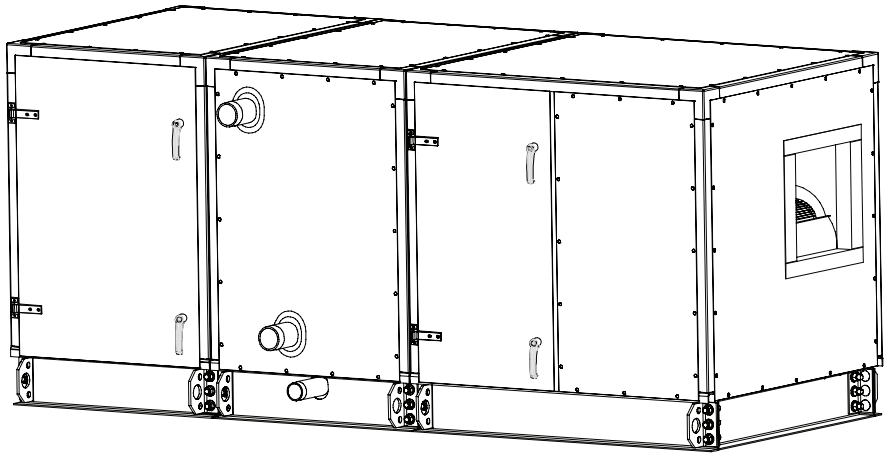
Product Data

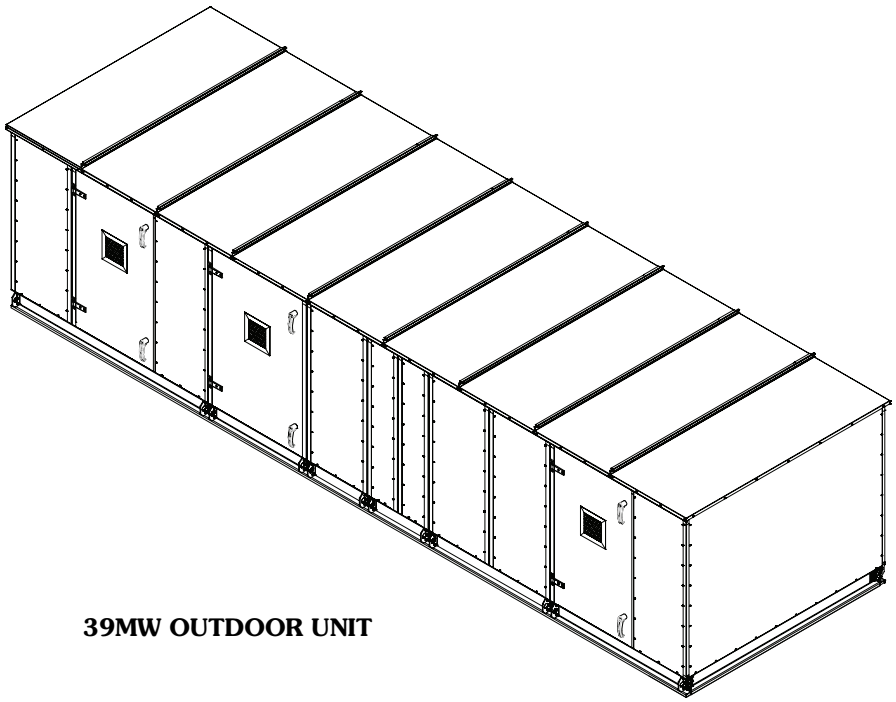
AERO® 39MN,MW03-110 Indoor and Weathertight Outdoor Air Handlers

1,500 to 60,500 Nominal Cfm

aero
the art of air handling



39MN INDOOR UNIT



39MW OUTDOOR UNIT

Carrier's 39M air handlers offer:

- Units are shrink wrapped for complete protection while in transit
- Factory-supplied variable frequency drives that are programmed and started up at the factory
- Sealed panel double-wall R-13 insulation system
- Stacked indoor unit configurations for application versatility and maximum space utilization
- Outdoor weathertight cabinets have sloped roofs to prevent standing water, and are gasketed in all critical areas.
- Factory-installed integral face and bypass coils for extreme conditions
- Factory-installed humidifiers for precise indoor climate conditioning
- Available factory-mounted controls, starters, disconnects and variable frequency drives
- ***AHU*Builder®** software for easy unit selection
- Optional prepainted unit exterior
- Optional AgION® anti-microbial coated panel interior
- Optional factory-installed UV-C germicidal lamps

Features/Benefits

The Aero 39M air handler is the only unit on the market that practically installs itself.

Easy installation

Frames, corners and base rails of the 39M air handler are all easily disassembled and reassembled in minutes with as little as 3 standard tools. Carrier's 39M units can be ordered with shipping splits, which speed section to section assembly. All panels are easily removed in one piece for cleaning or access to components.

Features/Benefits (cont)

Redefining flexibility

Standard stacked fans and exhaust box sections reduce the footprint of the unit and ensure economical use of building space. Accessibility is required from only one side of the unit, increasing location options. This may result in floor space savings of 20% over competitive units.

The use of non-staggered coils allows flat and cartridge style filter sections to maintain face velocities of 500 fpm or less at nominal airflow. Low velocity angle filtration sections typically have velocities of 350 fpm or less.

Custom engineered for durability and longevity

Sealed panel double-wall R-13 insulation system means no insulation is exposed to the airstream. All panels are easily removed in one piece for cleaning or access to all components. Hinged doors are also available.

Internally mounted motors and drives operate in a clean environment, giving longer life to motor and belts. Belts and drives are factory installed and aligned.

Factory installed and wired variable frequency drives, bypasses, motor starters and disconnects are easily available at the click of a button with ***AHU*Builder®** software.

Internal isolation of the fan assembly reduces vibration and eliminates the need for unit isolation at installation time. Fan and motor bearings are mounted on a corrosion-resistant steel frame, which is isolated from the outer casing with 2-in. deflection, factory-installed spring isolators and a vibration-absorbent fan discharge seal.

Easy service and maintenance

Panels are easily removed in one piece for cleaning or access to all components. Hinged doors are also available.

Optimized performance

Not only does ***AHU*Builder** software help define the footprint of your custom air handler, it also suggests an optimally selected fan based on your performance criteria. Choose from airfoil, forward-curved and plenum fans based on first cost and performance requirements. As standard, pillow-block bearings are rated at 200,000 hours average life (L_{50}) in all 03-110 size airfoil, forward-curved, and plenum fans. Optionally, bearings rated at 500,000 hours average life (L_{50}) are available.

Standard low-leak dampers in mixing box sections seal tightly. Optional high-efficiency airfoil blade dampers are also available.

Exclusive Carrier coil surface results in efficient heat transfer. Since less heating and cooling fluid is circulated, pumping costs are reduced.

Provisions for indoor air quality (IAQ) requirements

Filtration flexibility includes

- 2-in. or 4-in. flat filters
- 2-in. or 4-in. angle filters
- Side loading 12-in. bag/cartridge filters with 2-in. prefilters
- Side loading 30-in. bag/cartridge filters with 2-in. prefilters
- Face loading bag/cartridge filters without prefilters
- HEPA face loading bag/cartridge filters without prefilters

Optional galvanized or stainless steel coil drain pan — Drain pan is sloped toward the drain to remove condensate completely. This eliminates build-up of stagnant water during shutdown periods and keeps the air handler free of odors and bacteria. Stainless steel provides an easy-to-clean surface that resists corrosion.

UV-C germicidal lamps

- Energy Savings: Lowers energy costs by improving HVAC system heat transfer and increasing net cooling capacity.
- Maintenance Savings: Continuously cleans coils, drain pans, plenums, and ducts, reducing or eliminating manual cleaning and the use of harmful chemicals.
- Improved IAQ: Reduces the spread of airborne microorganisms that trigger allergy and asthma symptoms and reduces the spread of bacteria and viruses that can cause infectious diseases.
- Water Conservation: Reclaiming clean condensate for tower makeup, irrigation or gray water flushing reduces water and waste water costs.
- Rapid Return on Investment: Offers a return on investment in less than 2 years.
- LEED® Rating System Contribution: UV-C lamp may contribute to points in one or more areas of the U.S. Green Building Council's LEED rating system.

Extensive *AHU*Builder software optimized coil selection

The 39M air handlers have a wide selection of coils to meet your application needs. All 39M coils have Carrier's high-performance coil surface; the coil tubes are mechanically expanded into the fins for improved fin bonding and peak thermal transfer. All vent and drain connections are accessible from outside the cabinet. Optional copper fins and stainless steel casings are available for all coils.

Chilled water coils — These coils have headers precisely sized to minimize water pressure loss. Chilled water coils are manufactured of $^1/_2$-in. OD ($^5/_8$-in. OD optional) copper tubes with aluminum plate fins (8, 11, or 14 fins per in.). Copper and e-coated fins are optional. Large, medium and bypass face area coils are available in 4, 6, 8, or 10 rows. Steel coil connectors with male pipe thread are standard.

Direct expansion coils — There is no need to guess when it comes to direct expansion coil performance. ***AHU*Builder®** is the only selection program that crossplots the evaporator and condensing unit performance to show the true system capacity. Coils are available in large or medium face area, with 4, 6, or 8 rows. The tubes are of $^1/_2$-in. OD copper with aluminum-plate fins, and 8, 11, or 14 fins per inch. Copper and e-coated fins are available as an option. Choose from quarter, half, full, or double circuits. Most direct expansion coils have at least two splits allowing you to match a coil with one or two condensing units for independent refrigerant systems.

Hot water coils — Carrier's hot water coils are designed to provide heating capability for a complete range of applications, at a working pressure of 300 psig at 200 F. Hot water coils are offered in 1, 2 or 4 rows, with fin spacings of 8, 11, or 14 fins per inch. Coils have aluminum plate fins with copper tubes (copper and e-coat fins available). Hot water coils are available with large, medium, small or bypass face areas.

Steam coils — The 39M inner distributing tube (IDT) steam coils are designed for a working pressure of 175 psig at 400 F. The plate-fin steam coil is available in one row 1-in. OD and 1 or 2 row $^5/_8$-in. OD copper tubes, with 6, 9, or 12 aluminum fins per inch. Steam coils are available with

large, medium, small or bypass face areas, and are sloped to drain condensate. Steam coils are especially suited to applications where sub-freezing air enters the air-handling unit, or where uniformity of leaving-air temperature is required.

Integral face and bypass coil section — Carrier offers integral face and bypass (IFB) coils capable of maintaining a constant air volume within 5%, constant leaving-air temperature as entering-air conditions vary, and mixing of leaving-air temperatures within 3 ft downstream with a maximum variance in air temperature of 5° F, regardless of damper position.

Electric heat coil — The 39M electric heat coils may be ordered for factory installation into the electric heat section. Units with electric heat are designed in accordance by UL (Underwriters Laboratories) 1995.

Components for customizing standard units

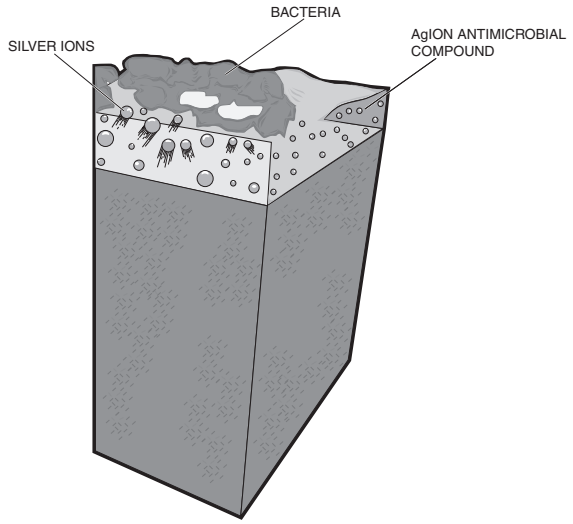
Face and bypass components with bypass cooling and heating coils — Four different component combinations provide controlled mixing of bypass air and conditioned air. These include bypass heating, bypass cooling, bypass heating/cooling, and bypass cooling/heating in either internal or external bypass mode.

Blow-thru coil — These components are available for single-duct, dual-duct, and multizone applications requiring cooling only or both heating and cooling. The diffuser plate is integrally mounted to the fan discharge in blow-thru applications.

Optional air mixer — When installed immediately downstream from a mixing box or filter mixing box, the air mixer section blends airstreams with different temperatures to within a range of 6° F. The mixer section prevents air stratification and ensures that exiting blended air has a uniform velocity. Blended air helps to prevent coil freeze-up and equalizes coil discharge temperatures.

Carrier factory-installed Direct Digital Controls — Carrier offers a wide range of Direct Digital Controls (DDC) to meet your application needs. Contact your Carrier sales representative for details.

Custom design flexibility — Options not shown in the Product Data or ***AHU*Builder®** software may be available through the factory design enhancement center. Contact your local Carrier sales representative for details.



AgION® ANTI-MICROBIAL COATING

How it works:

The AgION antimicrobial compound is blended into a paint system, which resides in zeolite's open molecular structure.

When ambient moisture is present, the zeolite acts as an "ion pump," slowly releasing silver ions into the air.

When the silver ions come into contact with bacteria and other microbes, their chemical interaction disrupts electron transfer and respiration, suppressing microbe growth on the air handler.

As the air becomes more humid (and the more favorable for microbial growth), more silver is released. However, there is a maximum release rate, so even under very wet conditions, the silver ions are released slowly, for long-term protection.

Table of contents

AHRI certification

Carrier 39 Series air handler units are rated and certified in accordance with AHRI Standard 430, which is the industry standard for central station air-handling units. Certification by participating manufacturers of units within the scope of this program requires that the ratings and performance of any central station unit certified to AHRI be established in accordance with the AHRI Standard.

Coils installed in the Carrier 39 Series air handler units are rated and certified in accordance with AHRI Standard 410.

Plenum fans are rated in accordance with Air Movement and Control Association (AMCA) 210.

Model number nomenclature

39M N 03 - 000001 12 X P S

39M – Aero®
Air Handler

Code Model
N – Indoor Unit
W – Outdoor Unit

Unit Size

03	30
06	36
08	40
10	50
12	61
14	72
17	85
21	96
25	110 (B0)*

Revision Level

000001 thru 999999 – Standard Unit

Shipping No. of Pieces
Example: 12 = 1 of 2
22 = 2 of 2

Order Type
S – Special Order
X – Standard Order

Finish and Thermal Option†

Shipping Option
S – Standard
Q – Quote Control

*B0 should be used to select unit size 110.
†See Finish and Thermal Option table.

Quality Assurance

Certified to ISO 9001

MEA (Materials and Equipment Acceptance) number: 92-02-E

FINISH AND THERMAL OPTION (POSITION 17)

CODE	EXTERNAL FINISH	INTERNAL FINISH	THERMAL BREAK
B	Pre-Paint	AgION™	Level 1
C	Pre-Paint	Galvanized	Level 2
D	Pre-Paint	Galvanized	Level 1
F	Galvanized	Galvanized	Level 2
G	Galvanized	Galvanized	Level 1
H	Galvanized	AgION	Level 2
K	Galvanized	AgION	Level 1
P	Pre-Paint	AgION	Level 2
X	Special Order		

Application data

Central station air handler

The central station air handler is a heating, ventilating, or air-conditioning unit that is centrally located in, or on, a building or structure. The air handler distributes air to desired areas through a system of ducts.

The 39M factory packaged unit

Individual components, such as fans, coils, and filters, are assembled at the factory.

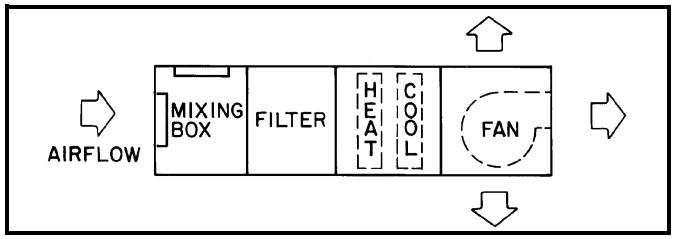
Packaged equipment is less costly than field-fabricated equipment and does not require assembly.

The basic air-handling unit consists of a fan section and a coil section. Other components, such as filter sections, air-mixing boxes, access sections, and damper sections, may also be provided.

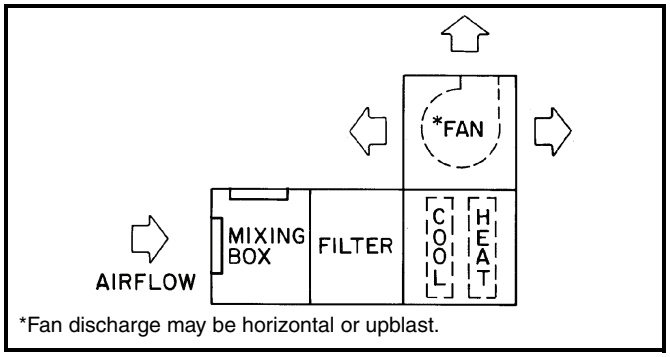
Central station configurations

Draw-thru units

Horizontal

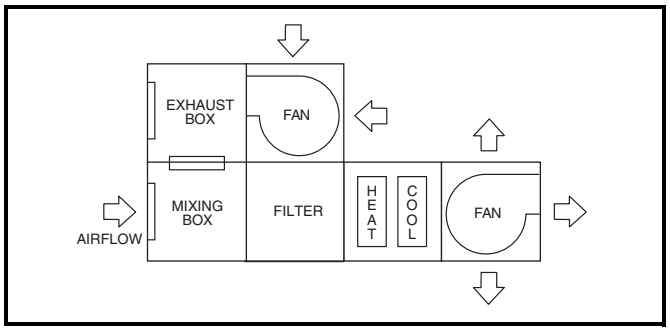


Vertical (indoor unit only)



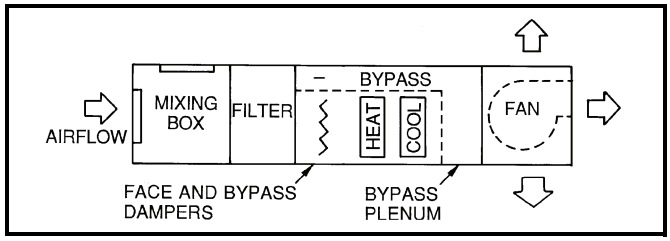
*Fan discharge may be horizontal or upblast.

Stacked return fan



Face and bypass units

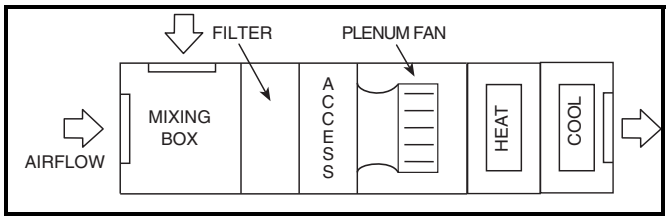
Horizontal



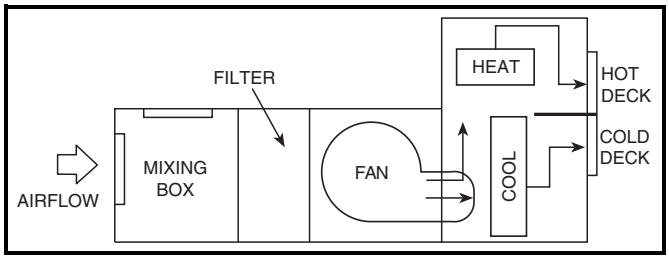
Blow-thru units

Blow-thru arrangements are more suitable on systems with a significant amount of fan (and motor) heat. Fan heat can add 0.3° F to 0.5° F per in. of total static pressure to the airstream. Therefore, on such systems, it is more efficient to use a blow-thru arrangement and add the fan heat before the cooling coil. With a draw-thru unit, the airstream must be subcooled to anticipate the addition of fan heat downstream of the cooling coil. Thermal storage and cold air distribution systems benefit from blow-thru applications.

Air mixing using a plenum fan — A static air mixer is only effective between 900 and 1100 fpm. Using a blow-thru plenum fan as the air mixing device assures proper mixing at all airflows. This arrangement is best for VAV systems and will eliminate the added expense of a static air mixer.

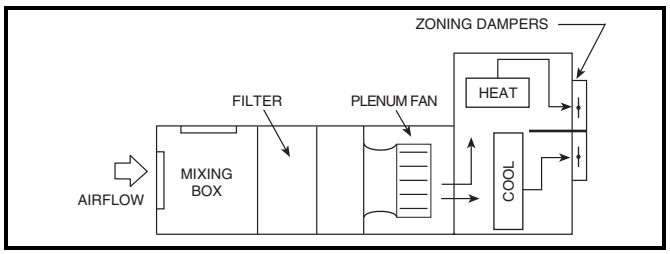


Dual duct — The unit delivers 2 outputs; one outlet produces hot air while the other produces cold air (indoor unit only).



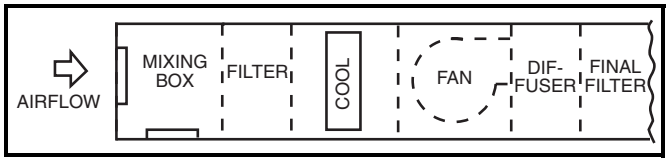
Application data (cont)

Multizone — Mixing dampers blend hot-deck and cold-deck temperatures to produce a desired temperature for individual zones. Several blending dampers per unit produce independent zones, each responding to its own thermostat (indoor unit only).



High filtration units

High filtration units employ a filter section ahead of the cooling and heating coils. A second filter section, called a final filter, is placed at the end of the unit at the point where the air enters the ductwork.



Fans

The 39M central station air handlers use belt-driven centrifugal fans. A centrifugal fan is one in which the air flows radially through the impeller. Centrifugal fans are classified according to fan wheel and blade construction. The 39M fans can be selected as double width, double inlet (DWDI) with forward curved or airfoil blades. Plenum fans are selected as single width, single inlet (SWSI) with airfoil blades. Standard and small wheels are available on most sizes.

Laws of fan performance

Fan laws are used to predict fan performance under changing operating conditions or by fan size. They are applicable to all types of fans.

The fan laws are stated below. The symbols used in the formulas represent the following variables:

CFM — Volume rate of flow through the fan.

RPM — Rotational speed of the impeller.

P — Pressure developed by the fan.

Hp — Horsepower input to the fan.

D — Fan wheel diameter. The fan size number can be used if it is proportional to the wheel diameter.

W — Air density, varying directly as the barometric pressure and inversely as the absolute temperature.

Application of these laws is limited to cases where fans are geometrically similar.

FAN LAWS

VARIABLE	CONSTANT	LAW	FORMULA
SPEED (RPM)	Air Density Fan Size Distribution System	Airflow varies directly with the Speed.	$\frac{CFM_1}{CFM_2} = \frac{RPM_1}{RPM_2}$
		Pressure varies as the square of the Speed.	$\frac{P_1}{P_2} = \left(\frac{RPM_1}{RPM_2}\right)^2$
		Horsepower varies as the cube of the Speed.	$\frac{Hp_1}{Hp_2} = \left(\frac{RPM_1}{RPM_2}\right)^3$
FAN SIZE (D)	Air Density Tip Speed	Capacity and Horsepower vary as the square of the Fan Size.	$\frac{CFM_1}{CFM_2} = \frac{Hp_1}{Hp_2} = \left(\frac{D_1}{D_2}\right)^2$
		Speed varies inversely as the Fan Size.	$\frac{RPM_1}{RPM_2} = \frac{D_2}{D_1}$
		Pressure remains constant.	$P_1 = P_2$
	Air Density Wheel Speed	Capacity varies as the cube of the Size.	$\frac{CFM_1}{CFM_2} = \left(\frac{D_1}{D_2}\right)^3$
		Pressure varies as the square of the Size.	$\frac{P_1}{P_2} = \left(\frac{D_1}{D_2}\right)^2$
		Horsepower varies as the fifth power of the Size.	$\frac{Hp_1}{Hp_2} = \left(\frac{D_1}{D_2}\right)^5$
AIR DENSITY (W)	Pressure Fan Size Distribution System	Speed, Capacity, and Horsepower vary inversely as the square root of Density.	$\frac{RPM_1}{RPM_2} = \frac{CFM_1}{CFM_2} = \frac{Hp_1}{Hp_2} = \left(\frac{W_2}{W_1}\right)^{1/2}$
	Airflow Fan Size Distribution System	Pressure and Horsepower vary with Density.	$\frac{P_1}{P_2} = \frac{Hp_1}{Hp_2} = \frac{W_1}{W_2}$
		Speed remains constant.	$RPM_1 = RPM_2$

Fan selection criteria

System requirements — The major factors that influence fan selection are airflow, external static pressure, fan speed, brake horsepower, and sound level. Additional system considerations include the fan control method, overloading, and non-standard air density. Fan selection for air-conditioning service usually involves choosing the smallest fan that provides an acceptable level of performance, efficiency and quality.

Pressure considerations — The static pressure is the resistance of the combined system apart from the fan. Contributors to static pressure include other components in the air handler, ductwork, and terminals. The static pressure is dependent on the airflow through the system, which is determined by the air conditioning requirements. As shown in the second fan law in the table on the preceding page, the static pressure varies as the square of the airflow (cfm). This ratio between pressure and airflow determines the system curve for any air-handling system.

The static pressure used to select a fan should be the pressure calculated for the system at design airflow. If the static pressure is overestimated, the increase in horsepower and air volume depends upon the steepness of the fan curves in the selection area.

With forward-curved (FC) fans, if the actual system static pressure is less than the design static pressure, the fan has a tendency to deliver more air and draw correspondingly higher bhp (kW of energy). This higher current draw may overload the motor and trip circuit breakers. This is a common occurrence when FC centrifugal fans are operated before all the ductwork has been installed, or during the pull-down load on a VAV system.

With airfoil (AF) fans (non-overloading), if the actual static pressure is less than the design static pressure, the fan delivers more air with little or no increase in bhp in most applications. In this case, adding a safety factor to the calculated static pressure can increase fan horsepower (and costs) unnecessarily.

Stability — Fan operation is stable if it remains unchanged after a slight temporary disturbance, or if the fan operation point shifts to another location on the fan curve after a slight permanent disturbance. Fan operation is unstable if it fluctuates repeatedly or erratically. There are 2 main types of unstable fan operation:

System surge is a cycling increase and decrease in system static pressure.

Fan stall is the most common type of instability, and it occurs with any type of centrifugal fan when the fan is starved for air.

Normally, the rotation of the fan wheel forces the air through the blade passageway from the low pressure to the high pressure side of the fan. If the airflow is restricted too much, however, there is not enough air to fill the space between the blades and the air distribution between the blades becomes uneven and erratic. Air can flow backwards through the wheel, substantially increasing the noise level. If the fan runs in this condition for a long time, wheel failure will likely occur.

For a given speed, the operating point where a fan stalls is a function of the wheel geometry and wheel speed. In general, the stall point is within 15 to 25% of the airflow obtained at free delivery.

Stability and VAV applications — Special considerations must be made for VAV systems. While the initial fan selection may be acceptable, its operating point could shift to a point of stall at minimum airflow and pressure conditions. The typical minimum airflow is half of the design cooling airflow, which is also often equal to the heating airflow. To determine and plot the minimum airflow versus static pressure, use the following equation. This equation solves for the static pressure at a specific airflow based on a minimum static pressure set point:

$$\left(\left(\frac{CFM_1}{CFM_{DESIGN}} \right)^2 X \quad (SP_{DESIGN} - SP_{MIN}) \right) + SP_{MIN} = SP_1$$

$$\left(\left(\frac{7{,}500}{15{,}000} \right)^2 X \quad (4 - 2) \right) + 2 = 2.50 \text{ in. wg}$$

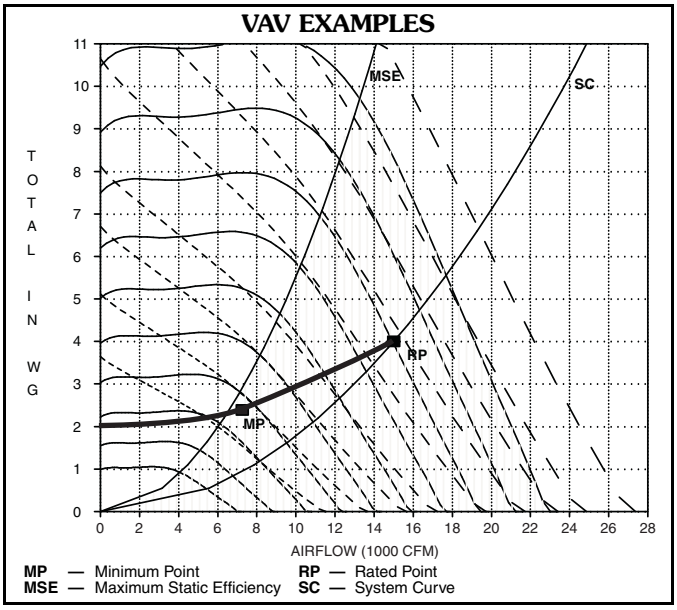
CFM — Airflow in Cubic Feet Per Minute
SP — Static Pressure

The table below illustrates a system with an airfoil fan wheel at a cooling design of 15,000 cfm and a system static pressure of 4 in. wg. The minimum airflow is 7,500 cfm with a minimum system static pressure set point of 2 in. wg. **The minimum static set point is based on zero airflow and does not coincide with the minimum design airflow.**

Example:

% CFM	CFM	SYSTEM AND FAN STATIC PRESSURE in. wg
100	15,000	4.00
90	13,500	3.62
80	12,000	3.28
70	10,500	2.98
60	9,000	2.72
50	7,500	2.50

As shown on the highlighted VAV curve, the minimum airflow and static pressure (MP) are both well within the fan's acceptable operating conditions.



Application data (cont)

Sound considerations — The fan is one of the main sound sources in an air-conditioning system. Other sources of sound include the duct system and terminals, because they generate turbulence in the air flowing through them. Simply estimating fan sound does not give an accurate picture of total system sound, but fan sound is a major component of system sound, and should be minimized.

To minimize its sound generation, a fan must be correctly sized and selected to operate at or near peak efficiency. Oversized fans can generate much higher sound power levels than necessary, especially in VAV systems operating at low airflows. Undersized fans can also result in higher sound power levels because of increased fan speeds and the higher tip velocity of the air leaving the fan blades.

For VAV systems, the part load point at which the fan operates most of the time should be used to select a fan for lowest sound output.

Variable frequency drives (VFDs) are used to modulate fan volume. A VFD reduces the sound power level as the fan speed is reduced. At 50% load, the sound level is reduced approximately 15 dB compared to the sound level at 100% load. When using variable frequency drives, it is important that the static deflection of the vibration isolators is adequate. At very low fan speeds, the fan frequency may approach the natural frequency of the spring isolation. If this happens, the vibration levels can be amplified and resonant vibration conditions can occur.

When sound level is a major consideration, a blow-thru fan should be considered because of the reduced discharge sound level. This sound reduction is due to the sound absorption of the coil section downstream from the fan. Transition fittings and elbows can be reduced in size or eliminated, thereby eliminating a sound source.

To obtain projected sound data for a selected 39M unit, use the electronic catalog ***AHU*Builder®** program.

Dirty filtration considerations — Consider selecting an air handler with dirty filters so that, in theory, the unit will have enough horsepower to deliver the same amount of air when the filters are dirty. On a constant volume unit, that would only work if the unit contained an airflow measuring station and could adjust the flow accordingly via a VFD. Otherwise, the point of operation moves along the rpm line as the static pressure in the system changes.

What happens when you order the fan with sheaves selected for dirty filters? Three things:

1. The air balancer forces the selection of a smaller sheave because the airflow is too high. When the filters load up, airflow is reduced.
2. If an air balance is not performed, the cooling coil may exhibit moisture carryover due to the considerable increase in airflow.
3. The fan motor trips out on overload with the forward curve fan because of the increase in bhp.

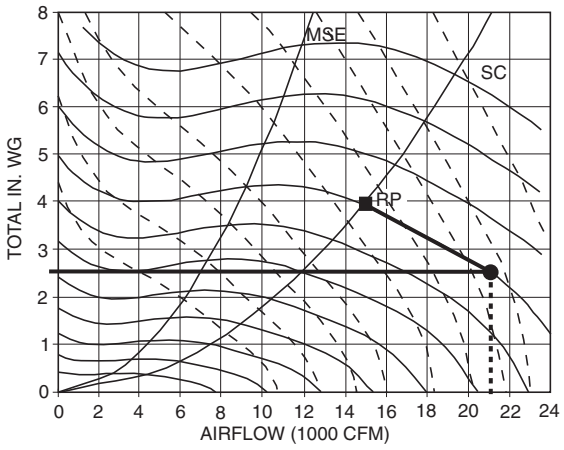
Example:

Forward-Curved Fan, 15,000 cfm, 1010 rpm, 17.8 hp, selected with 100% dirty 60 to 65% cartridge filters and pre-filters. Dirty filters result in a total static pressure (TSP) of 4 inches.

Clean filters result in a TSP of 2.55 inches.

In the chart below, follow the 1010 rpm line down to 2.55 inches.

39M SIZE 30 FORWARD-CURVED FAN CURVE



LEGEND

— Rpm
— Bhp (Brake Horsepower)
MSE — Max. Static Eff.
RP — Rated Point
SC — System Curve

RPM = 1010
BHP = 17.8
Class II Max RPM = 1217
Max BHP = 15.0
RPMs (x 100, L to R): 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
BHPs (L to R): 3, 5, 7.5, 10, 15, 20, 25, 30, 40

Airflow with a clean filter will be 21,000 cfm. Also note that the horsepower goes from 17.8 bhp to about 28 bhp because the FC fan is an overloading type fan.

So, if dirty filters need to be taken into consideration, do one of the following:

1. Make the final fan selection with the **clean** filter rpm but use the motor horsepower requirement for **dirty** filters.
2. Make the final fan selection with the **dirty** filter rpm and use the motor horsepower requirement for **dirty** filters – **only if** the engineer plans on using a VFD and airflow measurement station or if it is a VAV system.
3. Use an airfoil fan when the difference between dirty and clean filter pressure drop is greater than 1 inch. That way, the difference between clean and dirty airflow is minimized.

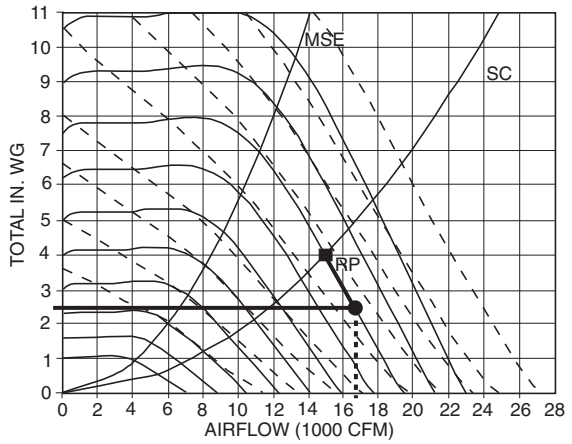
Example:

Airfoil Fan, 15,000 cfm, 2210 rpm, 18.8 hp, selected with 100% dirty 60 to 65% cartridge filters and pre-filters. Dirty filters result in a total static pressure (TSP) of 4 inches.

Clean filters result in a TSP of 2.55 inches.

In the chart below, follow the 2210 rpm line down to 2.55 inches.

39M SIZE 30 AIRFOIL FAN CURVE



LEGEND
— Rpm
— Bhp (Brake Horsepower)
MSE — Max. Static Eff.
RP — Rated Point
SC — System Curve

RPM = 2210
BHP = 18.8
Class II Max RPM = 2442
Max BHP = 15.0
RPM's (x 100, L to R): 8, 10, 12, 14, 16, 18, 20, 22, 24, 26
BHP's (L to R): 3, 5, 7.5, 10, 15, 20, 25, 30, 40

Airflow with a clean filter will be 16,700 cfm. Since airfoil fans are non-overloading (bhp lines run parallel with rpm lines) the bhp does not change (actually, bhp decreases).

Fan, motor, and drive heat considerations — The work output of a fan and its motor and drive contribute directly to the airflow and pressure exiting the air handler. Not all of the fan energy output generates airflow, however. Fan motors are not 100% efficient, and their efficiency loss translates directly into heat that must be factored in when calculating the temperature rise across a fan section. Fans also add a certain amount of heat to the airstream due to the effects of compression and bearing friction. Finally, belt drives do not transmit all of the energy generated by the motor. Some of the energy is lost as heat due to belt tension and the type and number of belts. Belt drive bhp losses range from 2 to 6 percent; a 3% loss is typical.

Because the 39M Series air handlers all have fans, motors, and drives located within the airstream, heat losses from these components affect the power requirements, cooling load, and heating load.

Power losses in the motor and drive should be allowed for when determining the motor output (bhp), so that the motor can be correctly sized and the additional heat output can be subtracted from cooling capacity or added to heating capacity. A typical example follows:

Given Fan Operating Point:

13,224 cfm
9.6 Fan bhp
3.0% Estimated drive loss

Calculate the required fan motor output (H_p) due to drive loss.

H_p = (Fan bhp) x (Drive Loss)
H_p = 9.6 x 1.03
H_p = 9.89 hp (select 10 Hp motor)

Calculate the total fan motor heat output (Q) according to motor efficiency:

Q = (Motor Output) ÷ (Motor Efficiency [Typical])
Q = 9.89 ÷ 0.86
Q = 11.5 hp

Convert horsepower to Btu per hour.

11.5 hp x 2545 = 29,268 Btuh

Calculate the increase in leaving-air temperature (ΔT) due to fan and motor heat and drive losses:

Q = 1.1 x cfm x ΔT

29,268 Btuh = 1.1 x 13,224 x ΔT
29,268 Btuh = 14,546.4 x ΔT
ΔT = 2.01 F (use to estimate coil requirements)

Fan application

Certain fans are more efficient in low static pressure systems, while others operate best in higher pressure systems. Some fan types are designed to handle very large air volumes while others are more efficient at lower volumes. See the Fan Type and Application table on page 11.

Forward-curved (FC) fans are typically used for low to medium pressure applications (0 to 5 in. wg total static pressure [TSP]).

The FC fans are reasonably stable over a wide airflow (cfm) range at constant speed. Because of the relatively flat curve, FC fans tolerate modulation in airflow without large increases in static pressure. Most important, FC fans have the lowest first cost.

Airfoil (AF) fans are most efficient at higher static pressures (4.0 to 8.0 in. wg total static pressure).

Because of the shape of the AF fan performance curve, bhp decreases as air volume decreases only when a VAV volume control device, such as a variable frequency drive (VFD), is used.

Airfoil fans are more expensive than FC fans and, in addition, there is a price premium for the volume control device, if required.

Application data (cont)

Plenum fans (sometimes called ''plug'' fans) are typically used in medium to high static pressure applications where ductwork requires discharge location flexibility. They can reduce the need for ductwork turns or diffusers, especially when equipment room space is limited.

Plenum fans are less efficient than double-width, double-inlet airfoil fans. General construction also differs from that of FC or AF fans. The fan does not have a scroll to enclose the fan wheel and direct airflow. Instead, the entire interior of the plenum fan section is pressurized by the fan.

Plenum fans have single-width, single-inlet (SWSI) construction. The fan shaft is parallel with the airflow, and the motor and bearings are located inside the plenum in the pressurized airstream. An optional inlet screen and wheel cage can be installed to help protect personnel during maintenance.

Plenum fans are generally used where there are space limitations, a need for discharge flexibility, a need for reduced discharge sound, or where duct configurations might change in the future. For example, in an application where there is not enough room in the building for a large main duct, several smaller duct runs may approach the mechanical equipment room from all sides. In such an application, several connections can be made to one or more sides of the plenum fan section. Installing contractors can cut outlets in the plenum box at the time of installation to suit the conditions at the jobsite.

Because the casing of a plenum fan section acts as a sound attenuator, plenum fans are also sometimes used when discharge sound levels need to be reduced.

Duct takeoffs from plenum fans can have relatively high pressure losses and can also create turbulence that causes a larger pressure drop across coil and filter sections. When selecting a plenum fan, the pressure drop for the duct takeoffs must be added to the external static pressure for the rest of the system.

To calculate the pressure losses from plenum fan duct takeoffs, use the following formula and refer to the figure at right.

$$P_l = P_p - P_d = (C_v)\ (V_p)$$

Where P_l is the pressure loss, P_p is the plenum pressure, P_d is the duct pressure, C_v is the pressure loss coefficient, and V_p is the velocity pressure in the duct. Note that for radial duct takeoffs, C_v is 1.5 in. wg, while for axial duct takeoffs, C_v is 2.0 in. wg. To calculate velocity pressure (V_p) in the duct, use the following formula, where V is the air velocity in the duct:

$$V_p = [(V) \div (4005)]^2$$

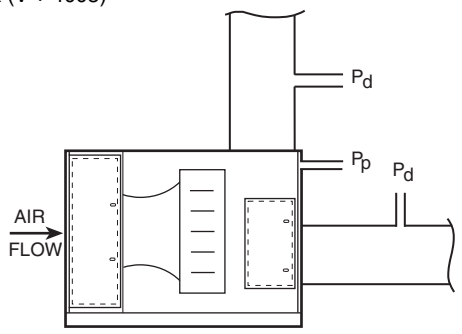
Also note that with more than one duct takeoff and different duct velocities, the highest duct velocity and highest C_v value should be used in the formulas.

Duct design considerations (system effect prevention)

The discharge ductwork immediately downstream from the fan is critical for successful applications. Poorly designed ductwork can degrade fan performance and contribute to excessive pressure drop and noise.

PLENUM FAN APPLICATION

C_v = 1.5 in. wg
$P = (1.5) \times (V \div 4005)^2$



C_v = 2.0 in. wg
$P = (2.0) \times (V \div 4005)^2$

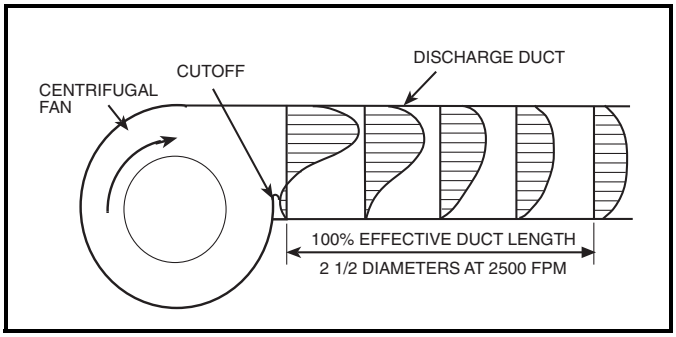
NOTE: V is the air velocity in the duct.

The 39M Series airfoil and forward-curved fans are tested as part of a system with straight discharge ductwork, and the fan ratings are based on this duct design. When designing ductwork in the field, it is important to use a straight discharge duct of the correct dimensions to obtain maximum fan performance. Straight ductwork helps the airflow to develop a uniform velocity profile as it exits the fan and allows the velocity pressure to recover into static pressure. See the figure below.

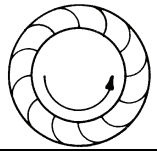
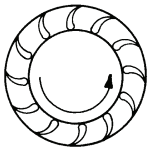
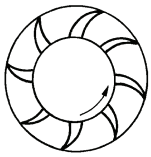
For 100% recovery of velocity pressure into static pressure, the straight portion of the discharge duct must be at least at least $2^1/_2$ times the discharge diameter in length for velocities of 2500 fpm or less. For each additional 1000 fpm, add one duct diameter to the length of the straight portion of the ductwork.

