

ECO-Series™ Family Application Guide

AG-ES01 Rev. A 7/22

ARCHITECTS

ENGINEERS

BUILDERS



TABLE OF CONTENTS

1. PURPOSE OF THIS GUIDE

2. ECO-SERIES FAMILY: ENGINEERED SOLUTIONS FOR MULTI-FAMILY APPLICATIONS

- 2.1 PACKAGED HVAC SYSTEM PROVIDES INDIVIDUAL COMFORT CONTROL
- 2.2 SEALED REFRIGERANT SYSTEM
- 2.3 SIMPLIFIED INSTALLATION OPTIONS
- 2.4 HEATING ALTERNATIVES

3. UNIT LOCATION

- 3.1 GENERAL CONSIDERATIONS
- 3.2 SOUND CONSIDERATIONS
- 3.3 ACCESSIBILITY
- 3.4 VENT LOCATION FOR THERMA-PAK MODELS

4. WALL SLEEVES

- 4.1 INSTALLATION
- 4.2 WEATHER –PROOFING WALL SLEEVES

5. TYPES OF WALL CONSTRUCTION

- 5.1 SUPPORT
- 5.2 WOOD-FRAMED WALLS
- 5.3 CEMENT BLOCK AND POURED CONCRETE WALLS
- 5.4 METAL STUD WALLS

6. NOISE TRANSMISSION

- 6.1 TRANSMISSION BY VIBRATION
- 6.2 RESONANT SURFACES OR OBJECTS AND RADIATED SOUND
- 6.3 CLEARANCES
- 6.4 AIR NOISE
 - 6.4.1. SUPPLY-AIR DUCT
 - 6.4.2. RETURN-AIR DUCT

7. INFILTRATION

- 7.1 WATER INFILTRATION
- 7.2 AIR INFILTRATION
- 7.3 INTRODUCTION OF VENTILATION AIR
- 7.4 SEALING RETURN-AIR DUCTS

8. EXTERIOR FACADES, GRILLES OR LOUVERS AND INTERIOR ACCESS PANELS

- 8.1 GRILLE AND LOUVER FURNISHED ON ECO-SERIES
- 8.2 OUTSIDE APPEARANCE VARIATIONS
- 8.3 ACCESS/RETURN AIR PANEL

9. ELECTRICAL SERVICE WIRING

10. AIR FILTER

11. CONSIDERATIONS FOR THERMA-PAK UNITS

12. CONSIDERATIONS FOR AQUA-PAK UNITS

13. CONSIDERATIONS FOR FRESH-PAK UNITS

1. PURPOSE OF THIS GUIDE

This manual provides assistance to architects and engineers who are considering the use of ECO-series family of heating and cooling equipment in multi-dwelling buildings. This document details the best practices for installation, and technical knowledge gained through many years of installation experience.

A qualified Professional Engineer (PE) who is familiar with applicable building code requirements should be used to determine the building structure heat loss, heat gain, duct sizing, gas supply mains, riser sizing, and electrical-supply wiring for any ECO-Series project.

2. ECO-SERIES FAMILY: ENGINEERED SOLUTIONS FOR MULTI-FAMILY APPLICATIONS

2.1 PACKAGED HVAC SYSTEM PROVIDES INDIVIDUAL COMFORT CONTROL

The ECO-Series family of units are compact, through-the-wall single packaged vertical HVAC units that deliver conditioned air from a single unit to multiple rooms. ECO-Series units provide a variety of combination heating-and-cooling options to meet the needs of any building project. Eco-series units are easy to install, reliable, inexpensive to maintain, and allows each individual unit personalized climate control.

				
AC Cooling	✓	✓	✓	✓
Heat Pump	✓	✓		
Electric Heat	✓	✓		
Gas Heat				✓
Hydronic Heating		✓	✓	
Integrated ERV		✓		
Factory Pre-Charge	✓	✓	✓	✓

Table 1 - ECO-Series Features

2.2 SEALED REFRIGERATION SYSTEM

All ECO-Series units come pre-charged from the factory, and are performance and leak tested prior to shipment. This testing eliminates the demand for highly trained technicians at the time of installation or start up.

2.3 SIMPLIFIED INSTALLATION OPTIONS

The eco-series units feature modern technology in heat transfer surface and high efficiency compressor design. Additionally, ECO-Series units feature a common, weight-bearing sleeve design to allow for interchangeable installation between certain units. For more information, contact application specialist.

2.4 HEATING ALTERNATIVES

ECO-Series units offer a variety of heat sources for all applications and energy requirements. All the ECO-Series units are fully ducted, “through-the-wall” units. Depending on energy costs, gas heating could maximize the efficiency of applications where gas is available. Eco-series THERMA-Pak is a direct vent application which uses only outside air for combustion. For locations where hot water applications are required, the ECO-Series AQUA-Pak can provide an efficient solution for your heating needs. COOL-Pak and FRESH-Pak units come with straight cooling or heat pump functionality with auxiliary electrical heating, and electric heat only units.

