SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION

Mini-Split Systems in Residential Retrofit Applications - 2026 Update

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Mini-Split Systems in Residential Retrofit Applications

Mini-split systems are being marketed for installation in new construction in all homes but are also being utilized in retrofits. Ductless mini-splits are gaining popularity due to their higher seasonal energy efficiency ratio (SEER) ratings and ease of installation. There are definite benefits to mini-splits, but there are some variables that cannot achieve the same level of performance of a traditional ducted split system. This paper addresses some benefits and limitations of mini-split systems in residential retrofit applications.

"These systems can be as simple as one outdoor condensing unit connected to one indoor unit, or more advanced systems that utilize one outdoor unit connected to multiple indoor units."

For retrofit applications, ductless mini-split Cold Climate heat pump systems offer homeowners and contractors good options. These systems utilize refrigerants as the heat flow medium, as do the ducted systems, but as the name implies do not utilize ductwork for distribution. These systems can be as simple as one outdoor condensing unit connected to one indoor unit, or more advanced systems that utilize one outdoor unit connected to multiple indoor units. The 2016 ASHRAE Systems and Equipment handbook Chapter 18 describes the different types of Variable Refrigerant Flow systems in more detail. These systems utilize a network of refrigerant piping to multiple units to control the comfort of a space.

Applications

The basic ductless mini-split cooling only system includes an outdoor condensing unit, very similar to conventional split systems. The outdoor unit contains the condenser coil, the compressor, and the fan motor to remove heat from the refrigerant in the coils. The refrigerant piping is installed in the same manner as traditional systems, through a single penetration in the exterior of the home and piped to an interior evaporator coil inside the indoor unit.

The indoor unit contains a fan that draws air from the space across the evaporator coil and returns the air to the space after the heat has been removed from it. In this manner, the mini-split acts the same as traditional systems. The significant difference in a central system is that the distribution fan is much larger, and it forces conditioned air through a system of ductwork. Condensate drain line for the indoor units can be either gravity drain or condensate pump drain to a interior existing drain source.

The above described unit works well for cooling only applications. If heat from the system is needed, most manufacturers offer heat pumps as an alternative. Heat pumps work by extracting heat from the outside air and transferring it via the refrigerant to the indoor unit. This option provides year-round solutions for most of the country. In the northernmost climates, upsizing the system capacity may be an option, or use of another source of heat for supplemental heat may be required. Or use a Cold Climate heat pump application. As of 2026, "Hyper-Heating" technology allows modern heat pumps to maintain 100% capacity down to -13°F (-25°C), making them a viable primary heat source even in extreme northern regions without the need for supplemental electric strips.

Mini-split systems can also include "mini-ducted" systems that incorporate short runs of ductwork that often allows for a conventional look with only grilles visible. This is done only when accessible attic or under floor space is available. Mini ducted systems can also be used effectively for retrofit projects either for a single zone

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application (such as a primary suite bedroom) or as part of a multi-zone system. Ductless systems can also connect to an air handler like traditional heat pumps, and with a branch box can do both an air handler and ductless simultaneously.

Most manufacturers also have products that allow for multiple indoor units to be placed throughout the home while utilizing a shared outdoor unit. This allows for "zoning" - temperature variations by room or area as desired by occupants. The outdoor unit is sized according to the maximum capacity and usually has an inverter driven compressor that will provide refrigerant flow to where it is needed inside. This is known as variable refrigerant flow (VRF) technology, sometimes called variable refrigerant volume (VRV). It basically alters the amount of refrigerant flowing to each indoor unit according to the needs of the units.

Energy Efficiency

"Each indoor unit designed for ductless mini-split systems must be correctly sized and located within the space to prevent short-cycling of conditioned air which also affects air movement and distribution."

