Technical Manual

SchoolMate®
Water Source Heat Pump Unit

Models SMG and SMW

AIREDALE

MODINE
Always Innovating. Always Improving.

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Modine is located in Racine, Wisconsin, and is one of the world's leading manufacturers of heat pump and air conditioning systems for schools. Our reputation for product excellence has been earned through innovative design, our use of the highest quality controls, engineering selections of component parts, and the highest quality manufacturing and assembly of all products.

State-of-the-art test facilities reflect Modine's commitment to the latest design and manufacturing technology to maintain leadership in the production of systems of unsurpassed quality and reliability.

In addition to creating a healthier and safer learning environment for our children, many of the features in Modine products are unique, and the range of systems available offer schools a variety of options.

Overview

The supplied product shall be a vertical water source heat pump in two possible configurations: Ground Source or Water Source. The unit may employ options for electric, hot water, or steam (plenum mount only) heating. The unit shall be floor-mounted and vertically sized to allow the supply air to be ducted or supplied through a high level plenum. All access and maintenance shall be through the front of the unit.

The unit shall be engineered to provide one stage of free cooling and two stages of mechanical cooling. A third dehumidification stage of mechanical cooling may be used when using a humidity sensor. Units shall also provide two stages of mechanical heating.

The unit shall be constructed in accordance with UL & CSA standards with a label affixed to the unit listing the product code under which it is registered. Unit performance shall be tested in accordance with AHRI/ISO Standard 13256-1.

Table of Contents

SchoolMate® - Model Nomenclature

1,2	3	4,5	6	7	8	9	10	11	12	13	14	15,16	17
PT	UC	MBH	SV	G	CC	VC	FL	CS	DS	DO	HP	HO	CX

1,2 - Product Type (PT)
SM - SchoolMate®

3 - Unit Configuration (UC)
G - Ground Source
W - Water Source

4,5 - Nominal Capacity (MBH)
24 - 24,000 Btu/Hr
30 - 30,000 Btu/Hr
36 - 36,000 Btu/Hr
42 - 42,000 Btu/Hr
48 - 48,000 Btu/Hr
60 - 60,000 Btu/Hr

6 - Supply Voltage (SV)
B - 208/60/1
C - 230/60/1
D - 208/60/3
E - 230/60/3
F - 460/60/3
H - 277/60/1

7 - Generation (G)
A - Current Design

8 - Control Code (CC)
M - Modine Control System
F - Factory Installed Free Issue
B - By Others - Field Installed

9 - Ventilation Configuration (VC)
No Exhaust
A - Economizer
B - Economizer with OA Damper
Z - Return Air Only
Gravity Exhaust
F - Economizer
G - Economizer with OA Damper
H - ERV with OA Damper
J - ERV with OA Damper & Economizer
K - ERV with OA & RA Damper & Economizer
Powered Exhaust
L - Economizer
M - Economizer with OA Damper
N - ERV with OA Damper & Economizer
P - ERV with OA & RA Damper & Economizer

10 - Filters (FL)
A - MERV 8
B - MERV 11
C - MERV 13
D - MERV 16

11 - Case Construction (CS)
A - 20Ga (Standard)
B - 16Ga
S - Study Package

12 - Door Mounted Stat (DS)
N - None
V - Vertical Stat
H - Horizontal Stat

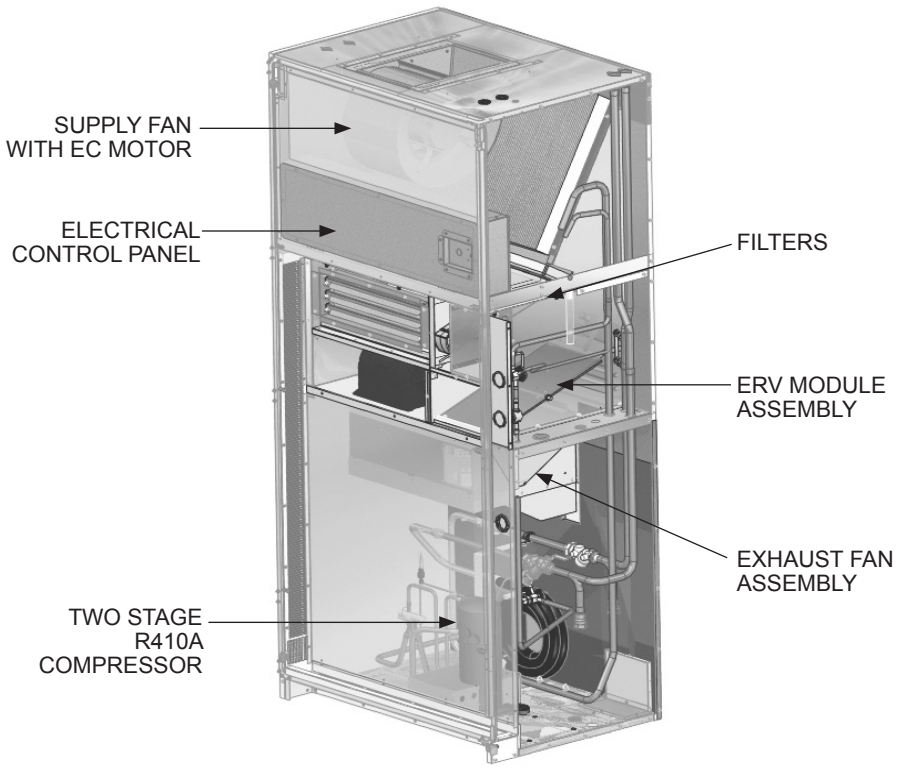
13 - Door Mounted Other (DO)
N - None
K - Key Over-ride
S - Occupancy Sensor
L - Indicator Light
T - Twist Timer

14 - HGRH & Pump Option (HP)
N - None
A - HGRH Coil
B - HGRH Coil & Condensate Pump
C - Condensate Pump

15,16 - Heating Option (HO)
00 - None
02 - 2 kW (1-stage)
03 - 3 kW (1-state)
04 - 4 kW (1-stage)
05 - 5kW (1-stage)
06 - 6 kW (1-stage)
07 - 7.5 kW (1-stage)
08 - 8 kW (1-stage)
09 - 9kW (1-stage)
10 - 10 kW (2-stage)
12 - 12 kW (2-stage)
15 - 15 kW (2-stage)
18 - 18 kW (2-stage)
20 - 20 kW (2-stage)
81 - 1R HW Coil (1/2") - Bottom Connection
82 - 1R HW Coil (3/4") - Bottom Connection
83 - 2R HW Coil (1/2") - Bottom Connection
84 - 2R HW Coil (3/4") - Bottom Connection
91 - 1R HW Coil (1/2") - Top Connection
92 - 1R HW Coil (3/4") - Top Connection
93 - 2R HW Coil (1/2") - Top Connection
94 - 2R HW Coil (3/4") - Top Connection

17 - Coaxial Coil Option (CX)
1 - Copper, Bottom Connection
2 - Cupro-Nickel, Bottom Connection
3 - Copper, Top Connection
4 - Cupro-Nickel, Top Connection
A,E - Copper, Bottom Conn., Circ. Pump
B,F - Cupro-Nickel, Bottom Conn., Circ. Pump
C,G - Copper, Top Conn., Circ. Pump
D,H - Cupro-Nickel, Top Conn., Circ. Pump

General Description – SchoolMate® Unit



View from front of unit. Parts of casing and sheet metal components removed for ease of viewing.

Digit 3: Unit Configuration (UC)

G,W = Water Source or Ground Source Heat Pump
Heat pump systems shall utilize HFC-R410A and shall be fitted with dual thermal expansion devices and a reversing valve to enable the unit to operate in either cooling or heat pump mode. Fitted with factory set automatic reset high-pressure and low-pressure cut-out switches and a sight glass for system observation.

Factory installed liquid line pressure sensor and fully modulating coaxial coil valve allow for superior control of refrigerant head pressure in cooling and/or dehumidification mode via metering of entering water resulting in increased unit operating performance.

Digit 8: Control Code (CC)

M = Modine Control System
The unit is fitted with a programmable microprocessor controller provided by the unit manufacturer mounted outside the air stream in the control panel. The controller is designed specifically for operating the unit in its most energy efficient manner using pre-engineered control strategies.

The microprocessor determines mode of operation based on the factory installed return air, supply air, and outdoor air temperature sensors. The controller shall also modify the minimum damper position to compensate for mode of operation and fan speed.

The factory Microprocessor Control includes a time clock card for units where time functions, night and weekend setback, etc. are not transmitted from a building management system or remote central time clock. The time clock shall have a full 7-day schedule and calendar function incorporated. The 7-day schedule shall have two adjustable occupied/unoccupied periods per day. The calendar function shall allow 20 calendar periods (start date / stop date = 1 period).

F = Factory Installed Free Issue
The unit is fitted in the factory with a controller, and temperature sensors provided by others. The controller provided by others will be required to operate in a similar fashion to Modine Control Systems (same inputs and outputs will be required). Modine will provide coordination with the controls contractor. The controls contractor will be responsible for appropriate sequence of operations. A wiring diagram agreed upon by Modine and the Controls Contractor will be required before the units can be released to production.

B = By Others – Field Installed
The unit will not have any controller or temperature sensors mounted in the factory. The controller provided by others will be required to operate in a similar fashion to Modine Control Systems (same inputs and outputs will be required). The controls contractor will be responsible for appropriate sequence of operations. A wiring diagram will be installed within the unit, but will reflect a generic controller.