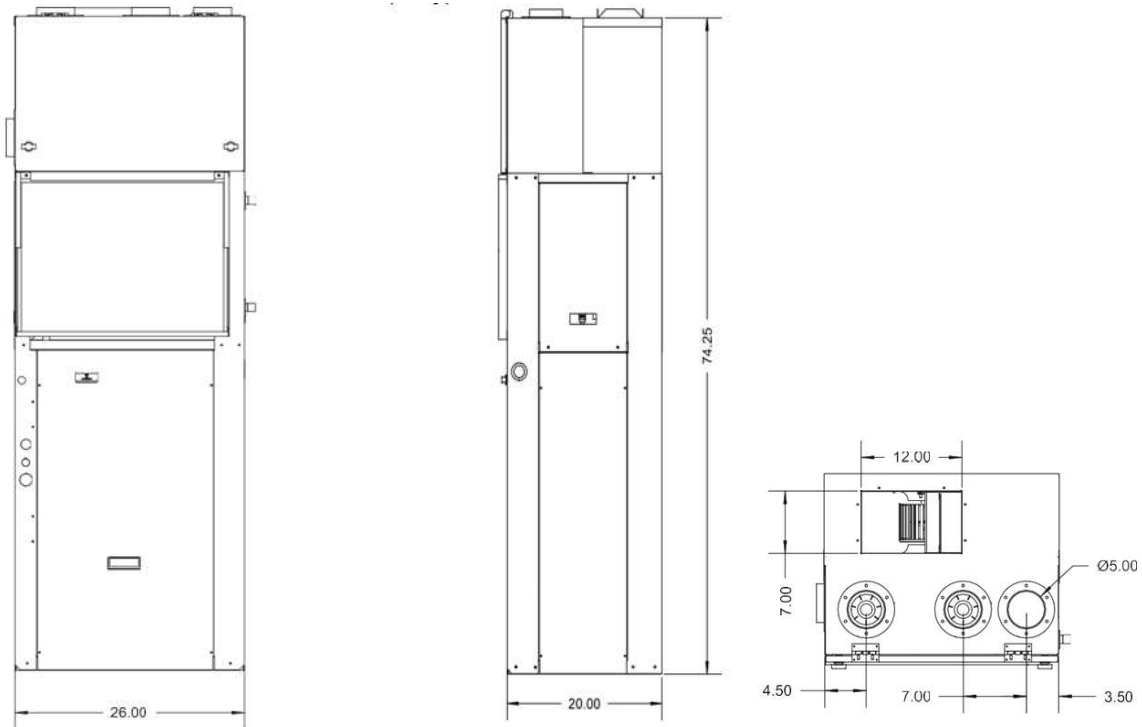


Figure 2 - Fresh-Pak ECO-Series Model

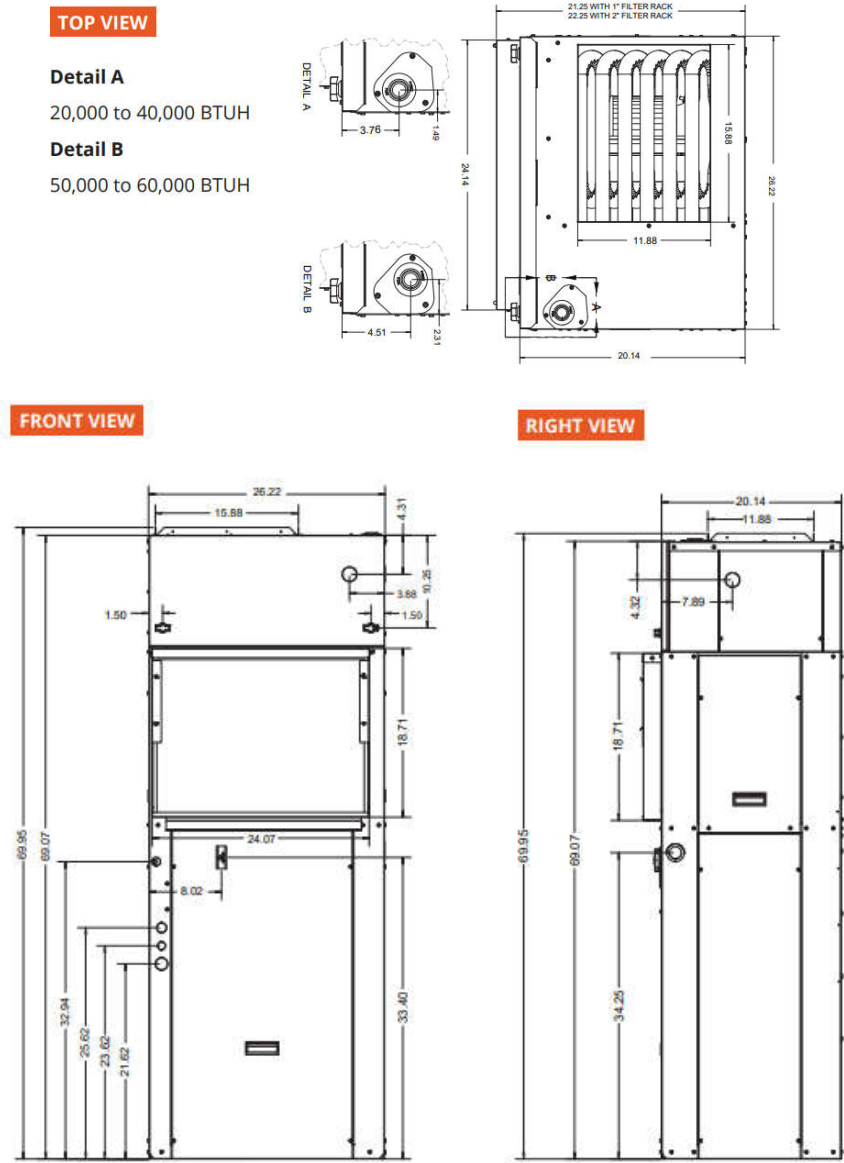
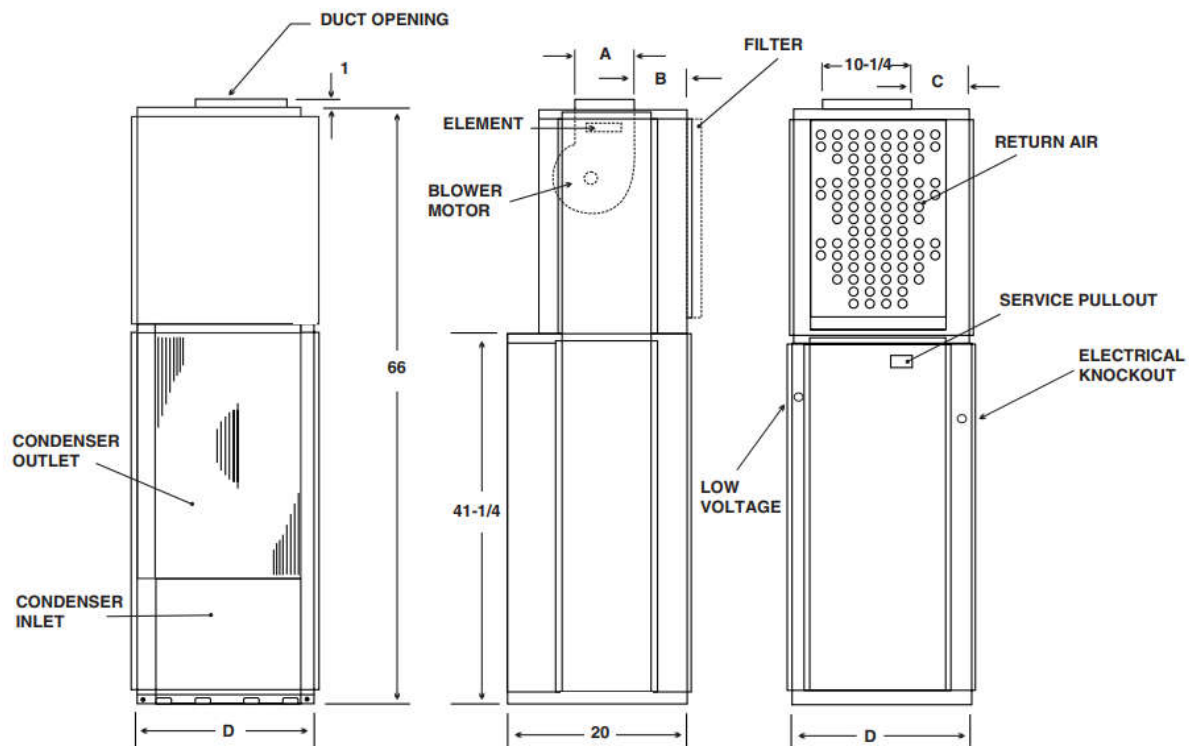
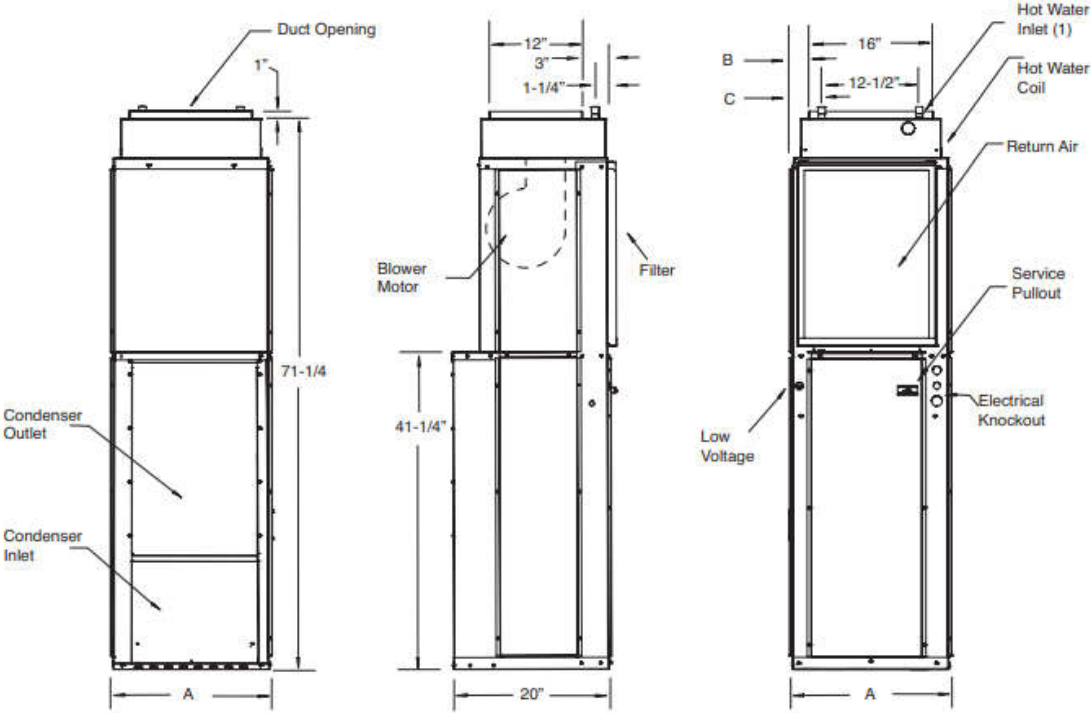