As an example of how to size the straight portion of duct, assume the fan has a 34 x 34 in. discharge outlet (8.03 sq ft). The equivalent diameter is 39 in., so the straight duct length required would be 8 ft long.

Plenum fans do not require straight ductwork of a particular minimum length, because velocity pressure is converted to static pressure inside the plenum fan section. Outlet ducts, however, should not be installed directly in line with the air discharge from the fan wheel.



FAN TYPE AND APPLICATION

TYPE	CHARACTERISTICS	APPLICATION
Forward-Curved (FC) Side View 	• Double-width, double-inlet (DWDI) construction. • Best at low or medium pressure (approximately 0 to 5 in. wg). • Horsepower increases continuously with increase in air quantity (overloads) as static pressure decreases. • Less expensive than AF fans. • Runs at relatively low speed, typically 400 to 1200 rpm. • Blades curve toward direction of rotation.	For low to medium pressure air-handling applications.
Airfoil (AF) Side View 	• Double-width, double-inlet (DWDI) construction. • Best in high capacity and high-pressure applications (4 to 8 in. wg). • Horsepower peaks at high capacities. • Most expensive of centrifugal fans. • Operates at high speeds, typically 1200 to 2800 rpm. About double the speed of FC fan for similar air quantity. • Blades have aerodynamic shape similar to airplane wing and are curved away from direction of rotation.	For medium to high air capacity and pressure applications.
Plenum (PAF) End View 	• Single-width, single-inlet (SWSI) construction. • Characteristics similar to DWDI airfoil fan. • Blades have aerodynamic shape similar to airplane wing and are curved away from direction of rotation. Fewer blades and wider blade spacing than AF fans.	Best in applications with limited space or multiple ducts.

Fan control on variable air volume systems

Introduction

Since VAV systems inherently reduce airflow to meet demand, they are a major source of energy savings. This occurs because fan brake horsepower (bhp) varies with the amount of air delivered.

The degree to which bhp savings are realized, however, is also affected by the type of fan volume control selected and the effectiveness of its application. Effective fan control ensures proper duct pressure for the required control stability of the air terminals and provides quiet terminal unit operation when "riding the fan curve."

Consider the following when selecting a fan volume control method:

1. System parameters
   a. Airflow (cfm)
   b. Static pressure
   c. Percent volume reduction (turndown)
2. Fan type and selection point
   a. Design point efficiency
   b. Part load efficiency (especially the point where the fan will be operating most of the time)
   c. Part load stability
3. Ease of control installation and use
4. Motor selection
   a. Higher bhp inputs due to efficiency of VAV control method
   b. Compatibility with VAV control
5. Sound levels
   a. Fan-generated sound
   b. Terminal sound
   c. Control-generated sound
   d. System sound (ducts, fittings)
6. Initial cost and operating cost
7. Reliability and ease of maintenance

Application data (cont)

System parameters

Before a fan type or control is selected, the system must be analyzed at both the design point and part load. The fan is likely to be operating at part load a large percentage of the time.

Methods of fan air-volume control

- "Riding the fan curve" with terminal throttling (forward curved fans)
- Variable frequency drives (VFDs)

A short description of air-volume control methods follows. A summary comparison table is provided at the end of the section.

Forward-curved (FC) fans with terminal throttling (riding fan curve) — This is the simplest, most reliable, and most economical first-cost method of air volume control on VAV systems, since no accessories are required. This type of VAV control can be used on forward-curved fans with flat pressure characteristics and in systems where static pressure changes at the terminals are moderate. Air volume reduction is produced solely by throttling of terminal units in response to load reduction. As the units throttle, system resistance changes.

The chart below, Forward-Curved Fan with Air Terminal Throttling, illustrates the reduction in bhp and airflow at constant speed. Point A is the peak airflow operating point. Note the required bhp at this airflow. As airflow is reduced by terminal throttling, move along the fan constant rpm curve to point B. Note the lower cfm and bhp values at B.

At reduced airflow conditions, the total system static pressure may undergo little or no change, although air pressure loss through the air-handling unit decreases. This means that duct pressure increases as pressure loss across the terminal unit increases. For low-static and medium-static pressure systems, this increase in duct pressure should not result in noticeable sound level changes. However, at higher design static pressures, sound levels and duct leakage may increase and the control method should be reviewed to determine if it is feasible.

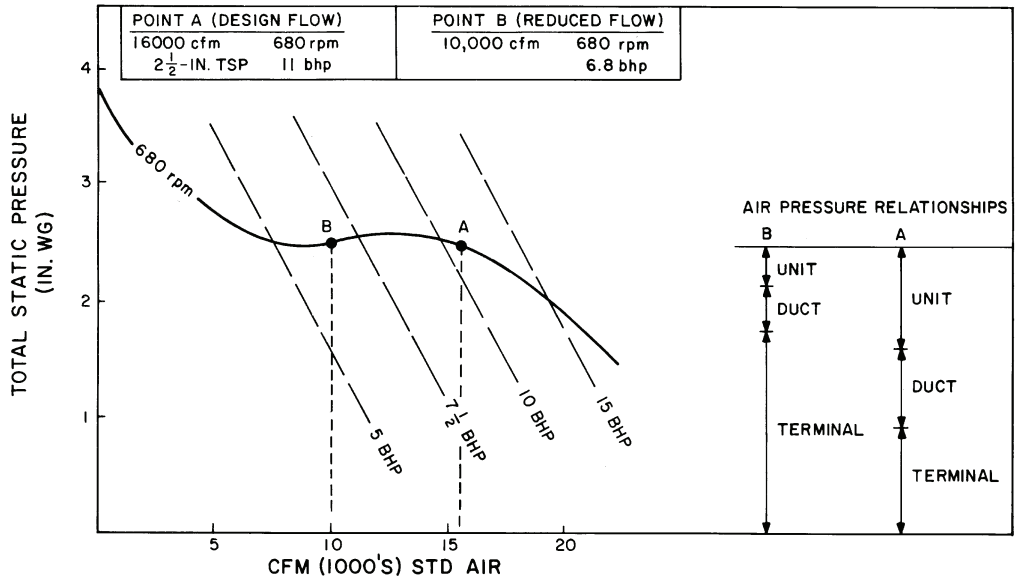
Variable frequency drives — Variable frequency drives (VFDs) modulate the fan motor speed in response to air volume requirements. To vary the motor speed, a VFD changes the input frequency and line voltage into a wide range of frequency and voltage outputs, while maintaining a constant frequency to voltage ratio.

Variable frequency drives convert input ac power to dc power and then convert the dc power to a different ac power output using an inverter. The inverter creates the ac output by rapidly switching the polarity of the voltage from positive to negative. Power output from the VFD is not a smooth sine wave, but has many "steps" in the wave form. This type of power output can cause a standard fan motor to exceed its rated temperature range. The stepped power output also results in motor efficiency losses that must be considered when calculating the energy savings offered by the VFD.

Due to the stepped power output generated by VFDs, fan motors rated for inverter duty are recommended. If a standard motor is used with a VFD, the motor should not be operated at the full service factor.

Variable frequency drives can be an effective way to control air volume and save energy. They can provide greater reduction in fan bhp than throttling with either fan discharge dampers or inlet guide vanes. At reduced load requirements, fan speed is reduced proportionately with resulting lower airflow, lower static pressure, lower bhp requirements, and lower sound levels.

FORWARD-CURVED FAN WITH AIR TERMINAL THROTTLING
VARIATIONS IN BHP AT CONSTANT RPM



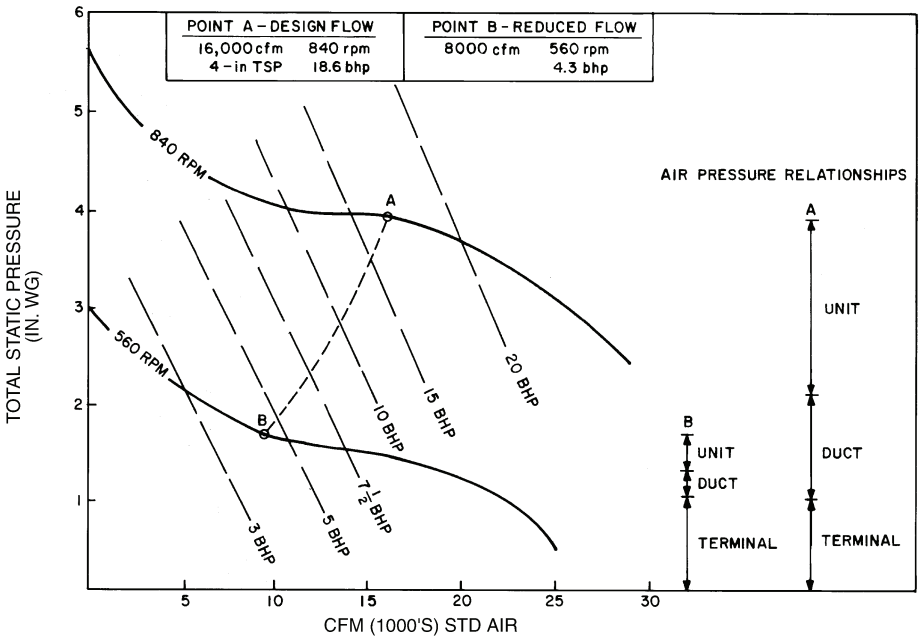
As the load decreases in a VAV system and the terminal units throttle, duct static pressure increases. A static pressure sensor in the duct system detects the pressure increase and initiates a fan speed change through the VFD. Fan speed is reduced until the duct sensor detects a satisfactory duct pressure.

The Variable Frequency Fan Speed Control chart illustrates the results of fan speed reduction as operation shifts from Point A to Point B. If duct pressure begins to fall due to terminal units opening, the duct sensor signals the VFD to increase fan speed.

This method of air volume control permits fan speed reduction down to as low as 10% of the design speed. With FC fans riding the fan curve at the lower rpm, airflow may be as low as 10% of peak design, as long as motor rpm is not less than $^1/_6$ of motor synchronous speed.

The method may be applied to any size VAV system with any type of fan. It is particularly cost effective on systems with high turndown requirements where the full speed reduction capability can be used.

VARIABLE FREQUENCY FAN SPEED CONTROL



FAN SUMMARY COMPARISON

TYPE OF CONTROL	FIRST-COST RANK	SOUND GENERATION RANK*	ENERGY-SAVINGS RANK	APPLICATION RANGE — NORMAL FOR AIR COND.	COMMENTS
FC Fan Terminal Throttling (Riding Fan Curve)	1 (Lowest Cost)	4	4	TSP 0 to 4.5 in. wg Cfm 3,000 to 35,000	For moderate turndown systems with a flat fan curve and low to medium static pressure and cfm range.
FC Fan with 2-Speed Motor	2	3	3	TSP 0 to 4.5 in. wg Cfm 3,000 to 35,000	For systems with predictable 2-load situations in low to medium static pressure range. Controls are more complicated. Starters are more costly.
FC Fan With Variable Frequency Drive	3	1 (Quietest)	1 (Best)	TSP 0 to 4.5 in. wg Cfm 3,000 to 35,000	For high turndown, low to medium static pressure systems. Best energy savings. Fast payback. Fan generates least sound.
AF and Plenum Fan With Variable Frequency Drive	4	1 (Quietest)	1 (Best)	TSP 4.5 to 8.0 in. wg Cfm 5,000 to 63,000	For high turndown, medium to high static pressure systems. Best energy savings. Fan generates least sound.

LEGEND

AF — Airfoil
FC — Forward Curved
TSP — Total Static Pressure

*Including part load.

NOTE: Rank is based on a relative scale of 1 to 4. Some methods have comparable rating.

Application data (cont)

Unit control arrangements with Carrier Direct Digital Controls

Supply fan control

In a VAV system, supply fan control is used to match the supply fan delivery to the airflow required by the load. This is done by maintaining a constant static pressure in the supply duct at a point approximately $^2/_3$ of the distance from the supply fan discharge.

The DDC processor uses a control loop to provide the capability. This processor measures the static pressure at the pick-up probe, compares it to the desired set point, and modulates the fan volume control device. See the Supply Fan Control figure. The volume control device can be a factory-installed or field-installed variable frequency drive (VFD).

The VFD offers several advantages over inlet guide vanes. First, the VFD operates more efficiently in most applications, thus saving energy. The VFD also provides the ability to maintain control over a much larger airflow range (it has a higher turn-down ratio). The following guideline should be used to ensure proper control:

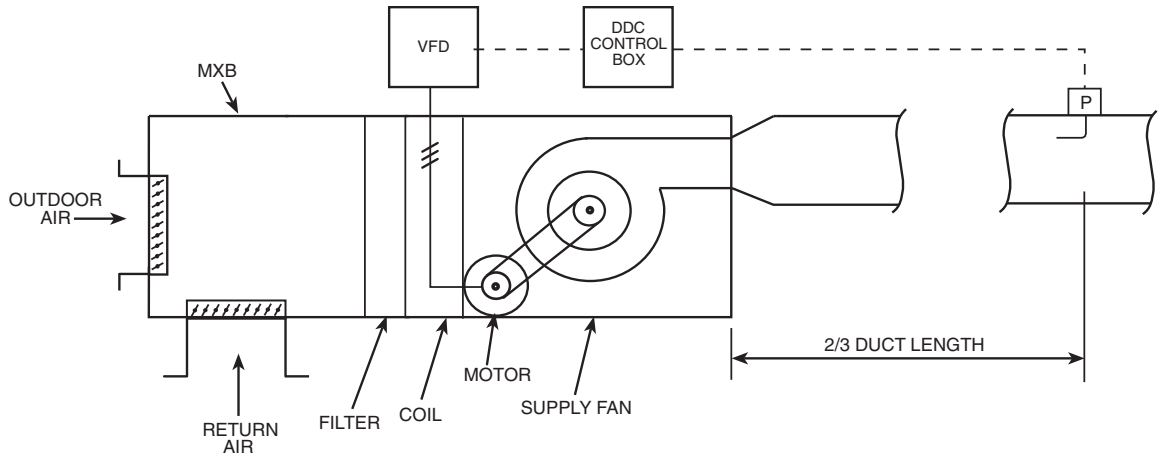
- Variable frequency drives should not be operated at below $^1/_6$ motor synchronous speed.

For supply fan applications, the DDC processor option maintains the duct static pressure at a desired set point between 0.2 and 4.5 in. wg to within ±0.1 in. wg throughout the fan control range. In applications where more than 100 ft of pneumatic tubing is required, the transducer must be removed from the control box and remotely mounted near the static pressure pickup.

Indoor air quality (IAQ) applications

The CO_2 demand-controlled ventilation (DCV) override increases the minimum ventilation level in order to maintain the CO_2 level at or below the maximum level per person. By ventilating only to the actual rate required, rather than the maximum design occupancy rate, energy savings are achieved. When combined with Product Integrated Controls, this feature automatically adapts and changes ventilation quantity without operator set point adjustments. The CO_2 DCV override feature has user-selectable values for minimum mixed-air temperature override, maximum damper ventilation override position, and supply air tempering (when hot water/steam heat is used).

SUPPLY FAN CONTROL



LEGEND

DDC — Direct Digital Control
MXB — Mixing Box
VFD — Variable Frequency Drive
P — Static Pressure Pick-Up

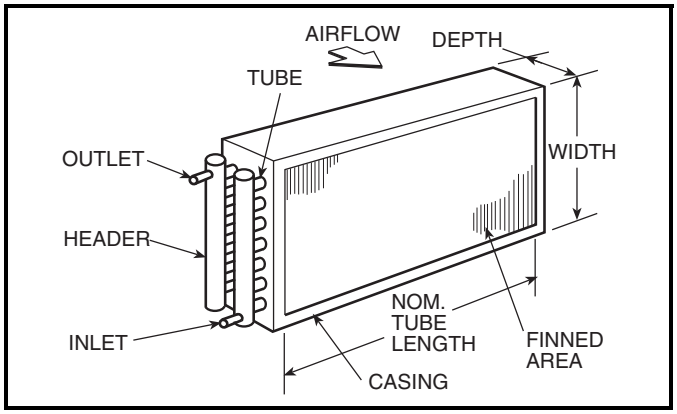
Coils

Coil definitions

A coil, as the term is used with air-handling equipment, is a heat exchange device. A heating or cooling medium passes through the coil, where it either rejects heat to, or absorbs heat from, the airstream passing over the coil, depending upon the relative temperatures of the medium and airstream.

Tube — The tube is a small-diameter pipe through which the heating or cooling medium passes as it rejects or absorbs heat. Coil tubes are generally constructed of copper but may be made of other metals.

Fin — The coil fin is a thin metal plate attached to the tube to improve the heat transfer efficiency from medium to airstream. Typically, it is made of either aluminum or copper.



Header — The header is a large diameter pipe to which several tubes are connected. It distributes the heating or cooling medium to the tubes. Headers are typically of nonferrous metal or steel.

Casing — The supporting metal structure for tubes and header is called a casing. It is usually made of galvanized steel but can be made of other materials (stainless steel).

Inlet and outlet — These are pipe stubs on the header where the heating or cooling medium enters and leaves the coil.

In water coils, the supply inlet is the pipe stub located on the side where the air leaves the coil. The outlet is the stub on the entering air side of the coil. Such an arrangement is known as counterflow.

In steam coils, the inlet is always the higher stub so that condensate will drain out of the lower stub.

Finned area or face area — The working area of the coil is defined as the width x length of the finned area through which air passes. This finned or face area does not include the casing.

Face velocity — This is the air velocity in fpm across the finned or face area of a coil. Face velocity is determined by dividing the air volume in cfm by the coil face area in square feet.

$$\text{Face Velocity (Fpm)} = \frac{\text{Air Volume (Cfm)}}{\text{Coil Face Area (Sq Ft)}}$$

The first step in selecting an air handler size is to determine the maximum allowable face velocity.

This maximum is determined by the specifier and is based primarily on the following criteria:

1. Avoidance of moisture carryover into the ductwork (applies to cooling coils only).
2. Air pressure drop across the coil.
3. Heat transfer efficiency.

The maximum safe air velocity without moisture carryover into the ductwork depends on the type and spacing of the finned surface, the amount of moisture on the coil, and the geometry between coil and fan inlet or ductwork. Since coil moisture conditions vary, and coil versus duct geometry varies (for example, between draw-thru, blow-thru, vertical, or horizontal units), the specified maximum face velocity should allow for these variations.

Fan horsepower is also affected by face velocity, since the air resistance across the coil varies roughly as the square of the face velocity.

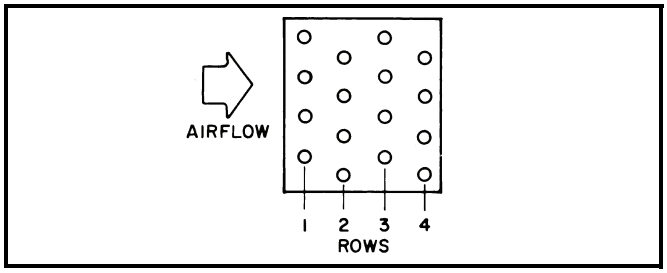
For the above reasons, the maximum specified face velocity is normally a conservative figure (on the low side). Suggested design face velocities are as follows:

COIL TYPE	FACE VELOCITY RANGE
Cooling	400 to 550 fpm
Heating	400 to 800 fpm

In variable air volume (VAV) applications, the system generally operates below peak air volume for extended periods. In such cases, the design face velocity is commonly selected at the higher end of the suggested range.

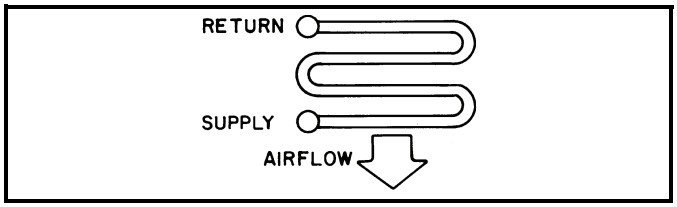
Tube face — This is the number of tubes in any one coil row.

Below is a diagram of a 4-row coil with a 4-tube face. Note that tubes are staggered in adjacent rows.



Cooling coils are typically available in 4, 6, 8, and 10-row configurations. Tubes should have an outside diameter (OD) of 1/2 in. to maximize heat transfer at minimum water flows. Coils should be sized for the most efficient use of water. Water temperature differences of 12 to 16° F are typical and represent optimum selection points.

Pass — That part of the circuit that passes through the airstream once.



Note that this is a 4-pass circuit.

Application data (cont)

Direct expansion (DX) coils — Direct expansion coils can have two intertwined refrigerant circuits. In addition, quarter, half, full and double circuiting configurations are offered to allow optimum system performance and oil return at full and part-load operation.

Circuiting selection should result in a circuit loading of 0.8 to 2.0 tons per circuit at design load. Circuit loading must be evaluated at minimum load to ensure that it does not drop below 0.6 tons per circuit. Solenoid valves may be used, if necessary, to shut off the refrigerant supply to individual expansion valves to maintain adequate coil circuit loading.

Compressor minimum unloading and TXV quantity is necessary to determine minimum tonnage per circuit.

Minimum Unloading Equation:

$$\frac{\textit{(Tons/Circuit) x (Minimum Unloading) x (Total \# of TXVs)}}{\textit{\# of TXVs Active}}$$

Example:

Condensing Unit:	38AUZ012
Minimum Unloading:	33%
Coil:	6 row, 11 FPI, Half Circuit
Coil Tons/Circuit:	1.68
Total TXVs:	2

In the first example we will determine the tons/circuit when both TXVs are active and the compressor is unloaded to its minimum of 33%.

$$= \frac{\textit{(1.68 Tons/Circuit) x (33\% Minimum Unloading) x (2 TXVs)}}{\textit{2 TXVs Active}}$$

$$= \frac{(1.68) \times (.33) \times (2)}{2}$$

= .55 tons/circuit at minimum unloading: UNACCEPTABLE

If we install a liquid line solenoid valve before one of the TXVs and close it so that only one TXV is active when the compressor is unloaded to its minimum of 33 %, we see the following:

$$= \frac{\textit{(1.68 Tons/Circuit) x (33\% Minimum Unloading) x (2 TXVs)}}{\textit{1 TXV Active}}$$

$$= \frac{(1.68) \times (.33) \times (2)}{1}$$

= 1.10 tons/circuit at minimum unloading: ACCEPTABLE

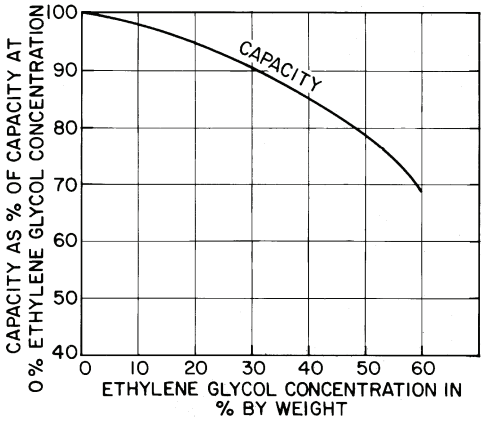
There are three different options to control tons/circuit when using an unloading compressor. The first is to use drop solenoid valve control (as illustrated above) and let the suction cutoff unloaders "ride" with the load. The second is to use drop solenoid valve control (as illustrated above) with electric unloaders and let the control algorithm determine the combination of solenoid valves and unloaders to limit tons/circuit to acceptable limits. The third is to limit the minimum amount of unloading so that tons/circuit is within acceptable limits.

Thermostatic expansion valve (TXV) kits are availble though ***AHU*Builder®** software. If TXVs are purchased from an alternate vendor, be sure to specify a 5% minimum bleed port.

Ethylene glycol

The effects of ethylene glycol usage on coil capacity and pressure drop can be determined from the ***AHU*-Builder®** program. For a quick estimate of these effects, use the chart below.

ETHYLENE GLYCOL EFFECTS



NOTE: Use the percentage of ethylene glycol concentration for burst protection, not freeze-up protection.

The chart is based on 6-row/14-fin coil performance with the only variable being ethylene glycol concentration by weight.

Filters

Air is contaminated in varying degrees by soil, organic matter, spores, bacteria, smoke, dust, and fumes.

Air cleaning and filtration devices are required in order to create a clean work environment, reduce cleaning costs, and extend the life of machinery or equipment.

Filter ratings (MERV)

Filters are rated according to efficiency and dust-holding capacity.

The most commonly accepted method of testing filter efficiency is per ASHRAE Standard 52. An explanation of filter ratings can be found in Chapter 24 of the ASHRAE HVAC Systems and Equipment Handbook. ASHRAE standard 52.2 defines the minimum efficiency reporting value (MERV).

Filter dust-holding capacity is directly related to filter life. The filter is replaced when the amount of dirt and dust it contains builds up air resistance to an unacceptable level. Air resistance build-up is measured by a filter air-resistance gage.

Selection procedure

Size selection

This catalog has been designed to provide a quick and accurate means of selecting and specifying a central station air-handling unit. Start with the information you have: required airflow and preferred coil face velocity to select a nominal unit size. Contact your Carrier sales representative for the ***AHU*Builder®** program. Next, refer to the component descriptions on pages 27-60. After determining the unit size and unit configuration, use the worksheet on this page to record dimension and weight information for each section and to add the total unit weight and length.

NOTE: Carrier's ***AHU*Builder** program provides exact coil and performance data certified to the AHRI 410 and 430 standards. In addition to standard outputs, the program provides coil moisture carryover information. When information from the computer selection programs is not available, use the following general guidelines for velocity limits to avoid moisture carryover.

COIL MOISTURE BLOWOFF LIMITS (fpm)

FINS per Inch	ALUMINUM	COPPER	E-COAT
8	550	500	475
11	550	425	400
14	550	375	350

NOTES:
1. See ***AHU*Builder** program for specific limitations.
2. Data shown is for general use at 80 F dry bulb (db)/67 F wet bulb (wb) entering air, 55 db/55 wb (F) leaving air conditions.
3. Units apply to clean, properly maintained coils.

Cost-efficient, computerized selection

The Products and Systems Electronic Catalog is a series of computer programs designed to run on an IBM-compatible personal computer to select products and systems offered by Carrier.

General features:

- Provides "true" selection for all air-handling units coils and fans. Required capacity and/or entering and leaving conditions may be specified with the program determining performance ratings for all applicable coil configurations. User-specified performance rating for a particular configuration or specified performance criteria
- Guaranteed projection of unit size vs airflow without water carryover problems
- Minimized specifying input criteria — fixed or rarely changing parameters user specified as defaults and separated from main input screen
- Displayed output mode of coil performance ratings allow side-by-side comparison of user-defined performance ratings values (4 calculated values for each coil), or complete performance ratings of all coils in a spreadsheet format.
- Detailed summary reports including cooling, heating, fan, acoustic, and physical performance data can be generated in different formats. Fully featured on-line help system contained within the program
- Easier to use than previous generation systems
- Uses AHRI approved method, reduces engineering expense

Special features — Allows user to continually monitor and modify input/output. Provides processing for special application:

- Ethylene glycol or brine
- Altitude

SPECIFICATION WORKSHEET

JOB NAME _____

MARK FOR _____

CAPACITY _____ CFM _____

STATIC PRESSURE (in. wg)

Internal _____ External _____ Total _____

RPM _____ BHP _____ CYCLES _____

MTR TYPE _____

PIPE CONNECTION SIZES

COOLING COIL: SUPPLY _____ RETURN _____

HEATING COIL: SUPPLY _____ RETURN _____

FILTERS

SIZE _____ QTY _____

SIZE _____ QTY _____

COMPONENT SEQUENCE		LENGTH	WEIGHT
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
_____	+	_____	_____
MOTOR		—	
_____	+	_____	_____
COIL		—	
_____	+	_____	_____
TOTAL		_____	_____

COMMENTS: _____

_____

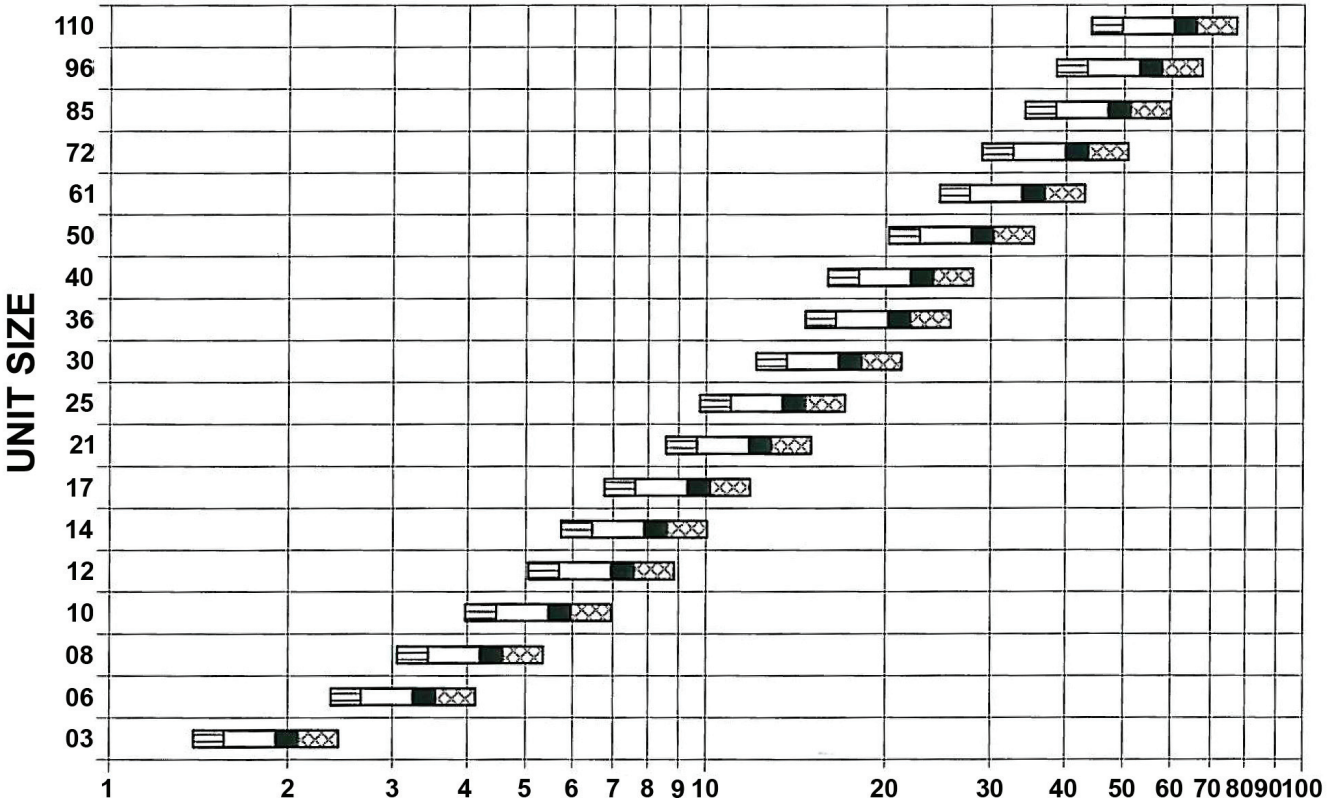
_____

PREPARED BY: _____

DATE: _____

Selection procedure (cont)

LARGE FACE AREA
AIRFLOW (CFM X 1000)



To use the selection chart:
1. Find the required airflow by reading across available airflow (cfm x 1000) scale at the top of the chart.
2. Read down from the selected airflow until the desired face velocity (fpm) is reached.
3. From this point, move to the left to determine the unit size.

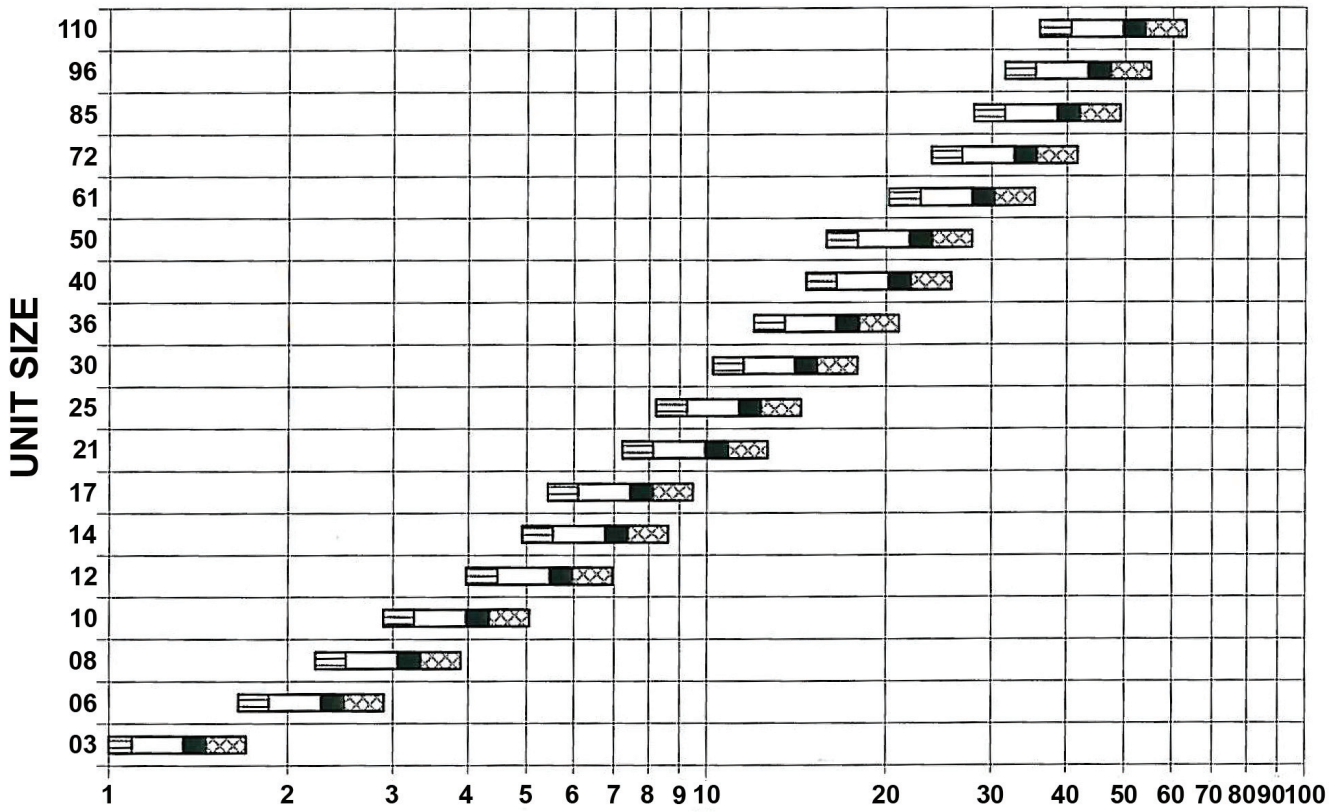
LEGEND

Face velocity 400 to 450 fpm
Most commonly used for high latent load applications. Space requirements and costs are higher than other selections.
Face velocity 450 to 500 fpm
Represents most standard commercial HVAC (Heating, Ventilation, and Air Conditioning) cooling applications. Good value and space balance.
Face velocity 550 to 600 fpm
Best selection for space and cost if conditions permit.
Face velocity 600 to 700 fpm
Best selection for heating only applications.

NOTES:
1. Airflow is based on the use of a large face area coil.
2. Fan velocities are based on a nominal cooling coil face area as shown by unit size; heat and vent applications can have velocities greater than 600 fpm.

MEDIUM FACE AREA

AIRFLOW (CFM X 1000)



To use the selection chart:

1. Find the required airflow by reading across available airflow (cfm x 1000) scale at the top of the chart.
2. Read down from the selected airflow until the desired face velocity (fpm) is reached.
3. From this point, move to the left to determine the unit size.

LEGEND

Face velocity 400 to 450 fpm
Most commonly used for high latent load applications. Space requirements and costs are higher than other selections.

Face velocity 450 to 500 fpm
Represents most standard commercial HVAC (Heating, Ventilation, and Air Conditioning) cooling applications. Good value and space balance.

Face velocity 550 to 600 fpm
Best selection for space and cost if conditions permit.

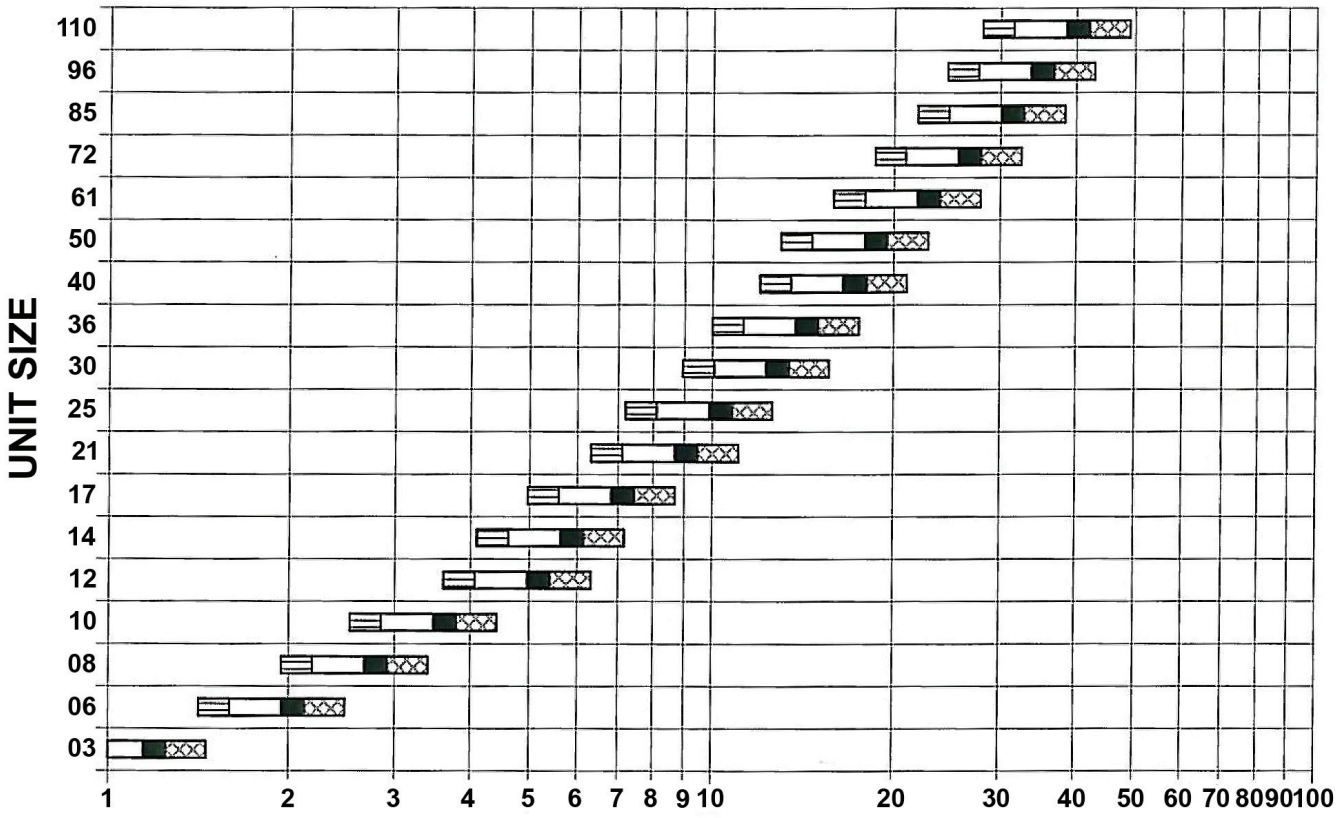
Face velocity 600 to 700 fpm
Best selection for heating only applications.

NOTES:

1. Airflow is based on the use of a large face area coil.
2. Fan velocities are based on a nominal cooling coil face area as shown by unit size; heat and vent applications can have velocities greater than 600 fpm.

Selection procedure (cont)

BYPASS FACE AREA
AIRFLOW (CFM X 1000)



To use the selection chart:
1. Find the required airflow by reading across available airflow (cfm x 1000) scale at the top of the chart.
2. Read down from the selected airflow until the desired face velocity (fpm) is reached.
3. From this point, move to the left to determine the unit size.

LEGEND

Face velocity 400 to 450 fpm
Most commonly used for high latent load applications. Space requirements and costs are higher than other selections.
Face velocity 450 to 500 fpm
Represents most standard commercial HVAC (Heating, Ventilation, and Air Conditioning) cooling applications. Good value and space balance.
Face velocity 550 to 600 fpm
Best selection for space and cost if conditions permit.
Face velocity 600 to 700 fpm
Best selection for heating only applications.

NOTES:
1. Airflow is based on the use of a large face area coil.
2. Fan velocities are based on a nominal cooling coil face area as shown by unit size; heat and vent applications can have velocities greater than 600 fpm.

Electric heat selection procedure

I Determine electric heat requirements based on size of selected unit.

Given:

Air Quantity . . . . . 3,000 cfm
Entering-Air Temperature . . . . . .54 F
Leaving-Air Temperature . . . . . .77 F
Maximum Air Velocity . . . . . .650 fpm
Electric Service 460-v, 3-ph, 60-Hz
Unit Type . . . . . Horizontal Draw-Thru

II Determine heating load.

Heating Load = 1.1 x Cfm x Air Temp Rise
= 1.1 x 3,000 x 23
= 75,900 Btuh (75.9 MBtuh)

III Verify unit size.

Size of the electric heating coil face area is usually predetermined by the selection of the air-handling unit and the cooling coil. However, the heater size must be checked to assure that the minimum face velocity is provided for the heater.

$$\text{Minimum Face Area} = \frac{3{,}000}{650 \text{ Fpm}}$$

$$= 4.6 \text{ sq ft}$$

$$\text{Actual Face Velocity} = \frac{3{,}000}{4.9 \text{ sq ft}} \quad \text{(Actual Coil Face Area)}$$

$$= 615 \text{ Fpm}$$

IV Determine kilowatt equivalent of heating load.

$$\text{kW Heating Load} = \frac{75.9 \text{ MBtuh}}{3.413 \text{ MBtuh/kW}}$$

$$= \frac{75.9}{3.413}$$

$$= 22.2 \text{ kW}$$

V Determine unit electric heater size.

Select the heater which has a kW rating closest to but greater than the required kW and is available at the required voltage. Electric heaters are available in one-kW increments. The Electric Heater Data on the following pages shows incremental sizes only.

VI Determine capacity of electric heater.

Capacity = 23 kW x 3.413
= 78.5 MBtuh

VII Calculate air temperature rise.

$$\text{Air Temp Rise} = \frac{78{,}500 \text{ Btuh}}{1.1 \times 3{,}000 \text{ Cfm}}$$

$$= 23.8 \text{ F}$$

VIII Calculate the actual leaving-air temperature.

Leaving Air Temp = Ent Air Temp + Air Temp Rise
= 54 + 23.8
= 77.8 F

IX Determine air friction loss of electric heating coil.

Enter Component Pressure Drop table, page 22, and find (by interpolation) air friction loss of electric heater at 615 fpm to be 0.02 in. wg.

X Voltage variations.

