	1" x 18 GA	3/8"	1" x 20 GA	1/4"
168"	1i" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 18 GA	3/8"
192"	1i" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 16 GA	3/8"

METHOD OF SUPPORTING DUCTS

NOT TO SCALE

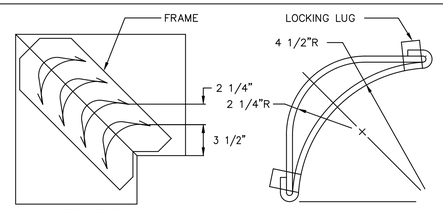


NOTES:

1. FURNISH THIS TYPE CONNECTION WHERE NOTED AND WHEN SINGLE LINE DUCTWORK IS INDICATED AS THIS FOR LOW PRESSURE BRANCHES WITH MORE THAN 700 CFM AND MEDIUM PRESSURE BRANCHES WITH MORE THAN 1000 CFM.
2. FURNISH THIS TYPE CONNECTION WITHOUT HAND DAMPER FOR ALL HIGH PRESSURE DUCTWORK BRANCHES."
3. MUST BE USED WHEN W≥ 36 .

RECTANGULAR DUCT BRANCH WITH THROAT + VOLUME DAMPER

NOT TO SCALE

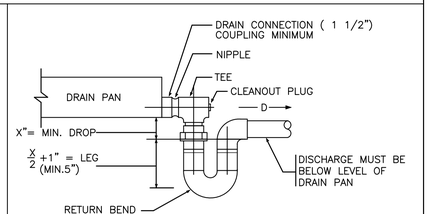


NOTES:

1. LOCKING LUGS INTEGRAL WITH VANE
2. MAXIMUM UNSUPPORTED VANE LENGTH 48"
3. FRAMES – BOLTED OR RIVETED TO ELBOW
4. VANES AND FRAMES – SAME GAUGE AS ELBOW

DOUBLE THICKNESS TURNING VANES FOR SQUARE ELBOW

NOT TO SCALE

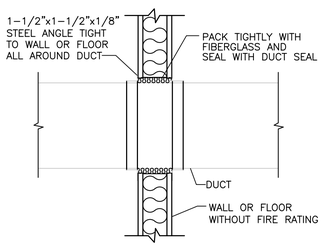


NOTES:

1. ALLOW SUFFICIENT SPACE BELOW DRAIN PAN FOR TRAP.
2. PITCH DRAIN FOR PROPER RUN-OFF.
3. MANUALLY, PRIME FILL TRAP BEFORE START-UP TO FORM INITIAL DRAIN SEAL.
4. SUPPORT LENGTHY DRAIN LINES TO PREVENT SAG AND CONDENSATE OVERFLOW.

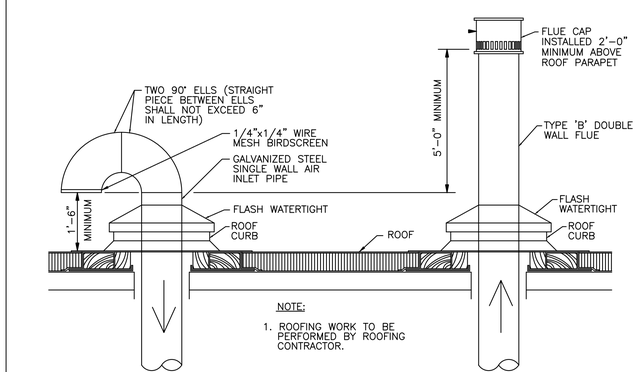
DRAIN PAN WATER SEAL PIPING RAW - THRU UNIT

NOT TO SCALE



DUCT PENETRATION THROUGH NON-FIRE RATED WALL OR FLOOR

NOT TO SCALE



NOTE:

1. ROOFING WORK TO BE PERFORMED BY ROOFING CONTRACTOR.

BOILER AIR INLET AND VERTICAL DIRECT VENT DETAIL

NOT TO SCALE

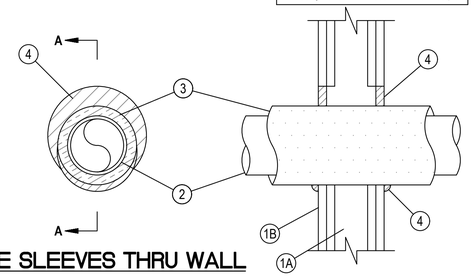
CLASSIFIED C UL US

Classified by Underwriters Laboratories, Inc. to UL 1479 and CAN/ULC-S115

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0, 3/4 and 1 Hr (See Item 3)	FT Ratings — 0, ¾ and 1 Hr (See Item 3)
L Rating At Ambient — Less Than 1 CFM/sq ft	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating At 400 F — Less Than 1 CFM/sq ft	FTH Ratings — 0, 3/4 and 1 Hr (See Item 3)
	L Rating At Ambient — Less Than 1 CFM/sq ft
	L Rating At 400 F — Less Than 1 CFM/sq ft

System No. W-L-5028

WL 5028



PIPE SLEEVES THRU WALL

N.T.S.

SECTION A-A

1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 7-1/2 in. (191 mm).
   The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrants — One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:
   A. Steel Pipe — Nom 4 in. (102 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. Copper Tubing — Nom 2 in. (51 mm) diam (or smaller) Type L (or heavier) copper tubing.
   C. Copper Pipe — Nom 2 in. (51 mm) diam (or smaller) Regular (or heavier) copper pipe.
3. Tube Insulation — Plastics+ — Min 1/2 in. (13 mm) to max 1 in. (25 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. An annular space of min 0 in. (point contact) to max 1-1/2 in. (38 mm) is required within the firestop system. The T, FT and FTH Ratings are 1 hr when the 1 in. (25 mm) thick tube insulation is used and 3/4 hr when the 3/4 in. (19 mm) thick tube insulation is used. When tube insulation thickness is less than 3/4 in. (19 mm), the T, FT and FTH Ratings are 0 Hr.
   See Plastics+ (QMFZ2) category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.
4. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum board, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe covering/gypsum board interface on both surfaces of wall.
   HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant
   *Bearing the UL Classification Mark

Hilti Firestop Systems

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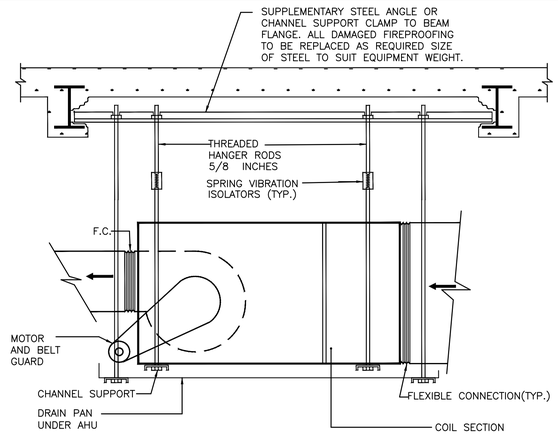
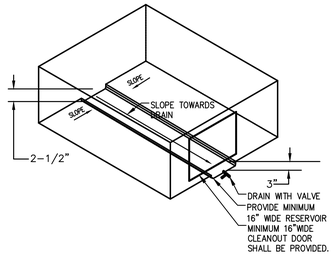


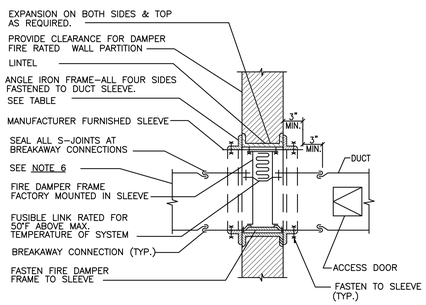
HANGING DETAIL H.V.A.C. EQUIPMENT

NOT TO SCALE



TYPICAL GREASE RESERVOIR DETAIL

NOT TO SCALE



GENERAL NOTES:

1. FIRE DAMPER TO BE U.L. LABELED N.F.P.A. 90 A.
2. N.F.P.A. APPROVED INSTALLATION DETAILS TO BE PART OF SUB-MISSION OF FIRE DAMPER FOR APPROVAL, WHICH SHALL MEET N.F.P.A. STANDARD 90 A.
3. DETAILS SHOWN ARE FOR FIRE DAMPERS IN HORIZONTAL DUCT-WORK FOR FIRE DAMPERS IN VERTICAL DUCTWORK DETAILS SIMILAR EXCEPT DAMPERS SHALL BE SPRING LOADED.
4. ACCESS DOOR IS SHOWN IN SIDE OF DUCT; IF FUSIBLE LINK IS MORE ACCESSIBLE FROM BOTTOM OF DUCT RELOCATE ACCESS DOOR.
5. U.L. APPROVED BREAKWAY SLIP JOINT CONNECTION SHALL BE USED.
6. FIRE DAMPER FOR DUCT HEIGHT LARGER THAN 24 IN. CAN BE IN AIR STREAM.
7. THE DETAIL IS FOR GUIDE ONLY INSTALL FIRE DAMPER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

ANGLE IRON TABLE	
WALL OPENING	ANGLE SIZE
UP TO 54"	1 1/2"x1 1/2"x1/8"
55" TO 84"	3"x2"x 3/16"
85" TO 120"	3"x2"x 3/16"

NOTE: RETAINING ANGLES MUST LAP STRUCTURAL OPENING 1" MIN. AND COVER CORNERS OF OPENINGS

FIRE DAMPER DETAIL

NOT TO SCALE

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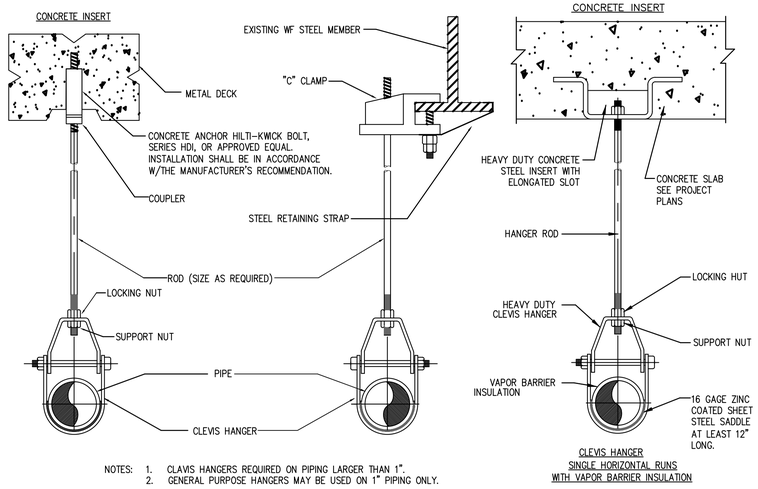
HVAC DETAILS-I

Drawing No.:
M-700

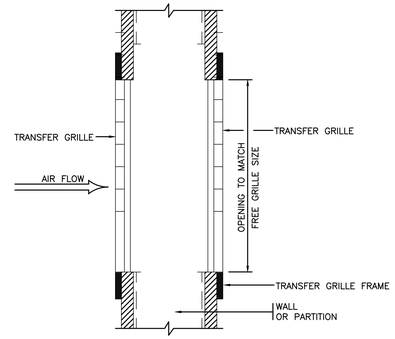


NOTES: 1. CLAVIS HANGERS REQUIRED ON PIPING LARGER THAN 1".
2. GENERAL PURPOSE HANGERS MAY BE USED ON 1" PIPING ONLY.

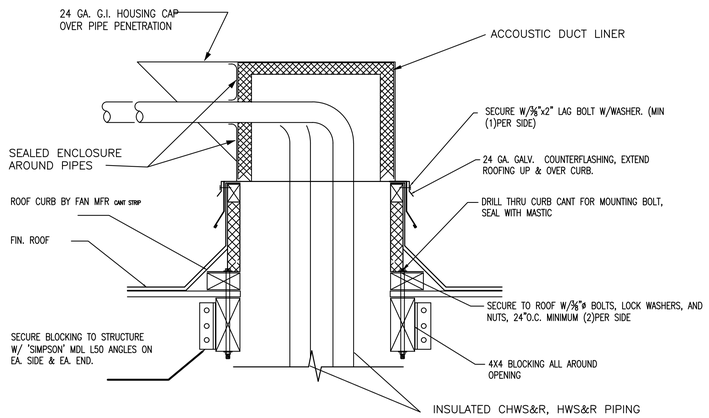
HANGER ROD SCHEDULE			
PIPE SIZE	ROD SIZE	PIPE SIZE	RODE SIZE
UP TO 2"	3/8" DIA.	4" THRU 5"	5/8" DIA.
2-1/2" THRU 3"	1/2" DIA.	6" THRU 12"	7/8" DIA.

HANGER ROD SPACING											
PIPE SIZE	1"	1-1/4"	1-1/2"	2"	2"	3"	4"	5"	6"	8"	10"	12"
MAX ALLOWABLE SPACING	7 FT.	8 FT.	9 FT.	10 FT.	11 FT.	12 FT.	14 FT.	16 FT.	17 FT.	19 FT.	22 FT.	13 FT.

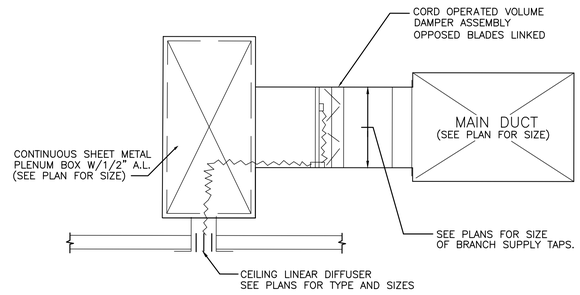
TYPICAL PIPING HANGER DETAILS
NOT TO SCALE



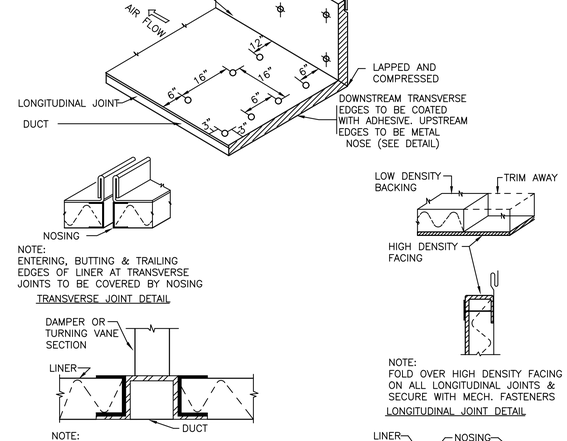
DETAIL OF TRANSFER GRILLE
NOT TO SCALE



PIPE THRU ROOF DETAIL

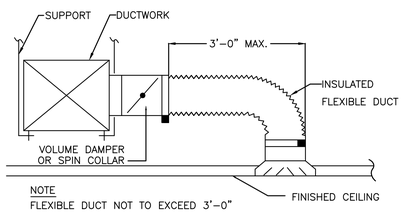


TYPICAL CEILING LINEAR DIFFUSER
NOT TO SCALE



GENERAL NOTES:
1. NOSING ATTACHED TO DUCT BY RIVETS, SCREWS OR WELDS.
2. NOSING : 24 GA. UP TO 48", OVER 48", SAME GA. AS DUCT

ACOUSTICAL DUCT LINER DETAIL
NOT TO SCALE



TYPICAL FLEXIBLE DUCT CONNECTION DETAIL
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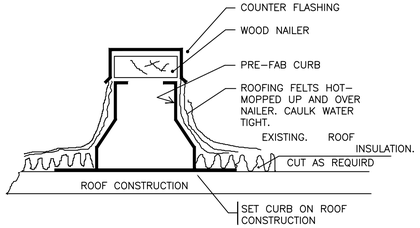

ROOF CURB DETAIL
NOT TO SCALE

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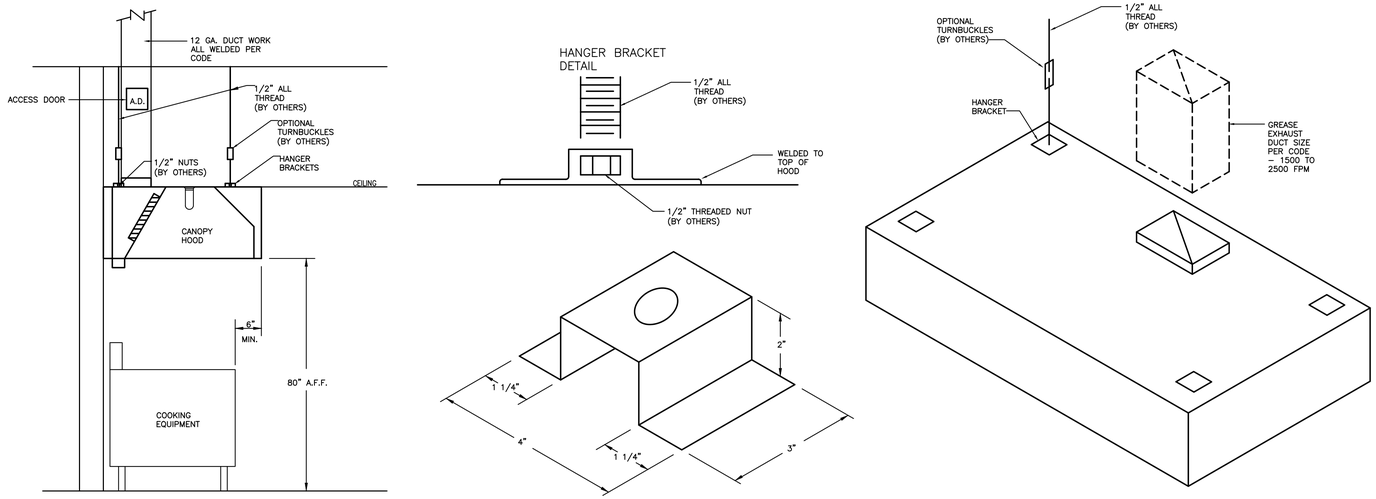
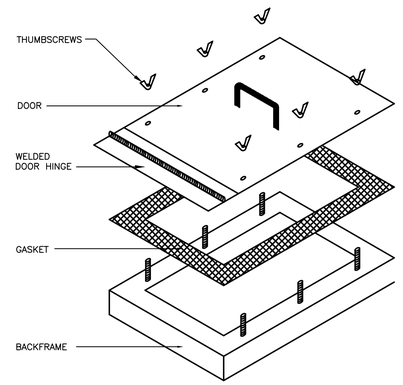


HOOD INSTALLATION DETAILS

NOT TO SCALE



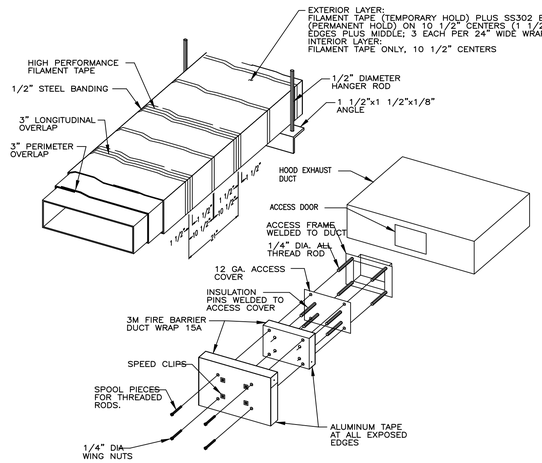
NOTES:

1. ACCESS DOOR IS TO BE DUCTMATE ULTIMATE DOOR II OR EQUAL.
2. ACCESS DOOR IS TO BE U.L. LISTED # 65X3.
3. ACCESS DOOR IS TO MEET OR EXCEED THE REQUIREMENTS OF NFPA 96, 2008 EDITION

AT ALL LOCATIONS REQUIRED BY LOCAL CODE.

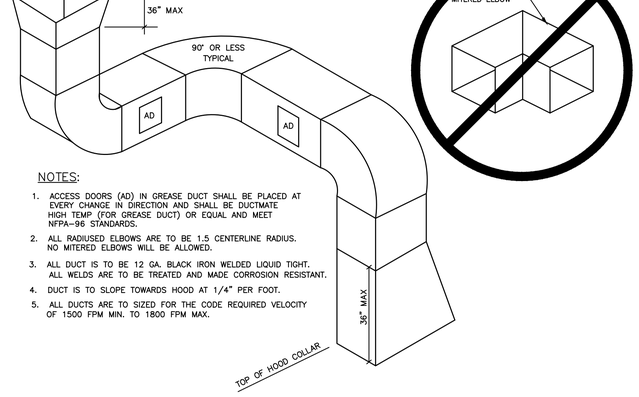
GREASE DUCT ACCESS DOOR DETAIL

NOT TO SCALE



GREASE DUCT WRAP DETAIL

NOT TO SCALE

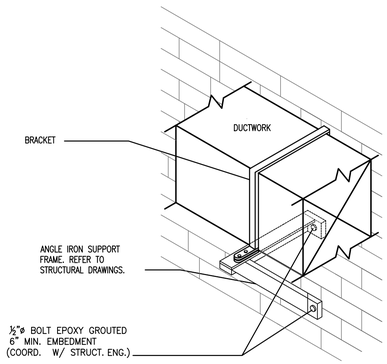


NOTES:

1. ACCESS DOORS (AD) IN GREASE DUCT SHALL BE PLACED AT EVERY CHANGE IN DIRECTION AND SHALL BE DUCTMATE HIGH TEMP (FOR GREASE DUCT) OR EQUAL AND MEET NFPA-96 STANDARDS.
2. ALL RADIUSED ELBOWS ARE TO BE 1.5 CENTERLINE RADIUS. NO MITERED ELBOWS WILL BE ALLOWED.
3. ALL DUCT IS TO BE 12 GA. BLACK IRON WELDED LIQUID TIGHT. ALL WELDS ARE TO BE TREATED AND MADE CORROSION RESISTANT.
4. DUCT IS TO SLOPE TOWARDS HOOD AT 1/4" PER FOOT.
5. ALL DUCTS ARE TO SIZED FOR THE CODE REQUIRED VELOCITY OF 1500 FPM MIN. TO 1800 FPM MAX.