Figure 3 - Therma-Pak ECO-Series Model



	A	B	C	D	FILTER
9,12,18	6-1/2	6-1/8	6-5/8	20	18 x 24 x 1
24,30	10	2-1/2	8	26	24 x 24 x 1

Figure 4 - Cool-Pak ECO-Series Model



(1) Hot water coil connections are 7/8" O.D., Sweat

UNIT	A	B	C	FILTER
9,12,18	20	2	3-3/4	18 x 24 x 1
24,30	26	5	6-3/4	24 x 24 x 1

Figure 5 - Aqua-Pak ECO-Series Model

3. UNIT LOCATION



Figure 6 - Condominium with ECO-Series unit on the exterior wall

3.1 GENERAL CONSIDERATIONS

The exterior of the unit must have no obstruction (trees, landscape materials, etc) within 30" [76.2cm], and must be installed at least 4 feet [1.22m] from electric meters, gas meters, regulators and relief equipment. Buildings that are designed with the utility closet next to each other, must have a minimum horizontal clearance of 12.0 in. between units and a vertical clearance of 60.0 in. between units (see **Figure 7**). Care should be taken when ECO-Series units are installed in colder climates to prevent frost build-up.

The provided dimensions are intended to reduce recirculation of condenser air between multiple ECO-Series units. These measurements may not be applicable to all installations; the designer should contact an application specialist if there are any questions regarding unit placement.