Ductless mini-splits are gaining popularity based on their high efficiency ratings. Like any advanced technology, as it becomes more widely accepted, the prices will fall according to market saturation and demand. Many government agencies are pushing for a more sustainable future from various angles, but most center on reducing the energy consumption of buildings. Ductless mini-splits currently have one of the highest SEER2, EER2, and coefficient of performance (COP) rating ranges in the industry, so it can be a wise choice for high performance homes. Advanced inverter and heat pump technologies achieve greater efficiency and energy-savings. This will result in long term savings by way of reduced electricity bills. Since 2023, the industry has transitioned from SEER to SEER2 and HSPF to HSPF2 standards to better reflect real-world performance, and modern high-efficiency units in 2026 now reach ratings exceeding 40 SEER2. Heating Capacity typically Rated @ 47F btuh /17F btuh/ -4°F btuh for cold climate heat pumps.

Each indoor unit designed for ductless mini-split systems must be correctly sized and located within the space to prevent short-cycling of conditioned air which also affects air movement and distribution. This inefficiency is not limited to ductless mini-splits however, as inappropriately sized ducts or inadequately placed registers and grilles will also contribute to short-cycling in conventional systems.

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Pricing

Equipment costs for mini-split systems can be high but total costs in a retrofit application will be offset with reduced labor costs and less energy use, allowing these installations to stay competitive. Over time, manufacturers will begin to offer new technology at more economical costs. Contractors must be able to provide quality estimates of payback periods to educate homeowners on the value of mini-split systems. The complexity

of the project will dictate pricing. For example, a single room addition would include one indoor unit and one outdoor unit, while a larger addition / retrofit may require multiple combinations.

Coordination of Controls

Most ductless mini-split systems have hand-held remote controls that adjust the temperature and fan settings. Most have functions similar to thermostats, but with individual control—each indoor unit can be operated independently to deliver air comfort only to rooms where needed.

Each interior unit is operated like a basic fan coil unit, with a single thermostat controlling only that unit. The controls for mini-split systems can also be integrated into other controls systems. Smart thermostats and development of interfaces with most 24-volt controls will enable integration with standard equipment, ductless mini-splits, or VRF controlled multi-split systems. This will add to the capital costs as well but integrates the entire household to allow for robust controls.

Comfort

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) defines thermal comfort as "that condition of mind which expresses satisfaction with the thermal environment." Measurable environmental factors, a large part of HVAC design, are air temperature, surface temperature, air motion and humidity. Typical design principles for HVAC systems include end user comfort needs, climate characteristics and building forms as parameters in selecting equipment.

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Temperature

Ductless mini-split systems when using multiple indoor units provides the ability to control temperature in each space. Each indoor unit has its own thermostat and can be set to different setpoints based on preference or use of space.

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Air Motion

One distinct disadvantage of ductless mini-split systems is the inability to mix air in a large space or multiple rooms. Because the discharge is from a single source, consideration must be given on the exact location of the indoor unit. Traditional ducted systems have registers near exterior walls and windows since the greatest amount of heat gain or loss occurs there. A typical trunk and branch system is designed to allow for even distribution around the home. Ductwork can also be placed in a variety of locations throughout. Effective air movement is highly desired in very cold, warm, and humid climates where airflow is important to controlling room temperature and comfort, but less so in more moderate climates where room temperatures and humidity are more stable.

Humidity

The need for humidity control varies throughout the country but is often an important consideration in overall comfort. Mini-split systems do a good job removing humidity but do not have the ability to add humidity. The recommended humidity range in buildings is typically between 30%-60% relative humidity (RH). In low humidity areas of the country and winter time in cold climates a stand-alone humidifier would be required to raise humidity levels.

Maintenance and Service

The filter and condensate pan are located within the indoor unit therefore each indoor unit requires filter maintenance and condensate pan/drain line cleaning. Multiple indoor units will need this regular maintenance for each unit resulting in increased labor costs. Service of a mini-split outdoor unit is similar to service of a traditional split system outdoor unit.

Nearly all the new HVAC systems require more advanced controls since they communicate continuously with the component of the HVAC system without human intervention. While these systems may require some programming by the HVAC contractor they are now completely "plug and play" from the end user's perspective. Modern automation controls is a main reason the system is more efficient. However, troubleshooting these systems can be more complicated and time consuming.