TYP. GREASE DUCT DETAIL

NOT TO SCALE



NOTE: MOUNT ASSEMBLY AT TOP AND BOTTOM OF RISER

TYPICAL WALL SUPPORT DETAIL

NOT TO SCALE

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No:	Description:	Date:
06	100% CD SET / BID AND PERMIT	08/19/25
05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
02	ISSUED FOR PROGRESS	12/01/23
01	ISSUED FOR REVIEW	10/05/23

Revisions:

Job No: 10015
Scale: AS SHOWN
Date: 10/02/23
Drawn: SC

Sheet Title:
HVAC DETAILS-III

Drawing No.:
M-702

PART 1 – GENERAL

1.1 GENERAL

A. THE WORK OF THIS SECTION SHALL CONFORM TO THE REQUIREMENTS OF THE GENERAL AND SPECIAL CONDITIONS OF THE CONTRACT AND BASED ON THE REQUIREMENTS IN THE LATEST EDITION OF AIA DOCUMENTS. THEY SHALL BE ADHERED TO WHEREVER APPLICABLE UNLESS OTHERWISE INDICATED SPECIFICALLY ON THE CONTRACT DRAWINGS WHICH ARE PART OF THIS CONTRACT.

B. BIDDER SHALL REVIEW ALL CONSTRUCTION DOCUMENTS ASSOCIATIED WITH THIS PROJECT, INCLUDING GENERAL CONSTRUCTION, DEMOLITION, ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND SPRINKLER PLANS AND SPECIFICATIONS. IF A CONFLICT OCCURS IN THE BID SPECIFICATIONS AND/OR ON THE DRAWINGS, THE MORE STRINGENT SITUATION SHALL APPLY.

C. BIDDERS SHALL FAMILIARISE THEMSELVES WITH PROPOSED WORK AND WITH ALL EXISTING CONDITIONS. BEFORE SUBMIITING PROPOSALS. BIDDERS SHALL VISIT AND CAREFULLY EXAMINE AREAS AFFECTED BY PROPOSED WORK AND THE DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THIS WORK. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT, OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ENGINEERS ATTENTION PRIOR TO BID. IF DISCREPANCIES ARE NOT RESOLVED TO CONTRACTORS SATISFACTION THEY SHALL BE QUALIFIED IN THEIR BID SUBMISSION.

D. WITHIN THREE (3) DAYS AFTER AWARD OF CONTRACT, CONTRACTOR SHALL SUBMIT A DETAILED SCHEDULE FOR HIS WORK, FROM START TO FINISH, AND SHALL UPDATE THIS SCHEDULE AS NECESSARY. THE SCHEDULE SHALL INDICATE THE EFFORT MADE TO MINIMIZE THE DURATION OF ALL NECESSARY INTERUPTIONS IN OPERATION OF EXISTING SYSTEMS. ALL OVERTIME WORK AND WORK ON WEEKENDS AND HOLIDAYS MUST BE IDENTIFIED AND SCHEDULED WITH A MINIMUM OF ONE (1) WEEK IN ADVANCE, WITH THE PROJECT MANAGER. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FROM THE NEW YORK CITY BUILDING DEPARTMENT, INCLUDING AFTER HOURS VARIANCES (AHV) FOR OVERTIME WORK AND WORK ON WEEKENDS. CONTRACTOR SHALL CLOSELY COORDINATE ALL WORK TO MINIMIZE INTERFERENCE WITH NORMAL BUILDING OPERATIONS. IF PREMIUM TIME IS REQUIRED FOR CERTAIN ITEMS OR WORK ON THIS PROJECT, THEN SUCH TIME SHALL BE INCLUDED IN THE BID. CONTRACTOR IS TO OBTAIN A COPY OF THE BUILDING RULES AND REGULATIONS FOR CONSTRUCTION WORK IN THE BUILDING PRIOR TO BID SUBMISSION.

E. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN CONTRACT. IT IS NOT INTENDED TO SPECIFY OR TO SHOW EVERY OFFSET, FITTING, OR COMPONENT. HOWEVER, CONTRACT DOCUMENTS REQUIRE COMPONENTS AND MATERIALS WHETHER OR NOT INDICATED OR SPECIFIED AS NECESSARY TO MAKE THE INSTALLATION COMPLETE AND OPERATIONAL. FINAL LOCATIONS OF DIFFUSERS, GRILLES, REGISTERS. THERMOSTATS, SENSORS, SWITCHES AND ANY WALL MOUNTED DEVICES SHALL BE AS PER THE ARCHITECT. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICT.

F. ANY EQUIPMENT DETAILS AND ACCESSORIES, MATERIAL ACCESSORIES OR LABOR REQUIRED FOR A CODE COMPLIANT AND COMPLETE INSTALLATION, NOT DETALIZED ON DRAWINGS OR SPECIFICATIONS, SHALL BE FURNISHED AND INSTALLED AS PART OF ORIGINAL BID.

G. ALL CUTTING AND PATCHING FOR THE INSTALLATION OF WORK IN THIS CONTRACT SHALL BE

PERFORMED BY THIS CONTRACTOR.

H. CONTRACTOR SHALL MAINTAIN HIS WORK AREA IN AN ORGANIZED MANNER, SHALL NOT ALLOW DEBRIS TO ACCUMULATE, SHALL CLEAN UP THE SITE AFFECTED BY HIS WORK DAILY, AND SHALL NOT CAUSE INTERFERENCE WITH THE ACTIVITIES OF OTHER ENGAGED ON THIS PROJECT.

I. OPEN ENDS OF PIPE, EQUIPMENT AND SPECIALTIES SHALL BE KEPT PROPERLY CLOSED DURING CONSTRUCTION AND INSTALLATION SO AS TO AVOID CONTAMINATIONS.

J. CONTRACTOR SHALL CLOSELY COORDINATE ALL WORK TO MINIMIZE INTERFERENCE WITH

NORMAL BUILDING OPERATIONS. IF PREMIUM TIME IS REQUIRED FOR CERTAIN ITEMS OR WORK

ON THIS PROJECT, THEN SUCH TIME SHALL BE INCLUDED IN THE BID.

K. ALL EQUIPMENT AND NEW SYSTEMS CONNECTIONS TO EXISTING BUILDING SYSTEMS AND INFRASTRUCTURE SHALL BE APPROVED BY THE BUILDING PRIOR TO INSTALLATION OF WORK.

L. BUILDING REQUIREMENTS. THE CONTRACTOR SHALL NOT DRILL INTO SLABS OR STRUCTURAL MEMBERS FOR THE PURPOSE OF SUPPORTING ANY LOADS, UNLESS WRITTEN APPROVAL IS OBTAINED BY THE ARCHITECT. THE CONTRACTOR SHALL REPAIR OR REPLACE EXISTING CONSTRUCTION DAMAGED IN THE PERFORMANCE OF THIS CONTRACT.

M. VIBRATION CONTROL

FREEDOM FROM VIBRATION AND NOISE IS ESSENTIAL. TAKE PARTICULAR CARE IN INSTALLING VIBRATION ISOLATION MOUNT AND HANGERS SO THAT VIBRATION FROM OPERATING EQUIPMENT IS NOT TRANSMITTED TO THE STRUCTURE OR OTHER WORK.

N. SUPPLEMENTARY STEEL

PROVIDE ALL NECESSARY SUPPLEMENTARY STEEL FOR SUPPORT OF EQUIPMENT, PIPING, DUCTWORK ATTACHMENT OF HANGERS AND PIPE IN SHAFTS AND BETWEEN BUILDING STRUCTURAL MEMBERS. STEEL SHALL BE PAINTED WITH ONE COAT OF RUST INHIBITING PRIMER.

O. SUPERVISION

MAINTAIN A FIELD REPRESENTATIVE ON THE PREMISES AT ALL TIMES DURING THE COURSE OF CONTSTRUCTION WORK.

P. GUARANTEE

ALL SYSTEMS AND COMPONENTS SHALL BE PROVIDED WITH A MINIMUM ONE (1) YEAR WARRANTY FROM THE TIME OF FINAL ACCEPTANCE OR BENEFICIAL OCCUPANCY. THE WARRANTY SHALL COVER ALL MATERIALS AND WORKMANSHIP. DURING THIS WARRANTY PERIOD, ALL DEFECTS IN MATERIALS AND WORKMANSHIP SHALL BE CORRECTED BY REPAIR OR REPLACEMENT WITHOUT INCURRING ADDITIONS TO THE CONTRACT. ALL AIR CONDITIONING COMPRESSORS SHALL BE WARRANTED FOR AN ADDITIONAL FOUR YEARS.

THE REPLACEMENT OR REPAIR SHALL BE PERFORMED THE SAME DAY OF NOTIFICATION IN AN EMERGENCY FASHION WHEN NOTIFIED BY THE OWNER OR AUTHORIZED REPRESENTATIVE. THE CONTRACTOR SHALL ALSO REPAIR ALL DAMAGE TO SURROUNDING WORK CAUSED BY THE FAILURE, REPAIR OR REPLACEMENT OF DEFECTIVE EQUIPMENT. ALL FINAL ACCEPTANCES WILL BE MADE AFTER THE CONTRACTOR HAS DEMONSTRATED THAT HIS WORK FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS, AND HAS FURNISHED ALL THE REQUIRED DOCUMENTATION AND APPLOVALS.

Q. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT CONFORMANCE WITH MANUFACTURER'S RECOMMENDATIONS, AS SPECIFIED HEREIN AND AS SHOWN. IF ANY CONFLICT ARISES BETWEEN THESE INSTRUCTIONS, NOTIFY THE ENGINEER IMMEDIATELY FOR GUIDANCE.

R. PROVIDE ADEQUATE ACCESS TO EQUIPMENT AND APPARATUS REQUIRING OPERATION, SERVICE, OR MAINTENANCE WITHIN THE LIFE OF THE SYSTEM, AND AS REQUIRED BY ALL CODES AND REGULATED AS PER THE LOCAL BUILDING DEPARTMENT OFFICIAL.

S. PROVIDE LABELS FOR EACH EQUIPMENT, EQUIPMENT STARTER AND CONTROL SWITCHES. EQUIPMENT SHALL BE LABELED USING DESIGNATIONS IN SCHEDULES ON DRAWINGS.

T. DO NOT RUN PIPING, OR LOCATE EQUIPMENT, IN SPACES WITH SWITCHBOARDS, PANEL BOARDS, POWER PANELS, MOTOR CONTROL CENTERS OR DRY TYPE TRANSFORMERS. NO PIPING SHALL RUN OVER OR THROUGH COMMUNICATIONS ROOMS.

U. PROVIDE PROTECTIVE COVERS, SKIDS, PLUGS, OR CAPS TO PROTECT EQUIPMENT AND MATERIALS FROM DAMAGE AND DETERIORATION DURING CONSTRUCTION.

V. COORDINATE INSTALLATION OF STARTERS, CONTRACTORS, THERMAL OVERLOAD SWITCHES AND REMOTE PUSH BUTTONS.

W. COORDINATE INSTALLATION OF ELECTRICAL POWER, INTERLOCK AND CONTROL WIRING, EXCEPT AS SPECIFIED HEREIN.

X. START-UP AND TESTING OF EQUIPMENT SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF A REPRESENTATIVE OF THE MANUFACTURER.

Y. FACTORY PAINTED EQUIPMENT THAT HAS BEEN SCRATCHED OR MARRED SHALL BE REPAINTED TO MATCH ORIGINAL FACTORY COLOR.

Z. ALL UN-INSULATED BLACK FERROUS METAL ITEMS EXPOSED TO SIGHT INSIDE THE BUILDING EQUIPMENT SUCH AS HANGERS AND SUPPORTS, NOT PROVIDED WITH FACTORY FINISH SHALL BE CLEANED AND PAINTED WITH ONE (1) COAT OF RUST INHIBITING PRIMER. IN ADDITION, SUCH ITEMS IN FINISHED SPACES SHALL ALSO BE PAINTED WITH TWO (2) COATS OF FINISH PAINT IN A COLOR TO MATCH ADJACENT SURFACES OR AS OTHERWISE SELECTED BY THE ARCHITECT.

AA. THIS CONTACTOR SHALL BE RESPONSIBLE FOR HOSTING AND RIGGING OF ALL EQUIPMENT, MATERIALS AND EQUIPMENT FURNISHED UNDER THIS SECTION OF THE SPECIFICATIONS, IN ACCORDANCE WITH ALL CITY, STATE AND FEDERAL RULES AND REGULATIONS.

1.2 CODES AND REGULATIONS

A. ALL WORK SHALL BE GOVERNED BY AND INSTALLED IN COMPLIANCE WITH:

1. THE 2020 NEW YORK STATE BUILDING CODE.
2. THE 2020 NEW YORK STATE MECHANICAL CODE.
3. THE 2020 NEW YORK STATE ENERGY CODE.
4. THE ALL OTHER CURRENT RULES AND REGULATIONS.

B. IN ADDITION TO THE REQUIREMENTS SHOWN OR SPECIFIED, COMPLY WITH THE LATEST CURRENT APPLICABLE STANDARDS, SPECIFICATIONS OR CODES PUBLISHED BY:

ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AWWA	AMERICAN WATER WORKS ASSOCIATION
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
NFPA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC
UL	UNDERWRITER'S LABORATORIES
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

C. UNLESS THE CONTRACTOR, BEFORE SIGNING THIS CONTRACT, HAS NOTIFIED THE ARCHITECT/ENGINEER IN WRITING OF ANY ITEMS IN CONFLICT WITH CODES, THEY SHALL THEREAFTER MAKE ANY ADJUSTMENTS NECESSARY TO MEET CODES AT NO COST TO THE OWNER.

D. CONTRACTOR SHALL INCLUDE ALL ITEMS OF LABOR AND MATERIAL REQUIRED TO COMPLY WITH SUCH STANDARDS AND CODES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. WHERE QUANTITIES, SIZES OR OTHER REQUIREMENTS INDICATED ON THE DRAWINGS OR HEREIN SPECIFIED ARE IN EXCESS OF THE STANDARD OR CODE REQUIREMENTS, THE SPECIFICATIONS AND/OR DRAWINGS SHALL GOVERN.

E. CONTRACTOR IS RESPONSIBLE FOR TIMELY NOTIFICATION OF READINESS FOR SPECIAL PROGRESS AND FINAL INSPECTIONS.

1.3 SCOPE OF WORK

A. THE WORK SPECIFIED SHALL BE TO PROVIDE A COMPLETE OPERATIONAL HVAC SYSTEM. ALL ITEMS OF WORK, OF COST AND EXPENSE OF ANY NATURE WHATSOEVER BELONGING WITH OR NECESSARY TO THE COMPLETION OF WORK CALLED FOR IN THIS SPECIFICATION OR IN THE CONTRACT DOCUMENTS ARE HEREBY SPECIFIED TO BE INCLUDED IN THIS CONTRACT.

B. WORK COVERED BY THESE SPECIFICATIONS AND ACCOMPANYING DRAWINGS CONSISTS IN FURNISHING ALL LABOR, EQUIPMENT, MATERIALS, AND IN PERFORMING ALL OPERATIONS IN CONNECTION WITH INSTALLATION OF A COMPLETE SYSTEM FOR THIS PROJECT AS INDICATED AND SPECIFIED. THIS WORK SHALL ALSO INCLUDE ALL INCIDENTAL ITEMS NOT ORDINARILY SPECIFIED, BUT NECESSARY FOR THE COMPLETE INSTALLATION.

C. ALL EQUIPMENT AND MATERIALS MENTIONED IN THESE SPECIFICATIONS AND/OR SHOWN ON THE DRAWINGS SHALL BE FURNISHED, EXCEPT WHERE OTHERWISE SPECIFICALLY NOTED, COMPLETELY INSTALLED, ADJUSTED, AND LEFT IN A SAFE AND SATISFACTORY OPERATING CONDITION. ALL ACCESSORIES, CONTROLS, AND CONNECTIONS NECESSARY FOR THE OPERATION OF THE EQUIPMENT SHALL BE FURNISHED AND INSTALLED.

D. THE HVAC SYSTEMS CONSIST OF THE FOLLOWING PRINCIPAL ITEMS: (SPECIFIER TO EDIT THE LIST OF SCOPE OF WORK FOR EACH PROJECT)

1. ELECTRIC AND HOT WATER HEATING SYSTEMS.
2. VENTILATION SYSTEM.
3. CONDENSER WATER SYSTEM.
4. AIR OUTLETS, AIR DEVICES
5. EXHAUST SYSTEMS.
6. AIR CONDITIONING SYSTEMS.
7. CONTROL OF HVAC SYSTEMS.
8. INSULATION OF DUCTWORK.
9. INSULATION OF PIPING.

1.4 DRAWINGS AND SPECIFICATIONS

A. THE COMMENCEMENT OF WORK UNDER THIS SECTION INDICATES THAT THE CONTRACTOR HAS EXAMINED AND HAS KNOWLEDGE OF THE ARCHITECTURAL, STRUCTURAL, ELECTRICAL, MECHANICAL, PLUMBING, AND SITE WORK DRAWINGS AND SPECIFICATIONS. THE FAILURE OF THE CONTRACTOR TO ACQUAINT HIMSELF WITH ALL AVAILABLE INFORMATION SHALL NOT RELIEVE HIM OF ANY RESPONSIBILITY FOR PERFORMING HIS WORK PROPERLY.

B. NO ADDITIONAL COMPENSATION SHALL BE ALLOWED BECAUSE OF CONDITIONS THAT OCCUR DUE TO THE CONTRACTOR'S FAILURE TO BECOME THOROUGHLY FAMILIAR WITH ALL OF THE CONTRACT DOCUMENTS FOR THIS PROJECT, AS DESCRIBED ABOVE, AND WITH THE JOB SITE.

C. UNLESS EXPRESSLY STIPULATED, NO ADDITIONAL ALLOWANCE WILL BE MADE IN THE CONTRACTOR'S AND/OR MANUFACTURER'S FAVOR BY VIRTUE OF ERRORS, AMBIGUITIES, AND/OR OMISSIONS WHICH WERE KNOWN TO OR WHICH SHOULD HAVE BEEN KNOWN OR DISCOVERED DURING THE PREPARATION OF THE BID ESTIMATE OR DURING THE COURSE OF THE WORK AND DIRECTED TO THE ARCHITECT'S ATTENTION IN A TIMELY MANNER.

D. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO SUPPLEMENT ONE ANOTHER. ANY MATERIAL OR LABOR CALLED FOR IN ONE BUT NOT THE OTHER SHALL BE FURNISHED AS IF BOTH WERE MENTIONED IN THE SPECIFICATIONS AND SHOWN ON THE DRAWINGS. LABOR AND/OR MATERIALS NEITHER SHOWN NOR SPECIFIED, BUT NECESSARY FOR THE COMPLETION AND PROPER FUNCTIONING OF THE SYSTEMS, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.

E. THE DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO DEPICT THE APPROXIMATE LOCATIONS OF EQUIPMENT, PIPING, AND APPARATUS AND SHALL NOT BE USED AS SHOP DRAWINGS. ALL DIMENSIONS, WHETHER IN FIGURES OR SCALED, SHALL BE VERIFIED IN THE FIELD.

F. THE CONTRACTOR SHALL KEEP A RECORD OF ALL FIELD CHANGES AND CONCEALED WORK AND, UPON COMPLETION OF THE JOB, SHALL SUPPLY AS-BUILT DRAWINGS SHOWING ANY DEVIATIONS FROM THE ORIGINAL DRAWINGS.

1.5 SHOP DRAWINGS, EQUIPMENT SUBMISSION, MAINTENANCE MANUALS

A. SUBMIT SHOP DRAWINGS FOR REVIEW IN ACCORDANCE WITH THE REQUIREMENTS DIVISIONS IN AIA. SHOP DRAWINGS SHALL BE BOUND INTO VOLUMES, WITH EACH VOLUME CONTAINING ONE COPY OF ALL SHOP DRAWINGS. ALL SHOP DRAWINGS SHALL BE SUBMITTED SIMULTANEOUSLY; NO SHOP DRAWINGS WILL BE CHECKED UNTIL ALL HAVE BEEN SUBMITTED WITH THE FOLLOWING EXCEPTIONS:

1. FABRICATION DRAWINGS MAY BE SUBMITTED SEPARATELY.
2. ANY SEPARATE SUBMITTALS SHALL HAVE A TAB IN THE BINDER FOR INSERTION AS PROVIDED.
3. PROVIDE IN THE ORIGINAL SUBMITTAL A SHEET MARKED "DRAWINGS TO BE SUBMITTED BY (DATE)".

B. ALL MATERIALS AND EQUIPMENT WHICH THE CONTRACTOR PROPOSES TO FURNISH SHALL BE SUBMITTED FOR REVIEW. DATA SHALL BE COMPLETE IN ALL RESPECTS AND SHALL REFERENCE, WHERE APPLICABLE, TO THE UNIT SYMBOL UTILIZED ON THE DRAWINGS AND SPECIFICATIONS.