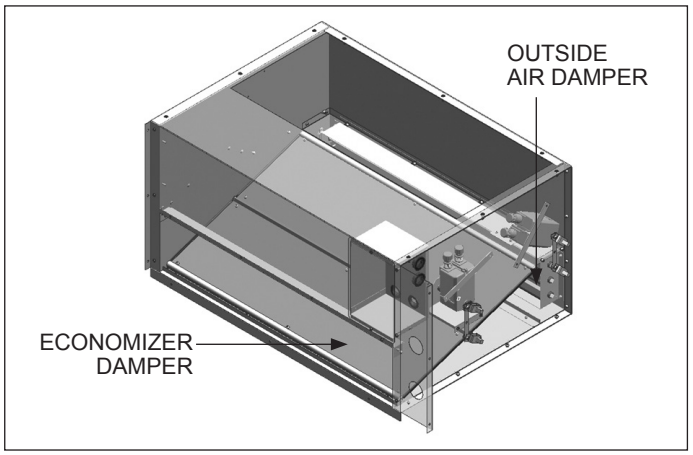
Digit 9: Ventilation Configuration (VC)

A, F, L = Economizer Ventilation
Single-blade damper that pivots using a central single shaft attached to a single actuator allowing for complete balance of the return, outside, and exhaust air streams. Capable of full modulation allowing any mixture of outside air and return air to be possible. Will allow for 100% of the units airflow to be taken from the outside during conditions allowing for full economizer savings. Damper blade edges lined with rubber gasket to prevent air infiltration in full recirculation or full economizer operation. Complete damper assembly slides out of unit on rails allowing for the damper assembly to be removed through the front of the unit if it requires service. Electrical and control wiring to damper assembly includes quick disconnect plug local to assembly.

Low voltage modulating damper actuator operates damper and is spring-return, fail safe. When power is cut to actuator, damper actuator will force damper blade closed to outside air.

B, G, M = Economizer Ventilation with Outside Air Damper
Standard economizer operation except with additional outside air damper and actuator provided for protection from outdoor elements when unit is not in use (See Figure 5.1).

Figure 5.1 - Ventilation Configuration Digits: B, G, M



C, H = Exhaust Recovery Ventilation (ERV) with Outside Air Damper
Energy recovery ventilation (ERV) provided within the unit through an enthalpy transfer wheel mounted in an insulated cassette frame complete with seals, drive motor, and belt. The rotary wheel is coated with silica gel desiccant and is sized to handle a maximum of 500 cfm of outside air. The entire assembly shall be a UL tested component. Performance shall be certified in accordance with the ASHRAE Standard 84 method of test and AHRI Rating Standard of 1060.

ERV section employs dual electronically commutated ventilation fans to ensure precise control of airflow through energy wheel and provide optimal wheel frost protection as required.

Separate outside air damper with actuator provided for protection from outdoor elements when unit is not in use.

Complete energy recovery ventilator installed on rails to allow the entire assembly to be slid out of the unit for service. Electrical and control wiring to damper assembly includes quick disconnect plugs local to assembly.

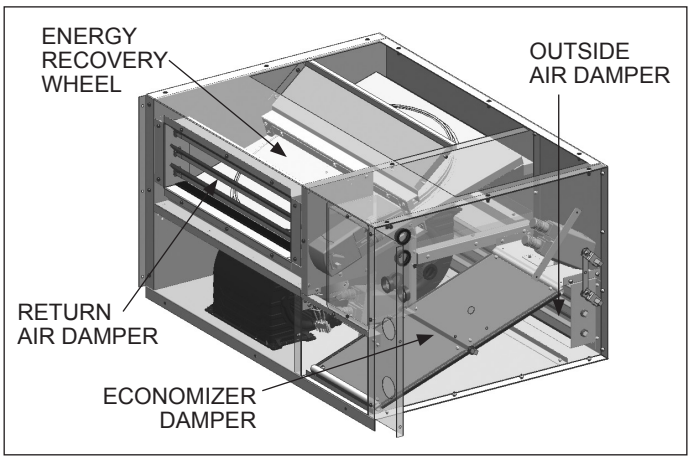
The Heat Recovery Wheel can be disabled to provide 500 cfm of outside air in economizer mode.

D, J, N = Exhaust Recovery Ventilation (ERV) with Outside Air Damper and Economizer (Only available when Digit 8 = Modine Control Systems)

Standard ERV operation except with the addition of an economizer damper with actuator. This option enables enhanced economizer functionality allowing up to 75% volume of outside air during free cooling applications

E, K, P = Exhaust Recovery Ventilation (ERV) with Outside air Damper, Economizer and Return Air Damper (Only available when Digit 8 = Modine Control Systems)
Standard ERV operation except with the addition of an economizer damper with actuator and return air damper with actuator. This option enables further enhanced economizer functionality by closing off return air allowing up to 100% volume of outside air during free cooling applications (See Figure 5.2).

Figure 5.2 - Ventilation Configuration Digits: E, K, P



Digit 10: Filters (FL)

Minimum Efficiency Reporting Value (MERV) corresponding to the MERV value shown below when evaluated per ASHRAE standard 52.2. Arrestance and Dust Spot Efficiency ratings are based on the ASHRAE 52.1 - 1992 test method.

A = MERV 8
2" thick radial pleated disposable cotton and synthetic blend filters.

B = MERV 11
2" thick and utilize 14.3 pleats per foot. Electrostatically enhanced pleated filter shall be constructed from 100% Synthetic media. 99% Arrestance and 35-40% Dust Spot Efficiency.

C = MERV 13
2" thick and utilize 17.5 pleats per foot. Filter shall be constructed from 100% Synthetic media and be LEED/Green compliant. 99% Arrestance and 70-80% Dust Spot Efficiency.

D = MERV 16
2" thick and incorporate a Mini-Pleat design. Filter shall incorporate a durable plastic frame and be constructed with no metal components. 95% evaporated Di-Octyl Phthalate (DOP) Tested Efficiency (Military Standard 282).

Digit 11: Case Construction

A = 20 Gage Casing

B = 16 Gage Casing

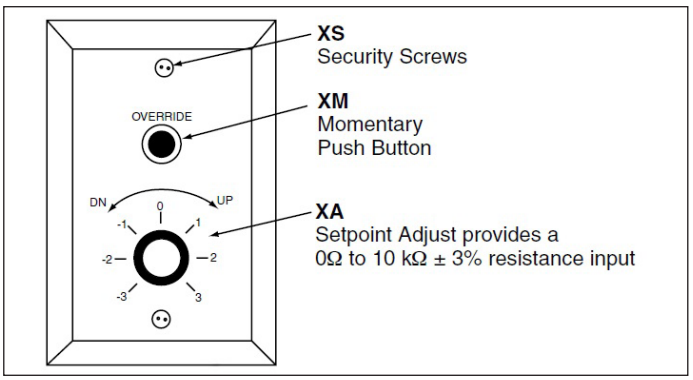
S = Study Package
20 Gage unit to be constructed with premium foam insulation with barrier and revised airflow paths to provide acoustic dampening.

Digit 12: Door Mounted Stat (DS)

N = None

V = Vertical Stat
For units fitted with Modine control systems. A stainless steel flush-mount thermistor sensor with insulated back provides for +/- 3º set-point adjustment and momentary push button override. Sensor is wall mounted remote from the unit or mounted on the front door of the unit, 48" above the finished floor (48" AFF only if no floor stand selected) (See Figure 6.1).

Figure 6.1 - Temperature Sensor



H = Horizontal Stat (Digital Thermostat)
Digital thermostat with (or without) humidity sensing used in conjunction with Modine control systems. Displays current room temperature, cooling/heating set-point, current room humidity level, humidity set-point, current time and day, current occupied mode, and the unit's compressor and fan speeds. The display will also display a remote alarm from the Microprocessor Control. Thermostat allows for occupied temperature and humidity set-point adjustment (when selected). The allowable set-point adjustment range can be limited by the Microprocessor Control. Thermostat allows for occupied override activation allowing user to select the amount of time the unit is to remain in the override state. Thermostat is mounted on the front door of the unit, 48" above the finished floor(48" AFF only if no floor stand selected) (See Figure 6.2).

Figure 6.2 - Digital Thermostat

Digit 13: Door Mounted Other (DO)

N = None

K = Key Override Switch
Key operated override switch mounted on the front of the unit sends a timed override signal to the Factory Microprocessor Control system. The time the unit will remain in occupied mode when the override key has been operated can be adjusted using the User Interface Display Module.

S = Occupancy Sensor
A passive infrared sensor mounted on the exterior of the unit controls the unit's occupancy mode based on changes in infrared energy (moving body heat) within the coverage area. The occupancy sensor shall utilize a dense wide angle lens, covering up to 2000 sq. ft. of walking motion and 1000 sq. ft. of desktop motion. If the sensor detects movement in the coverage area when the unit is in unoccupied mode, the unit shall switch to occupied mode. If the sensor detects no movement in the coverage area for a predetermined amount of time (adjustable) while the unit is in occupied mode, the unit shall switch to unoccupied mode or standby mode.

L = Indicator Light
A factory mounted Amber signal light shall illuminate upon alarm or fault signal from factory microprocessor control.

T = Twist Timer
The unit shall be provided with a manually adjustable 6 hour timer located on the exterior door of the unit which enables the unit for the specified time period.

Digit 14: Dehumidification (DE)

N = None

A = Hot Gas Reheat Coil
Required for units without hot water heating when utilizing the dehumidification cycle. Unit is equipped with a reclaim valve and a second condenser coil (reheat coil). When the unit enters the dehumidification mode, the unit will reclaims the heat of rejection to maintain dry bulb temperature and reduce the need for an auxiliary heat source.

B = Hot Gas Reheat Coil & Condensate Pump
Unit is equipped with a Hot Gas Reheat Coil and Condensate Pump.

C = Condensate Pump
Unit is equipped with a Condensate Pump.

Digit 15,16: Heating Option (HO)

00 = None

Electric Heating
Unit is equipped with electric resistance heating elements controlled in one or two stages, factory mounted downstream of the evaporator coil. A manual thermal protection and automatic thermal protection switch is included.

02 = 2 KW (1-stage)
03 = 3 KW (1-stage)
04 = 4 KW (1-stage)
05 = 5 KW (1-stage)
06 = 6 KW (1-stage)
07 = 7.5 KW (1-stage)
08 = 8 KW (1-stage)
09 = 9 KW (1-stage)
10 = 10 KW (2-stage)
12 = 12 KW (2-stage)
15 = 15 KW (2-stage)
18 = 18 KW (2-stage)
20 = 20 KW (2-stage)

Hot Water Heating
Unit is equipped with a hot water heating coil integral to the unit mounted in the reheat position relative to the evaporator coil. The coil is manufactured from refrigeration quality copper tubing mechanically bonded onto aluminum fins. Coil is fitted with both an air bleed and a drain valve with hose bib.

