

# ABBREVIATIONS

A/C	ABOVE CEILING	ID	INSIDE DIMENSION
AC	AIR CONDITIONING	IN	INCHES
AD	ACCESS DOOR	KW	KILOWATTS
ADJ	ADJUSTABLE	LAT	LEAVING AIR TEMPERATURE
AFF	ABOVE FINISHED FLOOR	LB	POUNDS
AHU	AIR HANDLING UNIT	LG	LINEAR GRILLE
AUTO	AUTOMATIC	LRS	LINEAR RETURN GRILLE
B/F	BELOW FLOOR	LWR	LOOP WATER RETURN
B/G	BELOW GRADE	LWS	LOOP WATER SUPPLY
BAL	BALANCING	MAX	MAXIMUM
BCO	BASE CLEANOUT	MD	MANUAL DAMPER
BOD	BACKDRAFT DAMPER	MIN	MINIMUM
BFLY	BUTTERFLY	MFR	MOTOR OPERATED DAMPER
BHP	BRAKE HORSEPOWER	MFR	MANUFACTURER
BOD	BASIS OF DESIGN/BOTTOM OF DUCT	NC	NORMALLY CLOSED
CD	CEILING DIFFUSER	NFCH	NON-FREEZE GROUND HYDRANT
CFM	CUBIC FEET PER MINUTE	NFVH	NON-FREEZE WALL HYDRANT
CHWS	CHILLED WATER SUPPLY	NG	NATURAL GAS
CHWR	CHILLED WATER RETURN	NO	NORMALLY OPEN
CO	CLEANOUT	NOM	NOMINAL
COND	CONDENSATE	OA	OUTSIDE AIR
CSR	CURVED SUPPLY REGISTER	OB	OPPOSED BLADE DAMPER
CJ	CONDENSING UNIT	OD	OUTSIDE DIMENSION
CW	COLD WATER (DOMESTIC)	PIU	POWERED INDUCTION UNIT
CWR	CONDENSER WATER RETURN	PSI	POUNDS PER SQUARE INCH
CWS	CONDENSER WATER SUPPLY	RA	RETURN AIR
dB	DECIBELS	RAD	RADIUS
DB	DRY BULB	RAG	RETURN AIR GRILLE
DO	DITTO	RAR	RETURN AIR REGISTER
DN	DOWN	RED	REDUCER
DR	DRAIN	RL	REFRIGERANT LIQUID
DWG	DRAWING	RS	REFRIGERANT SUCTION
EA	EACH	RTU	ROOFTOP UNIT
EAT	ENTERING AIR TEMPERATURE	SA	SUPPLY AIR
ECC	ECCENTRIC	SAN	SANITARY
EF	EXHAUST FAN	SD	SMOKE DAMPER
EFF	EFFICIENCY	SEN	SENSIBLE
ER	EXHAUST REGISTER	SP	STATIC PRESSURE
ESP	EXTERNAL STATIC PRESSURE	SPS	STATIC PRESSURE SENSOR
EWT	ENTERING WATER TEMPERATURE	SQ	SQUARE
EX	EXISTING	SR	SUPPLY REGISTER
EXH	EXHAUST	SS	SPLIT SYSTEM
		ST	STORM
F	FAHRENHEIT	TEMP	TEMPERATURE
FOO	FLOOR CLEANOUT	TG	TRANSFER GRILLE
FCU	FAN COIL UNIT	TY	TYPICAL
FD	FIRE DAMPER	UN	UNLESS OTHERWISE NOTED
FLR	FLOOR	V	VENT
FOB	FLAT ON BOTTOM	VA	VALVE
FOR	FUEL OIL RETURN	VAV	VARIABLE AIR VOLUME
FOS	FUEL OIL SUPPLY	VTR	VENT THRU ROOF
FOT	FLAT ON TOP	WB	WET BULB
FFM	FEET PER MINUTE	WC	WATER COLUMN
FFS	FEET PER SECOND	WHA	WATER HAMMER ARRESTOR
FSD	FIRE/SMOKE DAMPER	WT	WEIGHT
FT	FEET	W	WASTE
G	GATE		
GA	GAUGE		
GCO	GRADE CLEANOUT		
GPM	GALLONS PER MINUTE		
HD	HUB DRAIN		
HP	HORSEPOWER		
HTG	HEATING		
HW	HOT WATER (DOMESTIC)		
HWR	HEATING HOT WATER RETURN		
HWR	HOT WATER REVERSE RETURN		
HWS	HEATING HOT WATER SUPPLY		
HZ	HERTZ		

## GENERAL NOTES (APPLY TO ALL SHEETS)

- THESE DRAWINGS ARE SCHEMATIC IN NATURE AND ARE NOT INTENDED TO SHOW ALL POSSIBLE CONDITIONS. IT IS INTENDED THAT A COMPLETE TENANT MECHANICAL SYSTEM BE PROVIDED WITH ALL NECESSARY EQUIPMENT, ACCESSORIES, OPTIONS AND CONTROLS, COMPLETELY COORDINATED WITH ALL DISCIPLINES. ALL ITEMS AND LABOR REQUIRED FOR A COMPLETE TENANT MECHANICAL SYSTEM IN ACCORDANCE WITH ALL APPLICABLE CODES, STANDARDS AND THE BASE BUILDING CONTRACT DOCUMENTS SHALL BE FURNISHED WITHOUT INCURRING ADDITIONS TO THE CONTRACT.
- REFER TO THE ARCHITECTURAL DRAWINGS FOR EXACT PARTITION LAYOUTS, REFLECTED CEILING PLANS, DIMENSIONS, ETC.
- EXISTING MECHANICAL EQUIPMENT AND DUCTWORK ARE SHOWN BY DASHED LINES. NEW WORK AND RELOCATED WORK ARE SHOWN BY SOLID LINES. EXISTING WORK TO BE REMOVED IS SHOWN CROSSHATCHED. WHEN ANY DUCTWORK OR AIR DISTRIBUTION DEVICE IS REMOVED, THE ASSOCIATED TRUNK DUCT SHALL BE SEALED AIRTIGHT WITH A SHEET METAL PATCH OR CAP.
- VISIT SITE AND CAREFULLY EXAMINE EXISTING CONDITIONS PRIOR TO SUBMITTING BIDS. THE EXISTING CONDITIONS SHOWN ARE BASED ON DOCUMENTS PROVIDED BY OTHERS AND HAVE NOT BEEN VERIFIED BY THE ENGINEER. IF EXISTING CONDITIONS DIFFER FROM DRAWINGS IN SUCH A MANNER THAT WILL AFFECT PRICING, (I.E., DUCTWORK, VAV OR PIU ARE NOT IN THE SHOWN LOCATION) CONTRACTOR WILL NOTIFY OWNER SO THAT A RESOLUTION CAN BE MADE PRIOR TO SUBMITTING BIDS. NO ALLOWANCE WILL BE MADE FOR LACK OF KNOWLEDGE OF EXISTING CONDITIONS.
- REFER TO THE ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF ALL CEILING MOUNTED AIR DISTRIBUTION DEVICES. IF ANY ITEMS ARE NOT SHOWN ON THE REFLECTED CEILING PLANS, PREPARE A DRAWING OF THE PROPOSED LOCATION AND PRESENT IT TO THE ARCHITECT FOR APPROVAL PRIOR TO INSTALLATION.
- ALL ROUND AND FLEXIBLE DUCTWORK EXTENDING TO DIFFUSERS SHALL BE SIZED FULL SIZE OF DISTRIBUTION DEVICE INLET AND TAPS TO THE EXISTING LOW-PRESSURE DUCTWORK SHALL BE MADE WITH SPIN-IN FITTINGS HAVING INTEGRAL SCOOPS AND VOLUME DAMPERS. ALL NEW RECTANGULAR DUCTWORK TAPS SHALL BE MADE WITH SPLITTERS OR EXTRACTORS. ALL DUCTWORK SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SMACNA DUCT STANDARDS. NEW LOW PRESSURE SPIN-IN FITTINGS AND TAPS SHALL NOT BE MADE WITHIN 5 FT OF OUTLET OF EQUIPMENT. NEW LOW PRESSURE SPIN-IN FITTINGS SHALL BE MADE NO CLOSER THAN 2'-6" ON CENTER.
- FLEXIBLE DUCTS SHALL BE INSTALLED FREE OF SAGS AND KINKS; SUPPORTED AT NOT MORE THAN 48" O.C.
- TEST AND BALANCE ALL DIFFUSERS, BOXES, FANS, ETC. TO THE AIRFLOWS AND CONDITIONS INDICATED. ALL EXISTING DIFFUSERS, BOXES, FANS, ETC. WHICH ARE NOT NOTED OTHERWISE SHALL BE BALANCED TO THEIR PRIOR DESIGN AIRFLOWS. REFERENCE THE EXISTING RECORD DRAWING AVAILABLE FROM THE OWNER. TESTING AND BALANCING OF HVAC SYSTEM SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS OF AABC OR NEBB AND SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF AN AABC OR NEBB CERTIFIED TEST AND BALANCE ENGINEER. SUBMIT 4 COPIES OF THE REPORT TO THE OWNER.
- PORTIONS OF DUCTWORK VISIBLE THROUGH GRILLES AND REGISTERS IN FINISHED AREA SHALL BE PAINTED FLAT BLACK.
- ALL CONTROL WIRING AND TUBING INSTALLED ABOVE THE CEILING SHALL BE LOCATED AS HIGH ABOVE THE CEILING AS POSSIBLE AND SHALL FOLLOW THE DESIGNATED GENERAL ROUTING OF THE DUCTWORK. DO NOT HANG WIRING OR TUBING FROM DUCTWORK; RATHER, SUSPEND FROM THE STRUCTURE. ALL NEW TERMINAL UNITS SHALL BE TIED INTO THE BASE BUILDING CONTROL SYSTEM. SEE BASE BUILDING SPECIFICATIONS FOR REQUIREMENTS.
- SPRINKLER HEADS AND ASSOCIATED BRANCH PIPING SHALL BE PROVIDED AND RELOCATED IN ACCORDANCE WITH NFPA 13 AND ALL PREVAILING LOCAL CODES AS REQUIRED TO PROTECT ALL SPACES IN THIS TENANT AREA. SPRINKLER HEADS SHALL BE SEMI-RECESSED SPRINKLER HEADS IN TENANT AREAS AND CONCEALED FULLY RECESSED TYPE IN PUBLIC CORRIDORS.
- COORDINATE ALL WORK IN OCCUPIED AREAS WITH THE TENANT IN THAT AREA. COORDINATE ALL WORK IN UNOCCUPIED AREAS AND COMMON AREAS WITH LANDLORD.
- ALL MATERIALS IN PLENUM SHALL BE PLENUM-RATED.
- THERMOSTATS SHALL BE LOCATED IN EACH ZONE AS SHOWN. THE EXACT LOCATION ON THE WALL INDICATED SHALL BE AS DIRECTED BY THE ARCHITECT. NEW THERMOSTATS SHALL BE SELECTED TO MATCH EXISTING BASE BUILDING THERMOSTATS AND SHALL BE COMPATIBLE WITH EQUIPMENT SERVED. THERMOSTATS ON EXTERIOR WALLS SHALL BE PROVIDED WITH INSULATED BACKING.
- ALL WORK AND MATERIALS SHALL BE CONSISTENT WITH BASE BUILDING SPECS.
- MATERIALS EXPOSED WITHIN THE PLENUM SHALL BE NONCOMBUSTIBLE OR HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE DEVELOPMENT INDEX OF NOT MORE THAN 50 AS DETERMINED IN ACCORDANCE WITH ASTM E 84.

## MECHANICAL LEGEND

	CEILING DIFFUSER
	CEILING RETURN AIR GRILLE
	CEILING EXHAUST GRILLE
	SUPPLY REGISTER
	SLOT DIFFUSER UON
	FIRE DAMPER UON
	MANUAL VOLUME DAMPER UON
	MOTOR OPERATED DAMPER
	THERMOSTAT
	HUMIDISTAT
	CARBON DIOXIDE SENSOR
	SMOKE DETECTOR
	CONNECT TO EXISTING
	EXISTING WORK
	WORK TO BE REMOVED
	GAS PRESSURE REGULATOR

### Ventilation Sizing Summary for RTU-1

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	135 CFM
System Ventilation Efficiency (Ev)	1.000
Outdoor Air Intake (Vot)	169 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
102-CS-I	1	927	1747.0	0.06	6.0		0.8		169	135	1.000
<b>Totals (incl. Space Multipliers)</b>		<b>927</b>							<b>135</b>	<b>1.000</b>	

### Ventilation Sizing Summary for RTU-2

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	466 CFM
System Ventilation Efficiency (Ev)	1.000
Outdoor Air Intake (Vot)	583 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
101-ES-S	1	1138	2948.0	0.12	15.0		7.50	0.8	583	466	1.000
<b>Totals (incl. Space Multipliers)</b>		<b>1138</b>							<b>466</b>	<b>1.000</b>	

#### OUTSIDE AIR CALCULATION TABLE NOTES (APPLY THIS SHEET ONLY)

- BALANCE OUTSIDE AIR SYSTEM SERVING THE SPACE TO PROVIDE, AT A MINIMUM, THE OUTSIDE AIR RATE INDICATED. THE ASHRAE 2013 OA CALCULATION USED ABOVE IS CALCULATED THE SAME WAY AS FOUND IN THE OHIO MECHANICAL CODE.

### Ventilation Sizing Summary for RTU-3

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	126 CFM
System Ventilation Efficiency (Ev)	0.974
Outdoor Air Intake (Vot)	130 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
103-STORAGE	1	775	503.0	0.12	1.0		7.50	0.8	85	69	0.974
102-CS-W	1	737	434.0	0.12	0.9		7.50	0.8	73	59	0.964
<b>Totals (incl. Space Multipliers)</b>		<b>1512</b>							<b>126</b>	<b>0.974</b>	

### Ventilation Sizing Summary for RTU-4

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	83 CFM
System Ventilation Efficiency (Ev)	0.720
Outdoor Air Intake (Vot)	115 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
105-BR	1	460	304.0	0.12	1.5		5.00	0.8	96	44	0.992
104-HALLWAY	1	29	98.0	0.08	0.0		0.00	0.8	7	6	0.720
106-MO	1	114	205.0	0.06	1.0		5.00	0.8	22	17	0.892
107-IT	1	83	148.0	0.00	0.7		0.00	0.8	0	0	1.082
108-MEN	1	39	53.0	0.00	1.0		0.00	0.8	0	0	1.082
109-WOMEN	1	39	52.0	0.00	1.0		0.00	0.8	0	0	1.082
110-UTILITY	1	133	33.0	0.08	1.0		0.00	0.8	2	2	1.063
111-HALLWAY-W	1	93	92.0	0.06	0.0		0.00	0.8	7	9	1.099
111-HALLWAY-I	1	33	140.0	0.06	0.0		0.00	0.8	11	9	0.761
<b>Totals (incl. Space Multipliers)</b>		<b>1014</b>							<b>83</b>	<b>0.720</b>	

### Ventilation Sizing Summary for RTU-5

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	594 CFM
System Ventilation Efficiency (Ev)	0.876
Outdoor Air Intake (Vot)	678 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
101-RS-I	1	870	1949.0	0.12	20.0		7.50	0.8	480	384	0.876
101-RS-N	1	520	1126.0	0.12	10.0		7.50	0.8	263	210	0.922
<b>Totals (incl. Space Multipliers)</b>		<b>1390</b>							<b>594</b>	<b>0.876</b>	

### Ventilation Sizing Summary for RTU-6

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	338 CFM
System Ventilation Efficiency (Ev)	1.000
Outdoor Air Intake (Vot)	422 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
101-RS-E	1	3177	1453.0	0.12	21.8		7.50	0.8	422	338	1.000
<b>Totals (incl. Space Multipliers)</b>		<b>3177</b>							<b>338</b>	<b>1.000</b>	

### Ventilation Sizing Summary for RTU-7

Project Name: 2025-0647 BASSETT CINCINNATI  
Prepared by: Barrett Woodyard & Associates

08/27/2025  
04:02PM

**1. Summary**

Ventilation Sizing Method	ASHRAE Std 62.1-2016
Design Condition	Heating operation
Occupant Diversity (D)	1.000
Uncorrected Outdoor Air Intake (You)	16 CFM
System Ventilation Efficiency (Ev)	1.000
Outdoor Air Intake (Vot)	96 CFM

**2. Space Ventilation Analysis**

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (Sq Ft)	Area Outdoor Air Rate (CFM/Sq Ft)	Averaged Occupancy (Person)	Time Outdoor Air Rate (Pz)	People Outdoor Air Rate (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Evz)
Zone 1											
102-CS-E	1	976	1092.0	0.06	2.2		5.00	0.8	96	76	1.000
<b>Totals (incl.</b>											

FAN SCHEDULE										
I.D. TAG	CAPACITY (CFM)	S.P. (IN. WG)	MOTOR H.P.	DRIVE	VOLTS/ PHASE	MAXIMUM FAN RPM	MAXIMUM NOISE	TYPE OF FAN	BASIS OF DESIGN	REMARKS
TEF-A	200	0.4	F	DIRECT	115/1	736	1.7 SONES	CEILING EXHAUST	GREENHECK SP-A200	① ② ③
TEF-B	75	0.4	F	DIRECT	115/1	736	1.7 SONES	CEILING EXHAUST	GREENHECK SP-A90	① ②