C. SUBMITTAL REVIEW IS CONSIDERED AS GENERAL ACCEPTANCE OF THE BASIC APPLICABILITY OF THE SUBSTITUTED EQUIPMENT. CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION OF THE SUBSTITUTED EQUIPMENT AND/OR ALTERNATE ARRANGEMENT OF THE EQUIPMENT WITHIN A GIVEN SPACE. WHEN THE CONTRACTOR DESIRES TO USE SUBSTITUTED EQUIPMENT, HE SHALL BE RESPONSIBLE FOR PRODUCING HIS OWN COORDINATED WORK DRAWINGS WHICH DEPICT THE SUBSTITUTED EQUIPMENT ACCOMMODATED IN THE SPACE. WHERE THE SUBSTITUTED EQUIPMENT CREATES THE NEED FOR ALTERATIONS IN ANY PORTION OF THE WORK DEPICTED IN THE CONTRACT DOCUMENTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY ALL OF THE AFFECTED PARTIES AND COORDINATE THESE ITEMS WITH ALL OTHER TRADES. FURTHER, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ASSUME ANY ADDITIONAL COST TO THE CONTRACT CREATED BY THE SUBSTITUTED EQUIPMENT.

D. SUBSTITUTED EQUIPMENT IS CONSIDERED TO BE ANY EQUIPMENT OTHER THAN THE FIRST NAMED ITEM IN THE SPECIFICATIONS OR ON THE DRAWINGS.

E. CONTRACTOR FURTHER AGREES THAT IF DEVIATIONS, DISCREPANCIES OR CONFLICTS BETWEEN SHOP DRAWINGS AND SPECIFICATIONS ARE DISCOVERED EITHER PRIOR TO OR AFTER SHOP DRAWING SUBMITTALS ARE PROCESSED BY THE ENGINEER, THE DESIGN DRAWINGS AND SPECIFICATIONS SHALL CONTROL AND SHALL BE FOLLOWED. REVIEW OF SUBMITTAL DATA SHALL IN NO WAY RELIEVE THE CONTRACTOR OF HIS DUTY TO PERFORM ALL WORK AND PROVIDE ALL EQUIPMENT IN STRICT COMPLIANCE WITH THE REQUIREMENTS SET FORTH IN THE CONTRACT DOCUMENTS.

F. EACH INDIVIDUAL SUBMITTAL ITEM FOR MATERIALS AND EQUIPMENT SHALL BE MARKED TO SHOW SPECIFICATION SECTION AND PARAGRAPH NUMBER WHICH PERTAINS TO THE ITEM. FAILURE TO MARK SUBMITTALS IN ACCORDANCE WITH THE ABOVE FORMAT SHALL BE CONSIDERED DUE CAUSE FOR REJECTION OF SHOP DRAWINGS.

G. SUBMITTALS SHALL NOT BE MADE IN CONJUNCTION WITH ANY OTHER SYSTEMS.

H. SUBMIT FOR REVIEW COMPLETE DATA AND DRAWINGS FOR THE FOLLOWING ITEMS:

1. CONTROLS.
2. DUCTWORK AND SHEET METAL STANDARDS.
3. COORDINATED DUCTWORK AND PIPING LAYOUT.
4. INSULATION.
5. MOTORIZED DAMPERS, FIRE AND SMOKE DAMPERS
7. EXHAUST, OUTSIDE AIR, MAKE UP AIR FANS.
8. AIR CONDITIONING UNITS, ROOFTOP UNITS.
9. IDENTIFICATION FOR EQUIPMENT, PIPING, AND DUCTWORK.
10. CEILING HEATERS, BASE BOARD HEATERS.
11. AIR DISTRIBUTION DIFFUSERS, REGISTERS, LOUVERS.
12. PIPING MATERIAL.
13. HANGERS AND SUPPORTS.
14. ACCESS DOORS.
15. VIBRATION ISOLATORS.
16. VARIABLE FREQUENCY MOTOR CONTROLLERS.
17. TESTING AND BALANCING REPORTS.

I. SUBMITTALS SHALL BE SUPPORTED BY DESCRIPTIVE MATERIAL, SUCH AS CATALOG CUTS, DIAGRAMS, PERFORMANCE CURVES AND CHARTS PUBLISHED BY THE MANUFACTURER, TO SHOW CONFORMANCE TO SPECIFICATION AND DRAWING REQUIREMENTS; MODEL NUMBERS ALONE WILL NOT BE ACCEPTABLE. ALL LITERATURE SHALL CLEARLY INDICATE THE SPECIFIED MODEL NUMBER, DIMENSIONS, ARRANGEMENT, RATING AND CHARACTERISTICS OF THE PROPOSED EQUIPMENT. CAPACITIES AND RATINGS SHALL BE BASED ON CONDITIONS INDICATED OR SPECIFIED HEREIN. ANY DEVIATIONS FROM SPECIFIED EQUIPMENT (PARTICULARLY THOSE WHICH REQUIRE COORDINATION WITH OTHER TRADES) SHALL BE CLEARLY NOTED IN A CONCISE LIST ON A SEPARATE SHEET.

SUBMITTALS AND SHOP DRAWINGS SHALL NOT CONTAIN THE AVCON ENGINEERING NAME OR LOGO, NOR SHALL THEY CONTAIN THE AVCON ENGINEERING SEAL AND SIGNATURE. THE SHOP DRAWINGS SHALL NOT BE COPIES OF AVCON'S WORK. A CONTRACTOR CAN USE ELEMENTS OF ENGINEER'S DRAWINGS IF HE OBTAINS ELECTRONIC FILES FROM AVCON.

IN PREPARATION OF SHOP OR RECORD DRAWINGS, CONTRACTOR MAY, AT HIS OPTION, OBTAIN ELECTRONIC DRAWING FILES IN AUTOCAD OR DXF FORMAT FROM THE ENGINEER FOR A FEE UP TO $350 FOR A DRAWING SET UP TO 15 SHEETS AND $20 PER SHEET FOR EACH ADDITIONAL SHEET.

CONTRACTOR SHALL CONTACT THE ARCHITECT AND ENGINEER FOR WRITTEN AUTHORIZATION. CONTRACTOR SHALL SEND A REQUEST WITH AN ATTACHED CHECK MADE PAYABLE TO AVCON ENGINEERING, PC. CONTRACTOR SHALL INDICATE THE DESIRED SHIPPING METHOD AND DRAWING FORMAT IN THE REQUEST. IN ADDITION TO PAYMENT, ARCHITECT'S WRITIEN AUTHORIZATION AND ENGINEER'S RELEASE AGREEMENT FORM MUST BE RECEIVED BEFORE ELECTRONIC DRAWING FILES WILL BE SENT.

THE ENGINEER'S CHECKING AND SUBSEQUENT APPROVAL OF SUCH SHOP DRAWINGS WILL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN DIMENSIONS, DETAILS, SIZE OF MEMBERS, QUANTITIES, OMISSIONS OF COMPONENTS OR FITIINGS; COORDINATION OF ELECTRICAL REQUIREMENTS; OR FOR COORDINATING ITEMS WITH ACTUAL BUILDING CONDITIONS.

1.6 AS-BUILT DRAWINGS

A. THE CONTRACTOR SHALL MAINTAIN, ON A DAILY BASIS AT THE PROJECT SITE, A COMPLETE SET OF "RECORD DRAWINGS" REFLECTING AN ACCURATE DIMENSIONAL RECORD OF ALL BURIED OR CONCEALED WORK. IN ADDITION, THE "RECORD DRAWINGS" SHALL BE MARKED TO SHOW THE PRECISE LOCATION OF CONCEALED WORK OR EQUIPMENT, INCLUDING CONCEALED OR EMBEDDED PIPING AND VALVES, AND ALL CHANGES AND DEVIATIONS IN THE PLUMBING WORK FROM THAT SHOWN ON THE CONTRACT DOCUMENTS. THIS REQUIREMENT SHALL NOT BE CONSTRUED AS AUTHORIZATION FOR THE CONTRACTOR TO MAKE CHANGES IN THE LAYOUT OR WORK WITHOUT DEFINITE INSTRUCTIONS FROM THE ARCHITECT. THE "RECORD DRAWINGS" SHALL BE ELECTRONICALLY SAVED TO BE USED TO PROVIDE A SET OF "AS-BUILT" DOCUMENTS TO THE OWNER UPON COMPLETION OF THE PROJECT.

B. RECORD DIMENSIONS SHALL CLEARLY AND ACCURATELY DELINEATE THE WORK AS INSTALLED; LOCATIONS SHALL BE SUITABLY IDENTIFIED BY AT LEAST TWO (2) DIMENSIONS TO PERMANENT STRUCTURES.

C. THE CONTRACTOR SHALL MARK ALL "RECORD DRAWINGS" ON THE FRONT LOWER RIGHT HAND CORNER WITH A RUBBER STAMP IMPRESSION THAT STATES THE FOLLOWING:

D. THE CONTRACTOR SHALL MAINTAIN ON A DAILY BASIS AT THE PROJECT SITE A COMPLETE SET OF "RECORD DRAWINGS" REFLECTING AN ACCURATE DIMENSIONAL RECORD OF ALL BURIED OR CONCEALED WORK. IN ADDITION THE "RECORD DRAWINGS" SHALL BE MARKED TO SHOW THE PRECISE LOCATION OF CONCEALED WORK OR EQUIPMENT, INCLUDING CONCEALED OR EMBEDDED PIPING AND VALVES, AND ALL CHANGES AND DEVIATIONS IN THE PLUMBING WORK FROM THAT SHOWN ON THE CONTRACT DOCUMENTS. THIS REQUIREMENT SHALL NOT BE CONSTRUED AS AUTHORIZATION FOR THE CONTRACTOR TO MAKE CHANGES IN THE LAYOUT OR WORK WITHOUT DEFINITE INSTRUCTIONS FROM THE ARCHITECT. THE "RECORD DRAWINGS" SHALL BE ELECTRONICALLY SAVED TO BE USED TO PROVIDE A SET OF "AS-BUILT" DOCUMENTS TO THE OWNER UPON COMPLETION OF THE PROJECT.

E. RECORD DIMENSIONS SHALL CLEARLY AND ACCURATELY DELINEATE THE WORK AS INSTALLED; LOCATIONS SHALL BE SUITABLY IDENTIFIED BY AT LEAST TWO (2) DIMENSIONS TO PERMANENT STRUCTURES.

1.7 OPERATION AND MAINTENANCE MANUALS

A. CONTRACTOR SHALL FURNISH AT THE TIME OF REQUEST FOR FINAL PAYMENT, COPIES OF A BROCHURE CONTAINING THE FOLLOWING INFORMATION AS CALLED FOR IN THESE SPECIFICATIONS:

1. LETTER OF GUARANTEE.
2. OPERATING INSTRUCTIONS.
3. APPROVED BY ARCHITECT OR ENGINEER TESTING AND AIR OR WATER BALANCING REPORTS.
4. MANUFACTURER'S PARTS DATA AND SERVICE INSTRUCTIONS ON ALL ITEMS OF EQUIPMENT.
5. MANUFACTURER'S GUARANTEES AND WARRANTIES.
6. MANUFACTURERS' EQUIPMENT START-UP REPORTS

1.8 DEMOLITION

A. CONTRACTOR TO REVIEW AND COORDINATE WITH BUILDING MANAGEMENT THE COMPLETE EXTEND OF DEMOLITION WORK INDICATED ON DRAWINGS AND NESESSARY TO INSTALL THE NEW SYSTEMS.

B. CONTRACTOR IS RESPONSIBLE THAT ALL EXISTING SYSTEMS OUSIDE OF THIS PROJECT ARE REMAIN IN SERVICE.

C. ALL EXISTING EQUIPMENT AND COMPONENTS OF BUILDING SERVICE SYSTEMS THAT ARE SECURED TO EXISTING WALLS, CEILING TO BE DEMOLISHED, SHOULD BE RELOCATED.

D. ALL DEMOLISHED EQUIPMENT AND SYSTEM COMPONENTS SHALL BE REMOVED AND PROPERLY DISPOSED.

E. ALL DEMOLITION WORK SHALL BE PERFORMED WITH MINIMUM NOISE, DUST AND DISTURBANCE.

1.9 ORDINANCES, PERMITS AND CODES

A. IT SHALL BE THE CONTRACTOR'S DUTY TO PROVIDE ALL THE LABOR AND MATERIALS COVERED BY THESE SPECIFICATIONS IN CONFORMANCE WITH ALL ORDINANCES AND REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION.

B. THE CONTRACTOR SHALL FILE, OBTAIN AND PAY FOR ALL PERMITS, CONNECTION AND SPECIFICATION FEES AS REQUIRED FOR THE COMPLETE INSTALLATION OF THE FIRE PROTECTION SYSTEMS.

C. ALL WORK HEREIN SHALL CONFORM TO ALL APPLICABLE LAWS, ORDINANCES AND REGULATIONS OF THE LOCAL UTILITY COMPANIES.

D. THE WORK SHALL BE IN ACCORDANCE WITH, BUT NOT LIMITED TO, THE REQUIREMENTS OF FM GLOBAL AND NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET 13.

E. CODES AND REGULATIONS REFERRED TO ARE MINIMUM STANDARDS. WHERE THE REQUIREMENTS OF THESE SPECIFICATIONS OR DRAWINGS EXCEED THOSE OF THE CODES AND REGULATIONS, THE DRAWINGS AND SPECIFICATIONS GOVERN. CONFLICTS WITH LOCAL REGULATORY CODES SHOULD BE BROUGHT TO THE ATTENTION OF RISK MANAGEMENT AND FM GLOBAL.

1.10 COORDINATION AND CONFLICTS

A. THE CONTRACTOR SHALL COORDINATE HIS WORK SO THAT IT WILL NOT INTERFERE WITH THE WORK OF OTHER TRADES. IT SHALL BE THE CONTRACTOR'S DUTY TO SEE THAT HIS WORK IS INSTALLED IN A TIMELY MANNER TO AVOID CONFLICT WITH OTHER TRADES OR OWNER'S DATE TO OCCUPY.

B. WHERE MINOR DEVIATIONS FROM PLANS ARE REQUIRED TO CONFORM TO SPACE LIMITATIONS, SUCH CHANGES SHALL BE MADE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER AND SHALL BE SUBJECT TO THE APPROVAL OF THE ARCHITECT.

DUCTWORK

PART 1 – GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. PROVIDE A DUCT SYSTEM WITH MINIMUM RESISTANCE TO AIRFLOW. TAKE-OFFS SHALL BE THROATED AND TRANSITIONS MADE AS GRADUAL AS POSSIBLE. 'BULLHEAD' OR SHARP TAKE-OFFS ARE NOT ACCEPTABLE. BRANCH TAKE-OFFS SHALL BE 45 DEG ENTRY TYPE. STRAIGHT TAP OR BUTT FLANGED CONNECTIONS ARE NOT ACCEPTABLE. CLINCH LOCK CONNECTIONS ARE PREFERRED.

B. THE DUCT SYSTEM DESIGN, AS INDICATED, HAS BEEN USED TO SELECT AND SIZE AIR MOVING AND DISTRIBUTION EQUIPMENT AND OTHER COMPONENTS OF THE AIR SYSTEM. CHANGES OR ALTERATIONS TO THE LAYOUT OR CONFIGURATION OF THE DUCT SYSTEM MUST BE SPECIFICALLY APPROVED IN WRITING. ACCOMPANY REQUESTS FOR LAYOUT MODIFICATIONS WITH CALCULATIONS SHOWING THAT THE PROPOSAL LAYOUT WILL PROVIDE THE ORIGINAL DESIGN RESULTS WITHOUT INCREASING THE SYSTEM TOTAL PRESSURE.

C. DUCT HANGERS SHALL BE ATTACHED TO STEEL OR CONCRETE SLAB AS REQUIRED. HANGERS SHALL BE AS DETAILED ON THE DRAWINGS OR IN SMACNA MANUAL. ALL MATERIALS SHALL BE GALVANIZED.

PART 2 – PRODUCTS

2.1 GENERAL

A. DUCT DIMENSIONS INDICATED ON DRAWINGS ARE CLEAR, INSIDE DIMENSIONS. THE SHEET METAL DIMENSIONS SHALL BE INCREASED TO ACCOMMODATE INTERNAL LINER WHERE LINER IS REQUIRED.

B. DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE ARRANGEMENT OF THE PRINCIPAL APPARATUS, DUCTWORK AND PIPING AND SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. ALL OFFSETS, RISES, DROPS, FITTINGS AND ACCESSORIES ARE NOT INDICATED ON DRAWINGS, BUT SHALL BE PROVIDED AS REQUIRED TO INSTALL SYSTEM. CAREFULLY INVESTIGATE STRUCTURE, FINISH CONDITIONS, AND THE WORK OF OTHER SECTIONS AFFECTING SHEET METAL WORK, INCLUDING WORK ASSOCIATED WITH TESTING, ADJUSTING AND BALANCING, IN ORDER TO ARRANGE ALL ITEMS ACCORDINGLY. PROVIDE BEST POSSIBLE ARRANGEMENT SO AS TO PROVIDE MAXIMUM HEADROOM AND MAINTENANCE CLEARANCES.

C. IN ADDITION TO SHEET METAL DUCTWORK SPECIFIED HEREIN, FURNISH AND INSTALL, OR INSTALL AS FURNISHED BY OTHER SECTIONS, ACCESSORIES AND DEVICES INCLUDING AIR DISTRIBUTION DEVICES, SMOKE DETECTORS, PLENUMS, CANOPY HOODS, AND BLANK-OFF PANELS AT UNUSED LOUVER AREAS.

D. FURNISH AND INSTALL INTAKE AND EXHAUST PLENUMS ATTACHED TO LOUVERS.

E. EXCEPT AS NOTED, ALL REINFORCEMENT SHALL BE EXTERNAL.

2.2 SHEET METAL

A. DUCT SYSTEMS OTHER THAN RANGE HOOD EXHAUST (OR FUME HOOD EXHAUST) SHALL BE GALVANIZED STEEL AND SHALL COMPLY WITH THE PRESSURE CLASSIFICATIONS FOLLOWING IN COMPLIANCE WITH PAGE 1-18 TO PAGE 1-31 INCLUSIVE OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS, LATEST EDITION. DUCT SEALANTS SHALL HAVE A U.L. LABEL AND SHALL HAVE A FLAME SPREAD RATING NOT OVER 25, AND A SMOKE DEVELOPED RATING NO HIGHER THAN 50 WHEN IN THE FINAL DRY STATE.

2.3 ROUND AND FLAT OVAL DUCTS

A. CONSTRUCTION: IN ACCORDANCE WITH HVAC DUCT CONSTRUCTION STANDARDS AS SPECIFIED ABOVE.

B. ROUND AND FLAT OVAL DUCTWORK FOR LOW AND MEDIUM PRESSURE SYSTEM SHALL BE SPIRAL TYPE "UNI-SEAL" . BY UNITED SHEET METAL OR APPROVED EQUAL. GAUGES AND FITTINGS SHALL BE IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARD (AS REFERENCED ABOVE).

C. ELBOWS, TEES AND BRANCH TAKE-OFFS SHALL BE MADE OF SIMILAR MATERIAL TO ROUND STRAIGHT DUCTWORK.

D. DUCTWORK SHALL HAVE INTERNAL ACOUSTICAL LINING OR DOUBLE WALL CONSTRUCTION WHERE AOUSTICAL LINING IS REQUIRED BY THESE SPECIFICATIONS.

2.4 FLEXIBLE AIR DUCT

A. FLEXIBLE AIR DUCTS SHALL BE ALL METAL CONSTRUCTION CONSISTING OF A CORE OF STRANDED TRIPLE-LOCK METAL FLEXIBLE DUCTING FOR STRENGTH AND AIRTIGHTNESS. THE DUCTING SHALL HAVE APPLIED AT THE FACTORY A UL LISTED GLASS OR MINERAL WOOL INSULATING BLANKET, SHEATHED IN A UL APPROVED SEAMLESS EXTERIOR VAPOR BARRIER JACKET. FLEXIBLE AIR DUCTS SHALL BE SEMI-RIGID CONSTRUCTION CAPABLE OF BEING EASILY HAND PRE-FORMED INTO REQUIRED ELBOWS OR OFFSETS TO SUIT JOB CONDITIONS WITHOUT SUBSEQUENT SAGGING OR DROOP. DUCT CONNECTIONS TO EQUIPMENT OUTLET COLLARS SHALL BE MADE IN ACCORDANCE WITH THE DUCT MANUFACTURER'S RECOMMENDATIONS. FLEXIBLE DUCT SHALL BE FLEXMASTER TRIPLE LOCK TYPE V AS MANUFACTURED BY FLEXMASTER U.S.A. CORPORATION OR APPROVED EQUAL.

B. THE INSULATION MATERIAL SHALL HAVE COMPOSITE FIRE AND SMOKE HAZARD RATINGS OF 50/25.

C. THE FLEXIBLE AIR DUCTS SHALL BE RATED FOR AN OPERATING TEMPERATURE RANGE OF -40 TO +250°F AND AN OPERATING PRESSURE OF 12" W.G.

D. THE COMPLETE ASSEMBLY SHALL HAVE BEEN TESTED BY UNDERWRITERS LABORATORIES INC. AND GIVEN THE LISTING 181 CLASS I DUCT MATERIAL, AND COMPLY WITH NFPA 90A AND 90B.

E. THE JOINT SHALL CONSIST OF A TRIPLE LOCK THAT IS MECHANICALLY PERFORMED WITHOUT THE USE OF ADHESIVES TO MAKE A DURABLE, AIRTIGHT SEAM. A DOUBLE LOCK IS NOT ACCEPTABLE.

F. LENGTH OF FLEXIBLE DUCT SHALL BE AS SHOWN ON THE DRAWINGS BUT SHALL NOT EXCEED LENGTH DICTATED BY LOCAL JURISDICTION.

G. BENDS SHALL BE MADE WITH NOT LESS THAN 1 DUCT DIAMETER CENTERLINE RADIUS. DUCTS SHOULD EXTEND A FEW INCHES BEYOND THE END OF A SHEET METAL CONNECTION BEFORE BENDING. DUCTS SHOULD NOT BE COMPRESSED.