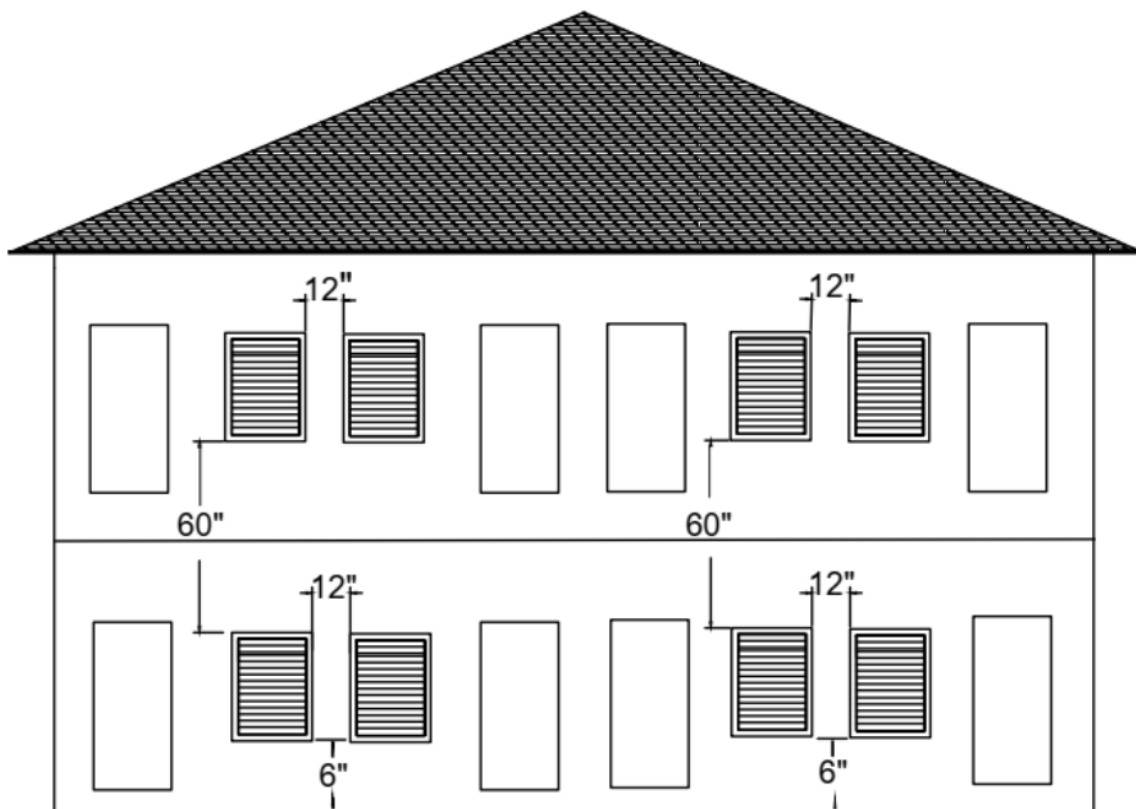


Figure 7 - Building Clearance Needed

3.2 SOUND CONSIDERATIONS

ECO-Series units installed opposite of walls or surfaces constructed of wood, concrete, or metal may reflect sound produced by the unit. Non parallel surfaces may deflect the unit noise to some degree, however, it is recommended to install ECO-Series units with as much space between walls or obstructions as practical.

Units placed in walls that create an air shaft or enclosed courtyard are less ideal than those placed in the building's outer perimeter walls when considering noise reflection. Similar to the previous example, if the unit is to be installed in a wall at a right angle to a wall that contains a window, at least 6 feet should be kept in between the window's glass and the unit to reduce sound transmission through the window.

3.3 ACCESSIBILITY

Provisions should be made to allow access to the indoor side of the unit for installation and inspection. The closet or access panel opening must be centered with the exterior wall opening and be at least 30 inches[76.2cm] wide by 84 inches[213.36cm] tall for all ECO-SERIES models.

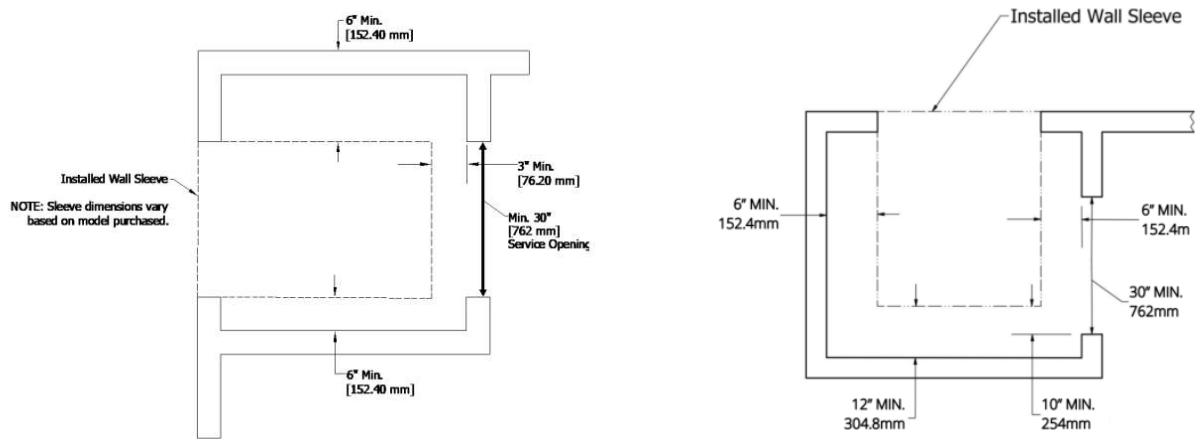


Figure 8– Typical Clearance for Standard ECO-Series (Rear and Side wall Sleeves)

If the unit is to be located in the end of a closet, before beginning installation activities, ensure that the closet is empty and the door of the closet is large enough to get the unit out of the closet.

DO NOT install units in locations where the unit may not be readily accessible. This will also ensure that the air filter remains accessible by the occupants or maintenance personnel for easy and timely cleaning.

3.4 VENT LOCATION FOR THERMA-PAK MODELS

Therma-Pak is a direct vent appliance and the flue gases venting on these units shall be in accordance with the latest edition of the National Fuel Gas Code (NFPA 54/ANSI Z223.1), and local codes.

The ECO-Series units are designed and certified only for indoor installation. The interior portions of the unit may be surrounded by a closet with minimum clearances to combustibile material maintained as follows:

- 0.0 in. on the sides,
- 2.0 in. on the top,
- 1.0 in. front of the plenum.

Adequate clearance shall be provided for the access and installation of the gas line union, the manual shutoff valve, and field wiring.