Indoor Air Quality (IAQ)

According to the National Institute of Occupational Safety and Health (NIOSH), inadequate ventilation accounts for 53% of indoor air quality problems. Most ductless mini-split systems cannot address this due to the inability to introduce outside air; however, ventilation systems can be designed separately. Because current building codes and/or construction methods often produce envelopes with higher air tightness values, air will stay circulating locally around the indoor units.

ASHRAE standard 62.2 -2016, Ventilation and Acceptable lndoor Air Quality in Residential Buildings, sets the minimum ventilation rate at 3 CFM for every 100 square feet of inhabitable floor area plus 7.5 CFM multiplied by (#bedrooms +1). This is a minimum amount, but the point is that the home needs some ventilation. This ventilation requirement may be partially satisfied by air infiltration rates. Some indoor units may have the ability to attach an outside air duct. Other methods to ensure ventilation is achieved through installation of systems such as heat recovery ventilators (HRV) or energy recovery ventilators (ERV).

2026 systems now increasingly include integrated UV-C light and bipolar ionization to actively purify air. Additionally, self-cleaning evaporator cycles that heat to 131°F (55°C) are becoming standard, helping to prevent the biological growth previously associated with condensate pan maintenance.

Aesthetics

Ductless mini-split systems have one or more indoor units, and typically hang high on the wall near the ceiling. It isn't the most appealing look for a permanent installation, but not as unsightly or inconvenient as a window unit. New mini-split designs have recessed and concealed louvers that offer better aesthetics than

"New mini-split designs have recessed and concealed louvers that offer better aesthetics than the typical wall-mounted evaporator units."

the typical wall-mounted evaporator units. If aesthetics is an issue for the retrofit, manufacturers do offer options for addressing the location and appearance of the indoor unit. Such as a ceiling cassette that flush mounts in the ceiling between ceiling joist spaces.

Noise Levels

Interior units of ductless mini-split systems will add slightly to the ambient noise levels of each conditioned room. This additional indoor noise varies with fan speed and can be similar to or slightly higher that what is expected from ducted systems. Today's indoor units, however, are very quiet, often generating less sound than comparable ducted systems.

Mini-split systems provide lower levels of sound from outside units. Close lot lines in existing communities, combined with enforcement of noise ordinances, leaves mini-split systems as a good solution for retrofits or additions.

Installation Methods

During renovations, time is certainly a chief constraint as well. The limited labor involved in mini-split systems allow for installations in as little as a day or two for single zone systems. In this regard, ductless mini-splits offer an excellent solution for additions to existing homes. Many consumers elect to expand or refurbish their existing homes rather than build new.

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Retrofits of existing construction do not offer the same luxuries of open walls and attics as found in new construction. This is where ductless mini-split systems have a distinct advantage. The installation is limited only by distance of refrigerant piping. However, one drawback to mini-split systems in retrofit applications is finding a practical and aesthetically pleasing way to dispose of the condensate created in cooling mode. For indoor units mounted on exterior walls condensate removal can be relatively simple but when the indoor consoles are installed on interior walls or where there is no adjacent legal disposal area, condensate pumps must sometimes be installed for removal of the condensate to an acceptable location. These pumps may create some noise and maintenance issues over time.

Line-set routing can be very complex in homes with multiple levels; traditional heat pumps have one line-set from the air handler (indoor coil if dual fuel) to the outdoor unit, whereas in a multi-head ductless system, line-set routing can become challenging. The cost benefit of multiple outdoor units (and accompanying electrical conduits) needs to be considered. Where the line-sets go can be limited by aesthetics (customer requirements), distance (ideally under 50'), and routing complexity (crawlspace, attic, etc.) to reach the indoor heads. Inexperienced estimating of hours can make a seemingly profitable job go backwards in a hurry. A layout by a lead installer for bidding is advisable if three or more heads are involved, or two if the locations are distant.