H. CUT DUCT TO PROPER LENGTH TO AVOID SHARP BENDS.

2.5 ACOUSTICAL DUCT LINING

A. QUALITY ASSURANCE:

1. APPLICATOR: COMPANY SPECIALIZING IN DUCTWORK ACOUSTIC LINING APPLICATION WITH THREE YEARS MINIMUM EXPERIENCE.

2.6 ACCEPTABLE MANUFACTURERS

A. ACOUSTICAL DUCT LINING MATERIALS: THE FOLLOWING VENDORS WILL BE REVIEWED FOR APPROVAL PROVIDING THEY MEET ALL OF THE PERFORMANCE REQUIREMENTS OF THE SPECIFICATIONS.

1. OWENS CORNING AEROFLEX.
2. MANVILLE LINACOUSTIC.
3. CERTAINTEED ULTRALITE 150 (SUBSTITUTIONS ARE NOT ACCEPTABLE).

B. ACOUSTICAL DUCT LINING DENSITY SHALL BE 1½ LB. PER CUBIC FOOT, MINIMUM THICKNESS OF 1", UNLESS SPECIFIED GREATER. SYSTEM SHALL HAVE MIN. R-6 THERMAL RESISTANCE.

C. LINING SHALL HAVE A COMPOSITE FIRE AND SMOKE HAZARD RATING (UL 723) NOT EXCEEDING: FLAME SPREAD: 25

D. THE FOLLOWING ITEMS SHALL BE ACOUSTICALLY LINED. WHERE DISTANCES OF LINING ARE INDICATED, THE INTENT IS THAT ALL DUCTWORK IN ANY DIRECTION BE ACOUSTICALLY LINED.

1. DUCTWORK DOWNSTREAM OF TERMINAL UNITS A MINIMUM DISTANCE OF 7 FEET.
2. BUILT-UP CASINGS AND PLENUMS, EXCEPT THAT LINING SHALL BE 2" THICK, AND ADD INNER METAL LINER.
3. ALL SUPPLY AIR DUCTWORK A DISTANCE OF 15 FEET FROM FAN DISCHARGE. IF THE DISTANCE FROM FAN DISCHARGE TO MECHANICAL EQUIPMENT ROOM WALL IS MORE THAN 25 FEET CONTINUE ACOUSTICAL LINING TO THE MECHANICAL EQUIPMENT ROOM WALL.
4. ALL CONDITIONED AIR SUPPLY DUCTWORK TO A DISTANCE OF 15 FEET FROM FAN DISCHARGE. IF THE DISTANCE FROM FAN DISCHARGE TO ROOF OR WALL PENETRATION IS LESS THAN 15 FEET, CONTINUE ACOUSTIC LINING TO A DISTANCE OF 15 FEET FROM FAN DISCHARGE.
5. UPSTREAM OF RETURN FANS AND EXHAUST FANS, A MINIMUM DISTANCE OF 10 FEET.
6. DOWNSTREAM OF OUTSIDE AIR SUPPLY FANS, A MINIMUM OF 15 FEET.
7. DOWNSTREAM FROM EXHAUST FANS A MINIMUM OF 10 FEET IF THE DISCHARGE OF THE EXHAUST FAN RUNS THROUGH OCCUPIED SPACES.
8. WHERE SHOWN ON DRAWINGS.

2.8 KITCHEN EXHAUST DUCTWORK

A. ALL KITCHEN EXHAUST DUCTWORK SHALL BE CONSTRUCTED OF 16 GAUGE MINIMUM BLACK IRON FOR HORIZONTAL DUCTS AND VERTICAL DUCTS. ALL SEAMS AND JOINTS SHALL HAVE A LIQUID TIGHT CONTINUOUS EXTERNAL WELD AS PER NFPA 96. THE EXTERIOR OF ALL KITCHEN RANGE EXHAUST DUCTS SHALL HAVE 1-1/2" X 1-1/2" X 1/8" WELDED ANGLES, PUNCHED FOR SECURING BLOCK INSULATION. WHERE KITCHEN RANGE EXHAUST DUCT RISERS PASS VERTICALLY THROUGH FLOORS OF THE BUILDING, PROVIDE ANGLE CLIPS WELDED TO THE DUCT OF REQUIRED SIZES TO SUPPORT THE WEIGHT OF THE RISER SECTIONS ON THE BUILDING'S STRUCTURE AT EACH OF THE FLOOR LEVELS. PROVIDE AND INSTALL ALL SUPPLEMENTARY STRUCTURAL STEEL IN SHAFTS TO PROPERLY SUPPORT EXHAUST DUCTWORK FROM BUILDING CONSTRUCTION. PROVIDE 18" X 18" ACCESS DOORS ON SIDE OF HORIZONTAL DUCT AT 20' SPACING. ACCESS DOORS SHALL BE SIMILAR TO DESCRIPTION IN "ACCESS DOORS IN SHEET METAL WORK" EXCEPT THAT DOOR GAUGE SHALL BE THE SAME AS DUCT GAUGE. ALL HORIZONTAL DUCTS SHALL BE PITCHED BACK TO HOODS 1/4" PER FOOT OR MAXIMUM PITCH ATTAINABLE. THIS TRADE SHALL DRILL OR CUT ALL REQUIRED OPENINGS AS REQUIRED BY THE DUCT EXTINGUISHING SYSTEM AND AS COORDINATED WITH THE TRADE SUPPLYING THE EXTINGUISHING SPRAY HEADS. MAINTAIN 6" CLEARANCE BETWEEN SHEET METAL DUCT AND ANY SURFACE SUCH AS SLAB, BEAM OR SHAFT ENCLOSURE.

B. ALL KITCHEN RANGE EXHAUST DUCTWORK SHALL BE CONSTRUCTED OF BLACK IRON FOR HORIZONTAL DUCTS AND VERTICAL DUCTS OF GAUGES AS FOLLOWS.

SIZE	GAUGE BLACK IRON
LESS THAN 155 SQ. IN.	16
155 – 200 SQ. IN.	14
201 – 255 SQ. IN.	12
256 SQ. IN. AND OVER	10

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No:	Description:	Date:
06	100% CD SET / BID AND PERMIT	08/19/25
05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
02	ISSUED FOR PROGRESS	12/01/23
01	ISSUED FOR REVIEW	10/05/23

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HVAC SPECIFICATIONS-I

Drawing No.:
M-800

2.9 AIR CASING AND PLENUMS

A. ALL AIR CASINGS AND PLENUMS SHALL BE CONSTRUCTED OF NO. 16 GAGE GALVANIZED IRON BRACED AND STIFFENED ON OUTSIDE BY MEANS OF 2" X 2" X 1/4" GALVANIZED STEEL ANGLES NOT TO EXCEED 26" WIDTH, OR WITH 16 GAUGE STANDING SEAM PANELS NOT TO EXCEED 26" IN WIDTH. STANDING SEAMS ARE TO HAVE ADDITIONAL RIGHT ANGLE BEND AND SHALL BE CAPPED WITH NO. 18 GAGE GALVANIZED "U" CAP OVER ENTIRE LENGTH OF SEAM. ALL JOINTS SHALL BE CAULKED TO MAKE THEM AIRTIGHT. THE BOTTOM OF ALL AIR CHAMBERS AT THE FLOOR SHALL BE GASKETED TO PREVENT AIR LEAKAGE.

B. THE PLENUM INSTALLATION SHALL BE CAPABLE OF WITHSTANDING A POSITIVE OR NEGATIVE INTERNAL STATIC PRESSURE OF 10" W.G.

C. CASINGS AND PLENUMS ARE LINED WITH 2" OF ACOUSTICAL INSULATION WITH AN INNER ALUMINUM PERFORATED LINER, SO AS TO RESULT IN DOUBLE WALL CONSTRUCTION.

D. CASINGS SHALL BE SUPPORTED ON FLOOR CURBS. THE BOTTOM OF ALL AIR CASINGS AT THE FLOOR AND AT ANY OTHER CONNECTION TO MASONRY SHALL BE RIVETED TO 1-1/2" X 1-1/2" X 1/8" GALVANIZED STEEL ANGLES WHICH HAVE BEEN SECURED TO MASONRY WITH EXPANSION SHIELDS AND CAULKED TIGHT WITH CEMENT.

E. PROVIDE ANGLES ABOVE AND BELOW ACCESS DOORS AND FRAMES FOR ACCESS DOORS. DOORS SHALL BE SUPPLIED TO PROVIDE THE NECESSARY ACCESS. ALL DOORS SHALL HAVE THE 3 HINGE CONNECTING AREAS AS WELL AS THE LATCH CONNECTING AREA INTERNALLY REINFORCED WITH 11-GAUGE PLATE. EACH DOOR SHALL BE FACTORY ASSEMBLED WITH DOOR AND HARDWARE ATTACHED AND ADJUSTED. DOOR LATCHES ARE TO BE OF THE POSITIVE PRESSURE TYPE WITH INSIDE PUSH ROD. ALL HINGES SHALL BE DESIGNED FOR THE DOOR LEAF SIZE AND WEIGHT. SEE "ACCESS DOORS IN SHEET METAL WORK" FOR ADDITIONAL REQUIREMENTS.

F. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL BRACING REQUIRED FOR STIFFNESS INCLUDING ROOF DECK OF CASINGS. THE ROOF DECK SHALL BE BRACED AND SUPPORTED FROM THE CEILING SLAB, IF REQUIRED FOR STIFFNESS.

G. THE PLENUM STRUCTURE SHALL BE NORMALLY SELF SUPPORTING. WHERE ROOF SPANS AND WALL LOADINGS REQUIRE ADDITIONAL STRUCTURAL STRENGTH, IT SHALL BE FURNISHED BY HEAVIER ROOF AND WALL JOINERS OR ADDITIONAL STRUCTURAL MEMBERS. LOLLY COLUMNS CAN ONLY BE USED WITH THE PRIOR APPROVAL OF THE MECHANICAL ENGINEER.

H. FINISH, METAL SURFACES:

1. ALL SHEET METAL SURFACES SUBJECT TO PAINTING SHALL BE PREPARED FOR PAINTING INCLUDING GRINDING, SMOOTHING OF WELDS, DEGREASING AND FILLING AS NEEDED.
2. ALL EXPOSED SHEET METAL SURFACES, AFTER CLEANING, SHALL BE PRIMED WITH A NITROCELLULOSE MODIFIED PHENOLIC PRIME COATING TO A DRY FILM THICKNESS OF 0.6 MIL MINIMUM.

I. FINISH, METAL SURFACES:

1. ALL SHEET METAL SURFACES SUBJECT TO PAINTING SHALL BE PREPARED FOR PAINTING INCLUDING GRINDING, SMOOTHING OF WELDS, DEGREASING AND FILLING AS NEEDED.
2. ALL EXPOSED SHEET METAL SURFACES, AFTER CLEANING, SHALL BE PRIMED WITH A NITROCELLULOSE MODIFIED PHENOLIC PRIME COATING TO A DRY FILM THICKNESS OF 0.6 MIL MINIMUM.

2.10 DAMPERS FOR BALANCING

A. PROVIDE MANUAL DAMPERS FOR BALANCING THE AIR SYSTEMS, AS SPECIFIED IN SECTION 15886.

B. CONSTRUCTION SHALL CONFORM TO LATEST SMACNA STANDARDS. WHEN INSTALLING DAMPERS IN DUCTS TO BE INSULATED PROVIDE RAISED BRACKET FOR DAMPER QUADRANT WITH HEIGHT EQUAL TO INSULATION THICKNESS.

C. PROVIDE VOLUME DAMPERS IN BRANCH TAKE-OFFS AND IN MAIN BRANCHES AND DUCTS OF ALL DUCTWORK SYSTEMS (SUPPLY, RETURN AND EXHAUST)FOR PROPERLY REGULATING AND BALANCING AIRFLOW TO ALL TERMINAL OUTLETS, WHETHER INDICATED ON DRAWINGS OR NOT.

1. VOLUME DAMPERS SHALL BE CONTROLLED BY AN APPROVED GALVANIZED LOCKING QUADRANT INDICATING THE DAMPER POSITION.
2. VOLUME DAMPERS INSTALLED IN DUCTWORK THAT IS TO BE INSULATED SHALL HAVE EXTENDED ACTIVATOR/HANDLE RODS SUCH THAT THE ADJUSTMENT OF THE DAMPER HANDLE WILL NOT DISTURB THE INSULATION.
3. LOCATE DAMPER AS FAR AS POSSIBLE FROM AIR OUTLET TO AVOID NOISE TRANSMISSION.

D. COORDINATE WITH G.C. FOR EASY ACCESS TO DAMPER.

E. FOR INACCESSIBLE CEILINGS, AS WELL AS FOR SPECIALTY AREAS SUCH AS LOBBIES, ETC., FURNISH REMOTE DAMPER ACTUATOR OPERABLE THROUGH FACE OF NEAREST DIFFUSER. DAMPER CONTROLLER AND CABLE SHALL BE CONCEALED ABOVE THE CEILING. SIMILAR TO BOWDEN REMOTE CABLE CONTROL SYSTEM WITH YOUNG REGULATOR DAMPER CONTROLLERS. BALANCING DAMPERS SHALL INCLUDE ALL NECESSARY HARDWARE TO ENSURE COMPATIBILITY WITH REMOTE CABLE CONTROL SYSTEM.

2.11 ACCESS DOORS IN SHEET METAL WORK

A. THIS CONTRACTOR SHALL PROVIDE SUITABLE ACCESS DOORS AND FRAMES TO PERMIT INSPECTIONS, OPERATION AND MAINTENANCE OF ALL VALVES, ALL COILS INCLUDING REHEAT COILS, CONTROLS, FIRE DAMPERS, AIR MONITORS WHERE APPLICABLE, AUTOMATIC OR MOTORIZED DAMPERS, FILTERS, BEARINGS, TRAPS, OR OTHER APPARATUS CONCEALED BEHIND THE SHEET METAL WORK. ALL SUCH DOORS SHALL BE OF DOUBLE CONSTRUCTION OF NOT LESS THAN NO. 20 GAUGE SHEET METAL AND SHALL HAVE SPONGE RUBBER GASKETS AROUND THEIR ENTIRE PERIMETER. DOORS IN INSULATED DUCTS OR INSULATED CASINGS SHALL HAVE RIGID FIBERGLASS INSULATION BETWEEN THE METAL PANELS.

B. ALL ACCESS DOORS IN SHEET METAL DUCTS SHALL BE HUNG ON HEAVY FLAT HINGES AND SHALL BE SECURED IN THE CLOSED POSITION BY MEANS OF CAST ZINC CLINCHING TYPE LATCHES. WHERE SPACE CONDITIONS PRECLUDE HINGES, USE FOUR HEAVY WINDOW TYPE LATCHES. DOORS INTO DUCTS SHALL IN GENERAL NOT BE SMALLER THAN 18" X 18" EXCEPT FOR ACCESS DOOR TO FIRE DAMPERS WHICH WILL DEPEND ON SIZE OF FIRE DAMPER. SUBMIT SAMPLES FOR APPROVAL.

C. IN NO CASE SHALL ACCESS TO ANY ITEMS OF EQUIPMENT REQUIRING INSPECTIONS, ADJUSTMENT, OR SERVICING REQUIRE THE REMOVAL OF NUTS, BOLTS, SCREWS, WING NUTS, WEDGES, OR ANY OTHER SCREWED OR LOOSE DEVICE.

D. EACH SHEET METAL CHAMBER SHALL HAVE ACCESS DOORS FOR ACCESS TO ALL PARTS OF THE SYSTEM. DOORS SHALL BE FITTED WITH CAST ZINC DOOR LATCHES, TWO PER DOOR. LATCHES SHALL BE OPERABLE FROM BOTH SIDES OF CASING. HINGES SHALL BE EXTRA HEAVY, ZINC PLATED HINGES, MINIMUM OF TWO PER DOOR. THE DOORS SHALL BE FELTED OR PROVIDED WITH RUBBER GASKETS SO AS TO MAKE THEM AIRTIGHT. THE DOORS SHALL BE MADE WITH INNER AND OUTER SHELLS 2 INCHES APART SO THAT THEY MAY BE PROPERLY INSULATED AND PROPERLY OPERATED. DOORS SHALL BE A MINIMUM SIZE OF 20" X 48".

E. ACCESS DOOR GAUGES FOR KITCHEN EXHAUST SYSTEMS SHALL BE EQUAL TO DUCT GAUGE.

2.12 INSPECTION PORTHOLES

A. PROVIDE VIEWING PORTHOLES AT BOTH SIDES OF FAN SECTIONS AND RETURN AIR MIXING PLENUMS AT AIR HANDLING UNITS 20,000 CFM OR LARGER (PACKAGE OR BUILT-UP) TO ALLOW FOR INSPECTION OF FAN BELTS, INLET VANES, DAMPER ACTUATORS, ETC.

B. PORTHOLES SHALL BE 8" DIA. OR 6" X 4" MADE OF 1/4" THICK ACRYLIC REINFORCED WITH FLANGES IN BOTH SIDES.

2.13 FLEXIBLE CONNECTIONS

A. ALL FAN AND AIR SUPPLY UNIT CONNECTIONS, BOTH AT INLET AND DISCHARGE SHALL BE MADE WITH FLEXIBLE MATERIAL SO AS TO PROHIBIT THE TRANSFER OF VIBRATION FROM FANS TO DUCTWORK CONNECTING THERETO, WITHOUT AIR LEAKAGE. THE MATERIAL BETWEEN THE CLAMPS SHALL HAVE SUFFICIENT SLACK SO AS TO PREVENT TEARING DUE TO FAN MOVEMENT.

B. THE FLEXIBLE CONNECTIONS SHALL BE A MINIMUM OF 12" LONG MATERIAL SHALL BE MECHANICALLY LOCKED TO THE OUTSIDE HELIX. USE OF ADHESIVES TO LOCK FABRIC IN PLACE IS NOT ACCEPTABLE. THE HELIX IS CONSTRUCTED OF A CORROSIVE RESISTANT GALVANIZED STEEL, FORMED AND MECHANICALLY LOCKED TO THE DUCT FABRIC ON THE OUTSIDE TO PREVENT TEARING.

C. FLEXIBLE FABRIC DUCTWORK SHALL BE RATED AT 6" POSITIVE PRESSURE AND AT 4" NEGATIVE PRESSURE.

D. FLEXIBLE METAL DUCT SHALL BE LISTED UL CLASS 1.

E. FLEXIBLE CONNECTIONS SHALL BE FABRICATED FROM APPROVED FLAME PROOFED FABRIC CONFORMING TO NFPA 90A. ASBESTOS CLOTH IS NOT PERMITTED.

F. INDOOR INSTALLATIONS SHALL BE NEOPRENE OR VINYL COATED FABRICS.

G. OUTDOOR INSTALLATIONS SHALL USE HYPALON COATED FABRIC.

H. MANUFACTURERS:

1. FLEXMASTER, TYPE 8.

2.14 AIR INTAKES AND DISCHARGES

A. AIR INTAKE AND DISCHARGE LOUVERS WHERE INDICATED IN DRAWINGS, SHALL BE FURNISHED, INSTALLED IN THIS CONTRACT, UNLESS OTHERWISE NOTED. SUCH LOUVRES SHALL BE MINIMUM 14 GAUGE ALUMINUM WITH MAXIMUM BLADE LENGTH BETWEEN MULLIONS OF 4'-0". PROVIDE WEATHER TIGHT JOINTS BETWEEN LOUVER FRAMES AND MASONRY OPENINGS BY MEANS OF FLASHING AND/OR CAULKING. PROVIDE ½" MESH HEAVY ALUMINUM WIRE SCREENS.

2.15 BLANK-OFF PANELS FOR UNUSED LOUVER AREAS

A. PROVIDE A MINIMUM 20 GAUGE SHEET METAL BLANK-OFF PANELS FOR UNUSED LOUVER AREAS THAT ARE NOT ENJOINED OR CONNECTED TO AN ACTIVE PLENUM.

B. EXTERIOR/VISIBLE FACE OF BLANK-OFF PANEL SHALL BE CLEANED AND PAINTED FLAT BLACK, PRIOR TO INSTALLATION.

C. PROVIDE SAFING CONSISTING OF 2" RIGID INSULATION ON AN ALUMINUM PANEL FOR ALL UNUSED PORTIONS OF THE LOUVER. LOUVER AREAS ON MECHANICAL DRAWINGS MAY BE INDICATED IN FREE AREA. CONTRACTOR TO REVIEW ARCHITECTURAL DRAWINGS TO DETERMINE ACTUAL LOUVER AREAS.

DAMPERS

PART 1 – GENERAL

1.1 QUALITY ASSURANCE

A. QUALIFY WELDING PROCESSES AND WELDING OPERATORS IN ACCORDANCE WITH AWS.D1.1 "STRUCTURAL WELDING CODE – STEEL" FOR HANGERS AND SUPPORTS AND SWS.D9.1"SHEET METAL WELDING CODE".

B. QUALIFY EACH WELDER IN ACCORDANCE WITH AWS QUALIFICATION TESTS FOR WELDING PROCESSES INVOLVED. CERTIFY THAT THEIR QUALIFICATION IS CURRENT.

C. NFPA COMPLIANCE: COMPLY WITH THE FOLLOWING NFPA STANDARDS:

1.NFPA 90A, "STANDARD FOR THE INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS", EXCEPT AS INDICATED OTHERWISE.
2.NFPA 96, "STANDARD FOR THE INSTALLATION OF EQUIPMENT FOR THE REMOVAL OF SMOKE AND GREASE-LADEN VAPORS FOR COMMERCIAL COOKING EQUIPMENT?, CHAPTER 3, "DUCT SYSTEM", FOR KITCHEN HOOD DUCT SYSTEMS, EXCEPT AS INDICATED OTHERWISE.