Variations from the rated voltage of the electric heating coils can significantly affect the coil's rated output. The effects of voltage variation can be determined by the following formula.

$$kW_a = kW_r \times \left(\frac{V_a}{V_r}\right)^2$$

kW_a = Actual kW Output From Coil
kW_r = Rated kW Output From Coil
V_a = Actual Voltage at Coil
V_r = Rated Voltage at Coil

Air handler selection guide

1. Unit size = Coil face area (ft^2) = design cfm/max face velocity

   Example: 12,000 cfm/500 fpm = 24 → Size 25
2. Consider your system and choose the appropriate component sections.
3. Determine overall unit dimensions and weight. The height and width for any given unit size is the same for all component sections.
4. Finalize your selections using Carrier's latest version of the ***AHU*Builder®** program. The ***AHU*Builder** program is a comprehensive selection tool designed to help our customers quickly and efficiently make the proper air handler choice.

Performance data

AIR FRICTION DATA

TYPICAL FILTER PRESSURE DROP (in. wg)

39M COMPONENT	FILTER TYPE		AIR VELOCITY THROUGH FILTER SECTION (fpm)										
			200	250	300	350	400	450	500	550	600	650	700
FLAT	Throwaway (2 in.)		0.05	0.08	0.11	0.14	0.19	0.22	0.28	0.32	0.35	0.40	0.46
	Permanent (2 in.)		0.03	0.04	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
	Throwaway (4 in.)		0.06	0.09	0.12	0.15	0.19	0.22	0.28	0.32	0.35	0.40	0.46
FILTER/MIXING BOX*	Throwaway (2 in.)		0.03	0.04	0.05	0.07	0.08	0.10	0.12	0.15	0.17	0.20	0.22
	Permanent (2 in.)		0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.10	0.12	0.14	0.15
	Throwaway (4 in.)		0.04	0.05	0.06	0.08	0.08	0.10	0.12	0.15	0.17	0.20	0.22
ANGLE*	Throwaway (2 in.)		0.01	0.02	0.03	0.05	0.05	0.06	0.07	0.08	0.11	0.12	0.14
	Permanent (2 in.)		0.01	0.01	0.02	0.03	0.04	0.04	0.06	0.06	0.08	0.09	0.10
	Throwaway (4 in.)		0.02	0.03	0.04	0.06	0.05	0.06	0.07	0.08	0.11	0.12	0.14
BAG/ CARTRIDGE	Bag† (% Efficient)	(60-65)	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.36	0.40	0.48	0.52
		(80-85)	0.14	0.18	0.22	0.27	0.32	0.38	0.43	0.48	0.54	0.60	0.65
		(90-95)	0.23	0.29	0.36	0.43	0.51	0.60	0.67	0.75	0.85	0.94	1.00
	Cartridge** (% Efficient)	(60-65)	0.11	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.47	0.51
		(80-85)	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.71
		(90-95)	0.23	0.30	0.37	0.44	0.51	0.58	0.65	0.72	0.79	0.85	0.92
HEPA††			0.54	0.68	0.82	0.97	1.11	1.25	1.40	1.53	1.67	1.83	1.95

*Filter data shown is for clean filter. Consult filter manufacturer's recommendation for final dirty-filter pressure drop. Typically, 0.5 in. wg is allowed for dirty filter. Add pressure drop for pre-filter (flat filter) if used.

†Filter data shown is for clean filter. Consult filter manufacturer's recommendation for final dirty-filter pressure drop. Typically, 1.0 in. wg is allowed for dirty filter. Add pressure drop for pre-filter (flat filter) if used.

**Filter data shown is for clean filter. Consult filter manufacturer's recommendation for final dirty-filter pressure drop. Typically, 1.5 in. wg is allowed for dirty filter. Add pressure drop for pre-filter (flat filter) if used.

††Filter data shown is for clean filter. Consult filter manufacturer's recommendation for final dirty-filter pressure drop. Typically, 2.5 in. wg is allowed for dirty filter. Add pressure drop for pre-filter (flat filter) if used.

NOTE: Filters are field-supplied and field-installed. Pressure drop values shown are typical and can vary with manufacturer and filter efficiency.

COMPONENT PRESSURE DROP (in. wg)

39M COMPONENT	STANDARD DAMPERS OR COMPONENT CONSTRUCTION Air Velocity Through Component (fpm)										
	400	600	800	1000	1200	1400	1600	1800	2000	3000	4000
Air Mixer	—	0.07	0.11	0.15	0.21	0.29	0.39	—	—	—	—
Diffuser Plate	0.01	0.02	0.04	0.05	0.08	0.10	0.14	0.17	0.22	0.56	—
Electric Heat	0.01	0.02	0.04	0.05	0.08	0.10	0.14	—	—	—	—
Mixing or Exhaust Box	0.02	0.05	0.10	0.15	0.22	0.31	0.40	0.50	0.62	1.38	—
Zone Damper	—	—	—	0.03	0.04	0.06	0.07	0.09	0.10	0.25	0.48
Side Intake Louver	0.02	0.05	0.08	0.13	0.18	0.25	0.33	—	—	—	—
Rear Inlet Hood	0.24	0.53	0.94	1.47	—	—	—	—	—	—	—

39M COMPONENT	PREMIUM DAMPERS OR COMPONENT CONSTRUCTION Air Velocity Through Dampers (fpm)										
	400	600	800	1000	1200	1400	1600	1800	2000	3000	4000
Mixing or Exhaust Box	0.02	0.04	0.07	0.11	0.16	0.22	0.28	0.36	0.44	1.00	—
Side Mixing or Exhaust Box	0.02	0.04	0.07	0.11	0.16	0.22	0.28	0.36	0.44	1.00	—

NOTES:
1. For mixing box dampers, worst case pressure drops will occur with one damper open and one closed. With one damper partially open and one partially closed, the actual pressure drop will be much less.
2. Diffuser plates are mounted on fan discharge.

COOLING COIL AIR FRICTION (in. wg, Dry Coil)

ROWS	FINS	FACE VELOCITY (fpm)				
		300	400	500	600	700
4	8	0.15	0.25	0.37	0.51	0.66
	11	0.19	0.31	0.45	0.61	0.79
	14	0.23	0.36	0.52	0.70	0.90
6	8	0.23	0.38	0.55	0.76	1.00
	11	0.29	0.46	0.67	0.91	1.18
	14	0.34	0.55	0.79	1.06	1.36
8	8	0.30	0.50	0.74	1.02	1.33
	11	0.38	0.62	0.90	1.22	1.57
	14	0.46	0.73	1.05	1.41	1.81
10	8	0.38	0.63	0.92	1.27	1.66
	11	0.48	0.77	1.12	1.52	1.97
	14	0.57	0.91	1.31	1.76	2.26

HEATING COIL AIR FRICTION (in. wg)

ROWS	FINS	FACE VELOCITY (fpm)								
		300	400	500	600	700	800	900	1000	1100
1 or 2	8	0.08	0.13	0.19	0.26	0.34	0.43	0.53	0.64	0.75
	11	0.09	0.15	0.22	0.30	0.39	0.50	0.61	0.72	0.85
	14	0.12	0.19	0.27	0.37	0.47	0.59	0.71	0.85	0.99
4	8	0.15	0.25	0.37	0.51	0.66	—	—	—	—
	11	0.19	0.31	0.45	0.61	0.79	—	—	—	—
	14	0.23	0.36	0.52	0.70	0.90	—	—	—	—

STEAM COIL AIR FRICTION (in. wg)

ROWS	FINS	FACE VELOCITY (fpm)									
		300	400	500	600	700	800	900	1000	1100	1200
1 or 2	6	0.03	0.05	0.07	0.10	0.13	0.16	0.20	0.25	0.29	0.34
	9	0.07	0.11	0.17	0.22	0.30	0.38	0.46	0.55	0.65	0.76
	12	0.12	0.18	0.27	0.37	0.47	0.58	0.72	0.85	1.01	1.15

ELECTRIC HEATER DATA

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
03	3	3	5	500	11	14	17	1	20	12	15	1	20	6	8	1	20	5	6	1	20	8	10	1	20
			10	500	21	28	35	1	35	24	30	1	35	12	15	1	20	10	12	1	20	15	19	1	20
			15	500	32	42	52	1	60	36	45	1	50	18	23	1	25	14	18	1	20	23	29	1	30
			20	500	43	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			25	500	53	69	87	2	90	60	75	2	80	30	38	1	40	24	30	1	35	38	48	1	50
			30	500	64	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			35	500	75	97	122	3	125	84	105	2	110	42	53	1	60	34	42	1	45	53	67	2	70
06	5.2	3	10	500	12	28	35	1	35	24	30	1	35	12	15	1	20	10	12	1	20	15	19	1	20
			15	500	18	42	52	1	60	36	45	1	50	18	23	1	25	14	18	1	20	23	29	1	30
			20	500	25	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	37	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	49	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	61	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	74	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
08	7.4	3	20	500	17	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	26	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	35	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	43	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	52	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	70	500	60	195	243	5	250	169	211	4	225	84	105	2	110	67	84	2	90	106	133	3	150
			80	500	69	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
10	9.9	3	20	500	13	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	19	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	26	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	32	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	39	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	75	500	48	208	261	5	300	181	226	4	250	90	113	2	125	72	90	2	100	114	143	3	150
			90	500	58	250	313	6	350	217	271	5	300	108	135	3	150	87	108	2	110	137	171	3	175
			100	500	65	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
12	12.4	3	20	500	10	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	15	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	21	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	26	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	31	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	41	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	52	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			115	500	59	320	399	7	400	277	346	6	350	138	173	3	175	111	138	3	150	175	219	4	225
			130	500	67	361	452	8	500	313	391	7	400	157	196	4	200	125	157	3	175	198	247	5	250
14	13.6	3	30	500	14	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			45	500	21	125	156	3	175	108	135	3	150	54	68	2	70	43	54	1	60	68	86	2	90
			60	500	28	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	38	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	47	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			115	500	54	320	399	7	400	277	346	6	350	138	173	3	175	111	138	3	150	175	219	4	225
			130	500	61	361	452	8	500	313	391	7	400	157	196	4	200	125	157	3	175	198	247	5	250
			150	500	70	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300

LEGEND

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FLA — Full Load Amps
MCA — Minimum Circuit Amps
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*Standard control steps are listed under the Control Step heading. "Free" additional steps of control are optionally available when the number of subcircuits exceeds the standard number of control steps.
†MCA = 1.25 x FLA; for proper wire sizing, refer to Table 310-16 of the NEC (National Electrical Code).

NOTES:
1. Subcircuits are internal heater circuits of 48 amps or less.
2. Electric heat performance is not within the scope of AHRI standard 430 certification.
3. To avoid damage due to overheating, minimum face velocity cannot fall below 350 fpm.
4. Heaters up to (and including) 60 kW have 3 control steps; beyond 60 kW, 6 steps are standard.
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Carrier®

ELECTRIC HEATER DATA (cont)

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
17	16.6	3	30	500	12	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			45	500	17	125	156	3	175	108	135	3	150	54	68	2	70	43	54	1	60	68	86	2	90
			60	500	23	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	75	500	29	208	261	5	300	181	226	4	250	90	113	2	125	72	90	2	100	114	143	3	150
			80	500	31	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	38	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	48	374	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	58	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	67	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
21	21	3	40	500	12	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	15	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	18	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	24	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	30	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	38	374	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	46	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	53	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	61	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			220	500	67	611	764	13	700	530	662	12	700	265	331	6	350	212	265	5	300	335	418	7	450
25	23.3	3	40	500	11	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	14	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	16	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	22	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	27	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	34	374	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	41	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	48	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	55	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			225	500	62	625	782	14	700	542	677	12	700	271	339	6	350	217	271	5	300	342	428	8	450
			250	500	69	695	868	15	700	602	753	13	700	301	376	7	400	241	301	6	350	380	475	8	500
30	29.3	3	40	500	9	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	11	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	13	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	17	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	22	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	27	374	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	33	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	38	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	44	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			225	500	49	625	782	14	700	542	677	12	700	271	339	6	350	217	271	5	300	342	428	8	450
			250	500	54	695	868	15	700	602	753	13	700	301	376	7	400	241	301	6	350	380	475	8	500
			275	500	60	764	955	16	700	662	828	14	700	331	414	7	450	265	331	6	350	418	523	9	600

LEGEND

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MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

*Standard control steps are listed under the Control Step heading. "Free" additional steps of control are optionally available when the number of subcircuits exceeds the standard number of control steps.
†MCA = 1.25 x FLA; for proper wire sizing, refer to Table 310-16 of the NEC (National Electrical Code).

NOTES:
1. Subcircuits are internal heater circuits of 48 amps or less.
2. Electric heat performance is not within the scope of AHRI standard 430 certification.
3. To avoid damage due to overheating, minimum face velocity cannot fall below 350 fpm.
4. Heaters up to (and including) 60 kW have 3 control steps; beyond 60 kW, 6 steps are standard.
5. Heater kW offering is controlled by ***AHU*Builder®**. This table for reference only.

ELECTRIC HEATER DATA (cont)

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
36	38	6	60	500	10	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	13	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	17	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	21	347	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	25	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	29	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	34	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			225	500	38	625	782	14	700	542	677	12	700	271	339	6	350	217	271	5	300	342	428	8	450
			250	500	42	695	868	15	700	602	753	13	700	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	50	834	1042	18	700	723	903	16	700	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	59	973	1216	21	700	843	1054	18	700	421	527	9	600	337	421	8	450	532	666	12	700
40	41.9	6	60	500	9	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	12	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	15	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	19	347	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	23	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	27	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	30	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	38	695	868	15	700	602	753	13	700	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	46	834	1042	18	700	723	903	16	700	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	53	973	1216	21	700	843	1054	18	700	421	527	9	600	337	421	8	450	532	666	12	700
			400	500	61	1112	1390	24	700	963	1204	21	700	482	602	11	700	385	482	9	500	608	761	13	700
50	52.6	6	60	500	7	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	10	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	12	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	15	278	347	6	350	241	301	6	350	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	18	347	434	8	450	301	376	7	400	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	21	417	521	9	600	361	452	8	500	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	24	486	608	11	700	421	527	9	600	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	30	556	695	12	700	482	602	11	700	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	36	695	868	15	700	602	753	13	700	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	42	834	1042	18	700	723	903	16	700	421	527	9	600	337	421	8	450	532	666	12	700
			400	500	49	973	1216	21	700	843	1054	18	700	482	602	11	700	385	482	9	500	608	761	13	700
			450	500	55	1112	1390	24	700	963	1204	21	700	542	677	12	700	434	542	10	600	685	856	15	700
			500	500	61	1251	1563	27	700	1084	1355	23	700	602	753	13	700	482	602	11	700	761	951	16	700
61	63.1	6	60	500	6	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	8	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	10	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	13	347	434	8	450	301	376	7	400	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	15	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	18	486	608	11	700	421	527	9	600	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	20	556	695	12	700	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	25	695	868	15	700	602	753	13	700	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	30	834	1042	18	700	723	903	16	700	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	35	973	1216	21	700	843	1054	18	700	421	527	9	600	337	421	8	450	532	666	12	700
			400	500	40	1112	1390	24	700	963	1204	21	700	482	602	11	700	385	482	9	500	608	761	13	700
			450	500	46	1251	1563	27	700	1084	1355	23	700	542	677	12	700	434	542	10	600	685	856	15	700
			500	500	51	1390	1737	29	700	1204	1505	26	700	602	753	13	700	482	602	11	700	761	951	16	700

LEGEND

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Carrier®

ELECTRIC HEATER DATA (cont)

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
72	73.5	6	60	500	5	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			100	500	9	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			150	500	13	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			200	500	17	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	22	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	26	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	30	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	35	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	39	—	—	—	—	—	—	—	—	542	677	12	700	434	542	10	600	—	—	—	—
			500	500	43	—	—	—	—	—	—	—	—	602	753	13	700	482	602	11	700	—	—	—	—
			550	500	48	—	—	—	—	—	—	—	—	—	—	—	—	530	662	12	700	—	—	—	—
			600	500	52	—	—	—	—	—	—	—	—	—	—	—	—	578	723	13	700	—	—	—	—
85	86.9	6	60	500	4	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			100	500	7	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			150	500	11	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			200	500	15	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	18	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	22	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	26	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	29	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	33	—	—	—	—	—	—	—	—	542	677	12	700	434	542	10	600	—	—	—	—
			500	500	37	—	—	—	—	—	—	—	—	602	753	13	700	482	602	11	700	—	—	—	—
			550	500	40	—	—	—	—	—	—	—	—	—	—	—	—	530	662	12	700	—	—	—	—
			600	500	44	—	—	—	—	—	—	—	—	—	—	—	—	578	723	13	700	—	—	—	—
96	98.0	6	60	500	4	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			100	500	7	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			150	500	10	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			200	500	13	—	—	—	—	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	16	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	20	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	23	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	26	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	29	—	—	—	—	—	—	—	—	542	677	12	700	434	542	10	600	—	—	—	—
			500	500	33	—	—	—	—	—	—	—	—	602	753	13	700	482	602	11	700	—	—	—	—
			550	500	36	—	—	—	—	—	—	—	—	662	828	14	700	530	662	12	700	—	—	—	—
			600	500	39	—	—	—	—	—	—	—	—	723	903	16	700	578	723	13	700	—	—	—	—
			650	500	42	—	—	—	—	—	—	—	—	—	—	—	—	626	783	14	700	—	—	—	—
			700	500	46	—	—	—	—	—	—	—	—	—	—	—	—	674	843	15	700	—	—	—	—
			750	500	49	—	—	—	—	—	—	—	—	—	—	—	—	723	903	16	700	—	—	—	—
110	112.3	6	60	500	3	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			100	500	6	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			150	500	9	417	521	9	600	361	452	8	500	181	226	4	250	145	181	4	200	228	285	5	300
			200	500	11	—	—	—	—	482	602	11	700	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	14	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	17	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	456	570	10	600
			350	500	20	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	23	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	26	—	—	—	—	—	—	—	—	542	677	12	700	434	542	10	600	—	—	—	—
			500	500	28	—	—	—	—	—	—	—	—	602	753	13	700	482	602	11	700	—	—	—	—
			550	500	31	—	—	—	—	—	—	—	—	662	828	14	700	530	662	12	700	—	—	—	—
			600	500	34	—	—	—	—	—	—	—	—	723	903	16	700	578	723	13	700	—	—	—	—
			650	500	37	—	—	—	—	—	—	—	—	—	—	—	—	626	783	14	700	—	—	—	—
			700	500	40	—	—	—	—	—	—	—	—	—	—	—	—	674	843	15	700	—	—	—	—
			750	500	43	—	—	—	—	—	—	—	—	—	—	—	—	723	903	16	700	—	—	—	—

LEGEND

AHRI — Air Conditioning, Heating and Refrigeration Institute
FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

*Standard control steps are listed under the Control Step heading. "Free" additional steps of control are optionally available when the number of subcircuits exceeds the standard number of control steps.
†MCA = 1.25 x FLA; for proper wire sizing, refer to Table 310-16 of the NEC (National Electrical Code).
NOTES:
1. Subcircuits are internal heater circuits of 48 amps or less.
2. Electric heat performance is not within the scope of AHRI standard 430 certification.
3. To avoid damage due to overheating, minimum face velocity cannot fall below 350 fpm.
4. Heaters up to (and including) 60 kW have 3 control steps; beyond 60 kW, 6 steps are standard.
5. Heater kW offering is controlled by *AHU*Builder®. This table for reference only.

Carrier®

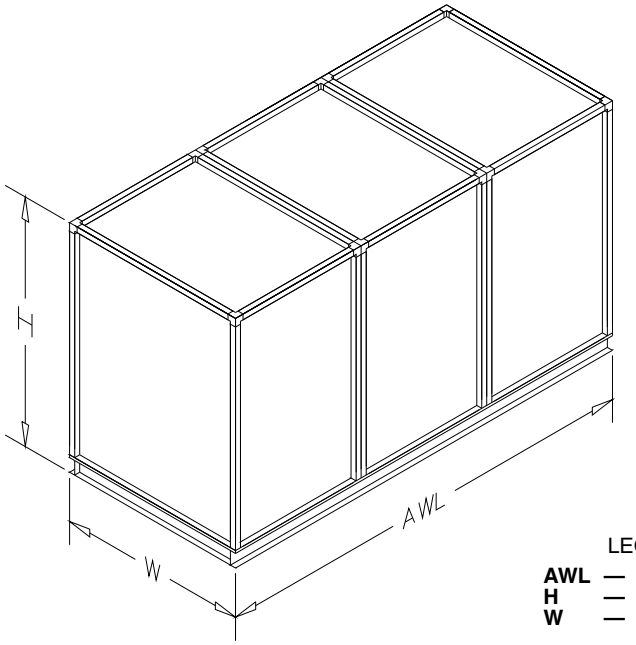
Dimensions

General unit dimensions

39MN INDOOR UNIT

39MN UNIT SIZE	UNIT CASING	
	H (in.)	W (in.)
03	37	33
06	37	46
08	40	54
10	40	67
12	47	67
14	47	72
17	50	79
21	60	79
25	60	86
30	60	104
36	71	109
40	77	109
50	87	117
61	102	117
72	113	120
85	113	139
96	126	139
110	126	157

NOTES:
1. Weights and dimensions are approximate. For more exact dimensions, consult with a local Carrier Sales Engineer or select the desired unit using ***AHU*Builder**® software.
2. All dimensions in inches unless otherwise noted.
3. Unit height based on 6 in. base rail option.

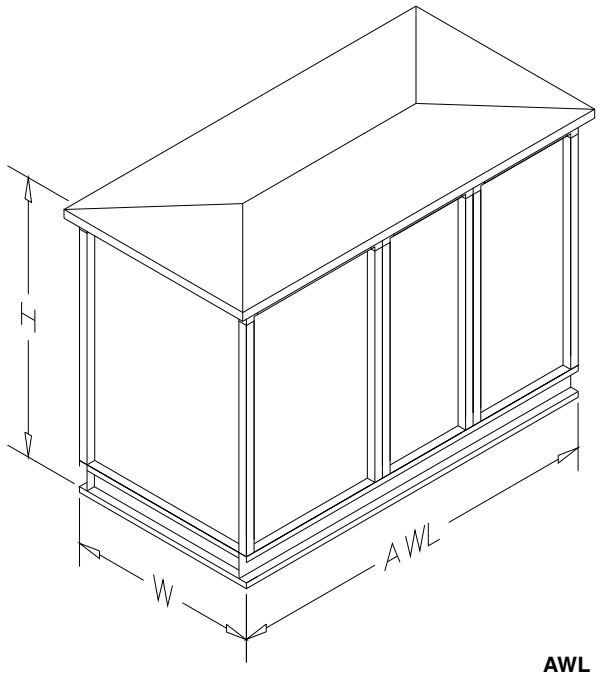


LEGEND
AWL — Airway Length
H — Height
W — Width

39MW OUTDOOR UNIT

39MW UNIT SIZE	UNIT CASING	
	H (in.)	W (in.)
03	41	36
06	41	49
08	44	57
10	44	70
12	51	70
14	51	75
17	54	82
21	64	82
25	64	89
30	64	107
36	75	112
40	81	112
50	91	120
61	106	120
72	117	123
85	117	142
96	130	142
110	130	160

NOTES:
1. Weights and dimensions are approximate. For more exact dimensions, consult with a local Carrier Sales Engineer or select the desired unit using ***AHU*Builder** software.
2. All dimensions in inches unless otherwise noted.
3. Unit height based on 6 in. base rail option.

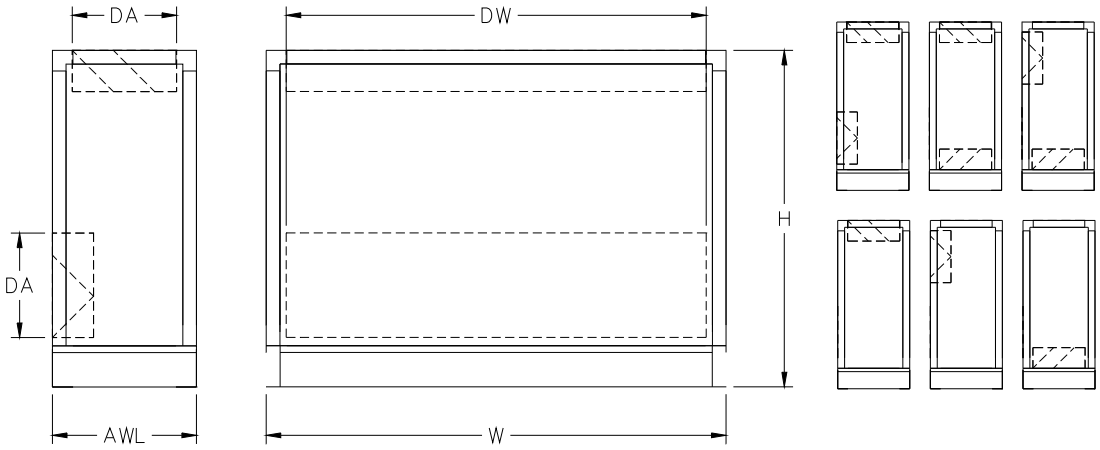


LEGEND
AWL — Airway Length
H — Height
W — Width

Dimensions (cont)

Air distribution components

MIXING BOX



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	18	21	21	21	21	24	24	27	27	27	36	39	42	51	53	53	59	59
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	270	330	370	420	460	520	570	710	760	870	1320	1520	1920	2650	3040	3490	4290	4820

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	18	21	21	21	21	24	24	27	27	27	36	39	42	51	53	53	59	59
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	370	450	510	570	610	690	750	900	960	1090	1580	1790	2220	2980	3380	3830	4650	5180

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted. Field-supplied dampers require 1 1/2 in. flanged damper frame.

SPECIFICATIONS

Top intake not available on 39MW outdoor units.

Mixing boxes shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

FACTORY-INSTALLED OPTIONS

A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of mixing box sections only.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

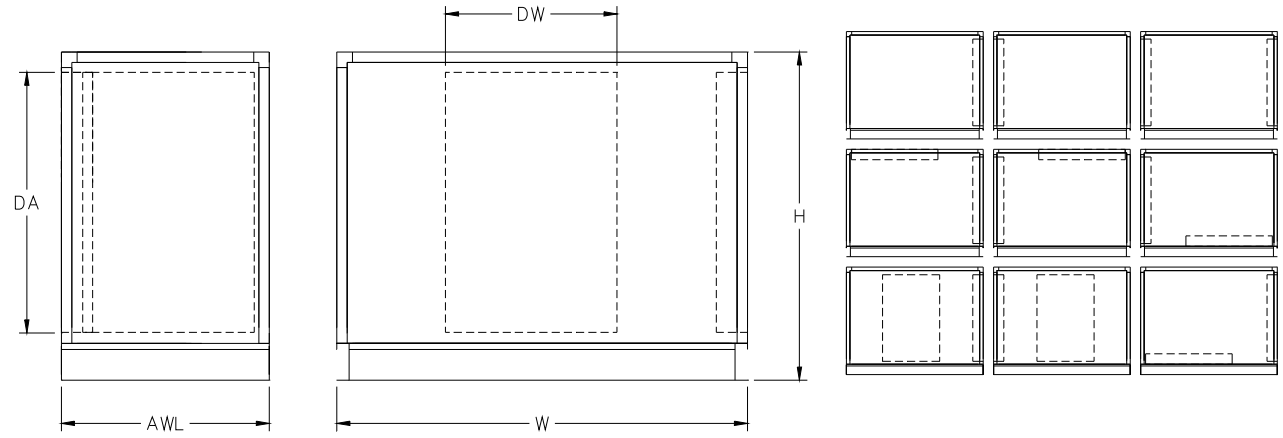
DAMPERS

Mixing boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.

A Standard Dampers — Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.
B. Premium Dampers — Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

Air distribution components (cont)

SIDE INLET MIXING BOX



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	21	27	27	33	33	39	39	39	45	51	57	57	63	63	57	65	65	73
DA	18	26	29	29	36	36	39	49	49	49	60	66	76	91	102	102	115	115
DW	14	20	20	26	26	32	32	32	38	44	50	50	56	56	50	58	58	66
Weight (lb)	300	360	390	470	510	580	640	710	830	1050	1360	1460	1870	2140	2160	2770	3070	3830

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	21	27	27	33	33	39	39	39	45	51	57	57	63	63	57	65	65	73
DA	18	26	29	29	36	36	39	49	49	49	60	66	76	91	102	102	115	115
DW	14	20	20	26	26	32	32	32	38	44	50	50	56	56	50	58	58	66
Weight (lb)	410	490	540	650	690	780	860	930	1080	1350	1690	1790	2240	2510	2510	3150	3450	4240

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted. Field-supplied dampers require $1^1/_2$ in. flanged damper frame.

SPECIFICATIONS

Top intake not available on 39MW outdoor units.

Mixing boxes shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

FACTORY-INSTALLED OPTIONS

A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of mixing box sections only.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

DAMPERS

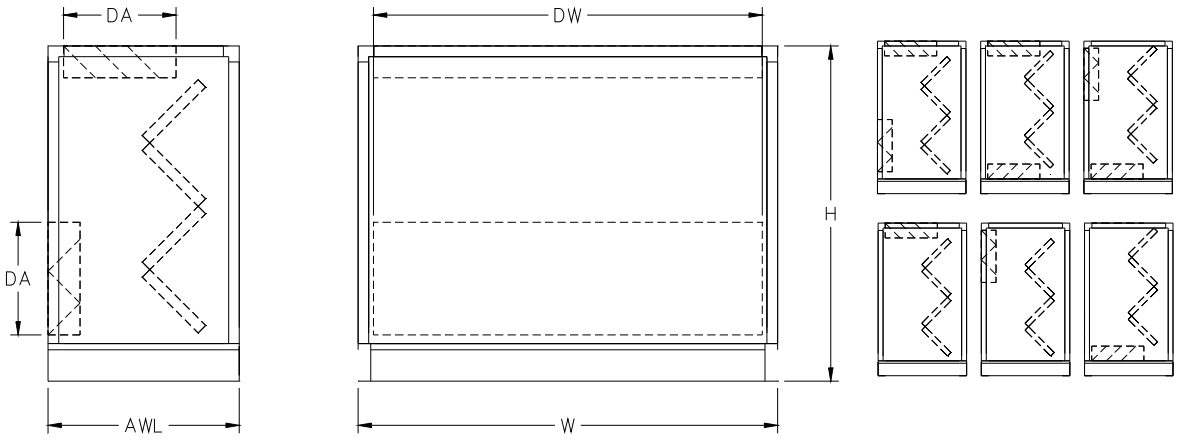
Mixing boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.

A. Standard Dampers — Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.
B. Premium Dampers — Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

Dimensions (cont)

Air distribution components (cont)

FILTER MIXING BOX



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	36	36	36	36	36	36	36	36	36	36	45	48	51	60	79	79	84	84
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	320	380	430	490	540	570	630	720	760	880	1260	1430	1790	2390	3410	3930	4620	5190

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	36	36	36	36	36	36	36	36	36	36	45	48	51	60	79	79	84	84
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	450	530	590	680	730	770	840	930	980	1130	1550	1730	2120	2750	3840	4360	5070	5640

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	—	—	—	—	—	12	—	—	—	—	—	—	—	—	—	—	—
16x20	—	4	—	6	—	—	—	—	—	—	—	—	18	24	56	64	64	72
16x25	2	—	4	—	—	—	—	12	12	16	—	24	12	16	—	—	—	—
20x20	—	—	—	—	6	2	—	—	—	—	—	—	—	—	—	—	—	—
20x24	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—
20x25	—	—	—	—	—	—	—	—	—	—	16	—	—	—	—	—	—	—
Face Area (sq ft)	5.6	8.9	11.1	13.3	16.7	18.9	24.0	33.3	33.3	44.4	55.5	66.7	73.3	97.8	124.4	142.2	142.2	160.0

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted. Field-supplied dampers require 1 1/2 in. flanged damper frame.

SPECIFICATIONS

Top intake not available on 39MW outdoor units.

Filter mixing boxes shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

FILTRATION

A. Flat filter sections shall accept either 2-in. or 4-in. filters. Sections shall include side access slide rails.

B. Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

DAMPERS

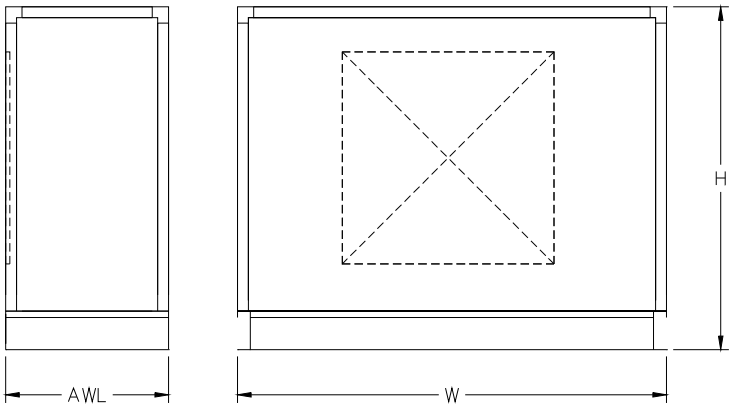
Filter-mixing boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.

A. Standard Dampers — Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

B. Premium Dampers — Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

Air distribution components (cont)

AIR MIXER



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	18	18	18	24	24	24	30	30	30	36	36	42	42	48	60	66	69	74
Weight (lb)	170	190	210	270	290	300	380	430	460	600	720	870	1030	1330	1800	2260	2610	3140

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	18	18	18	24	24	24	30	30	30	36	36	42	42	48	60	66	69	74
Weight (lb)	270	310	340	430	450	470	570	620	660	850	980	1150	1330	1650	2160	2640	3000	3550

LEGEND

AWL — Airway Length
H — Height
W — Width

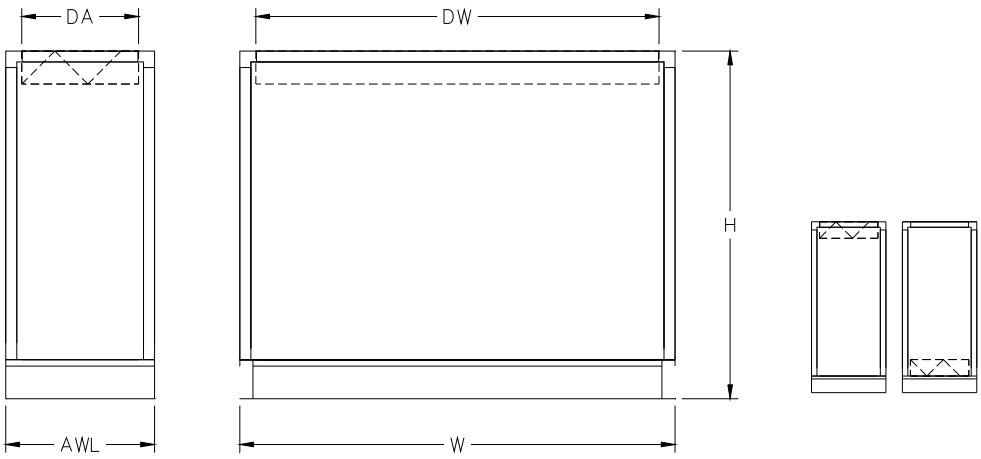
NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Air mixer of .081-in. aluminum construction of size, performance and maximum pressure drop indicated. The air mixer shall mix two or more air-streams of differing temperature to within ± 6° F of theoretical mixed-air temperature and provide a more uniform air velocity contour entering a downstream filter or coil bank.

Dimensions (cont)

Air distribution components (cont)

EXHAUST BOX



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	18	21	21	21	21	24	24	27	27	27	36	39	42	51	53	53	59	59
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	160	190	210	230	250	280	300	370	390	440	650	750	930	1270	1460	1670	2040	2290

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	18	21	21	21	21	24	24	27	27	27	36	39	42	51	53	53	59	59
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	260	310	350	380	400	450	480	560	590	660	910	1020	1230	1600	1800	2010	2400	2650

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted. Field-supplied dampers require 1 1/2 in. flanged damper frame.

SPECIFICATIONS
Upblast discharge not available on 39MW outdoor units.

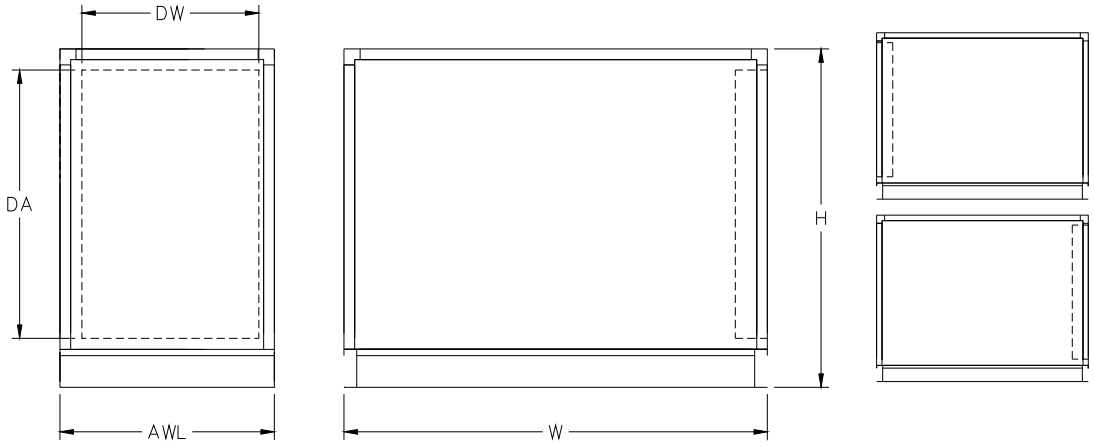
Exhaust boxes shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

DAMPERS
Exhaust boxes shall have parallel or opposed blades.

A. Standard Dampers — Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.
B. Premium Dampers — Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

Air distribution components (cont)

SIDE OUTLET EXHAUST BOX



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	21	27	27	33	33	39	39	39	45	51	57	57	63	63	57	65	65	73
DA	18	26	29	29	36	36	39	49	49	49	60	66	76	91	102	102	115	115
DW	14	20	20	26	26	32	32	32	38	44	50	50	56	56	50	58	58	66
Weight (lb)	300	360	390	470	510	580	640	710	830	1050	1360	1460	1870	2140	2160	2770	3070	3830

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	21	27	27	33	33	39	39	39	45	51	57	57	63	63	57	65	65	73
DA	18	26	29	29	36	36	39	49	49	49	60	66	76	91	102	102	115	115
DW	14	20	20	26	26	32	32	32	38	44	50	50	56	56	50	58	58	66
Weight (lb)	410	490	540	650	690	780	860	930	1080	1350	1690	1790	2240	2510	2510	3150	3450	4240

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted. Field-supplied dampers require $1^1/_2$ in. flanged damper frame.

SPECIFICATIONS
Exhaust boxes shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

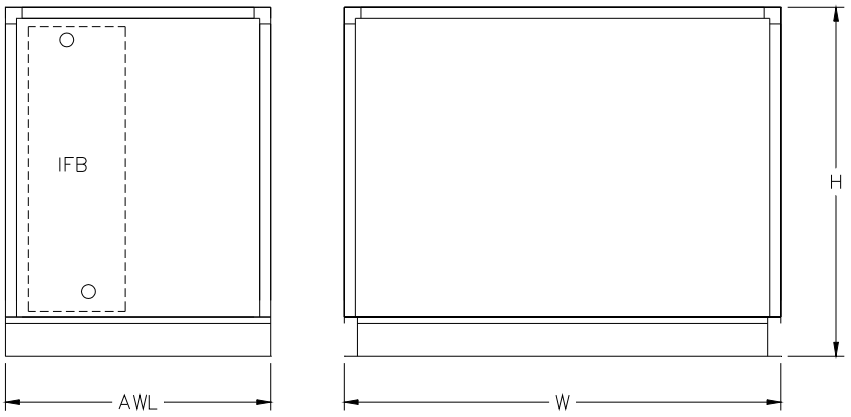
DAMPERS
Exhaust boxes shall have parallel or opposed blades.

A. Standard Dampers — Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.
B. Premium Dampers — Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

Dimensions (cont)

Air distribution components (cont)

INTEGRAL FACE AND BYPASS HEATING COIL SECTION



INDOOR 39MN UNIT SIZE	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																	
H	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	280	310	340	360	380	410	450	470	530	620	650	750	850	940	1060	1160	1290

OUTDOOR 39MW UNIT SIZE	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																	
H	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	450	500	560	580	610	650	690	720	820	920	950	1070	1170	1260	1380	1480	1610

LEGEND

AWL — Airway Length
H — Height
IFB — Integral Face and Bypass
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
All coil sections shall be solid double-wall construction of galvanized steel inner and outer panels and insulation. The panel assemblies shall not carry an R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

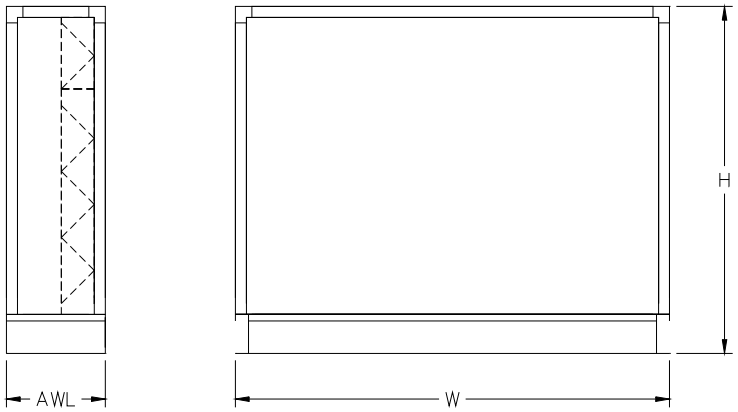
Integral face and bypass coils shall be capable of maintaining a constant air volume, within 5%, shall be capable of maintaining a constant leaving air temperature as entering air conditions vary, and shall be capable of producing mixed leaving air temperatures within three feet downstream with a maximum variance in air temperature of 5° F, regardless of damper position. When no heating is required, dampers shall divert air to bypass around heating surface with minimal temperature override. Coil casing, dampers and baffles shall be fabricated from galvanized steel with an option for stainless steel. Coils shall be tested at 300 psig.

Integral face and bypass coils are provided with a connection point for field-mounted actuator(s), electrical or pneumatic, or can be provided from the factory at an additional cost. Actuator connection point is mechanically attached to dampers via linkage mechanisms. Dampers are interconnected for operation simultaneously across each face of coil.

See the guide specifications on pages 80-107 for coil detail options.

Air distribution components (cont)

INTERNAL FACE AND BYPASS DAMPER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Weight (lb)	130	150	170	190	200	210	230	250	270	300	350	380	440	490	540	610	670	740

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Weight (lb)	230	270	300	340	350	360	390	410	440	500	550	580	650	700	750	820	880	950

LEGEND

AWL — Airway Length
H — Height
W — Width

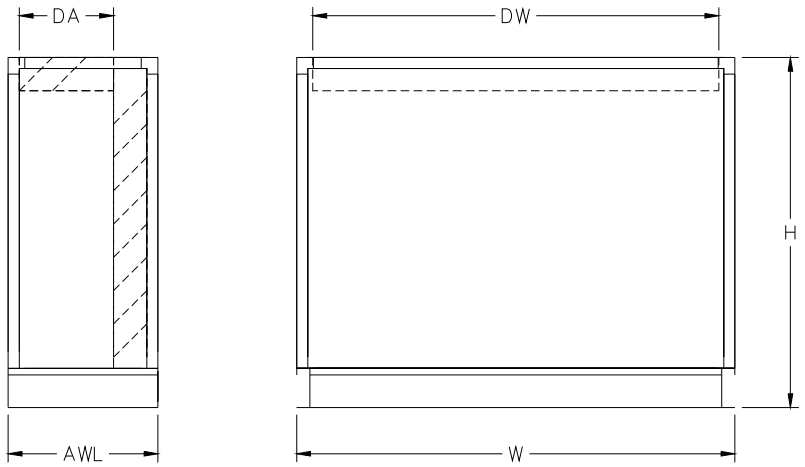
NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Internal face and bypass dampers shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with high temperature blade and edge seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. To eliminate blade warping, face dampers shall be sectionalized to limit blade length to 60 in. maximum. Face damper blades shall be opposed and arranged to match coil face with top bypass, and internal linkage.