81 = 1 Row Hot Water Coil (1/2") - Bottom Connection
82 = 1 Row Hot Water Coil (3/4") - Bottom Connection
83 = 2 Row Hot Water Coil (1/2") - Bottom Connection
84 = 2 Row Hot Water Coil (3/4") - Bottom connection
91 = 1 Row Hot Water Coil (1/2") - Top Connection
92 = 1 Row Hot Water Coil (3/4") - Top Connection
93 = 2 Row Hot Water Coil (1/2") - Top Connection
94 = 2 Row Hot Water Coil (3/4") - Top Connection

Steam Coil Heating (Plenum Mounted)
Field installed plenum includes a factory mounted steam heating coil. The coil is manufactured from refrigeration quality copper tubing mechanically bonded onto aluminum fins. Capacity control shall be achieved by either a field installed solenoid or modulating valve.

Digit 17: Coaxial Coil Option (CX)

1 = Copper, Bottom Connections
The unit shall be supplied with copper coaxial DX/water counter flow coil. The unit shall be fitted with 1” female NPT connections located at the bottom right hand side when facing the front of the unit.

2 = Cupro-Nickel, Bottom Connections
The unit shall be supplied with cupro-nickel coaxial DX/water counter flow coil. The unit shall be fitted with 1” female NPT connections located on the bottom right hand side when facing the front of the unit.

3 = Copper, Top Connections
The unit shall be supplied with copper coaxial DX/water counter flow coil. The unit shall be fitted with 1” female NPT connections located in the back right corner on the top panel when facing the front of the unit.

4 = Cupro-Nickel, Top Connections
The unit shall be supplied with cupro-nickel coaxial DX/water counter flow coil. The unit shall be fitted with 1” female NPT connections located in the back right corner on the top panel when facing the front of the unit.

A,E = Copper, Bottom Connections, Circulating Pump
Standard copper coaxial coil with bottom connections except with additional source circulating pump (Digit 17 = A or E depending on selected pump).

B,F = Cupro-Nickel, Bottom Connections, Circulating Pump
Standard cupro-nickel coaxial coil with bottom connections except with additional source circulating pump (Digit 17 = B or F depending on selected pump).

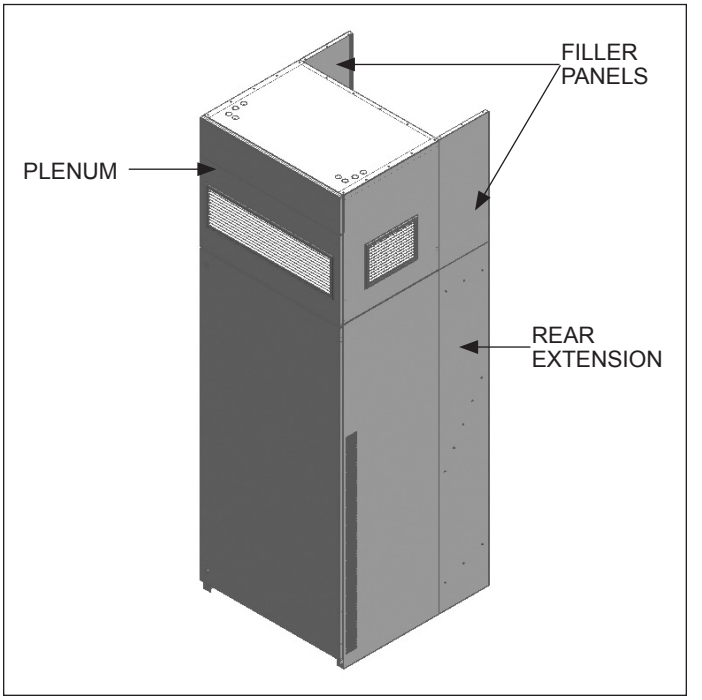
C,G = Copper, Top Connections, Circulating Pump
Standard copper coaxial coil with top connections except with additional source circulating pump (Digit 17 = C or G depending on selected pump).

D,H = Cupro-Nickel, Top Connections, Circulating Pump
Standard cupro-nickel coaxial coil with top connections except with additional source circulating pump (Digit 17 = D or H depending on selected pump).

FIELD INSTALLED ACCESSORIES

Where site conditions do not permit the use of standard locations for outside air and discharge air, Modine has sheet metal options to assist with the transition.

Figure 7.1 - Sheet Metal Options



Plenum

Figure 8.1 - Three-way Discharge Plenum

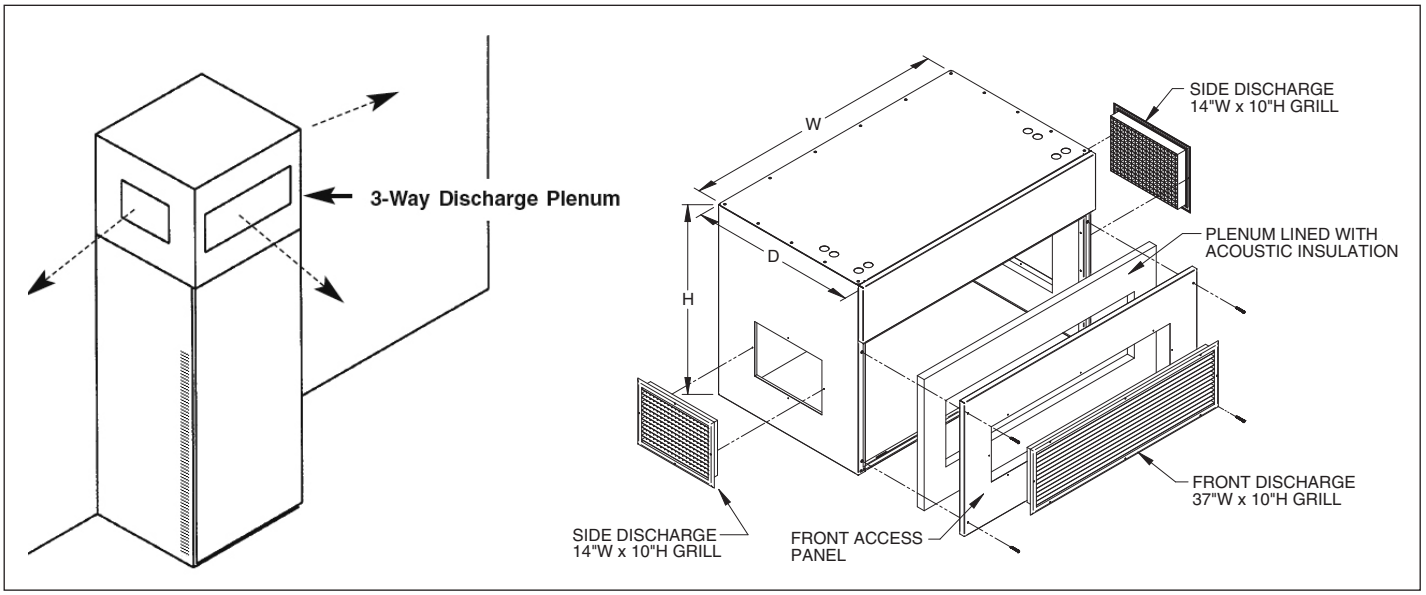


Figure 8.2 - Top Discharge Plenum

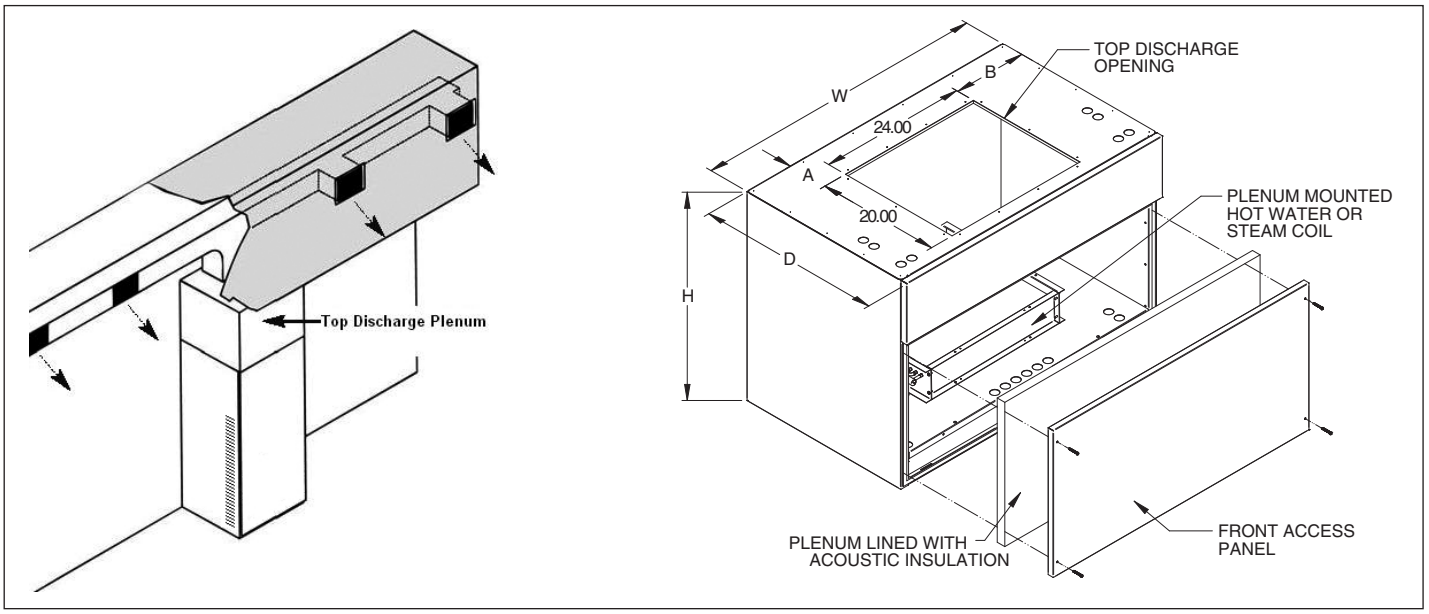


Table 8.1 - Discharge Plenum Dimensions

Model Size	Dimensions (inches)		
	W	D	H
24/30/36	42.00	30.00	12" to 48" (2" increments)
42/48/60	48.00	30.00	