D. SMACNA – HVAC DUCT CONSTRUCTION STANDARDS, LATEST EDITION.

E. THE CONTRACTOR MUST COMPLY WITH THE SPECIFICATION IN ITS ENTIRETY.

F. AT THE DISCRETION OF THE OWNER, SHEET METAL GAUGES, REINFORCING AND DAMPERS MAY BE CHECKED AT VARIOUS TIMES TO VERIFY ALL DUCT CONSTRUCTION IS IN COMPLIANCE. IF ON INSPECTIONS, CHANGES HAVE BEEN MADE WITHOUT PRIOR APPROVAL, THE CONTRACTOR WILL MAKE THE APPLICABLE CHANGES TO COMPLY WITH THIS SPECIFICATION, AT THE CONTRACTOR'S EXPENSE.

PART 2 – PRODUCTS

2.1 GENERAL

A. ALL ELECTRIC OPERATED DAMPERS WHICH HAVE A FIRE AND/OR SMOKE RATING SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR. FUSIBLE LINK DAMPERS FOR FIRE PROTECTION, MANUAL DAMPERS FOR BALANCING AND/OR SHUT-OFF AS WELL AS DAMPERS WHICH ARE SPECIFIED AS PART OF FACTORY BUILT AIR HANDLING UNITS OR TERMINAL UNITS SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR. ALL DAMPERS SHALL BE INSTALLED BY THE MECHANICAL CONTRACTOR.

B. DAMPERS OF ALL RATINGS AND TYPES SHALL BE OF THE NOMINAL 100% FACE AREA TYPE, WITH BLADE PACKAGE AND FRAME COMPONENTS OUT OF THE AIRSTREAM. THESE DAMPERS SHALL INCLUDE THE REQUIRED OVERSIZE ENCLOSURES THAT SHALL BE SEALED BY THE DAMPER MANUFACTURER FOR THE APPROPRIATE DUCT PRESSURE CLASS INTO WHICH THEY ARE INSTALLED. SUCH DAMPERS SHALL HAVE APPROPRIATE RECTANGULAR, FLAT OVAL OR ROUND DUCT COLLARS TO FACILITATE CONNECTION OF MATING DUCTWORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL SEALING OF DUCT COLLARS AND CONNECTIONS REQUIRED TO MAINTAIN THE DUCT SEAL CLASS REQUIREMENTS, BUT SHALL NOT JEOPARDIZE THE UL BREAKAWAY CONNECTION.

C. THE MECHANICAL CONTRACTOR SHALL FURNISH DAMPER ACTUATORS FOR ALL DAMPERS THAT HE FURNISHES. WHERE PRACTICAL, ACTUATORS SHALL BE FACTORY MOUNTED BY THE DAMPER MANUFACTURER. THE ACTUATORS SHALL BE LOCATED OUTSIDE OF THE AIRSTREAM. THE MECHANICAL CONTRACTOR SHALL PROVIDE A TERMINAL STRIP ALONGSIDE THE DAMPER FOR ALL DAMPERS HE FURNISHES.

D. WIRING FOR ALL MOTOR OPERATED DAMPERS AND/OR A FIRE SMOKE DAMPERS SHALL BE PROVIDED BY THE MECHANICAL TRADE: FROM THE DAMPER ACTUATOR AND ANY ASSOCIATED END SWITCHES AND SENSORS TO A TERMINAL STRIP THAT IS WALL MOUNTED ALONG SIDE THE DAMPER.

E. THE CONTROLS CONTRACTOR SHALL PROVIDE WIRING AS FOLLOWS:

F. DAMPERS INCORPORATING MULTIPLE SECTIONS SHALL BE CONTROLLED IN UNISON. WHERE MORE THAN ONE (1) ACTUATOR SERVES A DAMPER, THEN THE ACTUATORS SHALL BE DRIVEN IN UNISON AND THE CONTROL WIRING SHALL BE PROVIDED ACCORDINGLY.

G. DAMPERS INCORPORATING MULTIPLE SECTIONS SHALL BE DESIGNED IN SUCH A WAY THAT THE ACTUATORS ARE EASILY ACCESSIBLE. UNDER NO CIRCUMSTANCES SHALL IT BE NECESSARY TO REMOVE DAMPER SECTIONS OR STRUCTURAL OR OTHER FIXTURES TO FACILITATE REMOVAL OF DAMPER MOTORS. PROVIDE ACCESS DOORS WHEREVER NECESSARY TO MEET THIS REQUIREMENT.

H. THE FOLLOWING TABLE SUMMARIZES THE TRADE RESPONSIBILITIES WITH RESPECT TO AUTOMATIC DAMPERS:

2.2 PRESSURE SENSITIVE BACKDRAFT DAMPER

A. BACKDRAFT DAMPERS – PROVIDE AS SIZED IN DRAWINGS. BASED ON ARROW LOUVER & DAMPER MODEL 366 POTTEROFF LOUVER AND DAMPER MODELS BD-64, BD-84, WITH ADJUSTABLE COUNTERBALANCE MOUNTED INTERNALLY ON BLADES, OR APPROVED EQUAL.

B. FRAMES – EXTRUDED ALUMINUM 6063-T5 ALLOY .081 B & S GA., 1 WITH GASKETING ON ALL FOUR SIDES.

C. BLADES – EXTRUDED ALUMINUM 6063-T5 ALLOY .081 B & S GA. CONTOURED FOR STRENGTH AND OVERLAP EDGES WITH GASKETS TO INSURE LOW LEAKAGE.

D. SHAFTS – ½" DIA. EXTRUDED ALUMINUM – PINLOCK DESIGN.

E. SEALS – EXTRUDED INTERLOCKED SILICONE RUBBER SEALS ON BLADE EDGES AND EXPANDED POLYURETHANE ON FRAME.

F. LINKAGE – CADMIUM PLATED STEEL MOUNTED ON BLADES.

G. SCREEN – ½" ALUMINUM BIRD SCREEN IN "U" FRAME TO BE REMOVABLE ON BOTH SIDES OF UNIT, AS REQUIRED.

H. BALANCES:

1. REMOVABLE FIXED WEIGHTS ON BLADES AND ADJUSTABLE COUNTERWEIGHTS FOR FINITE ADJUSTMENTS IN FIELD BY THIS TRADE.
2. FIXED WEIGHTS AND ADJUSTABLE COUNTERBALANCE WEIGHTS SHALL BE INSTALLED TO RESIST OPENING. FIXED WEIGHTS AND ADJUSTABLE COUNTERBALANCE WEIGHTS ARE TO BE ABLE TO BE REMOVED FROM UPSTREAM OF DAMPER. ALL WEIGHT, FIXED AND ADJUSTABLE COUNTERBALANCE, CAN BE ON THE EXTERIOR OF DAMPER FRAME. FINITE ADJUSTMENTS ALLOWED IN FIELD BY THIS TRADE.

I. HOUSING – 16 GA. GALVANIZED METAL SLEEVE.

2.3 DAMPERS FOR FIRE PROTECTION

A. DAMPERS AND DOORS FOR FIRE PROTECTION SHALL BE IDENTIFIED BY THE USE OF THE SYMBOL FLD ON THE DRAWINGS. NOTE THAT THE USE OF THE SYMBOL FLD IMPLIES THE PROVISION OF ACCESS DOORS. FOR INSTALLATION IN 1-1/2 HR. OR 2 HR. FIRE SEPARATIONS OR FIRE DIVISIONS PROVIDE 1-1/2 HOUR FUSIBLE LINK FIRE DAMPERS U.L. LABELED FOR USE IN CLASS B OPENINGS. FOR INSTALLATION IN 3 OR 4 HOUR FIRE SEPARATIONS OR FIRE DIVISIONS PROVIDE TWO FIRE DAMPERS IN SERIES U.L. LABELED FOR USE IN CLASS A OPENINGS, OR OTHER UL CLASSIFIED DAMPER RATED FOR 3 HRS.

B. FIRE DAMPERS IN STAINLESS STEEL DUCT SYSTEMS SHALL BE TYPE 316 STAINLESS STEEL.

2.4 FUSIBLE LINK DAMPERS (FD)

A. FUSIBLE LINK DAMPERS AND FIRE DOORS SHALL BE INSTALLED WHERE SHOWN IN THE DRAWINGS AND WHERE REQUIRED BY CODE, AND SHALL BE OF THE FOLDING BLADE TYPE, FIRE/SEAL AS MANUFACTURED BY AIR BALANCE, INC., AND SHALL BEAR THE UNDERWRITERS' LABORATORY LABEL. TYPE "B" OR "C" MOUNTINGS SHALL BE USED FOR ALL INSTALLATIONS, FRAMES AND BLADES ARE TO BE OUTSIDE OF AIRSTREAM. TYPE "A" MOUNTINGS ARE NOT PERMITTED. HORIZONTALLY MOUNTED DAMPERS SHALL BE OPERATED BY STAINLESS STEEL NEGOTIATOR SPRINGS WITH LOCKING DEVICES TO INSURE POSITIVE CLOSURE. FIRE DAMPER SHALL MEET THE REQUIREMENTS OF LATEST N.F.P.A. BULLETIN #90A, AND SHALL BE TESTED IN ACCORDANCE WITH U.L. 555 TEST CRITERIA FOR FIRE, CORROSION AND DUST LOADING, LABELED AND LISTED BY UNDERWRITERS' LABORATORIES. DAMPERS OF OTHER MANUFACTURERS MAY BE APPROVED SUBJECT TO PROPER SUBMISSION OF UNDERWRITERS ACCEPTANCE PLUS PRESSURE DROP CALCULATIONS.

B. LOCAL CODES SHALL TAKE PRECEDENCE WHERE THEY SUPERCEDE NFPA. HOWEVER, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN WRITING CITING SUCH DIFFERENCES BY REFERENCE TO SUCH CODES SHOULD THE CONTRACT DOCUMENTS NOT REFLECT THESE DIFFERENCES.

C. FD'S SHALL BE PROVIDED AS FOLLOWS:

1. AT EACH PENETRATION OF A VERTICAL SHAFT. ON UPFLOW EXHAUST DUCTS WHERE PERMITTED BY CODE, A 22" LONG INTERNAL BOOT MAY BE USED AFTER APPROVAL OF DUCT PRESSURE DROP CALCULATION.
2. AT EACH FIREPROOF SLAB PENETRATION WHERE THERE IS NO VERTICAL FIREPROOF SHAFT.
3. AT EACH PENETRATION OF A REQUIRED FIRE SEPARATION OR FIRE DIVISION.
4. AT EACH PENETRATION OF A REQUIRED FIRE RATED CORRIDOR OR CEILING.

D. GENERAL:

1. UNITS SHOULD BE BOARD OF STANDARDS & APPEALS APPROVED TYPE FOR USE IN NEW YORK CITY.
2. UNITS SHALL BE APPROVED FOR USE BY THE AUTHORITIES HAVING JURISDICTION.
3. THE CONTRACTOR SHALL CLEARLY INDICATE LOCATION OF UNITS ON SHOP DRAWINGS AND SHALL PROVIDE ACCESS DOORS IN THE DUCTS AT EACH DAMPER OF SUFFICIENT SIZE AND TYPE TO PERMIT INSPECTION AND REPLACEMENT OF LINKAGE. PROVIDE ITEMIZED LIST OF FIRE DAMPERS FOR INSPECTION AND FOR POSTING IN ENGINEERS OFFICE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE ALL LOCATIONS OF DUCT ACCESS DOORS.
4. ACCESS DOORS SHALL BE CAM LATCHED WITH VINYL GASKET TO PROVIDE TIGHTEST POSSIBLE SEAL BETWEEN THE DUCT AND FRAME. DOORS SHALL BE SELF-TIGHTENING AND GASKETED WITH HAND OPERATED CAM LOCKS AND WILL BE FULLY INSULATED. ACCESS DOORS SHALL BE AIR BALANCE, INC. FIRE/SEAL OR APPROVED EQUAL.
5. COMPLY WITH U.L. RECOMMENDATIONS FOR BREAK AWAY CONNECTIONS AT MAXIMUM DISTANCE OF 6" FROM WALL, AND ALL OTHER U.L. RECOMMENDATIONS AND LOCAL CODE REQUIREMENTS. RETAINING ANGLES MUST BE WIDE ENOUGH TO HAVE SUFFICIENT BEARING ON WALL (MINIMUM SURFACE CONTACT OF 1").
6. DAMPER BLADES AND FRAME SHALL BE OUTSIDE OF AIRSTREAM, TO PROVIDE A NOMINAL 100% FREE AREA DAMPERS.

2.5 SMOKE DAMPERS

A. DAMPERS SHOWN ON DRAWINGS DESIGNATED AS "SD" SHALL COMPLY WITH THE FOLLOWING:

1. ALL FIRE/SMOKE DAMPERS SHALL HAVE A UL LABEL.
2. DAMPERS SHALL BE PROVIDED WITH FACTORY-INSTALLED, UL-RATED FULL SLEEVES.
3. PROVIDE AIRFOIL OR "V" BLADE DAMPER BLADES SUPPORTED WITH SHAFTS AND STAINLESS STEEL BEARINGS TO ALLOW DAILY OPERATION.
4. PROVIDE INTERMEDIATE SUPPORTS AND BEARINGS FOR DAMPER BLADES MORE THAN 36" LONG. THEY SHALL CONFORM TO UL STANDARD 555 AND 555S AS LEAKAGE RATED DAMPERS IN SMOKE CONTROL SYSTEMS AND WHEN CLOSED SHALL BE THE EQUIVALENT OF A 1 ½ HOUR FIRE DAMPER.
5. LEAKAGE SHALL CONFORM TO CLASS 2 WITH MAXIMUM LEAKAGE OF 10 CFM/SQ. FT. AT 1" W.G.
6. THE DAMPER MANUFACTURER SHALL PROVIDE DAMPER ACTUATORS. IF DAMPERS ARE PNEUMATICALLY ACTUATED, THE DAMPER MANUFACTURER SHALL PROVIDE EP SWITCH.
7. ALL DAMPERS SHALL BE PROVIDED WITH POSITION INDICATOR SWITCHES TO ENABLE REMOTE STATUS OF OPEN OR CLOSED POSITIONS, HOWEVER, ONLY THOSE DAMPERS DESIGNATED IN THE PLANS AND SPECIFICATIONS AS F/SM (HS), WHICH INDICATE THAT THEY WILL BE CONTROLLED FROM A CENTRAL FIRE COMMAND STATION WILL BE WIRED FOR REMOTE STATUS AND REMOTE OPEN/CLOSED OPERATION.
8. DAMPERS THAT ARE CONTROLLED FROM A CENTRAL FIRE COMMAND STATION SHALL:

   a. BE FACTORY-EQUIPPED WITH A SECOND NORMALLY CLOSED HEAT SENSOR CORRELATING TO THE OPERATOR/ACTUATOR DEGRADATION TEMPERATURE CLASSIFICATION (250°F., DEPENDING ON ACTUATOR UTILIZED). THE SECOND SENSOR IS WIRED THROUGH A MANUAL OVERRIDE SWITCH ON THE CENTRAL FIRE COMMAND STATION.

2.6 FIRE SMOKE DAMPERS

A. DAMPERS SHOWN ON DRAWINGS DESIGNATED AS "FSD" SHALL COMPLY WITH THE FOLLOWING:

1. ALL FIRE/SMOKE DAMPERS SHALL HAVE A UL LABEL.
2. DAMPERS SHALL BE PROVIDED WITH FACTORY-INSTALLED, UL-RATED FULL SLEEVES.
3. PROVIDE AIRFOIL OR "V" BLADE DAMPER BLADES SUPPORTED WITH SHAFTS AND STAINLESS STEEL BEARINGS TO ALLOW DAILY OPERATION.
4. PROVIDE INTERMEDIATE SUPPORTS AND BEARINGS FOR DAMPER BLADES MORE THAN 36" LONG. THEY SHALL CONFORM TO UL STANDARD 555 AND 555S AS LEAKAGE RATED DAMPERS IN SMOKE CONTROL SYSTEMS AND WHEN CLOSED SHALL BE THE EQUIVALENT OF A 1 ½ HOUR FIRE DAMPER.
5. LEAKAGE SHALL CONFORM TO CLASS 2 WITH MAXIMUM LEAKAGE OF 10 CFM/SQ. FT. AT 1" W.G.
6. THE DAMPER MANUFACTURER SHALL PROVIDE DAMPER ACTUATORS. IF DAMPERS ARE PNEUMATICALLY ACTUATED, THE DAMPER MANUFACTURER SHALL PROVIDE EP SWITCH.
7. ALL DAMPERS SHALL BE PROVIDED WITH POSITION INDICATOR SWITCHES TO ENABLE REMOTE STATUS OF OPEN OR CLOSED POSITIONS, HOWEVER, ONLY THOSE DAMPERS DESIGNATED IN THE PLANS AND SPECIFICATIONS AS FSD (HS), WHICH INDICATE THAT THEY WILL BE CONTROLLED FROM A CENTRAL FIRE COMMAND STATION WILL BE WIRED FOR REMOTE STATUS AND REMOTE OPEN/CLOSED OPERATION.
8. DAMPERS THAT ARE CONTROLLED FROM A CENTRAL FIRE COMMAND STATION SHALL:

   a. BE PROVIDED WITH A 212°F HEAT SENSOR WITH NORMALLY CLOSED CONTACTS (MANUAL RESET) TO CLOSE AND LOCK DAMPER IF OPEN.
   b. ADDITIONALLY, DAMPERS SHALL BE FACTORY-EQUIPPED WITH A SECOND NORMALLY CLOSED HEAT SENSOR CORRELATING TO THE OPERATOR/ACTUATOR DEGRADATION TEMPERATURE (°F., DEPENDING ON ACTUATOR UTILIZED). THE SECOND SENSOR IS WIRED THROUGH A MANUAL OVERRIDE SWITCH ON THE CENTRAL FIRE COMMAND STATION.
   c. THE FOLLOWING WILL BE ACCEPTED IN LIEU OF THE TWO FIRESTATS DESCRIBED. A RESETTABLE BIMETALLIC LINK WHICH OPENS ON HEAT PERMITTING DAMPER TO CLOSE AND LOCK IF OPEN. THIS LINK MAY BE RE-ENGAGED FROM FIRE COMMAND STATION AT TEMPERATURE OF 150 OR LESS.
   d. DAMPERS THAT ARE NOT CONTROLLED FROM A CENTRAL FIRE COMMAND STATION SHALL HAVE A FUSIBLE LINK THAT MELTS ON HEAT CAUSING DAMPER TO CLOSE AND LOCK IN A CLOSED POSITION.

2.7 MISCELLANEOUS

A. WHEN FLOOR SHUT-OFF DAMPERS ARE SHOWN ON DRAWINGS THEIR SELECTION SHALL BE MADE SO THAT THE FRAMES AND STOPS OF SUCH DAMPERS ARE OUTSIDE OF THE AIR STREAM, SO AS TO PROVIDE A NOMINAL 100% FREE AREA DAMPER.

B. WHERE FIRE DAMPERS, AUTOMATIC DAMPERS OR COMBINATION FIRE/SMOKE DAMPERS ARE SHOWN ON DRAWINGS OR ARE REQUIRED, THEIR SELECTION SHALL BE MADE SO THAT THE FRAMES, STOPS, ETC. OF SUCH DAMPERS ARE OUTSIDE OF THE AIRSTREAM SO AS TO PROVIDE A NOMINAL 100% FREE AREA DAMPER.

C. FURNISH AND INSTALL MANUAL DAMPERS, FIRE DAMPERS, REGISTERS, GRILLES, REGISTER BOXES, ACCESS DOORS, SOUND TRAPS, ETC., AS DESCRIBED ELSEWHERE IN THE SPECIFICATIONS AND AS REQUIRED FOR A COMPLETE SYSTEM, READY FOR OPERATION.

PART 3 – EXECUTION

3.1 INSTALLATION AS RECOMMENDED BY MANUFACTURER AND NFPA.

VIBRATION ISOLATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. VIBRATION CONTROL.

B. DESCRIPTION OF WORK:

1. IT IS THE OBJECTIVE OF THIS SPECIFICATION TO PROVIDE THE NECESSARY DESIGN REQUIREMENTS FOR THE CONTROL OF EXCESSIVE NOISE AND VIBRATION IN BUILDINGS DUE TO THE OPERATION OF MACHINERY OR EQUIPMENT, AND/OR DUE TO INTERCONNECTED PIPING, DUCTWORK OR CONDUIT.
2. PROVIDE VIBRATION ISOLATION SYSTEMS, COMPLETE AS SHOWN AND SPECIFIED PER CONTRACT DOCUMENTS.
3. THE WORK OF THIS SECTION INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

   a. VIBRATION ISOLATION ELEMENTS FOR PIPING AND EQUIPMENT.
   b. EQUIPMENT ISOLATION BASES.
   c. PIPING FLEXIBLE CONNECTIONS.

1.2 QUALITY ASSURANCE

A. APPLICATOR: PRODUCTS PROVIDED BY COMPANY SPECIALIZING IN VIBRATION ISOLATION WITH TEN YEARS MINIMUM EXPERIENCE.

B. ALL VIBRATION ISOLATION DEVICES SHALL BE THE PRODUCT OF A SINGLE MANUFACTURER. PRODUCTS OF OTHER MANUFACTURERS ARE ACCEPTABLE, PROVIDED THAT THEIR SYSTEMS COMPLY WITH THE DESIGN INTENT FOR SYSTEM PERFORMANCE, STATIC DEFLECTION AND STRUCTURAL DESIGN OF THE BASE MANUFACTURER.

