Proposed Heat Pump Specification Changes

Regional Technical Forum

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Heat Pump Specifications

Q: Isn’t there a moratorium on making changes to the heat pump specifications?

A: Yes, but these proposed changes are either clarifications or “loosening” of the specifications. If approved, it may be wise to make the changes sooner (FY 2006) rather than later (“Post” 2006).

Comments - Summarized

1. Requiring duct leakage tests and blower door tests <u>for sizing</u> is unnecessary and a waste of resources.

2. A microprocessor controlled indoor thermostat with a “heat pump recovery” function can be as effective as an outdoor thermostat at <u>reducing the energy use of supplemental heaters</u>. In addition, the two should not be mixed.

Comment 1

Comment 1

- Results from a blower door and duct blaster are unnecessary for properly sizing heat pumps.
- RTF specs – Needs to account for houses that will receive duct sealing with the heat pump installation.
- PTCS specs – An assumed default duct system efficiency should be allowed in lieu of performing an expensive duct test simply for sizing.

Comment 1 – Current Specifications

- **Current RTF Specification**
  - 4.1.6 - An infiltration rate of 0.5 air changes/hour shall be used in sizing calculations unless a blower door test is performed and an estimate is made using the result.
  - 4.1.7 - Duct system efficiency of 80% shall be used in sizing calculations unless a duct blaster test is performed and an estimate is made using the result.

- **Current PTCS Specification**
  - 4.1.6 - A blower door test shall be performed to determine the proper air infiltration rate to be used in the sizing calculations.
  - 4.1.7 - A duct blaster test shall be performed to make an estimate of duct system efficiency to be made in the sizing calculations

Comment 1 – Proposed Specifications

- **Proposed RTF Specification**
  - 4.1.6 - An infiltration rate of 0.5 or 0.8 air changes per hour shall be used for houses built in or after 1985 or before 1985, respectively, in sizing calculations unless a house (de)pressurization test has been performed and an estimate is made using the result.
  - 4.1.7 – Where available, the results of duct pressurization testing shall be used to estimate the duct system efficiency used in sizing calculations. If a duct pressurization test has not been performed on the house, a default duct system efficiency of 85% shall be used for houses that will receive duct sealing in conjunction with the heat pump installation; a default duct system efficiency of 80% shall be used for all other houses. Exception: If the air handler and all ductwork are within the thermal envelope of the house, 100% shall be used as the duct system efficiency in sizing calculations.
- **Proposed PTCS Specification**
  - 4.1.6 - An infiltration rate of 0.5 or 0.8 air changes per hour shall be used for houses built in or after 1985 or before 1985, respectively, in sizing calculations unless a house (de)pressurization test has been performed and an estimate is made using the result.
  - 4.1.7 - Where available, the results of duct pressurization testing shall be used to estimate the duct system efficiency used in sizing calculations. If a duct pressurization test has not been performed on the house, a default duct system efficiency of 85% shall be used for houses that will receive duct sealing in conjunction with the heat pump installation; a default duct system efficiency of 80% shall be used for all other houses. Exception: If the air handler and all ductwork are within the thermal envelope of the house, 100% shall be used as the duct system efficiency in sizing calculations.

Comment 1

Questions Discussion

Decision

Comment 2

Comment 2

- A microprocessor controlled thermostat with a “heat pump recovery” function can achieve the same goal (energy savings) as an outdoor thermostat.
  - An outdoor thermostat should not be installed with a thermostat with a “heat pump recovery” function enabled (unless some amount of auxiliary heat is controlled independent of the ODT) – this causes comfort issues and callbacks.

Comment 2 – Definitions

- Outdoor Thermostat
  - A device that disallows the use of auxiliary heat when the outdoor temperature is above a defined temperature (usually around 35 degrees). *This includes the hardwired type as well as an indoor thermostat with an outdoor temperature sensor and logic to keep auxiliary heat (second stage heat) off at temperatures above the internal setting.*
- Heat Pump Recovery
  - A feature of a programmable thermostat that allows the heat pump to recover gradually from an energy-saving setpoint temperature to a comfort setpoint temperature. The heat pump recovery feature is designed to minimize the use of auxiliary heat while also minimizing the on-time of the system.