Duct Shroud

Figure 9.1 - Duct Shroud

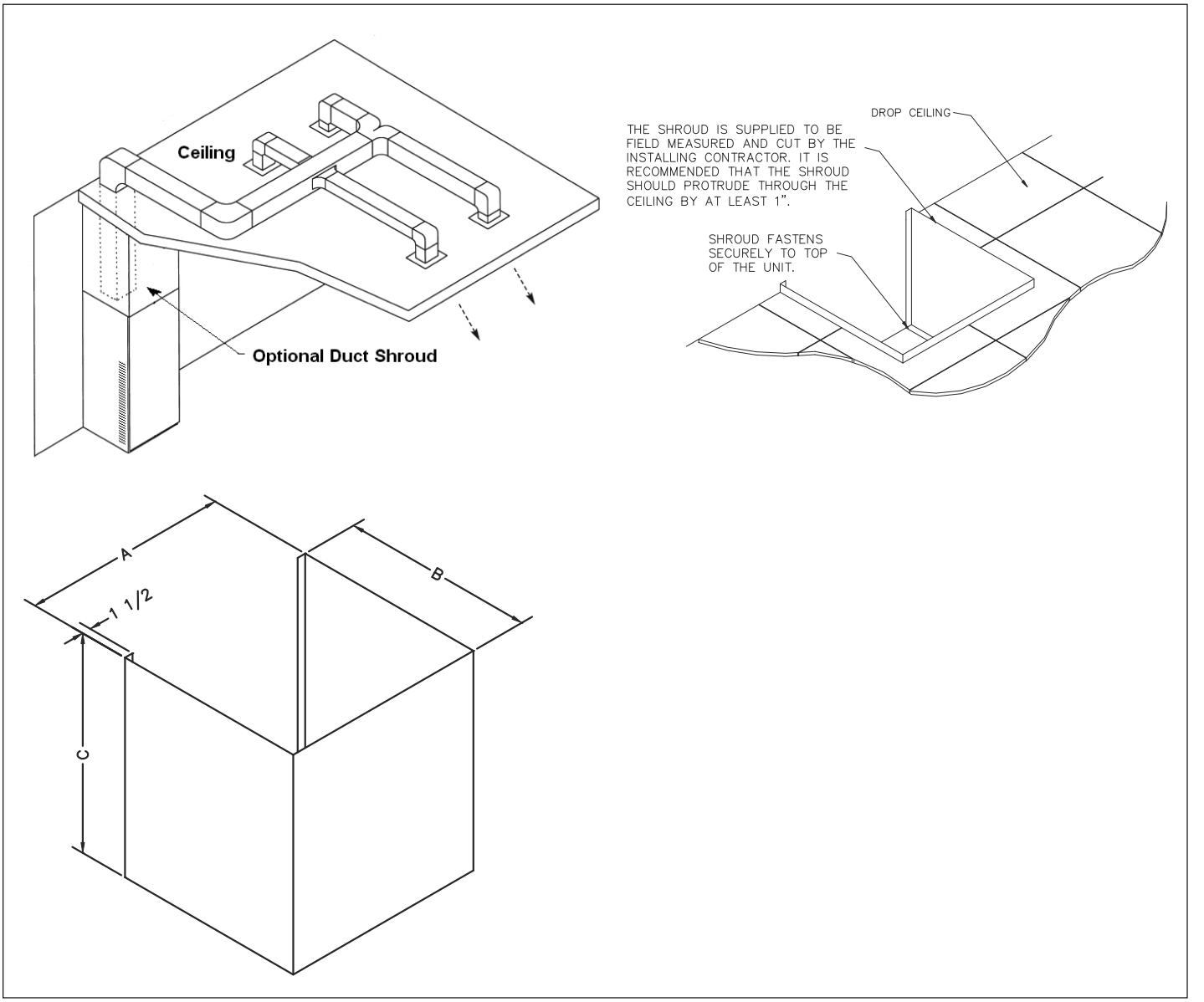


Table 9.1 - Duct Shroud Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/30/36	42.00	30.00	26" or 38"
42/48/60	48.00	30.00	26" or 38"

Table 13.1 - Performance Tables

SMG / SMW24 COOLING ① @ 750CFM & 6GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	23.7	18.2	1.010	27.2	23.5
	80/67	26.4	18.1	1.021	29.9	25.8
	85/71	28.5	18.7	1.029	32.0	27.7
60	75/62	23.1	17.9	1.162	27.0	19.9
	80/67	25.6	17.8	1.173	29.6	21.9
	85/71	27.7	18.4	1.181	31.7	23.4
70	75/62	22.3	17.6	1.306	26.8	17.1
	80/67	24.8	17.5	1.316	29.3	18.9
	85/71	26.8	18.1	1.324	31.3	20.2
80	75/62	21.5	17.2	1.451	26.5	14.8
	80/67	23.9	17.1	1.462	28.9	16.3
	85/71	25.8	17.7	1.470	30.8	17.5
90	75/62	20.6	16.9	1.612	26.1	12.8
	80/67	22.9	16.7	1.622	28.4	14.1
	85/71	24.6	17.3	1.629	30.2	15.1
100	75/62	19.6	16.4	1.797	25.7	10.9
	80/67	21.8	16.3	1.807	28.0	12.1
	85/71	23.4	16.9	1.813	29.6	12.9

SMG / SMW24 HEATING ① @ 750CFM & 6GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	19.0	1.182	15.0	4.7
	60	18.8	1.310	14.3	4.2
	70	18.5	1.474	13.4	3.7
40	50	22.0	1.226	17.9	5.3
	60	21.7	1.356	17.1	4.7
	70	21.3	1.519	16.1	4.1
50	50	25.0	1.27	20.7	5.8
	60	24.6	1.400	19.9	5.2
	70	24.1	1.563	18.8	4.5
60	50	27.7	1.309	23.3	6.2
	60	27.3	1.441	22.4	5.6
	70	26.7	1.604	21.2	4.9
70	50	29.8	1.339	25.2	6.5
	60	29.3	1.473	24.3	5.8
	70	28.8	1.638	23.3	5.2
80	50	30.4	1.348	25.8	6.6
	60	30.2	1.487	25.2	6.0
	70	30.0	1.656	24.3	5.3

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
6	100%	750	23.7	16.5	19.0	3.9
6	66%	600	17.5	18.0	15.0	3.9

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
6	100%	750	22.9	14.8	27	5.1
6	66%	600	16.5	13.9	21	5.1

① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 14.1 - Performance Tables

SMG / SMW30 COOLING ① @ 950CFM & 8GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	31.2	23.0	1.496	36.3	20.8
	80/67	34.7	22.8	1.530	39.9	22.7
	85/71	37.4	23.5	1.562	42.8	24.0
60	75/62	30.0	22.5	1.577	35.4	19.1
	80/67	33.5	22.3	1.607	39.0	20.8
	85/71	36.1	23.1	1.636	41.7	22.1
70	75/62	28.9	22.0	1.708	34.7	16.9
	80/67	32.2	21.8	1.736	38.2	18.6
	85/71	34.7	22.6	1.763	40.7	19.7
80	75/62	27.7	21.4	1.888	34.1	14.7
	80/67	30.9	21.3	1.914	37.4	16.1
	85/71	33.3	22.0	1.938	39.9	17.2
90	75/62	26.4	20.9	2.112	33.6	12.5
	80/67	29.5	20.7	2.137	36.8	13.8
	85/71	31.7	21.5	2.159	39.1	14.7
100	75/62	25.0	20.3	2.377	33.1	10.5
	80/67	28.0	20.2	2.402	36.2	11.6
	85/71	30.0	20.9	2.423	38.3	12.4

SMG / SMW30 HEATING ① @ 950CFM & 8GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	24.3	1.529	19.1	4.7
	60	23.7	1.647	18.1	4.2
	70	23.2	1.842	16.9	3.7
40	50	27.8	1.548	22.5	5.3
	60	27.1	1.674	21.4	4.8
	70	26.5	1.875	20.1	4.2
50	50	30.6	1.568	25.3	5.7
	60	30.0	1.700	24.2	5.2
	70	29.4	1.906	22.9	4.5
60	50	32.5	1.584	27.1	6.0
	60	32.0	1.721	26.1	5.5
	70	31.5	1.931	24.9	4.8
70	50	33.5	1.595	28.1	6.2
	60	33.3	1.736	27.3	5.6
	70	33.0	1.951	26.4	5.0
80	50	34.3	1.603	28.8	6.3
	60	34.1	1.754	28.1	5.7
	70	33.9	1.978	27.2	5.0

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
8	100%	950	30.6	15.8	23.9	3.7
8	66%	700	23.4	18.8	19.7	3.8

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
8	100%	950	29.6	14.5	31.3	4.7
8	66%	700	21.7	14.5	25.7	5.0

① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 15.1 - Performance Tables

SMG / SMW36 COOLING ① @ 1100CFM & 9GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	37.9	27.4	1.711	43.7	22.1
	80/67	42.0	27.2	1.767	48.1	23.8
	85/71	45.1	27.9	1.810	51.2	24.9
60	75/62	36.0	26.6	1.838	42.3	19.6
	80/67	40.1	26.4	1.881	46.5	21.3
	85/71	43.0	27.1	1.914	49.5	22.5
70	75/62	34.2	25.8	2.003	41.0	17.1
	80/67	38.1	25.6	2.035	45.0	18.7
	85/71	40.9	26.4	2.060	47.9	19.9
80	75/62	32.3	25.0	2.207	39.9	14.7
	80/67	36.1	24.8	2.231	43.7	16.2
	85/71	38.8	25.6	2.250	46.4	17.2
90	75/62	30.4	24.1	2.452	38.8	12.4
	80/67	34.0	24.0	2.471	42.4	13.8
	85/71	36.5	24.8	2.485	45.0	14.7
100	75/62	28.4	23.3	2.741	37.8	10.4
	80/67	31.8	23.1	2.757	41.2	11.5
	85/71	34.2	24.0	2.768	43.6	12.4