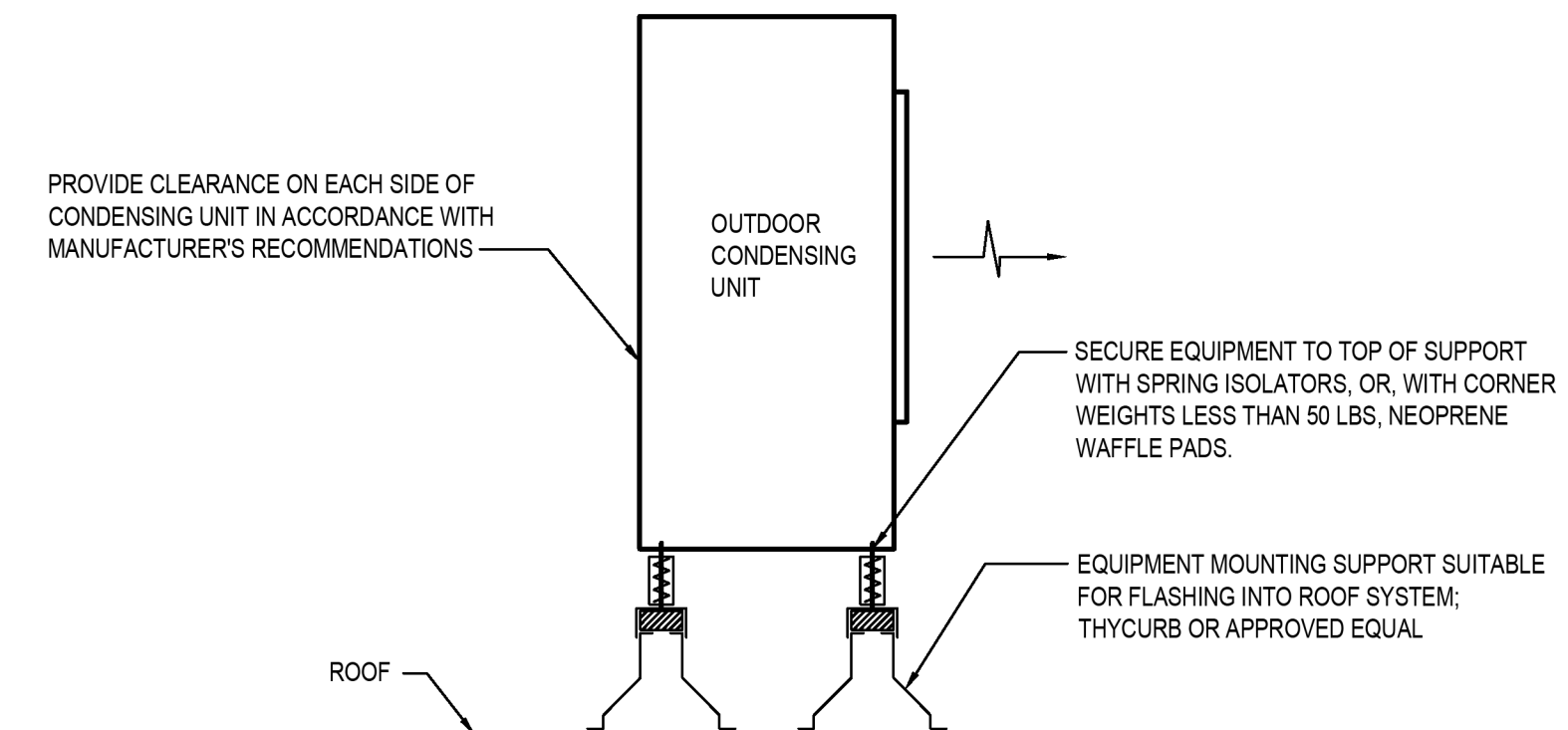
- ① FAN TO BE INTERLOCKED WITH LIGHTS COORDINATE WITH DIV 26 PROVIDE TRANSFORMER AS NEEDED.
- ② PROVIDE FAN WITH A BACKDRAFT DAMPER, AND SPEED CONTROLLER FOR BALANCING PURPOSES.
- ③ PROVIDE WITH 7-DAY PROGRAMMABLE TIME CLOCK. TIME CLOCK TO BE PROGRAMMED ON DURING OPERATING HOURS.

PACKAGED ROOF TOP UNITS																	
I.D. TAG	MINIMUM TOTAL CAP. (MBH)	MINIMUM SENSIBLE CAP. (MBH)	AMBIENT TEMP (°F)	COIL EAT		AIRFLOW (CFM)	EXT. S.P. (IN. W.C.)	MAX H.P.	OUTSIDE AIR (CFM)	HEATING			VOLTS/ PHASE	BASIS OF DESIGN	EER	APPROX. UNIT WEIGHT (LBS)	REMARKS
				°F db	°F wb					TYPE	INPUT	OUTPUT					
RTU-1	89.73	69.1	95.0	80.0	67.0	3,000	1.0	3.0	153	GAS	150	122	460/3	TRANE YSK090	11.0 EER	1056	② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
RTU-2	89.73	69.1	95.0	80.0	67.0	3,000	1.0	3.0	857	GAS	150	122	460/3	TRANE YSK090	11.0 EER	1056	② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
EX. RTU-3	-	-	-	-	-	1,600	-	-	-	-	-	-	-	ICP RGS048	-	-	-
EX. RTU-4	-	-	-	-	-	1,200	-	-	-	-	-	-	-	ICP RGS036	-	-	-
RTU-5	89.73	69.1	95.0	80.0	67.0	3,000	1.0	3.0	786	GAS	150	122	460/3	TRANE YSK090	11.0 EER	1056	② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
RTU-6	89.73	69.1	95.0	80.0	67.0	3,000	1.0	3.0	422	GAS	150	122	460/3	TRANE YSK090	11.0 EER	1056	② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
EX. RTU-7	-	-	-	-	-	1,600	-	-	-	-	-	-	-	CARRIER 48FCEA05	-	-	-
EX. RTU-8	-	-	-	-	-	1,200	-	-	-	-	-	-	-	ICP RGS036	-	-	-

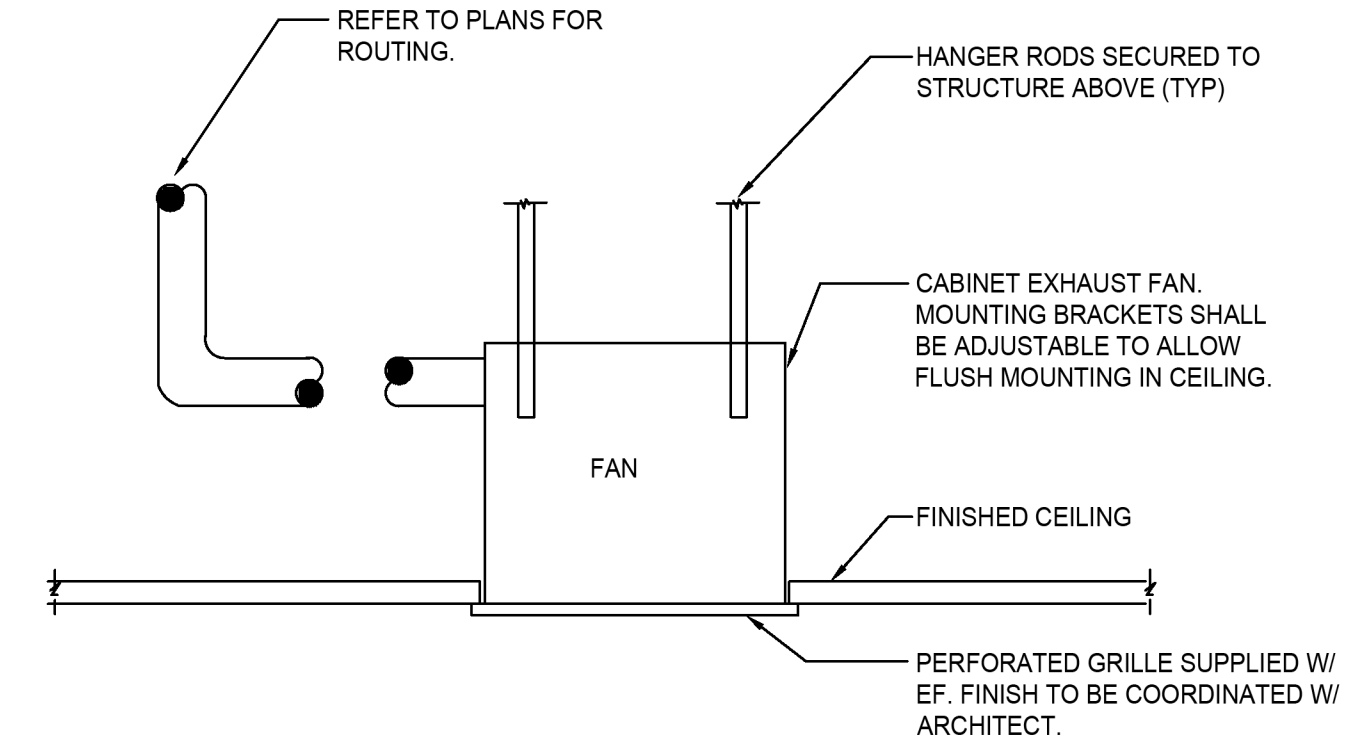
- ① THIS IS THE STATIC PRESSURE EXTERNAL TO THE UNIT. IT DOES NOT INCLUDE COIL, CASING, FILTER OR HEATER LOSSES.
- ② PROVIDE UNIT COMPLETE FACTORY DISCONNECT W/ LOCKOUT PROTECTION CAPABILITY.
- ③ CAPACITY IN MBH.
- ④ SUPPLY FAN SHALL BE CAPABLE OF SUPPLYING AIRFLOW AT CFM & E.S.P. (IN. W.C.) AS INDICATED ON SCHEDULE ABOVE.
- ⑤ PROVIDE SMOKE DETECTOR IN UNIT SUPPLY AND RETURN. INSTALLATION SHALL BE IN ACCORDANCE WITH NFPA 72E COORD. W/ DIVISION 16.
- ⑥ POWERED WEATHERPROOF GFI DEDICATED CONVENIENCE OUTLET TO BE PROVIDED, COORDINATE WITH ELECTRICAL.
- ⑦ PROVIDE UNIT WITH COMPARATIVE ENTHALPY ECONOMIZER.
- ⑧ PROVIDE WITH HAIL GUARD.
- ⑨ PROVIDE WITH 2 MULTI-STAGE COMPRESSORS.
- ⑩ PROVIDE WITH HOT GAS RE-HEAT.

SPLIT SYSTEM SCHEDULE																				
I.D. TAG	MINIMUM TOTAL CAP. (BTUH)	MINIMUM SENSIBLE CAP. (BTUH)	AIRFLOW (CFM)	OUTSIDE AIR (CFM)	EXT. S.P. (IN. W.C.)	MAX H.P.	FAN COIL UNIT DATA				TYPE OF UNIT	HEATING SECTION TYPE	CAPACITY	CONDENSING UNIT DATA				BASIS OF DESIGN	REMARKS	
							COIL EAT °F db	°F wb	VOLTS/ PHASE	DRIVE				MAX FAN RPM	AMBIENT TEMP. (°F)	VOLTS/ PHASE	STAGES			MIN. SEER
AHU-1/CU-1	12,000	12,000	205	-	-	F	94	76	208/1	D	-	WALL MOUNTED	-	-	95	208/1	1	21.3	MITSUBISHI PLA-A12/PUY-A12	④

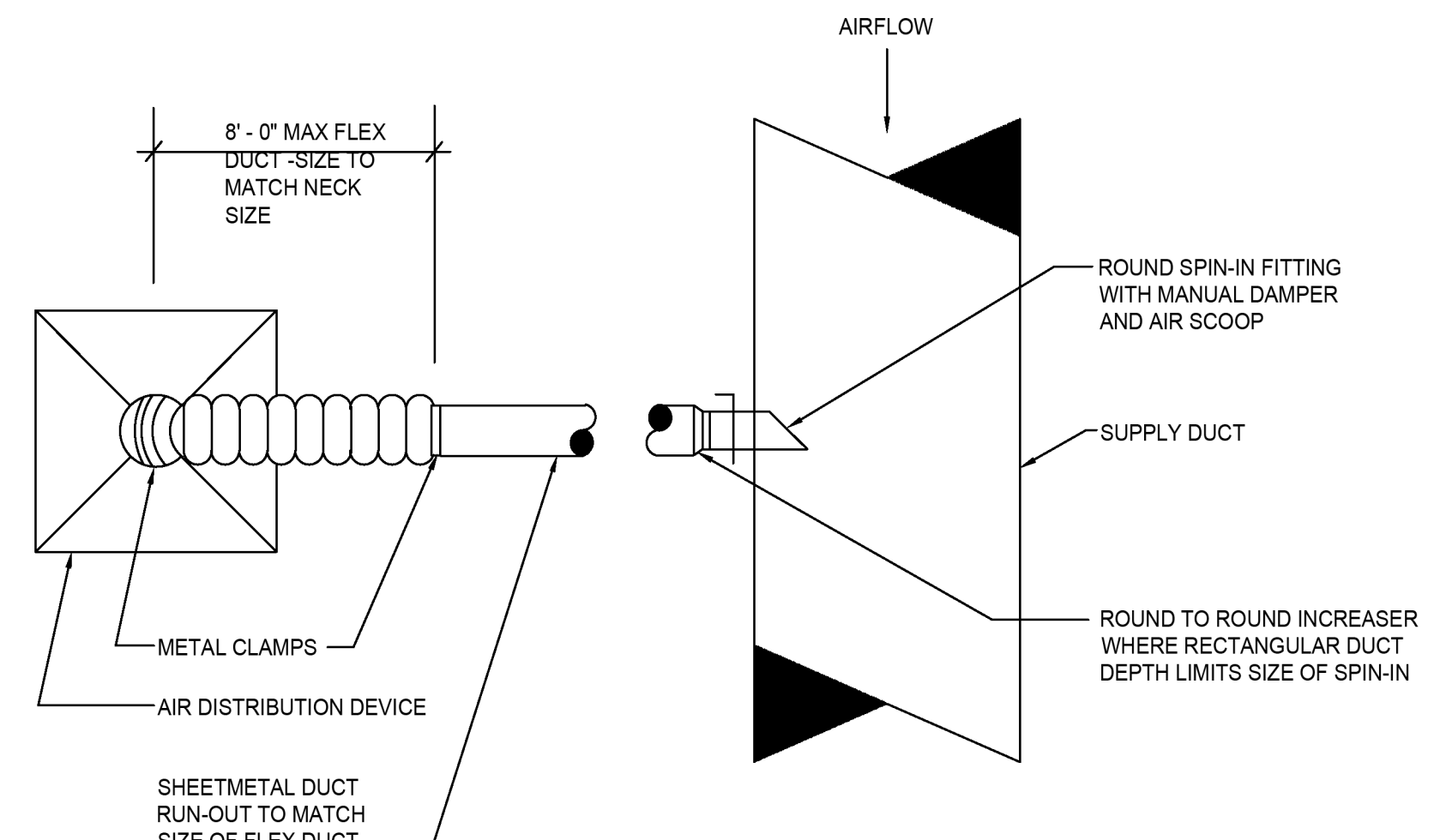
- ① THIS IS THE SP EXTERNAL TO THE ENTIRE FAN COIL UNIT ASSEMBLY (WET COIL, CASING, CLEAN FILTERS, AND FURNACE LOSSES ARE NOT INCLUDED IN THIS EXT. SP.)
- ② B = BELT DRIVE, D = DIRECT
- ③ HP STANDS FOR HEAT PUMP AND CAPACITY IS GIVEN IN MBH. ELEC STANDS FOR ELECTRIC HEAT AND VALUES ARE GIVEN IN KW.
- ④ PROVIDE WITH REMOTE WALL MOUNTED THERMOSTAT LOCATED AS SHOWN ON PLANS.