C. THE FOLLOWING ARE APPROVED MANUFACTURERS, PROVIDED THEIR SYSTEMS STRICTLY COMPLY WITH THE DESIGN INTENT FOR PERFORMANCE, DEFLECTION AND STRUCTURAL CAPACITY OF THIS SPECIFICATION.

1. MASON INDUSTRIES, INC., HAUPPAUGE, NY
2. VIBRATION MOUNTINGS & CONTROLS, BLOOMINGDALE, NJ
3. KINETICS COMPANY, DUNLIN, OH
4. KORFUND DYNAMICS CORP., BLOOMINGDALE, NJ
5. VIBRATION ELIMINATOR CO., INC., LONG ISLAND CITY, NY
6. AMBER BOOTH, HOUSTON, TX

D. VIBRATION ISOLATION FIRMS HAVING A MINIMUM OF TEN (10) YEARS EXPERIENCE IN DESIGNING AND INSTALLING VIBRATION ISOLATION SYSTEMS SHALL BE QUALIFIED TO PROVIDE THE MATERIALS AND INSTALLATION REQUIRED BY THIS SECTION. PROJECT LISTINGS SHALL BE PROVIDED INCLUDING GEOGRAPHICAL LOCATION AND A REFERENCE CONTACT.

E. VIBRATION ISOLATOR DEVICES SHALL BE IN GENERAL ACCORDANCE WITH ASHRAE GUIDELINES WITH MINIMUM EFFICIENCY OF 98%.

1.3 SUBMITTALS

A. SUBMIT PRODUCT DATA UNDER PROVISIONS OF SECTION 01300.

B. INCLUDE PRODUCT DESCRIPTION, LIST OF MATERIALS FOR EACH SERVICE, AND LOCATIONS.

C. SUBMIT MANUFACTURER'S INSTALLATION INSTRUCTIONS UNDER PROVISIONS OF SECTION 01300.

D. VIBRATION ISOLATION EQUIPMENT SUBMITTAL DRAWINGS SHALL INCLUDE THE FOLLOWING INFORMATION:

1. ISOLATION MOUNTING DEFLECTIONS.
2. SPRING DIAMETERS, COMPRESSED SPRING HEIGHTS AT RATED LOAD; SOLID SPRING HEIGHTS, WHERE STEEL SPRING ISOLATION MOUNTINGS ARE USED.
3. EQUIPMENT OPERATING SPEED.

E. IN ADDITION TO THE REQUIREMENTS ON MECHANICAL GENERAL PROVISIONS, THE SUBMITTAL MATERIAL SHALL INCLUDE THIRTEEN (13) COPIES OF DESCRIPTIVE DATA FOR ALL PRODUCTS AND MATERIALS INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

1. DESCRIPTIVE DATA:

   a. CATALOG CUTS AND DATA SHEETS ON SPECIFIC VIBRATION ISOLATORS TO BE UTILIZED SHOWING COMPLIANCE WITH THE SPECIFICATIONS.

MECHANICAL INSULATION

PART 1 – GENERAL

1.1 GENERAL

A. APPLICATOR: COMPANY SPECIALIZING IN DUCTWORK INSULATION APPLICATION WITH THREE YEARS MINIMUM EXPERIENCE.

B. INSULATION MATERIALS: INSULATION MATERIALS SHALL BE MANUFACTURED AT FACILITIES CERTIFIED AND REGISTERED TO CONFORM TO ISO 9000 QUALITY STANDARD.

C. INSULATION SHALL HAVE COMPOSITE (INSULATION, JACKET OR FACING, AND ADHESIVE USED TO ADHERE THE FACING OR JACKET TO THE INSULATION) FIRE AND SMOKE HAZARD RATINGS AS TESTED BY PROCEDURE ASTM E.84, NFPA 255 OR UL 723 NOT EXCEEDING:

FLAME SPREAD: 25
SMOKE DEVELOPED: 50

ACCESSORIES SUCH AS ADHESIVES, MASTICS, CEMENTS, AND TAPES FOR FITTINGS SHALL HAVE THE SAME COMPONENT RATING AS LISTED ABOVE. ALL PRODUCTS OR THEIR SHIPPING CARTONS SHALL BEAR A LABEL INDICATING THAT FLAME AND SMOKE RATINGS DO NOT EXCEED REQUIREMENTS. TREATMENT OF JACKETS OR FACINGS TO IMPART FLAME AND SMOKE-SAFETY SHALL BE PERMANENT. THE USE OF WATER SOLUBLE TREATMENTS IS PROHIBITED.

PART 2 – PRODUCTS

2.1 GENERAL

A. ALL FIBERGLASS INSULATION PRODUCTS, SPECIFIED HEREIN, SHALL BE MANUFACTURED FROM RECYCLED GLASS WITH A MINIMUM OF 30% POST CONSUME RECYCLED CONTENT BY WEIGHT. CONTRACTOR SHALL SUBMIT MANUFACTURERS CERTIFICATION OF RECYCLED CONTENT FOR APPROVAL.

1. ALL FIBERGLASS INSULATION PRODUCTS USED FOR DUCTWORK, PIPING, OR EQUIPMENT INSULATION SHALL BE FORMALDEHYDE FREE.

B. ADHESIVES:

1. ALL ADHESIVES USED ON THIS PROJECT SHALL BE OF THE TYPE HAVING LIMITED CAPABILITY TO EMIT VOLATILE ORGANIC COMPOUNDS. EACH ADHESIVE SHALL MEET THE FOLLOWING EMISSION FACTOR LIMITS:

   TOTAL VOC'S 10.0 MG/M3/HR.
   FORMALDEHYDE 0.05MG/M3/HR.
   2-ETHYL-1-HEXANOL 3.0 MG/M3/HR.

2. THE CONTRACTOR SHALL SUBMIT A CUT SHEET AND MSDS SHEET FOR EACH ADHESIVE TO BE USED IN THE BUILDING MECHANICAL SYSTEM, HIGHLIGHTING VOC LIMITS.

B. SEALANTS:

1. ALL SEALANTS USED IN MECHANICAL SYSTEMS SHALL BE OF THE LOW VOLATILE ORGANIC COMPOUND EMITTING TYPE. ALL SEALANTS SHALL HAVE EMISSION CHARACTERISTICS THAT DO NOT EXCEED A VOC LIMIT OF 250 G/L. THE CONTRACTOR SHALL PROVIDE A CUT SHEET AND MSDS SHEET FOR EACH SEALANT TO BE USED IN THE BUILDING MECHANICAL SYSTEM, HIGHLIGHTING VOC LIMITS.

2.3 INSULATION FOR SHEET METAL

A. NOTE THAT DUCTWORK AND CASINGS WHICH ARE ACOUSTICALLY LINED, AS DESCRIBED ELSEWHERE, NEED NOT BE INSULATED ON THE EXTERIOR.

B. THE EXCEPTION TO THE ABOVE IS THAT ACOUSTICALLY LINED DUCTWORK ABOVE ROOF SHALL BE INSULATED ON THE EXTERIOR.

C. INSULATE SHEET METAL AS FOLLOWS:

1. ALL AIR CONDITIONED AND/OR HEATED LOW PRESSURE SUPPLY DUCTWORK FROM FAN DISCHARGE AND FROM DEVICES WHICH REDUCE AIR PRESSURE TO DIFFUSERS, GRILLES AND REGISTERS INCLUDING DIFFUSER PLENUMS AND ALL EXHAUST DUCTWORK FROM DISHWASHERS, POT SINKS, OVENS, OR OTHER KITCHEN APPARATUS EMITTING HEAT OR VAPOR (OTHER THAN RANGE HOOD EXHAUST) – 1-1/2" TYPE D-1 FOR ROUND DUCTS AND CONCEALED RECTANGULAR DUCTS – 1" TYPE D-2 FOR EXPOSED RECTANGULAR DUCTS.

   a. NOTE THAT INSULATION (WITH VAPOR BARRIER) SHALL BE CONTINUOUS ACROSS ALL DUCT JOINTS, HOT WATER REHEAT COIL PIPE BENDS (INSULATED END CAPS), DIFFUSERS, ETC. SO AS TO PROVIDE A CONTINUOUS, FULLY INSULATED WITH UNINTERRUPTED VAPOR BARRIER FROM THE FAN DISCHARGE TO THE DIFFUSERS.

2. ALL RETURN AIR DUCTWORK IN NON-CONDITIONED SPACES SHALL BE INSULATED SIMILAR TO LOW PRESSURE SUPPLY DUCTWORK.

   a. CEILINGS OF CONDITIONED SPACES SHALL NOT REQUIRE RETURN DUCTWORK INSULATION EXCEPT FOR CEILING SPACE LOCATED BELOW ROOFS WHERE RETURN DUCTWORK SHALL BE INSULATED SIMILAR TO LOW PRESSURE SUPPLY DUCTWORK.
   b. NOTE THAT INSULATION (WITH VAPOR BARRIER) SHALL BE CONTINUOUS ACROSS ALL DUCT JOINTS, HOT WATER REHEAT COIL PIPE BENDS (INSULATED END CAPS), DIFFUSERS, ETC. SO AS TO PROVIDE A CONTINUOUS, FULLY INSULATED WITH UNINTERRUPTED VAPOR BARRIER FROM THE FAN DISCHARGE TO THE DIFFUSERS.

3. ALL MEDIUM PRESSURE DUCTWORK FROM FAN DISCHARGE TO ANY AIR TERMINAL DEVICE WHICH REDUCES AIR PRESSURE -1-1/2" TYPE D-1 FOR ROUND DUCTS AND CONCEALED RECTANGULAR. 1" TYPE D-2 FOR EXPOSED RECTANGULAR DUCTS. ALL LOW PRESSURE DUCTWORK FROM AIR TERMINAL DEVICE WHICH REDUCES PRESSURE TO DIFFUSERS, GRILLES, AND REGISTERS – 1-1/2" TYPE D-1.

   a. INSULATION (WITH VAPOR BARRIER) SHALL BE CONTINUOUS ACROSS ALL DUCT JOINTS, HOT WATER REHEAT COIL PIPE BENDS (INSULATED END CAPS) DIFFUSERS, ETC. SO AS TO PROVIDE A CONTINUOUS, FULLY INSULATED WITH UNINTERRUPTED VAPOR BARRIER FROM THE FAN DISCHARGE TO THE DIFFUSERS.

4. DUCTS AND SHEET METAL PLENUMS BEHIND LOUVERS CONTAINING ALL OR A PERCENTAGE OF OUTSIDE AIR ON INLET SIDE OF AIR HANDLING UNITS AND VENTILATION FANS – 2" TYPE D-2.
5. ALL SUPPLY AIR SHEET METAL PLENUMS – 2" TYPE D-2.
6. OUTDOOR DUCTS WHETHER ACOUSTICALLY LINED OR NOT SHALL BE INSULATED WITH 2" THICK TYPE D-2 AND THEN WEATHER PROOFED AS SPECIFIED UNDER WEATHERPROOFING FINISHES FOR OUTDOOR INSULATION. EXCEPTIONS: TOILET EXHAUST, GENERAL EXHAUST, SMOKE EXHAUST AND STAIR PRESSURIZATION DUCTWORK.
7. EXHAUST AIR DUCTWORK FROM AUTOMATIC DAMPERS TO DISCHARGE LOUVERS (INCLUDING SHEET METAL PLENUMS BEHIND LOUVERS) – 2" TYPE D-2.
8. NON AIR CONDITIONED AND NON-HEATED OUTSIDE AIR SUPPLY (EXCEPT IN UNHEATED AREAS SUCH AS GARAGES) – 2" TYPE D-1 FOR CONCEALED DUCTS, 2" TYPE D-2 FOR EXPOSED DUCTS.
9. NON HEATED AIR EXHAUST (I.E., UNHEATED GARAGE, ETC.) RUNNING THROUGH HEATED OR AIR CONDITIONED SPACES – 2" TYPE D-3 FOR CONCEALED DUCTS, 2" TYPE D-4 FOR EXPOSED DUCTS.
10. ALL DISHWASHER EXHAUST – 1-1/2" TYPE D-1 FOR ROUND DUCTS & CONCEALED RECTANGULAR – 1" TYPE D-2 FOR EXPOSED RECTANGULAR.
11. ALL OUTSIDE AIR SUPPLY (OTHER THAN GARAGE) – 2" TYPE D-2.
12. COMMERCIAL CLOTHES DRYER EXHAUST DUCTWORK – 1-1/2" TYPE D-1.
13. EXHAUST AIR DUCTWORK FROM DISCHARGE OF EMERGENCY GENERATOR FAN TO LOUVER (INCLUDING DUCT PLENUM BEHIND LOUVER) – 2" TYPE D-2.
14. EXHAUST DUCTS (FROM WET OR HUMID AREAS) – 2" TYPE D-2.

D. TYPE D-1 FLEXIBLE DUCT INSULATION WITH VAPOR BARRIER:

1. FLEXIBLE DUCT INSULATION SHALL BE 1 LB PER CU. FT. DENSITY GLASS FIBER WITH A MAXIMUM K FACTOR OF 0.29 AT 75 DEGREES F. MEAN TEMPERATURE, WITH REINFORCED FOIL-FACED, FLAME RESISTANT KRAFT VAPOR BARRIER.
2. INSULATION SHALL BE SECURED WITH DUCT ADHESIVE. ALL JOINTS SHALL BE SEALED BY ADHERING A 2" SEALING LAP AT ALL JOINTS WITH VAPOR BARRIER ADHESIVE OR 3" STRIPS OF VAPOR BARRIER JACKET APPLIED WITH VAPOR BARRIER ADHESIVE. INSULATION SHALL THEN BE FASTENED WITH 16 GAUGE COPPER- CLAD WIRE OR FIBERGLASS CORD ON 12" CENTERS. ON DUCTS OVER 24" WIDE, WELDED PINS & CLIPS SHALL BE USED ON THE UNDERSIDE.
3. EXPOSED ROUND SHALL HAVE A WHITE VINYL REINFORCED FOIL VAPOR BARRIER. APPLICATION SAME EXCEPT WIRES SHALL BE OMITTED AND BLANKET SHALL BE SECURED BY STAPLING 2" LONGITUDINAL LAP. STAPLES SHALL BE COATED WITH VAPOR BARRIER COATING.

E. TYPE D-2 RIGID DUCT INSULATION WITH VAPOR BARRIER:

1. RIGID DUCT INSULATION SHALL BE 4.2 LBS PER CU. FT. DENSITY GLASS FIBER WITH MAXIMUM K FACTOR OF .24 AT 75 DEGREES F MEAN TEMPERATURE WITH VAPOR BARRIER FACING.
2. INSULATION SHALL BE IMPALED OVER WELDED PINS APPLIED TO DUCT SURFACE ON 12" TO 18" CENTERS. USE A MINIMUM OF TWO ROWS OF FASTENERS ON EACH SIDE OF DUCT. SECURE INSULATION WITH SUITABLE SPEED WASHERS OR CLIPS FIRMLY IMBEDDED INTO INSULATION.
3. ALL JOINTS AND VOIDS IN THE INSULATION SHALL BE FILLED WITH MINERAL WOOL CEMENT. ALL JOINTS, SPEED WASHERS AND BREAKS IN THE VAPOR BARRIER SHALL BE SEALED WITH 3" WIDE STRIPS OF THE VAPOR BARRIER FACING ADHERED WITH VAPOR BARRIER ADHESIVE.
4. EXPOSED DUCT WORK SHALL HAVE A WHITE REINFORCED FOIL VAPOR BARRIER FACING. CARE SHALL BE TAKEN IN SEALING JOINTS SPEED WASHERS, ETC. WITH MATCHING STRIPS OF VAPOR BARRIER TO INSURE GOOD APPEARANCE.

2.4 INSULATION FOR KITCHEN EXHAUST

KITCHEN EXHAUST DUCTWORK INSULATION, THICKNESS SHALL BE A MINIMUM OF 2 INCHES, BLOCKS OR BOARDS, EITHER MINERAL FIBER CONFORMING TO ASTM C612, CLASS, 20 PCF AVERAGE OR 12 PCF HYDROUS CALCIUM SILICATE CONFORMING TO ASTM C533, TYPE II. PROVIDE VAPOR BARRIER FOR OUTSIDE AIR CONNECTION TO KITCHEN EXHAUST HOOD. THE ENCLOSURE MATERIALS AND THE GREASE DUCT ENCLOSURE SYSTEMS SHALL MEET TESTING REQUIREMENTS OF ASTM E2336 FOR NON-COMBUSTIBILITY, FIRE RESISTANCE, DURABILITY, INTERNAL FIRE, AND FIRE-ENGULFMENT WITH A THROUGH-PENETRATION FIRE STOP.
KITCHEN EXHAUST DUCTS SHALL BE INSULATED WITH HIGH TEMPERATURE BLOCK INSULATION.

A. HIGH TEMPERATURE BLOCK INSULATION:

1. HIGH TEMPERATURE INSULATION SHALL BE 11 LBS. PER CU. FT. DENSITY MOLDED HYDROUS CALCIUM SILICATE WITH A MAXIMUM K FACTOR OF 0.42 AT 200 DEGREES F MEAN TEMPERATURE.
2. INSULATION SHALL BE SECURELY WIRED IN PLACE WITH COPPER CLAD WIRE OR GALVANIZED STEEL BANDS (½" X .015) ON 12" CENTERS.
3. ALL JOINTS AND VOIDS OF INSULATION SHALL BE FILLED AND POINTED WITH MINERAL WOOL CEMENT.
4. OVER THE INSULATION APPLY 1" GALVANIZED WIRE NETTING SECURED TO THE BANDS OR WIRES AND PULLED DOWN TIGHT. THEY APPLY ¼" THICK COAT OF INSULATING AND FINISHING CEMENT TROWELLED TO A SMOOTH FINISH. THIS APPLIES TO BOTH EXPOSED AND CONCEALED WORK.
5. FOR KITCHEN EXHAUST DUCTS EXPOSED IN FINISHED SPACES COVER THE CEMENT FINISH WITH GLASS CLOTH SET IN ADHESIVE.
6. SECTIONS OF EQUIPMENT REQUIRING PERIODIC SERVICING SHALL BE INSULATED WITH ALUMINUM COVERS LINED WITH THE SAME THICKNESS OF MATERIAL AS THE ADJOINING INSULATION.

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No:	Description:	Date:
06	100% CD SET / BID AND PERMIT	08/19/25
05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
02	ISSUED FOR PROGRESS	12/01/23
01	ISSUED FOR REVIEW	10/05/23

Revisions:

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HVAC SPECIFICATIONS-II

Drawing No.:
M-801

2.5 WEATHERPROOFING FINISHES FOR OUTDOOR INSULATION

A. OUTDOOR DUCTWORK:

1. DUCTWORK SHALL BE INSULATED AS SPECIFIED UNDER ?INSULATION FOR SHEET METAL AND PROVIDED WITH A WEATHERPROOF FINISH AS DESCRIBED HEREIN.
2. FINISH WITH A .016" THICK ALUMINUM JACKET WHICH HAS A FACTORY APPLIED MOISTURE BARRIER. FOR ALL APPLICATIONS WHERE IT IS AVAILABLE, THE JACKETING SHALL BE FACTORY ATTACHED TO THE INSULATION AND INSTALLED PER MANUFACTURER'S RECOMMENDATION.
3. WHERE FIELD APPLIED JACKETING MUST BE USED IT SHALL BE APPLIED WITH 2" OVERLAP FACING DOWN FROM THE WEATHER AND SHALL BE SECURED WITH AN ALUMINUM BAND (½" X .020'), AND SEALS APPLIED ON 12" CENTERS WITH BANDS APPLIED DIRECTLY OVER BUTT OVERLAPS. AS AN ALTERNATE THE JACKETING MAY BE APPLIED WITH PLI-GRIP RIVETS. WHERE JACKETING IS CUT OUT OR ABUTS AN UNINSULATED SURFACE, THE JOINT SHALL BE SEALED WITH INSUL-COUSTIC SURE JOINT 405, OR BF 30-45 FOAM SEAL.
4. FITTINGS SHALL BE INSULATED AND FINISHED WITH MITERED SECTIONS OF THE INSULATION WITH FACTORY ATTACHED ALUMINUM JACKETS INSTALLED PER MANUFACTURER'S RECOMMENDATION.

PART 3 – EXECUTION

3.1 PREPARATION

A. INSTALL MATERIALS AFTER DUCTWORK HAS BEEN TESTED AND APPROVED.
B. CLEAN SURFACES FOR ADHESIVES.
C. DO NOT STARTUP AND OPERATE CHILLED WATER SYSTEM PRIOR TO COMPLETION OF INSULATION FOR THE ENTIRE CHILLED WATER PIPING SYSTEM AND COMPLETE CLOSURE OF BUILDING FROM THE EXTERNAL ATMOSPHERE.
D. DO NOT OPERATE AIR HANDLING SYSTEM WITH CONDITIONED AIR PRIOR TO COMPLETION OF INSULATION OF THE ENTIRE DUCT DISTRIBUTION SYSTEM FOR THAT AIR HANDLING SYSTEM.