SMG / SMW36 HEATING ① @ 1100CFM & 9GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	28.7	1.836	22.4	4.6
	60	28.2	2.036	21.3	4.1
	70	27.7	2.300	19.9	3.5
40	50	33.3	1.912	26.8	5.1
	60	32.7	2.114	25.5	4.5
	70	32.1	2.378	24.0	4.0
50	50	37.8	1.989	31.1	5.6
	60	37.1	2.192	29.6	5.0
	70	36.3	2.456	28.0	4.3
60	50	41.8	2.058	34.8	6.0
	60	41.0	2.265	33.3	5.3
	70	40.2	2.529	31.5	4.7
70	50	44.5	2.109	37.3	6.2
	60	43.9	2.321	36.0	5.5
	70	43.2	2.588	34.3	4.9
80	50	47.5	2.165	40.1	6.4
	60	47.0	2.384	38.9	5.8
	70	46.5	2.656	37.4	5.1

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
9	100%	1100	36.1	16.7	28.6	3.7
9	66%	800	26.2	20.6	22.1	3.7

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
9	100%	1100	34.2	14.5	42.8	5.0
9	66%	800	24.1	14.5	30.5	5.0

① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 16.1 - Performance Tables

SMG / SMW42 COOLING ① @ 1300CFM & 10GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	43.2	31.7	1.875	49.6	23.0
	80/67	47.9	31.5	1.902	54.4	25.2
	85/71	51.7	32.5	1.926	58.3	26.9
60	75/62	41.7	31.1	2.090	48.8	20.0
	80/67	46.3	30.8	2.112	53.5	21.9
	85/71	50.0	31.8	2.131	57.2	23.5
70	75/62	40.2	30.4	2.326	48.1	17.3
	80/67	44.7	30.2	2.344	52.7	19.1
	85/71	48.1	31.2	2.360	56.2	20.4
80	75/62	38.6	29.7	2.590	47.4	14.9
	80/67	42.9	29.5	2.606	51.8	16.5
	85/71	46.2	30.5	2.620	55.1	17.6
90	75/62	36.8	28.9	2.889	46.7	12.8
	80/67	41.0	28.7	2.905	50.9	14.1
	85/71	44.1	29.7	2.917	54.1	15.1
100	75/62	35.0	28.1	3.231	46.0	10.8
	80/67	39.0	28.0	3.248	50.1	12.0
	85/71	41.9	28.9	3.260	53.0	12.9

SMG / SMW42 HEATING ① @ 1300CFM & 10GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	34.8	2.126	27.6	4.8
	60	34.2	2.351	26.2	4.3
	70	33.5	2.644	24.5	3.7
40	50	40.1	2.215	32.5	5.3
	60	39.4	2.448	31.0	4.7
	70	38.5	2.746	29.1	4.1
50	50	45.4	2.323	37.4	5.7
	60	44.5	2.566	35.7	5.1
	70	43.5	2.869	33.7	4.5
60	50	50.3	2.446	42.0	6.0
	60	49.4	2.700	40.2	5.4
	70	48.4	3.011	38.1	4.7
70	50	54.7	2.580	45.9	6.2
	60	53.7	2.851	44.0	5.5
	70	52.7	3.170	41.9	4.9
80	50	57.8	2.713	48.5	6.2
	60	57.0	3.008	46.7	5.6
	70	56.2	3.341	44.8	4.9

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
10	100%	1300	42.5	16.6	34.5	3.9
10	66%	1000	31.6	19.0	27.1	3.8

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
10	100%	1300	40.5	14.6	50.2	4.9
10	66%	1000	29.0	13.9	38.0	4.9

① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 17.1 - Performance Tables

SMG / SMW48 COOLING ① @ 1500CFM & 12GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	50.2	38.1	2.145	57.5	23.4
	80/67	55.8	37.9	2.170	63.2	25.7
	85/71	59.9	39.0	2.184	67.4	27.4
60	75/62	49.2	37.6	2.400	57.4	20.5
	80/67	54.5	37.4	2.422	62.8	22.5
	85/71	58.5	38.5	2.435	66.8	24.0
70	75/62	47.7	37.0	2.669	56.8	17.9
	80/67	52.9	36.7	2.689	62.0	19.7
	85/71	56.6	37.8	2.702	65.8	21.0
80	75/62	45.9	36.2	2.965	56.0	15.5
	80/67	50.8	35.9	2.987	61.0	17.0
	85/71	54.3	37.0	3.000	64.6	18.1
90	75/62	43.7	35.3	3.304	55.0	13.2
	80/67	48.5	35.0	3.328	59.8	14.6
	85/71	51.8	36.1	3.343	63.2	15.5
100	75/62	41.4	34.3	3.700	54.0	11.2
	80/67	45.9	34.0	3.728	58.6	12.3
	85/71	49.0	35.1	3.746	61.8	13.1

SMG / SMW48 HEATING ① @ 1500CFM & 12GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	39.2	2.465	30.8	4.7
	60	38.8	2.746	29.5	4.2
	70	38.0	3.100	27.5	3.6
40	50	46.1	2.596	37.2	5.2
	60	45.3	2.874	35.5	4.6
	70	44.2	3.220	33.2	4.0
50	50	52.8	2.719	43.5	5.7
	60	51.7	3.000	41.5	5.1
	70	50.4	3.347	39.0	4.4
60	50	59.1	2.83	49.5	6.1
	60	57.8	3.121	47.2	5.4
	70	56.4	3.474	44.5	4.8
70	50	64.7	2.927	54.7	6.5
	60	63.3	3.232	52.3	5.8
	70	61.8	3.596	49.6	5.0
80	50	72.4	3.059	62.0	6.9
	60	70.7	3.386	59.2	6.1
	70	69.1	3.767	56.2	5.4

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
12	100%	1500	50.4	17.2	39.3	3.8
12	66%	1100	36.4	20.5	31.2	3.9

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
12	100%	1500	48.7	15.0	58.0	5.0
12	66%	1100	33.5	14.5	42.5	5.1

① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 18.1 - Performance Tables

SMG / SMW60 COOLING ① @ 1800CFM & 15GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Sensible Capacity (MBH)	Unit Power Input (kW)	Heat of Rejection (MBH)	EER (MBH/KW)
50	75/62	61.8	45.9	2.904	71.7	21.3
	80/67	68.5	45.5	2.972	78.7	23.1
	85/71	73.8	46.9	3.026	84.1	24.4
60	75/62	59.6	44.9	3.170	70.4	18.8
	80/67	66.1	44.5	3.227	77.1	20.5
	85/71	71.1	45.9	3.273	82.3	21.7
70	75/62	57.3	43.9	3.476	69.2	16.5
	80/67	63.7	43.6	3.527	75.7	18.1
	85/71	68.4	44.9	3.567	80.6	19.2
80	75/62	55.0	42.9	3.831	68.1	14.4
	80/67	61.2	42.6	3.878	74.4	15.8
	85/71	65.7	43.9	3.914	79.0	16.8
90	75/62	52.6	41.8	4.245	67.1	12.4
	80/67	58.5	41.5	4.290	73.1	13.6
	85/71	62.7	42.9	4.324	77.5	14.5
100	75/62	50.0	40.7	4.724	66.1	10.6
	80/67	55.6	40.4	4.771	71.9	11.7
	85/71	59.5	41.8	4.804	75.9	12.4

SMG / SMW60 HEATING ① @ 1800CFM & 15GPM

Entering Fluid Temperature (°F)	Entering Air db°F / wb°F	Total Capacity (MBH)	Unit Power Input (kW)	Heat of Absorption (MBH)	COP (W/W)
30	50	49.5	3.168	38.7	4.6
	60	48.6	3.490	36.7	4.1
	70	47.7	3.906	34.4	3.6
40	50	57.1	3.297	45.9	5.1
	60	56.0	3.625	43.7	4.5
	70	54.9	4.043	41.1	4.0
50	50	65.0	3.435	53.2	5.6
	60	63.7	3.769	50.8	5.0
	70	62.3	4.190	48.0	4.4
60	50	72.8	3.577	60.6	6.0
	60	71.3	3.921	57.9	5.3
	70	69.8	4.347	54.9	4.7
70	50	80.2	3.718	67.5	6.3
	60	78.6	4.074	64.7	5.7
	70	77.0	4.505	61.6	5.0
80	50	86.7	3.845	73.5	6.6
	60	85.1	4.216	70.7	5.9
	70	83.5	4.657	67.6	5.3

RATED IN ACCORDANCE WITH ARI/ISO STANDARD 13256-1 ①

Ground Loop Unit ①

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 77°F EWT / 80.6°Fdb 66.2°Fwb ①		Heating @ 32°F EWT / 68°F EAT ①	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
15	100%	1800	60.5	15.9	48.9	3.7
15	66%	1500	46.5	19.0	38.7	3.9

Water Loop Unit

Flow (GPM)	Comp. Load	Air Flow (CFM)	Cooling @ 86°F EWT / 80.6°Fdb 66.2°Fwb		Heating @ 68°F EWT / 68°F EAT	
			Capacity (MBH)	EER (MBH/KW)	Capacity (MBH)	COP (W/W)
15	100%	1800	58.6	13.8	73.8	4.9
15	66%	1500	42.8	14.3	55.4	5.1

