Propane-Fueled Direct-Vent Wall Furnace Systems

Research Fact Sheet

Residential | Agriculture | Industrial/ Commercial | Engine Fuel | R&D

Propane-fueled direct-vent wall furnace systems can provide energy-efficient, reliable heat to satisfy a variety of space-heating loads. While central heating systems use ductwork to distribute heated air to all rooms simultaneously, direct-vent propane furnaces use technology that constantly monitors the temperature of a room and automatically adjusts heat output and fan speed to respond to changes in temperature and maintain a more consistent level of heat.

A recent study assessed the performance of Rinnai's modulating propane-fueled direct-vent wall furnace system to demonstrate the benefits of using direct-vent furnaces fueled by propane for home heating.

Heating systems that use ductwork lose energy by air leakage through small cracks and seams in the ducts and by conduction of heat through the duct wall, where heat is wasted in parts of the home that are as cold as the outdoors, such as attics or vented crawl spaces.

—U.S. Department of Energy Building Technologies Program

Research Status: Results Available

- The study was completed in 2011 and is available at www.propaneresearch.com.
- The report verifies the benefits of direct-vent propane-fueled furnaces, such as lower electricity consumption and more consistent and reliable heat in comparison with central heating systems.

Supporting Facts

- Direct-vent wall furnaces can be used as a heating solution for the entire home or for zone heating of smaller or hard-to-heat spaces, increasing system versatility compared with central heating systems.
- The performance of the direct-vent wall furnace system fueled by propane had previously not been validated with third-party testing.

Direct-Vent Furnaces: Key Results

- Met all space-heating loads required in a single-family, four-bedroom home.
- Operated reliably and without interruption or fault during the testing period.
- Consumed an average of 2.1 gallons to 2.8 gallons of propane every day during the testing period.
- Reduced electricity consumption by between 76 percent and 88 percent compared with the condensing furnace.
- Maintained tighter temperature control throughout the living space than the condensing furnace with ductwork.
- Consumed an average of only 1.5 kilowatt-hours per day of electricity when not using the room-to-room air ventilation units.

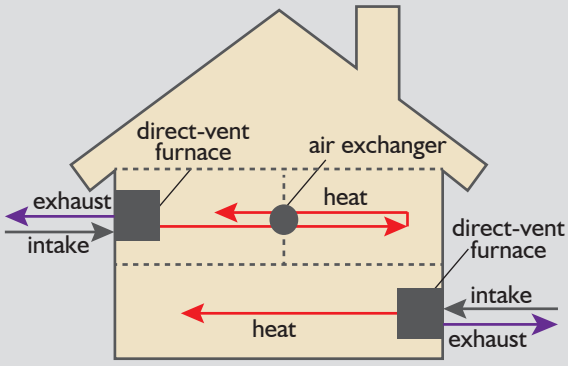
For more information on this and other research projects, go to www.propaneresearch.com.

PROPANE EXCEPTIONAL ENERGY®

A Closer Look

How It Works: Propane-Fueled Direct-Vent Wall Furnace

- The Rinnai propane-fueled direct-vent wall furnace detects temperature changes and responds by continuously emitting low levels of heat.
- The system's temperature-sensing technology can detect changes as small as less than one degree and automatically adjusts fan speed and heat output depending on the size of the temperature drop.
- Once the room reaches the desired temperature, the system goes into standby mode.
- Room-to-room air-share systems can be incorporated into the heating system to circulate heat generated by the furnace between rooms, allowing the system to be used for zone heating or as a total heating solution.



Projects:	Direct-Vent Fully Modulating Wall Performance Testing **(Docket 16726)**
Partners:	Gas Technology Institute, CanmetENERGY

Research Process

Siting and Installation

- Installed propane-fueled condensing furnaces with 46,000 British thermal units of heat output in each of the two identical side-by-side research houses (experimental and control) in Ottawa, Canada.
- After pre-experimental benchmarching, installed two propane-fueled direct-vent wall furnaces in the experimental house — one with 29,930 British thermal units of heat output in the living room on the first floor and one with 16,974 British thermal units of heat output in the master bedroom on the second floor.

Testing and Evaluation

- Collected and used data from each stage of testing to calculate all performance parameters of the heating systems (including temperatures, power usage, propane consumption, and flue gas emissions), temperatures throughout the experimental and control houses, and weather conditions and solar radiation.

Pre-Experimental Benchmarking (February 10 to February 21)

- Ran the condensing furnaces in the experimental and control houses and collected performance data for 11 days to baseline any minor differences between the construction of the two houses to ensure consistent results.

Experiment (February 24 to March 24)

- Turned off the condensing furnace and taped shut all ducts in the experimental house.
- Installed two propane-fueled direct-vent wall furnaces in the experimental house.
- Added room-to-room air ventilation units to distribute warm air between second-floor bedrooms in experimental house.
- Ran the heating systems in both houses and collected performance data for 28 days.

Post-Experimental Benchmarking (March 31 to April 25)

- Turned off and sealed the direct-vent wall furnaces and room-to-room air ventilation units in the experimental house.
- Turned on the condensing furnace and reopened all ducts in the experimental house to match the control house.
- Ran the furnaces and collected performance data on both houses for 25 days.

What's Next?

Rinnai propane-fueled direct-vent furnaces are available for purchase. For more information on propane heating and cooling technologies visit www.propaneresearch.com.

FOR MORE INFORMATION:

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