Dimensions (cont)

Air distribution components (cont)

EXTERNAL FACE AND BYPASS DAMPER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	18	21	21	21	21	24	24	27	27	27	33	33	39	45	53	53	59	59
DA	10 3/4	14	14	14	14	16 3/4	16 3/4	20	20	20	29	32	35	44	46	46	52	52
DW	25 3/4	38 3/4	46 3/4	59 3/4	59 3/4	64 3/4	71 3/4	71 3/4	78 3/4	96 3/4	101 3/4	101 3/4	109 3/4	109 3/4	113	132	132	150
Weight (lb)	140	160	180	190	200	220	240	280	300	330	450	470	630	810	1050	1200	1460	1630

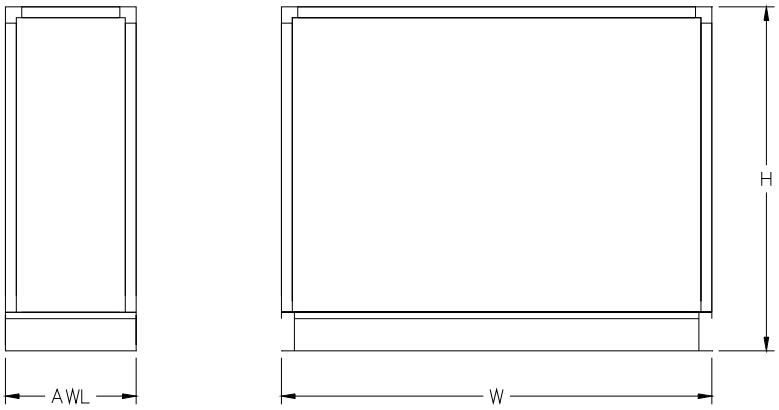
LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

SPECIFICATIONS
External face and bypass dampers not available on outdoor unit.
External face and bypass dampers shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with high temperature blade and edge seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Bypass damper shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rod rotating in self-lubricating synthetic bearings. Face damper blades shall be opposed with top bypass, and internally mounted linkage.

Plenum sections

PLENUM SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	120	140	150	170	180	190	200	220	230	260	310	320	370	420	460	520	570	630
AWL	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Weight (lb)	140	160	180	190	210	210	230	260	270	300	350	370	430	480	530	590	650	720
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	170	190	210	230	240	250	270	300	320	350	410	430	490	550	600	680	740	820
AWL	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	210	240	260	280	300	310	340	380	400	440	510	540	620	700	760	860	940	1040
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	250	280	310	340	360	380	410	450	470	530	620	650	750	850	920	1040	1140	1260

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	210	250	270	300	310	330	350	370	380	440	490	500	560	610	650	710	760	820
AWL	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Weight (lb)	240	280	310	340	360	360	390	420	440	500	550	570	640	690	740	800	860	930
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	280	320	350	390	400	420	450	480	510	560	630	650	730	790	840	920	980	1060
AWL	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	340	390	420	470	490	510	550	590	620	690	770	800	900	980	1040	1140	1220	1320
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	400	450	500	560	580	610	650	690	720	820	920	950	1070	1170	1240	1360	1460	1580

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

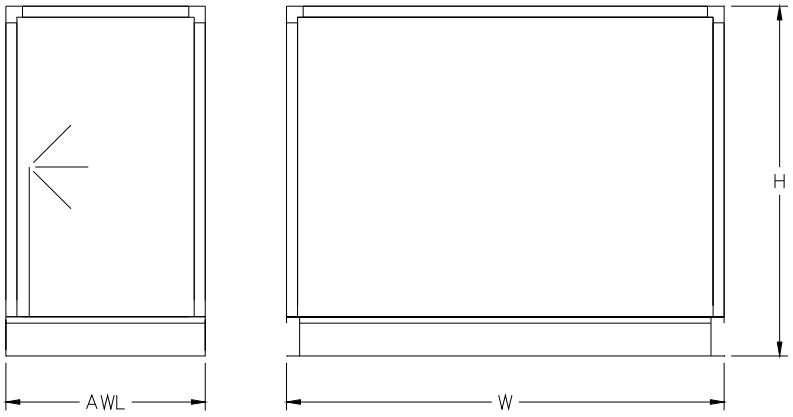
SPECIFICATIONS
Plenum and access sections shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged doublewall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

Optionally, drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.

Dimensions (cont)

Plenum sections (cont)

HUMIDIFIER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	287	340	380	420	460	490	540	600	640	734	870	930	1080	1230	1350	1540	1700	1890
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	327	380	430	480	520	550	600	680	720	824	970	1040	1210	1380	1510	1720	1890	2110

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	410	490	540	610	650	690	750	810	860	990	1130	1190	1360	1510	1630	1820	1980	2170
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	470	550	620	700	740	780	840	920	970	1120	1270	1340	1530	1700	1830	2040	2210	2430

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

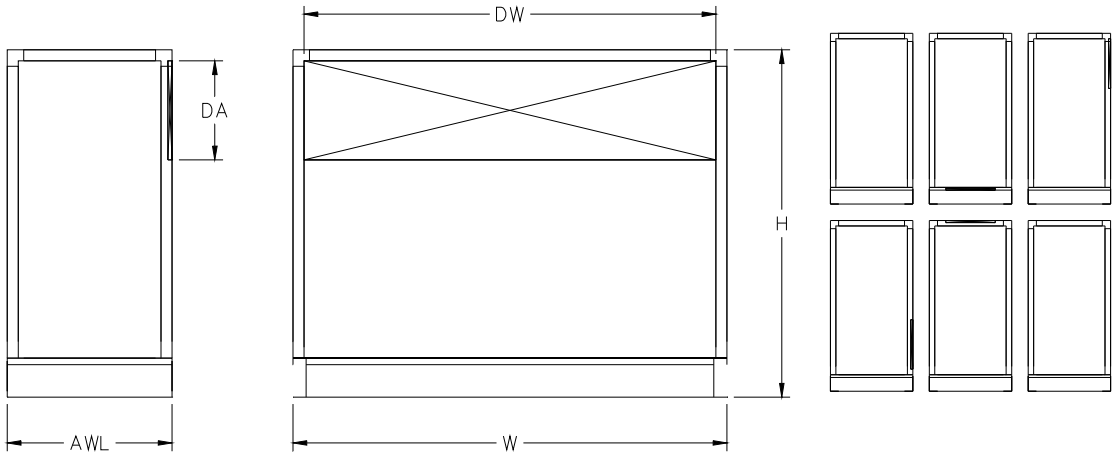
SPECIFICATIONS
Humidifier sections shall have double-wall, insulated, galvanized steel floors. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option.

Optionally, drain pans shall be constructed of insulated double-wall galvanized or stainless steel. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each section. Drain pan shall not allow standing water and shall comply with ASHRAE Standard 62.

Each humidifier shall consist of multiple, vertical steam discharge pipes, supported on horizontal header manifolds, spaced to provide the optimum of steam to air contact while minimizing pressure drop. Each humidifier shall be sized to nominally match the air plenum width and height for maximum contact of the discharging steam to the air passing around the vertical steam discharge pipes.

Plenum sections (cont)

→ HORIZONTAL BLOW-THRU DISCHARGE PLENUM SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	24	24	24	24	24	24	30	30	30	33	33	36	36	34	34	38	38
DA	20	20	20	20	20	20	20	26	26	26	29	29	32	32	30	30	34	34
DW	29	42	50	63	63	68	75	75	82	100	105	105	113	113	116	135	135	153
Weight (lb)	170	200	220	240	260	270	300	380	410	460	590	630	790	900	940	1070	1310	1460

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	24	24	24	24	24	24	24	30	30	30	33	33	36	36	34	34	38	38
DA	20	20	20	20	20	20	20	26	26	26	29	29	32	32	30	30	34	34
DW	29	42	50	63	63	68	75	75	82	100	105	105	113	113	116	135	135	153
Weight (lb)	280	330	360	400	420	440	480	570	610	690	840	880	1070	1180	1210	1340	1590	1740

LEGEND

AWL — Airway Length
DA — Duct Depth
DW — Duct Width
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

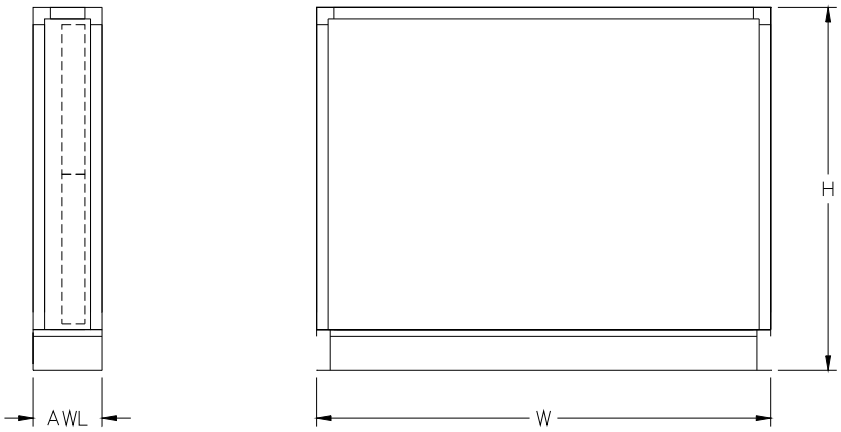
SPECIFICATIONS
Upblast discharge not available on 39MW outdoor units.

Blow-thru plenum sections shall have double-wall, insulated, galvanized steel floors. Discharge options include: field cut, bottom, front upper, front lower, top, and full face. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

Dimensions (cont)

Filtration components

HORIZONTAL, FLAT FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	190	230	260	300	330	340	380	430	460	530	630	680	800	910	1000	1140	1260	1410

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	280	340	380	430	460	480	530	580	610	710	810	860	990	1100	1190	1330	1450	1600

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
16x20	—	—	—	—	6	3	—	—	—	—	—	—	—	14	33	38	24	27
16x25	—	—	3	—	—	—	—	—	—	—	—	—	—	14	—	—	—	—
20x20	—	—	—	—	—	3	6	—	—	—	—	—	—	—	—	—	—	—
20x24	—	—	—	—	—	—	—	—	8	10	—	—	—	—	—	—	—	—
20x25	1	2	—	3	—	—	—	6	—	—	12	13	15	—	—	—	12	14
Face Area (sq ft)	3.5	6.9	8.3	10.4	13.3	15.0	16.7	20.8	26.7	33.3	41.7	45.1	52.1	70.0	73.3	84.4	95.0	108.6

LEGEND

AWL — Airway Length
H — Height
W — Width

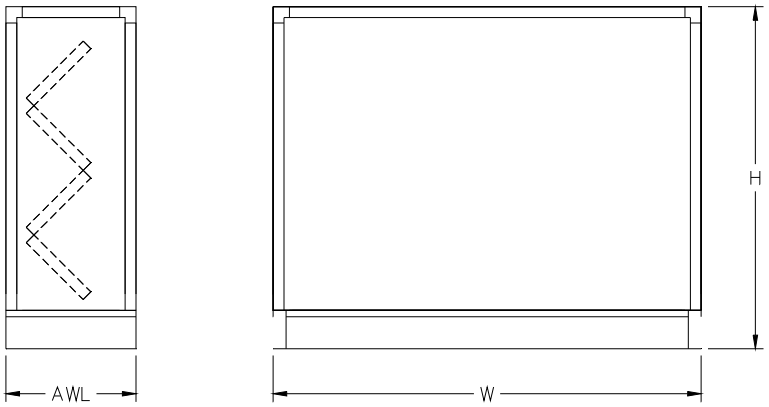
NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Flat filter sections shall accept either 2-in. or 4-in. filters. Sections shall include side access slide rails.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

Filtration components (cont)

HORIZONTAL, ANGLE FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	27	27	27	27
Weight (lb)	230	270	310	350	390	400	450	510	540	620	790	790	920	1060	1290	1470	1630	1820

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	27	27	27	27
Weight (lb)	340	400	450	510	550	570	630	690	730	830	1020	1010	1160	1300	1540	1720	1880	2070

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	—	—	—	—	—	12	—	—	—	—	—	—	—	—	—	—	—
16x20	—	4	—	6	—	—	—	—	—	—	—	—	18	24	56	64	64	72
16x25	2	—	4	—	—	—	—	12	12	16	—	24	12	16	—	—	—	—
20x20	—	—	—	—	6	2	—	—	—	—	—	—	—	—	—	—	—	—
20x24	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—
20x25	—	—	—	—	—	—	—	—	—	—	16	—	—	—	—	—	—	—
Face Area (sq ft)	5.6	8.9	11.1	13.3	16.7	18.9	24.0	33.3	33.3	44.4	55.5	66.7	73.3	97.8	124.4	142.2	142.2	160.0

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

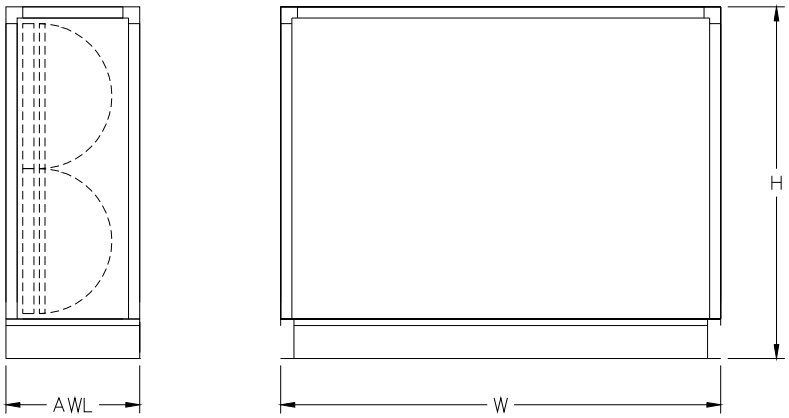
SPECIFICATIONS
Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

Dimensions (cont)

Filtration components (cont)

HORIZONTAL, SHORT BAG/SIDE LOADING CARTRIDGE FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	230	270	310	350	390	400	450	510	540	620	740	790	920	1060	1160	1320	1460	1630

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	340	400	450	510	550	570	630	690	730	830	960	1010	1160	1300	1400	1560	1700	1870

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	1	—	1	3	3	3	—	—	—	4	4	3	7	4	4	9	6
24x24	1	1	2	2	2	2	3	6	6	8	8	8	12	12	16	20	20	24
Face Area (sq ft)	4	6	8	10	14	14	18	24	24	32	40	40	54	62	72	88	98	108

LEGEND

AWL — Airway Length
H — Height
W — Width

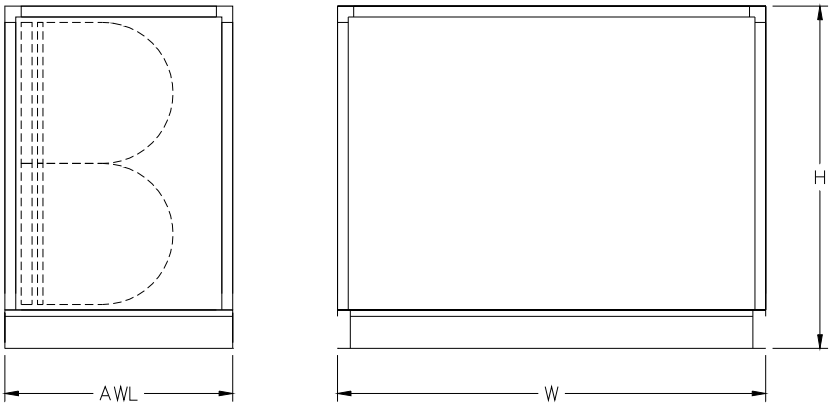
NIOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 6-in. to 12-in. deep rigid media or bag filters.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

Filtration components (cont)

HORIZONTAL, LONG BAG/SIDE LOADING CARTRIDGE FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Weight (lb)	300	350	390	440	480	500	560	630	670	760	900	960	1120	1270	1400	1590	1750	1950

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Weight (lb)	440	510	570	640	680	710	780	850	910	1030	1180	1240	1420	1570	1700	1890	2050	2250

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	1	—	1	3	3	3	—	—	—	4	4	3	7	4	4	9	6
24x24	1	1	2	2	2	2	3	6	6	8	8	8	12	12	16	20	20	24
Face Area (sq ft)	4	6	8	10	14	14	18	24	24	32	40	40	54	62	72	88	98	108

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

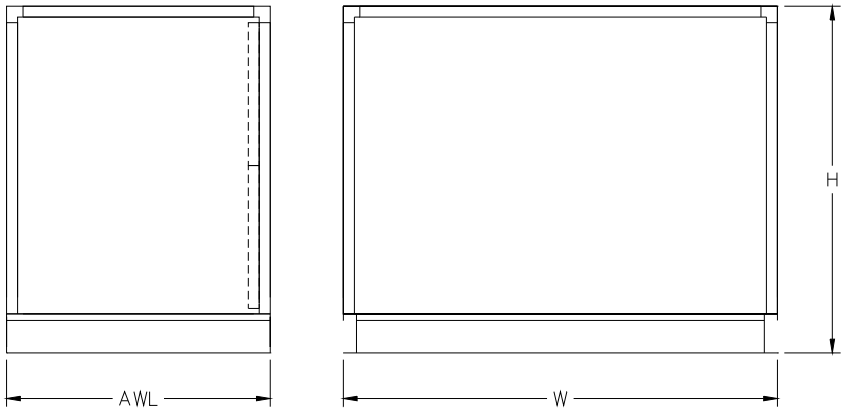
SPECIFICATIONS
Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 12-in. to 30-in. deep rigid media or bag filters.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

Dimensions (cont)

Filtration components (cont)

HORIZONTAL, BAG/FRONT LOADING CARTRIDGE FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	320	370	420	470	510	540	590	670	710	810	960	1020	1190	1360	1490	1690	1870	2080

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	470	540	610	690	730	770	830	910	960	1100	1260	1320	1510	1680	1810	2010	2190	2400

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	1	—	1	2	3	3	—	—	—	4	4	3	7	4	4	9	6
24x24	1	1	2	2	2	2	3	6	6	8	8	8	12	12	16	20	20	24
Face Area (sq ft)	4	6	8	10	12	14	18	24	24	32	40	40	54	62	72	88	98	108

LEGEND

AWL — Airway Length
H — Height
W — Width

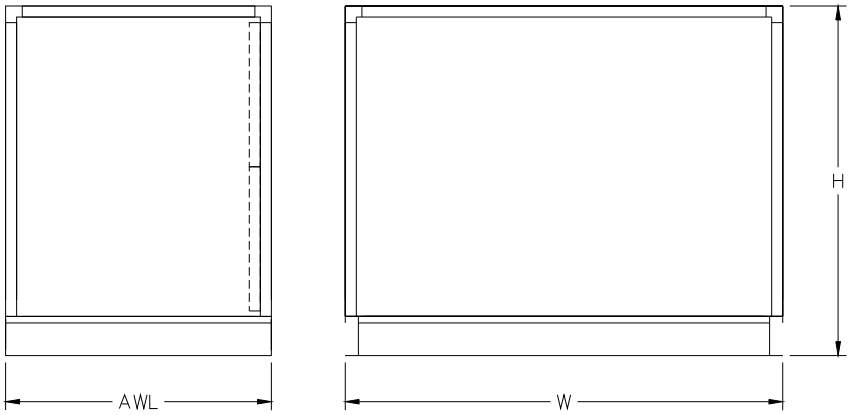
NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Blow-thru bag/cartridge filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep rigid media (headered or box) or bag filters.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of bag/cartridge filter sections only.

Filtration components (cont)

HORIZONTAL, BLOW-THRU FRONT LOADING HEPA FILTER SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	320	370	420	470	510	540	590	670	710	810	960	1020	1190	1360	1490	1690	1870	2080

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Weight (lb)	470	540	610	690	730	770	830	910	960	1100	1260	1320	1510	1680	1810	2010	2190	2400

FILTER SIZES (Qty)	39M UNIT SIZE																	
	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
12x24	—	1	—	1	2	3	3	—	—	—	4	4	3	7	4	4	9	6
24x24	1	1	2	2	2	2	3	6	6	8	8	8	12	12	16	20	20	24
Face Area (sq ft)	4	6	8	10	12	14	18	24	24	32	40	40	54	62	72	88	98	108

LEGEND

AWL — Airway Length
H — Height
HEPA — High-Efficiency Particulate Air
W — Width

NOTE: All dimensions in inches unless otherwise noted.

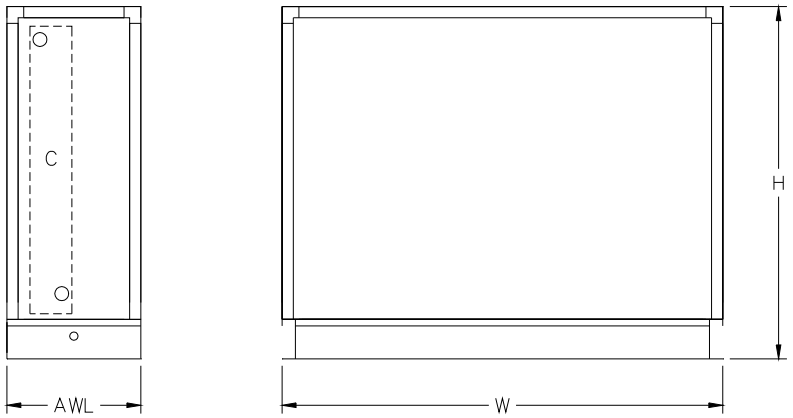
SPECIFICATIONS
Blow-thru HEPA filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep HEPA box filters.

Filter types as shown on the equipment schedule. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of bag/cartridge filter sections only.

Dimensions (cont)

Heat transfer sections

COOLING COIL SECTION WITH DRAIN PAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	170	190	210	230	240	250	270	300	320	350	410	430	490	550	600	680	740	820

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	280	320	350	390	400	420	450	480	510	560	630	650	730	790	840	920	980	1060

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Coil face areas available:
— Large
— Medium
— Bypass

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

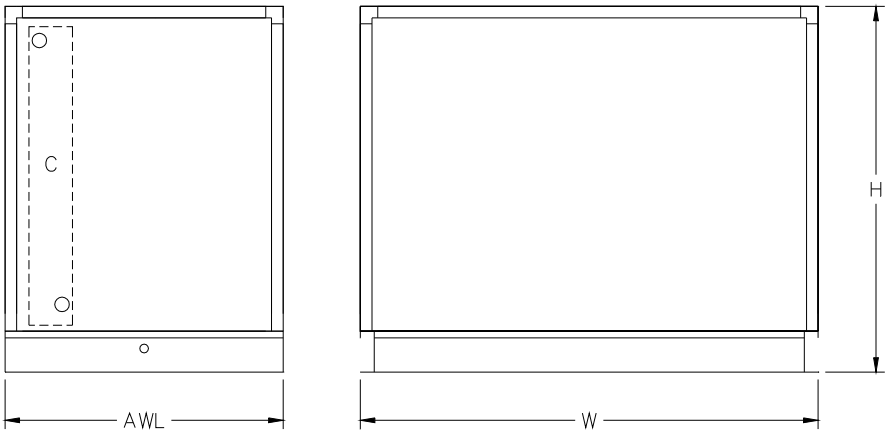
Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and shall comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Heat transfer sections (cont)

EXTENDED LENGTH COOLING COIL SECTION WITH DRAIN PAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	42	42	42	42	42	42	42	48	48	48	48	54	60	72	60	60	66	66
Weight (lb)	230	260	290	310	340	350	380	450	480	540	630	730	930	1230	1160	1310	1570	1750

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	42	42	42	42	42	42	42	48	48	48	48	54	60	72	60	60	66	66
Weight (lb)	370	420	470	510	540	560	600	690	730	830	930	1050	1290	1630	1520	1670	1950	2130

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Coil face areas available:
- — Large
- — Large with external bypass return (indoor only)
- — Medium
- — Medium with external bypass return (indoor only)
- — Bypass

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and shall comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

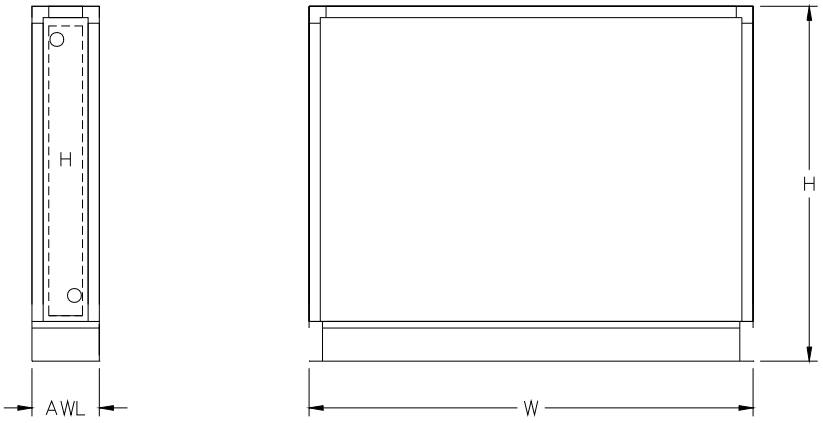
Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Dimensions (cont)

Heat transfer sections (cont)

HEATING COIL SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	120	140	150	170	180	190	200	220	230	260	310	320	370	420	460	520	570	630

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Weight (lb)	210	250	270	300	310	330	350	370	380	440	490	500	560	610	650	710	760	820

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Coil face areas available:
— Large
— Medium
— Bypass

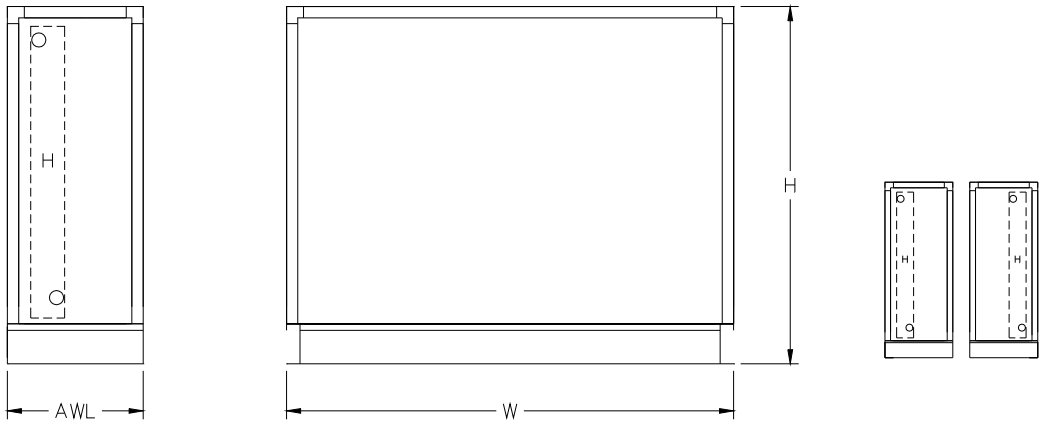
All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Heat transfer sections (cont)

EXTENDED LENGTH HEATING COIL SECTION



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	170	190	210	230	240	250	270	300	320	350	410	430	490	550	600	680	740	820

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Weight (lb)	280	320	350	390	400	420	450	480	510	560	630	650	730	790	840	920	980	1060

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS

Coil face areas available:
- — Large
- — Medium
- — Bypass

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

Optional drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each coil section. Drain pan shall allow no standing water and shall comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

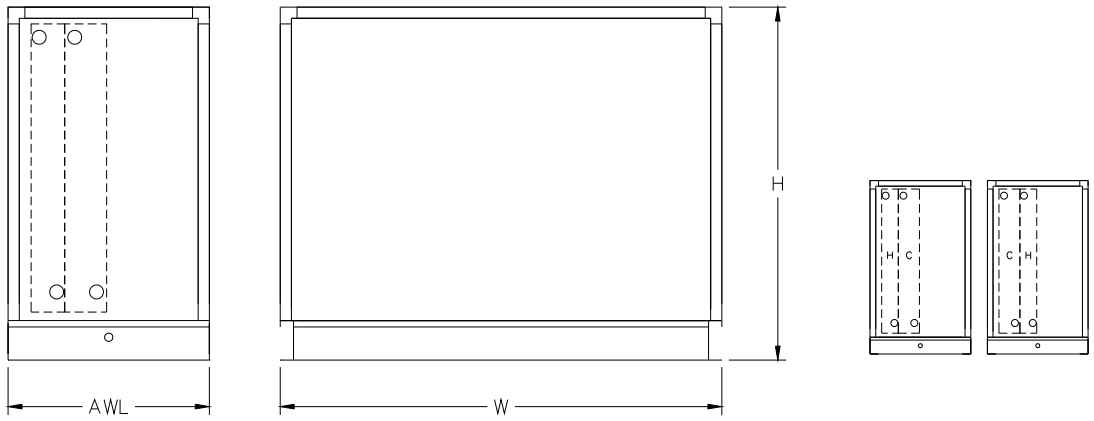
Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Dimensions (cont)

Heat transfer sections (cont)

DUAL COIL SECTION WITH DRAIN PAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36
Dimensions (in.)											
H	37	37	40	40	47	47	50	60	60	60	71
W	33	46	54	67	67	72	79	79	86	104	109
AWL	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	210	240	260	280	300	310	340	380	400	440	510

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36
Dimensions (in.)											
H	41	41	44	44	51	51	54	64	64	64	75
W	36	49	57	70	70	75	82	82	89	107	112
AWL	36	36	36	36	36	36	36	36	36	36	36
Weight (lb)	340	390	420	470	490	510	550	590	620	690	770

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Coil face areas available:
— Large
— Medium

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

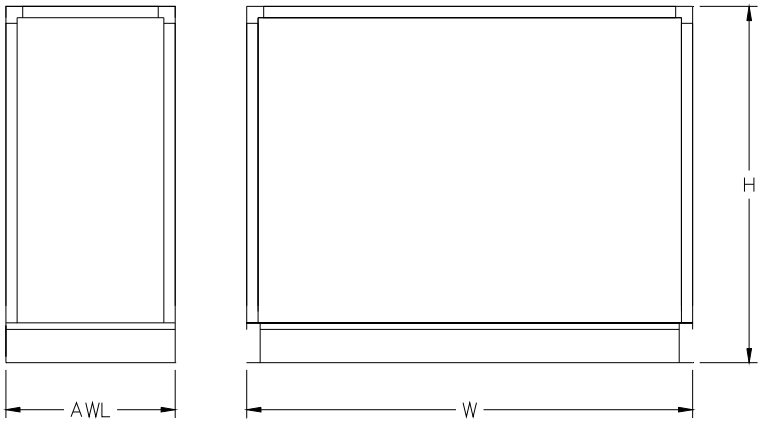
Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each coil section. Drain pan shall allow no standing water and shall comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Heat transfer sections (cont)

ELECTRIC HEAT SECTION (LOW AMPERAGE WITH CONTROL BOX)



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	24	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Weight (lb)	180	240	280	320	350	370	410	470	500	580	700	740	880	1010	1110	1270	1400	1570

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	36	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Weight (lb)	300	390	440	510	540	570	620	680	720	830	980	1020	1180	1310	1410	1570	1700	1870

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
The electric heater casing is constructed of galvanized steel. All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. Heater control box access door shall be mounted on the designated hand side of the unit. Element construction as follows:

A. Open-wire type, 80% nickel, 20% chromium resistance coils, insulated by Steatite bushings and supported in a galvanized steel frame. Bushings shall be recessed into embossed openings and stacked into supporting brackets, spaced no more than 4-in. centers. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
B. Sheathed type, 80% nickel, 20% chromium resistance coils, suspended in a magnesium oxide insulator fill within a tubular steel sheath/brazed fin assembly. Silicone rubber end seals shall prevent contamination of the interior, and the exterior shall be protected from corrosion by a high temperature aluminum coating. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.

The manufacturer shall furnish an integral control box containing thermal cutouts, primary control, sub-circuit fusing, airflow switch, and fused control transformer.

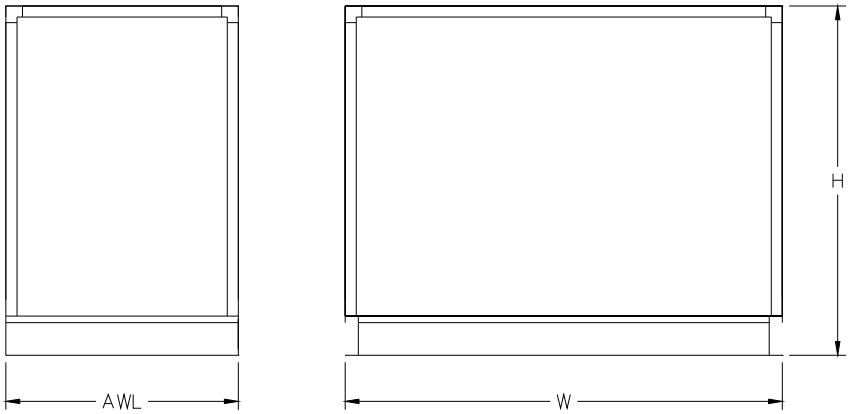
Electric heaters shall be UL listed for zero clearance and shall meet all applicable National Electric Code requirements.

Units with electric heat sections shall be listed under UL 1995 Standard for Safety.

Dimensions (cont)

Heat transfer sections (cont)

ELECTRIC HEAT SECTION (HIGH AMPERAGE WITH CONTROL BOX)



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL	36	36	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Weight (lb)	180	220	290	340	380	400	450	530	560	660	800	860	1020	1180	1300	1500	1660	1860

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL	48	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Weight (lb)	320	380	480	560	600	630	690	770	810	950	1120	1180	1360	1520	1640	1840	2000	2200

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
The electric heater casing is constructed of galvanized steel. All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. Heater control box access door shall be mounted on the designated hand side of the unit. Element construction as follows:

A. Open-wire type, 80% nickel, 20% chromium resistance coils, insulated by Steatite bushings and supported in a galvanized steel frame. Bushings shall be recessed into embossed openings and stacked into supporting brackets, spaced no more than 4-in. centers. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
B. Sheathed type, 80% nickel, 20% chromium resistance coils, suspended in a magnesium oxide insulator fill within a tubular steel sheath/brazed fin assembly. Silicone rubber end seals shall prevent contamination of the interior, and the exterior shall be protected from corrosion by a high temperature aluminum coating. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.

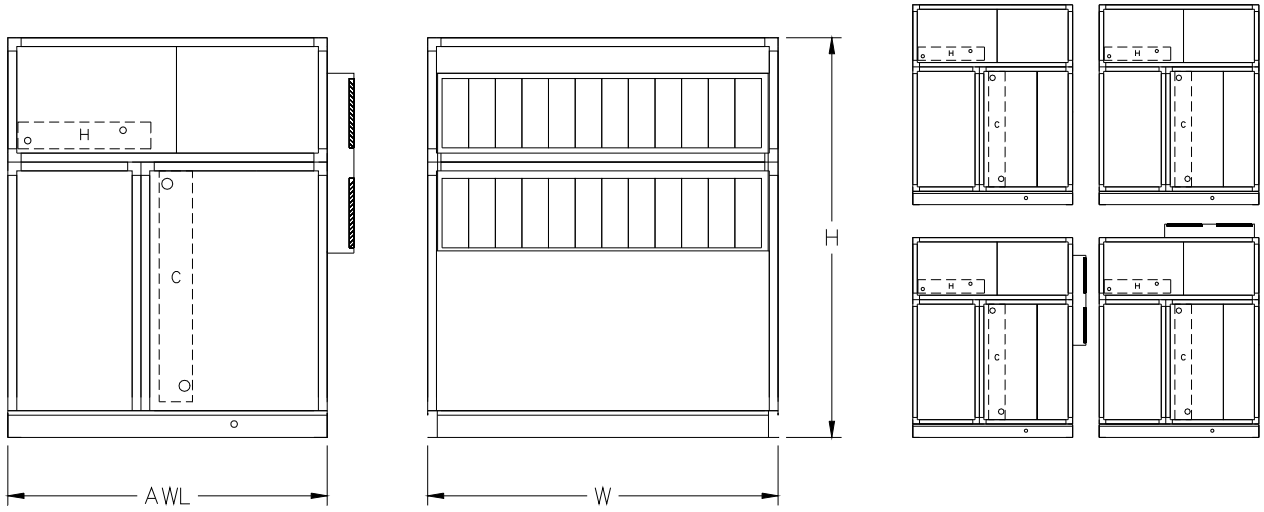
The manufacturer shall furnish an integral control box containing thermal cutouts, primary control, sub-circuit fusing, airflow switch, and fused control transformer.

Electric heaters shall be UL listed for zero clearance and shall meet all applicable National Electric Code requirements.

Units with electric heat sections shall be listed under UL 1995 Standard for Safety.

Heat transfer sections (cont)

MULTIZONE/DUAL DUCT HEATING/COOLING COIL SECTION WITH DRAIN PAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61
Dimensions (in.)														
H	—	59	62	62	69	69	72	88	88	88	99	105	117	138
W	—	46	54	67	67	72	79	79	86	104	109	109	117	117
AWL	—	48	48	48	60	60	60	72	72	72	84	90	102	120
Zones	—	6	7	10	10	10	12	12	13	16	17	17	18	18
Weight (lb)	—	570	620	690	820	850	920	1180	1250	1430	1840	2030	2630	3500
Quantity of Extension Shaft Kits	—	4	4	6	6	6	7	7	8	10	10	10	12	12

LEGEND

AWL — Airway Length
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Multizone/dual duct heating/cooling coil section with drain pan not available on outdoor unit.

Coil face areas available:
- — Large - Cooling Coil
- — Medium - Cooling Coil
- — Small - Heating Coil

Duct Arrangement:
- — Dual Duct Top Discharge
- — Dual Duct Front Discharge
- — Multizone Top Discharge
- — Multizone Front Discharge

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

Multizone dampers (if supplied) shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with blade and edge seals. Axles shall have self-lubricating nylon bearings. Linkage shall have external connections. Number of zones shall vary by size of section.

Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.

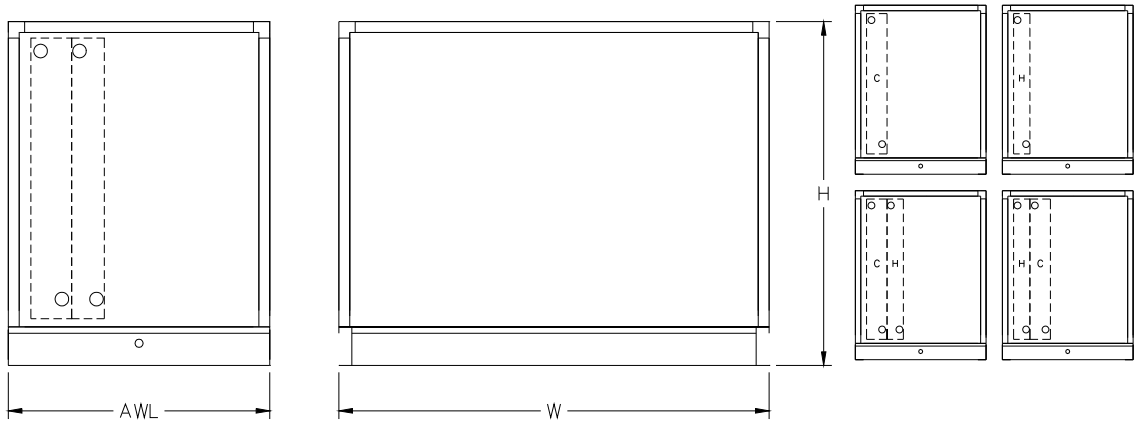
Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Dimensions (cont)

Heat transfer sections (cont)

VERTICAL COIL SECTION WITH DRAIN PAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61
Dimensions (in.)														
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117
AWL														
FC	42	42	36	36	42	48	48	48	60	60	60	60	66	66
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78
Weight (lb)	250	290	290	320	370	420	460	510	630	722	860	980	1240	1520

LEGEND

AF — Airfoil
AWL — Airway Length
FC — Forward Curved
H — Height
W — Width

NOTES:
1. All dimensions in inches unless otherwise noted.
2. Dual coil arrangements are not available on sizes 40, 50 or 61.

SPECIFICATIONS
Vertical coil section with drain pan not available on outdoor unit.

Coil face areas available:
— Large
— Medium
— Bypass

All coil sections shall be solid double-wall construction of galvanized steel with insulation sealed between the inner and outer panels. The panel assemblies shall not carry a resultant minimum R-value of less than 13. Coil sections shall have removable frame sections to facilitate vertical coil extraction.

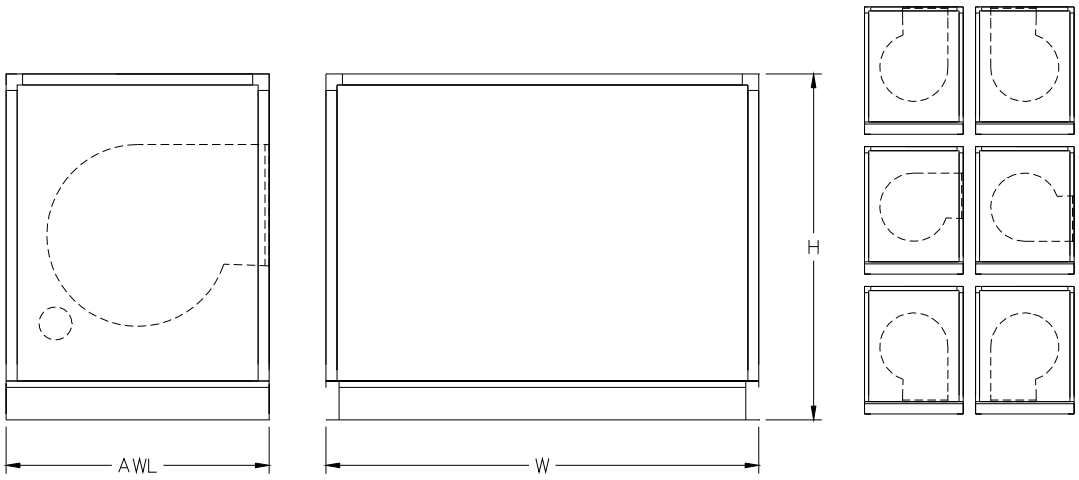
Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have a $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

See the guide specifications on pages 80-107 for coil detail options.

Fan motor sections

HORIZONTAL DRAW-THRU SUPPLY FAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	77	83	83	83
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	77	83	83	92
AF DB	42	42	42	42	48	54	54	54	66	66	60	66	72	78	77	83	83	92
Weight (lb)																		
FC	480	550	640	700	810	910	990	1100	1360	1560	1840	1960	2480	2830	3560	4350	4800	5370
AF	550	620	640	700	810	900	990	1100	1360	1560	1840	2120	2670	3270	3560	4350	4800	5910
AF DB	550	620	670	740	850	940	1030	1150	1400	1600	1750	2010	2520	3080	3350	4090	4510	5550

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	77	83	83	83
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	77	83	83	92
AF DB	42	42	42	42	48	54	54	54	66	66	60	66	72	78	77	83	83	92
Weight (lb)																		
FC	590	690	800	890	1010	1140	1230	1340	1650	1890	2180	2300	2860	3210	3980	4790	5240	5810
AF	690	780	800	890	1010	1130	1230	1340	1650	1890	2180	2480	3070	3700	3980	4790	5240	6390
AF DB	690	780	850	940	1070	1180	1290	1410	1700	1950	2090	2370	2920	3510	3770	4530	4950	6030

LEGEND

AF — Airfoil
AWL — Airway Length
DB — Downblast
FC — Forward Curved
H — Height
W — Width

NOTES: All dimensions in inches unless otherwise noted.