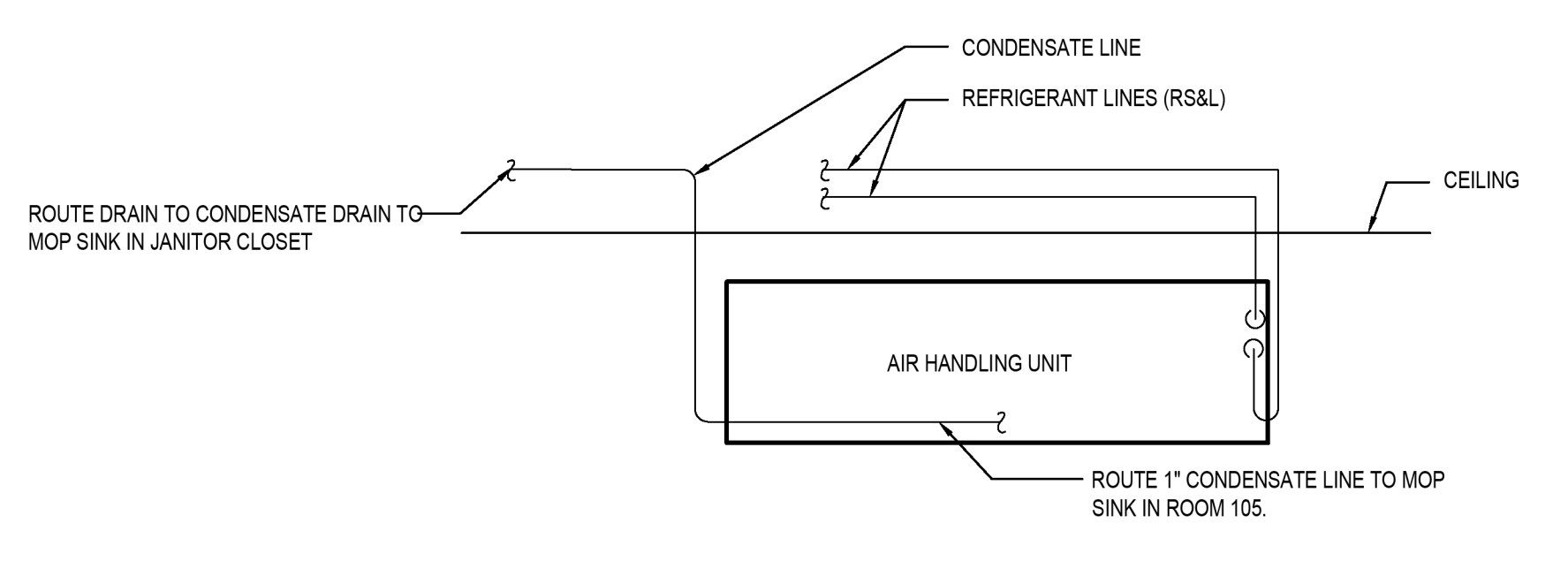
8 CONDENSING UNIT DETAIL  
M0.02 NO SCALE



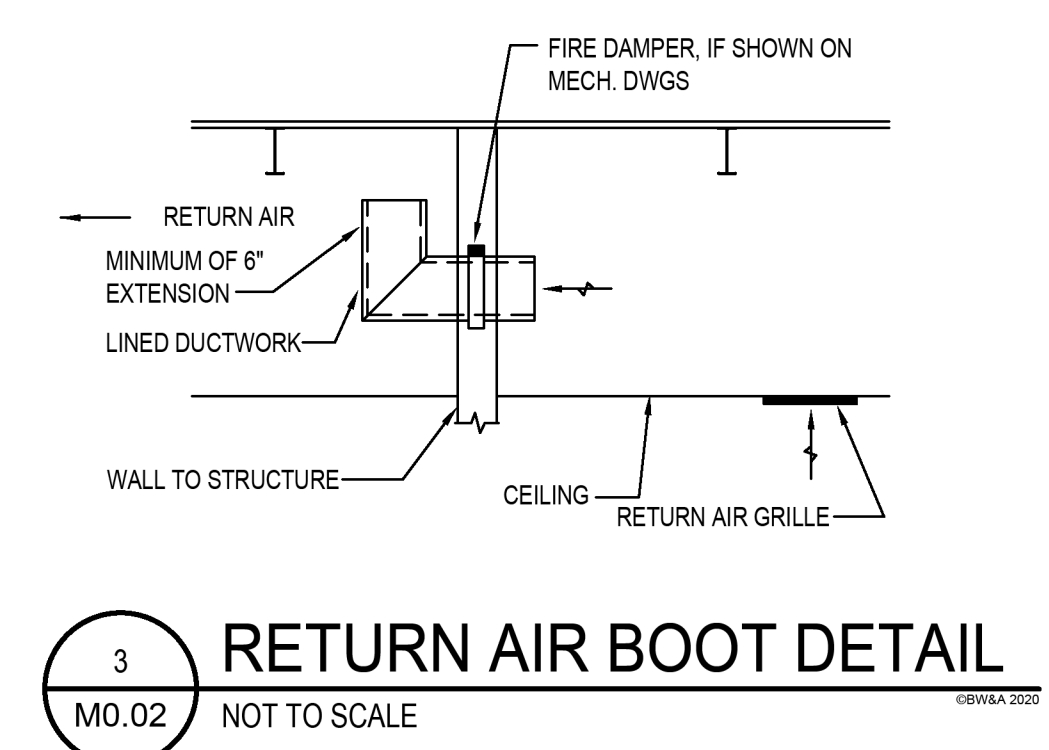
1 CEILING FAN  
M0.02 NOT TO SCALE



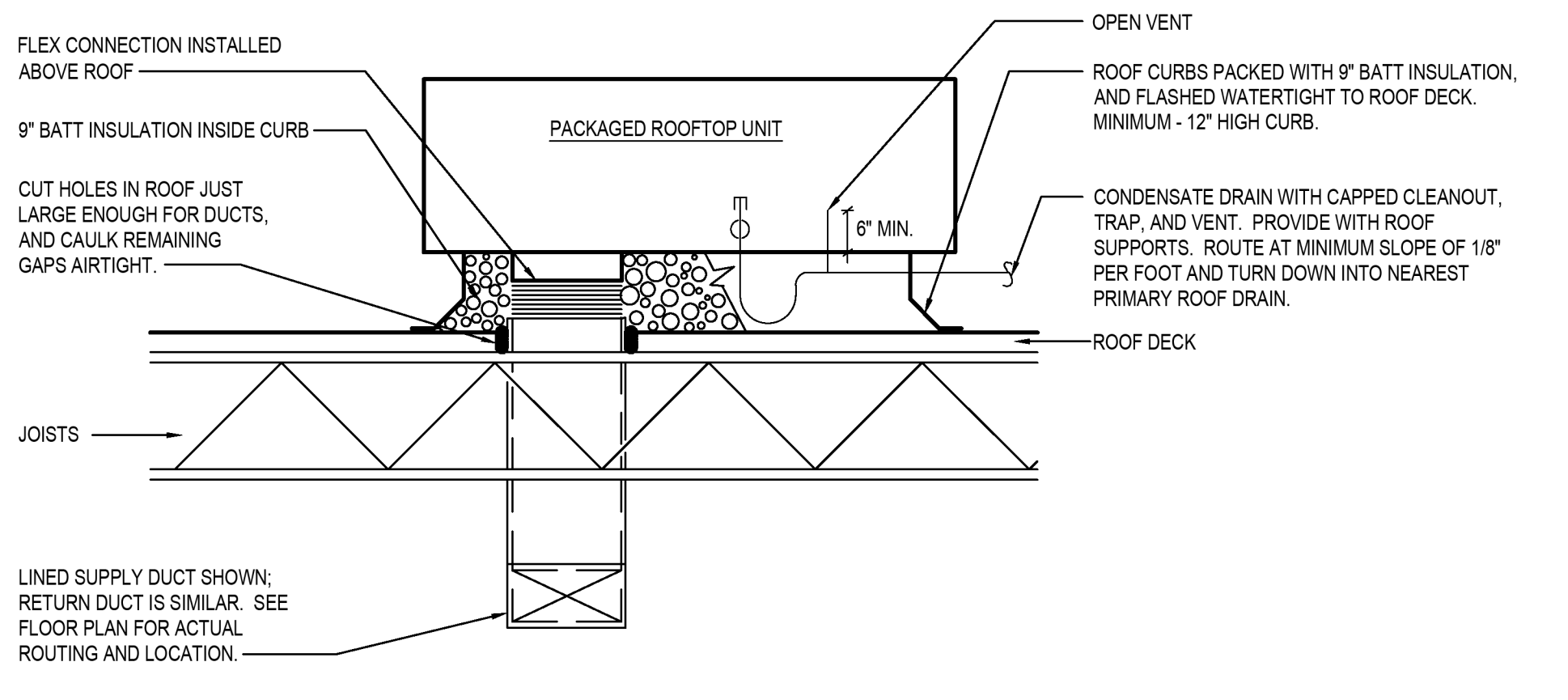
2 DIFFUSER CONNECTION DETAIL  
M0.02 NOT TO SCALE



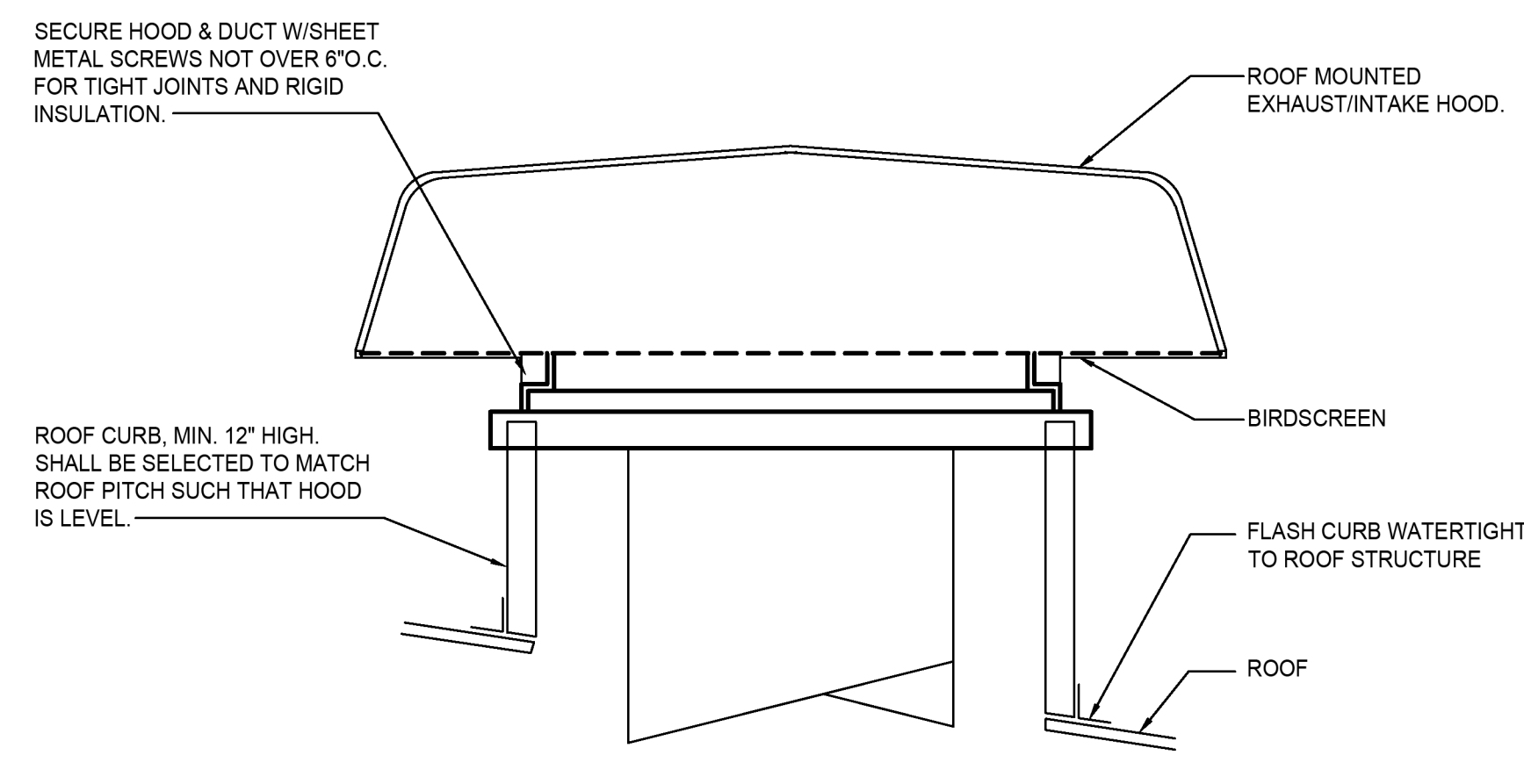
7 WALL/CEILING MOUNTED DUCTLESS MINI-SPLIT AIR HANDLER UNIT DETAIL  
M0.02 NO SCALE



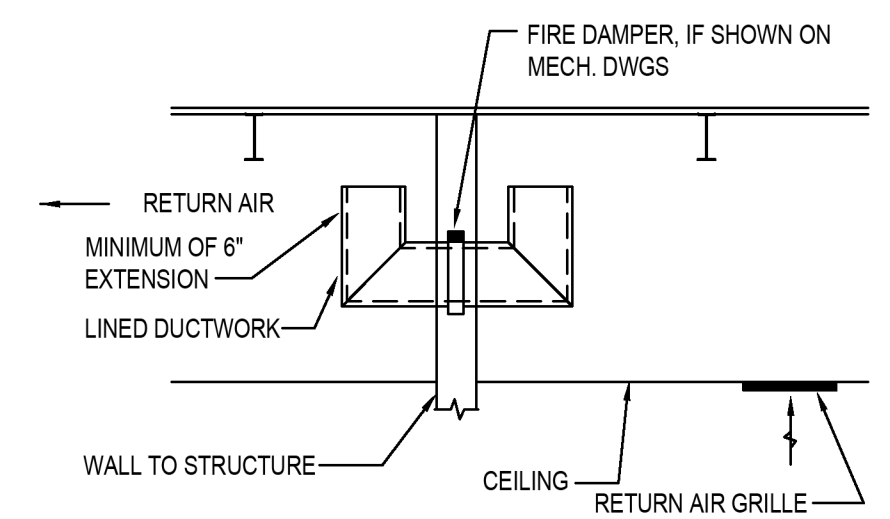
3 RETURN AIR BOOT DETAIL  
M0.02 NOT TO SCALE



4 ROOFTOP UNIT DETAIL  
M0.02 NO SCALE

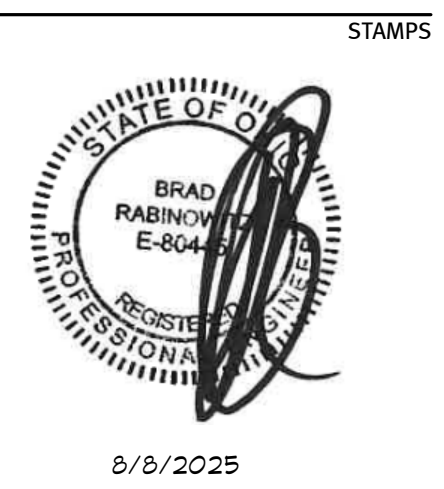


5 ROOF MOUNTED EXHAUST/INTAKE HOOD  
M0.02 NOT TO SCALE



6 RETURN AIR U BOOT DETAIL  
M0.02 NOT TO SCALE

- NOTES:
- 1. SEE MECH DWGS FOR DUCT SIZE. DUCT SIZE GIVEN IN SQUARE FEET OF FREE AREA. CONTRACTOR TO COORDINATE DUCT SIZE WITH ALL OTHER EQUIPMENT IN PLENUM.
- 2. RA BOOT OPENINGS SHALL BE AT LEAST 6" FROM ANY OBSTRUCTION TO ALLOW FREE RETURN.
- 3. RA BOOT OPENINGS SHALL NOT BE WITHIN 18" OF VERTICAL BEAM FACE IN THE DIRECTION OF THE RETURN. BOOTS SHALL BE EXTENDED INTO ADJACENT STRUCTURAL BAYS AS REQUIRED.



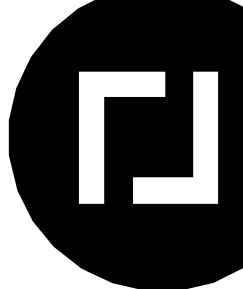
SECTION 23 05 00 COMMON WORK RESULTS FOR HVAC	
<b>1.0 GENERAL</b>	
<b>1.01 DESCRIPTION</b>	<p>A. This Division 23 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the air conditioning, ventilating, heating, fire suppression and plumbing systems as specified herein and as shown.</p> <p>B. The General Provisions and Division 01, including the general, supplementary and other conditions and other Divisions, as appropriate, apply to work specified in this Division.</p>
<b>1.02 EXISTING CONDITIONS</b>	<p>A. Attention is called to the fact that the work is to be performed within an existing, operational facility. Prior to the submission of bids, each bidder shall visit the project site, thoroughly investigate and be familiar with all existing conditions which will affect their work; especially the work to be performed above the existing ceilings.</p> <p>B. Connect new work to existing work in a neat and workmanlike manner. Where an existing structure must be cut or existing utilities interfere, such obstructions shall be bypassed, removed, replaced or relocated, patched and repaired. Work disturbed or damaged shall be replaced or repaired to its prior condition.</p> <p>C. Prior to the start of any demolition or construction, secure the services of a qualified, EPA Certified Asbestos Abatement Agency to check the existing insulation, etc. for asbestos. Should asbestos be found, do not proceed with demolition or construction; notify the Architect in any case in writing of the Agency's findings.</p>
<b>1.03 INTENT OF DRAWINGS AND SPECIFICATIONS</b>	<p>A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.</p> <p>B. The engineering drawings are diagrammatic, intended to show general arrangement and sizes of system components, and shall not be scaled. Further, the architectural and structural drawings shall govern space constraints, dimensions and finishes. All offsets and fittings which will be necessary to accomplish the finished installation shall be provided at no additional cost or increase in the Contract.</p>
<b>1.04 SPACE PRIORITY</b>	<p>A. Ensure optimum use of available space for materials and equipment installed above ceilings. Allocate space in the order of priority as listed below except as otherwise detailed. Items are listed in the order of priority, with items of equal importance listed under a single priority number.</p> <ol style="list-style-type: none"> <li>Gravity flow piping systems</li> <li>Vent piping systems</li> <li>Recessed lighting fixtures</li> <li>Concealed HVAC terminals and equipment</li> <li>Air duct systems</li> <li>Sprinkler piping systems</li> <li>Pressurized piping systems</li> <li>Electrical conduit, wiring, control air tubing</li> </ol> <p>B. Order of space priority does not dictate installation sequence. Installation sequence shall be as required to install all affected trades.</p> <p>C. The work of this Division 23 shall not obstruct access for installation, operation and maintenance of the work of any other Division.</p> <p>D. All major items of equipment shall be arranged so as to provide a minimum of 28" clear aisle space. Additional space shall be provided between and around equipment for maintenance and proper operation as shown in the Equipment Manufacturer's literature.</p>
<b>1.05 COORDINATION</b>	<p>A. Coordinate all work under this Division 23 with work under all other Divisions, providing adjustment as necessary.</p> <p>B. Coordination of space requirements with respect to Division 26 shall be performed such that:</p> <ol style="list-style-type: none"> <li>No equipment, piping or ductwork, other than electrical, shall be installed within 42" of switchboards or panelboards.</li> <li>No piping or ductwork which ever operates at a temperature in excess of 120°F shall be installed within 3" of any electrical conductor.</li> </ol> <p>C. All items mounted in or below the ceiling, and all items penetrating the ceiling, shall be coordinated with the architectural reflected ceiling plans. If any items are not shown on these plans, or any items need to be relocated for coordination purposes, prepare a reflected ceiling plan and submit it to the Architect for approval.</p> <p>D. Variable-Frequency Drives shall be provided under Division 23 and installed by Division 26. See specification 26 29 23 Variable – Frequency Motor Controllers.</p> <p>E. Fused disconnects shall be provided under this Division 23 for all equipment connected directly to bus duct, and rating shall match bus duct rating. Coordinate with Division 26.</p>
<b>1.06 CODE COMPLIANCE</b>	<p>A. All workmanship and materials provided under this Division 23 shall comply with all laws, ordinances, codes and regulations of all Federal, State and Local Authorities Having Jurisdiction.</p> <p>B. All fire suppression, plumbing, heating, ventilating, and air conditioning materials and workmanship shall comply with the following codes and standards as minimum requirements:</p> <ol style="list-style-type: none"> <li>NFPA 70, National Electrical Code, 2023 Edition</li> <li>Life Safety Code (NFPA 101) – 2015 Edition</li> <li>All other NFPA Codes and Standards – Applicable Editions</li> <li>Ohio Building Code – 2024 Edition</li> <li>Ohio Energy Code – 2017 Edition</li> <li>Ohio Mechanical Code – 2024 Edition</li> <li>Ohio Plumbing Code – 2024 Edition</li> <li>American with Disabilities Act, January 26, 1992</li> <li>American National Standard Handicapped Code, A117.1 – 1986 Edition</li> <li>ASME A17.1 Safety Code Elevators and Escalators, 2013 Edition</li> </ol> <p>C. Secure and pay all fees associated with all permits and licenses required for execution of the Contract. Arrange for all inspections required by City, County, State and other Authorities Having Jurisdiction, and deliver certificates of approval to the Architect.</p> <p>D. The code requirements are strictly a minimum and shall be met without incurring additions to the Contract. Where requirements of the drawings or specifications exceed the code requirements, the work shall be provided in accordance with these drawings or specifications. In the event of conflict or ambiguity between the various codes, the most stringent requirement shall govern.</p>
<b>1.07 ELECTRICAL REQUIREMENTS AND INTERFACE</b>	<p>A. All electrical equipment and wiring provided under this Division 23 shall comply with the electrical system characteristics indicated on the electrical drawings and specified in Division 26.</p> <p>B. Electric controls, contactors, starters, pilot lights, push buttons, etc., shall be provided complete as part of the motor, heater or other equipment which it operates. All electrical components shall be in conformance with the requirements of the National Electrical Code and Division 26. Starters shall be wye-delta, closed transition type. Reference Division 26 and the electrical engineering drawings for those motor starters provided under that Division 26. All starters not shown shall be provided under this Division 23. Unless specified otherwise under other individual equipment Sections, motor starters shall conform to the following minimum requirements:</p> <ol style="list-style-type: none"> <li>Starters for motors 1/3 horsepower or smaller shall be manual unless remote or automatic starting is required, in which case the starters shall be magnetic, full voltage, non-reversing, single-speed, unless otherwise indicated. All other starters shall be magnetic.</li> </ol>