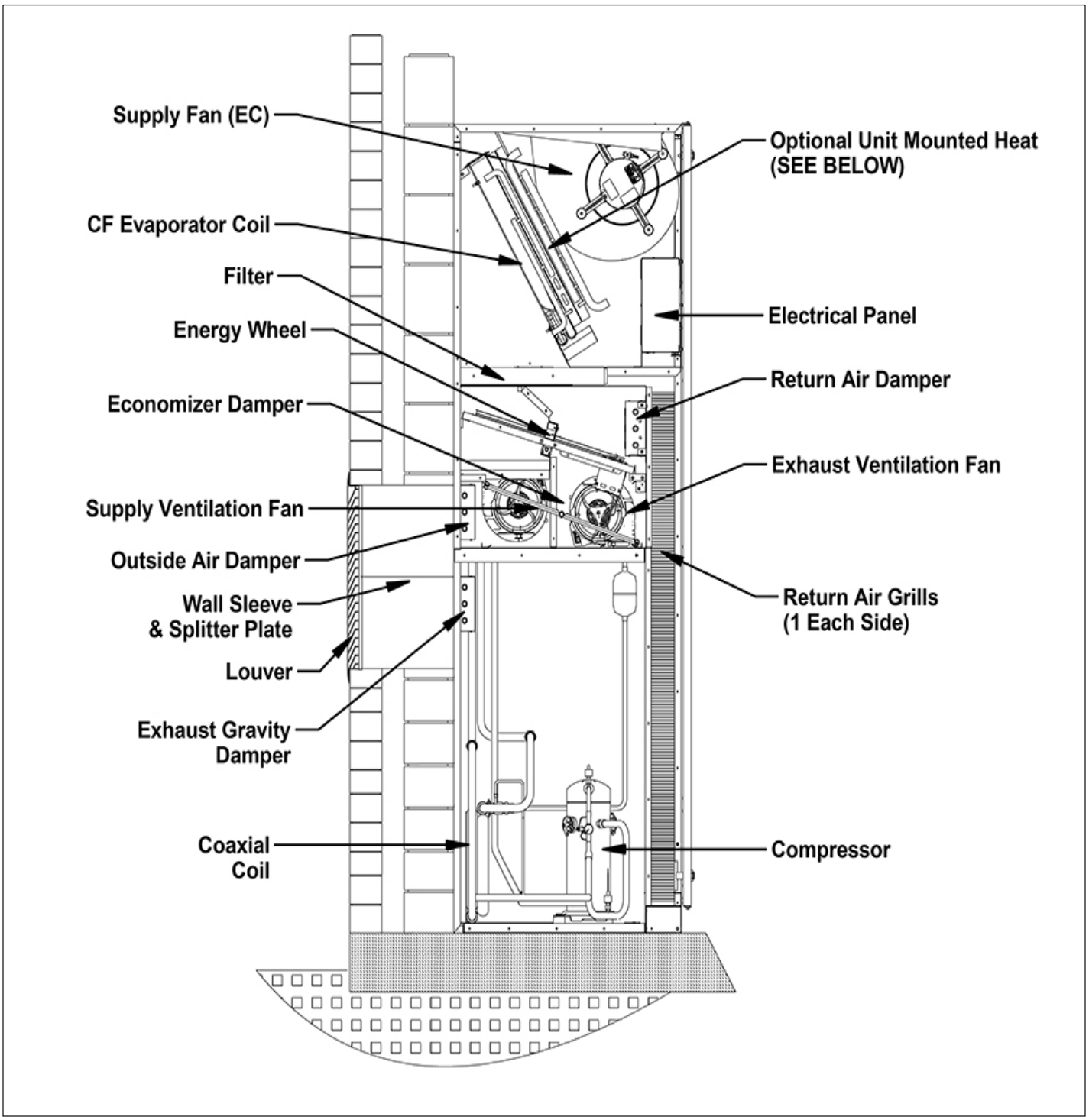
① Data in accordance to ISO Standard 13256 – 1:1998(E) reflects ISO fan and pump power correction factors at 0" ESP.
② Data shows unit performance using 15% (by mass) methanol-water solution.
③ Entering water temperature for part-load (66%) is 68ºF in cooling and 41°F in heating.

Table 19.1 - Technical Data - SMG & SMW

NOMINAL CAPACITY	MBH	24	30	36	42	48	60
DIMENSIONS – (H x W x D)	IN	90 X 42 X 30			90 X 48 X 30		
INDOOR (Evaporator) COIL - Face Area	IN²	720	720	720	863	863	863
SUPPLY FAN		Direct Drive Centrifugal					
Fan Quantity		1	1	1	1	1	1
Motor Size (Qty 1)	HP	3/4	3/4	3/4	3/4	3/4	3/4
Motor Type		Electronically Commutated Motor (ECM)					
Indoor Coil Airflow	CFM	750	950	1,100	1,300	1,500	1,800
Rated/Max External Static Pressure	IN.Wg	0.10/0.50	0.10/0.50	0.15/0.50	0.20/0.50	0.20/0.50	0.20/0.50
EXHAUST FAN (optional)		Backward Curved Motorized Impellor					
Fan Quantity		1	1	1	1	1	1
Motor Type		Speed Controlled PSC Motor					
Max Room Exhaust Airflow	CFM	600	760	880	1,040	1,200	1,200
Max External Static Pressure	IN.Wg	0.25	0.25	0.25	0.25	0.25	0.25
COMPRESSOR		Copeland Scroll ULTRATECH					
Stages		0, 67%, 100%					
Refrigerant Type		HFC-R410A					
UNIT WEIGHT							
Operating Weight	LBS.	655	655	655	765	765	765
FILTER		MERV 8,11,13,16					
Quantity		2	2	2	2	2	2
Dimensions	IN	16 X 25	16 X 25	16 X 25	20 X 25	20 X 25	20 X 25
ELECTRIC HEATING (optional)							
Electric Heating Capacity	KW	20	20	20	20	20	20
Stages		2	2	2	2	2	2
ENERGY RECOVERY WHEEL (optional)		DATA SHOWN FOR ALL UNITS					
Outdoor Air Volume	CFM	200	250	300	350	400	500
Total Capacity Recovered (Cooling) ①	MBH	8.6	10.2	11.6	12.8	13.8	15.2
Measured Cooling Effectiveness	%	76.3	72.5	68.8	65.2	61.5	54.3
Total Capacity Recovered (Heating) ②	MBH	7.6	9.1	10.5	11.7	12.7	14.3
Measured Heating Effectiveness	%	78.8	75.5	72.3	69.1	65.9	59.4

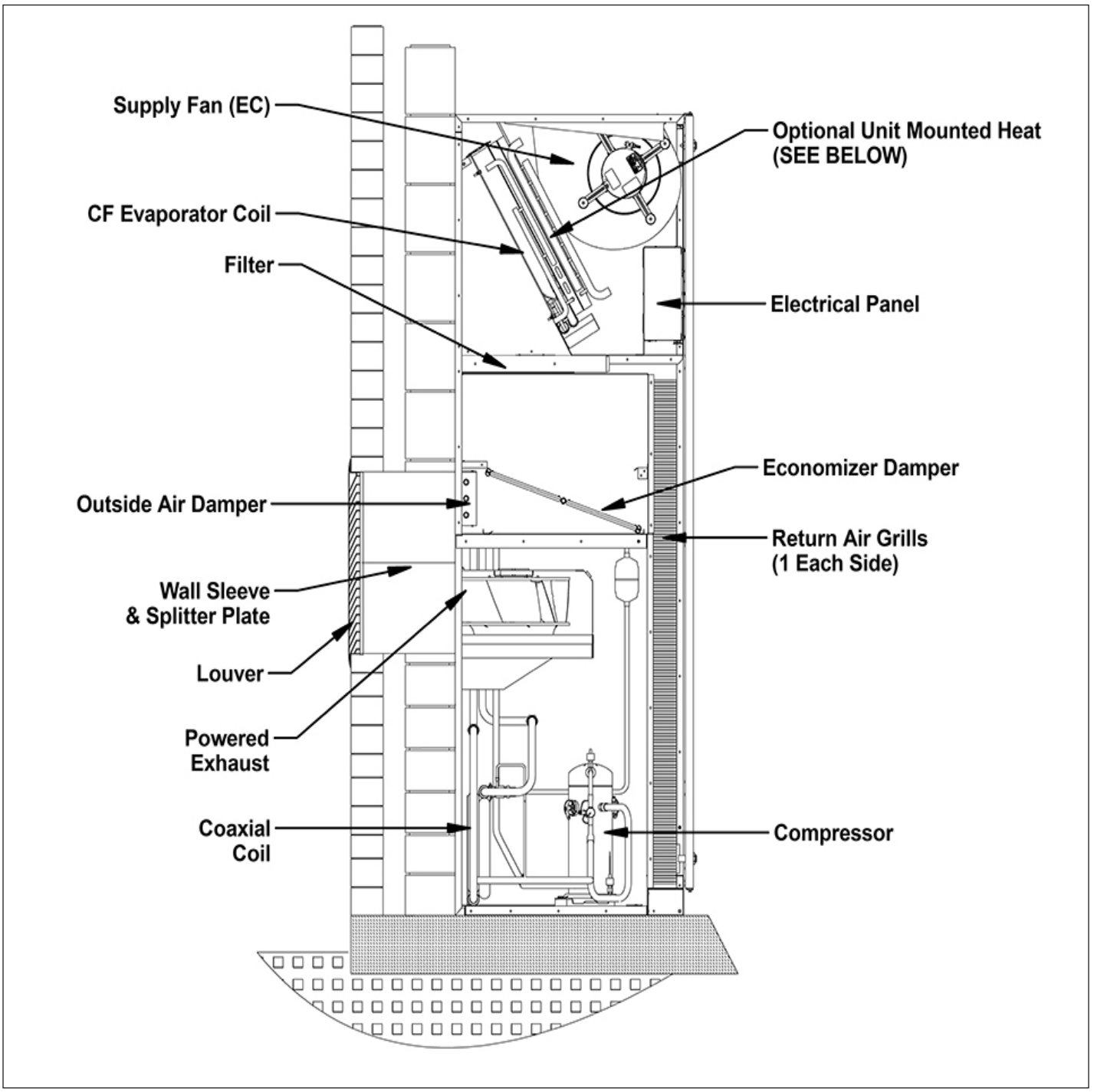
① Cooling capacity based on: Room 75/63˚F Dry/Wet Bulb, Ambient 95/78˚F Dry/Wet Bulb.
② Heating capacity based on: Room 70/58.5˚F Dry/Wet Bulb, Ambient 35/33˚F Dry/Wet Bulb.

Figure 17.1 - General Arrangement
Ventilation Configuration K - ERV with 100% Capable Economizer and Gravity Exhaust



Unit shown with optional unit mounted heat, energy recovery wheel ventilation configuration with economizer damper, single wall sleeve and louver. For project-specific general arrangement, contact your local sales representative for submittal data.

Figure 18.1 - General Arrangement
Ventilation Configuration M - Economizer Damper Ventilation with Optional Powered Exhaust



Unit shown with optional unit mounted heat, energy recovery wheel ventilation configuration with economizer damper, powered exhaust, single wall sleeve and louver. For project-specific general arrangement, contact your local sales representative for submittal data.