Fan airway length based on standard diameter fan with a top horizontal front discharge. Other fan diameters or discharge locations may affect airway lengths. Please consult ***AHU*Builder®** for exact dimensions.

Upblast fans not available for 39MW outdoor units.

SPECIFICATIONS

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.

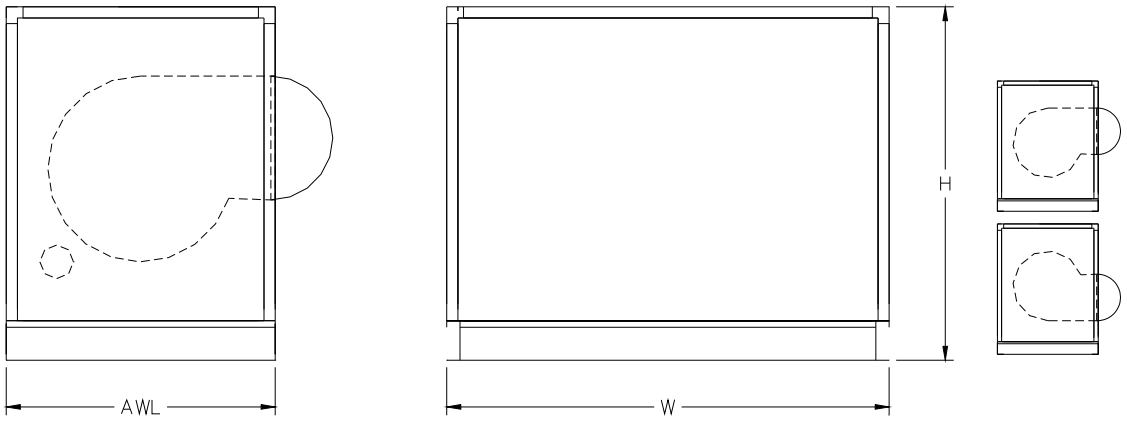
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Dimensions (cont)

Fan motor sections (cont)

HORIZONTAL BLOW-THRU SUPPLY FAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	480	550	640	700	810	910	990	1100	1360	1560	1840	1960	2480	2830	3520	4250	4700	5250
AF	550	620	640	700	810	900	990	1100	1360	1560	1840	2120	2670	3270	3520	4250	4700	5070

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	590	690	800	890	1010	1140	1230	1340	1650	1890	2180	2300	2860	3210	3940	4690	5140	5690
AF	690	780	800	890	1010	1130	1230	1340	1650	1890	2180	2480	3070	3700	3940	4690	5140	5500

LEGEND

AF — Airfoil
AWL — Airway Length
FC — Forward Curved
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS

Fan airway length based on standard diameter fan with a top horizontal front discharge. Other fan diameters or discharge locations may affect airway lengths. Please consult ***AHU*Builder®** for exact dimensions.

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

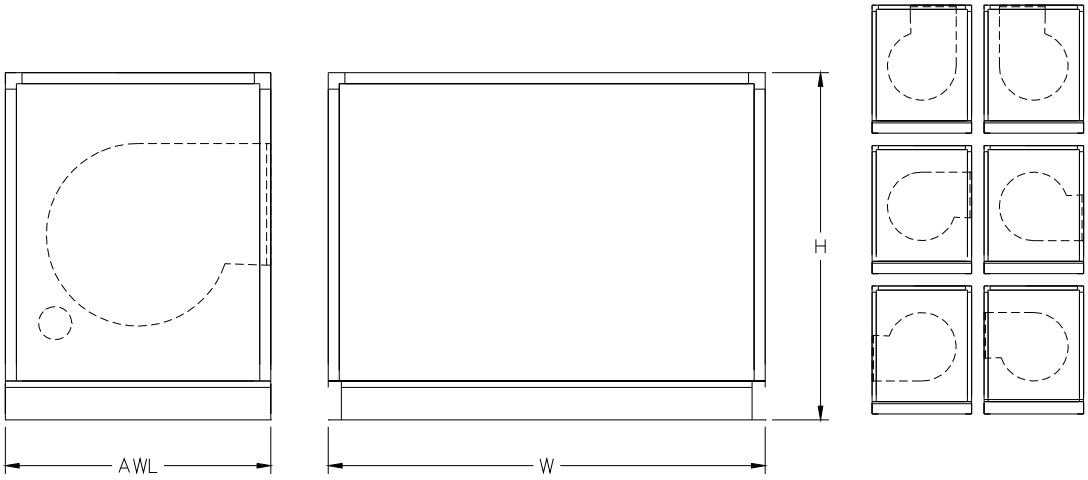
Blow-thru sections shall have a diffuser plate as an integral part of the fan section if used immediately downstream of the fan section. The system effect created by the diffuser plate and the lack of ductwork to properly develop airflow shall be taken into account when calculating fan performance by the air handler selection program.

The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Fan motor sections (cont)

VERTICAL DRAW-THRU SUPPLY FAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61
Dimensions (in.)														
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117
AWL														
FC	42	42	36	36	42	48	48	48	60	60	60	60	66	66
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78
Weight (lb)														
FC	560	630	660	720	840	940	1030	1160	1440	1650	1950	2080	2640	3020
AF	560	630	660	720	840	940	1030	1160	1440	1650	1950	2250	2840	3500

LEGEND

AF — Airfoil
AWL — Airway Length
FC — Forward Curved
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Vertical draw-thru supply fan not available on outdoor unit.
Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

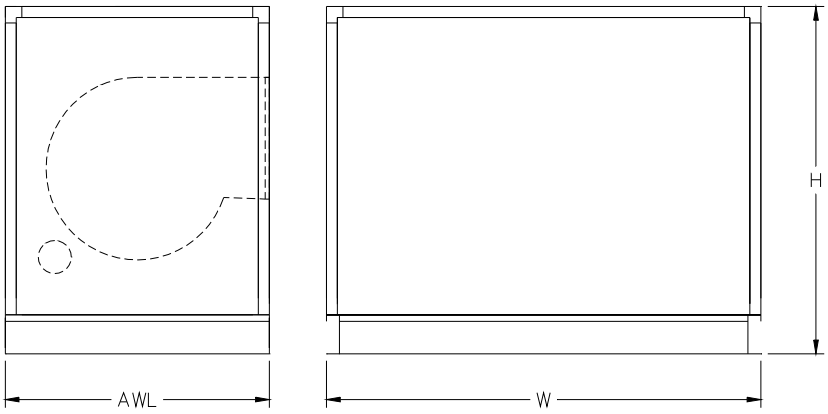
The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Dimensions (cont)

Fan motor sections (cont)

HORIZONTAL RETURN FAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	480	550	640	700	810	910	990	1100	1360	1560	1840	1960	2480	2830	3520	4250	4700	5250
AF	550	620	640	700	810	900	990	1100	1360	1560	1840	2120	2670	3270	3520	4250	4700	5070

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	590	690	800	890	1010	1140	1230	1340	1650	1890	2180	2300	2860	3210	3940	4690	5140	5690
AF	690	780	800	890	1010	1130	1230	1340	1650	1890	2180	2480	3070	3700	3940	4690	5140	5500

LEGEND

AF — Airfoil
AWL — Airway Length
FC — Forward Curved
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Fan airway length based on standard diameter fan with a top horizontal front discharge. Other fan diameters or discharge locations may affect airway lengths. Please consult ***AHU*Builder®** for exact dimensions.

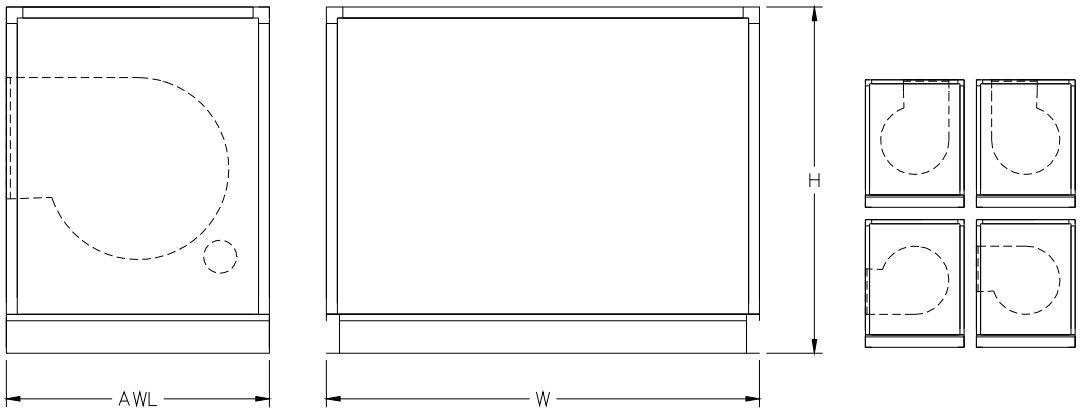
Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Fan motor sections (cont)

HORIZONTAL POWER EXHAUST FAN



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	480	550	640	700	810	910	990	1100	1360	1560	1840	1960	2480	2830	3520	4250	4700	5250
AF	550	620	640	700	810	900	990	1100	1360	1560	1840	2120	2670	3270	3520	4250	4700	5070

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.)																		
H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
AWL																		
FC	24	30	36	36	42	48	48	48	60	60	60	60	66	66	76	81	81	81
AF	42	42	36	36	42	48	48	48	60	60	60	66	72	78	76	81	81	78
Weight (lb)																		
FC	590	690	800	890	1010	1140	1230	1340	1650	1890	2180	2300	2860	3210	3940	4690	5140	5690
AF	690	780	800	890	1010	1130	1230	1340	1650	1890	2180	2480	3070	3700	3940	4690	5140	5500

LEGEND

AF — Airfoil
AWL — Airway Length
FC — Forward Curved
H — Height
W — Width

NOTE: All dimensions in inches unless otherwise noted.

SPECIFICATIONS
Fan airway length based on standard diameter fan with a top horizontal front discharge. Other fan diameters or discharge locations may affect airway lengths. Please consult ***AHU*Builder**® for exact dimensions.

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

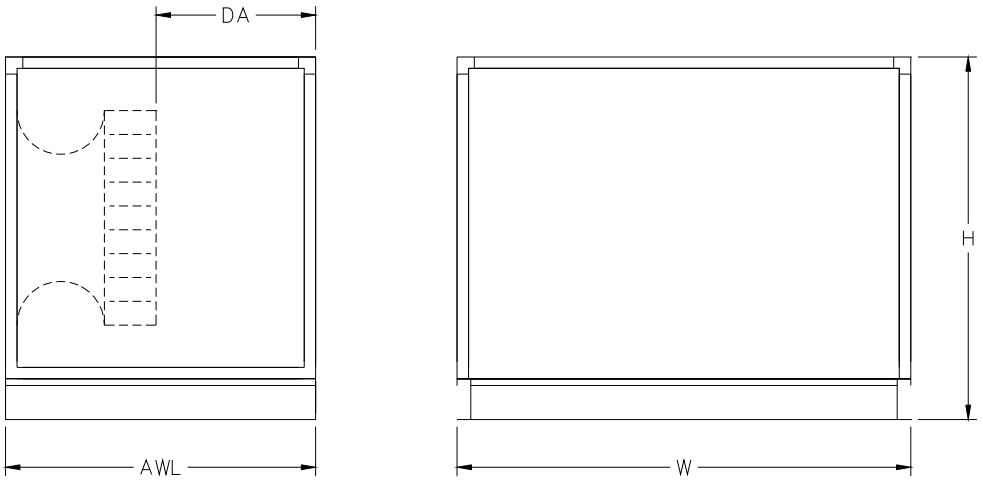
The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Dimensions (cont)

Fan motor sections (cont)

PLENUM FAN (SUPPLY DRAW-THRU, SUPPLY BLOW-THRU, RETURN)



INDOOR 39MN UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	37	37	40	40	47	47	50	60	60	60	71	77	87	102	113	113	126	126
W	33	46	54	67	67	72	79	79	86	104	109	109	117	117	120	139	139	157
DA	24	33	20	19	24	23	22	27	26	24	29	33	30	32	35	44	50	47
AWL	48	54	42	42	48	48	48	54	54	54	66	72	72	78	70	79	89	95
Weight (lb)	600	720	720	800	940	980	1080	1320	1400	1610	2240	2580	3040	3740	3740	4780	5900	7040

OUTDOOR 39MW UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
Dimensions (in.) H	41	41	44	44	51	51	54	64	64	64	75	81	91	106	117	117	130	130
W	36	49	57	70	70	75	82	82	89	107	112	112	120	120	123	142	142	160
DA	24	33	20	19	24	23	22	27	26	24	29	33	30	32	35	44	50	47
AWL	48	54	42	42	48	48	48	54	54	54	66	72	72	78	70	79	89	95
Weight (lb)	770	900	900	1000	1160	1210	1320	1580	1670	1920	2600	2960	3440	4170	4140	5210	6360	7530

LEGEND

AWL — Airway Length
DA — Duct Depth
H — Height
W — Width

NOTES:
1. All dimensions in inches unless otherwise noted. Bottom discharge not available; use discharge plenum.
2. Standard diameter plenum fan dimension shown.

SPECIFICATIONS
Fan airway length based on standard diameter fan with a top horizontal front discharge. Other fan diameters or discharge locations may affect airway lengths. Please consult ***AHU*Builder®** for exact dimensions.

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used.

The fan section shall have a double-wall, insulated, galvanized steel floor. Accessibility options shall be hinged double-wall access door on either side, hinged double-wall access doors on both sides, or removable double-wall access panels.
A. Thermal pane reinforced glass viewports shall be available as a factory-installed option on the access panel(s) or door(s) of this section.
B. Marine lights shall be available as a factory-installed option with or without convenience outlets.

See the guide specifications on pages 80-107 for fan detail options.

Physical data

FAN OFFERINGS BY UNIT SIZE AND TYPE

FORWARD CURVE FANS

UNIT SIZE	SUPPLY						RETURN / EXHAUST					
	FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME	
		MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN
03	N/A	N/A	N/A	A9-4A	5 / 184T	0.5 / 56	N/A	N/A	N/A	A9-4A	5 / 184T	0.5 / 56
06	A10-8A	5 / 184T	0.75 / 56	A10-8A	5 / 184T	0.75 / 56	A9-4A	5 / 184T	0.5 / 56	A10-8A	5 / 184T	0.75 / 56
08	A10-8A	7.5 / 213T	3 / 182T	A12-12A	5 / 184T	0.75 / 56	A10-8A	7.5 / 213T	3 / 182T	A12-12A	5 / 184T	0.75 / 56
10	A12-12A	10 / 215T	5 / 184T	A15-15A	5 / 184T	1 / 143T	A12-12A	10 / 215T	5 / 184T	A15-15A	5 / 184T	1 / 143T
12	A12-11A	15 / 254T	5 / 184T	A15-15A	7.5 / 213T	1.5 / 145T	A12-12A	10 / 215T	5 / 184T	A15-15A	7.5 / 213T	1.5 / 145T
14	A15-15A	15 / 254T	5 / 184T	A18-18A	7.5 / 213T	1.5 / 145T	A15-15A	15 / 254T	5 / 184T	A18-18A	7.5 / 213T	1.5 / 145T
17	A15-15A	25 / 284T	7.5 / 213T	A18-18A	10 / 215T	1.5 / 145T	A15-15A	25 / 284T	7.5 / 213T	A18-18A	10 / 215T	1.5 / 145T
21	A15-15A	25 / 284T	7.5 / 213T	A20-18A	15 / 254T	2 / 145T	A18-18A	10 / 215T	1.5 / 145T	A20-18A	15 / 254T	2 / 145T
25	A20-15A	25 / 284T	10 / 215T	A20-18A	15 / 254T	2 / 145T	A18-18A	10 / 215T	1.5 / 145T	A20-18A	15 / 254T	2 / 145T
30	A20-18H	30 / 286T	10 / 215T	A20-20H	20 / 256T	3 / 182T	A20-18H	30 / 286T	10 / 215T	A20-20H	20 / 256T	3 / 182T
36	A22-22H	30 / 286T	15 / 254T	A25-25H	25 / 284T	3 / 182T	A20-20H	20 / 256T	3 / 182T	A25-25H	25 / 284T	3 / 182T
40	A25-20H	30 / 286T	15 / 254T	A25-25H	25 / 284T	3 / 182T	A20-20H	20 / 256T	3 / 182T	A25-25H	25 / 284T	3 / 182T
50	A27-22H	40 / 324T	15 / 254T	A27-27H	30 / 286T	5 / 184T	A25-25H	25 / 284T	3 / 182T	A27-27H	30 / 286T	5 / 184T
61	A27-27H	50 / 326T	20 / 256T	A30-30H	40 / 324T	5 / 184T	A27-27H	50 / 326T	20 / 256T	A30-30H	40 / 324T	5 / 184T
72	32	75 / 365T	10 / 215T	36	75 / 365T	10 / 215T	32	75 / 365T	10 / 215T	36	75 / 365T	10 / 215T
85	36	75 / 365T	10 / 215T	40	75 / 365T	10 / 215T	36	75 / 365T	10 / 215T	40	75 / 365T	10 / 215T
96	N/A	N/A	N/A	40	75 / 365T	10 / 215T	N/A	N/A	N/A	40	75 / 365T	10 / 215T
110	N/A	N/A	N/A	40	75 / 365T	10 / 215T	N/A	N/A	N/A	40	75 / 365T	10 / 215T

AIRFOIL FANS

UNIT SIZE	SUPPLY						RETURN / EXHAUST					
	FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME	
		MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN
03	N/A	N/A	N/A	101	5 / 184T	0.5 / 56	N/A	N/A	N/A	101	5 / 184T	0.5 / 56
06	101	5 / 184T	0.5 / 56	121	7.5 / 184T	0.5 / 56	101	5 / 184T	0.5 / 56	121	7.5 / 184T	0.5 / 56
08	121	7.5 / 184T	0.5 / 56	131	10 / 215T	1 / 143T	121	7.5 / 184T	0.5 / 56	131	10 / 215T	1 / 143T
10	121	7.5 / 184T	0.5 / 56	131	15 / 254T	1.5 / 145T	121	7.5 / 184T	0.5 / 56	131	15 / 254T	1.5 / 145T
12	131	15 / 254T	1.5 / 145T	161	15 / 254T	1.5 / 145T	131	15 / 254T	1.5 / 145T	161	15 / 254T	1.5 / 145T
14	131	15 / 254T	1.5 / 145T	161	20 / 256T	1.5 / 145T	131	15 / 254T	1.5 / 145T	161	20 / 256T	1.5 / 145T
17	161	20 / 256T	1.5 / 145T	181	20 / 256T	1.5 / 145T	161	20 / 256T	1.5 / 145T	181	20 / 256T	1.5 / 145T
21	181	20 / 256T	1.5 / 145T	201	25 / 284T	2 / 145T	181	20 / 256T	1.5 / 145T	201	25 / 284T	2 / 145T
25	201	25 / 284T	2 / 145T	221	30 / 286T	2 / 145T	201	25 / 284T	2 / 145T	221	30 / 286T	2 / 145T
30	N/A	N/A	N/A	221	40 / 324T	3 / 182T	N/A	N/A	N/A	221	40 / 324T	3 / 182T
36	271	40 / 324T	3 / 182T	241	40 / 324T	5 / 184T	241	40 / 324T	5 / 184T	271	40 / 324T	3 / 182T
40	301	50 / 326T	3 / 182T	271	50 / 326T	5 / 184T	271	50 / 326T	5 / 184T	301	50 / 326T	3 / 182T
50	331	60 / 364T	5 / 184T	301	60 / 364T	7.5 / 213T	301	60 / 364T	7.5 / 213T	331	60 / 364T	5 / 184T
61	301	60 / 364T	7.5 / 213T	331	75 / 365T	7.5 / 213T	331	75 / 365T	7.5 / 213T	361	20 / 256T	5 / 184T
72	32	75 / 365T	7.5 / 213T	36	100 / 405T	7.5 / 213T	32	75 / 365T	7.5 / 213T	36	100 / 405T	7.5 / 213T
85	36	100 / 405T	7.5 / 213T	40	125 /444T	10 / 215T	36	100 / 405T	7.5 / 213T	40	125 /444T	10 / 215T
96	36	100 / 405T	7.5 / 213T	40	125 /444T	10 / 215T	36	100 / 405T	7.5 / 213T	40	125 /444T	10 / 215T
110	40	125 /444T	10 / 215T	44	150 / 445T	15 / 254T	40	125 /444T	10 / 215T	44	150 / 445T	15 / 254T

PLENUM FANS

UNIT SIZE	SUPPLY						RETURN / EXHAUST					
	FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME		FAN WHEEL	HP / FRAME	
		MAX	MIN		MAX	MIN		MAX	MIN		MAX	MIN
03	N/A	N/A	N/A	123	5 / 184T	0.5 / 56	N/A	N/A	N/A	123	5 / 184T	0.5 / 56
06	N/A	N/A	N/A	153	7.5 / 213T	.75 / 56	N/A	N/A	N/A	153	7.5 / 213T	.75 / 56
08	153	7.5 / 213T	.75 / 56	163	10 / 215T	.75 / 56	153	7.5 / 213T	.75 / 56	163	10 / 215T	.75 / 56
10	N/A	N/A	N/A	183Q	15 / 254T	1 / 143T	N/A	N/A	N/A	183Q	15 / 254T	1 / 143T
12	N/A	N/A	N/A	223Q	20 / 256T	1 / 143T	N/A	N/A	N/A	223Q	20 / 256T	1 / 143T
14	N/A	N/A	N/A	223Q	20 / 256T	1 / 143T	N/A	N/A	N/A	223Q	20 / 256T	1 / 143T
17	223Q	20 / 256T	1 / 143T	243Q	20 / 256T	1.5 / 145T	223Q	20 / 256T	1 / 143T	243Q	20 / 256T	1.5 / 145T
21	243Q	20 / 256T	1.5 / 145T	273Q	25 / 284T	2 / 145T	243Q	20 / 256T	1.5 / 145T	273Q	25 / 284T	2 / 145T
25	273Q	25 / 284T	2 / 145T	303Q	25 / 284T	2 / 145T	273Q	25 / 284T	2 / 145T	303Q	25 / 284T	2 / 145T
30	303Q	25 / 284T	2 / 145T	333Q	30 / 286T	3 / 182T	303Q	25 / 284T	2 / 145T	333Q	30 / 286T	3 / 182T
36	333Q	30 / 286T	3 / 182T	363Q	40 / 324T	3 / 182T	333Q	30 / 286T	3 / 182T	363Q	40 / 324T	3 / 182T
40	333Q	30 / 286T	3 / 182T	363Q	40 / 324T	3 / 182T	363Q	40 / 324T	3 / 182T	403Q	20 / 256T	3 / 182T
50	363Q	40 / 324T	3 / 182T	403Q	50 / 326T	7.5 / 213T	403Q	50 / 326T	7.5 / 213T	443Q	60 / 364T	5 / 184T
61	403Q	50 / 326T	7.5 / 213T	443Q	60 / 364T	5 / 184T	443Q	60 / 364T	5 / 184T	493Q	30 / 286T	5 / 184T
72	40HE	75 / 365T	7.5 / 213T	44HE	100 / 405T	7.5 / 213T	40HE	75 / 365T	7.5 / 213T	44HE	100 / 405T	7.5 / 213T
85	44HE	100 / 405T	7.5 / 213T	49HE	125 / 444T	10 / 215T	44HE	100 / 405T	7.5 / 213T	49HE	125 / 444T	10 / 215T
96	49HE	125 / 444T	10 / 215T	55HE	150 / 445T	15 / 254T	49HE	125 / 444T	10 / 215T	55HE	150 / 445T	15 / 254T
110	49HE	125 / 444T	10 / 215T	55HE	150 / 445T	15 / 254T	49HE	125 / 444T	10 / 215T	55HE	150 / 445T	15 / 254T

Physical data (cont)

FAN DATA BY WHEEL DIAMETER AND TYPE

FORWARD CURVE FANS

Fan Wheel	Wheel Diameter (in.)	Inlet Cone Diameter (in.)	Max Speed (rpm)		Fan Shaft Diameter (in.)*		Fan Wheel Weight (lb)		Number of Fan blades
			Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	
A9-4A	9 1/2	7 13/16	2132	2749	3/4	3/4	4	4	43
A10-8A	10 5/8	8 13/16	1806	2347	3/4	1	6	6	48
A12-11A	12 5/8	10 3/8	1533	1986	1	1 3/16	10	10	43
A12-12A	12 5/8	10 3/8	1491	1938	1	1 3/16	10	10	43
A15-15A	15	12 5/8	1262	1639	1 3/16	1 3/16	16	17	51
A18-18A	18 1/32	15 1/2	1097	1378	1 3/16	1 7/16	32	34	48
A20-15A	20	16 1/4	969	1238	1 7/16	1 11/16	51	51	37
A20-18A	20	16 1/4	960	1217	1 7/16	1 11/16	53	53	37
A20-18H	20	16 1/4	952	1237	1 3/16	1 7/16	42	45	51
A20-20H	20	16 1/4	952	1237	1 3/16	1 7/16	42	45	51
A22-22H	22 3/8	18 1/16	884	1119	1 7/16	2 3/16	63	63	37
A25-20H	25	21 5/16	770	980	1 11/16	2 7/16	73	73	37
A25-25H	25	21 5/16	751	960	1 11/16	2 7/16	81	81	37
A27-22H	27 5/8	23 15/16	684	873	1 11/16	2 7/16	101	101	37
A27-27H	27 5/8	23 15/16	656	865	1 11/16	2 7/16	111	111	37
A30-30H	30 1/4	26 3/8	618	793	1 11/16	2 11/16	128	128	37
32	31 1/2	25 3/4	675	760	2 3/16	2 3/16	132	134	38
36	35 7/16	29	600	660	2 7/16	2 7/16	158	178	42
40	39	32 3/4	550	600	2 7/16	2 7/16	194	214	48

AIRFOIL FANS

Fan Wheel	Wheel Diameter (in.)	Inlet Cone Diameter (in.)	Max Speed (rpm)		Fan Shaft Diameter (in.)*		Fan Wheel Weight (lb)		Number of Fan blades
			Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	
101	10	6 1/8	N/A	4655	N/A	1	N/A	8	18
121	12 1/4	7 1/2	N/A	4560	N/A	1 3/16	N/A	11	18
131	13 1/2	8 3/8	N/A	4033	N/A	1 7/16	N/A	15	18
161	16 1/2	10 1/8	N/A	3254	N/A	1 11/16	N/A	37	18
181	18 1/4	11	2261	2950	1 11/16	1 15/16	52	52	20
201	20	12 7/16	2019	2598	1 11/16	1 15/16	60	60	20
221	22 1/4	13 7/8	1872	2442	1 15/16	2 3/16	73	73	20
241	24 1/2	15 1/8	1701	2218	2 3/16	2 7/16	88	91	20
271	27	16 13/16	1463	1910	2 3/16	2 7/16	104	106	20
301	30	18 13/16	1316	1715	2 7/16	2 11/16	136	145	20
331	33	20 9/16	1202	1568	2 7/16	2 15/16	168	176	20
361	36 1/2	23 1/8	1055	1378	2 11/16	2 15/16	235	233	18
32	31 7/8	21 5/8	1300	1700	2 3/16	2 7/16	195	195	10
36	35 13/16	24	1250	1550	2 7/16	2 3/4	262	273	10
40	39 3/8	26 7/8	1200	1350	2 3/4	2 15/16	348	358	10
44	44 3/32	30	850	1150	2 15/16	3 3/16	441	459	10

PLENUM FANS

Fan Wheel	Wheel Diameter (in.)	Inlet Cone Diameter (in.)	Max Speed (rpm)		Fan Shaft Diameter (in.)*		Fan Wheel Weight (lb)		Number of Fan blades
			Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	
123	12 1/4	7 1/2	3567	4655	1	1 3/16	8	8	9
153	15	9 1/4	2765	3610	1	1 3/16	13	13	9
163	16 1/2	10 1/8	2465	3216	1	1	27	27	9
183Q	18 1/4	11 82/93	2190	2855	1	1 3/16	35	35	12
223Q	22 1/4	14 1/2	1872	2442	1 7/16	1 7/16	50	50	12
243Q	24 1/2	15 67/83	1701	2218	1 7/16	1 7/16	70	70	12
273Q	27	17 35/68	1463	1910	1 7/16	1 7/16	80	80	12
303Q	30	19 11/16	1316	1715	1 7/16	1 7/16	100	100	12
333Q	33	21 33/68	1202	1568	1 11/16	1 11/16	135	135	12
363Q	36 1/2	24	1055	1378	1 11/16	1 11/16	171	171	12
403Q	40 1/4	26 5/8	955	1249	1 15/16	1 15/16	203	203	12
443Q	44 1/2	29 1/2	865	1131	2 3/16	2 3/16	277	277	12
493Q	49	32 1/2	808	1050	2 11/16	2 11/16	366	366	12
40HE	40	26 7/8	1150	1400	2 7/16	2 7/16	250	257	10
44HE	44 3/4	30	1100	1200	2 3/16	2 7/16	356	360	10
49HE	49 13/16	33 7/16	950	1100	2 7/16	2 7/16	454	454	10
55HE	55 1/4	37 1/16	850	975	2 15/16	2 15/16	651	651	10

* Minimum fan shaft diameter listed. Refer to centerline distance table for specific diameter by unit size.

DIRECT-EXPANSION CIRCUITING DATA

MEDIUM FACE AREA COILS

39M UNIT SIZE	03			06			08			10			12			14		
CIRCUITING TYPE	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full
Airflow (cfm) at 500 fpm	1,215			2,066			2,778			3,611			4,965			6,146		
Total Face Area (sq ft)	2.4			4.1			5.6			7.2			9.9			12.3		
Tubes in Face	14	14	14	14	14	14	16	16	16	16	16	16	22	22	22	24	24	24
Tube Length (in.)	20	20	20	34	34	34	40	40	40	52	52	52	52	52	52	59	59	59
No. of Circuits - Total	4	7	14	4	7	14	4	8	16	4	8	16	6	11	22	6	12	24
4-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	2	2	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	E-12	G-2	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 1/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	—	G-2	G-4	—
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	G-2.5	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4	E-12	—	G-4	C-12	—
6-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	2	2	2	—	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	7/8	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	G-8	G-1.5	G-2.5	G-8	G-2	G-4/G-3	E-12	—	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	2	—	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	E-12	—	G-4	C-12
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	—	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	—	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	—	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	G-2.5	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4	E-12	—	—	C-12	—
8-Row Coil																		
Face Split Coils																		
No. of TXVs	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-2.5/G-2	G-6	—	G-2.5/G-2	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4/G-3	E-12	—	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	—	2	—	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	7/8	—	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	—	7/8	—	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-2.5/G-2	—	—	G-2.5/G-2	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4/G-3	E-12	—	G-4	C-12
Single-Circuit Coils																		
No. of TXVs	1	1	—	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	—	7/8	—	—	7/8	—	—	7/8	—	—	1 1/8	—	—	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	—	G-6	—	—	G-8	—	—	G-8	—	—	E-12	—	—	C-12	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

Physical data (cont)

DIRECT-EXPANSION CIRCUITING DATA (cont)

MEDIUM FACE AREA COILS (cont)

39M UNIT SIZE	17		21			25			30			36		40		50		61			
CIRCUITING TYPE	Half	Full	Half	Full	Double	Half	Full	Double	Half	Full	Double	Full	Double	Full	Double	Full	Double	Full		Double	
Airflow (cfm) at 500 fpm	6,771		9,028			10,278			12,778			15,000		18,333		19,861		25,278			
Total Face Area (sq ft)	13.5		18.1			20.6			25.6			30.0		36.7		39.7		50.6			
Tubes in Face	24	24	32	32	32	32	32	32	32	32	32	36	36	44	44	44	44	28	28	28	28
Tube Length (in.)	65	65	65	65	65	72	72	72	92	92	92	96	96	60	60	104	104	104	104	104	104
No. of Circuits - Total	12	24	16	32	64	16	32	64	16	32	64	36	72	44	88	44	88	28	28	56	56
4-Row Coil																		Upper	Lower	Upper	Lower
Face Split Coils																					
No. of TXVs	2	2	2	2	—	2	2	—	2	2	—	2	—	4	—	4	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 3/8	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 5/8	—	1 3/8	—	1 3/8	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	7/8	1 3/8	—	7/8	1 3/8	—	7/8	1 3/8	—	1 3/8	—	1 1/8	—	1 1/8	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-4	C-12	G-8	C-17	—	G-8	C-17	—	G-8	C-17	—	C-17	—	E-12	—	E-12	—	C-15	C-15	—	—
Intertwined Row Split Coils																					
No. of TXVs	2	2	2	2	—	2	2	—	2	2	—	2	—	4	—	4	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 3/8	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 5/8	—	1 3/8	—	1 3/8	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	7/8	1 3/8	—	7/8	1 3/8	—	7/8	1 3/8	—	1 3/8	—	1 1/8	—	1 1/8	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-4	C-12	G-8	C-17	—	G-8	C-17	—	G-8	C-17	—	C-17	—	E-12	—	E-12	—	C-15	C-15	—	—
Single-Circuit Coils																					
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6-Row Coil																					
Face Split Coils																					
No. of TXVs	2	2	2	2	—	2	2	—	2	2	—	2	—	4	—	4	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 3/8	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 5/8	—	1 3/8	—	1 3/8	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	7/8	1 3/8	—	7/8	1 3/8	—	7/8	1 3/8	—	1 3/8	—	1 1/8	—	1 1/8	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-4	C-12	G-8	C-17	—	G-8	C-17	—	G-8	C-17	—	C-17	—	E-12	—	E-12	—	C-15	C-15	—	—
Intertwined Row Split Coils																					
No. of TXVs	2	2	2	2	—	2	2	—	2	2	—	2	—	4	—	4	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 3/8	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—	1 5/8	—	1 3/8	—	1 3/8	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	7/8	1 3/8	—	7/8	1 3/8	—	7/8	1 3/8	—	1 3/8	—	1 1/8	—	1 1/8	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-4	C-12	G-8	C-17	—	G-8	C-17	—	G-8	C-17	—	C-17	—	E-12	—	E-12	—	C-15	C-15	—	—
Single-Circuit Coils																					
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Row Coil																					
Face Split Coils																					
No. of TXVs	2	2	2	2	4	2	2	4	2	2	4	2	4	4	8	4	8	2	2	4	4
Suction Connections (in. OD)	1 1/8	1 3/8	1 1/8	1 5/8	1 5/8	1 1/8	1 5/8	1 5/8	1 1/8	1 5/8	1 5/8	1 5/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	7/8	1 3/8	7/8	1 3/8	1 3/8	7/8	1 3/8	1 3/8	7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	G-4	C-12	G-8	C-17	C-17	G-8	C-17	C-17	G-8	C-17	C-17	C-17	C-17	E-12	E-12	E-12	E-12	C-15	C-15	C-15	C-15
Intertwined Row Split Coils																					
No. of TXVs	2	2	—	2	4	—	2	4	—	2	4	2	4	4	8	4	8	2	2	4	4
Suction Connections (in. OD)	1 1/8	1 3/8	—	1 5/8	1 5/8	—	1 5/8	1 5/8	—	1 5/8	1 5/8	1 5/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	7/8	1 3/8	—	1 3/8	1 3/8	—	1 3/8	1 3/8	—	1 3/8	1 3/8	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	G-4	C-12	—	C-17	C-17	—	C-17	C-17	—	C-17	C-17	C-17	C-17	E-12	E-12	E-12	E-12	C-15	C-15	C-15	C-15
Single-Circuit Coils																					
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

DIRECT-EXPANSION CIRCUITING DATA (cont)

MEDIUM FACE AREA COILS (cont)

39M UNIT SIZE	72				85				96				110			
CIRCUITING TYPE	Full		Double		Full		Double		Full		Double		Full		Double	
Airflow (cfm) at 500 fpm	29,722				35,000				39,375				45,000			
Total Face Area (sq ft)	59.4				70.0				78.8				90.0			
Tubes in Face	32	32	32	32	32	32	32	32	36	36	36	36	36	36	36	36
Tube Length (in.)	107	107	107	107	126	126	126	126	126	126	126	126	144	144	144	144
No. of Circuits - Total	32	32	60	64	32	32	64	64	36	36	72	72	36	36	72	72
4-Row Coil	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Face Split Coils																
No. of TXVs	2	2	—	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—
Intertwined Row Split Coils																
No. of TXVs	2	2	—	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6-Row Coil																
Face Split Coils																
No. of TXVs	2	2	—	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—
Intertwined Row Split Coils																
No. of TXVs	2	2	—	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—	C-17	C-17	—	—
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Row Coil																
Face Split Coils																
No. of TXVs	2	2	4	4	2	2	4	4	2	2	4	4	2	2	4	4
Suction Connections (in. OD)	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17
Intertwined Row Split Coils																
No. of TXVs	2	2	4	4	2	2	4	4	2	2	4	4	2	2	4	4
Suction Connections (in. OD)	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17	C-17
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

Physical data (cont)

DIRECT-EXPANSION CIRCUITING DATA (cont)

LARGE FACE AREA COILS

39M UNIT SIZE	03			06			08			10			12			14		
CIRCUITING TYPE	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full
Airflow (cfm) at 500 fpm	1,736			2,951			3,819			4,965			6,319			7,170		
Total Face Area (sq ft)	3.5			5.9			7.6			9.9			12.6			14.3		
Tubes in Face	20	20	20	20	20	20	22	22	22	22	22	22	28	28	28	28	28	28
Tube Length (in.)	20	20	20	34	34	34	40	40	40	52	52	52	52	52	52	59	59	59
No. of Circuits - Total	4	10	20	4	10	20	6	11	22	6	11	22	7	14	28	7	14	28
4-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2		2	2	—	2	2	2	2	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 5/8	7/8	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 3/8	7/8	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3		G-1.5	G-3	—	G-2	G-4/G-3	—	G-2	G-4/G-3	—	G-2.5/G-2	G-6	C-15	G-2.5/G-2	G-6	C-15
Intertwined Row Split Coils									—									
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	—	G-2	G-4/G-3	—	G-2.5/G-2	G-6	—	G-2.5/G-2	G-6	—
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—
Suction Connections (in. OD)	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—
Distributor Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8	—
Distributor Nozzle Size	G-3	E-10	—	G-3	E-10	—	G-4	E-12	—	G-4	E-12	—	G-6	C-15	—	G-6	C-15	—
6-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	E-12	G-2	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	E-12	G-2	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	—	1 5/8	—	—	1 5/8	—
Distributor Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Nozzle Size	G-3	E-10	—	G-3	E-10	—	G-4	E-12	—	G-4	E-12	—	—	C-15	—	—	C-15	—
8-Row Coil																		
Face Split Coils																		
No. of TXVs	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-3	E-10	—	G-3	E-10	—	G-4/G-3	E-12	—	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Intertwined Row Split Coils																		
No. of TXVs	—	2	—	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	1 1/8	—	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	—	7/8	—	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-3	—	—	G-3	E-10	—	G-4/G-3	E-12	—	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Single-Circuit Coils																		
No. of TXVs	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	—	1 3/8	—	—	1 3/8	—	—	1 3/8	—	—	1 3/8	—	—	1 5/8	—	—	1 5/8	—
Distributor Connections (in. OD)	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Nozzle Size	—	E-10	—	—	E-10	—	—	E-12	—	—	E-12	—	—	C-15	—	—	C-15	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

DIRECT-EXPANSION CIRCUITING DATA (cont)

LARGE FACE AREA COILS (cont)

39M UNIT SIZE	17			21			25			30			36		40				50				61			
CIRCUITING TYPE	Half	Full	Double	Half	Full	Double	Half	Full	Double	Half	Full	Double	Full	Double	Full		Double		Full		Double		Full		Double	
Airflow (cfm) at 500 fpm	8,464			10,720			12,205			15,174			18,333		20,000				25,278				30,694			
Total Face Area (sq ft)	16.9			21.4			24.4			30.3			36.7		40.0				50.6				61.4			
															Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Tubes in Face	30	30	30	38	38	38	38	38	38	38	38	38	44	44	24	24	24	24	28	28	28	28	34	34	34	34
Tube Length (in.)	65	65	65	65	65	65	72	72	72	92	92	92	96	96	96	96	96	96	104	104	104	104	104	104	104	104
No. of Circuits - Total	15	30	60	19	38	76	19	38	76	19	38	76	44	88	24	24	48	48	28	28	56	56	34	34	68	68
4-Row Coil																										
Face Split Coils																										
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	4	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	—	1 3/8	1 3/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-8/G-6	C-15	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-12	—	C-12	C-12	—	—	C-15	C-15	—	—	C-17	C-17	—	—
Intertwined Row Split Coils																										
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	4	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	—	1 3/8	1 3/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-8/G-6	C-15	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-12	—	C-12	C-12	—	—	C-15	C-15	—	—	C-17	C-17	—	—
Single-Circuit Coils																										
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 5/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6-Row Coil																										
Face Split Coils																										
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	4	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	—	1 3/8	1 3/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-8/G-6	C-15	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-12	—	C-12	C-12	—	—	C-15	C-15	—	—	C-17	C-17	—	—
Intertwined Row Split Coils																										
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	4	—	2	2	—	—	2	2	—	—	2	2	—	—
Suction Connections (in. OD)	1 1/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	1 5/8	—	1 3/8	—	1 3/8	1 3/8	—	—	1 5/8	1 5/8	—	—	1 5/8	1 5/8	—	—
Distributor Connections (in. OD)	7/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Nozzle Size*	G-8/G-6	C-15	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-10/E-8	C-20	—	E-12	—	C-12	C-12	—	—	C-15	C-15	—	—	C-17	C-17	—	—
Single-Circuit Coils																										
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 5/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Row Coil																										
Face Split Coils																										
No. of TXVs	2	2	4	2	2	4	2	2	4	2	2	4	4	8	2	2	4	4	2	2	4	4	2	2	4	4
Suction Connections (in. OD)	1 1/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	7/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	G-8/G-6	C-15	C-15	E-10/E-8	C-20	C-20	E-10/E-8	C-20	C-20	E-10/E-8	C-20	C-20	E-12	E-12	C-12	C-12	C-12	C-12	C-15	C-15	C-15	C-15	C-17	C-17	C-17	C-17
Intertwined Row Split Coils																										
No. of TXVs	2	2	4	2	2	4	2	2	4	2	2	4	4	8	2	2	4	4	2	2	4	4	2	2	4	4
Suction Connections (in. OD)	1 1/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 5/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
Distributor Connections (in. OD)	7/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 3/8	1 3/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Nozzle Size*	G-8/G-6	C-15	C-15	E-10/E-8	C-20	C-20	E-10/E-8	C-20	C-20	E-10/E-8	C-20	C-20	E-12	E-12	C-12	C-12	C-12	C-12	C-15	C-15	C-15	C-15	C-17	C-17	C-17	C-17
Single-Circuit Coils																										
No. of TXVs	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	1 5/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	1 3/8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	C-15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU-Builder®*** software selection program for correct nozzle selection.