Installing appliances directly on carpet, tile, or any other combustibile material is **NOT** recommended (with the exception of wood flooring).

4. WALL SLEEVES

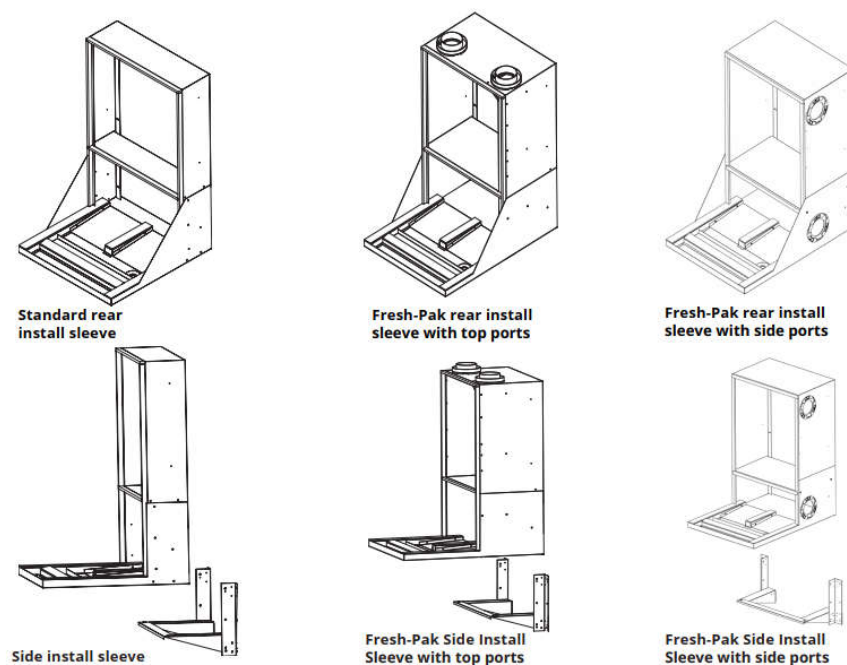


Figure 9 - Wall sleeve frame

Rear or side install wall sleeves are provided for installation during rough-in and, when ready, the unit simply slides into the sleeve and the duct work and electrical is connected. The sleeve is a weight-bearing sleeve that supports the entire weight of the unit and provides a weather tight seal against wind and water infiltration. All side install sleeves are shipped with a separate wall mounting support bracket. A 3/4" male NPT fitting is provided in the bottom of the sleeve for field connection to a condensate riser. Four wall sleeve depths are available to accommodate wall thickness from 5" to 20". Each sleeve includes a factory installed "weather guard" to cover the sleeve opening during construction.

Wall Thickness	Standard Wall Sleeve Dimensions				Large Wall Sleeve Dimensions			
	AQUA-PAK	COOL-PAK	THERMA-PAK	FRESH-PAK	AQUA-PAK	COOL-PAK	THERMA-PAK	FRESH-PAK
5"-8" Thick Walls	43-3/4 x 21-3/8 x 26		43-1/4 x 26-1/2 x 29-3/4		43-3/4 x 27-3/8 x 26		43-1/4 x 26-1/2 x 37-1/4	
8"-12" Thick Walls	43-3/4 x 21-3/8 x 30		43-1/4 x 26-1/2 x 33-3/4		43-3/4 x 27-3/8 x 30		43-1/4 x 26-1/2 x 41-1/4	
12"-15" Thick Walls	43-3/4 x 21-3/8 x 33		43-1/4 x 26-1/2 x 36-3/4		43-3/4 x 27-3/8 x 33		43-1/4 x 26-1/2 x 44-1/4	
15"-20" Thick Walls	43-3/4 x 21-3/8 x 38		43-1/4 x 26-1/2 x 42-3/4		43-3/4 x 27-3/8 x 38		43-1/4 x 26-1/2 x 50-1/4	

Table 2 – Wall Sleeve Dimensions

4.1 INSTALLATION

Install the sleeve into the pre-cut opening, using shims as necessary to maintain proper alignment of the sealing surfaces and ensure the sleeve is square with the building cutout.

The Front edge of the wall sleeve should protrude $\frac{1}{4}$ " [6.35mm] to $\frac{1}{2}$ " [12.7mm] from the finished outside surface of the wall. It is recommended to use fasteners with seal washers to minimize the possibility of water leakage into the wall.

Align the sleeve with the wall so that the top of the sleeve protrudes $\frac{1}{2}$ " and the bottom protrudes $\frac{1}{4}$ " from the finished surface of the outside wall (Figure 9). Ensure the bottom of the sleeve pan is pitched toward the outside to ensure positive secondary draining in case of overflow.