3.2 INSTALLATION

A. INSULATION SHALL BE APPLIED ON CLEAN DRY SURFACES, AFTER INSPECTION AND RELEASE FOR INSULATION APPLICATION.
B. INSULATION SHALL BE CONTINUOUS THROUGH WALL AND CEILING OPENINGS AND SLEEVES. WHERE INSULATED PIPING OR DUCTWORK PIERCES FIRE RATED PARTITIONS, WALLS, AND FLOORS, SUBSTITUTE ANHYDROUS CALCIUM SILICATE INSULATION WITH VAPOR BARRIER IN LIEU OF FIBERGLASS FOR A MINIMUM OF 8" FROM WALL, TO PRODUCE A HARD SURFACE FOR FIRE RESISTIVE PACKING.
C. INSULATION ON COLD SURFACES WHERE VAPOR BARRIER JACKETS ARE USED SHALL BE APPLIED WITH A CONTINUOUS, UNBROKEN VAPOR SEAL. HANGERS, SUPPORTS, ANCHORS, ETC., THAT ARE SECURED DIRECTLY TO COLD SERVICES SHALL BE ADEQUATELY INSULATED AND VAPOR SEALED TO PREVENT CONDENSATION.
D. INSERTS SHALL BE INSTALLED AT HANGERS FOR COLD INSULATED PIPING. INSERTS BETWEEN THE PIPE AND PIPE HANGERS SHALL CONSIST OF RIGID PIPE INSULATION OF EQUAL THICKNESS TO THE ADJOINING INSULATION AND SHALL BE PROVIDED WITH VAPOR BARRIER WHERE REQUIRED. INSERTS SHALL HAVE SUFFICIENT COMPRESSIVE STRENGTH SO THAT WHEN USED IN COMBINATION WITH A SHEET METAL SHIELD, THEY SUPPORT THE WEIGHT OF THE PIPE AND THE FLUID IN IT WITHOUT CRUSHING THE INSULATION.

AIR TESTING, ADJUSTING AND BALANCING

A. GENERAL

1. PROVIDE QUALIFIED PERSONNEL, EQUIPMENT, APPARATUS AND SERVICES FOR TESTING, INSPECTION, BALANCING AND ADJUSTING OF ALL MECHANICAL SYSTEMS, (EXISTING AND NEW) TO PERFORMANCE DATA SHOWN IN SCHEDULES AND AS SPECIFIED, AND AS REQUIRED BY CODES, STANDARDS, REGULATIONS AND AUTHORITIES HAVING JURISDICTION INCLUDING CITY INSPECTORS, AND ENGINEER. NOTIFY THE ENGINEER AND INVOLVED AUTHORITIES AT LEAST 24 HOURS PRIOR TO TESTING OR INSPECTION. DO NOT COVER WORK PRIOR TO TESTING OR INSPECTION.
2. TESTING, INSPECTION, BALANCING AND ADJUSTING SHALL IN NO WAY RELIEVE OR REDUCE GUARANTEE REQUIREMENTS.
3. DO NOT COVER OR CONCEAL WORK PRIOR TO TESTING AND INSPECTION AND OBTAINING APPROVAL.
4. PRIOR TO DATE OF ACCEPTANCE FURNISH ENGINEER WITH CERTIFICATES OF TESTING AND INSPECTION FOR HVAC SYSTEMS INDICATING APPROVAL OF AUTHORITIES HAVING JURISDICTION AND CONFORMANCE WITH REQUIREMENTS OF CONTRACT DOCUMENTS. INSTRUMENTS USED FOR TESTING AND BALANCING SHALL HAVE BEEN CALIBRATED WITHIN SIX MONTHS PRIOR TO TESTING OR BALANCING. CALIBRATION SHALL BE CERTIFIED.
5. SUBMIT FOUR (4) COPIES OF ALL TESTING AND BALANCING REPORTS TO ENGINEER FOR APPROVAL.
6. BALANCING SHALL BE PERFORMED BY AN INDEPENDENT AIR BALANCE CONTRACTOR NOT AFFILIATED WITH TENANT'S MECHANICAL CONTRACTOR AND APPROVED BY LANDLORD. BALANCING MUST BE COMPLETED AND ACCEPTED BY LANDLORD PRIOR TO OCCUPANCY BY TENANT FOR BUSINESS.

B. AIR BALANCING AND ADJUSTING

1. BALANCING SHALL NOT BEGIN UNTIL SYSTEMS HAVE BEEN INSTALLED COMPLETE. PUT HVAC SYSTEMS AND EQUIPMENT INTO FULL WORKING ORDER AND CONTINUE OPERATION OF SAME DURING EACH DAY OF TESTING AND BALANCING.
2. PROCURE SERVICE OF INDEPENDENT BALANCING AND TESTING AGENCY WITH FOLLOWING QUALIFICATIONS:
   a. AGENCY IS KNOWN TO SPECIALIZE IN STARTING AND TESTING OF HVAC SYSTEMS.
   b. AGENCY-EMPLOYED, PROFESSIONAL AND QUALIFIED HVAC ENGINEER SHALL PERFORM WORK SPECIFIED HEREIN.
   c. AGENCY SHALL BE NEBB OR AABC CERTIFIED.
3. TESTING AGENCY SHALL BALANCE, ADJUST AND TEST MOTORS, SUPPLY FANS, AS FOLLOWS:
   a. ADJUST AH BLOWER RPM TO DESIGN CFM REQUIREMENTS AND RECORD. TEST AND RECORD MOTOR FULL LOAD AMPERES.
   b. MAKE PITOT TRAVERSE OF MAIN SUPPLY DUCTS AND ADJUST TO OBTAIN DESIGN CFM AT FANS.
   c. TEST AND RECORD SYSTEM STATIC PRESSURE, SUCTION AND DISCHARGE.
   d. TEST AND ADJUST SYSTEM FOR DESIGN CFM, RECIRCULATED AIR AND OUTSIDE AIR.
4. TEST AND RECORD ENTERING AND LEAVING AIR TEMPERATURE.
5. ADJUST AND BALANCE VAV BOXES TO PROPER DESIGN CFM.
6. TEST AND ADJUST EACH DIFUSER, GRILLE AND REGISTER TO WITHIN 5% OF DESIGN REQUIREMENTS.
7. IDENTIFY LOCATION AND AREA AND INCLUDE IN A REPORT EACH GRILLE, DIFFUSER, AND REGISTER.
8. IDENTIFY AND LIST SIZE, TYPE AND MANUFACTURE OF HVAC UNITS, DIFFUSERS, GRILLES, REGISTERS AND ALL TESTED EQUIPMENT. MANUFACTURE'S RATINGS ON ALL EQUIPMENT SHALL BE USED TO MAKE REQUIRED CALCULATIONS.
9. READINGS AND TESTS OF DIFFUSERS, GRILLES, AND REGISTERS SHALL INCLUDE REQUIRED FPM VELOCITY AND TEST RESULTANT VELOCITY, REQUIRED CFM AND RESULTANT CFM AFTER ADJUSTMENTS.
10. IN COOPERATION WITH THE CONTROL MANUFACTURE'S REPRESENTATIVE SET ALL AUTOMATICALLY OPERATED DAMPERS TO OPERATE AS SPECIFIED, INDICATED AND/OR NOTED. TESTING AGENCY SHALL CHECK AND CALIBRATE ALL CONTROLS ON FULL HEATING AND FULL COOLING.
11. ADJUST ALL DIFFUSERS, GRILLES, AND REGISTERS TO MINIMIZE DRAFTS IN ALL AREAS.
12. INSTALL FIXED PITCH PULLEYS PROVIDED BY MECHANICAL CONTRACTOR AFTER AIR BALANCING IS COMPLETED AND RPM DETERMINED.
13. BALANCE SYSTEM ON FULL COOLING.
14. ALL FAN AND AIR CONDITIONING SYSTEMS CHARACTERISTICS SHALL BE MEASURED AND RECORDED AFTER SYSTEM IS BALANCED AND SUBMITTED AS PART OF THE FINAL TESTING AND BALANCING REPORT.
15. A DRAWING SHALL BE SUBMITTED AS PART OF THE TESTING AND BALANCING REPORT. THE DRAWING SHALL SHOW CLEARLY THE TEST LOCATIONS IN THE DUCTWORK AND THE DUCT SIZES.

C. TEST HOLES

DUCT TEST HOLES SHALL BE PROVIDED BY MECHANICAL CONTRACTOR IN DUCTS AND PLENUMS WHERE DIRECTED OR NECESSARY FOR THE PITOT TUBES IN TAKING AIR MEASUREMENTS AND BALANCING THE AIR SYSTEMS. TEST HOLES SHALL BE PROVIDED WITH AN APPROVED REMOVABLE PLUG OR SEAL. WHERE DUCTS OR PLENUMS ARE INSULATED THE TEST HOLES SHALL BE PROVIDED WITH AN APPROVED EXTENSION OF PLUG FITTING.

D. FINAL AIR BALANCE

1. ALL AIR OUTLETS SHALL BE SET TO SPECIFIED AIR QUANTITIES.
2. ALL AIR SUPPLY, RETURN AND EXHAUST OUTLETS, AND DAMPERS SHALL BE ADJUSTED TO WITHIN 5% OF THE AIR QUANTITIES INDICATED ON THE DRAWINGS. THE SYSTEMS SHALL BE PROPERLY BALANCED AND ADJUSTED FOR THE REQUIRED OPERATING CONDITIONS. ALL AIR MEASUREMENT READINGS TAKEN DURING THE ADJUSTMENT WORK SHALL BE RECORDED AND THE RESULTING DATA SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. AFTER BALANCING IS COMPLETED AS DIRECTED ABOVE,
3. SET ALL THERMOSTATS AS DIRECTED AND AFTER SYSTEMS HAVE REACHED THEIR SET POINTS, RECORD TOTAL CFM DELIVERED TO SPACE, BALANCE AND RECORD TOTAL CFM RETURNED FROM SPACE AND STATIC PRESSURE ON THE INLET SIDE ON THE AIR OUTLET FURTHEST FROM THE SUPPLY DUCT.
4. A DRAWING SHALL BE SUBMITTED AS PART OF THE TESTING AND BALANCING REPORT. THE DRAWING SHALL SHOW CLEARLY THE TEST LOCATIONS IN THE DUCTWORK AND THE DUCT SIZES. THE AIR BALANCING INFORMATION SHALL BE SUBMITTED ON THE STANDARD FORM OF THE N.A.B.C. SHEETS AND DELIVERED TO THE ENGINEER.

COMMISSIONING OF HVAC

1.1 SUMMARY

A. SECTION INCLUDES COMMISSIONING PROCESS REQUIREMENTS FOR THE FOLLOWING HVAC SYSTEMS, ASSEMBLIES, AND EQUIPMENT:
   1. DISTRIBUTION SYSTEMS, INCLUDING:
      a. ALL AIR DISTRIBUTION HEATING AND COOLING SYSTEMS.
      b. HOT WATER DISTRIBUTION SYSTEMS.
      c. CONDENSER WATER DISTRIBUTION SYSTEMS.
      d. EXHAUST SYSTEMS.
   2. TERMINAL AND PACKAGED UNITS, INCLUDING:
      a. ELECTRIC HEATING.
      b. WATER COOLED PACKAGED UNITS.
   3. VIBRATION AND SOUND SYSTEMS, INCLUDING:
      a. SOUND ATTENUATION, VIBRATION ISOLATION DEVICES.
   4. CONTROLS AND INSTRUMENTATION, INCLUDING:
      a. BAS.
      b. CONTROL SYSTEM.
   5. SYSTEMS TESTING AND BALANCING VERIFICATION, INCLUDING:
      a. HEATING WATER PIPING SYSTEMS.
      b. CONDENSER WATER PIPING SYSTEMS.
      c. DOMESTIC HOT WATER CIRCULATING SYSTEMS.
      d. SUPPLY AIR SYSTEMS.
      e. RETURN AIR SYSTEMS.
      f. EXHAUST AIR SYSTEMS.

B. RELATED REQUIREMENTS:
   1. SECTION 019113 "GENERAL COMMISSIONING REQUIREMENTS" FOR GENERAL COMMISSIONING PROCESS REQUIREMENTS AND COMMISSIONING COORDINATOR RESPONSIBILITIES.
   2. DIVISION 23 FOR ALL HVAC WORK ON THE PROJECT.
   3. DIVISIONS 21, 22, AND 26.

C. REFERENCES:
   1. 2020 NYS BUILDING CODE.
   2. 2020 NYS MECHANICAL CODE.
   3. 2020 NYS ENERGY CONSERVATION CODE.
   4. ASHRAE GUIDELINES 0-2005. THE COMMISSIONING PROCESS.
   5. SMACNA CURRENT HVAC SYSTEMS COMMISSIONING MANUAL.
   6. NETA (INTERNATIONAL ELECTRICAL TESTING ASSOCIATION).
   7. PECI COMMISSIONING GUIDELINES AND TEMPLATES.

1.2 DEFINITIONS

A. BAS: BUILDING AUTOMATION SYSTEM.
B. DDC: DIRECT DIGITAL CONTROLS.
C. HVAC&R: HEATING, VENTILATING, AND AIR CONDITIONING.
D. "SYSTEMS", "SUBSYSTEMS", "EQUIPMENT", AND "COMPONENTS": WHERE THESE TERMS ARE USED TOGETHER OR SEPARATELY, THEY SHALL MEAN "AS-BUILT" SYSTEMS, SUBSYSTEMS, EQUIPMENT, AND COMPONENTS.
E. TAB: TESTING, ADJUSTING, AND BALANCING.

1.3 INFORMATIONAL SUBMITTALS

A. QUALIFICATION DATA: FOR BAS AND HVAC TESTING TECHNICIAN.
B. CONSTRUCTION CHECKLISTS: FOR THE FOLLOWING:
   1. VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT.
   2. INSTRUMENTATION AND CONTROL FOR HVAC.
   3. HEATING-WATER PIPING AND ACCESSORIES.
   4. HOT WATER COILS.
   5. CONDENSER WATER PIPING, PUMPS, AND ACCESSORIES.
   6. METAL DUCTS AND ACCESSORIES.
   7. FANS.
   8. PARTICULATE AIR FILTRATION.
   9. AIR-HANDLING UNITS.
   10. WATER COOLED UNITS.
   11. KITCHEN EMISSION SYSTEMS.
   12. HEAT EXCHANGERS.
   13. VFD

1.4 QUALITY ASSURANCE

A. BAS TESTING TECHNICIAN QUALIFICATIONS: TECHNICIANS TO PERFORM BAS CONSTRUCTION CHECKLIST VERIFICATION TESTS, CONSTRUCTION CHECKLIST VERIFICATION TEST DEMONSTRATIONS, COMMISSIONING TESTS, AND COMMISSIONING TEST DEMONSTRATIONS SHALL HAVE THE FOLLOWING MINIMUM QUALIFICATIONS:
   1. JOURNEY-LEVEL OR EQUIVALENT SKILL LEVEL WITH KNOWLEDGE OF BAS, HVAC, ELECTRICAL CONCEPTS, AND BUILDING OPERATIONS.
   2. MINIMUM THREE YEARS EXPERIENCE INSTALLING, SERVICING, AND OPERATING SYSTEMS MANUFACTURED BY APPROVED MANUFACTURER.
   3. INTERNATIONAL SOCIETY OF AUTOMATION (ISA) CERTIFIED CONTROL SYSTEMS TECHNICIAN (CCST) LEVEL I.

B. HVAC TESTING TECHNICIAN QUALIFICATIONS: TECHNICIANS TO PERFORM HVAC CONSTRUCTION CHECKLIST VERIFICATION TESTS, CONSTRUCTION CHECKLIST VERIFICATION TEST DEMONSTRATIONS, COMMISSIONING TESTS, AND COMMISSIONING TEST DEMONSTRATIONS SHALL HAVE THE FOLLOWING MINIMUM QUALIFICATIONS:
   1. JOURNEY-LEVEL OR EQUIVALENT SKILL LEVEL. VOCATIONAL SCHOOL FOUR-YEAR PROGRAM GRADUATE OR AN ASSOCIATES DEGREE IN MECHANICAL SYSTEMS, AIR CONDITIONING, OR SIMILAR FIELD. DEGREE MAY BE OFFSET BY THREE YEARS' EXPERIENCE IN SERVICING MECHANICAL SYSTEMS IN THE HVAC INDUSTRY. GENERALLY, REQUIRED KNOWLEDGE INCLUDES HVAC SYSTEMS, ELECTRICAL CONCEPTS, BUILDING OPERATIONS, AND APPLICATION AND USE OF TOOLS AND INSTRUMENTATION TO MEASURE PERFORMANCE OF HVAC EQUIPMENT, ASSEMBLIES, AND SYSTEMS.
   2. MINIMUM THREE YEARS EXPERIENCE INSTALLING, SERVICING, AND OPERATING SYSTEMS MANUFACTURED BY APPROVED MANUFACTURER.
   3. ONE OF THE FOLLOWING:
      a. NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB) CERTIFIED TESTING, ADJUSTING, AND BALANCING TECHNICIAN.
      b. ASSOCIATED AIR BALANCE COUNCIL (AABC) CERTIFIED TEST AND BALANCE TECHNICIAN.
      c. OWNER RETAINS THE RIGHT TO WAIVE NEBB OR AABC CERTIFICATION.

C. TESTING EQUIPMENT AND INSTRUMENTATION QUALITY AND CALIBRATION: FOR TEST EQUIPMENT AND INSTRUMENTATION REQUIRED TO PERFORM HVAC COMMISSIONING WORK, PERFORM THE FOLLOWING:
   1. SUBMIT TEST EQUIPMENT AND INSTRUMENTATION LIST. FOR EACH EQUIPMENT OR INSTRUMENT, IDENTIFY THE FOLLOWING:
      a. EQUIPMENT/INSTRUMENT IDENTIFICATION NUMBER.
      b. PLANNED COMMISSIONING APPLICATION OR USE.
      c. MANUFACTURER, MAKE, MODEL, AND SERIAL NUMBER.
      d. CALIBRATION HISTORY, INCLUDING CERTIFICATES FROM AGENCIES THAT CALIBRATE THE EQUIPMENT AND INSTRUMENTATION.
   2. TEST EQUIPMENT AND INSTRUMENTATION SHALL MEET THE FOLLOWING CRITERIA:
      a. CAPABLE OF TESTING AND MEASURING PERFORMANCE WITHIN THE SPECIFIED ACCEPTANCE CRITERIA.
      b. BE CALIBRATED AT THE MANUFACTURER'S RECOMMENDED INTERVALS WITH CURRENT CALIBRATION TAGS PERMANENTLY AFFIXED TO THE INSTRUMENT BEING USED.
      c. BE MAINTAINED IN GOOD REPAIR AND OPERATING CONDITION THROUGHOUT THE DURATION OF USE ON THIS PROJECT.
      d. BE RECALIBRATED/REPAIRED IF DROPPED OR DAMAGED IN ANY WAY SINCE LAST CALIBRATED.

D. PROPRIETARY TEST INSTRUMENTATION AND TOOLS:
   1. EQUIPMENT MANUFACTURER'S PROPRIETARY INSTRUMENTATION AND TOOLS: FOR INSTALLED EQUIPMENT INCLUDED IN THE COMMISSIONING PROCESS, TEST INSTRUMENTATION AND TOOLS MANUFACTURED OR PRESCRIBED BY EQUIPMENT MANUFACTURER TO SERVICE, CALIBRATE, ADJUST, REPAIR, OR OTHERWISE WORK ON ITS EQUIPMENT OR REQUIRED AS A CONDITION OF EQUIPMENT WARRANTY, PERFORM THE FOLLOWING:
      a. SUBMIT PROPRIETARY INSTRUMENTATION AND TOOLS LIST. FOR EACH INSTRUMENT OR TOOL, IDENTIFY THE FOLLOWING:
         1) INSTRUMENT OR TOOL IDENTIFICATION NUMBER.
         2) EQUIPMENT SCHEDULE DESIGNATION OF EQUIPMENT FOR WHICH THE INSTRUMENT OR TOOL IS REQUIRED.
         3) MANUFACTURER, MAKE, MODEL, AND SERIAL NUMBER.
         4) CALIBRATION HISTORY, INCLUDING CERTIFICATES FROM AGENCIES THAT CALIBRATE THE INSTRUMENT OR TOOL, WHERE APPROPRIATE.
      b. INCLUDE A SEPARATE LIST OF PROPRIETARY TEST INSTRUMENTATION AND TOOLS IN THE OPERATION AND MAINTENANCE MANUALS.
      c. HVAC PROPRIETARY TEST INSTRUMENTATION AND TOOLS BECOME THE PROPERTY OF OWNER AT THE TIME OF SUBSTANTIAL COMPLETION.