Physical data (cont)

DIRECT-EXPANSION CIRCUITING DATA (cont)

LARGE FACE AREA COILS (cont)

39M UNIT SIZE	72				85				96				110			
CIRCUITING TYPE	Full		Double		Full		Double		Full		Double		Full		Double	
Airflow (cfm) at 500 fpm	36,224				46,656				48,125				55,000			
Total Face Area (sq ft)	72.4				85.3				96.3				110.0			
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Tubes in Face	38	40	38	40	38	40	38	40	44	44	44	44	44	44	44	44
Tube Length (in.)	107	107	107	107	126	126	126	126	126	126	126	126	144	144	144	144
No. of Circuits - Total	38	40	76	80	38	40	76	80	44	44	88	88	44	44	88	88
4-Row Coil																
Face Split Coils																
No. of TXVs	2	4	—	—	2	4	—	—	4	4	—	—	4	4	—	—
Suction Connections (in. OD)	1 5/8	1 3/8	—	—	1 5/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Connections (in. OD)	1 3/8	1 1/8	—	—	1 3/8	1 1/8	—	—	1 1/8	1 1/8	—	—	1 1/8	1 1/8	—	—
Distributor Nozzle Size*	C-20	E-10	—	—	C-20	E-10	—	—	E-12	E-12	—	—	E-12	E-12	—	—
Intertwined Row Split Coils																
No. of TXVs	2	4	—	—	2	4	—	—	4	4	—	—	4	4	—	—
Suction Connections (in. OD)	1 5/8	1 3/8	—	—	1 5/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Connections (in. OD)	1 3/8	1 1/8	—	—	1 3/8	1 1/8	—	—	1 1/8	1 1/8	—	—	1 1/8	1 1/8	—	—
Distributor Nozzle Size*	C-20	E-10	—	—	C-20	E-10	—	—	E-12	E-12	—	—	E-12	E-12	—	—
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6-Row Coil																
Face Split Coils																
No. of TXVs	2	4	—	—	2	4	—	—	4	4	—	—	4	4	—	—
Suction Connections (in. OD)	1 5/8	1 3/8	—	—	1 5/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Connections (in. OD)	1 3/8	1 1/8	—	—	1 3/8	1 1/8	—	—	1 1/8	1 1/8	—	—	1 1/8	1 1/8	—	—
Distributor Nozzle Size*	C-20	E-10	—	—	C-20	E-10	—	—	E-12	E-12	—	—	E-12	E-12	—	—
Intertwined Row Split Coils																
No. of TXVs	2	4	—	—	2	4	—	—	4	4	—	—	4	4	—	—
Suction Connections (in. OD)	1 5/8	1 3/8	—	—	1 5/8	1 3/8	—	—	1 3/8	1 3/8	—	—	1 3/8	1 3/8	—	—
Distributor Connections (in. OD)	1 3/8	1 1/8	—	—	1 3/8	1 1/8	—	—	1 1/8	1 1/8	—	—	1 1/8	1 1/8	—	—
Distributor Nozzle Size*	C-20	E-10	—	—	C-20	E-10	—	—	E-12	E-12	—	—	E-12	E-12	—	—
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Row Coil																
Face Split Coils																
No. of TXVs	2	4	4	8	2	4	4	8	4	4	8	8	4	4	8	8
Suction Connections (in. OD)	1 5/8	1 3/8	1 5/8	1 3/8	1 5/8	1 3/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Connections (in. OD)	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
Distributor Nozzle Size*	C-20	E-10	C-20	E-10	C-20	E-10	C-20	E-10	E-12	E-12	E-12	E-12	E-12	E-12	E-12	E-12
Intertwined Row Split Coils																
No. of TXVs	2	4	4	8	2	4	4	8	4	4	8	8	4	4	8	8
Suction Connections (in. OD)	1 5/8	1 3/8	1 5/8	1 3/8	1 5/8	1 3/8	1 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
Distributor Connections (in. OD)	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
Distributor Nozzle Size*	C-20	E-10	C-20	E-10	C-20	E-10	C-20	E-10	E-12	E-12	E-12	E-12	E-12	E-12	E-12	E-12
Single-Circuit Coils																
No. of TXVs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Suction Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Connections (in. OD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distributor Nozzle Size	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and field-installed nozzles. Consult ***AHU-Builder®*** software selection program for correct nozzle selection.

COIL DATA

39M UNIT SIZE	03	06	08	10	12	14	17	21	25
1/2-in. CHILLED WATER/DIRECT EXPANSION									
Large Face Area									
Nominal Capacity (cfm) at 500 fpm	1,736	2,951	3,819	4,965	6,319	7,170	8,464	10,720	12,205
Lower Coil Height (in.)	25	25	27.5	27.5	35	35	37.5	47.5	47.5
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.5	5.9	7.6	9.9	12.6	14.3	16.9	21.4	24.4
Medium Face Area									
Nominal Capacity (cfm) at 500 fpm	1,215	2,066	2,778	3,611	4,965	6,146	6,771	9,028	10,278
Lower Coil Height (in.)	17.5	17.5	20	20	27.5	30	30	40	40
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.4	4.1	5.6	7.2	9.9	12.3	13.5	18.1	20.6
Bypass Face Area (Internal Chilled Water Only)									
Nominal Capacity (cfm) at 500 fpm	1,042	1,771	2,431	3,160	4,514	5,122	6,207	7,899	8,993
Lower Coil Height (in.)	15	15	17.5	17.5	25	25	27.5	35	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.9	6.3	9.0	10.2	12.4	15.8	18.0
1/2-in. HOT WATER HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	2,431	4,132	5,347	6,951	8,847	10,038	11,849	15,009	17,087
Lower Coil Height (in.)	25	25	27.5	27.5	35	35	37.5	47.5	47.5
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.5	5.9	7.6	9.9	12.6	14.3	16.9	21.4	24.4
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	1,701	2,892	3,889	5,056	6,951	8,604	9,479	12,639	14,389
Lower Coil Height (in.)	17.5	17.5	20	20	27.5	30	30	40	40
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.4	4.1	5.6	7.2	9.9	12.3	13.5	18.1	20.6
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	4,424	5,019	6,319	7,109	8,094
Height (in.)	—	15	15	15	17.5	17.5	20	22.5	22.5
Length (in.)	—	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	—	3.5	4.2	5.4	6.3	7.2	9.0	10.2	11.6
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,403	4,424	6,319	7,170	8,689	11,059	12,590
Lower Coil Height (in.)	15	15	17.5	17.5	25	25	27.5	35	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.9	6.3	9.0	10.2	12.4	15.8	18.0
5/8-in. STEAM HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	2,333	3,967	5,250	6,825	8,342	9,465	11,375	14,219	16,188
Lower Coil Height (in.)	24	24	27	27	33	33	36	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.3	5.7	7.5	9.8	11.9	13.5	16.3	20.3	23.1
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,500	4,550	6,825	8,604	9,479	12,323	14,029
Lower Coil Height (in.)	15	15	18	18	27	30	30	39	39
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	5.0	6.5	9.8	12.3	13.5	17.6	20.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	3,792	4,302	5,688	6,635	7,554
Height (in.)	—	15	15	15	15	15	18	21	21
Length (in.)	—	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	—	3.5	4.2	5.4	5.4	6.1	8.1	9.5	10.8
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	2,917	3,792	6,067	6,883	8,531	10,427	11,871
Height (in.)	15	15	15	15	24	24	27	33	33
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.2	5.4	8.7	9.8	12.2	14.9	17.0

Physical data (cont)

COIL DATA (cont)

39M UNIT SIZE	30	36	40	50	61	72	85	96	110
1/2-in. CHILLED WATER/DIRECT EXPANSION									
Large Face Area									
Nominal Capacity (cfm) at 500 fpm	15,174	18,333	20,000	25,278	30,694	36,224	42,656	48,125	55,000
Lower Coil Height (in.)	47.5	55	30	35	42.5	50	50	55	55
Upper Coil Height (in.)	N/A	N/A	30	35	42.5	47.5	47.5	55	55
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	30.3	36.7	40.0	50.6	61.4	72.4	85.3	96.3	110.0
Medium Face Area									
Nominal Capacity (cfm) at 500 fpm	12,778	15,000	18,333	19,861	25,278	29,722	35,000	39,375	45,000
Lower Coil Height (in.)	40	45	55	55	35	40	40	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	35	40	40	45	45
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	25.6	30.0	36.7	39.7	50.6	59.4	70.0	78.8	90.0
Bypass Face Area (Internal Chilled Water Only)									
Nominal Capacity (cfm) at 500 fpm	11,181	12,500	15,000	16,250	19,861	23,220	27,344	30,625	35,000
Lower Coil Height (in.)	35	37.5	45	45	55	32.5	32.5	35	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	30	30	35	35
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	22.4	25.0	30.0	32.5	39.7	46.4	54.7	61.3	70.0
1/2-in. HOT WATER HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	21,243	25,667	28,000	35,389	42,972	50,714	59,719	67,375	77,000
Lower Coil Height (in.)	47.5	55	30	35	42.5	50	50	55	55
Upper Coil Height (in.)	N/A	N/A	30	35	42.5	47.5	47.5	55	55
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	30.3	36.7	40.0	50.6	61.4	72.4	85.3	96.3	110.0
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	17,889	21,000	25,667	27,806	35,389	41,611	49,000	55,125	63,000
Lower Coil Height (in.)	40	45	55	55	35	40	40	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	35	40	40	45	45
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	25.6	30.0	36.7	39.7	50.6	59.4	70.0	78.8	90.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	10,063	14,000	14,000	17,694	21,486	—	—	—	—
Height (in.)	22.5	30	30	35	42.5	—	—	—	—
Length (in.)	92	96	96	104	104	—	—	—	—
Total Face Area (sq ft)	14.4	20.0	20.0	25.3	30.7	—	—	—	—
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	15,653	17,500	21,000	22,750	27,806	32,509	38,281	42,875	49,000
Lower Coil Height (in.)	35	37.5	45	45	55	32.5	32.5	35	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	30	30	35	35
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	22.4	25.0	30.0	32.5	39.7	46.4	54.7	61.3	70.0

COIL DATA (cont)

39M UNIT SIZE	03	06	08	10	12	14	17	21	25
5/8-in. CHILLED WATER									
Large Face Area									
Nominal Capacity (cfm) at 500 fpm	1,667	2,833	3,750	4,875	5,958	6,760	8,125	10,156	11,563
Lower Coil Height (in.)	24	24	27	27	33	33	36	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.3	5.7	7.5	9.8	11.9	13.5	16.3	20.3	23.1
Medium Face Area									
Nominal Capacity (cfm) at 500 fpm	1,042	1,771	2,500	3,250	4,875	6,146	6,771	8,802	10,021
Lower Coil Height (in.)	15	15	18	18	27	30	30	39	39
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	5.0	6.5	9.8	12.3	13.5	17.6	20.0
Bypass Face Area (Internal Chilled Water Only)									
Nominal Capacity (cfm) at 500 fpm	1,042	1,771	2,083	2,708	4,333	4,917	6,094	7,448	8,479
Lower Coil Height (in.)	15	15	15	15	24	24	27	33	33
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.2	5.4	8.7	9.8	12.2	14.9	17.0
5/8-in. HOT WATER HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	2,333	3,967	5,250	6,825	8,342	9,465	11,375	14,219	16,188
Lower Coil Height (in.)	24	24	27	27	33	33	36	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.3	5.7	7.5	9.8	11.9	13.5	16.3	20.3	23.1
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,500	4,550	6,825	8,604	9,479	12,323	14,029
Lower Coil Height (in.)	15	15	18	18	27	30	30	39	39
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	5.0	6.5	9.8	12.3	13.5	17.6	20.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	3,792	4,302	5,688	6,635	7,554
Height (in.)	—	15	15	15	15	15	18	21	21
Length (in.)	—	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	—	3.5	4.2	5.4	5.4	6.1	8.1	9.5	10.8
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	2,917	3,792	6,067	6,883	8,531	10,427	11,871
Lower Coil Height (in.)	15	15	15	15	24	24	27	33	33
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.2	5.4	8.7	9.8	12.2	14.9	17.0
1-in. STEAM HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	2,333	3,967	5,250	6,825	8,342	9,465	11,375	14,219	16,188
Lower Coil Height (in.)	24	24	27	27	33	33	36	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	3.3	5.7	7.5	9.8	11.9	13.5	16.3	20.3	23.1
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,500	4,550	6,825	8,604	9,479	12,323	14,029
Lower Coil Height (in.)	15	15	18	18	27	30	30	39	39
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	5.0	6.5	9.8	12.3	13.5	17.6	20.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	3,792	4,302	5,688	6,635	7,554
Height (in.)	—	15	15	15	15	15	18	21	21
Length (in.)	—	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	—	3.5	4.2	5.4	5.4	6.1	8.1	9.5	10.8
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	2,917	3,792	6,067	6,883	8,531	10,427	11,871
Lower Coil Height (in.)	15	15	15	15	24	24	27	33	33
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Length (in.)	20	34	40	52	52	59	65	65	74
Total Face Area (sq ft)	2.1	3.5	4.2	5.4	8.7	9.8	12.2	14.9	17.0
5/8-in. HOT WATER INTEGRAL FACE AND BYPASS									
Nominal Capacity (cfm)	—	3,000	4,000	5,000	6,000	7,000	8,500	10,500	12,500
Coil Height (in.)	—	22.9	30.6	30.6	30.6	30.6	24	33	33
Length (in.)	—	24	30	39	39	45	59.4	59.4	59.4
Total Face Area (sq ft)	—	3.3	5.7	7.4	7.4	8.5	9.2	12.6	12.6
5/8-in. STEAM INTEGRAL FACE AND BYPASS									
Nominal Capacity (cfm)	—	3,000	4,000	5,000	6,000	7,000	8,500	10,500	12,500
Coil Height (in.)	—	22.88	30.56	30.56	30.56	30.56	24	33	33
Length (in.)	—	24	30	39	39	45	59.38	59.38	59.38
Total Face Area (sq ft)	—	3.3	5.7	7.4	7.4	8.5	9.2	12.6	12.6

Physical data (cont)

COIL DATA (cont)

39M UNIT SIZE	30	36	40	50	61	72	85	96	110
5/8-in. CHILLED WATER									
Large Face Area									
Nominal Capacity (cfm) at 500 fpm	14,375	18,000	20,000	24,917	30,333	35,667	42,000	47,250	54,000
Lower Coil Height (in.)	45	54	30	36	42	48	48	54	54
Upper Coil Height (in.)	N/A	N/A	30	33	42	48	48	54	54
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	28.8	36.0	40.0	49.8	60.7	71.3	84.0	94.5	108.0
Medium Face Area									
Nominal Capacity (cfm) at 500 fpm	12,458	15,000	18,000	19,500	24,917	28,979	34,125	38,063	43,500
Lower Coil Height (in.)	39	45	54	54	36	39	39	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	33	39	39	42	42
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	24.9	30.0	36.0	39.0	49.8	58.0	68.3	76.1	87.0
Bypass Face Area (Internal Chilled Water Only)									
Nominal Capacity (cfm) at 500 fpm	10,542	12,000	15,000	16,250	19,500	23,406	27,563	31,500	36,000
Lower Coil Height (in.)	33	36	45	45	54	33	33	36	36
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	30	30	36	36
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	21.1	24.0	30.0	32.5	39.0	46.8	55.1	63.0	72.0
5/8-in. HOT WATER HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	20,125	25,200	28,000	34,883	42,467	49,933	58,800	66,150	75,600
Lower Coil Height (in.)	45	54	30	36	42	48	48	54	54
Upper Coil Height (in.)	N/A	N/A	30	33	42	48	48	54	54
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	28.8	36.0	40.0	49.8	60.7	71.3	84.0	94.5	108.0
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	17,442	21,000	25,200	27,300	34,883	40,571	47,775	53,288	60,900
Lower Coil Height (in.)	39	45	54	54	36	39	39	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	33	39	39	42	42
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	24.9	30.0	36.0	39.0	49.8	58.0	68.3	76.1	87.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	9,392	14,000	14,000	16,683	21,233	—	—	—	—
Height (in.)	21	30	30	33	42	—	—	—	—
Length (in.)	92	96	96	104	104	—	—	—	—
Total Face Area (sq ft)	13.4	20.0	20.0	23.8	30.3	—	—	—	—
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	14,758	16,800	21,000	22,750	27,300	32,769	38,588	44,100	50,400
Lower Coil Height (in.)	33	36	45	45	54	33	33	36	36
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	30	30	36	36
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	21.1	24.0	30.0	32.5	39.0	46.8	55.1	63.0	72.0
1-in. STEAM HEATING									
Large Face Area									
Nominal Capacity (cfm) at 700 fpm	20,125	25,200	28,000	34,883	42,467	49,933	58,800	66,150	75,600
Lower Coil Height (in.)	45	54	30	36	42	48	48	54	54
Upper Coil Height (in.)	N/A	N/A	30	33	42	48	48	54	54
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	28.8	36.0	40.0	49.8	60.7	71.3	84.0	94.5	108.0
Medium Face Area									
Nominal Capacity (cfm) at 700 fpm	17,442	21,000	25,200	27,300	34,883	40,571	47,775	53,288	60,900
Lower Coil Height (in.)	39	45	54	54	36	39	39	45	45
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	33	39	39	42	42
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	24.9	30.0	36.0	39.0	49.8	58.0	68.3	76.1	87.0
Small Face Area									
Nominal Capacity (cfm) at 700 fpm	9,392	14,000	14,000	16,683	21,233	—	—	—	—
Height (in.)	21	30	30	33	42	—	—	—	—
Length (in.)	92	96	96	104	104	—	—	—	—
Total Face Area (sq ft)	13.4	20.0	20.0	23.8	30.3	—	—	—	—
Bypass Face Area (Internal)									
Nominal Capacity (cfm) at 700 fpm	14,758	16,800	21,000	22,750	27,300	32,769	38,588	44,100	50,400
Lower Coil Height (in.)	33	36	45	45	54	33	33	36	36
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	30	30	36	36
Length (in.)	92	96	96	104	104	107	126	126	144
Total Face Area (sq ft)	21.1	24.0	30.0	32.5	39.0	46.8	55.1	63.0	72.0
5/8-in. HOT WATER INTEGRAL FACE AND BYPASS									
Nominal Capacity (cfm)	15,000	18,000	20,000	25,000	30,500	36,000	42,500	48,000	55,000
Coil Height (in.)	33	45	51	60	75	87	87	96	96
Length (in.)	81.4	81.4	81.4	92.4	92.4	92.4	114.4	114.4	136.4
Total Face Area (sq ft)	17.6	24.1	27.3	36.7	45.8	53.2	66.5	73.3	88.0
5/8-in. STEAM INTEGRAL FACE AND BYPASS									
Nominal Capacity (cfm)	15,000	18,000	20,000	25,000	30,500	36,000	42,500	48,000	55,000
Coil Height (in.)	33	45	51	60	75	87	87	96	96
Length (in.)	81.4	81.4	81.4	92.4	92.4	92.4	114.4	114.4	136.4
Total Face Area (sq ft)	17.6	24.1	27.3	36.7	45.8	53.2	66.5	73.3	88.0

1/2-in. WATER COIL CONNECTION SIZES

FACE AREA	ROWS	CIRCUIT TYPE	39M UNIT SIZE																	
			03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
			Nozzle Size (in. MPT)																	
LARGE	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	(2)1.5	(2)1.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	(2)1.5	(2)1.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8, 10	HALF	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)1.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		FULL	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	3	(2)1.5	(2)2.5	(2)2.5	(2)3	(2)3	(2)3	(2)3
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	(2)2.5	(2)2.5	(2)3	(2)3	(2)3	(2)3	(2)3
MEDIUM	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)1.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)1.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8, 10	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	3	3	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	(2)2.5	(2)3	(2)3	(2)3	(2)3
BYPASS	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	(2)1.5	(2)1.5	(2)1.5	(2)1.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	(2)1.5	(2)1.5	(2)1.5	(2)1.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8, 10	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	(2)2.5	(2)2.5	(2)2.5	(2)2.5
SMALL	1, 2	HALF/FULL	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	—	—	—	—
	4	HALF/FULL	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	—	—	—	—
		DOUBLE	—	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—

NOTES:
1. Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of water coil connections.
2. All 72-110 sized units have 2 sets of water coil connections.

5/8-in. WATER COIL CONNECTION SIZES

FACE AREA	ROWS	CIRCUIT TYPE	39M UNIT SIZE																	
			03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
			Nozzle Size (in. MPT)																	
LARGE	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	(2)1.5	(2)1.5	(2)2	(2)2	(2)2	(2)2	(2)2
	2,4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	(2)1.5	(2)1.5	(2)2	(2)2	(2)2	(2)2	(2)2
		FULL	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8	FULL	2	2	2	2	2.5	2.5	2.5	3	3	3	3	(2)2	(2)2.5	(2)2.5	(2)3	(2)3	(2)3	(2)3
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	(2)2.5	(2)2.5	(2)2.5	(2)4	(2)4	(2)4	(2)4
MEDIUM	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	(2)1.5	(2)2	(2)2	(2)2	(2)2
	2,4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	(2)1.5	(2)2	(2)2	(2)2	(2)2
		FULL	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8	FULL	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	3	3	3	(2)2.5	(2)3	(2)3	(2)3	(2)3
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	(2)2.5	(2)3	(2)3	(2)3	(2)3
BYPASS	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	(2)1.5	(2)1.5	(2)1.5	(2)1.5
	2,4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	(2)1.5	(2)1.5	(2)1.5	(2)1.5
		FULL	1.5	1.5	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
	6, 8	FULL	1.5	1.5	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	3	3	3	(2)2.5	(2)2.5	(2)3	(2)3
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	(2)3	(2)3	(2)3	(2)3
SMALL	1	HALF	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	—	—	—	—
	2	HALF	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	—	—	—	—
		FULL	—	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	—	—	—	—

NOTES:
1. Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of water coil connections.
2. All 72-110 sized units have 2 sets of water coil connections.

Physical data (cont)

1-in. STEAM COIL CONNECTION SIZES

FACE AREA	ROWS	CONNECTION	39M UNIT SIZE																
			03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
			Nozzle Size (in. MPT)																	
ALL*	ALL	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2)2.5	(2)2.5	(2)2.5	(2)2.5

*Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of steam coil connections.

5/8-in. STEAM COIL CONNECTION SIZES

FACE AREA	ROWS	CONNECTION	39M UNIT SIZE																
			03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
			Nozzle Size (in. MPT)																	
LARGE	1	INLET	2	2	2	2	2	2	2	2.5	2.5	—	—	—	—	—	—	—	—	—
		OUTLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
MEDIUM	1	INLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
		OUTLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
BYPASS	1	INLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
		OUTLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
SMALL	1	INLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
		OUTLET	2	2	2	2	2	2	2	2	2	—	—	—	—	—	—	—	—	—
LARGE	2	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	—	—	—	—	—	—	—	—	—
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
MEDIUM	2	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
BYPASS	2	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
SMALL	2	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	—	—	—	—	—	—	—	—	—

HOT WATER — INTEGRAL FACE AND BYPASS COIL CONNECTION SIZES

ROWS	CONNECTION	39M UNIT SIZE																	
		03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
		Nozzle Size (in. MPT)																	
1	INLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2	2	2	2	2	2	2	2	2
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2	2	2	2	2	2	2	2	2
2	INLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3
3	INLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3

STEAM — INTEGRAL FACE AND BYPASS COIL CONNECTION SIZES

ROWS	CONNECTION	39M UNIT SIZE																	
		03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
		Nozzle Size (in. MPT)																	
1	INLET	—	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2	2	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5
2	INLET	—	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3	3	3	4	4	4
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3
3	INLET	—	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	3	3	3	4	4	4
	OUTLET	—	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3

OPERATING CHARGE (Approximate) — DIRECT-EXPANSION COIL

ROWS	CONNECTION	39M UNIT SIZE																	
		03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
		Refrigerant R-410A or R-22 (lb)																	
4	Large	1	3	4	4	5	6	7	9	11	13	16	18	22	27	32	37	42	48
	Medium	1	2	3	3	4	5	6	7	8	10	12	13	17	20	24	28	32	36
6	Large	2	4	6	7	9	10	12	15	18	22	26	29	37	45	53	62	70	80
	Medium	2	3	4	5	7	8	9	11	14	16	20	22	27	33	39	47	53	60
8	Large	3	6	8	10	12	15	18	22	26	31	37	42	52	63	75	88	100	114
	Medium	2	5	6	8	9	11	13	16	20	23	28	31	39	48	56	66	75	86

COIL VOLUME (Gal. Water)

39M UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
CHILLED WATER																		
Large Face Area																		
4-Row	1.4	2.2	2.8	3.7	4.7	5.3	6.2	7.8	8.9	11.0	13.3	14.5	18.3	22.2	26.2	30.7	34.7	39.6
6-Row	2.0	3.3	4.3	5.5	7.0	7.9	9.3	11.8	13.3	16.5	19.9	21.7	27.4	33.3	39.3	46.1	52.0	59.3
8-Row	2.7	4.4	5.7	7.3	9.3	10.5	12.4	15.7	17.8	22.0	26.5	29.0	36.5	44.4	52.3	61.5	69.3	79.1
10-Row	3.4	5.5	7.1	9.1	11.6	13.1	15.5	19.6	22.2	27.5	33.2	36.2	45.7	55.5	65.4	76.8	86.7	98.9
Medium Face Area																		
4-Row	0.9	1.5	2.1	2.7	3.7	4.5	4.9	6.6	7.5	9.3	10.9	13.3	14.4	18.3	21.5	25.2	28.4	32.4
6-Row	1.4	2.3	3.1	4.0	5.5	6.8	7.4	9.9	11.2	13.9	16.3	19.9	21.5	27.4	32.2	37.8	42.6	48.5
8-Row	1.9	3.1	4.1	5.3	7.3	9.0	9.9	13.2	15.0	18.5	21.7	26.5	28.7	36.5	42.9	50.4	56.7	64.7
10-Row	2.4	3.9	5.2	6.6	9.1	11.3	12.4	16.5	18.7	23.1	27.1	33.2	35.9	45.7	53.7	63.0	70.9	80.9
Small Face Area																		
4-Row	—	1.3	1.5	2.0	2.3	2.6	3.3	3.7	4.2	5.2	7.2	7.2	9.1	11.1	—	—	—	—
Bypass Face Area																		
4-Row	0.8	1.3	1.8	2.3	3.3	3.8	4.5	5.8	6.5	8.1	9.0	10.9	11.7	14.4	16.8	19.7	22.1	25.2
6-Row	1.2	2.0	2.7	3.5	5.0	5.6	6.8	8.7	9.8	12.2	13.6	16.3	17.6	21.5	25.2	29.6	33.1	37.8
8-Row	1.6	2.7	3.6	4.7	6.6	7.5	9.1	11.5	13.1	16.2	18.1	21.7	23.5	28.7	33.6	39.4	44.1	50.3
10-Row	2.0	3.3	4.5	5.8	8.3	9.4	11.3	14.4	16.4	20.3	22.6	27.1	29.4	35.9	41.9	49.3	55.2	62.9
HOT WATER																		
Large Face Area																		
1-Row	0.3	0.6	0.7	0.9	1.2	1.3	1.5	2.0	2.2	2.7	3.3	3.6	4.6	5.5	6.5	7.7	8.7	9.9
2-Row	0.7	1.1	1.4	1.8	2.3	2.6	3.1	3.9	4.4	5.5	6.6	7.2	9.1	11.1	13.1	15.4	17.3	19.8
Medium Face Area																		
1-Row	0.2	0.4	0.5	0.7	0.9	1.1	1.2	1.6	1.9	2.3	2.7	3.3	3.6	4.6	5.4	6.3	7.1	8.1
2-Row	0.5	0.8	1.0	1.3	1.8	2.3	2.5	3.3	3.7	4.6	5.4	6.6	7.2	9.1	10.7	12.6	14.2	16.2
Small Face Area																		
1-Row	—	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.1	1.3	1.8	1.8	2.3	2.8	—	—	—	—
2-Row	—	0.7	0.8	1.0	1.2	1.3	1.6	1.9	2.1	2.6	3.6	3.6	4.6	5.5	—	—	—	—
Bypass Face Area																		
1-Row	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.4	1.6	2.0	2.3	2.7	2.9	3.6	4.2	4.9	5.5	6.3
2-Row	0.4	0.7	0.9	1.2	1.7	1.9	2.3	2.9	3.3	4.1	4.5	5.4	5.9	7.2	8.4	9.9	11.0	12.6
Integral Bypass Face Area																		
1-Row	—	0.3	0.5	0.6	0.6	0.7	0.6	0.8	0.8	1.2	1.6	1.8	2.4	3.0	3.4	4.3	4.7	5.6
2-Row	—	0.6	0.9	1.2	1.2	1.4	1.2	1.7	1.7	2.3	3.2	3.6	4.8	5.9	6.8	8.5	9.4	11.3
3-Row	—	0.8	1.4	1.8	1.8	2.0	1.9	2.5	2.5	3.5	4.7	5.3	7.1	8.9	10.3	12.8	14.1	16.9

NOTE: One gallon of water weighs 8.33 lb.

Physical data (cont)

DRY COIL WEIGHTS (lb)

COIL TYPE	FACE AREA	ROWS	FPI	39M UNIT SIZE																	
				03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
CHILLED WATER OR DIRECT EXPANSION	LARGE	4	8	50	85	110	143	182	207	244	309	353	437	528	576	728	884	1043	1229	1386	1584
			11	52	89	115	149	190	215	254	322	367	455	550	600	758	921	1087	1280	1444	1650
			14	54	92	119	155	197	224	264	335	382	473	572	624	789	958	1130	1331	1502	1716
		6	8	70	120	154	200	255	289	341	432	494	612	739	806	1019	1238	1461	1720	1940	2218
			11	73	124	160	209	265	301	355	450	514	637	770	840	1062	1289	1521	1792	2021	2310
			14	76	129	167	217	276	313	370	468	535	663	801	874	1104	1341	1582	1863	2102	2402
		8	8	90	154	198	258	328	372	439	556	635	787	950	1037	1310	1591	1878	2211	2495	2851
			11	94	160	206	268	341	387	457	579	661	819	990	1080	1365	1658	1956	2303	2599	2970
			14	98	166	215	279	355	403	475	602	688	852	1030	1123	1420	1724	2034	2396	2703	3089
		10	8	107	182	235	305	388	441	520	659	753	932	1126	1229	1553	1886	2226	2621	2957	3379
			11	111	190	244	318	404	459	542	686	784	971	1173	1280	1618	1964	2318	2730	3080	3520
			14	116	197	254	331	421	477	563	714	815	1010	1220	1331	1682	2043	2411	2839	3203	3661
	MEDIUM	4	8	35	60	80	104	143	177	195	260	296	368	432	528	572	728	856	1008	1134	1296
			11	36	62	83	108	149	184	203	271	308	383	450	550	596	758	892	1050	1181	1350
			14	38	64	87	113	155	192	211	282	321	399	468	572	620	789	927	1092	1229	1404
		6	8	49	83	112	146	200	248	273	364	414	515	605	739	801	1019	1198	1411	1588	1814
			11	51	87	117	152	209	258	284	379	432	537	630	770	834	1062	1248	1470	1654	1890
			14	53	90	121	158	217	268	296	394	449	558	655	801	868	1104	1298	1529	1720	1966
		8	8	63	107	144	187	257	319	351	468	533	662	778	950	1030	1310	1541	1814	2041	2333
			11	66	112	150	195	268	332	366	488	555	690	810	990	1073	1365	1605	1890	2126	2430
			14	68	116	156	203	279	345	380	507	577	718	842	1030	1115	1420	1669	1966	2211	2527
		10	8	75	127	171	222	305	378	416	555	631	785	922	1126	1220	1553	1826	2150	2419	2765
			11	78	132	178	231	318	393	433	578	658	818	960	1173	1271	1618	1902	2240	2520	2880
			14	81	138	185	240	330	409	451	601	684	850	998	1220	1322	1682	1978	2330	2621	2995
	SMALL	4	8	—	51	60	78	91	103	130	146	167	207	288	288	364	442	—	—	—	—
			11	—	53	63	81	95	108	135	152	173	216	300	300	379	460	—	—	—	—
			14	—	55	65	85	99	112	141	158	180	224	312	312	394	479	—	—	—	—
	BYPASS	4	8	30	51	70	91	130	148	179	228	259	322	360	432	468	572	669	788	882	1008
			11	31	53	73	95	135	154	186	237	270	335	375	450	488	596	697	820	919	1050
			14	33	55	76	99	141	160	194	246	281	349	390	468	507	620	724	853	956	1092
		6	8	42	71	98	127	182	207	250	319	363	451	504	605	655	801	936	1103	1235	1411
			11	44	74	102	133	190	215	261	332	378	470	525	630	683	834	975	1148	1286	1470
			14	46	77	106	138	197	224	271	345	393	488	546	655	710	868	1014	1194	1338	1529
		8	8	54	92	126	164	234	266	322	410	466	580	648	778	842	1030	1204	1418	1588	1814
			11	56	96	131	171	244	277	335	427	486	604	675	810	878	1073	1254	1477	1654	1890
			14	59	99	137	177	254	288	349	444	505	628	702	842	913	1115	1304	1536	1720	1966
		10	8	64	109	149	194	277	315	381	485	553	687	768	922	998	1220	1427	1680	1882	2150
			11	67	113	156	202	289	328	397	506	576	716	800	960	1040	1271	1486	1750	1960	2240
			14	69	118	162	210	300	341	413	526	599	744	832	998	1082	1322	1546	1820	2038	2330
HOT WATER	LARGE	1	8	17	28	37	48	61	69	81	103	118	146	176	192	243	295	348	410	462	528
			11	17	30	38	50	63	72	85	107	122	152	183	200	253	307	362	427	481	550
			14	18	31	40	52	66	75	88	112	127	158	191	208	263	319	377	444	501	572
		2	8	23	40	51	67	85	96	114	144	165	204	246	269	340	413	487	573	647	739
			11	24	41	53	70	88	100	118	150	171	212	257	280	354	430	507	597	674	770
			14	25	43	56	72	92	104	123	156	178	221	267	291	368	447	527	621	701	801
		4	8	50	85	110	143	182	207	244	309	353	437	528	576	728	884	1043	1229	1386	1584
			11	52	89	115	149	190	215	254	322	367	455	550	600	758	921	1087	1280	1444	1650
			14	54	92	119	155	197	224	264	335	382	473	572	624	789	958	1130	1331	1502	1716
	MEDIUM	1	8	12	20	27	35	48	59	65	87	99	123	144	176	191	243	285	336	378	432
			11	12	21	28	36	50	61	68	90	103	128	150	183	199	253	297	350	394	450
			14	13	21	29	38	52	64	70	94	107	133	156	191	207	263	309	364	410	468
		2	8	16	28	37	49	67	83	91	121	138	172	202	246	267	340	399	470	529	605
			11	17	29	39	51	70	86	95	126	144	179	210	257	278	354	416	490	551	630
			14	18	30	40	53	72	89	99	131	150	186	218	267	289	368	433	510	573	655
		4	8	35	60	80	104	143	177	195	260	296	368	432	528	572	728	856	1008	1134	1296
			11	36	62	83	108	149	184	203	271	308	383	450	550	596	758	892	1050	1181	1350
			14	38	64	87	113	155	192	211	282	321	399	468	572	620	789	927	1092	1229	1404
	SMALL	1	8	—	17	20	26	30	34	43	49	56	69	96	96	121	147	—	—	—	—
			11	—	18	21	27	32	36	45	51	58	72	100	100	126	153	—	—	—	—
			14	—	18	22	28	33	37	47	53	60	75	104	104	131	160	—	—	—	—
		2	8	—	24	28	36	42	48	61	68	78	97	134	134	170	206	—	—	—	—
			11	—	25	29	38	44	50	63	71	81	101	140	140	177	215	—	—	—	—
			14	—	26	30	39	46	52	66	74	84	105	146	146	184	223	—	—	—	—
		4	8	—	51	60	78	91	103	130	146	167	207	288	288	364	442	—	—	—	—
			11	—	53	63	81	95	108	135	152	173	216	300	300	379	460	—	—	—	—
			14	—	55	65	85	99	112	141	158	180	224	312	312	394	479	—	—	—	—
	BYPASS	1	8	10	17	23	30	43	49	60	76	86	107	120	144	156	191	223	263	294	336
			11	10	18	24	32	45	51	62	79	90	112	125	150	163	199	232	273	306	350
			14	11	18	25	33	47	53	65	82	94	116	130	156	169	207	241	284	319	364
		2	8	14	24	33	42	61	69	83	106	121	150	168	202	218	267	312	368	412	470
			11	15	25	34	44	63	72	87	111	126	157	175	210	228	278	325	383	429	490
			14	15	26	35	46	66	75	90	115	131	163	182	218	237	289	338	398	446	510
		4	8	30	51	70	91	130	148	179	228	259	322	360	432	468	572	669	788	882	1008
			11	31	53	73	95	135	154	186	237	270	335	375	450	488	596	697	820	919	1050
			14	33	55	76	99	141	160	194	246	281	349	390	468	507	620	724	853	956	1092
1-in. IDT STEAM	LARGE	1	6	23	40	51	67	85	96	114	144	165	204	246	269	340	413	487	573	647	739
			9	24	41	53	70	88	100	118	150	171	212	257	280	354	430	507	597	674	770
			12	25	43	56	72	92	104	123	156	178	221	267	291	368	447	527	621	701	801
	MEDIUM		6	16	28	37	49	67	83	91	121	138	172	202	246	267	340	399	470	529	605
			9	17	29	39	51	70	86	95	126	144	179	210	257	278	354	416	490	551	630
			12	18	30	40	53	72	89	99	131	150	186	218	267	289	368	433	510	573	655
	SMALL		6	—	24	28	36	42	48	61	68	78	97	134	134	170	206	—	—	—	—
			9	—	25	29	38	44	50	63	71	81	101	140	140	177	215	—	—	—	—
			12	—	26	30	39	46	52	66	74	84	105	146	146	184	223	—	—	—	—
	BYPASS		6	14	24	33	42	61	69	83	106	121	150	168	202	218	267	312	368	412	470
			9	15	25	34	44	63	72	87	111	126	157	175	210	228	278	325	383	429	490
			12	15	26	35	46	66	75	90	115	131	163	182	218	237	289	338	398	446	510

LEGEND

FPI — Fins Per Inch
IDT — Inner Distributing Tube

NOTES:
1. Weights shown include headers and are the sum of two coils where applicable.
2. Coils are full length.
3. Weights shown are for aluminum fin coils; for copper fin coils, multiply by 1.20.
4. Weights shown are for 1/2-in., .016 in. wall tubes; for 1/2-in., .025-in. wall tubes, multiply by 1.15.
5. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .020-in. wall tubes, multiply by 1.15.
6. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .035-in. wall tubes, multiply by 1.50.

DRY COIL WEIGHTS (lb) (cont)

COIL TYPE	FACE AREA	ROWS	FPI	39M UNIT SIZE																	
				03	06	08	10	12	14	17	21	25	30	36	40	50	61	72	85	96	110
5/8-IN. IDT STEAM	LARGE	1	6	19	32	41	53	68	77	91	115	132	—	—	—	—	—	—	—	—	—
			9	19	33	43	56	71	80	95	120	137	—	—	—	—	—	—	—	—	—
			12	20	35	44	58	74	84	99	125	143	—	—	—	—	—	—	—	—	—
		2	6	23	40	51	67	85	96	114	144	165	—	—	—	—	—	—	—	—	—
			9	24	41	53	70	88	100	118	150	171	—	—	—	—	—	—	—	—	—
			12	25	43	56	72	92	104	123	156	178	—	—	—	—	—	—	—	—	—
	MEDIUM	1	6	13	22	30	39	53	66	73	97	111	—	—	—	—	—	—	—	—	—
			9	14	23	31	40	56	69	76	101	115	—	—	—	—	—	—	—	—	—
			12	14	24	32	42	58	72	79	105	120	—	—	—	—	—	—	—	—	—
		2	6	16	28	37	49	67	83	91	121	138	—	—	—	—	—	—	—	—	—
			9	17	29	39	51	70	86	95	126	144	—	—	—	—	—	—	—	—	—
			12	18	30	40	53	72	89	99	131	150	—	—	—	—	—	—	—	—	—
	SMALL	1	6	—	19	22	29	34	39	49	55	62	—	—	—	—	—	—	—	—	—
			9	—	20	23	30	35	40	51	57	65	—	—	—	—	—	—	—	—	—
			12	—	21	24	32	37	42	53	59	67	—	—	—	—	—	—	—	—	—
		2	6	—	24	28	36	42	48	61	68	78	—	—	—	—	—	—	—	—	—
			9	—	25	29	38	44	50	63	71	81	—	—	—	—	—	—	—	—	—
			12	—	26	30	39	46	52	66	74	84	—	—	—	—	—	—	—	—	—
	BYPASS	1	6	11	19	26	34	49	55	67	85	97	—	—	—	—	—	—	—	—	—
			9	12	20	27	35	51	57	70	88	101	—	—	—	—	—	—	—	—	—
			12	12	21	28	37	53	60	72	92	105	—	—	—	—	—	—	—	—	—
		2	6	14	24	33	42	61	69	83	106	121	—	—	—	—	—	—	—	—	—
			9	15	25	34	44	63	72	87	111	126	—	—	—	—	—	—	—	—	—
			12	15	26	35	46	66	75	90	115	131	—	—	—	—	—	—	—	—	—
HOT WATER OR STEAM	INTEGRAL FACE AND BYPASS	1	6	—	146	192	224	224	239	507	587	587	749	853	906	1064	1181	1356	1628	1699	1983
			9	—	152	200	233	233	249	528	612	612	780	889	944	1108	1230	1412	1695	1769	2066
			12	—	158	208	242	242	259	550	637	637	813	926	983	1154	1281	1471	1766	1843	2152
		2	6	—	152	202	237	237	254	536	630	630	810	935	997	1180	1320	1530	1846	1931	2262
			9	—	158	210	247	247	265	559	657	657	844	974	1039	1229	1375	1594	1923	2011	2356
			12	—	164	218	257	257	276	582	684	684	879	1015	1082	1280	1432	1660	2003	2095	2454
		3	6	—	158	212	251	251	269	585	695	695	899	1044	1117	1327	1491	1736	2102	2202	2586
			9	—	165	221	261	261	280	610	724	724	936	1088	1164	1382	1553	1809	2190	2293	2694
			12	—	172	230	271	271	291	635	754	754	975	1133	1212	1440	1618	1884	2281	2389	2806

LEGEND

FPI — Fins Per Inch
IDT — Inner Distributing Tube

NOTES:
1. Weights shown include headers and are the sum of two coils where applicable.
2. Coils are full length.
3. Weights shown are for aluminum fin coils; for copper fin coils, multiply by 1.20.
4. Weights shown are for 1/2-in., .016 in. wall tubes; for 1/2-in., .025-in. wall tubes, multiply by 1.15.
5. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .020-in. wall tubes, multiply by 1.15.
6. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .035-in. wall tubes, multiply by 1.50.