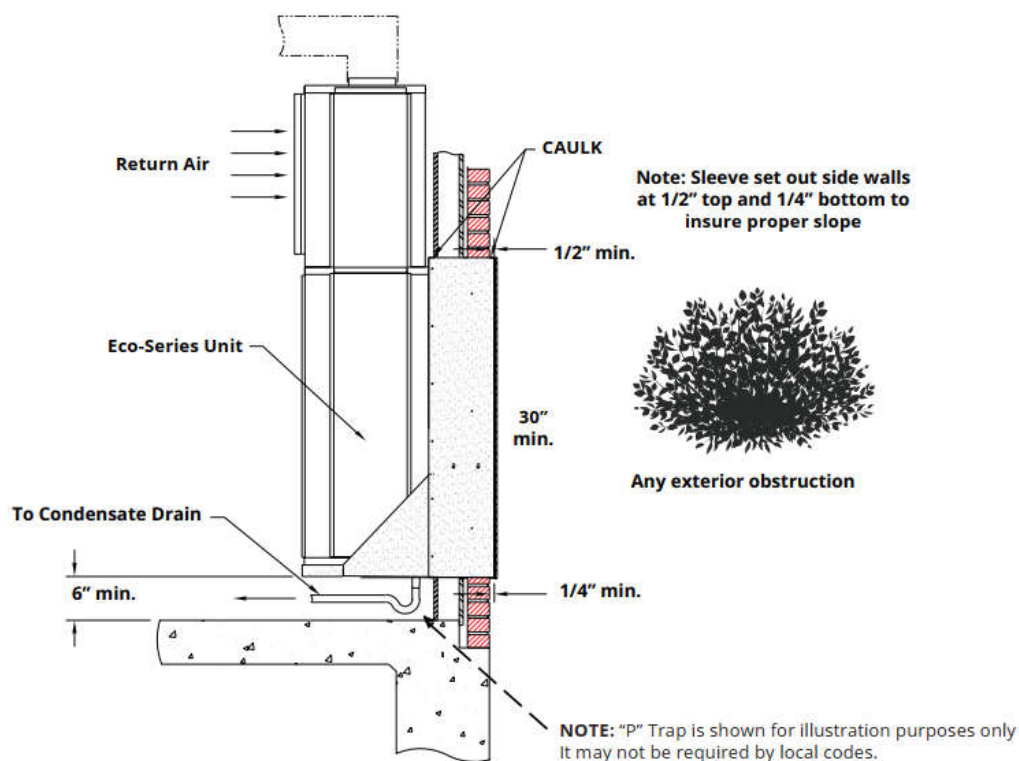


Figure 10 - Wall sleeve installation



Figure 11 – Exterior Wall sleeve installation

4.2 WEATHER-PROOFING WALL SLEEVES

The grille and wall sleeve are shipped in separate packages. Material in this shipment has been inspected at the factory and released to the transportation agency in good condition. When received, a visual inspection of all cartons should be made immediately. Any evidence of rough handling or apparent damage should be noted on the delivery receipt and the material inspected in the presence of the carrier's representative. If damage is found, a claim should be filed against the carrier immediately.

The factory applies a sealant to the outside of the interface between the seal and the sleeve. The installer is responsible to check this for damage due to installation and to add sealant as necessary to ensure that no air gaps exist. After sleeve installation ensure that the sleeve seal is in contact with the sleeve sides. Any air gaps must be sealed or outdoor air and/or water leakage will occur.

Additional sealing against air infiltration must be done after the ECO-Series unit is installed in the wall sleeve and all utility connections are completed. For additional protection, place a bead of silicone sealant or other high grade non-hardening sealing compound approved for exterior use to seal the gap between the wall sleeve and both the inside and outside wall surfaces. Sealant should also be applied around the heads of the fasteners used to secure the sleeve.

5. TYPES OF WALL CONSTRUCTION

5.1 SUPPORT

In general, wall sleeves are designed to support an ECO-Series unit on any wall. However, the wall must still be robust enough to support the unit; if it is not, the installer must provide additional support between the unit and the floor. Side install configurations come with an additional support bracket to help the sleeve support the weight of the ECO-Series unit, as shown in **Figure 11**.

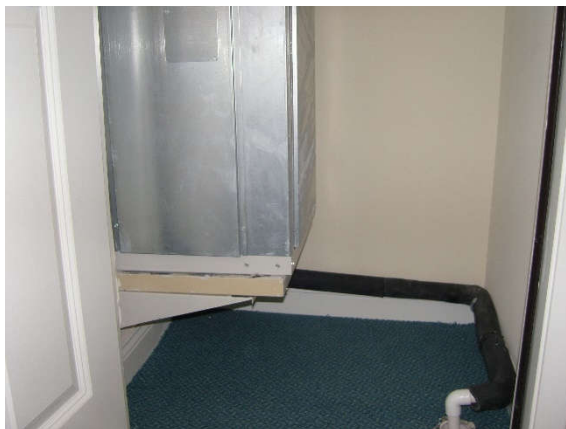
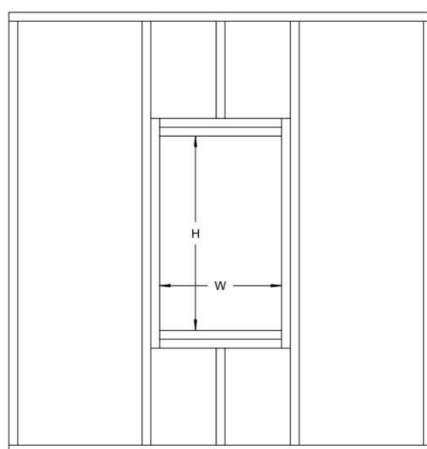


Figure 11- Photo of additional support bracket under unit

5.2 WOOD FRAMED WALLS

For wood framed building, it is recommended to use a double 2 ft. x 4 ft. frame on both sides and across the top and bottom of the opening, using a minimum of one vertical support underneath and above the center of the opening (**Figure 12**).

Most wood-frame walls should be strong enough to support the weight of the ECO-Series unit with no additional support, and with proper insulation can be more effective than concrete walls in reducing vibration. However, it is important to consider the structure of the mounting wall in the vicinity of the unit. It is recommended to make sure the mounting wall on either side of the ECO-Series unit does not have any windows, doors, or other openings within 3 feet that might reduce the stability of the supporting structure.



	Width	Height
Standard Sleeve	21-5/8"	44"
Large Sleeve	27-5/8"	44"
Fresh-Pak /Therma-Pak Sleeve	26-3/4"	43-1/2"

Figure 12- ECO-Series Wall Frame

If there are conflicting requirements or recommendations, local building codes supersede this document. Contact the application specialist for more information.

5.3 CEMENT BLOCK AND POURED CONCRETE WALLS

Cement or cinder block walls are typically the most forgiving for vibration and noise transmission in single or multi story buildings. Poured concrete buildings can produce a significant amount of noise from vibration and may require additional methods to reduce noise at the mounting wall.

Wall sleeve openings must include a suitable frame that can support the weight of the ECO-Series unit, and provide a proper seal to prevent air or water leakage into the building. For questions regarding specialized installations please contact your application specialist.

5.4 METAL STUD WALLS

For building projects that incorporate metal studs should follow the recommendations detailed in section 5.2 with the following additional considerations. ECO-Series unit wall sleeves are attached to the metal studding, similar to wood stud attachment, however, self-drilling screws are required to fasten the sleeve to the metal framing. Flexible metal studs, such as aluminum, may require additional support studs to support the weight of the ECO-Series unit.