In homes with non-ducted heating systems, (hot water or electric radiant), where an attic or Basement/ crawlspace is not available for ductwork, a ductless mini-split is a good option. In homes with non-ducted

heating systems (hot water or electric radiant) the addition of ductwork is not feasible; therefore, a ductless mini-split system is a good option. A mini-split requires only a small aperture to install the refrigerant and drain lines. This provides an excellent opportunity to utilize a ductless system regardless of the demands of the room. Refrigerant lines can be installed in the wall without damage to the drywall or plaster, very similar to running new electric lines in the wall. Condensate drain lines can be more of a challenge, though not always.

Conclusions

Ductless mini-split systems are a high performing HVAC technology that incorporate independent and integrated controls and offer increased efficiency. Even at almost double to quadruple the costs versus packaged terminal air conditioners (PTAC) or window-type air conditioners, the increases in efficiency and comfort make these systems an attractive option in all homes, retrofits and additions. In 2026, federal and local rebates (such as the Inflation Reduction Act) have significantly improved the payback period, moving these systems from a luxury "add-on" to a core residential comfort solution.

In some retrofits and additions, where ample space and time permit greater flexibility, the ability to customize multi zone systems can be considered. On the other hand, advances in heat pump technology and ground source technology offer similar SEER2, EER2 and COP ratings if capital cost is not an issue.

SMACNA residential contractors are well qualified in diverse applications to provide retrofit customers a whole menu of comfort solutions. Where mini-split systems are not currently part of a contractor's portfolio, they certainly should be considered as an addition.

Summary Table

The following table is a summary of the characteristics of a mini-split system for a retrofit in residential applications.

Characteristic	Pros	Cons
Efficiency – SEER/EER/HSPF*	Range is higher than standard efficiency conventional systems. Since 2023, ratings reflect SEER2/HSPF2 standards; 2026 high-efficiency units exceed 40 SEER2.	
Efficiency – Energy Consumption	Requires less energy in comparable climates than traditional systems.	
Costs – Capital		$1,500 to $2,000 per ton of cooling capacity – 30% more than central systems (without ductwork) – Twice as much as PTACs or window units.**
Costs – Life Cycle	Lower energy consumption eventually has a break-even point.	
Temperature control	Individual temperature control with every indoor unit.	
Circulation		Non-ducted system requires multiple units to achieve whole home climate control.
Humidity		Not a standard feature on mini-split systems.
Filtration/IAQ	2026 systems increasingly add integrated UV-C light and bipolar ionization for active air purification, plus self-cleaning evaporator cycles (131°F/55°C) that reduce biological growth in the condensate pan.	Filters are local at each indoor unit, must be changed more frequently than conventional systems. Stratification can also occur due to lack of options for interior install.
Ventilation/IAQ		Stagnation can occur if outside air isn't introduced.
Aesthetics	Newer 2026 designs include picture-frame units, floor consoles, and joist-fit cassettes for improved aesthetics.	Indoor units can be obtrusive.
Noise	Not a major concern – relatively quiet based on fan speed.	

Characteristic	Pros	Cons
Space requirements	No space needed for large AH or ductwork.	Small unit on wall in each room instead of diffusers.
Ease of Installation/ Retrofits	Small penetrations and minimal sized copper refrigerant lines. No duct installation needed.	Routing of condensate disposal if on an interior wall. Line-set routing can become complex in multi-level or multi-head installations; a lead-installer layout is advisable for three or more heads (or two if distant), as estimating errors can quickly erode job profitability.
Heating Range (Cold Climate)	As of 2026, "Hyper-Heating" technology maintains 100% capacity down to -13°F (-25°C), enabling use as a primary heat source without supplemental electric strips.	
Controls	2026 systems increasingly add AI-driven thermal-scanning sensors and App/Cloud integration alongside hand-held remotes.	

* SEER = Seasonal Energy Efficiency Ratio, EER = Energy Efficiency Ratio, HSPF = Heating Seasonal Performance Factor (as of 2023, updated to SEER2, EER2, and HSPF2 respectively, using revised M1 testing procedures)

** https://www.energy.gov/energysaver/ductless-mini-split-air-conditioners