MOTOR WEIGHTS (lb)

HP	230/460-3-60		200/400-3-50*		575-3-60	
	ODP	TEFC	ODP	TEFC	ODP	TEFC
1	40	68	29	34	37	60/68
1 1/2	46	66	36	41	48	60/66
2	54	66	41	47	50	65/66
3	87	92	73	62	70	87
5	94	99	102	72	88	89/99
7 1/2	130	158	121	105	89	142/158
10	126	200	139	128	119	154/200
15	217	259	170	210	170	250/259
20	250	290	205	254	212	287/290
25	309	358	273	363	240	394/368
30	300	436	283	414	284	436/436
40	415	661	416†	470†	370	661/661
50	414	686	403†	527†	440	686/686
60	652**	799	545	790†	591	799
75	706**	850**	651†	884†	670	850
100	782**	1475**	1133†	1450†	750	1008†
125	1000**	1600**	1210†	1625†	950	1714†
150	1318**	1773**	—	—	—	—

LEGEND

ODP — Open Drip Proof
TEFC — Totally Enclosed Fan Cooled

*Both ODP and TEFC 50 Hz motors available in standard models only.
†Availability unconfirmed.
**460 volt only.

NOTE: Multiply motor weight by 0.10 to estimate drive weight.

Physical data (cont)

ELECTRICAL DATA - PREMIUM EFFICIENCY EISA COMPLIANT MOTORS

ODP T-FRAME MOTORS - 1800 RPM

MOTOR HP	FLA FOR 3-PHASE, 60 Hz VOLTAGES				EFF. (%)	NEMA FRAME
	208	230	460	575		
1	3.1	2.8	1.4	1.1	85.5	143T
1.5	4.6	4.2	2.1	1.7	86.5	145T
2	6.1	5.6	2.8	2.2	86.5	145T
3	8.6	7.8	3.9	3.1	89.5	182T
5	14.3	13.0	6.5	5.2	89.5	184T
7.5	20.8	18.8	9.4	7.5	91.0	213T
10	27.3	24.7	12.4	9.9	91.7	215T
15	39.8	36.0	18.0	14.4	93.0	254T
20	53.1	48.0	24.0	19.2	93.0	256T
25	65.5	59.3	29.6	23.7	93.6	284T
30	77.8	70.4	35.2	28.2	94.1	286T
40	103.8	93.8	46.9	37.5	94.1	324T
50	128.6	116.3	58.2	46.5	94.5	326T
60	152.7	138.1	69.1	55.2	95.0	364T
75	190.9	172.6	86.3	69.1	95.0	365T
100	252.4	228.3	114.1	91.3	95.4	404T
125	—	—	142.7	114.1	95.4	405T
150	—	—	169.8	135.8	95.8	444T

ODP T-FRAME MOTORS - 3600 RPM

MOTOR HP	FLA FOR 3-PHASE, 60 Hz VOLTAGES				EFF. (%)	NEMA FRAME
	208	230	460	575		
1	3.9	3.5	1.8	1.4	77.0	143T
1.5	4.9	4.4	2.2	1.8	84.0	143T
2	6.3	5.7	2.8	2.3	85.5	145T
3	9.4	8.5	4.3	3.4	85.5	145T
5	15.4	13.9	6.9	5.6	86.5	182T
7.5	22.0	19.9	9.9	8.0	88.5	184T
10	28.7	25.9	13.0	10.4	89.5	213T
15	42.4	38.3	19.1	15.3	90.2	215T
20	55.5	50.2	25.1	20.1	91.0	254T
25	68.3	61.8	30.9	24.7	91.7	256T
30	82.0	74.1	37.1	29.6	91.7	284T
40	107.6	97.3	48.7	38.9	92.4	286T
50	132.8	120.1	60.0	48.0	93.0	324T
60	157.3	142.3	71.1	56.9	93.6	326T
75	196.6	177.8	88.9	71.1	93.6	364T
100	262.2	237.1	118.6	94.8	93.6	365T
125	—	—	146.6	117.3	94.1	404T
150	—	—	176.0	140.8	94.1	405T

TEFC T-FRAME MOTORS - 1800 RPM

MOTOR HP	FLA FOR 3-PHASE, 60 HZ VOLTAGES				EFF. (%)	NEMA FRAME
	208	230	460	575		
1	3.1	2.8	1.4	1.1	85.5	143T
1.5	4.6	4.2	2.1	1.7	86.5	145T
2	6.1	5.6	2.8	2.2	86.5	145T
3	8.6	7.8	3.9	3.1	89.5	182T
5	14.3	13.0	6.5	5.2	89.5	184T
7.5	20.5	18.5	9.3	7.4	91.7	213T
10	27.3	24.7	12.4	9.9	91.7	215T
15	40.4	36.5	18.2	14.6	92.4	254T
20	53.1	48.0	24.0	19.2	93.0	256T
25	65.5	59.3	29.6	23.7	93.6	284T
30	78.7	71.1	35.6	28.5	93.6	286T
40	103.8	93.8	46.9	37.5	94.1	324T
50	128.6	116.3	58.2	46.5	94.5	326T
60	152.7	138.1	69.1	55.2	95.0	364T
75	189.3	171.2	85.6	68.5	95.4	365T
100	252.4	228.3	114.1	91.3	95.4	405T
125	—	—	142.7	114.1	95.4	444T
150	—	—	169.8	135.8	95.8	445T

TEFC T-FRAME MOTORS - 3600 RPM

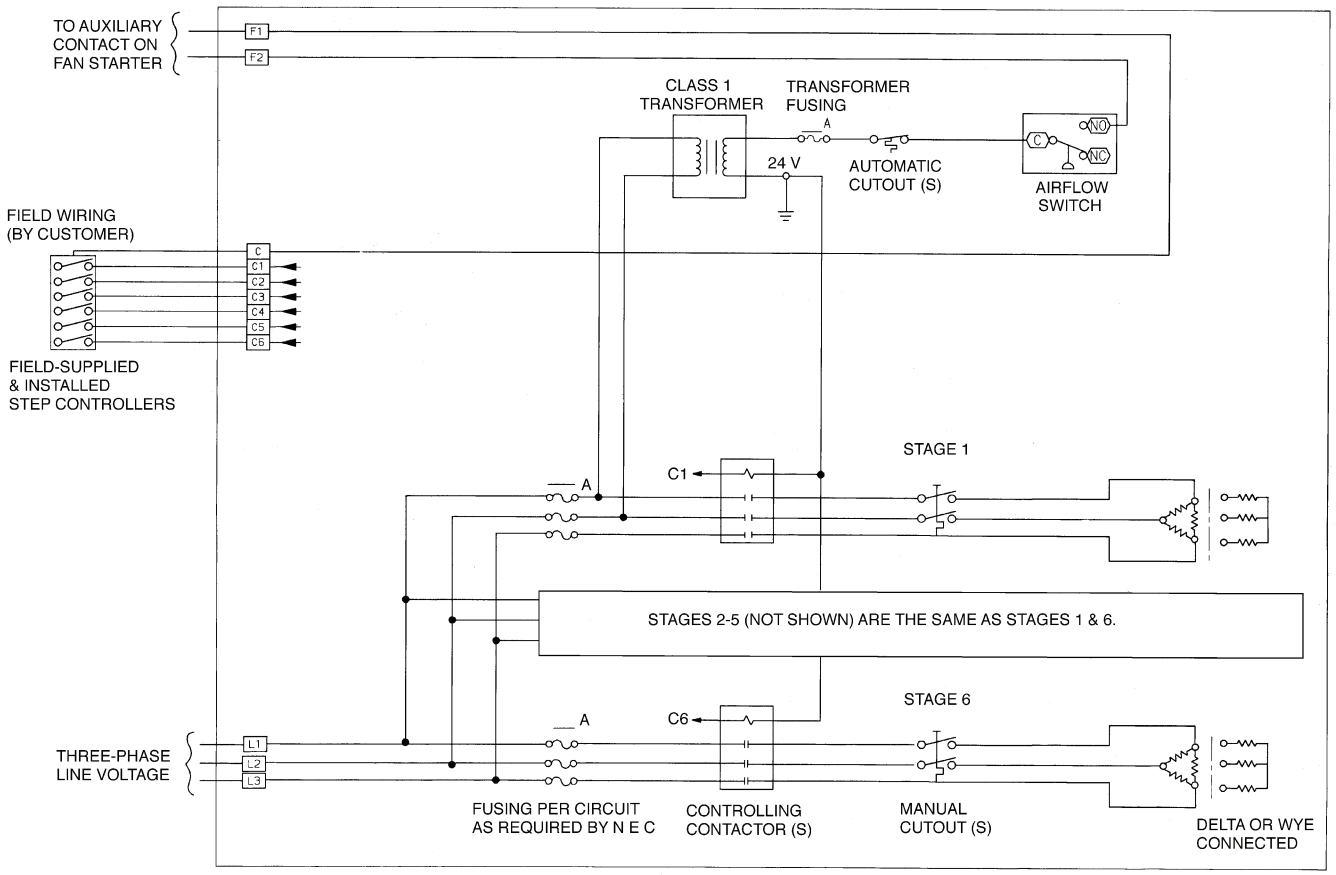
MOTOR HP	FLA FOR 3-PHASE, 60 HZ VOLTAGES				EFF. (%)	NEMA FRAME
	208	230	460	575		
1	3.9	3.5	1.8	1.4	77.0	143T
1.5	4.9	4.4	2.2	1.8	84.0	143T
2	6.3	5.7	2.8	2.3	85.5	145T
3	9.2	8.3	4.2	3.3	86.5	182T
5	14.7	13.3	6.6	5.3	88.5	184T
7.5	21.5	19.5	9.7	7.8	89.5	213T
10	28.2	25.5	12.8	10.2	90.2	215T
15	41.6	37.6	18.8	15.1	91.0	254T
20	55.5	50.2	25.1	20.1	91.0	256T
25	68.3	61.8	30.9	24.7	91.7	284T
30	82.0	74.1	37.1	29.6	91.7	286T
40	107.6	97.3	48.7	38.9	92.4	324T
50	132.8	120.1	60.0	48.0	93.0	326T
60	157.3	142.3	71.1	56.9	93.6	364T
75	196.6	177.8	88.9	71.1	93.6	365T
100	259.4	234.6	117.3	93.8	94.1	405T
125	—	—	143.9	115.1	95.0	444T
150	—	—	172.6	138.1	95.0	445T

LEGEND

EFF. — Efficiency
EISA — Energy Independence and Security Act of 2007
FLA — Full Load Amps
NEMA — National Electrical Manufacturers Association
ODP — Open Drip Proof
TEFC — Totally Enclosed Fan Cooled

NOTES:
1. Approximate motor full load amps listed. Actual motor full load amps can be found on the motor nameplate.
2. Motor voltage and availability is controlled by ***AHU*Builder**.

Typical electric heater wiring



LEGEND

NC — Normally Closed
NEC — National Electrical Code
NO — Normally Open

NOTE: All wiring must be copper and must conform to NEC.

Guide specifications — indoor unit

39M Central Station Air Handler Units

HVAC Guide Specifications

Size Range: **1,500 to 60,500 Nominal Cfm**

Carrier Model Number: **39MN — Indoor Unit**

Part 1 — General

1.01 QUALITY ASSURANCE

A. Manufacturer Qualifications:

Company specializing in manufacturing the products specified in this section with minimum of five years documented experience.

B. Units shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

C. Air-handling unit assembly shall have UL 1995 certification for safety, including use with electric heat.

D. Products requiring electric connection shall be listed and classified by ETL and CSA as suitable for the purpose specified and indicated.

E. Coil performance shall be certified in accordance with AHRI Standard 410.

F. Air-handling unit shall be AHRI 430 listed and meet NFPA 90A requirements.

1.02 DELIVERY, STORAGE AND PROTECTION

A. All indoor units, painted or unpainted, shall be completely shrink-wrapped from the factory for protection during shipment. Tarping of bare units is unacceptable.

B. Inspect for transportation damage and store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.03 START-UP REQUIREMENTS

Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly trapped, piping connections verified and leak tested, belts aligned and tensioned, all shipping braces have been removed, and fan has been test run under observation.

Part 2 — Products

2.01 GENERAL DESCRIPTION

A. Units shall ship in the number of sections necessary to meet project requirements and shall ship in as many splits as specified in selection software. Split options as follows:

1. Shipped in sections — shipping split.
2. Shipped assembled.

B. Unit shall be factory-supplied, central station air handler. The air-handling unit may consist of a fan with the following factory-installed components as indicated on the equipment schedule.

1. Mixing Box Section:
   a. With angle filter tracks.
   b. No filter tracks.
2. Air Mixer Section.
3. Exhaust Box Section.
4. Integral Face and Bypass Section:
   a. With hot water coil.
   b. With steam coil.
5. Internal Face and Bypass Damper Section.
6. External Face and Bypass Damper Section.
7. Plenum Section:
   a. With drain pan.
   b. No drain pan.
8. Humidifier Section.
9. Blow-Thru Discharge Plenum.
10. Filter Section:
    a. 2-in. flat filters.
    b. 4-in. flat filters.
    c. 2-in. angle filters.
    d. 4-in. angle filters.
    e. Side loading 12-in. bag/cartridge filters with 2-in. pre-filters.
    f. Side loading 30-in. bag/cartridge filters with 2-in. pre-filters.
    g. Face loading bag/cartridge filters without pre-filters. Maximum bag/cartridge filter length is limited to access/plenum sections placed after this section.
    h. Face loading HEPA (high-efficiency particulate air) bag/cartridge filters without pre-filters.
11. Coil Section:
    a. Chilled water coil.
    b. Direct expansion coil.
    c. Hot water coil.
    d. Steam coil.
    e. Electric coil.
12. Multi-Zone Cooling/Heating Coil Section:
    a. With dampers.
    b. No dampers (for dual duct).
13. Fan Section:
    a. Horizontal draw-thru.
    b. Horizontal blow-thru (with integral diffuser).

2.02 CASING

A. Construction:

1. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
2. All units shall be supplied with 14-gage or heavier, G-90 galvanized steel base rails. Bolt-on legs are NOT acceptable. Perimeter lifting lugs for overhead lifting shall be provided on each section. Slinging units in place of lifting lugs shall not be acceptable.
3. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.
4. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following exterior finishes as specified:
   a. Pre-painted with a baked enamel finish passing 500-hour salt spray test (ASTM B-117) for pre-painted steel and 125-hour marine level 1 prohesion test (ASTM G-85.A5) for pre-painted steel.
   b. Unpainted G-90 galvanized steel.
5. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following interior finishes as specified:
   a. Pre-coated with a silver zeolite antimicrobial material registered by the US EPA for use in HVAC applications.
   b. Unpainted G-90 galvanized steel.
6. Casing panels (top, sides, and bottom) shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
7. Casing deflection shall not exceed a 1:200 ratio when subject to an internal pressure of ± 8-in. wg. Casing leakage rate shall be less than 1% at 8 in. wg of nominal unit airflow or 50 cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on random production units. Optionally, factory witness leak testing and/or test reports shall be available.
8. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.
9. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
10. Accessibility options shall be as follows:
    a. Hinged double-wall access door on either side with removable access panel(s) on the other side.
    b. Hinged double-wall access doors on both sides.
    c. Removable double-wall access panels on both sides.
11. Depending on the options selected and the remaining available space inside each section, the following options may be available:
    a. Thermal pane reinforced glass viewports shall be factory-installed on the access panel(s) or door(s) of the section.
    b. Marine lights shall be factory installed with or without GFCI (ground fault circuit interrupter) convenience outlets.
12. Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
13. All coil sections shall be doublewall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13. Single height coil sections shall have removable frame sections to facilitate vertical coil extraction.
14. Blow-thru sections shall have a diffuser plate as an integral part of the fan section.

B. Access Doors:

Access doors shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

C. Drain Pans:

Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

2.03 FANS

A. General:

1. Forward-curved fans shall have one double-width double-inlet (DWDI) fan wheel and scroll. They shall be constructed of galvanized steel with baked enamel. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I or II). Completed fan assembly shall be dynamically balanced in accordance with 1989 ARI Guideline G and ANSI S2.19-1986 at design operating speed using contract drive and motor if ordered.
2. Airfoil fan sections shall have one DWDI airfoil fan wheel and scroll. Airfoil blades shall be double thickness design constructed of heavy gage, high strength steel or aluminum continuously welded to the backplate and the spun inlet flange. Entire fan assembly shall be cleaned, primed and painted with alkyd enamel, except for an aluminum fan wheel when supplied. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I, II, or III). Completed fan assembly shall be dynamically balanced to minimum grade of G 6.3 per ANSI/AMCA 204-96 at design operating speed using contract drive and motor if ordered.
3. Plenum fan sections shall have one single-width single-inlet (SWSI) airfoil fan wheel. Airfoil blades shall be double thickness design constructed of heavy gage, high strength steel or aluminum continuously welded to the backplate and the spun inlet flange. Entire fan assembly shall be cleaned, primed and painted with alkyd enamel, except for an aluminum fan wheel when supplied. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I, II, or III). Completed fan assembly shall be dynamically balanced to minimum grade of G 6.3 per ANSI/AMCA 204-96 at design operating speed using contract drive and motor if ordered.
4. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25% below the first critical.
5. Fan motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be premium efficiency, open drip-proof or totally enclosed fan cooled NEMA Design B with size and electrical characteristics as shown on the equipment schedule. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members. All three-phase motors shall have a ± 10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with the Energy Independence and Security Act (EISA) of 2007 where applicable. Single-phase motors shall be available up to and including 5 hp.

B. Performance Ratings:

Fan performance shall be rated and certified in accordance with AHRI Standard 430.

C. Sound Ratings:

Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound.

D. Mounting:

Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2-in. deflection spring isolators.

E. Fan Accessories:

1. Forward-curved fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Belt guards.
   e. Inlet screen.
2. Airfoil Fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Belt guards.
   e. Inlet screen.
3. Plenum Fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Inlet screen and wheel cage.

F. Flexible Connection:

The base assembly is isolated from the outer casing with factory-installed isolators and rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.04 BEARINGS AND DRIVES

A. Bearings:

Self-aligning, grease lubricated, anti-friction with lubrication fittings extended to drive side of fan section. Optional grease fittings extended to the exterior of the casing are available.

1. Size 03 to 110 forward-curved fans: Cartridge type bearings for Class I fans. Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.
2. Size 03 to 110 airfoil fans: Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.
3. Size 06 to 110 plenum fans: Heavy-duty pillow block type, self-aligning, regreasable roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.

B. Shafts:

Fan shafts shall be solid steel, turned, ground, polished and coated with a rust inhibitor.

C. V-Belt Drive:

Drive shall be designed for a minimum 1.2 service factor as standard with a 1.5 service factor option and/or a factory-supplied extra set of belts. Drives shall be fixed pitch with optional variable pitch for motors 15 hp and less. All drives shall be factory mounted, with sheaves aligned and belts properly tensioned.

2.05 COILS

A. All water, steam and direct expansion (DX) refrigerant coils shall be provided to meet the scheduled performance. All coil performance shall be certified in accordance with AHRI Standard 410. All water and direct expansion coils shall be tested at 450 psig air pressure. Direct expansion coils shall be designed and tested in accordance with ASHRAE/ANSI 15 Safety Code for Mechanical Refrigeration (latest edition).

B. General Fabrication:

1. All water and refrigerant coils shall have minimum $^1/_2$-in. OD copper tubes mechanically expanded into fins to ensure high thermal performance with lower total flow and pumping requirements. Minimum tube wall thickness shall be 0.016 inches. Optional tube wall thickness of 0.025 in. shall be supplied, if specified.
2. Optionally, water coils shall have minimum $^5/_8$-in. OD copper tubes mechanically expanded into fins to ensure high thermal performance with lower total flow and pumping requirements. Minimum tube wall thickness shall be 0.020 inches. Optional tube wall thickness of 0.035 in. shall be supplied, if specified.
3. Aluminum plate fin type with belled collars. Optional copper plate fins shall be supplied, if specified.
4. Aluminum-finned coils shall be supplied with die-formed casing and tube sheets of mill galvanized steel or stainless steel as specified. Copper-finned coils shall be supplied with stainless steel casing and tube sheets.

C. Hydronic Heating and Cooling Coils:

1. Headers shall be constructed of steel with steel MPT connections. Headers shall have drain and vent connections accessible from the exterior of the unit. Optional non-ferrous headers and red brass nipples shall be supplied if specified.
2. Configuration: Coils shall be drainable, with non-trapping circuits. Coils will be suitable for a design working pressure of 300 psig at 200 F.

D. Steam Distribution (Non-Freeze Type) Heating Coils:

1. Headers shall be steel with MPT connections.
2. Inner steam distributing tubes shall be $^5/_8$-in. OD, 0.020 in. wall thickness, located within 1 in. OD, 0.030 in. wall outer condensing tubes. Working pressure shall be 175 psig at 400 F.
3. Inner steam distributing tubes shall be $^3/_8$-in. OD, 0.020 in. wall thickness, located within $^5/_8$-in. OD, 0.035 in. wall outer condensing tubes. Working pressure shall be 175 psig at 400 F.

E. Integral Face and Bypass Coils:

1. Sizes 03-14 shall have horizontal steam or hot water coils with a tubewall thickness of not less than 0.020 inches. Tubes shall be mechanically expanded into die formed collars formed in aluminum plate type fins.
2. Sizes 17-110 shall have vertical steam or hot water coils with a tubewall thickness of not less than 0.035 inches. Fins shall be spiral edge-wound copper. Tubes shall be free-floating for thermal expansion and contraction without the use of offset bends or floating headers.

F. Refrigerant Coils:

1. Headers shall be constructed of copper with brazed joints.
2. Standard circuiting selections include:
   a. Single distributor arrangement for sizes 03-17.
   b. Row split intertwined, multiple distributor arrangement for sizes 03-110.
   c. Face split, multiple distributor arrangement for sizes 03-110.
3. Replaceable nozzle, brass refrigerant distributors and seamless copper distribution tubes are supplied to ensure uniform flow.

G. Electric Heating Section:
   1. The electric heater casing is constructed of galvanized steel. Heater control box access door shall be mounted on the designated hand side of the unit. Element construction as follows:
      a. Open-wire type, 80% nickel, 20% chromium resistance coils, insulated by Steatite bushings and supported in a galvanized steel frame. Bushings shall be recessed into embossed openings and stacked into supporting brackets, spaced no more than 4-in. centers. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
      b. Sheathed type, 80% nickel, 20% chromium resistance coils, suspended in a magnesium oxide insulator fill within a tubular steel sheath/brazed fin assembly. Silicone rubber end seals shall prevent contamination of the interior, and the exterior shall be protected from corrosion by a high temperature aluminum coating. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
   2. The manufacturer shall furnish an integral control box containing thermal cutouts, primary control, subcircuit fusing, airflow switch, and fused control transformer.
   3. Electric heaters shall be UL listed for zero clearance and shall meet all applicable National Electric Code requirements.
   4. Units with electric heat sections shall be listed under UL 1995 Standard for Safety.

2.06 HUMIDIFIERS

A. The humidifiers shall be of the direct discharge type, using steam from existing steam lines or boilers to be injected into the air plenums for humidification.

B. Each humidifier shall consist of multiple, vertical steam discharge pipes, supported on horizontal header manifolds, spaced to provide the optimum of steam to air contact while minimizing pressure drop. Each humidifier shall be sized to nominally match the air plenum width and height for maximum contact of the discharging steam to the air passing around the vertical steam discharge pipes.

C. The vertical steam discharge pipes shall be constructed of 316 stainless steel. Each pipe shall have a full-length, inverted slot on each side for steam discharge at 100% air to steam contact. Nozzles and holes have less than 15% air to steam contact and are, therefore, unacceptable.

D. A full-length stainless steel fishbone shaped baffle shall be used inside the vertical discharge pipe to wick condensate away from the discharge slots and back to the center of the pipe for re-evaporation.

E. The feeder manifolds shall be constructed of 316 stainless steel, sized to move the steam in a specific mass-flow speed range, for maximum condensate separation. Final condensate separation shall occur inside the feeder manifolds, after the control valve, with the dried steam then injected directly into the vertical discharge pipes.

F. The vertical steam discharge pipes and horizontal feeder manifolds shall be coated with a thin, nontoxic insulative coating capable of reducing surface temperature to no more than 120 F during operation, to reduce heat gain to the airstream. The insulative coating shall have an insulating value at 30 mils equal to 8 in. of R-40 foam. The insulative coating shall have a flame spread and smoke developed rating of 5 under ASTM E-84 with a crosshatch adhesion of 100% under ASTM D-3359, acceptable for use in air ducts.

G. The steam humidifier shall be designed with slip fittings for easy assembly. The steam humidifier shall be designed without plastic nozzles, collars, o-rings or gaskets for zero maintenance.

2.07 FILTER SECTIONS

A. Flat filter sections shall accept either 2-in. or 4-in. filters. Sections shall include side access slide rails.

B. Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

C. Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 6-in. to 12-in. deep rigid media or bag filters.

D. Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 12-in. to 30-in. deep rigid media or bag filters.

E. Blow-thru bag/cartridge filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep rigid media (headered or box) or bag filters.

F. Blow-thru HEPA filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep HEPA box filters.

G. Magnehelic Gages:
   1. Housing shall be constructed of a die cast aluminum case and bezel with acrylic cover. Exterior finish shall be coated gray to withstand 168 hr salt spray corrosion test.
   2. Accuracy shall be ±2% of full scale throughout range at 70 F (21.1 C).
   3. Pressure limits shall be –20 in. Hg to 15 psig (0.677 bar to 1.034 bar).
   4. Overpressure relief plugs shall open at approximately 25 psig (1.72 kPa).
   5. Temperature limits shall be 20 to 140 F (–6.67 to 60 C).

6. Diameter of dial face shall be 4 in. (101.6 mm).
7. Process connections shall be 1/8-in. female NPT duplicate high and low pressure taps — one pair side and one pair back.

2.08 DAMPERS

A. Mixing boxes, filter-mixing boxes, and exhaust boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.

1. Standard Dampers:

   Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

2. Premium Dampers:

   Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

3. Outside Air Measurement Dampers:

   a. Damper frame shall be nominal 4 in. x 1 in. x minimum 0.081 in. (102 mm x 25 mm x minimum 2 mm) and constructed of 6063-T5 extruded aluminum.

   b. Airflow measuring blades shall be airfoil-shaped, heavy gage anodized 6063-T5 extruded aluminum and fixed in 10 in. x minimum 16 gage (254 mm x minimum 1.5 mm) galvanized steel frame.

   c. Jamb seals shall be flexible metal compression type along control damper sides.

   d. Blade seals shall be neoprene along control damper blade edges.

   e. Bearings shall be molded synthetic.

   f. Linkage shall be galvanized steel, concealed in frame.

   g. Axles shall be minimum 1/2-in. (13 mm) diameter plated steel, hex-shaped, mechanically attached to blade.

   h. Operating temperature shall be –22 to 140 F (–30 to 60 C).

   i. Air straightener section shall be aluminum alloy honeycomb contained in 5 in. (127 mm) long, 16 gage (1.5 mm) galvanized steel sleeve attached to monitoring blade frame.

   j. Airflow range shall be 400 to 5,000 ft per minute (122 to 1524 m/min) face velocity.

   k. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

B. Integral Face and Bypass Dampers:

1. Integral face and bypass (IFB) coils shall be capable of maintaining a constant air volume, within 5%, shall be capable of maintaining a constant leaving air temperature as entering air conditions vary, and shall be capable of producing mixed leaving air temperatures within 3 ft downstream with a maximum variance in air temperature of 5° F, regardless of damper position.
2. When no heating is required, dampers shall divert air to bypass around heating surface with minimal temperature override.
3. Coil casing, dampers and baffles shall be fabricated from galvanized steel with an option for stainless steel. Coils shall be tested at 300 psig.
4. Integral face and bypass coils shall be provided with a connection point for field-mounted actuator(s), electrical or pneumatic, or can be provided from the factory at an additional cost.
5. Actuator connection point shall be mechanically attached to dampers via linkage mechanisms. Dampers shall be interconnected for operation simultaneously across each face of coil.

C. Face and Bypass Dampers:

1. Internal Face and Bypass Dampers:

   Internal face and bypass dampers shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with high temperature blade and edge seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. To eliminate blade warping, face dampers shall be sectionalized to limit blade length to 60 in. maximum. Face damper blades shall be opposed and arranged to match coil face with top bypass, and internal linkage.

2. External Face and Bypass Dampers:

   Face damper shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with high temperature blade and edge seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Bypass damper shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rod rotating in self-lubricating synthetic bearings. Face damper blades shall be opposed with top bypass, and internally mounted linkage.

D. Multi-Zone Dampers:

Multi-zone dampers shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 11 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure. Maximum pressure drop due to dampers shall be no more than 0.40 in. wg. Number of zones shall vary by size of section.

2.09 AIR MIXER

Air mixer of 0.081-in. aluminum construction of size, performance and maximum pressure drop indicated. The air mixer shall mix two or more airstreams of differing temperature to within ±6° F of theoretical mixed-air temperature and provide a more uniform air velocity contour entering a downstream filter or coil bank.

2.10 UV-C GERMICIDAL LAMPS

Emitters and fixtures for UV-C lamps shall be designed for use inside an HVAC system. Individual lamp output shall be measured in an ASME nozzled test apparatus using a 45 F airstream moving at not less than 400 fpm. Lamp output at 253.7 nm shall not be less than 10 μW/cm^2 per inch of arc length measured at a distance of one meter.

A. Power supplies for UV-C lamps shall be a high-efficiency electronic type which are matched to the emitters and are capable of producing the specified output intensity with an input power no more than 80 watts.

B. Fixtures for UV-C lamps shall be factory installed and wired to a SPDT disconnect switch and door interlock switches in each door. Fixtures are wired for 120 v/single ph requiring a minimum circuit ampacity of 15 amps. Lamps shall ship separately for field installation to minimize the chance for bulb damage.

C. Emitters and fixtures shall be installed in sufficient quantity and arranged so as to provide an equal distribution of UV-C energy on the coil and drain pan.

D. The minimum UV-C energy striking the leading edge of the coil pan shall be not less than 820 μW/cm^2 at the closest point and through placement, not less than 60% of that value at the farthest point. Equal amounts are to strike the drain pan, either directly or indirectly through reflection.

E. Emitters and fixtures shall be installed such that UV-C energy strikes all surfaces of the coil, drain pan, and the available line of sight airstream.

2.11 ELECTRICAL ACCESSORIES:

A. Marine Lights and Convenience Outlets:

1. Cast, non-ferrous metal, weatherproof, fixture.
2. Cast, non-ferrous metal, weatherproof, electrical junction box.
3. Gasketed, heat and shock resistant glass globe protects against moisture and debris.
4. Cast, non-ferrous metal lamp guard to protect glass globe.
5. UL listed.
6. 100 watt type 'A' lamp maximum capacity.
7. Each fixture is equipped with a 75 watt, 130 volt, long life, vibration resistant, lamp (8000+ hour typical lamp life), factory installed.
8. Metallic, single gang, electrical junction box, UL listed.
9. With convenience outlet: Factory supplied and wired, SPST, toggle switch and 15 amp, 120 vac/60 Hz, NEMA 5-15 type, ground fault circuit interrupt (GFCI) receptacle, UL listed.
10. Without convenience outlet: Factory supplied and wired, SPST, UL listed toggle switch.
11. Each fixture is factory wired to an externally mounted switch box. (Field power connections are made to the switch box mounted externally on the unit.)
12. All factory wiring penetrating through the panel is protected in 'RIGID' type metal conduit.

B. Disconnects:

1. 115-230 volt/single-phase non-fused disconnects shall have the following characteristics:
   a. Plated current carrying components for superior corrosion protection.
   b. Factory-installed equipment grounding terminals with slot/square drive screws.
   c. Rated for motor disconnect applications (10 Hp maximum).
   d. NEMA type 3R non-metallic enclosure.
   e. Up to 10,000 rms symmetrical amperes SCCR, when protected by a fuse or circuit breaker rated 60 amperes or less.
   f. Cover padlock hasp.
   g. Pull-out cartridge type.
   h. UL listed.
2. 115-230 volt/single-phase fused disconnects shall have the following characteristics:
   a. Visible blades.
   b. Quick-make, quick-break operating mechanism.
   c. Cover padlock hasp and handle lock "OFF."
   d. 240 vac maximum.
   e. Factory supplied and installed class 'T Series' fuses (fused disconnects only).
   f. Up to 10,000 rms symmetrical amperes SCCR, utilizing appropriately rated factory-supplied fuses.
   g. Horsepower rated for motor applications.

h. Tangential combination knockouts for field wiring.
i. Spring reinforced plated copper fuse clips.
j. NEMA type 1 enclosures.
k. Insulated, bondable solid neutral assemblies.
l. UL listed, File E2875.
m. Meet or exceed NEMA KS1-1990.

3. 200-230 volt/3-phase fused and non-fused disconnects shall have the following characteristics:
   a. Visible blades.
   b. Quick-make, quick-break operating mechanism.
   c. Cover padlock hasp and handle lock "OFF."
   d. 240 vac maximum.
   e. Factory supplied and installed class RK5 fuses (fused disconnects only).
   f. Up to 100,000 rms symmetrical amperes SCCR, utilizing appropriately rated, factory-supplied Class R fuses.
   g. Horsepower rated for motor applications.
   h. Tangential combination knockouts for field wiring.
   i. Spring reinforced plated copper fuse clips.
   j. NEMA type 1 enclosures.
   k. Insulated, bondable solid neutral assemblies.
   l. UL listed, File E2875.
   m. Meet or exceed NEMA KS1-1990.
4. 380-575 volt/3-phase fused and non-fused disconnects shall have the following characteristics:
   a. Visible switch blades with for positive "OFF" indication.
   b. Quick-make, quick-break operating mechanism.
   c. Dual cover interlock.
   d. Color coded "ON" — "OFF" indicator handle.
   e. Cover padlock hasp and handle lock "OFF" provision for multiple padlocks.
   f. 600 vac maximum.
   g. Factory supplied and installed class RK5 fuses (fused disconnects only).
   h. Up to 200,000 rms symmetrical amperes SCCR, utilizing appropriately rated, factory-supplied Class R fuses.
   i. Horsepower rated for motor applications.
   j. Spring reinforced plated copper fuse clips.
   k. Tangential combination knockouts.
   l. NEMA type 1 enclosures.
   m. Insulated, bondable solid neutral assemblies.
   n. Wire terminations suitable for aluminum or copper conductors.
   o. UL listed.
   p. Meet or exceed NEMA KS1-1999.

C. Starters:
   1. Starter without disconnect:
      a. Adjustable motor overload with trip indication.
      b. Manual overload reset button (accessible without opening enclosure).
      c. 115-v fused secondary control transformer (fuse included — fused primary and secondary over 50 amps).
      d. Hand/Off/Auto selector switch (accessible without opening enclosure).
      e. Separate 4-position terminal strip for remote H-O-A wiring.
      f. C series contactors.
      g. Horsepower rated for motor applications.
      h. NEMA 4X type non-metallic enclosures.
      i. Lug connections for field wiring.
      j. Factory mounted, wired, and run tested with factory-supplied motor.
      k. UL listed.
   2. Combination Starter/Disconnect:
      a. Non-fused UL 508 Disconnect Switch with Lockable Handle (locks not provided).
      b. Cover interlock.
      c. Adjustable motor overload with trip indication.
      d. Manual overload reset button (accessible without opening enclosure).
      e. 115-v fused secondary control transformer (fuse included — fused primary and secondary over 50 amps).
      f. Hand/Off/Auto selector switch (accessible without opening enclosure).
      g. Separate 4-position terminal strip for remote H-O-A wiring.
      h. C series contactors.
      i. Horsepower rated for motor applications.
      j. NEMA 4X type non-metallic enclosures.
      k. Lug connections for field power wiring.
      l. Factory mounted, wired, and run tested with factory-supplied motor.
      m. UL listed.

D. Bypass for Variable Frequency Drives:
   1. 200-230 v/3 Ph/60 Hz (1 to 7.5 Hp), 460-575 v/3 Ph/60 Hz (1 to 20 Hp), 380 v/3 Ph/50 Hz (1 to 15 Hp):
      a. 4-position panel-mounted disconnect style switch with lockable handle (locks not provided), meets OSHA 1910.
      b. Switch position indication (LINE/OFF/DRIVE/TEST).
      c. Adjustable motor overload with trip indication (LINE position).

d. Manual overload reset button.
e. Horsepower rated for motor applications.
f. Direct control (no contactors, relays, or holding coils).
g. Complete isolation of inverter in LINE position.
h. NEMA 12 type metal enclosures.
i. Terminal strip provided for field power supply wiring.
j. Lug connection for field ground wire.
k. Gold flashed, auxiliary switch contact set (for switch position monitoring).
l. Factory mounted, wired to VFD and motor, and run tested (motor and VFD must be factory supplied and installed).
m. UL; UL, Canada; CE listed.

2. 200-230 v/3 Ph/60 Hz (10 to 75 Hp), 460-575 v/3 Ph/60 Hz (25 to 150 Hp), 380 v/3 Ph/50 Hz (20 to 75 Hp):
   a. 4-position panel-mounted disconnect style switch with lockable handle (locks not provided), meets OSHA 1910.
   b. Switch position indication (LINE/OFF/DRIVE/TEST).
   c. Adjustable motor overload with trip indication (in LINE position).
   d. Manual overload reset button.
   e. Horsepower rated for motor applications.
   f. 115-v control transformer with fused secondary (fused primary on units over 50 amps).
   g. Contactor for Line Start/Stop.
   h. Door-mounted Line Start and Line Stop pushbuttons.
   i. Complete isolation of inverter in LINE position.
   j. NEMA 12 type metal enclosures.
   k. Terminal strip provided for field power supply wiring.
   l. Lug connection for field ground wire.
   m. Gold flashed, auxiliary switch contact set (for switch position monitoring).
   n. Factory mounted, wired to VFD and motor, and run tested (motor and VFD must be factory supplied and installed).
   o. UL; UL, Canada; CE listed.

E. Variable Frequency Drives:
   1. Factory-mounted variable frequency drives (VFDs) shall be wired to factory-supplied motors.
   2. Factory-supplied VFDs are programmed and started up from the factory and qualify the VFD, through ABB, for a 24-month warranty from date of commissioning or 30 months from date of sale, whichever occurs first.
   3. The VFD parameters are programmed into the controller and removable keypad. In the event that the VFD fails and needs replacement, the program can then be uploaded to the replacement VFD via the original keypad.
   4. The VFD package as specified herein shall be enclosed in a UL Listed type enclosure, exceeding NEMA enclosure design criteria (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer in an ISO 9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and –35% nominal voltage as a minimum.
      a. Environmental operating conditions: VFDs shall be capable of continuous operation at 0 to 50 C (32 to 122 F) ambient temperature as per VFD manufacturers documented/submittal data or VFD must be oversized to meet these temperature requirements. Not acceptable are VFD's that can only operate at 40 C intermittently (average during a 24 hour period) and therefore, must be oversized. VFDs shall be capable of operating at altitude 0 to 3300 feet above sea level and less than 95% humidity, non-condensing. All circuit boards shall have conformal coating.
      b. Enclosure shall be rated UL Type 1 and shall be UL listed as a plenum rated VFD. VFD's without these ratings are not acceptable. Type 1 enclosures with only NEMA rating are not acceptable (must be UL Type 1).
   5. All VFDs shall have the following standard features:
      a. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
      b. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.
      c. There shall be a built-in timeclock in the VFD keypad. The clock shall have a battery back-up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. Capacitor back-up is not acceptable. The clock

shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays. The VFD shall have a digital input that allows an override to the timeclock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

d. The VFDs shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

e. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required. To extend the fan and bearing operating life, the VFD shall cycle the cooling fans on and off as required.

f. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

g. The VFD shall have the ability to automatically restart after an overcurrent, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

h. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.

i. The VFD shall have internal 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add an AC line reactor.

j. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFDs with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120. Input and output current ratings must be shown on the VFD nameplate.

k. The VFD shall include a coordinated AC transient surge protection system consisting of 4 to 120 joule rated MOVs (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

l. The VFD shall provide a programmable loss-of-load (broken belt/broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and/or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.

m. The VFD shall have user programmable underload and overload curve functions to allow user defined indications of broken belt or mechanical failure/jam condition causing motor overload

n. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and/or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control.

o. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and/or over the serial communication bus.

p. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

6. All VFDs to have the following adjustments:

   a. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.

   b. Two (2) PID set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed-loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter

supplied by others. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two independent parameter sets for the PID controller and the capability to switch between the parameter sets via a digital input, serial communications or from the keypad. The independent parameter sets are typically used for night setback, switching between summer and winter set points, etc.

c. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (ie. valves, dampers, etc.). All set points, process variables, etc. to be accessible from the serial communication network.

d. Two (2) programmable analog inputs shall accept current or voltage signals.

e. Two (2) programmable analog outputs (0 to 20 mA or 4 to 20 mA). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback, and other data.

f. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC or 24VAC.

g. Three (3) programmable, digital Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.

h. Run permissive circuit: There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close. The keypad shall display "start enable 1 (or 2) missing". The safety input status shall also be transmitted over the serial communications bus.

i. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates. The time delay shall be field programmable from 0 to 120 seconds. Start delay shall be active regardless of the start command source (keypad command, input contact closure, time-clock control, or serial communications).

j. Seven (7) programmable preset speeds.

k. Two independently adjustable accelerate and decelerate ramps with 1 to 1800 seconds adjustable time ramps.

l. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. The VFD shall have selectable software for optimization of motor noise, energy consumption, and motor speed control.

m. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency settings without derating the VFD.

n. The VFD shall include password protection against parameter changes.

7. The keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alphanumeric codes are not acceptable). All VFD faults shall be displayed in English words. The keypad shall include a minimum of 14 assistants including:
   a. Start-up assistant
   b. Parameter assistants
   c. PID assistant
   d. Reference assistant
   e. I/O assistant
   f. Serial communications assistant
   g. Option module assistant
   h. Panel display assistant
   i. Low noise set-up assistant
   j. Maintenance assistant
   k. Troubleshooting assistant
   l. Drive optimizer assistants
8. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all

times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

a. Output Frequency
b. Motor Speed (RPM, %, or Engineering units)
c. Motor Current
d. Motor Torque
e. Motor Power (kW)
f. DC Bus Voltage
g. Output Voltage

9. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from –500 Hz (reverse) to 500 Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.
10. Serial Communications:
    a. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. [Optional protocols for LonWorks, Profibus, EtherNet, BACnet IP, and DeviceNet shall be available.] Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.
    b. The BACnet connection shall be an EIA-485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
        1) Data Sharing – Read Property – B.
        2) Data Sharing – Write Property – B.
        3) Device Management – Dynamic Device Binding (Who-Is; I-Am).
        4) Device Management – Dynamic Object Binding (Who-Has; I-Have).
        5) Device Management – Communication Control – B.
    c. If additional hardware is required to obtain the BACnet interface, the VFD manufacturer shall supply one BACnet gateway per drive. Multiple VFDs sharing one gateway shall not be acceptable.
    d. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.
    e. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass valve control, chilled water valve / hot water valve control, etc. Both the VFD PID control loop and the independent PID control loop shall continue functioning even if the serial communications connection is lost. As default, the VFD shall keep the last good set point command and last good DO and AO commands in memory in the event the serial communications connection is lost and continue controlling the process.
11. EMI/RFI filters: All VFDs shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level with up to 100 feet of motor cable. No Exceptions. Certified test reports shall be provided with the submittals confirming compliance to EN 61800-3, First Environment.
12. All VFDs through 75 hp at 480 V shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not sustain damage from this power mis-wiring condition.
13. Operational Functions:
    a. The drive shall contain two separate acceleration/deceleration times with auto tuning for optimum setting (0.1 to 6000 seconds) with

choice of linear, S, or C curves that shall be factory programmed to match the fan load and prevent nuisance overcurrent fault trips.

b. The drive shall be equipped with both local/remote and manual/auto keys on touchpad.

c. The drive shall be equipped with a quick setup key.

d. The drive shall contain 15 preset speeds, which can be activated from the keypad, terminal inputs, and host computer.

e. The drive shall have the capability of storable special custom user setting.

f. The drive shall restart into a rotating motor operating in either the forward or reverse direction and match that frequency.

g. The drive shall have adjustable soft stall (10% to 150%) which reduces frequency and voltage of the inverter to sustain a run in an overload situation factory programmed for each motor's characteristics.

h. The drive shall be capable of performing a time base pattern run using 4 groups of 8 patterns each using the 15 preset speed values for a maximum of 32 different patterns.

i. The drive shall have adjustable UL listed electronic overload protection (10% to 100%) factory programmed to match each motor's FLA/RLA ratings.

j. The drive shall have a custom programmable volt/hertz pattern.