Figure 13- Wall sleeve installation example.

6. NOISE TRANSMISSION

In order to maximize air distribution, it is advisable to place a unit in the center of the floor plan. The unit should not be placed in the living room or bedroom; instead, it should be in a utility closet, kitchen, or balcony. This suggestion will make it possible to better address both ductwork and sound-transmission issues. There are various techniques to lessen the perception of noise in occupied rooms next to the ECO-Series family unit if the floor layout does not permit this.

In general, one or more of the following factors contribute to our perception of noise:

- Vibration transmission
- Sound propagating through the panels and enclosure walls from the source (compressor and motors)
- Turbulence
- Resonance through surfaces and objects

6.1 TRANSMISSION BY VIBRATION

Even with the use of rubber mounting, balancing, flexible loops of tubing, and mufflers, components within an ECO-Series unit will always produce some amount of vibration. The issue can be resolved if the vibration can be absorbed by the supporting wall without further transmitting the energy into the structural supports.

Concrete block walls can be better vibration absorbers than poured concrete, however, wood frame walls can provide more efficient vibration reduction.

When possible, flexible duct collars should be used between any sheet metal ducts and the ECO-Series plenum duct flanges to reduce noise.

6.2 RESONANT SURFACES OR OBJECTS AND RADIATED SOUND

On eco-series units, the compressor and fan motors are typically the main sources of noise. In these situations, a 60 Hz AC power hum may occasionally be heard from either these sources or the control transformer, although normally this hum is mostly undetectable in a regular running unit and does not cause sound issues.

However, the sound frequencies produced by the motor and compressor can contribute significantly to the overall sound that the ECO-Series units emit. There are numerous sources of radiated sound, including the air blower and condenser fan blades. These sound sources could transfer specific frequencies to other surfaces or objects, that might cause them to reverberate with some of the frequencies coming from these sound sources. If so, this could cause further resonance in the system, eventually transferring through the cabinet panels.

The sound level in the adjacent room can be decreased by installing a separately built closet enclosure that is made to fit the ECO-Series unit.

6.3 CLEARANCES

A minimum of 3" clearance is required on all sides of the ECO-Series cabinet, however, some configurations may require additional clearance space. Detailed instructions for unit clearances can be found in the applicable ECO-Series installation manual. Not only does this allow proper airflow around the ECO-Series cabinet, but it also helps reduce the noise transmitted from the cabinet to the occupied space. This minimum dimension also applies to the front access door of the closet

6.4 AIR NOISE

6.4.1 SUPPLY-AIR DUCT

In contrast to the vibration and radiating noise of moving machinery, the sound produced by duct air velocity, air rounding corners, duct size transitions, and other geometric elements can all have a very distinct character. Supply air ducts are typically connected to the ECO-Series units for air distribution, however, this can lead to air noise produced by the ECO-Series unit to be audible at the registers and return air grille. To avoid condensation building up on the outside of the supply ducts during summer operation, the plenum and supply ducts on the eco-series unit should be insulated. Insulating the inside of the supply duct is an excellent way to reduce the amount of noise audible to the occupants.

To help reduce noise, the ductwork should be configured such that there is no line of sight between the unit discharge and the distribution diffusers. The ability to distinguish sound from air noise will eventually depend on the face velocity of air exiting the supply register. For each supply register, the selection tables provided by the register manufacturer will normally provide noise values in addition to those for face velocity, throw, and air friction at the appropriate air flow.

ASHRAE Fundamentals Handbook includes louver selection criteria based on cubic feet per minute and a face velocity of roughly **400 to 500 fpm** through the louver free area is recommended.

6.4.2 RETURN-AIR DUCT

The return air duct of an ECO-Series unit is typically brought through a wall grille and then to the unit. This duct system will normally consist of a flexible connector at the unit and a trunk duct to the return air grille. If metal duct material is used for the return air, it should be internally lined with acoustic insulation for sound attenuation.

7. INFILTRATION

7.1 WATER INFILTRATION

Periods of heavy wind and rain may cause an abnormal amount of water to flow through the drainage paths of the ECO-Series units. The ECO-Series base is designed to allow excess water to drain into the wall sleeve so that it does not back fill into the closet.

If for any reason the primary condensate riser becomes clogged, water will fill the catch tray and then be diverted through the sleeve to the exterior of the building, rather than be allowed to overflow into the closet or living area. Rain water entering the sleeve is automatically diverted to the 3/4" sleeve drain.



Figure 14- Sleeve with condensate drain line

7.2 AIR INFILTRATION

The design of the ECO-Series cabinet does not permit a transfer of outside air through the condenser section of the cabinet into the conditioned space unless ventilation air is required.

7.3 INTRODUCTION OF VENTILATION AIR

Some local building codes require that a specific amount of ventilation be brought into the conditioned space as a function of building use and occupancy. The ECO-Series Fresh-Pak features a built in ERV system to allow 50 to 120 CFM of pre-conditioned fresh air into the building. The Fresh-Pak offers a “balanced ventilation system”, in that it supplies fresh air into the space while exhausting it at the same rate, keeping the air pressure inside the building neutral.

Other ECO-Series models include a 3” vent pipe which is connected between the condenser and cabinet wall to allow for up to 50CFM of fresh air into the plenum space. An external source of negative pressure (i.e. a bathroom fan) could be used to introduce more than 50 CFM of fresh air. Consult with factory for further details.

7.4 SEALING RETURN-AIR DUCTS

Return air can be ducted to the unit, however, most applications normally do not require ducted return air. All return air must be filtered to prevent dirt buildup on the coil surface. A flexible duct collar can then be attached between a duct transition and the return air ductwork. The return air duct transition must be the same size as the return air coil face area.

8. EXTERIOR FACADES, GRILLES OR LOUVERS AND INTERIOR ACCESS PANELS

8.1 GRILLE AND LOUVER FURNISHED ON ECO-SERIES UNITS

ECO-Series units offer an identical exterior appearance between the Cool-Pak/Aqua-Pak units, and the Fresh-Pak/Therma-Pak units.

The top louvers are turned slightly upward to throw discharge air away from the condenser coil intake and minimize the recirculation of air. The lower louvers are turned downward to further help separate the intake air from the unit exhaust.