	<p>2. Each starter for a three-phase motor shall be furnished with three (3) overload relays sized for the full load running current of the motor actually provided. Provide an external "HAND-OFF-AUTO" selector switch with red "RUNNING" light. Provide a green pilot light to indicate motor "STOPPED". Each pilot light shall have a legend plate indicating reason for signal.</p> <p>3. Each overload relay shall have a normally open alarm contact which will close only when actuated by an overload (not to be confused with N.O. or N.C. auxiliary contacts). These contacts shall be properly wired to their respective blue pilot light provided on the starter front cover and having a "TRIPPED" legend plate.</p> <p>4. Individually mounted motor starters shall be in a NEMA Type 1 general purpose enclosure in unfinished areas and shall be flush mounted in all finished areas. All starters mounted in exterior areas shall have a NEMA 3R enclosure. Each starter shall have a laminated nameplate to indicate equipment unit number, function and circuit number.</p> <p>5. All motor starters, push buttons and pilot lights shall be of the same Manufacturer as the switchboard and shall be General Electric, Square D, Siemens I.T.E., or Westinghouse.</p>
	<p>C. Motor starters for the following equipment shall be provided under this Division 23 by the Manufacturer of the equipment:</p> <ol style="list-style-type: none"> <li>Packaged air conditioning equipment</li> <li>Water chillers</li> <li>Other equipment hereinafter specified in other Sections to be provided with integral starters</li> </ol> <p>D. Unless otherwise noted or specified in individual Sections, all 3-phase motors shall be standard NEMA continuous duty "B" type, with Class B insulation, open drip-proof frame for indoor service, TEC for outdoor service and a service factor of 1.15. All motors 5 HP and larger shall be U.S. Motors HI-Efficiency Model or Reliance XE HI-Efficiency Model.</p> <p>E. All power wiring and final connections to equipment shall be provided under Division 26.</p> <p>F. Control components, all interlocks, (VAVs, actuators, smoke dampers, fire/smoke dampers, motor-operated dampers, fire alarm motors, etc.) and control wiring (277 volt, single phase and less) shall be provided under this Division 23 as required to achieve the specified control sequences. All electrical connections shall be specifically coordinated with Division 26 and any necessary scope included as part of Division 23.</p> <p>G. All control wiring over 30 volts shall be installed by a licensed Electrician working under this Division 23.</p>
<b>1.08 SLEEVES, SEALS AND ESCUTCHEONS</b>	<p>A. Sleeves shall be provided through all pipe and ductwork penetrations of concrete or masonry walls, elevated floors and roofs, except those piping penetrations for equipment, etc.</p> <p>B. Sleeves shall be fabricated from Schedule 40 steel pipe through 10" and Standard Wall steel pipe or elevated ceilings 12" and larger sizes and all penetrating exterior walls, underground walls, pit or vault walls shall be provided with a 3" x 3/8" thick waterstop ring welded completely to the midpoint of the sleeve.</p> <p>C. All sleeves penetrating exterior walls, underground walls, pit or vault walls and elevated floors shall be packed and sealed watertight.</p> <p>D. Sleeves through roofs shall extend above the roof surface and be flashed watertight.</p> <p>E. Sleeves through walls shall be cut and finished flush with each surface of the wall in which they are installed.</p> <p>F. Sleeves through floors in mechanical rooms or other back of house spaces shall be installed with the top no less than 1/2" above the finished floor to allow for leak protection. Space between the top of the fire-stopping and top of the sleeve shall be packed with mineral wool and caulked to not allow water ponding within the sleeve.</p> <p>G. Sleeves shall be sized to provide a minimum of 1/2" clearance between the inside surface of the sleeve and the outside finished surface of the pipe plus any insulation specified.</p> <p>H. Fire-stops shall be provided as specified herein. All annular spaces between piping and sleeves, which do not require fire-stops, shall be packed with mineral wool and caulked.</p> <p>I. Provide round, chrome-plated escutcheons on all exposed piping and ductwork penetrations passing through walls, floors, partitions and ceilings. Escutcheons shall be painted and caulked in coordination with Architect. Note that escutcheons shall be only attached to the wall as piping and ductwork may move slightly during operation.</p>
<b>1.09 FIRESTOPS</b>	<p>A. Where piping, conduit, etc. pass through fire partitions, fire walls and floors, a firestop shall be provided that will ensure an effective barrier against the spread of fire, smoke and gases. Firestop material shall be packed tight and completely fill gaps between the ductwork, piping, conduit, etc. and the perimeter of their rough openings.</p> <p>B. All penetrations shall be in accordance with UL 1479 or ASTM E 814 listed systems, and products used shall be specifically applicable for the appropriate installation conditions. Assemblies shall provide a minimum rating equal to the construction penetrated. Products shall be by HILTI, 3M, or ProSet.</p> <p>C. Installation shall be by a Qualified Installer. Installer shall be certified, licensed, or otherwise qualified by the Firestopping Manufacturer as having the necessary training to install the Manufacturer's specific product. A Manufacturer or Vendor's willingness to sell the firestopping product to the Contractor or Installer does not in itself confer qualification.</p> <p>D. Installer shall have at least one of the following qualifications:</p> <ol style="list-style-type: none"> <li>FM 4891 Approved Contractor</li> <li>UL Approved Contractor</li> <li>HILTI, 3M, or ProSet Accredited Fire Stop Specialty Contractor</li> </ol> <p>E. Installing Firm shall have no less than 3 years of experience with firestop installation.</p> <p>F. A Manufacturer's direct Representative (not Distributor or Agent) shall be on site during initial installation of firestop systems and shall be present when Contractor personnel in proper selection and installation procedures.</p> <p>The firestop Contractor or Installer shall supply As-Built documentation of each individual penetration location on the through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach label permanently on both sides of penetrated construction in a visible location. The label shall include the following:</p> <ol style="list-style-type: none"> <li>The words "Warning – Through Penetration Firestop System-Do Not Disturb"</li> <li>Through Penetration firestop system designation and Manufacturer</li> <li>Date of installation</li> </ol>
<b>1.10 CORE DRILLING</b>	<p>A. Cutting of holes through concrete and masonry shall be by diamond core or concrete saw. Pneumatic hammer, impact electric and hand or manual hammer type drills will not be allowed, except as permitted by the Architect where required by limited working space. Locate holes such that they will not affect structural sections such as ribs or beams. Holes shall be laid out well in advance of the installation. These layout locations shall be approved by the Architect prior to drilling.</p>
<b>1.11 IDENTIFICATION OF PIPING</b>	<p>A. All aboveground HVAC piping sized 3/4" and larger which is installed in accessible locations (including piping above removable ceilings and behind access panels) shall be identified in strict conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1-2015).</p> <p>B. Piping labels in exposed areas shall be oriented and located in coordination with the Architect.</p> <p>C. Specific system names shall be subject to Owner approval. System names shall, at minimum, uniquely identify the system and performance category – i.e. Base Building Condenser Water Supply, Cooling Tower Make-up, etc.</p> <p>D. Each identification marker shall include to the following:</p> <ol style="list-style-type: none"> <li>Proper color-coded background</li> <li>Proper color of legend in relation to background color</li> <li>Proper legend letter size</li> <li>Proper marker length</li> <li>Direction of flow arrows shall be included on each marker</li> </ol>


	<p>E. Locations for pipe markers shall be as follows:</p> <ol style="list-style-type: none"> <li>Adjacent to each valve and fitting</li> <li>At each branch and tee</li> <li>At each pipe passage through walls, floors or ceilings</li> <li>On all straight pipe runs every 25 feet</li> </ol> <p>F. Identification markers may be stenciled or shall be Setmark Pipe Markers, as manufactured by Seton Name Plate Corporation.</p> <p>G. All valves shall be identified with the appropriate service designation and valve number with brass valve tags. Each valve tag shall be 19 gauge brass with 1/4" black-filled letters over 1/2" black-filled numbers. Tags shall be fastened to valves with brass "S" hooks or brass jack chain. Brass tags and fasteners shall be as manufactured by Seton Name Plate Corporation.</p> <p>H. Provide charts of all valves. Valve charts shall include the following items:</p> <ol style="list-style-type: none"> <li>Valve Identification Number</li> <li>Location</li> <li>Purpose/Material</li> </ol>
<b>2.0 PRODUCTS</b>	<p><b>2.01 BID BASIS AND SUBSTITUTION PROCEDURES</b></p> <p>A. Manufacturer names, series and model numbers, as noted or specified, are for the purpose of describing type, capacity, and quality of equipment, materials and products to be used. Unless "or equal" is specifically stated, bids shall be based only on the specified "basis of design" Manufacturer. The listing of a particular manufacturer as an "equal" or "acceptable substitute" manufacturer shall not be misconstrued as approving nor allowing the substitution of that Manufacturer's standard product in place of the basis of design. No consideration will be given to a product, which would require dimensional, spatial or aesthetic changes to the project. "Acceptable substitute" and "equal" manufacturers shall only bid those products, which exactly match the size and other characteristics of the specified basis of design. Any changes to other disciplines and trades of work required by an "or equal" or "substitute" product shall be duly considered and priced accordingly prior to bidding or pricing. The decision as to whether or not a proposed substitute or "equal" product is actually equal to that specified shall rest solely with the Architect.</p> <p>B. Requests to provide "equal" products in lieu of those specified shall be submitted to the Architect in writing at least ten (10) days prior to final pricing and execution of the Contract. No consideration will be given to substitute products after final pricing and execution of the Contract.</p> <p>C. Any "or equal" product or proposed product substitution which will cause a change in the appearance, dimensions or design of any part of the building, its structure, electrical system or any other engineered systems shall be accompanied by a scaled drawing and written description of the required change(s) for approval by the Architect. If deemed necessary by the Architect, Owner, or design changes shall be signed and sealed by a registered Professional Engineer, currently licensed in this State. This shall be performed under the Contractor's scope who selects the substitution.</p> <p>D. Any and all changes due to a substitution of basis of design equipment including but not limited to electrical connection, physical size, access, duct or piping connections, controls, etc. shall be solely the responsibility of substituting Contractor.</p>
<b>2.02 MINIMUM STANDARDS</b>	<p>A. Every piece of energy consuming equipment, all fire suppression products and fire safety equipment shall comply with the following standards as applicable, especially in regard to prevailing codes:</p> <ol style="list-style-type: none"> <li>Factory Mutual Laboratories (FM)</li> <li>Industrial Risk Insurers (IRI)</li> <li>Underwriters Laboratories, Inc. (UL)</li> <li>ADC: Air Diffusion Council</li> <li>AGA: American Gas Association</li> <li>AMCA: Air Moving and Conditioning Association, Inc.</li> <li>ANSI: American National Standards Institute</li> <li>API: American Petroleum Institute</li> <li>AHRF: Air Conditioning, Heating, and Refrigeration Institute</li> <li>ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers</li> <li>ASME: American Society of Mechanical Engineers</li> <li>ASTM: American Society of Testing and Materials</li> <li>AWWA: American Water Works Association</li> <li>IBR: Institute of Boiler and Radiator Manufacturers</li> <li>MSS: Manufacturers Standardization Society</li> <li>NBBI: National Board of Boiler and Pressure Vessel Inspectors</li> <li>NEMA: National Electrical Manufacturer's Association</li> <li>OSHA: Occupational Safety &amp; Health Administration</li> <li>PDI: Plumbing Drainage Institute</li> <li>PIPI: Plastic Pipe Institute</li> <li>SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.</li> </ol>
<b>2.03 PIPE HANGERS AND SUPPORTS</b>	<p>A. Pipe hangers, trapeze hangers, upper attachments, rods and other supports shall be selected based on pipe size and material contained therein. Provide all hangers, rods, turnbuckles, angles, channels and other supports to securely support the piping systems from the building structure.</p> <p>B. All materials utilized for the hanging and support of the piping systems shall be manufactured products, which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.</p> <p>C. Supports and hangers shall be selected to fit around the pipe (and insulation unless otherwise specified herein) and provide adequate movement for expansion of the piping systems. Anchors shall be provided to restrict and control such movement within offsets and expansion loops.</p> <p>D. All hangers and supports shall be selected at a minimum factor of safety of five based on the ultimate tensile strength of the material.</p> <p>E. Intermediate pipe supports shall be provided between building structural members so as not to exceed maximum support spacing specified and shall be structural steel angles (minimum 2 1/2" x 2 1/2" x 1/4"). In steel construction, intermediate supports shall be securely clamped to steel beams, and to steel joists, and in no case shall supports be attached to roof decks.</p> <p>F. For suspending pipes from concrete beams, upper attachments shall be side beam brackets utilizing bolts in sleeves set in top portions of the beams. Where sleeves are not used, provide expansion shields or power-actuated fasteners.</p> <p>G. Hanger rods for pipe hangers shall be as follows:</p> <ol style="list-style-type: none"> <li>3/8" hanger rod – 2" nominal pipe and smaller</li> <li>1/2" hanger rod – 2 1/2" and 3" nominal pipe</li> <li>5/8" hanger rod – 4" and 5" nominal pipe</li> <li>3/4" hanger rod – 6" nominal pipe</li> <li>7/8" hanger rod – 8" through 16" nominal pipe</li> </ol> <p>H. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation except for the following services, which shall be sized to fit around the pipe and under the insulation:</p> <ol style="list-style-type: none"> <li>Hot water supply and return piping, steam, condensate return and related piping sized 2" and smaller.</li> </ol> <p>I. Provide pipe saddles, inserts and shields on all insulated piping as outlined below:</p> <ol style="list-style-type: none"> <li>Hot water supply and return piping and associated steam and condensate return piping over 2" shall be supported by steel saddles welded to pipe. Insulation shall be continuous through the saddle.</li> <li>All other insulated piping shall be supported on Foamglas insulation inserts and galvanized shields, except that no inserts are required on piping sized less than 2". Foamglas inserts shall extend at least 2" past each end of the pipe shields.</li> </ol> <p>a. Shields shall be as follows:</p> <ol style="list-style-type: none"> <li>Pipes 2" and smaller: 18 gauge x 12" long</li> <li>Pipes 2 1/2" and larger: 16 gauge x 18" long</li> </ol> <p>b. Shields and inserts shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.</p>

