



## Building America Case Study Technology Solutions for New and Existing Homes

# Improving the Field Performance of Natural Gas Furnaces

Chicago, Illinois

### PROJECT INFORMATION

**Project Name:** Improving Gas Furnace Performance—A Field and Lab Study at End of Life

**Location:** Chicago, IL

Partnership for Advanced Residential Retrofit  
[www.gastechnology.org](http://www.gastechnology.org)

**Building Component:** Natural Gas Furnaces

**Application:** New and/or retrofit; Single and/or multifamily

**Year Tested:** 2012/2013

**Applicable Climate Zone(s):** All or specify which ones

### PERFORMANCE DATA

Cost of Energy Efficiency Measure (including labor): \$250 for adjustments

Projected Energy Savings:  
6.4% heating savings

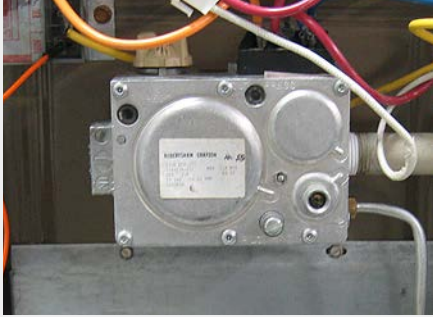
Projected Energy Cost Savings:  
\$100/year climate-dependent

Gas furnaces can successfully operate in the field for 20 years or longer with little or no maintenance, performing at the settings used when they were initially installed. The manufacturer provides installation guidelines for each furnace that identify the settings for tuning furnace firing rate and fan speed settings. When replacing existing equipment, the settings for the new unit may be significantly different from the existing equipment and the ductwork may need modifications to accommodate new furnace dimensions. Prior studies claim that 5%–15% savings can be achieved through proper tuning.

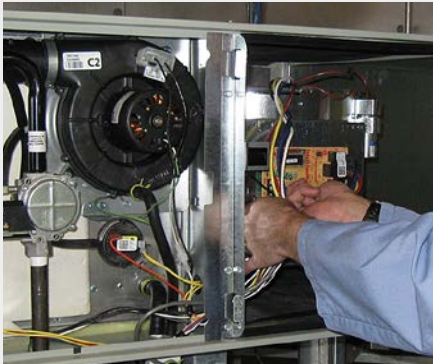
The Partnership for Advanced Residential Retrofit (PARR), a U.S. Department of Energy Building America team, looked at the performance of gas furnaces installed in the field compared to their optimal performance when retrieved and installed in the laboratory. In the laboratory, researchers adjusted the furnaces to the manufacturers' recommended settings for input, static pressure, and the rise in air temperature between the return duct and the supply duct. Based on this research, PARR provides recommendations for proper field installation to achieve optimal performance. Good field installation sometimes requires the replacement of parts of the supply and return ductwork for proper airflow.

The results of the study show that an improvement of 6.4% in efficiency is achievable when good installation and tuning practices are followed, based on a sample of furnaces of all types that were an average of 19 years old when removed from the field. A second finding is that furnace efficiency does not degrade over the useful life of the furnace if the proper operating conditions are maintained, including adjusting the gas input rate to the manufacturer's specifications, changing the filter periodically, and cleaning the cooling coil as necessary.

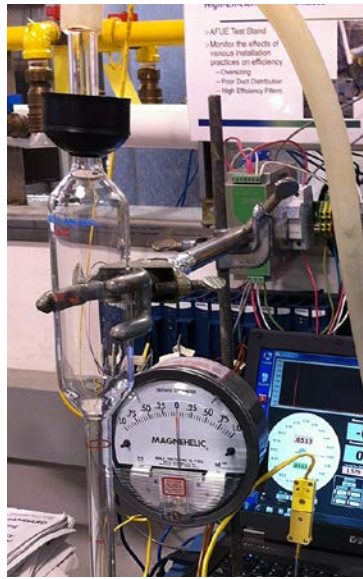
## DESCRIPTION



Tune the gas valve to set the firing rate at installation.



Adjust the airflow for the location by selecting a fan speed that produces an air temperature within the rise range specified by the manufacturer.



Laboratory testing requires the use of a tracer gas for atmospheric furnaces.

## Lessons Learned

- Follow the manufacturer's installation instructions for the best installed performance.
- Set the gas valve on the labeled input rate.
- Adjust the blower to the right airflow so the temperature rise across the furnace is in the recommended range.
- Modify the ductwork if necessary to set the correct temperature rise.
- Seal the ducts to avoid losses.
- Maintain the initial settings (use a qualified technician) by checking the input rate and fan speed and cleaning coils and replacing dirty filters as necessary.

## Looking Ahead

Furnaces will provide residential space heating for a lifetime of 20–30 years at their rated efficiencies if installed correctly and maintained properly. On-board diagnostics could provide the homeowner information on the performance of the equipment in the future through a Web-enabled interface on a smart thermostat, smart phone, or personal computer.

For more information, see the Building America report, *Improving Gas Furnace Performance: A Field and Laboratory Study at End of Life*, at [www.buildingamerica.gov](http://www.buildingamerica.gov)

Image credit: All images were created by the PARR team.

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The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.

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