Figure 19.1 - Dimensional Data - Base Unit SMG and SMW

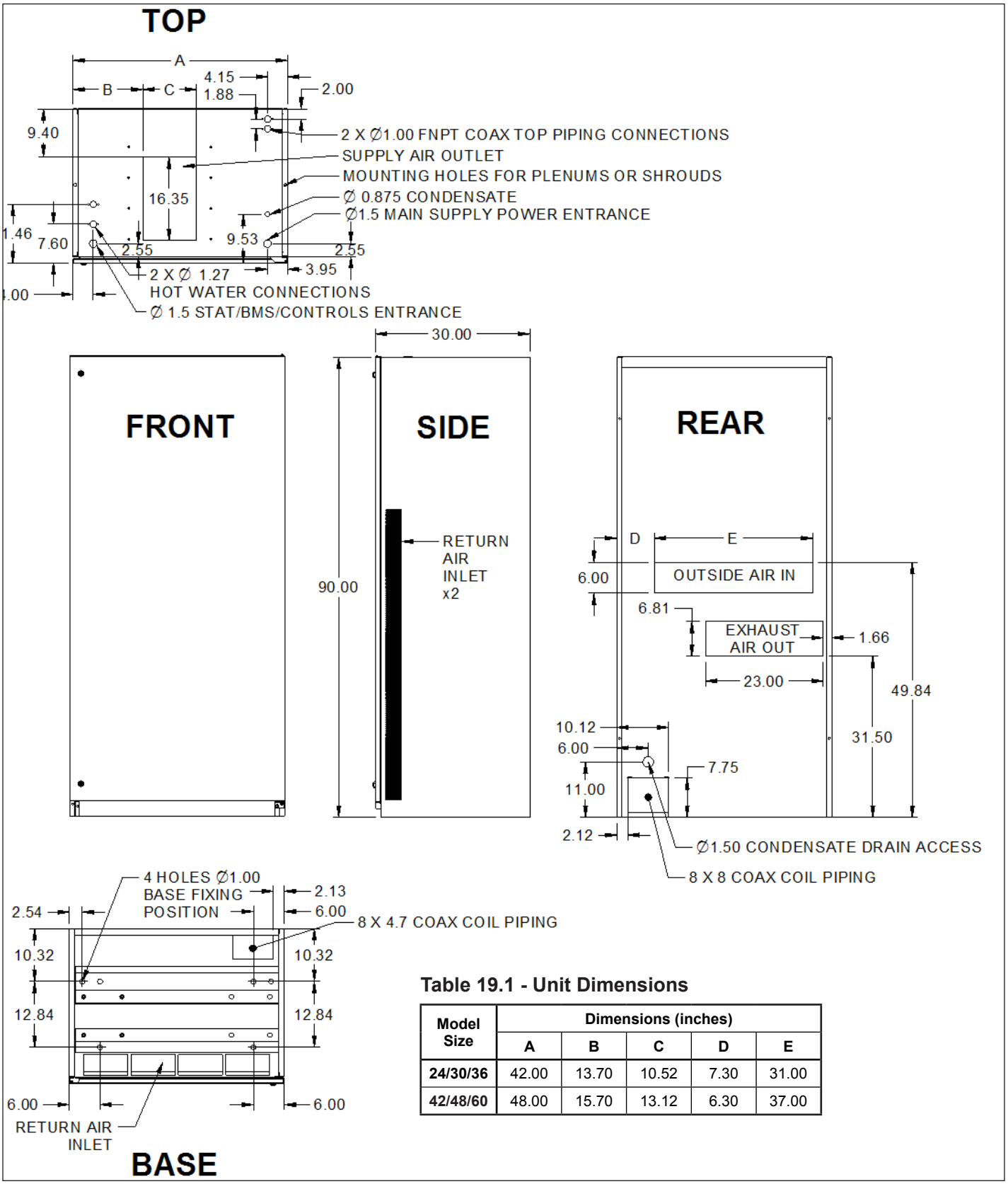


Table 19.1 - Unit Dimensions

Model Size	Dimensions (inches)				
	A	B	C	D	E
24/30/36	42.00	13.70	10.52	7.30	31.00
42/48/60	48.00	15.70	13.12	6.30	37.00

Figure 20.1 - Dimensional Data - Base Unit SMG & SMW with STUDY Package

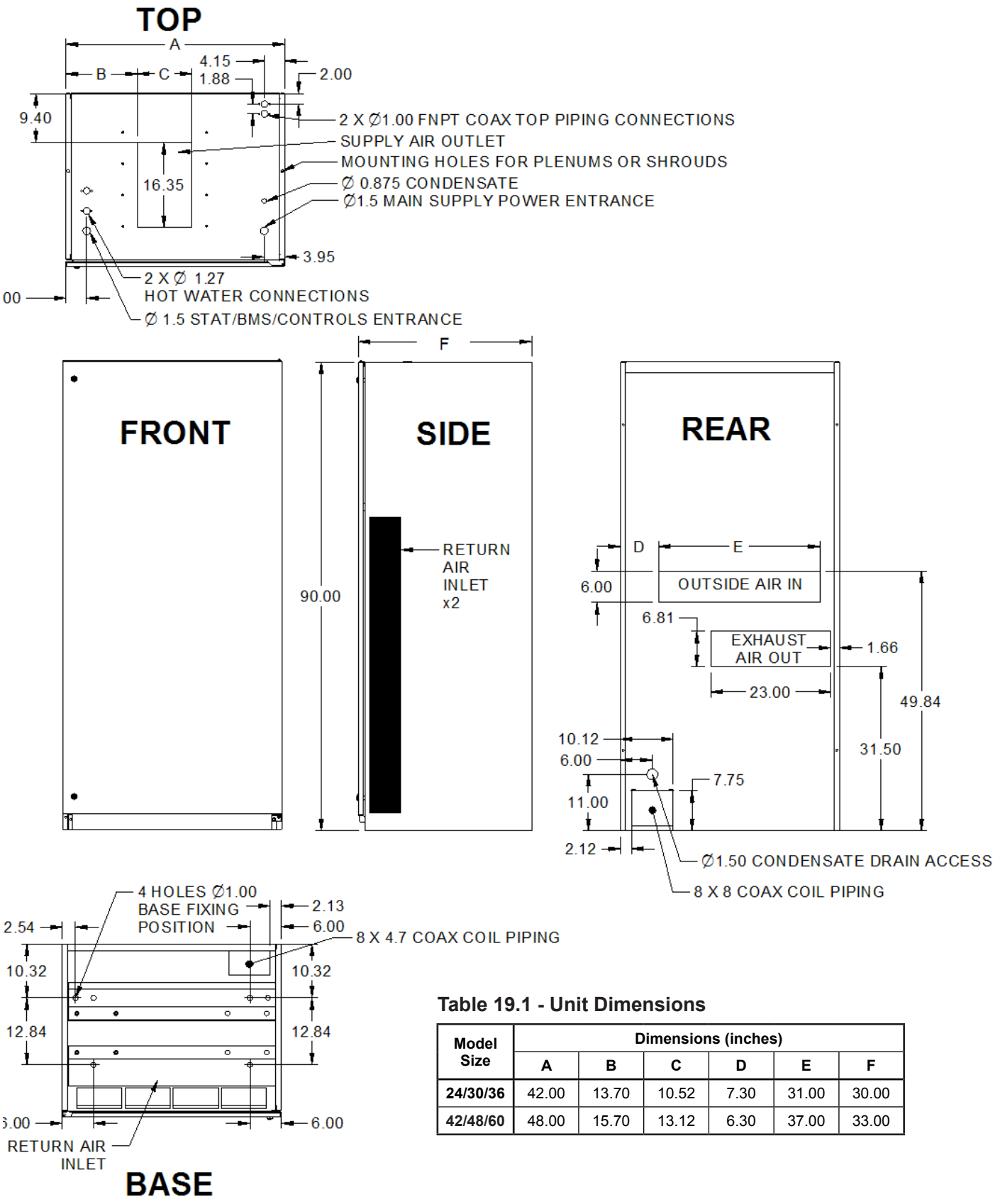


Table 19.1 - Unit Dimensions

Model Size	Dimensions (inches)					
	A	B	C	D	E	F
24/30/36	42.00	13.70	10.52	7.30	31.00	30.00
42/48/60	48.00	15.70	13.12	6.30	37.00	33.00

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Standard Single Wall Sleeve and Louver Dimensions and Mounting