PART 2 – PRODUCTS (NOT USED)
PART 3 – EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

A. MECHANICAL, CONTROLS AND TAB CONTRACTORS. THE COMMISSIONING RESPONSIBILITIES APPLICABLE TO EACH OF THE MECHANICAL, CONTROLS AND TAB CONTRACTORS OF DIVISION 23 AND DIVISION 22 ARE AS FOLLOWS (ALL REFERENCES APPLY TO COMMISSIONED EQUIPMENT ONLY):
   1. PERFORM COMMISSIONING TESTS AT THE DIRECTION OF THE COMMISSIONING AGENCY.
   2. ATTEND CONSTRUCTION PHASE CONTROLS COORDINATION MEETINGS.
   3. ATTEND TESTING, ADJUSTING, AND BALANCING REVIEW AND COORDINATION MEETINGS.
   4. PARTICIPATE IN HVAC SYSTEMS, ASSEMBLIES, EQUIPMENT, AND COMPONENT MAINTENANCE ORIENTATION AND INSPECTION AS DIRECTED BY THE COMMISSIONING AGENCY.
   5. PROVIDE INFORMATION REQUESTED BY THE COMMISSIONING AGENCY FOR FINAL COMMISSIONING DOCUMENTATION. INCLUDE REQUIREMENTS FOR SUBMITTAL DATA, OPERATION AND MAINTENANCE DATA, AND TRAINING IN EACH PURCHASE ORDER OR SUB-CONTRACT WRITTEN.
   6. PREPARE PRELIMINARY SCHEDULE FOR MECHANICAL SYSTEM ORIENTATIONS AND INSPECTIONS, OPERATION AND MAINTENANCE MANUAL SUBMISSIONS, TRAINING SESSIONS, PIPE AND DUCT SYSTEM TESTING, FLUSHING AND CLEANING, EQUIPMENT START-UP, TESTING AND BALANCING AND TASK COMPLETION FOR OWNER. DISTRIBUTE PRELIMINARY SCHEDULE TO COMMISSIONING TEAM MEMBERS.
   7. UPDATE SCHEDULE AS REQUIRED THROUGHOUT THE CONSTRUCTION PERIOD.
   8. DURING THE STARTUP AND INITIAL CHECKOUT PROCESS, EXECUTE THE RELATED PORTIONS OF THE PREFUNCTIONAL CHECKLISTS FOR ALL COMMISSIONED EQUIPMENT.
   9. ENSURE ALL SENSORS AND ACTUATORS ARE PROPERLY CALIBRATED.
      a. ALL FIELD-INSTALLED TEMPERATURE, CO, CO, AND PRESSURE SENSORS, FEEDBACK SIGNALS, CONTROLLERS, METERS, GAUGES, AND ALL ACTUATORS (DAMPERS AND VALVES) ON ALL EQUIPMENT SHALL BE CALIBRATED USING THE METHODS DESCRIBED BELOW. ALTERNATE METHODS MAY BE USED, IF APPROVED BY THE OWNER BEFOREHAND. ALL TEST INSTRUMENTS SHALL HAVE HAD A CERTIFIED CALIBRATION WITHIN THE LAST TWELVE (12) MONTHS. SENSORS INSTALLED IN THE UNIT AT THE FACTORY WITH CALIBRATION CERTIFICATION PROVIDED NEED NOT BE FIELD CALIBRATED.
      b. ALL PROCEDURES USED SHALL BE FULLY DOCUMENTED ON THE PRE-FUNCTIONAL PERFORMANCE TESTS OR OTHER SUITABLE FORMS, CLEARLY REFERENCING THE PROCEDURES FOLLOWED AND WRITTEN DOCUMENTATION OF INITIAL, INTERMEDIATE AND FINAL RESULTS.
      c. SENSOR CALIBRATION METHODS:
         1) ALL SENSORS:
            (a) VERIFY THAT ALL SENSOR LOCATIONS ARE APPROPRIATE AND AWAY FROM CAUSES OF ERRATIC OPERATION.
            (b) VERIFY THAT SENSORS WITH SHIELDED CABLE ARE GROUNDED ONLY AT ONE END.
            (c) FOR SENSOR PAIRS THAT ARE USED TO DETERMINE A TEMPERATURE OR PRESSURE DIFFERENCE, MAKE SURE THEY ARE READING WITHIN 0.2°F OF EACH OTHER FOR TEMPERATURE AND WITHIN A TOLERANCE EQUAL TO 2% OF THE READING, OF EACH OTHER, FOR PRESSURE.
         2) SENSORS WITHOUT TRANSMITTERS: MAKE A READING WITH A CALIBRATED TEST INSTRUMENT WITHIN 6 INCHES OF THE SITE SENSOR. VERIFY THAT THE SENSOR READING (VIA THE PERMANENT THERMOSTAT, GAUGE OR BUILDING AUTOMATION SYSTEM [BAS]) IS WITHIN THE TOLERANCES IN THE TABLE BELOW OF THE INSTRUMENT-MEASURED VALUE. IF NOT, INSTALL OFFSET IN BAS, CALIBRATE OR REPLACE SENSOR.
         3) SENSORS WITH TRANSMITTERS:
            (a) DISCONNECT SENSOR. CONNECT A SIGNAL GENERATOR IN PLACE OF SENSOR. CONNECT AMMETER IN SERIES BETWEEN TRANSMITTER AND BAS CONTROL PANEL. USING MANUFACTURER'S RESISTANCE-TEMPERATURE DATA, SIMULATE MINIMUM DESIRED TEMPERATURE. ADJUST TRANSMITTER POTENTIOMETER ZERO UNTIL 4 MA IS READ BY THE AMMETER. REPEAT FOR THE MAXIMUM TEMPERATURE MATCHING 20 MA TO THE POTENTIOMETER SPAN OR MAXIMUM AND VERIFY AT THE BAS. RECORD ALL VALUES AND RECALIBRATE CONTROLLER AS NECESSARY TO CONFORM WITH SPECIFIED CONTROL RAMPS, RESET SCHEDULES, PROPORTIONAL RELATIONSHIP, RESET RELATIONSHIP AND P/I REACTION. RECONNECT SENSOR. MAKE A READING WITH A CALIBRATED TEST INSTRUMENT WITHIN 6 INCHES OF THE SITE SENSOR. VERIFY THAT THE SENSOR READING (VIA THE PERMANENT THERMOSTAT, GAUGE OR BUILDING AUTOMATION SYSTEM [BAS]) IS WITHIN THE TOLERANCES IN THE TABLE BELOW OF THE INSTRUMENT-MEASURED VALUE. IF NOT, REPLACE SENSOR AND REPEAT.
            (b) FOR PRESSURE SENSORS, PERFORM A SIMILAR PROCESS WITH A SUITABLE SIGNAL GENERATOR.
         4) GAS DETECTION: USE CERTIFIED TEST GAS CONCENTRATIONS.
         5) SOUND, LIGHT, VIBRATION: USE APPROPRIATE FACTORY-OR LAB-CALIBRATED WORKING REFERENCE.
         6) BINARY DEVICES (ON/OFF, OPEN/CLOSED, END SWITCHES, POSITION INDICATORS, ETC.): CONFIRM DESIRED OUTPUT STATE OF EACH DEVICE MATCHES INPUT SIGNAL FOR BOTH INCREASING AND DECREASING SIGNAL CHANGE, NOTING SIGNAL DIFFERENTIAL AT CHANGE-OF-STATE POINTS FOR THREE (3) SUCCESSIVE TRIALS FOR EACH DEVICE.
         7) TRANSMITTER/TRANSDUCER:
            (a) PERFORM CALIBRATION AT A SENSOR'S TRANSMITTER/TRANSDUCER IF POSSIBLE TO ALLOW SENSOR REPLACEMENT WITHOUT HAVING TO MODIFY CALIBRATION PARAMETER SETTINGS IN THE CONTROL SYSTEM DATABASE. VERIFY THAT SENSORS WITH SHIELDED CABLE ARE GROUNDED ONLY AT ONE END.
            (b) MAKE CALIBRATION CORRECTION ON THE CONTROL SYSTEM DATABASE IF A SENSOR DOES NOT HAVE A LOCAL TRANSMITTER/TRANSDUCER OR OTHER DEVICE THAT ALLOWS CALIBRATION AT THE SENSOR. MODIFY THIS CORRECTION IN THE DATABASE IF THE ORIGINAL SENSOR GETS REPLACED TO RA-ACHIEVE VIABLE END-TO-END CALIBRATION WITH THE NEW SENSOR-TRANSMITTER/TRANSDUCER-NETWORK-CONTROL-SYSTEM COMBINATION.
         8) USER INTERFACES:
            (a) VERIFY MEASUREMENT CONSISTENCY OF INPUT/OUTPUT DATA POINT INFORMATION AT AVAILABLE USER INTERFACES BETWEEN EACH SENSOR AND THE ASSOCIATED CONTROL INDICATING PANEL OR OPERATOR'S WORKSTATION.
            (b) SUSPEND CHANGE-OF-VALUE GOVERNORS IF NECESSARY FOR MEASUREMENT VERIFICATION AND RESTORE AFTER VERIFICATION.
            (c) TOLERANCES, STANDARD APPLICATIONS:

SENSOR	REQUIRED TOLERANCE (+/-)	SENSOR	REQUIRED TOLERANCE (+/-)
COOLING COIL, CONDENSER WATER TEMPS	0.4°F	FLOW RATES, WATER RELATIVE HUMIDITY	4% OF DESIGN
AIR CONDITIONG UNITS WET BULB OR DEW POINT	2.0°F	COMBUSTION FLUE TEMPS	5.0°F
HOT WATER COILS	1.5°F	OXYGEN OR CO_2 MONITOR	0.1% PTS
OUTSIDE AIR, SPACE AIR, DUCT AIR TEMPS	0.4°F	CO MONITOR	0.01% PTS
WATTHOUR, VOLTAGE, AND AMPERAGE	1% OF DESIGN	NATURAL GAS AND OIL FLOW RATE	1% OF DESIGN
PRESSURES, AIR, WATER	3% OF DESIGN	STEAM FLOW RATE	3% OF DESIGN
FLOW RATES, AIR	10% OF DESIGN	BAROMETRIC PRESSURE	0.1 IN OF HG

         9) VALVE AND DAMPER STROKE SETUP AND CHECK
            (a) BAS READOUT: FOR ALL VALVE AND DAMPER ACTUATOR POSITIONS CHECKED, VERIFY THE ACTUAL POSITION AGAINST THE BAS READOUT.
            (b) MAKE SURE TO SET PUMPS OR FANS TO NORMAL OPERATING MODE. COMMAND VALVE OR DAMPER CLOSED, VISUALLY VERIFY THAT VALVE OR DAMPER IS CLOSED AND ADJUST OUTPUT ZERO SIGNAL AS REQUIRED. COMMAND VALVE OR DAMPER OPEN, VERIFY POSITION IS FULL OPEN AND ADJUST OUTPUT SIGNAL AS REQUIRED. COMMAND VALVE OR DAMPER TO A FEW INTERMEDIATE POSITIONS. IF ACTUAL VALVE OR DAMPER POSITION DOES NOT REASONABLY CORRESPOND, REPLACE ACTUATOR OR ADD PILOT POSITIONER (FOR PNEUMATICS).
            (c) CLOSURE FOR HEATING COIL VALVES (NO): SET HEATING SET POINT 20°F ABOVE ROOM TEMPERATURE. OBSERVE VALVE OPEN. REMOVE CONTROL AIR OR POWER FROM THE VALVE AND VERIFY THAT THE VALVE STEM AND ACTUATOR POSITION DO NOT CHANGE. RESTORE TO NORMAL. SET HEATING SET POINT TO 20°F BELOW ROOM TEMPERATURE. OBSERVE THE VALVE CLOSE. FOR PNEUMATICS, BY OVERRIDE IN THE EMS, INCREASE PRESSURE TO VALVE BY 3 PSI (DO NOT EXCEED ACTUATOR PRESSURE RATING) AND VERIFY VALVE STEM AND ACTUATOR POSITION DOES NOT CHANGE. RESTORE TO NORMAL.
            (d) CLOSURE FOR COOLING COIL VALVES (NC): SET COOLING SET POINT 20°F ABOVE ROOM TEMPERATURE. OBSERVE THE VALVE CLOSE. REMOVE CONTROL AIR OR POWER FROM THE VALVE AND VERIFY THAT THE VALVE STEM AND ACTUATOR POSITION DO NOT CHANGE. RESTORE TO NORMAL. SET COOLING SET POINT TO 20°F BELOW ROOM TEMPERATURE. OBSERVE VALVE OPEN. FOR PNEUMATICS, BY OVERRIDE IN THE EMS, INCREASE PRESSURE TO VALVE BY 3 PSI (DO NOT EXCEED ACTUATOR PRESSURE RATING) AND VERIFY VALVE STEM AND ACTUATOR POSITION DOES NOT CHANGE. RESTORE TO NORMAL.
   10) ASSIST THE COMMISSIONING AGENCY IN ALL VERIFICATION AND FUNCTIONAL PERFORMANCE TESTS.

B. GATHER OPERATION AND MAINTENANCE LITERATURE ON ALL EQUIPMENT, AND ASSEMBLE IN BINDERS AS REQUIRED BY THE SPECIFICATIONS. SUBMIT TO ENHANCED COMMISSIONING AGENCY (45) DAYS AFTER SUBMITTAL ACCEPTANCE.
C. COORDINATE WITH THE COMMISSIONING AGENCY TO PROVIDE (48) HOUR ADVANCE NOTICE SO THAT THE WITNESSING OF EQUIPMENT AND SYSTEM START-UP AND TESTING CAN BEGIN.
D. NOTIFY THE COMMISSIONING AGENCY A MINIMUM OF (2) WEEKS IN ADVANCE OF THE TIME FOR START OF THE TESTING AND BALANCING WORK. ATTEND THE INITIAL TESTING AND BALANCING MEETING FOR REVIEW OF THE OFFICIAL TESTING AND BALANCING PROCEDURES.
E. PARTICIPATE IN, AND SCHEDULE VENDORS AND CONTRACTORS TO PARTICIPATE IN THE TRAINING SESSIONS.
F. PROVIDE WRITTEN NOTIFICATION TO THE CM AND COMMISSIONING AGENCY AUTHORITY THAT THE FOLLOWING WORK HAS BEEN COMPLETED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND THAT THE EQUIPMENT, SYSTEMS, AND SUB-SYSTEM ARE OPERATING AS REQUIRED.
   1. HVAC EQUIPMENT INCLUDING ALL FANS, PACKAGED AIR CONDITIONING UNITS, DUCTWORK, DAMPERS, TERMINALS, AND ALL OTHER EQUIPMENT FURNISHED UNDER THIS DIVISION.
   2. FIRE STOPPING IN THE FIRE RATED CONSTRUCTION, INCLUDING FIRE AND SMOKE DAMPER INSTALLATION, CAULKING, GASKETING AND SEALING OF SMOKE BARRIERS.
   3. FIRE DETECTION AND SMOKE DETECTION DEVICES FURNISHED UNDER OTHER DIVISIONS OF THE SPECIFICATION.
H. THE EQUIPMENT SUPPLIER SHALL DOCUMENT THE PERFORMANCE OF HIS EQUIPMENT.
I. TEST, ADJUST AND BALANCE CONTRACTOR:
   1. ATTEND INITIAL COMMISSIONING COORDINATION MEETING SCHEDULED BY THE COMMISSIONING AUTHORITY.
   2. SUBMIT THE SITE SPECIFIC TESTING AND BALANCING PLAN TO THE COMMISSIONING AGENCY AND AE FOR REVIEW AND ACCEPTANCE.
   3. ATTEND THE TESTING AND BALANCING REVIEW MEETING SCHEDULED BY THE COMMISSIONING AGENCY. BE PREPARED TO DISCUSS THE PROCEDURES THAT SHALL BE FOLLOWED IN TESTING, ADJUSTING, AND BALANCING THE HVAC SYSTEM.
   4. AT THE COMPLETION OF THE TESTING AND BALANCING WORK, AND THE SUBMITTAL OF THE FINAL TESTING AND BALANCING REPORT, NOTIFY THE HVAC CONTRACTOR AND THE CM.
   5. AT THE COMPLETION OF TESTING AND BALANCING WORK, AND THE SUBMITTAL OF THE FINAL TESTING AND BALANCING REPORT, NOTIFY THE HVAC CONTRACTOR AND THE CM.
   6. PARTICIPATE IN VERIFICATION OF THE TESTING AND BALANCING REPORT, WHICH WILL CONSIST OF REPEATING MEASUREMENTS CONTAINED IN THE TESTING AND BALANCING REPORTS. ASSIST IN DIAGNOSTIC PURPOSES WHEN DIRECTED.
J. PROVIDE TRAINING OF THE OWNER'S OPERATING STAFF USING EXPERT QUALIFIED PERSONNEL, AS SPECIFIED.
K. EQUIPMENT SUPPLIERS:
   1. PROVIDE ALL REQUESTED SUBMITTAL DATA, INCLUDING DETAILED START-UP PROCEDURES AND SPECIFIC RESPONSIBILITIES OF THE OWNER, TO KEEP WARRANTIES IN FORCE.
   2. ASSIST IN EQUIPMENT TESTING PER AGREEMENTS WITH CONTRACTORS.
   3. PROVIDE INFORMATION REQUESTED BY COMMISSIONING AGENCY REGARDING EQUIPMENT SEQUENCE OF OPERATION AND TESTING PROCEDURES.

3.5 FACTORY TESTING

L. REFER TO THE VARIOUS DIVISION 23 SPECIFICATION SECTIONS FOR REQUIREMENTS FOR FACTORY TESTING OF EQUIPMENT AND DEVICES.

3.6 TESTING PREPARATION

A. CERTIFY IN WRITING TO THE COMMISSIONING AGENCY THAT HVAC SYSTEMS, SUBSYSTEMS, AND EQUIPMENT HAVE BEEN INSTALLED, CALIBRATED, AND STARTED AND ARE OPERATING ACCORDING TO THE CONTRACT DOCUMENTS.

3.7 GENERAL TESTING REQUIREMENTS

A. CERTIFY THAT HVAC SYSTEMS, SUBSYSTEMS, AND EQUIPMENT HAVE BEEN INSTALLED, CALIBRATED, AND STARTED AND ARE OPERATING ACCORDING TO THE CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS AND SUBMITTALS.
B. CERTIFY THAT HVAC INSTRUMENTATION AND CONTROL SYSTEMS HAVE BEEN COMPLETED AND CALIBRATED, THAT THEY ARE OPERATING ACCORDING TO THE CONTRACT DOCUMENTS AND APPROVED SHOP DRAWINGS AND SUBMITTALS, AND THAT PRETEST SET POINTS HAVE BEEN RECORDED.
C. CERTIFY THAT TAB PROCEDURES HAVE BEEN COMPLETED AND THAT TAB REPORTS HAVE BEEN SUBMITTED, DISCREPANCIES CORRECTED, AND CORRECTIVE WORK APPROVED.
D. SET SYSTEMS, SUBSYSTEMS, AND EQUIPMENT INTO OPERATING MODE TO BE TESTED ACCORDING TO APPROVED TEST PROCEDURES (E.G., NORMAL SHUTDOWN, NORMAL AUTO POSITION, NORMAL MANUAL POSITION, UNOCCUPIED CYCLE, EMERGENCY POWER, AND ALARM CONDITIONS).
E. CONSTRUCTION CHECKLISTS: PREPARE AND SUBMIT DETAILED CONSTRUCTION CHECKLISTS FOR HVAC SYSTEMS, SUBSYSTEMS, EQUIPMENT, AND COMPONENTS.
   1. CONTRIBUTORS TO THE DEVELOPMENT OF CONSTRUCTION CHECKLISTS SHALL INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
      a. HVAC SYSTEMS AND EQUIPMENT INSTALLERS.
      b. TAB TECHNICIANS.
      c. HVAC INSTRUMENTATION AND CONTROLS INSTALLERS.
F. PERFORM TESTS USING DESIGN CONDITIONS, WHENEVER POSSIBLE.
   1. SIMULATED CONDITIONS MAY, WITH APPROVAL OF ARCHITECT, BE IMPOSED USING AN ARTIFICIAL LOAD WHEN IT IS IMPRACTICAL TO TEST UNDER DESIGN CONDITIONS. BEFORE SIMULATING CONDITIONS, CALIBRATE TESTING INSTRUMENTS. PROVIDE EQUIPMENT TO SIMULATE LOADS. SET SIMULATED CONDITIONS AS DIRECTED BY COMMISSIONING COORDINATOR AND DOCUMENT SIMULATED CONDITIONS AND METHODS OF SIMULATION. AFTER TESTS, RETURN CONFIGURATIONS AND SETTINGS TO NORMAL OPERATING CONDITIONS.
   2. COMMISSIONING TEST PROCEDURES MAY DIRECT THAT SET POINTS BE ALTERED WHEN SIMULATING CONDITIONS IS IMPRACTICAL.
   3. COMMISSIONING TEST PROCEDURES MAY DIRECT THAT SENSOR VALUES BE ALTERED WITH A SIGNAL GENERATOR WHEN DESIGN OR SIMULATING CONDITIONS AND ALTERING SET POINTS ARE IMPRACTICAL.
G. IF TESTS CANNOT BE COMPLETED BECAUSE OF A DEFICIENCY OUTSIDE THE SCOPE OF THE HVAC SYSTEM, DOCUMENT THE DEFICIENCY AND REPORT IT TO OWNER. AFTER DEFICIENCIES ARE RESOLVED, RESCHEDULE TESTS.
H. IF SEASONAL TESTING IS SPECIFIED, COMPLETE APPROPRIATE INITIAL PERFORMANCE TESTS AND DOCUMENTATION AND SCHEDULE SEASONAL TESTS.
I. COORDINATE SCHEDULE WITH, AND PERFORM THE FOLLOWING ACTIVITIES AT THE DIRECTION OF, COMMISSIONING COORDINATOR.
J. COMPLY WITH CONSTRUCTION CHECKLIST REQUIREMENTS, INCLUDING MATERIAL VERIFICATION, INSTALLATION CHECKS, START-UP, AND PERFORMANCE TESTS REQUIREMENTS SPECIFIED IN SECTIONS SPECIFYING HVAC SYSTEMS AND EQUIPMENT.
K. PROVIDE TECHNICIANS, INSTRUMENTATION, TOOLS, AND EQUIPMENT TO COMPLETE AND DOCUMENT THE FOLLOWING:
   1. PERFORMANCE TESTS.
   2. DEMONSTRATION OF A SAMPLE OF PERFORMANCE TESTS.
   3. COMMISSIONING TESTS.
   4. COMMISSIONING TEST DEMONSTRATIONS.

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No:	Description:	Date:
06	100% CD SET / BID AND PERMIT	08/19/25
05	100% REVIEW SET	06/16/25
04	95% CD SET	01/20/25
03	80% COORDINATION SET	08/07/24
02	ISSUED FOR PROGRESS	12/01/23
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