	<p>J. Piping installed on the roof – i.e. condenser water piping – shall be supported with steel tube posts and rollers on the outside of insulation or other approved method. Supports shall be incorporated into the roofing membrane as needed and in coordination with the Roofing SubContractor. Support location and spacing shall be coordinated with the Structural Engineer. Supports shall be under this scope unless otherwise agreed. Coordinate with the GC exact location, sizes, routes, etc. of supports.</p>
<b>3.0 EXECUTION</b>	
<b>3.01 SUBMITTALS</b>	<p>A. Before preparing submittals, study all Contract Drawings and specifications in detail, obtain manufacturer's recommended instructions, and have submittals prepared based on specific equipment and material proposed for installation. An officer of the Contracting Firm shall sign all shop drawings (certifying compliance with plans and specifications) before submitting to the Architect or releasing to the field.</p> <p>B. The submit process shall not be utilized as an avenue to substitute products after the execution of the contract. Should an unspecified or unequal product be submitted, it will be rejected. If a second attempt of substitution is made during the resubmission of the same product, then no more reviews of that product will be performed without direct compensation to the Engineer being paid for the additional services required for the third review and any further reviews.</p> <p>C. All submittals shall be submitted and returned electronically.</p> <p>D. Submittals will not be accepted for review unless they:</p> <ol style="list-style-type: none"> <li>Comply with the requirements of Division 1</li> <li>Include complete information pertaining to all appurtenances and accessories</li> <li>Are submitted as complete packages which pertain to all related items in Division 23. Separate packages shall be submitted as follows: <ol style="list-style-type: none"> <li>All HVAC equipment and components</li> <li>The automatic controls and EMS</li> </ol> </li> <li>Are properly marked with equipment, service, or function identification as related to the project and are marked with pertinent specification paragraph number</li> </ol> <p>E. Submit catalog information, factory assembly drawings, field installation drawings and certifications as required for complete explanation and description of all items of equipment. The submittal data shall provide ample, unquestionable compliance with the Contract Documents.</p> <p>F. Review of submittals shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are clearly identified and separately submitted in the form of a letter that is enclosed with the submittals.</p> <p>G. Submittals are required on all manufactured equipment, especially energy consuming equipment. Submittals shall include, but are not limited to, the following items of equipment:</p> <ol style="list-style-type: none"> <li>Piping and Piping Specialties</li> <li>Ductwork and Piping Insulation</li> <li>Packaged Rooftop Units including proposed controller and points list</li> <li>Air Distribution Devices</li> <li>Ductwork Accessories (Including All Dampers)</li> <li>Louvers and Hoods</li> <li>T&amp;B Company Certifications and Final Report</li> <li>Control Diagrams, System, and Components</li> <li>Ductwork and Piping Shop Drawings</li> <li>Firestopping Products and Applicable UL Firestop Details</li> </ol>
<b>3.03 INSTALLATION REQUIREMENTS</b>	<p>A. All equipment shall be installed in strict conformance with the recommendations of the Equipment Manufacturer, as indicated on the Drawings and as specified.</p> <p>B. Provide installation manuals for each piece of equipment. Submit in separately bound volumes after review of submittals.</p> <p>C. Provide supplementary steel framing and welded steel equipment support stands as required for proper hanging and support of the mechanical systems. Steel angles, channels and tubing utilized for such framing shall be selected for a maximum deflection of 1/360th of the span.</p> <p>D. All roof curbs shall be a minimum of 12" high and selected for the various roof pitches. Curbs installed on roofs having pitches of not more than 1/4" per foot may be standard curbs shimmed level with steel channels or Zs to provide suitable support and flashing surfaces.</p>
<b>3.04 CLEANING, LUBRICATION AND ADJUSTMENT</b>	<p>A. The exterior surfaces of all mechanical equipment, piping, ductwork, conduit, etc., shall be cleaned and free of all dirt, grease, oil, paint splatter, and other construction debris.</p> <p>B. Ducts, plenums, and air unit casings shall be cleaned of all debris and either vacuumed or blown free of all rubbish, dirt, and dust before installing grilles, registers or diffusers.</p> <p>C. Bearings that require lubrication shall be lubricated in strict accordance with the manufacturer's recommendations.</p> <p>D. All control equipment shall be adjusted to the settings required for the performance specified.</p> <p>E. Fans shall be adjusted to the speed indicated by the Manufacturer to meet the installed fan system pressure at the airflow indicated. Any additional shaves and belts required for final adjustments shall be provided with no increase in the Contract amount.</p> <p>F. Any fans operated during construction shall have temporary filters. Temporary filters shall be changed regularly to minimize contamination of the equipment and duct systems. Permanent filters shall be installed prior to final inspection.</p> <p>G. All coils shall be thoroughly cleaned and combed prior to final inspection.</p> <p>H. All materials, equipment, etc. subject to weather, corrosion, dust, debris, water etc. to be installed or utilized for the project shall be fully protected. This is inclusive of piping and duct openings and internal fan ventilation intakes and discharges. This Division's scope includes protection and remediation of any and all Division materials, etc. including cleaning, vacuuming, dusting, etc. required for a clean system and operation. Insulation and equipment with electrical connections subject to water shall be replaced in their entirety. Coordinate with all other trades and schedules.</p>
<b>3.05 PAINTING</b>	<p>A. All uncoated and uninsulated steel surfaces exposed to sight inside the building, such as piping, equipment hangers and supports which are not provided with factory prime coat or galvanizing, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, all surfaces in finished spaces shall also be painted with two coats of finish paint in a color selected by the Architect.</p> <p>B. All ductwork surfaces, piping, supports, etc. visible through grilles, registers and diffusers in finished areas shall be painted flat black. All ductwork, equipment, piping, supports, air distribution, etc. visible in exposed finished areas shall be painted a color selected by the Architect, except that nameplates shall not be painted.</p> <p>C. Steel items exposed outside the building, such as equipment supports, uninsulated piping and hangers, which are not factory painted or galvanized, shall be cleaned and painted with one coat of rust inhibiting primer and two coats of asphaltic base aluminum paint. Insulated steel pipes outside the building shall be cleaned and painted with one coat of rust inhibiting primer before installing insulation.</p> <p>D. Factory painted equipment that has been scratched or marred shall be repainted to match the original factory color.</p>
<b>3.06 DUCTWORK AND PIPING LEAK TESTING</b>	<p>A. Insulated, underground, and concealed ductwork and piping shall be tested for leaks in place before backfilling, concealing or covering. Tests shall be conducted in the presence of the Architect or their designated Representative.</p> <p>B. All low pressure ductwork (design operating pressure of 1.0" WC ESP or less) shall be tested by the operation of the system to which it is connected.</p> <p>C. All medium and high pressure ductwork (operating pressure of more than 1.0" WC ESP) shall be tested at 1.5 times the design operating pressure of the system to which it is connected, or at the total fan pressure at shut-off, whichever is greater, up to the maximum pressure classification of the associated ductwork system.</p> <p>D. All visible and audible air leaks from the ductwork systems shall be repaired.</p>

	<p>E. See specification section 23 11 23 for testing requirements of natural gas piping. System shall be part of Division 22 scope unless otherwise arranged within the Contract. Coordinate with Division 22.</p> <p>F. Chilled water, condenser water, and hot water supply and return piping shall be hydrostatically tested at a pressure of not less than the greater of 1.5 times the operating pressure or 100 psig, whichever is greater, for a minimum of one hour. No loss in pressure shall be permitted.</p> <p>G. All refrigerant piping shall be 100% tested with the applicable ASHRAE standard – latest version.</p> <p>H. All leaks shall be repaired by tightening, remaking joints, or replacing pipe and fittings. Caulking of joints shall not be permitted.</p>																		
<b>3.07 RECORD (AS-BUILT) DRAWINGS</b>	<p>A. At the completion of the project, provide a set of reproducible prints to the Architect which reflects all changes, deviations and revisions made to the original design documents. Locations of all underground piping and utilities shall be clearly shown and dimensioned from permanent reference points such as building column lines. Record drawings shall be produced in electronic format compatible with AUTOCAD. Furnish electronic copies of all drawings in dig. format, and two (2) bound copies of all drawing sheets. As-Builts for electronic incorporation by the Design Team, as applicable, shall be define mark-ups of the Construction Documents.</p>																		
<b>3.08 OPERATING AND MAINTENANCE MANUALS AND INSTRUCTIONS</b>	<p>A. Complete operating and maintenance manuals shall be provided to the Owner. Four copies shall be provided. Each copy shall be bound in a separate 3-ring, loose-leaf notebook. Operating instructions shall be provided for each mechanical system, and shall each include a brief system description, a simple schematic and a sequence of operation. Operating and maintenance instructions shall be provided for each piece of equipment. A control system wiring diagram shall be included in each operating and maintenance manual.</p> <p>B. Prior to final acceptance or beneficial occupancy, provide the services of a Competent Technician for not less than one (1) day to instruct the Owner in the operation of the mechanical systems.</p>																		
<b>3.09 TESTING AND BALANCING</b>	<p>A. Testing and balancing of the HVAC system shall be performed in accordance with the standards of AABC and shall be performed under the direct supervision of a Certified Test and Balance Engineer as specified in Section 23 05 93. Note that this work is to be performed under a separate Contract directly under the General Contractor. Submit four (4) copies of the test and balance report directly to the Architect.</p>																		
<b>3.10 PIPING SUPPORTS</b>	<p>A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and within 18" of the centerline of horizontal or vertical changes in direction summing to 90° or more. Specific attention is called to vertical turns into risers.</p> <p>B. Piping supports shall be provided, at a minimum, in accordance with the greater of the below or at code minimum. Where the below or code does not address support for specific piping, supports shall be in accordance with manufacturer's requirements.</p> <table border="1"> <thead> <tr> <th>Piping Material</th> <th>Max. Horiz. Spacing</th> <th>Max. Vert. Spacing</th> </tr> </thead> <tbody> <tr> <td>Cast-iron pipe</td> <td>5'</td> <td>15'</td> </tr> <tr> <td>Copper pipe</td> <td>12'</td> <td>10'</td> </tr> <tr> <td>Copper tubing ≤ 1-1/4" dia.</td> <td>6'</td> <td>10'</td> </tr> <tr> <td>Copper tubing ≥ 1-1/2" dia.</td> <td>10'</td> <td>10'</td> </tr> <tr> <td>PVC pipe</td> <td>4'</td> <td>10*</td> </tr> </tbody> </table> <p>*Midstory guide required for piping 2" diameter and smaller</p> <p>C. Riser clamps shall be provided at each floor penetration. For pressurized piping systems except refrigerant suction and liquid service, provide vibration isolation at all riser clamps with two (2) pad-type mountings consisting of a minimum 3/8" thick ribbed or waffled elastomeric pads bonded between minimum 16-gauge galvanized steel separator plates. Pads shall be sized for a deflection of 0.12" to 0.16". Pads shall be minimum 3" x 3" square.</p>	Piping Material	Max. Horiz. Spacing	Max. Vert. Spacing	Cast-iron pipe	5'	15'	Copper pipe	12'	10'	Copper tubing ≤ 1-1/4" dia.	6'	10'	Copper tubing ≥ 1-1/2" dia.	10'	10'	PVC pipe	4'	10*
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<b>3.11 WARRANTY</b>	<p>A. All work provided under this Division 23 shall be subject to a minimum one year warranty. The warranty shall include prompt repair or replacement of equipment or system failures and shall include all parts, refrigerant, and labor. In addition, all compressors shall carry an additional four year parts-only warranty. Extended warranties shall be provided on all other equipment so specified in other Sections.</p>																		
<b>3.14 SHOP DRAWINGS</b>	<p>A. Shop drawings per the submittal requirements shall be submit to the Design Team with adequate time for multiple rounds of review. Shop drawings shall show "As-Built" conditions including elevations, offsets, transitions, and accessories. Shop drawings shall indicate all code and manufacturer's recommended clearances, access, and coordinate the clearance and access requirements with all other trades.</p> <p>B. Shop drawings that use keynotes direct from the Design Documents shall not be acceptable as they do not demonstrate coordination with all other trades, necessary transitions, etc.</p> <p>C. Shop drawings shall be provided as complete packages in parallel with all trades for complete facility. Any areas that appear to be void of systems or drawings are generally not acceptable.</p>																		
<b>3.17 BID REQUIREMENTS</b>	<p>A. The Contractor shall include all systems, equipment and accessories shown on the plans and specifications.</p> <p>B. The Contractor is responsible for providing all design documents to all SubContractors. All systems, equipment and accessories shall be included in the bid, whether shown on the SubContractor applicable plans or other design documents.</p> <p>C. Should any discrepancy occur in the Design Documents, the Contractor shall provide a request for clarification prior to bid or note the discrepancy in the bid and provide an appropriate cost allowance in the bid.</p> <p>D. The Contractor shall acknowledge that the Design Documents are diagrammatic and shall provide all systems, equipment and accessories required for complete facility. Any areas that appear to be void of systems or inappropriate systems shall be noted in the bid. No post bid change order shall be considered for areas or discrepancies not noted in the bid.</p> <p>E. All installation coordination and means and methods and labor and materials required for proper system installation shall be included.</p> <p>F. These requirements are in addition to bid procedures and requirements of the RFP or general specifications.</p>																		
<b>END OF SECTION</b>	SECTION 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC																		
<b>1.0 GENERAL</b>																			
<b>1.01 DESCRIPTION</b>	<p>A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.</p> <p>B. This Section 23 05 93 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the testing and balancing (T&amp;B) of the heating, ventilating and air conditioning (HVAC) systems as specified herein and as shown. These systems include, but are not limited to, the following:</p> <ol style="list-style-type: none"> <li>Supply distribution systems</li> <li>Return and exhaust air systems</li> <li>Heating, ventilating and air conditioning equipment (all scheduled equipment as a minimum)</li> <li>Hydronic systems</li> </ol>																		
<b>1.02 INTENT</b>	<p>A. It is the intent of this Section of the specifications to provide a complete operable and balanced HVAC system as shown and specified which is reasonably airtight, comfortable and free of objectionable noise and vibration.</p>																		
<b>1.03 SCOPE OF WORK</b>																			



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8/8/2025

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IRB JOB # 2025-0847

**BASSET DEERFIELD TOWNE CENTER**

PROJECT NUMBER	2025-0847
<b>ISSUE DATE</b>	08/08/25

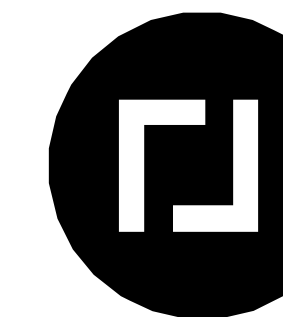
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**SHEET TITLE**  
**SPECIFICATIONS**  
**- HVAC**

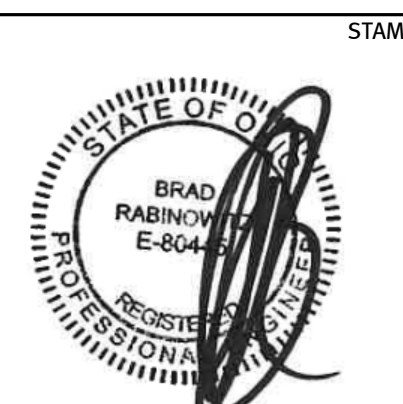
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**SHEET NUMBER**  
**M0.03**

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IRA JOB # 2025-0847

**BASSET**  
**DEERFIELD**  
**TOWNE**  
**CENTER**

PROJECT NUMBER 2025-0847  
**ISSUE DATE**  
ISSUED FOR CONSTRUCTION 08/08/25

**DRAWING DATA**

**SHEET TITLE**  
**SPECIFICATIONS**  
- HVAC

**SHEET NUMBER**

**M0.04**

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E. All exhaust fans shall be provided complete with gravity-type backdraft dampers.

F. All belt-drive assemblies shall be mounted on vibration isolators.

G. All motors on belt-drive assemblies shall be mounted on slide bases to provide adjustment of belt tension.

H. All belts in belt drives shall be rated for not less than 150% of the connected motor horsepower.

I. All belt-drives driven by a 5 HP or larger motor shall be multiple belt arrangements.

J. All belt-drives shall be adjustable to a minimum speed variation of plus or minus 20% of the design RPM.

K. All centrifugal fan wheels shall be statically and dynamically balanced.

L. All electric motors and equipment shall be UL labeled.

M. Refer to Division 26 of these specifications and to the electrical Contract Drawings for electrical characteristics and connections to all equipment. Coordinate all electric motors and other equipment with these electrical documents.

N. Fans with variable-frequency drives (VFDs) shall have shaft grounding ring and appropriate insulation class.

O. All exposed motors and belts shall be protected with enclosures or guards in accordance with OSHA requirements.

P. Life safety fans (i.e. stair pressurization, elevator hoistway pressurization, smoke control, etc.) shall have 1.5 times the number of belts necessary for the scheduled performance with no less than two (2) belts.

**2.05 CEILING/CABINET EXHAUST FANS**

A. Ceiling/cabinet exhaust fans shall be Greenheck Model CSP (inline/cabinet) or Greenheck Model SP (ceiling) with integral grille, or an approved equal. Fans shall be provided with speed controller for balancing.

**3.0 EXECUTION**

**3.01 INSTALLATION**

A. Fans shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

**3.02 ADJUSTMENT**

A. The fans shall be tested and adjusted after installation to provide the capacities indicated.

**END OF SECTION**

SECTION 23 37 13  
DIFFUSERS, REGISTERS, AND GRILLES

**1.0 GENERAL**

**1.01 DESCRIPTION**

A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.

B. This Section 23 37 13 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of air distribution devices as specified herein and as shown. These units include, but are not limited to the following:

- Ceiling Diffusers (CD)
- Return Air Grilles (RAG)

**1.02 INTENT**

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted air distribution devices as shown and specified which are free of excessive noise, vibration and airflow fluctuations.

**1.03 SELECTION CRITERIA**

A. All air distribution devices shall be selected in accordance with the following minimum criteria unless otherwise noted below or on the drawings:

- Method of mounting shall be compatible with the ceiling, wall or duct surface which it mounts on or in; i.e. lay-in, surface mounting, plaster frame, duct collar, etc. The architectural drawings shall be referenced to determine the mounting method for each device. All flanges on surface mounted devices shall be provided with a gasket.
- Finish of all ceiling mounted devices shall be selected to match the color of the adjacent ceiling. Finish of all wall mounted devices shall be primary finish which is compatible with the finish coating specified for the adjacent wall; finish coat will be applied under Division 9.

**1.04 BASIS OF DESIGN**

A. The basis of design is Titus. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design. Any modifications to ductwork, controls, ceilings, building structure, etc., that result from any substitution shall be coordinated with all trades. This coordination shall occur before delivery of equipment and any modifications shall be performed without incurring additions to the Contract.