14. Protective Features:

a. The drive shall be rated for 200,000 AIC (ampere interrupting capacity). The use of input fuses to achieve this rating shall not be acceptable.

b. The drive shall have external fault input.

c. The drive shall be capable of resetting faults remotely and locally.

d. The drive shall be programmable to alert the following alarms:

1) Over torque alarm.
2) Inverter overload pre-alarm.
3) Motor overload pre-alarm.
4) Braking resistor overload pre-alarm.
5) Inverter overheat pre-alarm.
6) Undercurrent alarm.
7) Overcurrent pre-alarm.
8) Communication error alarm.
9) Cumulative timer alarm.
10) Executing retry.

e. The drive shall identify and display the following faults:

1) Overcurrent during acceleration trip.
2) Overcurrent during deceleration trip.
3) Overcurrent during normal run trip.
4) Overcurrent on the DC Bus during acceleration trip.
5) Overcurrent on the DC Bus during deceleration trip.
6) Overcurrent on the DC Bus during normal run trip.
7) Load end overcurrent trip detected at start-up (output terminals, motor wiring, etc.).
8) U-phase short circuit trip detected at start-up.
9) V-phase short circuit trip detected at start-up.
10) W-phase short circuit trip detected at start-up.
11) Overvoltage during acceleration trip.
12) Overvoltage during deceleration trip.
13) Overvoltage during normal (constant speed) run trip.
14) Inverter overloaded trip.
15) Motor overloaded trip.
16) Inverter overheat trip.
17) Emergency off trip message.
18) EEPROM failure during write cycle.
19) EEPROM abnormality during initial reading.
20) RAM error.
21) ROM error.
22) CPU error.
23) Communication interruption error.
24) Gate array error.
25) Output current detection circuit error.
26) Option PCB error trip.
27) Low operating current trip.
28) Main circuit under voltage trip.
29) Over torque trip.
30) Software detected earth fault trip.
31) Hardware detected earth fault trip.
32) Inverter type form mismatch error.
33) EEPROM type form mismatch error.

15. Monitor Functions:

a. The drive digital display shall be capable of displaying the following: Frequency, percent current, current amps, percent voltage I/O, voltage in volts I/O, RPM, GPM, I/O watts, torque, and input reference signal, kWh.

b. The drive shall have 320 programmable parameters which can be changed while the drive is operating.

c. The drive's 353 parameters shall be adjustable from the 8-key touchpad or computer link.

d. The drive's 8-key touchpad shall be NEMA 12 rated.

e. The drive's keypad shall be capable of being extended 15 ft from the drive.

f. The drive shall contain a reset of all parameters to factory default settings or user defaults (whichever one is chosen).

g. The drive shall have 2 programmable analog outputs programmable to 17 choices.

h. The drive shall have one programmable relay output programmable to 67 choices.

i. The drive shall have 8 programmable digital inputs programmable to 54 choices.

j. The drive shall have a pulse train out-put proportional to frequency (48, 96, 360 times frequency).

k. The drive shall have an elapsed time meter.

Guide specifications — outdoor unit

39M Central Station Air Handler Units

HVAC Guide Specifications

Size Range: **1,500 to 60,500 Nominal Cfm**

Carrier Model Number: **39MW — Outdoor Unit**

Part 1 — General

1.01 QUALITY ASSURANCE

A. Manufacturer Qualifications:

Company specializing in manufacturing the products specified in this section with minimum of 5 years documented experience.

B. Units shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

C. Air-handling unit assembly shall have UL 1995 certification for safety, including use with electric heat.

D. Products requiring electric connection shall be listed and classified by ETL and CSA as suitable for the purpose specified and indicated.

E. Coil performance shall be certified in accordance with AHRI Standard 410.

F. Air-handling unit shall be AHRI 430 listed and meet NFPA 90A requirements.

1.02 DELIVERY, STORAGE AND PROTECTION

Inspect for transportation damage and store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.03 START-UP REQUIREMENTS

Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly trapped, piping connections verified and leak tested, belts aligned and tensioned, all shipping braces have been removed, and fan has been test run under observation.

Part 2 — Products

2.01 GENERAL DESCRIPTION

A. Units shall ship in the number of sections necessary to meet project requirements and shall ship in as many splits as specified in selection software. Split options as follows:

1. Shipped in sections — shipping split.
2. Shipped assembled.

B. Unit shall be factory-supplied, factory-assembled, outdoor, curb-mounted central station air handler. The air-handling unit may consist of a fan with the following factory-installed components as indicated on the equipment schedule.

1. Mixing Box Section:
   a. With angle filter tracks.
   b. No filter tracks.
2. Air Mixer Section.
3. Exhaust Box Section.
4. Integral Face and Bypass Section:
   a. With hot water coil.
   b. With steam coil.
5. Internal Face and Bypass Damper Section.
6. Plenum Section:
   a. With drain pan.
   b. No drain pan.
7. Humidifier Section.
8. Blow-Thru Discharge Plenum.
9. Filter Section:
   a. 2-in. flat filters.
   b. 4-in. flat filters.
   c. 2-in. angle filters.
   d. 4-in. angle filters.
   e. Side loading 12-in. bag/cartridge filters with 2-in. pre-filters.
   f. Side loading 30-in. bag/cartridge filters with 2-in. pre-filters.
   g. Face loading bag/cartridge filters without pre-filters. Maximum bag/cartridge filter length is limited to access/plenum sections placed after this section.
   h. Face loading HEPA (high-efficiency particulate air) bag/cartridge filters without pre-filters.
10. Coil Section:
    a. Chilled water coil.
    b. Direct expansion coil.
    c. Hot water coil.
    d. Steam coil.
    e. Electric coil.
11. Fan Section:
    a. Horizontal draw-thru.
    b. Horizontal blow-thru (with integral diffuser).
    c. Plenum fan.

2.02 CASING

A. Construction:

1. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
2. All units shall be supplied with a perimeter, 14-gage or heavier, G-90 galvanized, high tensile steel base rail with a pocket to accommodate roof curb. Perimeter lifting lugs for overhead lifting shall be provided. Slinging units in place of lifting lugs shall not be acceptable.
3. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.

4. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following exterior finishes as specified:
   a. Pre-painted with a baked enamel finish passing 500-hour salt spray test (ASTM B-117) for pre-painted steel and 125-hour marine level 1 prohesion test (ASTM G-85.A5) for pre-painted steel.
   b. Unpainted G-90 galvanized steel.
5. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following interior finishes as specified:
   a. Pre-coated with a silver zeolite antimicrobial material registered by the US EPA for use in HVAC applications.
   b. Unpainted G-90 galvanized steel.
6. Roof shall be double-wall, pitched in four directions at a minimum roof slope of 1/4-in. per foot across the width of the unit. No penetrations shall be made in pressure sensitive panels. Roof shall incorporate a standing top seam. All seams in the roof shall be gasketed and capped to prevent water infiltration into the unit.
7. Casing panels (top, sides, and bottom) shall be one piece double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
8. Casing deflection shall not exceed a 1:200 ratio when subject to an internal pressure of ± 8-in. wg. Casing leakage rate shall be less than 1% at ± 8 in. wg of nominal unit airflow or 50 cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on random production units. Optionally, factory witness leak testing and/or test reports shall be available.
9. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.
10. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
11. Base rail shall overhang the curb to facilitate water run-off and protection of the curb to base connection from water intrusion.
12. Accessibility options shall be as follows:
    a. Hinged double-wall access door on either side with removable access panel(s) on the other side.
    b. Hinged double-wall access doors on both sides.
    c. Removable double-wall access panels on both sides.
13. Depending on the options selected and the remaining available space inside each section, the following options may be available:
    a. Thermal pane reinforced glass viewports shall be factory-installed on the access panel(s) or door(s) of this section.
    b. Marine lights shall be factory-installed with or without GCFI (ground fault circuit interrupter) convenience outlets.
14. Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
15. All coil sections shall be solid double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
16. Blow-thru fan sections shall have a diffuser plate as an integral part of the fan section.

B. Access Doors:

   Access doors shall be one piece double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

C. Drain Pans:

   Drain pans shall be insulated double-wall galvanized or stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have 1 1/2-in. MPT connection exiting through the hand side or opposite side of the casing as specified. Drain connection shall be insulated from the drain pan to the point at which it exits the casing. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

D. Roof Curbs:
   1. Roof curb shall be delivered to jobsite in an unassembled, knockdown state.
   2. Curb shall be constructed of 14-gage G-90 galvanized steel, 14 in. or 24 inches in height.
   3. Full perimeter wood nailers shall be securely mounted to curb sheet metal.
   4. Curb channel supports will be supplied on all curbs exceeding 10 ft in total unit airway length.
   5. Gasketing between curb and unit shall be shipped for field installation with the unit curb.

6. Coil connection housing curb will be offered optionally to enclose coil piping. Multiple coil connection housings may be specified (up to two per side).

E. Hoods and Louvers:

1. Outside Air Hoods:
   a. Outside air hoods shall be constructed of 20-gage galvanized G-90 steel and sized for 100% of unit nominal cfm.
   b. Hoods shall include easily accessible 1-in. moisture eliminators with a maximum velocity of no more than 500 fpm.
2. Exhaust Air Hoods:
   a. Exhaust air hoods shall be constructed of 16-gage galvanized G-90 steel and shipped collapsed in place.
   b. Expanded metal bird screen shall be provided to prevent entry of unwanted materials into air handler.
3. Side Intake Louvers:
   a. Frames and blades shall be 6063 alloy, 0.081 in. thick, mechanically fastened with stainless steel fasteners. Frame depth shall be 6 inches.
   b. Vertical blades shall be designed to collect and drain water to exterior at sill by means of a center rain hook and channels in jambs and mullions.
   c. Louvers shall have 1/2-in. mesh removable aluminum bird screen.
   d. Visible mullions required for louver widths greater than 96 inches.
   e. Provide sill-flashing pans 4 in. high by full depth formed from minimum 0.060 in. thick aluminum.
   f. Louvers shall be designed to withstand a wind load of 25 lb per sq ft.
   g. Water penetration shall be no more than 0.01 oz per sq ft of free area at 1250 fpm per AMCA publication 511. The AMCA test was unable to determine the beginning water penetration for this louver due to the fact that it lies above 1250 fpm through free area.
   h. Louver shall have a mill finish.

2.03 FANS

A. General:

1. Forward-curved fans shall have one double-width double-inlet (DWDI) fan wheel and scroll. They shall be constructed of galvanized steel with baked enamel. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I or II). Completed fan assembly shall be dynamically balanced in accordance with 1989 ARI Guideline G and ANSI S2.19-1986 at design operating speed using contract drive and motor if ordered.
2. Airfoil fan sections shall have one DWDI airfoil fan wheel and scroll. Airfoil blades shall be double thickness design constructed of heavy gage, high strength steel or aluminum continuously welded to the backplate and the spun inlet flange. Entire fan assembly shall be cleaned, primed and painted with alkyd enamel, except for an aluminum fan wheel when supplied. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I, II, or III). Completed fan assembly shall be dynamically balanced to minimum grade of G 6.3 per ANSI/AMCA 204-96 at design operating speed using contract drive and motor if ordered.
3. Plenum fan sections shall have one single-width single-inlet (SWSI) airfoil fan wheel. Airfoil blades shall be double thickness design constructed of heavy gage, high strength steel or aluminum continuously welded to the backplate and the spun inlet flange. Entire fan assembly shall be cleaned, primed and painted with alkyd enamel, except for an aluminum fan wheel when supplied. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I, II, or III). Completed fan assembly shall be dynamically balanced to minimum grade of G 6.3 per ANSI/AMCA 204-96 at design operating speed using contract drive and motor if ordered.
4. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25% below the first critical.
5. Fan motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be premium efficiency, open drip-proof or totally enclosed fan cooled NEMA Design B with size and electrical characteristics as shown on the equipment schedule. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members. All three-phase motors shall have a ±10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with the Energy Independence and Security Act (EISA) of 2007 where applicable. Single-phase motors shall be available up to and including 5 hp.

B. Performance Ratings:

Fan performance shall be rated and certified in accordance with AHRI Standard 430.

C. Sound Ratings:

Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound.

D. Mounting:

Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and vibration absorbent an discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2-in. deflection spring isolators.

E. Fan Accessories:

1. Forward curved fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Belt guards.
   e. Inlet screen.
2. Airfoil fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Belt guards.
   e. Inlet screen.
3. Plenum fans:
   a. Variable frequency drives with or without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   d. Inlet screen and wheel cage.

F. Flexible Connection:

The base assembly is isolated from the outer casing with factory-installed isolators and vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.04 BEARINGS AND DRIVES

A. Bearings:

Self-aligning, grease lubricated, anti-friction with lubrication fittings extended to drive side of fan section. Optional grease fittings extended to the exterior of the casing are available.

1. Size 03 to 110 forward-curved fans: Cartridge type bearings for Class I fans. Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.
2. Size 03 to 110 airfoil fans: Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.
3. Size 06 to 110 plenum fans: Heavy-duty pillow block type, self-aligning, regreasable roller type bearings selected for a minimum average life (L_{50}) of 200,000 hours or optionally for an (L_{50}) of 500,000 hours.

B. Shafts:

Fan shafts shall be solid steel, turned, ground, polished and coated with a rust inhibitor.

C. V-Belt Drive:

Drive shall be designed for a minimum 1.2 service factor as standard with a 1.5 service factor option and/or a factory-supplied extra set of belts. Drives shall be fixed pitch with optional variable pitch for motors 15 hp and less. All drives shall be factory mounted, with sheaves aligned and belts properly tensioned.

2.05 COILS

A. All water, steam and direct expansion (DX) refrigerant coils shall be provided to meet the scheduled performance. All coil performance shall be certified in accordance with AHRI Standard 410. All water and direct expansion coils shall be tested at 450 psig air pressure. Direct expansion coils shall be designed and tested in accordance with ASHRAE/ANSI 15 Safety Code for Mechanical Refrigeration (latest edition).

B. General Fabrication:

1. All water and refrigerant coils shall have minimum $^1/_2$-in. OD copper tubes mechanically expanded into fins to ensure high thermal performance with lower total flow and pumping requirements. Minimum tube wall thickness shall be 0.016 inches. Optional tube wall thickness of 0.025 in. shall be supplied, if specified.
2. Optionally, water coils shall have minimum $^5/_8$-in. OD copper tubes mechanically expanded into fins to ensure high thermal performance with lower total flow and pumping requirements. Minimum tube wall thickness shall be 0.020 inches. Optional tube wall thickness of 0.035 in. shall be supplied, if specified.
3. Aluminum plate fin type with belled collars. Optional copper plate fins shall be supplied, if specified.
4. Aluminum-finned coils shall be supplied with die-formed casing and tube sheets of mill galvanized steel or stainless steel as specified. Copper-finned coils shall be supplied with stainless steel casing and tube sheets.

C. Hydronic Heating and Cooling Coils:

1. Headers shall be constructed of steel with steel MPT connections. Headers shall have drain and vent connections accessible from the exterior of

the unit. Optional non-ferrous headers and red brass nipples shall be supplied if specified.

2. Configuration: Coils shall be drainable, with non-trapping circuits. Coils will be suitable for a design working pressure of 300 psig at 200 F.

D. Steam Distribution (Non-Freeze Type) Heating Coils:
   1. Headers shall be steel with MPT connections.
   2. Inner steam distributing tubes shall be 5/8-in. OD, 0.020 in. wall thickness, located within 1 in. OD, 0.030 in. wall outer condensing tubes. Working pressure shall be 175 psig at 400 F.
   3. Inner steam distributing tubes shall be 3/8-in. OD, 0.020 in. wall thickness, located within 5/8-in. OD, 0.035 in. wall outer condensing tubes. Working pressure shall be 175 psig at 400 F.

E. Integral Face and Bypass Coils:
   1. Sizes 03-14 shall have horizontal steam or hot water coils with a tubewall thickness of not less than 0.020 inches. Tubes shall be mechanically expanded into die formed collars formed in aluminum plate type fins.
   2. Sizes 17-110 shall have vertical steam or hot water coils with a tubewall thickness of not less than 0.035 inches. Fins shall be spiral edge-wound copper. Tubes shall be free-floating for thermal expansion and contraction without the use of offset bends or floating headers.

F. Refrigerant Coils:
   1. Headers shall be constructed of copper with brazed joints.
   2. Standard circuiting selections include:
      a. Single distributor arrangement for sizes 03-17.
      b. Row split intertwined, multiple distributor arrangement for sizes 03-110.
      c. Face split, multiple distributor arrangement for sizes 03-110.
   3. Replaceable nozzle, brass refrigerant distributors and seamless copper distribution tubes are supplied to ensure uniform flow.

G. Electric Heating Section:
   1. The electric heater casing is constructed of galvanized steel. Heater control box access door shall be mounted on the designated hand side of the unit. Element construction as follows:
      a. Open-wire type, 80% nickel, 20% chromium resistance coils, insulated by Steatite bushings and supported in a galvanized steel frame. Bushings shall be recessed into embossed openings and stacked into supporting brackets, spaced no more than 4-in. centers. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
      b. Sheathed type, 80% nickel, 20% chromium resistance coils, suspended in a magnesium oxide insulator fill within a tubular steel sheath/brazed fin assembly. Silicone rubber end seals shall prevent contamination of the interior, and the exterior shall be protected from corrosion by a high temperature aluminum coating. Thermal cutouts for overtemperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch.
   2. The manufacturer shall furnish an integral control box containing thermal cutouts, primary control, subcircuit fusing, airflow switch, and fused control transformer.
   3. Electric heaters shall be UL listed for zero clearance and shall meet all applicable National Electric Code requirements.
   4. Units with electric heat sections shall be listed under UL 1995 Standard for Safety.

2.06 HUMIDIFIERS

A. The humidifiers shall be of the direct discharge type, using steam from existing steam lines or boilers to be injected into the air plenums for humidification.

B. Each humidifier shall consist of multiple, vertical steam discharge pipes, supported on horizontal header manifolds, spaced to provide the optimum of steam to air contact while minimizing pressure drop. Each humidifier shall be sized to nominally match the air plenum width and height for maximum contact of the discharging steam to the air passing around the vertical steam discharge pipes.

C. The vertical steam discharge pipes shall be constructed of 316 stainless steel. Each pipe shall have a full-length, inverted slot on each side for steam discharge at 100% air to steam contact. Nozzles and holes have less than 15% air to steam contact and are, therefore, unacceptable.

D. A full-length stainless steel fishbone shaped baffle shall be used inside the vertical discharge pipe to wick condensate away from the discharge slots and back to the center of the pipe for re-evaporation.

E. The feeder manifolds shall be constructed of 316 stainless steel, sized to move the steam in a specific mass-flow speed range, for maximum condensate separation. Final condensate separation shall occur inside the feeder manifolds, after the control valve, with the dried steam then injected directly into the vertical discharge pipes.

F. The vertical steam discharge pipes and horizontal feeder manifolds shall be coated with a thin, non-toxic insulative coating capable of reducing surface temperature to no more than 120 F during operation, to reduce heat gain to the airstream. The insulative coating shall have an insulating value at 30 mils equal to 8 in. of R-40 foam. The insulative coating shall have a flame spread and smoke developed rating of 5 under ASTM E-84 with a

cross-hatch adhesion of 100% under ASTM D-3359, acceptable for use in air ducts.

G. The steam humidifier shall be designed with slip fittings for easy assembly. The steam humidifier shall be designed without plastic nozzles, collars, o-rings or gaskets for zero maintenance.

2.07 FILTER SECTIONS

A. Flat filter sections shall accept either 2-in. or 4-in. filters. Sections shall include side access slide rails.

B. Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

C. Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 6-in. to 12-in. deep rigid media or bag filters.

D. Draw-thru bag/cartridge filter sections shall be capable of accepting headered standard size 12-in. to 30-in. deep rigid media or bag filters.

E. Blow-thru bag/cartridge filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep rigid media (headered or box) or bag filters.

F. Blow-thru HEPA filter sections shall contain a face loading filter frame and be capable of accepting standard size 12-in. deep HEPA box filters.

G. Magnehelic Gages:

1. Housing shall be constructed of a die cast aluminum case and bezel with acrylic cover. Exterior finish shall be coated gray to withstand 168 hr salt spray corrosion test.
2. Accuracy shall be ±2% of full scale throughout range at 70 F (21.1 C).
3. Pressure limits shall be –20 in. Hg to 15 psig (0.677 bar to 1.034 bar).
4. Overpressure relief plugs shall open at approximately 25 psig (1.72 kPa).
5. Temperature limits shall be 20 to 140 F (–6.67 to 60 C).
6. Diameter of dial face shall be 4 in. (101.6 mm).
7. Process connections shall be $1/8$-in. female NPT duplicate high and low pressure taps — one pair side and one pair back.

2.08 DAMPERS

A. Mixing boxes, filter-mixing boxes, and exhaust boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.

1. Standard Dampers:

   Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

2. Premium Dampers:

   Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

3. Outside Air Measurement Dampers:

   a. Damper frame shall be nominal 4 in. x 1 in. x minimum 0.081 in. (102 mm x 25 mm x minimum 2 mm) and constructed of 6063-T5 extruded aluminum.

   b. Airflow measuring blades shall be airfoil-shaped, heavy gage anodized 6063-T5 extruded aluminum and fixed in 10 in. x minimum 16 gage (254 mm x minimum 1.5 mm) galvanized steel frame.

   c. Jamb seals shall be flexible metal compression type along control damper sides.

   d. Blade seals shall be neoprene along control damper blade edges.

   e. Bearings shall be molded synthetic.

   f. Linkage shall be galvanized steel, concealed in frame.

   g. Axles shall be minimum $1/2$-in. (13 mm) diameter plated steel, hex-shaped, mechanically attached to blade.

   h. Operating temperature shall be –22 to 140 F (–30 to 60 C).

   i. Air straightener section shall be aluminum alloy honeycomb contained in 5 in. (127 mm) long, 16 gage (1.5 mm) galvanized steel sleeve attached to monitoring blade frame.

   j. Airflow range shall be 400 to 5,000 ft per minute (122 to 1524 m/min) face velocity.

   k. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg (0.25 kPa) differential pressure.

B. Integral Face and Bypass Dampers:

1. Integral face and bypass (IFB) coils shall be capable of maintaining a constant air volume, within 5%, shall be capable of maintaining a constant leaving air temperature as entering air conditions vary, and shall be capable of producing mixed leaving air temperatures within 3 ft downstream with a maximum variance in air temperature of 5° F, regardless of damper position.
2. When no heating is required, dampers shall divert air to bypass around heating surface with minimal temperature override.
3. Coil casing, dampers and baffles shall be fabricated from galvanized steel with an option for stainless steel. Coils shall be tested at 300 psig.

4. Integral face and bypass coils shall be provided with a connection point for field-mounted actuator(s), electrical or pneumatic, or can be provided from the factory at an additional cost.
5. Actuator connection point shall be mechanically attached to dampers via linkage mechanisms. Dampers shall be interconnected for operation simultaneously across each face of coil.

C. Internal Face and Bypass Dampers:

Internal face and bypass dampers shall be factory mounted in galvanized steel frame. Damper blades shall be constructed of galvanized steel, with high temperature blade and edge seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. To eliminate blade warping, face dampers shall be sectionalized to limit blade length to 60 in. maximum. Face damper blades shall be opposed and arranged to match coil face with top bypass, and internal linkage.

2.09 AIR MIXER

Air mixer of 0.081-in. aluminum construction of size, performance and maximum pressure drop indicated. The air mixer shall mix two or more airstreams of differing temperature to within ± 6° F of theoretical mixed-air temperature and provide a more uniform air velocity contour entering a downstream filter or coil bank.

2.10 UV-C GERMICIDAL LAMPS

A. Emitters and fixtures for UV-C lamps shall be designed for use inside an HVAC system. Individual lamp output shall be measured in an ASME nozzled test apparatus using a 45 F airstream moving at not less than 400 fpm. Lamp output at 253.7 nm shall not be less than 10 $\mu W/cm^2$ per inch of arc length measured at a distance of one meter.

B. Power supplies for UV-C lamps shall be a high-efficiency electronic type which are matched to the emitters and are capable of producing the specified output intensity with an input power no more than 80 watts.

C. Fixtures for UV-C lamps shall be factory installed and wired to a SPDT disconnect switch and door interlock switches in each door. Fixtures are wired for 120 v/single ph requiring a minimum circuit ampacity of 15 amps. Lamps shall ship separately for field installation to minimize the chance for bulb damage.

D. Emitters and fixtures shall be installed in sufficient quantity and arranged so as to provide an equal distribution of UV-C energy on the coil and drain pan.

E. The minimum UV-C energy striking the leading edge of the coil pan shall be not less than 820 $\mu W/cm^2$ at the closest point and through placement, not less than 60% of that value at the farthest point. Equal amounts are to strike the drain pan, either directly or indirectly through reflection.

F. Emitters and fixtures shall be installed such that UV-C energy strikes all surfaces of the coil, drain pan, and the available line of sight airstream.

2.11 ELECTRICAL ACCESSORIES

A. Marine Lights and Convenience Outlets:

1. Cast, non-ferrous metal, weatherproof, fixture.
2. Cast, non-ferrous metal, weatherproof, electrical junction box.
3. Gasketed, heat and shock resistant glass globe protects against moisture and debris.
4. Cast, non-ferrous metal lamp guard to protect glass globe.
5. UL listed.
6. 100 watt type 'A' lamp maximum capacity.
7. Each fixture is equipped with a 75 watt, 130 volt, long life, vibration resistant, lamp (8000+ hour typical lamp life), factory installed.
8. Cast, non-ferrous metal, single gang, weatherproof, switch enclosure.
9. With convenience outlet: Factory supplied and wired, SPST, toggle switch and 15 amp, 120 vac/60 Hz, NEMA 5-15 type, ground fault circuit interrupt (GFCI) receptacle, weatherproof, 'In-Use' type, lockable cover, UL listed.
10. Without convenience outlet: Factory supplied and wired, SPST switch with non-ferrous metal, weatherproof cover plate, UL listed.
11. Each fixture is factory wired to an externally mounted switch box. (Field power connections are made to the switch box mounted externally on the unit.)
12. All factory wiring penetrating through the panel is protected in 'RIGID' type metal conduit.

B. Disconnects:

1. 115-230 volt/single-phase non-fused disconnects shall have the following characteristics:
   a. Plated current carrying components for superior corrosion protection.
   b. Factory-installed equipment grounding terminals with slot/square drive screws.
   c. Rated for motor disconnect applications (10 hp maximum).
   d. NEMA type 3R nonmetallic enclosure.
   e. Up to 10,000 rms symmetrical amperes SCCR, when protected by a fuse or circuit breaker rated 60 amperes or less.
   f. Cover padlock hasp.
   g. Pull-out cartridge type.
   h. UL listed.
2. 115-230 volt/single-phase fused disconnects shall have the following characteristics:
   a. Visible blades.

b. Quick-make, quick-break operating mechanism.
c. Cover padlock hasp and handle lock "OFF."
d. 240 vac maximum.
e. Factory supplied and installed class RK5 fuses.
f. Up to 100,000 rms symmetrical amperes SCCR, utilizing appropriately rated, factory supplied, Class R fuses.
g. Horsepower rated for motor applications.
h. Tangential combination knockouts for field wiring.
i. Spring reinforced plated copper fuse clips.
j. NEMA type 3R enclosures.
k. Insulated, bondable solid neutral assemblies.
l. UL listed, File E2875.
m. Meet or exceed NEMA KS1-1990.

3. 200-230 volt/3-phase fused and non-fused disconnects shall have the following characteristics:
a. Visible blades.
b. Quick-make, quick-break operating mechanism.
c. Cover padlock hasp and handle lock "OFF."
d. 240 vac maximum.
e. Factory supplied and installed class RK5 fuses (fused disconnects only).
f. Up to 100,000 rms symmetrical amperes SCCR, utilizing appropriately rated Class R fuses.
g. Horsepower rated for motor applications.
h. Tangential combination knockouts for field wiring.
i. Spring reinforced plated copper fuse clips.
j. NEMA type 3R enclosures.
k. Insulated, bondable solid neutral assemblies.
l. UL listed, File E2875.
m. Meet or exceed NEMA KS1-1990.

4. 380-575 volt/3-phase fused and non-fused disconnects shall have the following characteristics:
a. Visible switch blades with for positive "OFF" indication.
b. Quick-make, quick-break operating mechanism.
c. Dual cover interlock.
d. Color coded "ON" — "OFF" indicator handle.
e. Cover padlock hasp and handle lock "OFF" provision for multiple padlocks.
f. 600 vac maximum.
g. Factory supplied and installed class RK5 fuses (fused disconnects only).
h. Up to 200,000 rms symmetrical amperes SCCR, utilizing appropriately rated Class R fuses.
i. Horsepower rated for motor applications.
j. Spring reinforced plated copper fuse clips.
k. Tangential combination knockouts.
l. NEMA type 3R enclosures.
m. Insulated, bondable solid neutral assemblies.
n. Wire terminations suitable for aluminum or copper conductors.
o. UL listed.
p. Meet or exceed NEMA KS1-1999.

C. Starters:
1. Starter without disconnect:
a. Adjustable motor overload with trip indication.
b. Manual overload reset button (accessible without opening enclosure).
c. 115-v fused secondary control transformer (fuse included — fused primary and secondary over 50 amps).
d. Hand/Off/Auto selector switch (accessible without opening enclosure).
e. Separate 4-position terminal strip for remote H-O-A wiring.
f. C series contactors.
g. Horsepower rated for motor applications.
h. NEMA 4X type non-metallic enclosures.
i. Lug connections for field wiring.
j. Factory mounted, wired, and run tested with factory-supplied motor.
k. UL listed.

2. Combination Starter/Disconnect:
a. Non-fused UL 508 disconnect switch with lockable handle (locks not provided).
b. Cover interlock.
c. Adjustable motor overload with trip indication.
d. Manual overload reset button (accessible without opening enclosure).
e. 115-v fused secondary control transformer (fuse included — fused primary and secondary over 50 amps).
f. Hand/Off/Auto selector switch (accessible without opening enclosure).
g. Separate 4-position terminal strip for remote H-O-A wiring.
h. C series contactors.
i. Horsepower rated for motor applications.
j. NEMA 4X type non-metallic enclosures.
k. Lug connections for field power wiring.
l. Factory mounted, wired, and run tested with factory-supplied motor.

D. Bypass for Variable Frequency Drives:
   1. 200-230 v/3 Ph/60 Hz (1 to 7.5 Hp), 460-575 v/3 Ph/60 Hz (1 to 20 Hp), 380 v/3 Ph/50 Hz (1 to 15 Hp):
      a. 4-position panel-mounted disconnect style switch with lockable handle (locks not provided), meets OSHA 1910.
      b. Switch position indication (LINE/OFF/DRIVE/TEST).
      c. Adjustable motor overload with trip indication (LINE position).
      d. Manual overload reset button.
      e. Horsepower rated for motor applications.
      f. Direct control (no contactors, relays, or holding coils).
      g. Complete isolation of inverter in LINE position.
      h. NEMA 12 type metal enclosures.
      i. Terminal strip provided for field power supply wiring.
      j. Lug connection for field ground wire.
      k. Gold flashed, auxiliary switch contact set (for switch position monitoring).
      l. Factory mounted, wired to VFD and motor, and run tested (motor and VFD must be factory supplied and installed).
      m. UL; UL, Canada; CE listed.
   2. 200-230 v /3 Ph/60 Hz (10 to 75 Hp), 460-575 v/3 Ph/60 Hz (25 to 150 Hp), 380 v/3 Ph/50 Hz (20 to 75 Hp):
      a. 4-position panel-mounted disconnect style switch with lockable handle (locks not provided), meets OSHA 1910.
      b. Switch position indication (LINE/OFF/DRIVE/TEST).
      c. Adjustable motor overload with trip indication (in LINE position).
      d. Manual overload reset button.
      e. Horsepower rated for motor applications.
      f. 115-v control transformer with fused secondary (fused primary on units over 50 amps).
      g. Contactor for Line Start/Stop.
      h. Door-mounted Line Start and Line Stop pushbuttons.
      i. Complete isolation of inverter in LINE position.
      j. NEMA 12 type metal enclosures.
      k. Terminal strip provided for field power supply wiring.
      l. Lug connection for field ground wire.
      m. Gold flashed, auxiliary switch contact set (for switch position monitoring).
      n. Factory mounted, wired to VFD and motor, and run tested (motor and VFD must be factory supplied and installed).
      o. UL; UL, Canada; CE listed.

E. Variable Frequency Drives:
   1. Factory-mounted variable frequency drives (VFDs) shall be wired to factory-supplied motors.
   2. Factory-supplied VFDs are programmed and started up from the factory and qualify the VFD, through ABB, for a 24-month warranty from date of commissioning or 30 months from date of sale, whichever occurs first.
   3. The VFD parameters are programmed into the controller and removable keypad. In the event that the VFD fails and needs replacement, the program can then be uploaded to the replacement VFD via the original keypad.
   4. The VFD shall be mounted inside the unit cabinet shielded from upstream components and within the unit's ambient conditions. Access to the VFD shall be through the unit's hinged access door.
   5. The VFD package as specified herein shall be enclosed in a UL Listed type enclosure, exceeding NEMA enclosure design criteria (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer in an ISO 9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and –35% nominal voltage as a minimum.
      a. Environmental operating conditions: VFDs shall be capable of continuous operation at 0 to 50 C (32 to 122 F) ambient temperature as per VFD manufacturers documented/submittal data or VFD must be oversized to meet these temperature requirements. Not acceptable are VFDs that can only operate at 40 C intermittently (average during a 24-hour period) and therefore must be oversized. VFDs shall be capable of operating at altitude 0 to 3300 feet above sea level and less than 95% humidity, non-condensing. All circuit boards shall have conformal coating.
      b. Enclosure shall be rated UL Type 1 and shall be UL listed as a plenum rated VFD. VFDs without these ratings are not acceptable. Type 1 enclosures with only NEMA ratings are not acceptable (must be UL Type 1).
   6. All VFDs shall have the following standard features:
      a. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and

downloading of parameter settings as an aid for start-up of multiple VFDs.

b. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.

c. There shall be a built-in timeclock in the VFD keypad. The clock shall have a battery back-up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. Capacitor back-up is not acceptable. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays. The VFD shall have a digital input that allows an override to the timeclock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

d. The VFDs shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

e. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required. To extend the fan and bearing operating life, the VFD shall cycle the cooling fans on and off as required.

f. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

g. The VFD shall have the ability to automatically restart after an overcurrent, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

h. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.

i. The VFD shall have internal 5% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add an AC line reactor.

j. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120. Input and output current ratings must be shown on the VFD nameplate.

k. The VFD shall include a coordinated AC transient surge protection system consisting of 4 to 120 joule rated MOVs (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

l. The VFD shall provide a programmable loss-of-load (broken belt/broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and/or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.

m. The VFD shall have user programmable underload and overload curve functions to allow user defined indications of broken belt or mechanical failure/jam condition causing motor overload

n. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and/or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control.

o. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C

relay output and / or over the serial communication bus.

p. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

7. All VFDs to have the following adjustments:
   a. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.
   b. Two (2) PID Set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed-loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two independent parameter sets for the PID controller and the capability to switch between the parameter sets via a digital input, serial communications or from the keypad. The independent parameter sets are typically used for night setback, switching between summer and winter set points, etc.
   c. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (ie. valves, dampers, etc.). All set points, process variables, etc. to be accessible from the serial communication network.
   d. Two (2) programmable analog inputs shall accept current or voltage signals.
   e. Two (2) programmable analog outputs (0 to 20 mA or 4 to 20 mA). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback, and other data.
   f. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC or 24VAC.
   g. Three (3) programmable, digital Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.
   h. Run permissive circuit: There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close. The keypad shall display "start enable 1 (or 2) missing". The safety input status shall also be transmitted over the serial communications bus.
   i. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates. The time delay shall be field programmable from 0 to 120 seconds. Start delay shall be active regardless of the start command source (keypad command, input contact closure, time-clock control, or serial communications).
   j. Seven (7) programmable preset speeds.
   k. Two independently adjustable accelerate and decelerate ramps with 1 to 1800 seconds adjustable time ramps.
   l. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. The VFD shall have selectable software for optimization of motor noise, energy consumption, and motor speed control.
   m. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency settings without derating the VFD.
   n. The VFD shall include password protection against parameter changes.
8. The keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alphanumeric codes are not acceptable). All VFD faults shall be displayed in English words. The

keypad shall include a minimum of 14 assistants including:

a. Start-up assistant
b. Parameter assistants
c. PID assistant
d. Reference assistant
e. I/O assistant
f. Serial communications assistant
g. Option module assistant
h. Panel display assistant
i. Low noise set-up assistant
j. Maintenance assistant
k. Troubleshooting assistant
l. Drive optimizer assistants

9. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):
   a. Output Frequency
   b. Motor Speed (RPM, %, or Engineering units)
   c. Motor Current
   d. Motor Torque
   e. Motor Power (kW)
   f. DC Bus Voltage
   g. Output Voltage
10. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.
11. Serial Communications:
    a. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. [Optional protocols for LonWorks, Profibus, EtherNet, BACnet IP, and DeviceNet shall be available.] Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.
    b. The BACnet connection shall be an EIA-485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
       1) Data Sharing – Read Property – B.
       2) Data Sharing – Write Property – B.
       3) Device Management – Dynamic Device Binding (Who-Is; I-Am).
       4) Device Management – Dynamic Object Binding (Who-Has; I-Have).
       5) Device Management – Communication Control – B.
    c. If additional hardware is required to obtain the BACnet interface, the VFD manufacturer shall supply one BACnet gateway per drive. Multiple VFDs sharing one gateway shall not be acceptable.
    d. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.
    e. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass valve control, chilled water valve / hot water valve control, etc. Both the VFD PID control loop and the independent PID control loop shall continue functioning even if the serial communications connection is lost. As default, the VFD shall keep the last good set point command and last good DO and AO commands in memory in the event

the serial communications connection is lost and continue controlling the process.

12. EMI/RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level with up to 100 feet of motor cable. No Exceptions. Certified test reports shall be provided with the submittals confirming compliance to EN 61800-3, First Environment.
13. All VFDs through 75 hp at 480 V shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not sustain damage from this power mis-wiring condition.
14. Operational Functions:
    a. The drive shall contain two separate acceleration/deceleration times with auto tuning for optimum setting (0.1 to 6000 seconds) with choice of linear, S, or C curves that shall be factory programmed to match the fan load and prevent nuisance overcurrent fault trips.
    b. The drive shall be equipped with both local/remote and manual/auto keys on touchpad.
    c. The drive shall be equipped with a quick setup key.
    d. The drive shall contain 15 preset speeds, which can be activated from the keypad, terminal inputs, and host computer.
    e. The drive shall have the capability of storable special custom user setting.
    f. The drive shall restart into a rotating motor operating in either the forward or reverse direction and match that frequency.
    g. The drive shall have adjustable soft stall (10% to 150%) which reduces frequency and voltage of the inverter to sustain a run in an overload situation factory programmed for each motor's characteristics.
    h. The drive shall be capable of performing a time base pattern run using 4 groups of 8 patterns each using the 15 preset speed values for a maximum of 32 different patterns.
    i. The drive shall have adjustable UL listed electronic overload protection (10% to 100%) factory programmed to match each motor's FLA/RLA ratings.
    j. The drive shall have a custom programmable volt/hertz pattern.
15. Protective Features:
    a. The drive shall be rated for 200,000 AIC (ampere interrupting capacity). The use of input fuses to achieve this rating shall not be acceptable.
    b. The drive shall have external fault input.
    c. The drive shall be capable of resetting faults remotely and locally.
    d. The drive shall be programmable to alert the following alarms:
        1) Over torque alarm.
        2) Inverter overload pre-alarm.
        3) Motor overload pre-alarm.
        4) Braking resistor overload pre-alarm.
        5) Inverter overheat pre-alarm.
        6) Undercurrent alarm.
        7) Overcurrent pre-alarm.
        8) Communication error alarm.
        9) Cumulative timer alarm.
        10) Executing retry.
    e. The drive shall identify and display the following faults:
        1) Overcurrent during acceleration trip.
        2) Overcurrent during deceleration trip.
        3) Overcurrent during normal run trip.
        4) Overcurrent on the DC Bus during acceleration trip.
        5) Overcurrent on the DC Bus during deceleration trip.
        6) Overcurrent on the DC Bus during normal run trip.
        7) Load end overcurrent trip detected at start-up (output terminals, motor wiring, etc.).
        8) U-phase short circuit trip detected at start-up.
        9) V-phase short circuit trip detected at start-up.
        10) W-phase short circuit trip detected at start-up.
        11) Overvoltage during acceleration trip.
        12) Overvoltage during deceleration trip.
        13) Overvoltage during normal (constant speed) run trip.
        14) Inverter overloaded trip.
        15) Motor overloaded trip.
        16) Inverter overheat trip.
        17) Emergency off trip message.
        18) EEPROM failure during write cycle.
        19) EEPROM abnormality during initial reading.
        20) RAM error.
        21) ROM error.
        22) CPU error.
        23) Communication interruption error.
        24) Gate array error.

25) Output current detection circuit error.
26) Option PCB error trip.
27) Low operating current trip.
28) Main circuit under voltage trip.
29) Over torque trip.
30) Software detected earth fault trip.
31) Hardware detected earth fault trip.
32) Inverter type form mismatch error.
33) EEPROM type form mismatch error.

16. Monitor Functions:
    a. The drive digital display shall be capable of displaying the following: Frequency, percent current, current amps, percent voltage I/O, voltage in volts I/O, RPM, GPM, I/O watts, torque, and input reference signal, kWh.
    b. The drive shall have 320 programmable parameters which can be changed while the drive is operating.
    c. The drive's 353 parameters shall be adjustable from the 8-key touchpad or computer link.
    d. The drive's 8-key touchpad shall be NEMA 12 rated.
    e. The drive's keypad shall be capable of being extended 15 ft from the drive.
    f. The drive shall contain a reset of all parameters to factory default settings or user defaults (whichever one is chosen).
    g. The drive shall have 2 programmable analog outputs programmable to 17 choices.
    h. The drive shall have one programmable relay output programmable to 67 choices.
    i. The drive shall have 8 programmable digital inputs programmable to 54 choices.
    j. The drive shall have a pulse train output proportional to frequency (48, 96, 360 times frequency).
    k. The drive shall have an elapsed time meter.