Figure 22.1 - Standard Single Arrangement

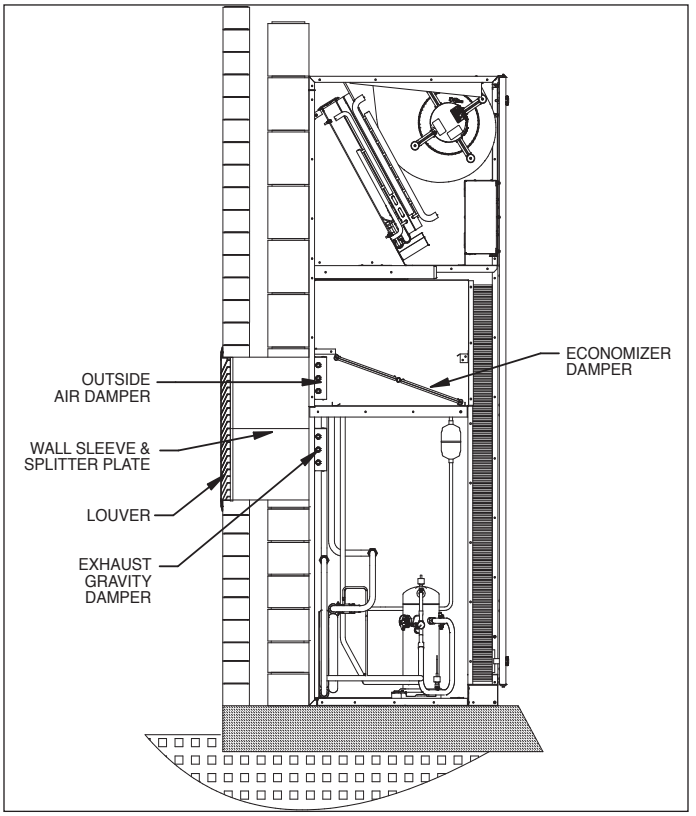


Figure 22.2 - Standard Single Louver

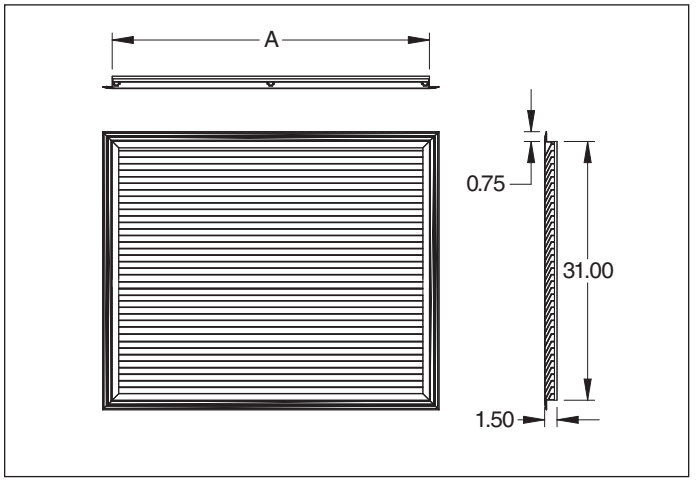


Figure 22.3 - Standard Single Wall Sleeve

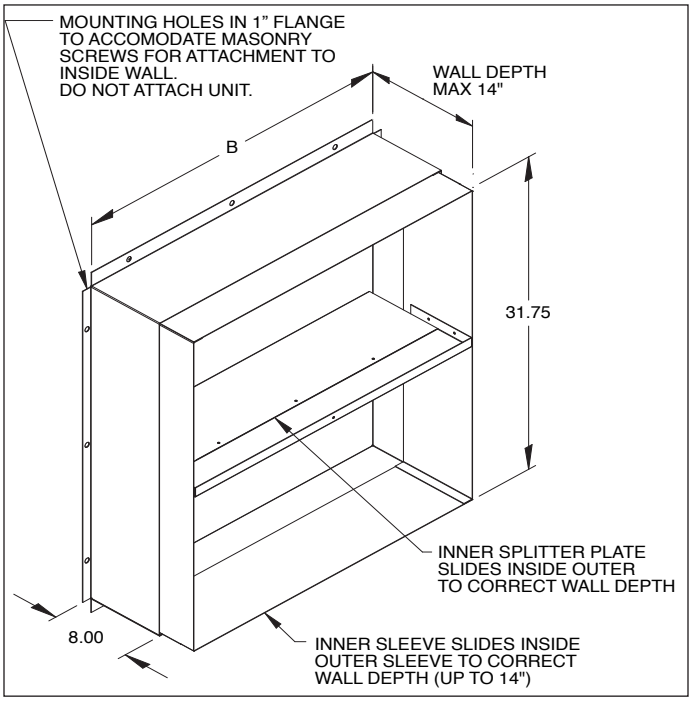


Figure 22.4 - Standard Single Wall Opening

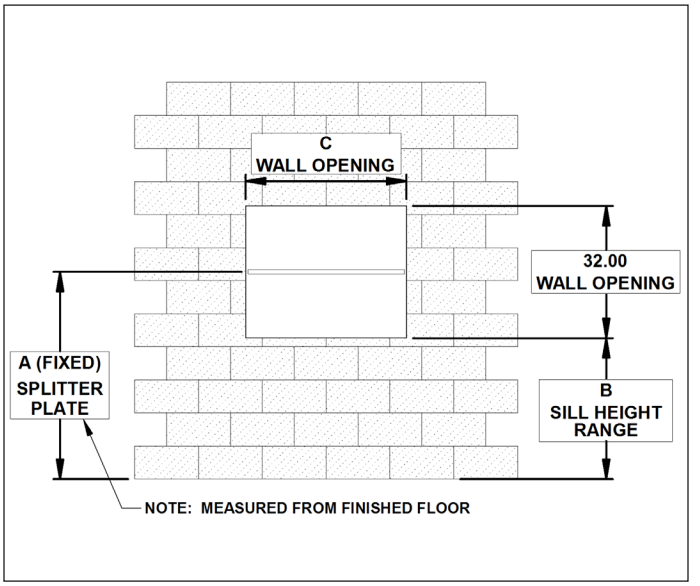


Table 22.1 - Standard Single Louver Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/30/36	39.00	39.75	40.00
42/48/60	45.00	45.75	46.00

Split No Exhaust Wall Sleeve and Louver Dimensions and Mounting

Figure 23.1 - Standard Arrangement

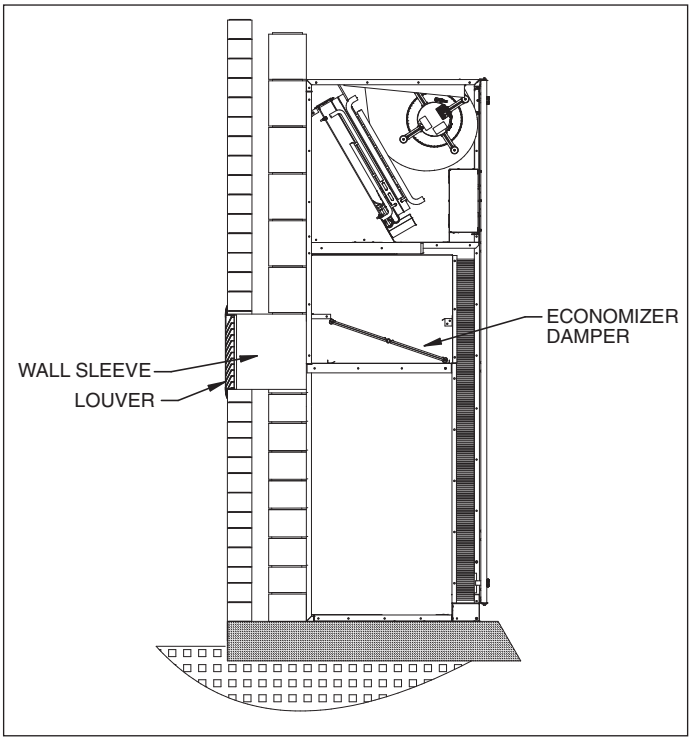


Figure 23.2 - Standard Louver

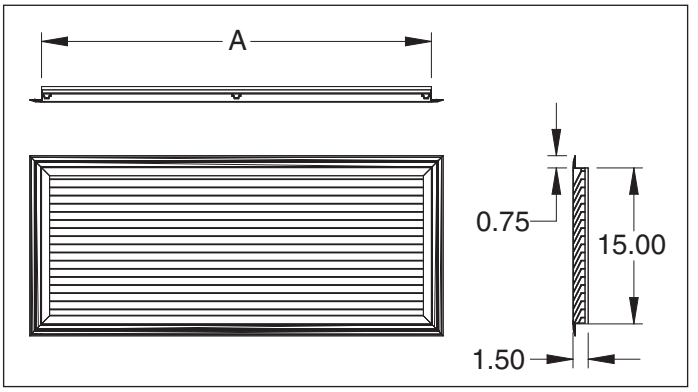


Table 23.1 - Standard Louver Dimensions

Model Size	Dimensions (inches)		
	A	B	C
24/30/36	39.00	39.75	40.00
42/48/60	45.00	45.75	46.00

Figure 23.3 - Standard Wall Sleeve

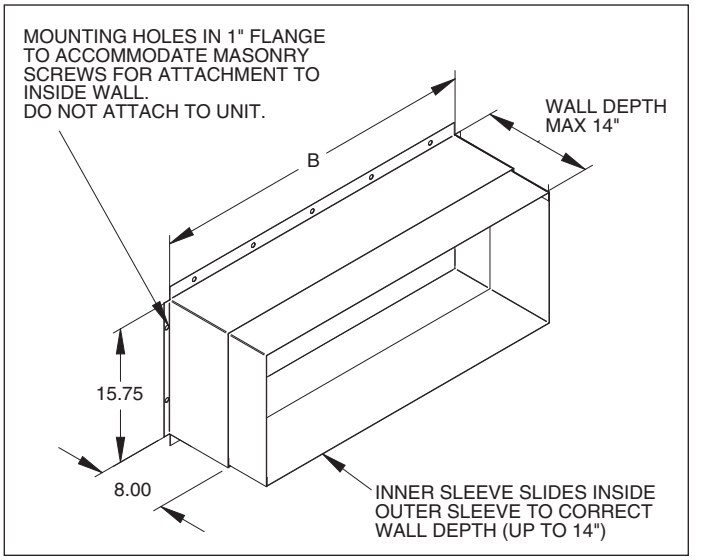
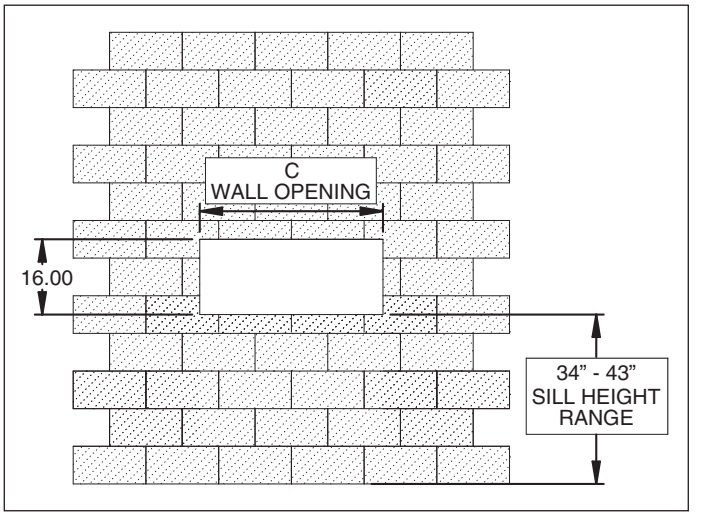


Figure 23.4 - Standard Wall Opening



Modine Manufacturing Company
1500 DeKoven Avenue
Racine, Wisconsin 53403-2552
Phone: 1.800.828.4328 (HEAT)
www.modinehvac.com

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