**1.05 ACCEPTABLE MANUFACTURERS**

A. Acceptable manufacturers are Price, Carnes, Metal Aire, Krueger, Nalor, and Titus LION, provided that their units, performance, appearance and physical characteristics are equal in all respects for this specific project.

**2.0 PRODUCTS**

**2.01 DESCRIPTION**

A. Ceiling Diffusers (CD)

- CD Ceiling diffusers (CD) shall be square, plaque face diffusers capable of providing one-way, two-way, two-way corner, three-way, and four-way air patterns; Titus Model OMIN with directional blow clips. The diffuser shall have a 22 gauge steel face panel that captures a secondary 22-gauge panel. The face panel shall be removable by means of four hanger brackets. The exposed surface of the face panel shall be smooth, flat, and free of visible fasteners. The back pan shall be one piece precision die-stamped and shall be constructed of 22-gauge steel. Diffuser performance data shall be in accordance with ANSI/ASHRAE Standard 70-1991. The maximum NC level at design airflow shall not exceed 35 when measured in a direct field 5'-0" from the face of the device. Diffusers to be 24"x24" unless noted on drawings. The finish shall be baked enamel white, unless directed otherwise by the Architect. Provide plaster frames and round neck damper (operable from face of diffuser) for diffusers installed in hard ceilings.
- CD Ceiling diffuser (CD-B) shall match ceiling diffuser but shall be 12"x12"

B. Return Air Grilles (RAG)

- Return air grilles shall match the ceiling diffusers in the area or shall be hollow core, perforated face, lay-in type, selected to match the CDs; with the largest neck size available LION Titus PAR. Performance data shall be in accordance with ADC 162R4. All other characteristics shall be equal to the ceiling diffusers.

**3.0 EXECUTION**

**3.01 INSTALLATION**

A. Air distribution devices shall be installed as indicated and in conformance with the manufacturer's recommendations. The color, frame, and border types shall be coordinated with Architectural requirements and shall be selected to install in the finished surface indicated.

B. All air distribution devices to be reused shall be installed the same way as indicated for new devices. All existing cover, frame, and border types shall be modified as required to match new device requirements.

C. All air distribution devices with blade orientations shall be coordinated with Architect. Specific attention is called to devices in exposed ceiling areas, including wall-mounted.

1. 8"-0" on low-pressure supply air systems limited to short runouts and end of runs connected to round neck supply diffusers and registers.

2. 4"-0" on medium and high-pressure supply air systems limited to the runouts from the sheetmetal ductwork to each terminal unit.

3. 2"-0" on connections from round neck grilles to sheetmetal ductwork on return, exhaust and transfer ductwork.

G. Provide a spin-in fitting with integral scoop and volume damper at all flexible run-out connections in low-pressure supply air ductwork only, except locations where spin-in fittings would project more than 50% into the projecting ductwork dimension.

H. Flexible ductwork shall not pass through wall, floors, or ceilings.

**2.11 TERMINAL UNIT RUNOUTS**

A. Medium and high-pressure runouts to terminal units shall be connected to the trunk duct with factory-welded laterals, conical tees or bellmouth fittings; abrupt round to rectangular taps are strictly prohibited and shall be rejected.

B. Terminal unit runouts shall be the largest of the associated terminal unit inlet, the size noted on the drawings, or the scheduled runout size.

**2.12 FLEXIBLE CONNECTIONS**

A. Provide flexible duct connections at the inlet and outlet of each belt-driven fan, indoor unit, fan coil unit, air handling unit, etc., and at all other locations indicated. Flexible connections shall be fabricated from a glass fabric coated on both sides with neoprene. Minimum weight shall be 30 oz. per sq. yard. Flexible connections shall be used for vibration isolation only and shall not be used to correct connection misalignment.

**2.13 DUCT HARDWARE**

A. Duct hardware shall be as manufactured by Young Regulator or an approved equal.

**2.14 ACCESS DOORS**

A. A duct access door shall be provided at each fire and smoke damper. Access doors shall be designed for 1.5 times the pressure of the duct in which they are mounted. Access doors shall be of sufficient size to provide access to the dampers for resetting the blades and replacing the links. Access doors in medium and high-pressure ductwork shall be installed downstream of fire dampers and shall be implosion type. Where access is provided through gypsum board walls or ceilings, furnish access door for installation under Division 09. Coordinate with Division 09 and Architect. Each door shall match the fire-rating of the wall or ceiling indicated.

B. Access shall be provided to duct-mounted smoke detector locations. Access shall allow inspection and maintenance of all aspects of the detector. Access doors shall meet the requirements of A, above, as needed.

**3.0 EXECUTION**

**3.01 INSTALLATION**

A. Ductwork shall be installed in strict accordance with SMACNA, UL, and NFPA standards.

B. All ductwork installed outside the building shall be secured to the structure. Coordinate with the Structural Engineer as needed. It is the Contractor's responsibility to design and coordinate all supports. All supports shall be designed to withstand all code-required wind and seismic loads.

C. Flexible ducts utilized in the low-pressure ductwork systems shall be installed without kinks or bends which are less than a centerline radius equal to or greater than twice the diameter of the flexible duct being installed. Also, in the runouts from the medium or high-pressure ductwork to the terminal units, the flexible ducts shall be installed with a variance of no more than 1" per foot of installed length off a straight and level line from the centerline of the sheetmetal ductwork runout or top to the centerline of the terminal unit inlet. The size of the flexible ductwork connected to each terminal unit shall be the equivalent size of the larger of the following:

- The inlet size of the terminal unit valve
- The runout size indicated on the drawings

Should the runout size indicated on the drawings differ from the inlet size of the terminal unit valve, or where the inlet to the terminal unit is rectangular, the transition shall be made with sheetmetal and shall occur at the inlet to the terminal unit.

D. All low pressure ductwork downstream of VAV units shall be left uncapped for balancing until tenant fit-up affects the units.

E. All intersections (crossing) of low-pressure and medium-pressure ductwork shall be made with offsets in the low-pressure ductwork only. The medium pressure ductwork shall be ran straight and level.

F. Electric duct heaters shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades. The heater shall be tested and adjusted after installation to provide the capacities indicated.

G. Ductwork labels, including factory labels, tags, etc. except equipment nameplates shall be removed to the satisfaction of the Architect in all exposed areas.

H. Dampers shall be adjustable. Where dampers are not or will not be accessible without access panels, provide and install remote balancing cable control system, Young Regulator or equal. Adjustment shall be from a nearby accessible area.

**END OF SECTION**

SECTION 23 34 00  
HVAC FANS

**1.0 GENERAL**

**1.01 DESCRIPTION**

A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.

B. This Section 23 34 00 and the accompanying drawings cover the provision of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the fans as specified herein and as shown. These fans include, but are not limited to the following:

- Ceiling/cabinet fans

**1.02 INTENT**

A. It is the intent of this Section of the specifications to provide complete, operable, adjusted fans as shown and specified which are free of excessive noise, vibration and airflow fluctuations.

**1.03 BASIS OF DESIGN**

A. The basis of design is as scheduled. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design. Particular attention is called to the requirements of Section 23 05 00.

**1.04 ACCEPTABLE SUBSTITUTE MANUFACTURERS**

A. Acceptable substitute manufacturers are Carnes, Cook, Acme, PennBarry, Twin City, Price, and Greenheck. Acceptable manufacturers for kitchen grease exhaust fans are Captive-Aire, Viking, and Greenheck.

**2.0 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

A. All non-filtered fans shall be factory tested, rated and certified in accordance with the requirements of AMCA Standard No. 210 and shall be labeled accordingly. Filtered fans may be non-labeled but must be rated in an AMCA approved laboratory in accordance with 210.

B. All roof-mounted fans shall be constructed such that water cannot enter the building through the fan regardless of whether or not the fan is operating. Fans shall be provided with drain connection and piped to the nearest roof drain as applicable.

C. Fans installed outside or otherwise subject to weather shall have a weatherproof enclosure over the motor compartment. All components, including VFDs, shall have enclosures and be appropriate for the installation locations.

D. All roof-mounted fans shall be provided complete with roof curbs. Roof curbs shall be of aluminum construction, insulated, coated and complete with wood nailer strips. Insulation shall meet NFPA 25/50 flame spread/smoke developed ratings.

**2.0 PRODUCTS**

**2.01 GALVANIZED SHEETMETAL**

A. Galvanized sheetmetal shall be lock-forming grade G90-ASTM A 653 hot dip galvanized steel sheets. Sheetmetal shall be galvanized on each side with not less than 1.25 ounces of zinc per square foot.

B. Galvanized sheetmetal installed outside the building and subject to weather shall be soldered or welded. See Section 23 07 13 for additional information about covering and insulation.

C. Galvanized sheetmetal installed outside the building and not exposed to weather, such as in covered loading docks and parking decks, may match the construction of ductwork inside the building.

D. Galvanized sheetmetal ductwork outside the building within 20 miles of the seacoast shall have corrosion coating appropriate to the installation location.

**2.02 SPIRAL DUCT**

A. Spiral duct shall be utilized for all flat-oval and round ductwork in medium and high-pressure systems.

B. Spiral duct shall be the product of United McGill Corporation, R.V. Money, Eastern Sheet Metal, or an approved equal.

C. Spiral duct with internal ribs is not acceptable.

D. Spiral duct shall conform to SMACNA 2005 Standards. Lighter gauges, etc. due to standing ribs are not acceptable.

E. Spiral duct in exposed ceiling applications shall have slip fittings, minimum Class 3 for 2" WG negative pressure to 10" WG positive pressure, with EPDM gaskets. Coordinate assembly with ductwork insulation.

**2.03 DOUBLE-WALL DUCTWORK**

A. See Section 23 07 13 for insulation. Insulation shall be sandwiched between two (2) layers of sheetmetal in accordance with SMACNA standards. All joints shall be permanently sealed airtight. Inner ductwork shall be perforated.

**2.08 DAMPERS**

A. Manual Volume Dampers

- Single blade butterfly dampers are acceptable up to 12" round or 12" x 12" square. Dampers larger than these dimensions shall be multi-blade type. Single blade dampers shall be constructed of 16 gauge or heavier galvanized sheetmetal.
- No multi-blade damper blade shall exceed 8" in width. All multiple blade dampers shall be constructed of 16 gauge galvanized steel or heavier. The damper frame shall be 16 gauge or heavier. The damper action shall be opposed-blade type.
- Each blade shall pivot on a 1/2" cadmium plated, cold-rolled steel axle which pivots within self-lubricating, Oilite bronze bearings.
- The top and bottom edges of each rectangular damper blade shall be crimped for stiffness.
- The operating rod for all dampers shall be extended outside the damper frame for attachment of an operator. Each operator shall have a position indicator and locking quadrant.
- All dampers utilized for introduction of outside air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a nominal 48" x 48" damper size.
- All dampers utilized for exhaust or relief air shall have flexible, gasketed edge and end seals. The leakage rate shall be less than 4 CFM per SF of face area against a 1" WC differential pressure, based on a nominal 48" x 48" damper size.
- Dampers to be installed in insulated ductwork shall have standoffs sufficient to allow for insulation and vapor barrier integrity.

9. Manual volume dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nalor, Ruskin, or an approved equal.

B. Control Dampers

- Control dampers shall be of the same construction as manual volume dampers, except that no manual operator and quadrant is required. The operating rod shall be suitable for operation by an automatic pneumatic or electric operator.

C. Fire Dampers

- Fire dampers shall be UL-listed and labeled for 1 1/2 or 3 hours, in accordance with the installation location, and shall be provided with 160T links or linkages appropriate for the service. Dampers installed within ducts shall be Type B or Type C with the blades out of the air stream. Areas indicated shall be net, clear, open areas.
- Fire dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
- Fire dampers shall be as manufactured by Louvers & Dampers, Inc., Pottorff, Greenheck, Nalor, Ruskin, or an approved equal.

D. Smoke Dampers

- Smoke dampers shall be UL-listed as Class 1 low-leakage smoke dampers. Smoke dampers shall be 24V and wired under this Division.
- Smoke dampers shall be appropriate for the installation location and application. All fire dampers in supply, return, exhaust, etc. shall be dynamic-type.
- Smoke dampers shall be as manufactured by Prefco, Louvers & Dampers, Inc., Pottorff, Greenheck, Nalor, Ruskin, or an approved equal.

E. Fire/Smoke Dampers

- Fire/smoke dampers may be combined into a combination fire/smoke dampers. All provisions of the above shall apply. Fire/smoke dampers shall be UL-listed.

F. Backdraft Dampers

- Backdraft dampers shall be sized according to their installation location and noted pressure setting. Damper pressure setting shall be adjustable and shall be accessible from outside ductwork or via access hatch, as applicable.

**2.09 LOW-PRESSURE DUCT BRANCHES**

A. Splitter dampers shall be provided at all low-pressure ductwork branches. All low-pressure ductwork branches shall be radiused or 45 degree take-offs; straight taps are unacceptable. The length of the damper blade shall be the same as the width of the widest duct section of the split, but in no case shall blade length be less than 12". Each operator rod shall have a locking swivel joint.

**2.10 FLEXIBLE DUCT**

A. Flexible ductwork shall be Class 1, UL 181 air duct and meet NFPA 90A and 90B Standards.

B. The internal duct surface shall be acoustically rated, core layers bonded to a coated steel wire helix. The external jacket shall be a fiberglass, bi-directionally reinforced, metallized vapor barrier with a standing, triple ply seam. Fiberglass insulation shall be provided between the duct surface and the jacket to achieve a minimum R-4.2. Any flex duct outside the building thermal envelope shall be R-8 in Climate Zones 1-4 and R-12 in Climate Zones 5-8.

C. Flexible ductwork shall be suitable for 10" WG positive pressure and 0.5" WG negative pressure in sizes 4" through 12" ID, and 6" WG positive pressure and 0.5" WG negative pressure in sizes 14"-16" ID.

D. Flexible ductwork, insulation and insulation cover shall be suitable for ceiling return air plenum installation and shall comply with all applicable codes and standards regarding such ceiling plenum installations.

E. Flexible duct shall be ATCO or an approved equal.

F. The maximum allowable installed length of flexible ductwork shall be as follows:

1. Maximum Flame Spread 25  
2. Maximum Smoke Developed 50

**2.02 TYPICAL DUCT INSULATION**

A. Duct insulation shall be 2.2" thick, minimum 3/4 lb. density fiberglass, installed R ≥ 6.0, with an FSKL 0.00035" thick aluminum foil jacket, reinforced with fiberglass scrim. Thermal conductivity shall be a maximum of K = 0.20 at 75°F mean temperature, or a maximum of K=0.27 at 25% compression.

B. Insulation adhesive shall be Benjamin Foster 85-20. Tape shall be aluminum foil and shall be SMACNA listed and labeled.

C. The composite NFPA 90A and 90B, ASTM E84, UL rating of the installed insulation shall not exceed 25/50.

D. The grease exhaust ductwork shall have zero-clearance to combustibles wrap from the hood connection to discharge termination. Coordinate the insulation with all required access panels, drains, etc. as required by NFPA 96.

**3.0 EXECUTION**

**3.01 INSTALLATION**

A. Ductwork shall be installed in strict accordance with SMACNA, UL, and NFPA standards.

B. Duct liner shall be provided throughout all return air, transfer, and plenums. Duct liner shall also be provided for the following minimum distances, through the first elbow(s), or as otherwise indicated on the drawings, whichever is greater, downstream of each unit indicated below:

- Packaged rooftop unit - 25 ft
- Self-contained air conditioning unit - 25 ft
- Central air handling unit - 25 ft
- Split system air handling unit - 5 ft
- Water-source heat pump - 5 ft
- Fan coil unit - 5 ft
- Terminal unit - 5 ft

C. Straight runs only shall be factored into the above distance requirements. Elbows, etc. within the length shall be lined but shall not count towards the length requirement.

D. Duct liner shall not be installed within six inches of a damper, including fire and/or smoke dampers. Metal nosings are required on the upstream side of the exposed insulation. Where lining has been interrupted, external insulation is required.

E. Duct liner shall be cut to provide overlapped and compressed longitudinal corner joints. Liner shall be installed with the coated surface facing the air stream. Duct liner shall be adhered to the ductwork with a 100% coverage of the sheet metal surfaces using a fire-retardant adhesive applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured using metal pins welded to the duct and speed washers. All leading edges shall be secured with sheet metal airfoils.

F. Inside the vapor barrier of the building all supply air ductwork which is not lined shall be insulated. All outside air ductwork shall be insulated. Insulation shall be cut slightly longer than circumference of duct to insure full thickness at corners. All insulation shall be applied with edges tightly bonded. Insulation shall be adhered to duct with fire resistant adhesive. Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly. In addition to the adhesive, the insulation shall be additionally secured to the bottom of all ducts 18" or wider by means of welded pins and speed clips. The protruding end of the pins shall be cut off flush after the speed clips have been applied. The vapor barrier facing shall be thoroughly sealed with tape where the pins have pierced through. All joints shall be sealed with 2" wide SMACNA tape. Any cuts or tears shall be sealed with SMACNA tape.

G. All outside air ductwork located in conditioned or semi-conditioned spaces shall be externally insulated similar to supply ductwork.

H. All conditioned air ductwork, including partially conditioned energy recovery ventilator outside air supply to the building and exhaust ductwork, installed in spaces that are ventilated only, i.e. penthouses, shall be insulated.

**END OF SECTION**

SECTION 23 31 00  
HVAC DUCTS, ACCESSORIES, AND CASINGS

**1.0 GENERAL**

**1.01 DESCRIPTION**

A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.

B. This Section 23 31 00 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:

- Supply air ductwork
- Return, transfer and relief air ductwork
- Exhaust ductwork
- Outside air ductwork
- Ductwork accessories

**1.02 INTENT**

A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

**1.03 DESIGN AND CONSTRUCTION - DUCTWORK**

A. Ductwork shall be provided in strict accordance with the third edition - 2005 - of the SMACNA HVAC Duct Construction Standards - Metal and Flexible. NFPA No. 90A, 90B, 91 and 96, and UL 181. Where SMACNA tables have an option between different gauges and supports, the heavier gauge shall be used.