Comment 2 – ODT

The History of Outdoor Thermostats in the Specs

- FY 2001 & 2002
  - ODT optional (may)
- FY 2003
  - ODT required (shall)
- FY 2004 & 2005
  - ODT optional for “RTF” (should)
  - ODT required for “PTCS” (shall)

Comment 2 – ODT

Can we really say which one is better?

Outdoor Thermostat

Good	**Bad**
Prohibits electric resistance at “high” temperatures	No control of resistance heat at low temperatures
Most homeowners will not deactivate or change setting on their own	Can cause “cold blow” and other “comfort” issues leading to callbacks and deactivation
Easy to model & determine energy savings impact	Costs $125 installed (t-stat option may be less)
	Difficult to verify installation

Heat Pump Recovery

Good	**Bad**
Reduces use of electric resistance at both high and low temperatures	Proprietary logic – difficult to model energy savings
Easy to install and verify installation	Some occupants don’t want their heat pump on at night
Maintains comfort	Some thermostats allow homeowners to deactivate “heat pump recovery” setting
Inexpensive – many new thermostats have this feature	

Comment 2 – Current Specifications

- **Current RTF Specification**
  - 4.5 - Unless prohibited by the manufacturer, an outdoor thermostat should be installed and set so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure. A thermostat equipped with an outdoor temperature sensor may be used in place of an outdoor thermostat if programmed so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure.

- **Current PTCS Specification**
  - 4.5 - An outdoor thermostat shall be installed and set so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure. A thermostat equipped with an outdoor temperature sensor may be used in place of an outdoor thermostat if programmed so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure.

Comment 2 – Discussion

- What's the intent of the specification?
  - *Reduce the unnecessary use of installed auxiliary heaters*
- Definition of "Unnecessary use of installed auxiliary heaters":
  - *offsetting available heat output of the heat pump's refrigeration cycle with heat output from auxiliary heaters*

Comment 2 – Proposed Specifications

- **Proposed RTF Specification**

  4.5 – A control strategy that minimizes the unnecessary use of installed auxiliary heaters should be implemented. "Unnecessary use of installed auxiliary heaters" is defined as offsetting available heat output of the heat pump's refrigeration cycle with heat output from auxiliary heaters. One of the following control strategies may be used to accomplish this goal:

  a. A standard non-programmable or time-clock programmable indoor thermostat installed with an outdoor thermostat, or equivalent. The outdoor thermostat shall be installed and set so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure.

  b. A microprocessor controlled indoor thermostat with an enabled heat pump recovery function. The installer and/or utility should instruct the homeowner on proper, efficient, operation of the thermostat. If this option is used in conjunction with an outdoor thermostat (optional), the first stage of auxiliary heat (~ 5kW) shall be allowed to operate independently of the outdoor thermostat.

Comment 2 – Proposed Specifications

- **Proposed PTCS Specification**

  4.5 – A control strategy that minimizes the unnecessary use of installed auxiliary heaters shall be implemented. "Unnecessary use of installed auxiliary heaters" is defined as offsetting available heat output of the heat pump's refrigeration cycle with heat output from auxiliary heaters. One of the following control strategies may be used to accomplish this requirement:

  a. A standard non-programmable or time-clock programmable indoor thermostat installed with an outdoor thermostat, or equivalent. The outdoor thermostat shall be installed and set so that auxiliary heating does not engage above 35°F, or that temperature required by the utility, except when supplemental or emergency heating is required during a defrost cycle or refrigeration cycle failure.

  b. A microprocessor controlled indoor thermostat with an enabled heat pump recovery function. The installer and/or utility should instruct the homeowner on proper, efficient, operation of the thermostat. If this option is used in conjunction with an outdoor thermostat (optional), the first stage of auxiliary heat (~ 5kW) shall be allowed to operate independently of the outdoor thermostat.

Comment 2 – Discussion & *Decision*

Options:

1. Keep specs as is; continue to require the ODT for PTCS
2. Accept the proposed changes; allow a “heat pump recovery” thermostat in lieu of an ODT for PTCS specs. Assume equal performance.
3. Table the decision – study the difference in performance of ODT’s and “heat pump recovery” thermostats.
4. ~~Require “heat pump recovery” thermostat in RTF specs.~~
5. ?