



ASHPs in Cold Climates

Concord, Massachusetts

GENERAL INFORMATION

Homeowners: The Slack Family

Location: Concord, MA

Year Built: 1955

Home Characteristics: Single family, two-story home in an historic neighborhood

Square Footage: 2,200 conditioned square feet

Previous HVAC System: Heating source = fuel oil furnace with radiators/hydronic system. No A/C.

New ccASHP System: Mitsubishi ductless hyper heat: two outdoor units (25000 btu/hr, 45000 @ 5 degrees) with six indoor air handlers. No HVAC back-up in place.

PROJECT OVERVIEW

Nestled in the historic town of Concord, Massachusetts, Kim and Amanda Slack's home demonstrates that even with the Boston area's hot summers and frigid winters, cold climate air source heat pump (ccASHP) systems can satisfy home heating and cooling needs.

In 2018, the Slack family moved to their home in Concord, a town that epitomizes historic New England, with many elegant, mature single family homes on large lots. Built in 1955, the Slack home is newer than many of the surrounding homes and fits nicely into the neighborhood's quiet and dignified character.

When the Slack family purchased the home, it was apparent that the 40+ year-old fuel oil hydronic heating system needed to be replaced. The homeowners are very environmentally conscious and had a strong interest in reducing their new home's greenhouse gas (GHG) emissions. They saw the need to replace the HVAC system as an excellent

opportunity to install a ccASHP system rather than a new high-efficiency oil furnace. Installing a new gas furnace was not an option as their road has a five year moratorium on new natural gas home hook-ups. Even if gas were an option, the Slacks wanted to demonstrate that home electrification is the future, and a ccASHP system can fully handle the heating and cooling load in the Boston area climate. Along with installing the ccASHP system, the Slacks installed a rooftop solar panel array that serves half of their electricity needs and a charging outlet for their electric vehicle.



Kim and Amanda chose to condition their home's 2,200 square feet of livable space by installing a Mitsubishi ductless hyper heat ccASHP system. This ductless system includes two outdoor units (one in the rear of the home and one on the side) that serve six indoor air handlers (one in the basement, three on the first floor, and two on the second floor). The homeowners found that installation was quick and easy, taking just two days. The indoor units are sleek and blend in with the home's aesthetics. The homeowners have kept the existing radiators in place though they are not in use, as they bring classic character to the home's interior.

State and Local ccASHP Rebates

Initial cost of ccASHP system	\$21,250
MA Department of Energy Resources' Home MVP program rebate	-\$3,000
Concord Municipal Light Plant rebate	-\$3,200
Alternative Energy Credit	-\$1,250
Rebate for removing existing oil tank	-\$650
Cost of ccASHP system after rebates	\$13,150



The ccASHP system kept the house comfortable in single digit weather conditions.

ASHP Operating Costs are 5%



High Efficiency Oil Furnace Operating Costs

the ccASHP system amounted to only **20%** of emissions from the previous oil system

The Slacks report that the ccASHP system provides more even, less drafty heat than what they experienced with the fuel oil system and radiators. The new system has also been able to cool their home even in the hottest summer conditions with temperatures in the 90s and high humidity. Cooling is very quiet and removes humidity effectively, and the ccASHP system has the added bonus of filtering the air and dramatically cutting down on the amount of pollen that comes into the home. The homeowners also feel more comfortable without an oil tank, with its odor upon oil delivery and a danger of spillage, in their basement.

Maintenance of the ccASHP system requires a comparable level of effort as the Slack's previous fuel oil system. Annual checks of the equipment are required, and the air handler filters need to be vacuumed every few months. Similar to most home improvement projects, there were a couple of minor issues after the ccASHP system was installed. Two of the air handlers had defective thermistors, which the installer repaired promptly under warranty. The homeowner also installed wireless wall thermostats to address temperature irregularities that were occurring with two of the air handlers. Adding the thermostats solved this issue, and the Slacks have since been pleased with the system's operation. They also note that defrost cycles during very cold days can be noisy and recommend avoiding connections under bedrooms.



Overall, Kim and Amanda are very pleased with their new ccASHP system. They are meeting their heating and cooling needs entirely from a system that dramatically reduces their home's GHG emissions, and the installation and operating costs are lower than they would have been with a new high efficiency oil furnace.