### Residential Furnace Tune-Up

**Description**

This measure is for a natural gas Residential furnace that provides space heating. The tune-up will improve furnace performance by inspecting, cleaning and adjusting the furnace and appurtenances for correct and efficient operation. Additional savings maybe realized through a complete system tune-up.

This measure was developed to be applicable to the following program types: Residential.

If applied to other program types, the measure savings should be verified.

**Definition of Efficient Equipment**

To qualify for this measure an approved technician must complete the tune-up requirements[[1]](#footnote-1) listed below:

* Measure combustion efficiency using an electronic flue gas analyzer
* Check and clean blower assembly and components per manufacturer’s recommendations
* Where applicable Lubricate motor and inspect and replace fan belt if required
* Inspect for gas leaks
* Clean burner per manufacturer’s recommendations and adjust as needed
* Check ignition system and safety systems and clean and adjust as needed
* Check and clean heat exchanger per manufacturer’s recommendations
* Inspect exhaust/flue for proper attachment and operation
* Inspect control box, wiring and controls for proper connections and performance
* Check air filter and clean or replace per manufacturer’s
* Inspect duct work connected to furnace for leaks or blockages
* Measure temperature rise and adjust flow as needed
* Check for correct line and load volts/amps
* Check thermostat operation is per manufacturer’s recommendations(if adjustments made, refer to ‘Residential Programmable Thermostat’ measure for savings estimate)
* Perform Carbon Monoxide test and adjust heating system until results are within standard industry acceptable limits

**Definition of Baseline Equipment**

The baseline is furnace assumed not to have had a tune-up in the past 2 years.

**Deemed Lifetime of Efficient Equipment**

The measure life for the tune up is 2 years.[[2]](#footnote-2)

**Deemed Measure Cost**

The incremental cost for this measure should be the actual cost of tune up.

**Deemed O&M Cost Adjustments**

There are no expected O&M savings associated with this measure.

**Loadshape**

Loadshape R09 - Residential Electric Space Heat

**Coincidence Factor**

N/A

**Algorithms**

**Calculation of Energy Savings**

**Electric Energy Savings**

ΔkWh = ΔTherms \* Fe \* 29.3

Where:

ΔTherms = as calculated below

Fe = Furnace Fan energy consumption as a percentage of annual fuel consumption

= 3.14%[[3]](#footnote-3)

29.3 = kWh per therm

**Summer Coincident Peak Demand Savings**

N/A

**Natural Gas Savings**

Δtherms =( Gas\_Furnace\_Heating\_Load \*HF \* (1/ Effbefore – 1/ (Effbefore + Ei)))

Where:

Gas\_Furnace\_Heating\_Load = Estimate of annual household heating load[[4]](#footnote-4) for gas furnace heated single-family homes. If location is unknown, assume the average below[[5]](#footnote-5).

= Actual if informed by site-specific load calculations, ACCA Manual J or equivalent[[6]](#footnote-6).

|  |  |
| --- | --- |
| **Climate Zone**  **(City based upon)** | **Gas\_Furnace\_Heating\_Load (therms)** |
| 1 (Rockford) | 873 |
| 2 (Chicago) | 834 |
| 3 (Springfield) | 714 |
| 4 (Belleville) | 551 |
| 5 (Marion) | 561 |
| Average | 793 |

HF = Household factor, to adjust heating consumption for non-single-family households.

|  |  |
| --- | --- |
| **Household Type** | **HF** |
| Single-Family | 100% |
| Multi-Family | 65%[[7]](#footnote-7) |
| Actual | Custom[[8]](#footnote-8) |

Effbefore = Efficiency of the furnace before the tune-up

= Actual

*Note: Contractors should select a mid-level firing rate that appropriately represents the average building operating condition over the course of the heating season and take readings at a consistent firing rate for pre and post tune-up.*

EI = Efficiency Improvement of the furnace tune-up measure

= Actual

**Water Impact Descriptions and Calculation**

N/A

**Deemed O&M Cost Adjustment Calculation**

N/A

**O&M Cost Adjustment Calculation**

N/A

**Measure Code: RS-HVC-FTUN-V02-160601**

1. American Standard Maintenance for Indoor Units: http://www.americanstandardair.com/owner-support/maintenance.html [↑](#footnote-ref-1)
2. Act on Energy Commercial Technical Reference Manual No. 2010-4, 9.2.3 Gas Forced-Air Furnace Tune-up. [↑](#footnote-ref-2)
3. Fe is not one of the AHRI certified ratings provided for residential furnaces, but can be reasonably estimated from a calculation based on the certified values for fuel energy (Ef in MMBtu/yr) and Eae (kWh/yr). An average of a 300 record sample (non-random) out of 1495 was 3.14%. This is, appropriately, ~50% greater than the Energy Star version 3 criteria for 2% Fe. See “Programmable Thermostats Furnace Fan Analysis.xlsx” for reference. [↑](#footnote-ref-3)
4. Heating load is used to describe the household heating need, which is equal to (gas consumption \* AFUE ) [↑](#footnote-ref-4)
5. Values are based on household heating consumption values and inferred average AFUE results from Table 2-1, Energy Efficiency / Demand Response Nicor Gas Plan Year 1 (6/1/2011-5/31/2012) Research Report: Furnace Metering Study (August 1, 2013) (prepared by Navigant Consulting, Inc.) and adjusting to a statewide average using relative HDD values to adjust for the evaluation results focus on northern region. Values for individual cities are then calculated by comparing average HDD to the individual city’s HDD. [↑](#footnote-ref-5)
6. The Air Conditioning Contractors of America Manual J, Residential Load Calculation 8th Edition produces equipment sizing loads for Single Family, Multi-single, and Condominiums using input characteristics of the home. [↑](#footnote-ref-6)
7. Multifamily household heating consumption relative to single-family households is affected by overall household square footage and exposure to the exterior. This 65% reduction factor is applied to MF homes with electric resistance, based on professional judgment that average household size, and heat loads of MF households are smaller than single-family homes [↑](#footnote-ref-7)
8. Program-specific household factors may be utilized on the basis of sufficiently validated program evaluations. [↑](#footnote-ref-8)