

Ductless Cold Climate Heat Pumps for Multifamily Applications

This field study developed and validated design, installation, and operational principles necessary for cold climate air source heat pumps (ASHPs) to achieve high market acceptance and maximum energy savings in Minnesota's multifamily buildings. The results from this project will support ongoing training, program development, and market transformation work for ASHPs.

Heat Pump Applications for Multifamily Buildings



Ductless mini-split, one-to-one system

Ductless mini-splits are heat pumps systems designed with an outdoor unit containing the system's compressor, reversing valve, and outdoor coil, and an indoor unit, which contains the indoor coil and a distribution fan. One-to-one systems use a single outdoor unit and a single indoor head. The defining characteristic of the ductless unit is that the indoor unit is mounted inside the living space and does not connect to any duct work.

Benefits: Ease of installation, ideal for smaller spaces, established equipment with a strong market presence.

Limitations: Impact is limited due to lack of distribution, the cost to install in multiple zones, complex integration with other heating systems.

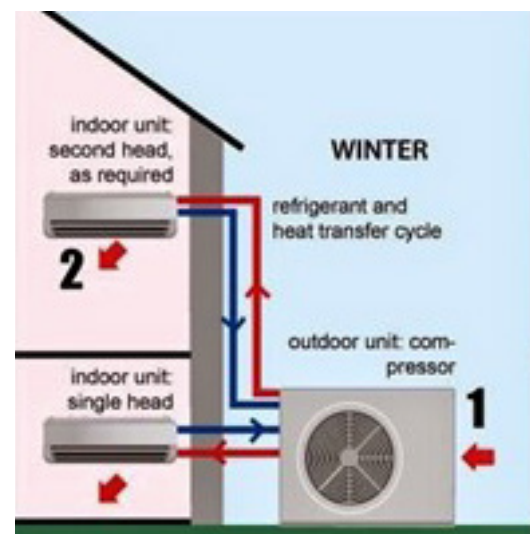
Performance: Measured seasonal heating COPs of 2.2 in this project.

Ductless multi-splits are similar to one-to-one mini-split systems, but they can utilize multiple indoor units paired to a single outdoor unit. This allows the ductless systems to deliver heat to multiple zones within the unit.

Benefits: Cost-effective for multi-zone installations, newer technologies from existing established manufacturers and supply chains.

Limitations: More complicated controls, less established M&V work, contractors have less experience with these installation.

Performance: Measured seasonal heating COPs of 2.1 in this project.



Ductless multi-split systems



PTHPs are a new application for heat pumps. These systems are designed to replace Packaged Terminal Air Conditioners, the horizontal heating and cooling systems often installed under windows in hotels and multifamily buildings. These systems have all the components in a single package that is installed in an exterior wall with penetration to the exterior.

Benefits: Easy installation typically does not require a licensed installer, direct replacement for common PTAC systems.

Limitations: Current versions mostly rely on older generations with HPs, requires multiple units for multi-zone applications.

Performance: Measured seasonal heating COPs of 1.7 of one unit in this project.

Packaged Terminal Heat Pumps (PTHPs)

Window heat pump systems are designed to be installed through a window. Portable heat pumps systems typically have all components within a single package that is inside the living space and connected to the outdoors with flexible venting. Both types have smaller and lower capacity components but do not require professional installation.

Benefits: Occupant installed, very flexible, C=can be moved with an occupant at tenant turnover

Limitations: Lower capacity systems, smaller form factors and engineering limitations for flexibility limit performance.

Performance: These systems emerged during this project and were not installed as part of this work.



Window and Portable Heat Pumps