B. Ductwork dimensions shown are net, clear, inside dimensions with no allowance shown for duct liner. All ductwork specified to be lined shall be 2" larger than shown in each dimension to compensate for the liner. Ductwork shall be square, rectangular, round, spiral or flat oval as noted. Conversion of duct shapes and sizes shown shall be accomplished without increasing air velocities or friction losses and is subject to prior approval by the Architect and Engineer.

C. Elbows shall be either full radius type (inside radius equal to duct width), five-gore radused flat-oval type or, in low pressure systems only, mitered with double-thickness turning vanes except that lined ductwork for low pressure returns and transfers shall not have turning vanes.

D. Abrupt changes in duct sizes and shapes shall not be permitted. The total angle of diverging transitions shall be more than 15 degrees; converging transitions shall be not more than 30 degrees unless otherwise noted or required due to structural constraints.

E. Offsets, transitions, rises and drops are not individually called out on the Design Drawings. They shall be provided as required to fit the ductwork into the allocated spaces.

F. Transition rectangular ductwork on bottom and sides. Maintain top of ductwork level and as high as possible.

G. "Medium pressure ductwork" shall be constructed for 3" WC static pressure class at 4000 FPM velocity with Class A seals. Applications shall include:

- All supply air ductwork between the packaged rooftop unit and the terminal units.
- All ductwork between central ventilation fans (such as outside air, toilet exhaust, pressure relief, energy recovery units, 100% outdoor air units) and their terminal units.
- All ductwork in systems subject to more than 1" WC.

H. All other ductwork shall be constructed for standard 1" WC static pressure class at 2500 FPM with Class C seals and is herein defined as "low pressure ductwork".

I. Provide the following types of ductwork material for the services indicated:

- Galvanized sheetmetal: supply, return, exhaust, and relief of conditioned and outside air

A. HVAC Test and Balance shall be performed by an Independent Agency certified by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) under direct contract to the General Contractor. All work performed by this Agency shall be performed by qualified Technicians under the direct supervision of an AABC or NEBB Certified Test and Balance Engineer. The Agency shall be independent and shall not be associated in any way with the installing HVAC SubContractor.

C. HVAC Test and Balance shall be performed in accordance with the 7th edition of the AABC National Standards, 2016 for Total System Balance or the NEBB Procedural Standards for TAB of Environmental Systems, 8th Edition, 2015 together with the NEBB TAB Manual for Technicians, 2nd Edition.

D. The final Test and Balance report shall serve to substantiate compliance with the intent of the Contract Documents, specifically the HVAC systems.

E. HVAC Test and Balance shall not begin until the systems are substantially complete.

F. Upon the completion of the Test and Balance work, the Agency shall submit four (4) copies of the complete HVAC Test and Balance Report directly to the Architect.

G. The Agency, as a part of its contract with the General Contractor, shall act as an Authorized Inspection Agency, responsible to the General Contractor and the Architect and shall, during the test and balance, list those items which require correction or have not been installed in accordance with the Contract Documents.

H. The Agency shall plainly mark the settings of all valves, dampers and other adjustable devices. If a balancing device is provided with a memory stop, it shall be set, locked and marked.

I. The Agency shall record all of the final set points on all variable speed drives.

**1.04 SUBMITTALS**

A. The name and certification of the Agency, along with the name and certification of the Certified Test and Balance Engineer, shall be submitted to the Architect for review within 30 days after the award of the General Contract.

B. The selected Agency shall submit to the Owner:

- Procedural Manual
- Report Forms
- AABC or NEBB Performance Guaranty
- Instrument List and Calibration Dates
- Schedule
- Floorplans as Needed to Uniquely Identify Device Locations

C. A reviewed copy of each of the above shall be returned to the Agency before the HVAC Test and Balance begins.

D. If a complete submittal in accordance with these requirements is not received within 60 days from award of the General Contract, then the Architect reserves the right to select the Agency.

**2.0 PRODUCTS**

2.01 (Not applicable).

**3.0 EXECUTION**

**3.01 GENERAL CONTRACTOR'S DUTIES**

A. The General Contractor shall provide the following, within 10 days after his receipt, to the Agency:

- Contract Drawings
- Contract applicable specification Division 23 (others as applicable)
- Addenda
- Change orders
- Reviewed submittals

B. The General Contractor shall start-up and maintain the HVAC systems and shall continue the operation of the HVAC systems during each day of testing and balancing. Start-up and operation shall include, as a minimum, the following:

- All equipment operable and in safe condition.
- Temperature control system complete.
- Proper thermal overload protection in place for electrical equipment.
- Ductwork leakage rates not exceeding those specified and all duct systems clean of debris.
- Air transfer systems shall have:
  - Correct fan rotation and RPM.
  - Coil fins cleaned and combed.
  - Filters clean and in place.
  - Access doors closed.
  - All dampers in place and open.
  - All grilles, registers and diffusers installed.

C. Provide sufficient time before final completion date so that testing and balancing can be accomplished. Coordinate the submitted TAB schedule.

D. Provide immediate labor and tools to make required corrections and repairs without undue delay.

E. The General Contractor and his SubContractors shall cooperate fully with the Agency to provide the following:

- Access to HVAC system components.
- The right to adjust the systems.

F. Any conditions which prevent a proper HVAC Test and Balance shall be reported by the Agency to the General Contractor and Architect within 7 days of their discovery.

G. If it is determined by the Agency and confirmed by the Architect that drive changes or additional balancing dampers are required, the Contractor shall obtain and install all necessary components.

H. The Agency shall cooperate with the Architect and the Contractor and all his SubContractors to perform the work in such a manner as to meet the job schedule.

I. The Agency shall verify that all system components are in place and in proper working order prior to leaving the project.

J. All reported and recorded data shall represent true measured conditions.

K. Where equipment uses variable speed drives, and where feasible, VFDs shall be used as the primary balancing method prior to adjustment or balancing of valves, dampers, etc.

**END OF SECTION**

SECTION 23 07 13  
DUCT INSULATION

**1.0 GENERAL**

**1.01 DESCRIPTION**

A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.

B. This Section 23 07 13 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the ductwork systems as specified herein and as shown. These systems include, but are not limited to, the following:

- Insulation for typical ductwork
- Duct liner

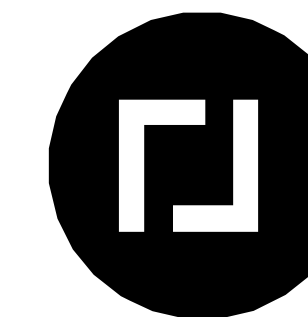
**1.02 INTENT**

A. It is the intent of this Section of the specifications to provide a complete operable duct system as shown and specified which is reasonably airtight, free of noise, vibration and sweating, and fabricated so as to fit into the space allotted and to exhibit a minimum resistance to airflow.

**2.0 PRODUCTS**

**2.01 DUCT LINER**

A. Duct liner shall be one inch thick, 1 1/2 lb. density (3 lb. density on medium- and high-pressure supply air systems except that 1 lb. density is acceptable if the liner is at least R ≥ 4.2 and NRCS ≥ 0.65) fibrous glass with one face coated with a black fire retardant compound. The permanent composite fire and smoke hazard rating of the liner shall be stenciled on the liner face and shall be:



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8/8/2025

CONSULTANT

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BWA JOB # 2025-0847

**BASSET**  
**DEERFIELD**  
**TOWNE**  
**CENTER**

PROJECT NUMBER 2025-0847

**I S S U E D A T E**  
0 ISSUED FOR CONSTRUCTION 08/08/25

**DRAWING DATA**

**S H E E T T I T L E**  
**SPECIFICATIONS**  
**- HVAC**

**S H E E T N U M B E R**

**M0.05**

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3.02 ADJUSTMENT

A. Grilles, registers, diffusers, etc. shall be tested and adjusted to provide the scheduled air flow capacities.

B. All devices shall have adjustable and accessible volume dampers. Where dampers are not or will not be accessible without access panels, provide and install remote balancing cable control system, Young Regulator or equal. Adjustment shall be from the face of the air distribution device, coordinated with the Air Distribution Manufacturer. Coordinate the location and size of the damper with the installation.

C. In all slot diffuser applications, the inactive sections of the slot shall be finished with perforated steel, painted flat black, selected to match the SDs. These sections shall be open to the plenum as a return air path. Inactive sections shall have an insulated light shield.

END OF SECTION

SECTION 23 37 23

HVAC GRAVITY VENTILATORS AND LOUVERS

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 37 23 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the fabrication, construction and installation of the louvers, air inlet and air outlet devices as specified herein and as shown.
- C. Coordinate with Architectural plans and specifications for all louvers subject to public view. Architectural documents shall supersede this specification section, except Architectural louvers must meet the free area noted in the Division 23 plans, and louvers exposed to rain must be stormproof.

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide complete, operable, finished louvers, air inlet and air outlet devices as shown and specified which are free of leaks.

1.03 BASIS OF DESIGN

- A. The basis of design is as outlined for each louver and device in the 2.0 PRODUCTS subsection. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design.

2.0 PRODUCTS

2.01 STORMPROOF LOUVERS

- A. Louvers shall be stormproof, depth to match the width of the wall but no less than 4" deep, and of all-welded construction fabricated from 12 gauge extruded aluminum alloy 6063-T5. Blades shall be slanted at 45 degrees and feature an integral water baffle.
- B. Louvers shall be fitted with a 1/2" mesh 16 gauge aluminum birdscreen in an aluminum frame.
- C. Finish shall be 70% PVDF in a color selected by the Architect at the time of submittal review. Finish shall have a minimum of a 10 year warranty.
- D. The performance standards shall be certified by the Manufacturer in accordance with the AMCA Certified Ratings Program and the louver shall carry the AMCA Seal.
- E. Performance Standards
  1. Maximum static pressure drop at 600 FPM velocity through the free area - 0.065" W.C.
  2. No water penetration at up to 760 FPM velocity through the free area.
  3. Minimum free area in relation to gross overall area - 53%.
- F. The basis of design is Greenheck. Acceptable equal manufacturers are Louvers & Dampers, Inc., Airloite, Ruskin, Greenheck, Pattorff, Nailor, and Construction Specialties.

2.02 GRAVITY INTAKE AND RELIEF HOODS

- A. Hoods shall be constructed from 0.063" thick aluminum sheets with rolled interlocking seams or all welded construction.
- B. Relief hoods shall be fitted with a 1/2" x 1/2" galvanized birdscreen and backdraft damper.
- C. Intake hoods shall be fitted with 1" thick cleanable filters.
- D. All hoods shall be provided complete with 12" high roof curbs. Roof curbs shall be of aluminum construction, insulated, conted and complete with wood nailer strips. Insulation shall meet NFPA 25/50 flame spread/smoke developed ratings.
- E. All hoods with a throat area of 12 square feet or less shall have hinged hoods.
- F. Performance Standards
  1. Maximum total pressure drop at 600 FPM throat velocity through the free area.
    - a. Intake Hoods - 0.125" WC
    - b. Relief Hoods - 0.08" WC
- G. The basis of design is Greenheck Fabra Hood. Acceptable equal manufacturers are Louvers & Dampers, Inc., and Carnes.

3.0 EXECUTION

3.01 INSTALLATION

- A. Units shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual devices to be provided with all trades.
- B. All devices shall be free of leaks, provided completely finished, trimmed, adjusted, cleaned and ready for use. They shall be properly secured to the structure.
- C. Louvers with ductwork connections or future duct connections (louvers for future tenant connection) shall have a minimum of 12" deep insulated sheetmetal plenum back-box.
- D. Insulated sheetmetal blank-offs shall be provided over all inactive sections or sections for future tenant use of louvers where the Architectural size exceeds the mechanical requirements.

END OF SECTION

SECTION 23 74 00

PACKAGED OUTDOOR HVAC EQUIPMENT

1.0 GENERAL

1.01 DESCRIPTION

- A. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
- B. This Section 23 74 00 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with the construction and installation of the packaged rooftop units as specified herein and as shown. This work includes, but is not limited to, the following:
  1. Packaged rooftop units including curbs and accessories
  2. Control system (interlocked to the units)
- C. Units shall be self-contained, rooftop curb-mounted, single package type. The rooftop units shall be completely factory-assembled as a unitary package complete with operating controls and shall be completely piped, internally wired and fully charged with R-410A refrigerant. Only one electrical power connection shall be required.

1.02 INTENT

- A. It is the intent of this Section of the specifications to provide complete, operable, adjusted single package rooftop units, as shown and specified which are free of excessive noise and vibration.

1.03 BASIS OF DESIGN

- A. The basis of design is as scheduled. Any proposed substitutions or equals by other manufacturers shall be proven equal in all respects to the equipment specified as the basis of design. Particular attention is called to the requirements of Section 23 05 00.
- B. Acceptable substitute manufacturers are Trane, Carrier, and Daikin.

2.0 PRODUCTS

2.01 CURB

- A. Each unit shall be provided with a full perimeter roof curb. The roof curb shall be of the same Manufacturer as the unit, shall support the unit and provide a watertight enclosure to protect ductwork and utility services. Curb design shall comply with National Roofing Contractors Association requirements. Supply/return air opening gasketing shall be provided. Channel shall be provided allowing for adjustment of return air opening location to match the building structural frame indicated.
- B. All duct and utility connections shall be routed through bottom of unit within the curb perimeter.

2.02 UNIT CABINETS

- A. Rooftop unit cabinets shall be formed, galvanized steel construction with welded base assembly. Galvanized steel surfaces shall be bonderized and painted with baked acrylic enamel for complete weather protection. All sheet metal screws shall be stainless steel. The outside air dampers shall be low leak gasketed dampers which must match and interlock with the single package rooftop units. Cabinets shall be fully insulated.
- B. Unit cabinets shall be designed for curb mounting and mate with the full perimeter roof curb for a complete weathertight seal. Unit sides shall overhang the curb to form protective drip lip.
- C. Access doors for the filter section and the fan section of all units sized 20 nominal tons and larger shall be hinged, walk-in type.

2.03 COMPRESSOR SECTION

- A. Compressor section refrigeration system shall be factory charged, ready for operation, providing minimum two stage cooling capacity (50% and 100%) on units of over 5 tons capacity, minimum of three stages on units of nominal 20 and 25 tons and minimum of four stages on units larger than 25 nominal tons. Compressor protection shall include high and low pressure control, outdoor ambient protection, compressor pump heat, three-phase overload protection, anticycling timer providing a minimum five (5) minute time shut down of unit on interruption of power or automatic control shutoff. Compressors shall have factory-installed service valves, vibration isolators, crankcase heaters, liquid line sight glasses, filter driers, and liquid line service valves.

2.04 EVAPORATOR COILS

- A. Coils shall be aluminum plate fins mechanically bonded to copper tubes. They shall be of an intertwined design for equal circuit loading and to ensure a fully active coil on part-load operation to provide evenly conditioned air. Aluminum tubes shall not be acceptable.

2.05 FANS

- A. Fans shall be either single or double wheels, forward-curved, Class 1 type, and mounted on a common shaft with adjustable sheave drive. All fans shall be statically and dynamically balanced and tested in the factory. Fan shall not pass through its first critical speed in order to meet the scheduled performance. Fan shaft shall be mounted on not less than two grease-lubricated ball bearings with all fan wheels mounted inboard of the bearings. The fan and motor assembly shall be mounted on a common base; on units with motor sizes larger than five (5) HP, the entire assembly shall be isolated from the rest of the unit by double deflection vibration isolators.
- B. Variable air volume (VAV) units shall be complete with variable frequency inverter drives and matched inverter-duty motors.
- C. Motors on VFDs shall have shaft-grounding rings.

2.06 ELECTRIC HEATING SECTIONS

- A. Electric heating sections shall be furnished with nickel-chromium open coil resistance heating elements with each element protected by an automatic reset high-limit thermostat and manual reset high-limit thermostat for the primary and secondary overcurrent/thermal protection. Controls shall provide for multiple stage start-up and operation.

2.07 GAS HEATING SECTION

- A. Gas heating sections shall be mounted downstream of evaporator coils and shall be certified by AGA for use on natural gas. Heating shall be accomplished with a minimum of two stages on units 7.5 tons nominal and larger.
- B. Heat exchanger shall be fabricated from stainless steel, stress-relieved and free-floating.
- C. The unit shall utilize an electronic, spark-ignition pilot light; not a standing pilot.
- D. Each heating system shall include an induced draft combustion air exhaust fan protected by centrifugal switches, heat limit switches, time-delay relay, flame roll-out switches and pilot sensors. Heating controls shall consist of a redundant gas valve, intermittent pilot ignition with electric spark ignition system. Each unit shall be AGA certified.

2.09 CONTROLS AND ACCESSORIES - ALL SYSTEMS

- A. All operating and safety controls shall be factory-installed and shall include solid state compressor overload protection, magnetic contactors, thermostatic expansion valve, refrigerant line drier and automatic damper motors.
- B. Controls an electric heat section shall meet NEMA specifications and requirements.
- C. During night setback operation, morning warm-ups after night setbacks and whenever the unit is off, the outside air dampers shall be fully closed and admit no outside air.
- D. Interlocks shall be made to the duct-mounted smoke detectors in each unit's supply and return ductwork to shut the unit off and fully close the return air dampers to prevent migration of smoke upon its detection.
- E. Provide a factory mounted disconnect and integral powered duplex GFI convenience outlet on all units. Coordinate with Division 26.
- F. Provide downflow units with accessory condensate overflow switch in the primary drain pan. Switch shall be interlocked to shut the unit off in an overflow situation.