8.2 OUTSIDE APPEARANCE VARIATIONS

ECO-Series' compact through-the-wall design eliminates the need for external condensers or cooling towers and seamlessly integrate into a building design. ECO-Series grilles can be painted to match most color siding or building exterior faces to provide a consistent building appearance.



Figure 15– Typical ECO-Series Louver

CAUTION:

The ECO-Series ventilation system must not be altered from the factory configuration in any manner. Agency Approvals may become void if any modifications to the unit is attempted or performed. Any grilles or louvers that are not supplied by the manufacturer must be approved before installation.

8.3 ACCESS/RETURN AIR PANEL

Access panels are provided in a flat white finish and come with both louvered and non-louvered options. ECO-Series unit access panels come in a variety of sizes to meet the requirements of most installations. Insulated panels are available to help reduce noise transferred to the occupied space.

9. ELECTRICAL SERVICE WIRING

In most cases, gas-fired ECO-Series units will be connected to nominal 208/230-volt, 60 Hz, single-phase power. The same units can be connected to 208-volt power if assurances can be given by the power supplier that a minimum of 197 volts will always be available. Cooling capacities will be reduced by about 1% for 208-volt operation. The rated voltage of the heaters is 208/230 volts. The nominal KW is for a 240- volt rating.

The remainder of the ECO-Series unit are rated at 208/240 volts, but have a typical operating voltage range from 253 to 197 volts, in accordance with the AHRI Standard 210/240.

The actual BTUH output of the electric heaters varies with the square of the voltage ratio; so, if the expected operating voltage at a job location is known or can be determined, the actual heater output can be determined, or a heater optional size can be selected to meet a heating requirement at any chosen voltage.

Example:

- At 240 volts, 8 KW delivers 27,300 BTUH
- At 208 volts, the same heater delivers:

$$\left(\frac{208}{240}\right)^2 \times 8 = 6.0 \text{ kW or } 20,500 \text{ BTUH}$$

The heat output for any other application voltage may be determined in the same manner.

The minimum fuse requirements and ampacity values used to determine wire sizes can be found in the specification sheet for each ECO-Series unit.

10. AIR FILTER

All ECO-Series units allow for one 1", or two 1" factory installed disposable air filter(s) that cover the entering face of the indoor coil. This air filter is accessible for replacement or cleaning by removing the filter retainer bracket. A permanent washable filter may also be used provided it has the same or greater surface area as the original filter.

As an alternative to the factory provided filter location, a filter rack may be field installed elsewhere in the return duct system. Do not use filters which are highly restrictive to air flow. The total external static pressure, including ducts, grilles, registers, and filters must not exceed 0.5" w.c.

All indoor return air must be filtered.

11. CONSIDERATIONS FOR THERMA PAK UNITS

The Therma-Pak unit is a certified direct vent product. Direct vent units are really optimal for spaces where there's not enough ventilation as they draw combustion air from the outside of the home instead of inside. The displacement and pressure needed to overcome the heat-exchanger passageways' internal resistance are provided by a centrifugal combustion-air blower, which efficiently draws in the right amount of air for combustion. The conditioned space is supplied with air using a blower with a high airflow, quiet operation, and efficiency. It makes use of an efficient, multi-speed ECM motor.

The construction materials used in the heat exchanger, combustion blower, flue gas discharge tube, and outside louver grille are corrosion resistant against water moisture and the acid products that can form through combustion product condensation on the louvered grille. The temperature and flue-gas velocity are typically high enough to propel the gases outside the louvered grille before they condense on the surfaces of the louvers. However, even in situations when there is a strong wind that can blow the condensate products back onto the louvers, the louver material retains its corrosion resistance. If a decorative grille or facade is desired, please contact the ECO-Series support team for further support

Therma-Pak units have three door switches for additional safety. It is very important to ensure that the door panels are shut to ensure quiet and safe operation. The unit won't operate if a panel is removed. Units are certified to be used without a return duct, but if local regulations mandate the use of a return duct, then precedence shall be given to the regulation.

Therma-Pak sleeves come with a field installed flue pipe that needs to be connected with the flue pipe from the unit to ensure that flue products do not recirculate and get discharged easily to the outdoors.

12. CONSIDERATIONS FOR AQUA PAK UNITS

AQUA PAK units employ hydronic coils designed for use with hot water. Hydronic coils are not designed to hold pressurized air and should only be tested with water. Pressurizing system with air could damage the system.

When connecting the piping to the AQUA PAK unit, it is important to ensure the coil tubing is not bent or repositioned, as this could cause a fracture resulting in water leakage when pressure is applied to the system. Prior to connection, all piping should be flushed to remove any debris that may have collected in the system during construction. If piping is intended to be run in an unconditioned space, it is recommended that all piping be insulated to prevent freezing.

In applications where the AQUA PAK units are located in ambient air locations or within structures that are unoccupied during freezing conditions, coil freeze protection should be considered.

13. CONSIDERATIONS FOR FRESH PAK UNITS

FRESH-PAK units with hydronic coils for hot water heating must follow the same guidelines as stated for the AQUA-PAK coils in section 12.

The FRESH-PAK ERV is controlled via a separate “smart controller” that allows for independent control to maximize comfort and adjust ventilation to meet the needs of each installation. The controller comes pre-programmed from the factory with Comfort, Economy and Unoccupied normal operating modes. The operating mode settings and schedule can be modified by the installer, and accessed wirelessly through the *Siemens ABT GO* App from your computer, smart phone or tablet. Detailed instructions for the smart controller can be found in the FRESH-PAK installation manual.

In colder climates, the built in ERV will cycle between defrost and normal operation to ensure proper functionality. The standard defrost mode reduces the speed of the fresh air supply to help warm the ERV core with return air from the conditioned space. Second and Third stage heating options are available for use with third party, field installed electric pre-heaters.

The ERV core should be inspected at least twice a year to ensure it is not damaged. The core should be removed from the unit and cleaned with light air pressure or a mild detergent and water solution at least once per year. Be sure that the ERV core is completely dry before reinserting it back into the unit.



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