2.10 CONTROLS- non-VVT systems

- A. A 24 volt transformer shall be provided to accommodate controls and accessories. Each unit shall be complete with an indoor thermostat and control panel complete with the following minimum list of features and capabilities:
  1. Seven day programmable electronic thermostat for programming heating and cooling temperatures as well as night setback times and temperatures.
  2. Battery back-up to protect the programs for up to 24 hours after a power failure.
  3. Manual overrides and a failsafe program.

2.12 FILTERS

- A. Units shall have 1-inch thick high-efficiency throwaway filters in commercially available sizes. Filters shall be not less than 30%/30% average dust spot efficient when tested in accordance with ASHRAE Test Standard 52.2-2007; Farr 30/30 or an approved equal.

2.13 AIRSIDE ECONOMIZER

- A. A differential enthalpy airside economizer shall be provided with each unit. The economizer shall be factory-assembled complete with dampers, electrical actuators, exhaust fans and air controls.
- B. The outside air dampers shall be low-leakage type, with a maximum leakage of 3% at 3" WC static pressure. The dampers shall be spring operated to close during power failure.
- C. The differential enthalpy sensor shall be adjustable for temperature and humidity setpoints.

- D. If the cooling load is satisfied by the airside economizer alone, no mechanical refrigeration shall be initiated, and the economizer dampers shall be modulated to maintain the desired discharge air temperature. The economizer shall modulate up to its full open position to meet the cooling load. When the economizer is at its maximum outside air position and further cooling is required, mechanical refrigeration shall be utilized. When the enthalpy of the outside air is above its setpoint and during normal heating cycles, the outside air damper shall be at its minimum outdoor air position.
- E. Provide with barometric relief on all units 5 tons or less, set by T&B to maintain positive building pressure.
- F. Provide exhaust fan on units above 5 tons and shall be provided to prevent over-pressurization of the building during economizer mode, set by T&B to maintain positive building pressure. Provide variable frequency drives on exhaust fans in all units over 25 tons. Drives shall be controlled by a building pressure sensor.
- G. The position of the return and outside air dampers shall also be controlled as specified elsewhere in response to unit and external controls.

3.0 EXECUTION

3.01 INSTALLATION

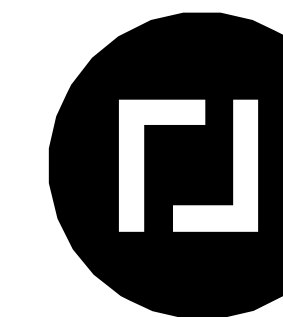
- A. The packaged rooftop units and associated controls shall be installed in strict accordance with the manufacturer's recommendations.
- B. The control system shall be completely wired under this Division 23. Wiring shall be in accordance with the NEC and shall meet all requirements for this installation.

3.02 STARTUP

- A. Provide the services of a factory-trained and qualified Service Technician employed by the Unit Manufacturer who shall inspect the installation including external control interlock and electrical power connections; supervise leak testing, initial operation, calibration of operating and safety controls and supervise electrical testing including insulation resistance of motors and voltage balance between phases during starting and running.
- B. This Service Technician shall forward a report in four (4) copies to the Owner when the unit is in safe and proper operating condition. This report shall include all pressure and control settings, meg readings, voltage readings per phase during start and run, and shall list minor discrepancies to be corrected that affect safe and reliable operation. One additional copy of the report shall be left in the unit control panel. One copy of bound installation, operation, maintenance service and parts brochures, including applicable serial numbers, full unit description and parts ordering sources, shall be placed in the unit control panel at the time of startup; four (4) additional copies shall be forwarded to the Owner.

END OF SECTION

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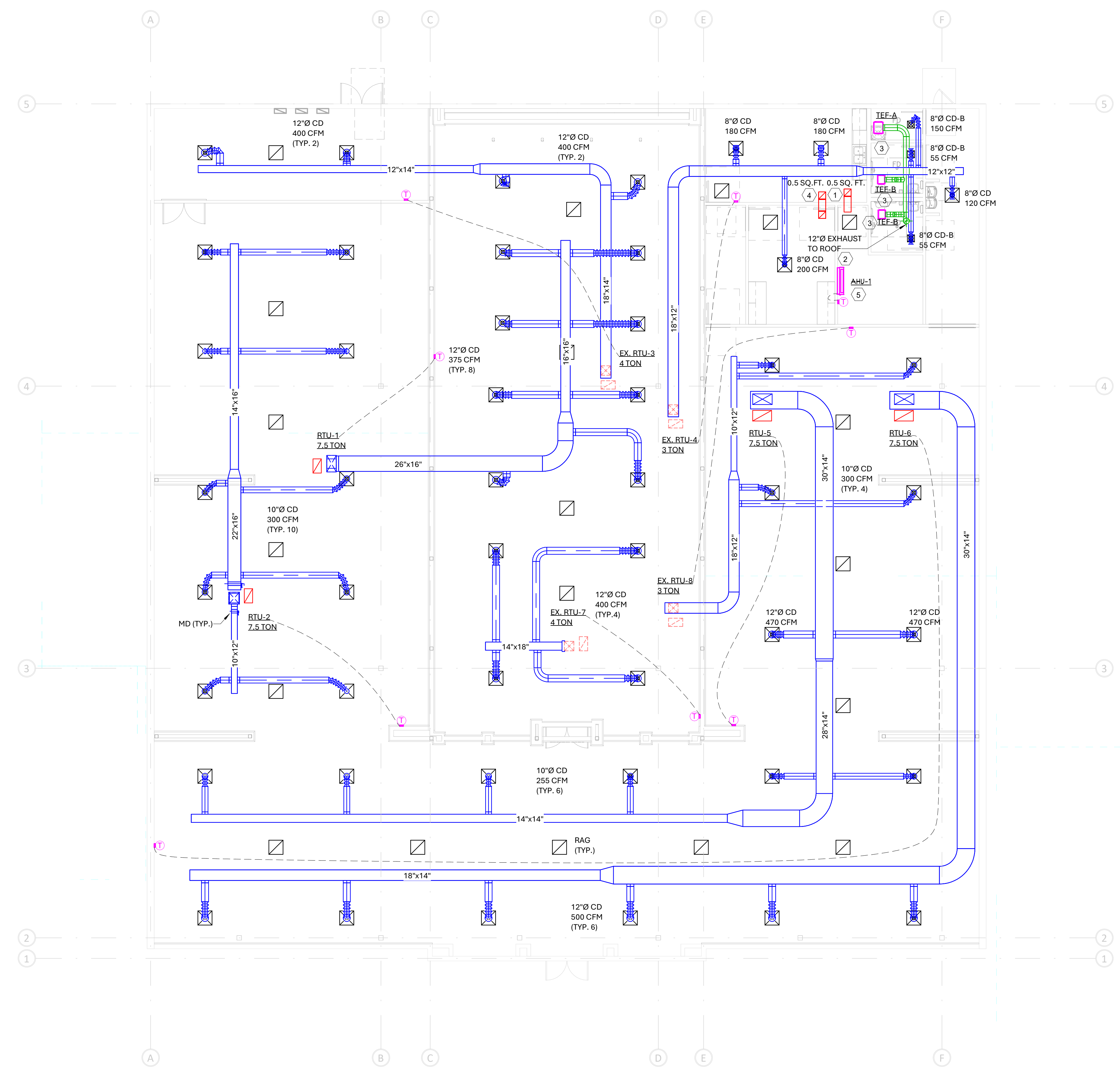
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8/8/2025

CONSULTANT

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**GENERAL NOTES: (APPLIES TO ALL SHEETS)**

- EXACT LOCATION OF ALL AIR DISTRIBUTION DEVICES SHALL BE COORDINATED WITH THE ARCHITECTURAL RCP.
- PLENUM IS USED FOR RETURN AIR. MATERIALS EXPOSED WITHIN PLENUMS SHALL BE NONCOMBUSTIBLE OR SHALL HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84 OR OTHER APPROPRIATE STANDARDS.
- COORDINATE ALL WORK ON OTHER FLOORS AND IN OTHER TENANT SPACES WITH OWNERS REP SO THAT WORK DOES NOT INTERFERE WITH OTHER TENANTS.
- REPAIR AND REPLACE ANY DUCTWORK THAT DOES NOT MEET SPECIFICATION SECTION 233100. SEAL ANY HOLES IN DUCTWORK AIRTIGHT WITH SHEET METAL AND "HARDCAST."
- COORDINATE THE EXACT LOCATION OF ALL THERMOSTATS WITH FINAL FURNITURE LAYOUT, EQUIPMENT LAYOUT, ARCH AND OWNERS REPRESENTATIVE. NEW T'STATS SHALL MATCH BASE BUILDING T'STATS IN EVERY RESPECT. CONTRACTOR SHALL TIE NEW T'STATS INTO BUILDING EMS AND UPDATE IT ACCORDINGLY.
- EXISTING DIFFUSERS AND THERMOSTATS MAY BE RE-USED IF IN GOOD WORKING CONDITION, NOT DISCOLORED, AND IF THEY ARE OF ADEQUATE SIZE.
- PROVIDE ALL MANUFACTURER AND NEC REQUIRED CLEARANCE FOR ALL EQUIPMENT.
- RELOCATE ALL SPRINKLER AND PLUMBING PIPING AS REQUIRED TO ACCOMMODATE NEW EQUIPMENT.
- AIR QUANTITIES AS SHOWN SHALL BE USED TO BALANCE SYSTEM PER NEW LAYOUT. CONTRACTOR SHALL VERIFY ACTUAL CAPACITY (CFM) OF THE EXISTING UNIT AND DISTRIBUTE THEM PROPORTIONALLY TO CFMs SHOWN TO ALL DIFFUSERS.
- ALL THERMOSTATS LOCATED ON EXTERIOR WALLS SHALL BE PROVIDED WITH INSULATED BACKING.
- LINED RETURN AIR BOOTS PROVIDED ABOVE CEILING IN ALL WALLS TO DECK AS INDICATED ON PLANS. IF ANY WALLS ARE TAKEN TO DECK THAT DEVIATE FROM PLANS, PROVIDE A LINED RETURN AIR BOOT. CONTRACTOR SHALL VERIFY BOOT SIZE WITH ENGINEER.
- SUPPORT ELEMENTS TO BE HUNG FROM TRUSSES OR CHORDS. COORDINATE WITH STRUCTURAL FOR INSTALLATION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING AND COORDINATING WITH THE LOCAL UTILITY COMPANIES (GAS, WATER, SEWER, ELECTRICAL, TELEPHONE) TO INSURE TIMELY INSTALLATION OF UTILITY SERVICES TO THE POINTS SHOWN ON THE PLANS.

**KEY NOTES: (APPLY TO THIS SHEET ONLY)**

- PROVIDE LINED RETURN AIR BOOT ABOVE CEILING WITH INDICATED FREE AREA. IF NECESSARY BECAUSE OF SPACE CONSTRAINTS MULTIPLE RETURN AIR BOOTS MAY BE USED FOR AN EQUAL FREE AREA. PROVIDE FIRE DAMPERS IF SHOWN. REFER TO DETAIL 3/M0.02.
- ROUTE 12" Ø UP THROUGH ROOF TO EXHAUST HOOD. PROVIDE EXHAUST HOOD WITH CURB, AND BIRDSCREEN.
- REFER TO 1/M0.02 FOR INSTALLATION DETAIL. EE SHALL BE AT LEAST 10'-0" FROM ANY FRESH AIR INTAKE. COORDINATE WITH DIV. 26.
- PROVIDE LINED RETURN AIR U-BOOT ABOVE CEILING WITH INDICATED FREE AREA. IF NECESSARY BECAUSE OF SPACE CONSTRAINTS MULTIPLE RETURN AIR BOOTS MAY BE USED FOR AN EQUAL FREE AREA. PROVIDE FIRE DAMPERS IF SHOWN. REFER TO DETAIL 6/M0.02.
- REFER TO 7/M0.02 FOR INSTALLATION DETAIL. NEW UNIT SHALL MAINTAIN ALL MANUFACTURER & NEC REQUIRED CLEARANCES. COORDINATE UNIT TAGGING WITH OWNER/BUILDING REPRESENTATIVE. COORDINATE WITH DIV. 26.

**1** FIRST FLOOR PLAN - HVAC  
M1.01 1/8" = 1'-0"

**BASSET  
DEERFIELD  
TOWNE  
CENTER**

PROJECT NUMBER	2025-0847
ISSUE DATE	08/08/25

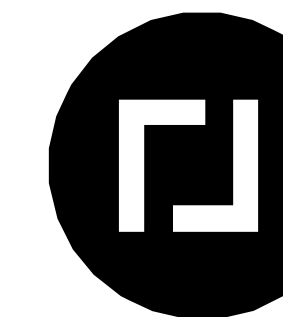
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**SHEET TITLE**  
FIRST FLOOR  
PLAN - HVAC

**SHEET NUMBER**

**M1.01**

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**BASSET  
DEERFIELD  
TOWNE  
CENTER**

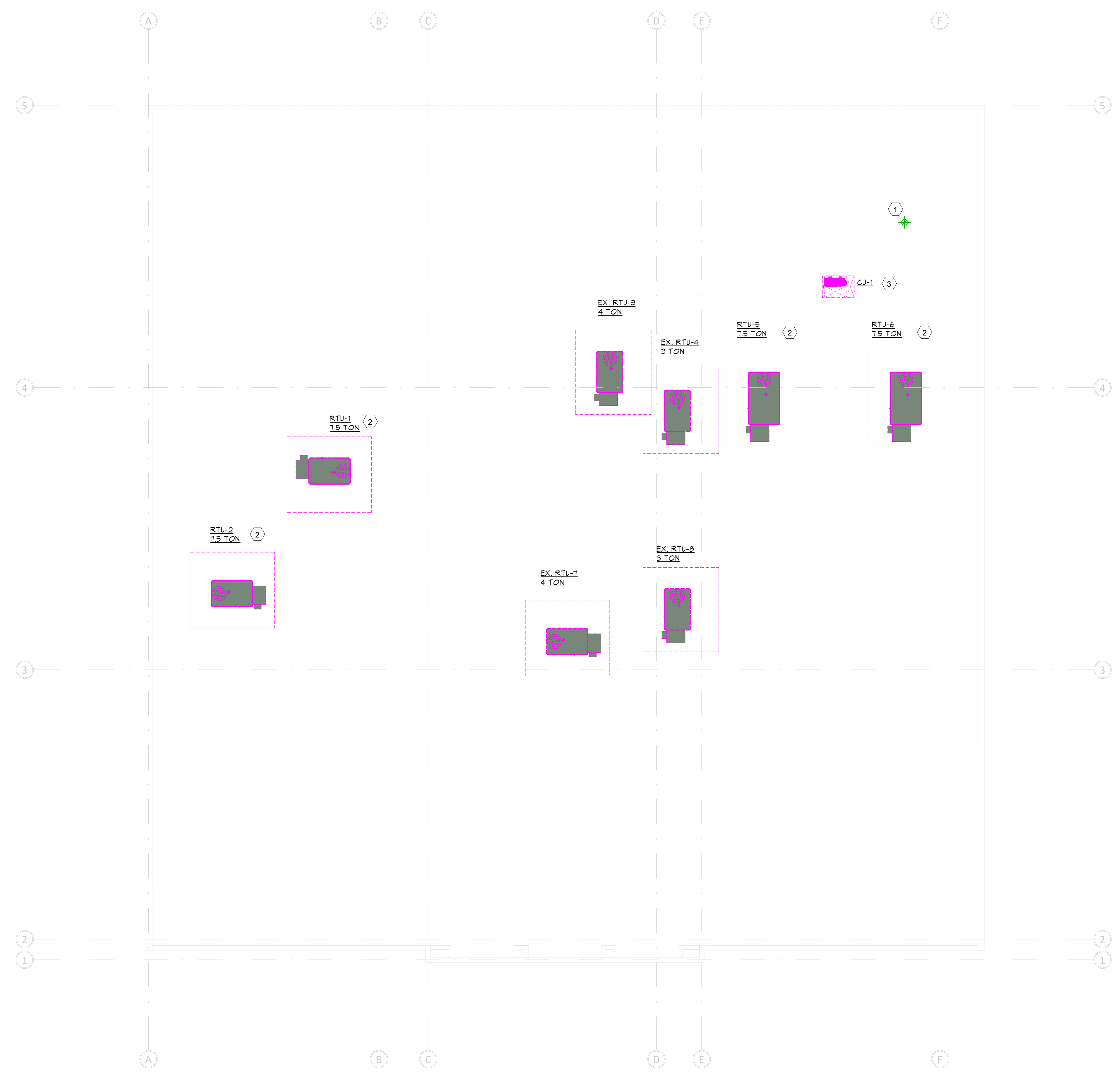
PROJECT NUMBER 2025-0847  
ISSUE DATE  
ISSUED FOR CONSTRUCTION 08/08/25

DRAWING DATA

SHEET TITLE  
**ROOF PLAN -  
HVAC**

SHEET NUMBER  
**M1.02**

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**1 FIRST FLOOR PLAN - LIGHTING**  
M1.02 1/8" = 1'-0"

- KEY NOTES: (APPLY TO THIS SHEET ONLY)
- REFER TO 5/M0.02 FOR INSTALLATION DETAIL. EXHAUST SHALL NOT BE WITHIN 10' OF ANY FRESH AIR INTAKE.
  - REPLACE EXISTING RTU ONE FOR ONE AS SCHEDULED. PROVIDE CURB ADAPTER AS NECESSARY. COORDINATE WITH STRUCTURAL AND DIVISION 26. CONTRACTOR TO RECONNECT EXISTING GAS LINES AND CONFIRM EXISTING METER IS CAPABLE OF PROVIDING SCHEDULED GAS INPUT MBH.
  - REFER TO 8/M0.02 FOR INSTALLATION DETAIL. NEW UNIT SHALL MAINTAIN ALL MANUFACTURER & NEC REQUIRED CLEARANCES. COORDINATE UNIT TAGGING WITH OWNER/BUILDING REPRESENTATIVE. COORDINATE WITH DIV. 26.