

No Longer a Black Box

Rating Software Testing

HVAC Equipment Working Group



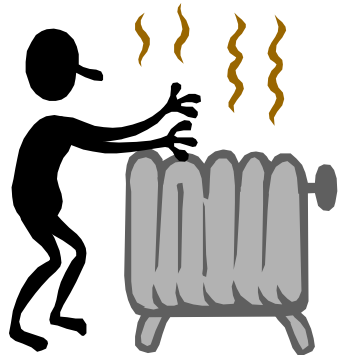
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The HVAC Working Group Task



Produce a working test specification that will describe the HVAC capabilities and acceptance criteria associated with HERS Software

Status Test set complete, acceptance criteria development in progress

Required MINIMUM Capabilities

Tools must be capable of generating HVAC results using system type and efficiency as inputs.

System Types

- Compressor based air conditioning systems

- Oil, propane or natural gas forced air furnaces

- Electric resistance forced air furnaces

- Air source heat pumps

Other system types are optional

Tools must account for duct insulation and leakage, the presence of a programmable thermostat and hot water consumption

Test 1: AC Efficiency

Cooling Systems - Las Vegas

HVAC1a	Air-cooled A/C	10 SEER
HVAC1b	Air-cooled A/C	13 SEER

Purpose: Determine expected cooling energy impacts associated with a high efficiency air conditioner design.

Test 2a,b: Fuel Furnace Efficiency

Fuel Heating Systems - Colorado Springs

HVAC2a Gas Furnace 78% AFUE

HVAC2b Gas Furnace 90% AFUE

Purpose: Determine expected heating energy impacts associated with a high efficiency furnace design.

Test 2 c,d,e: Elec. Heat Efficiency

Electric Heating Systems - Colorado Springs

HVAC2c	Air-source HP	6.8 HSPF
HVAC2d	Air-source HP	9.85 HSPF
HVAC2e	Electric Furnace	COP= 1.0

Purpose: Determine expected heating energy impacts associated with several electric heating designs.

Test 3a-d: Duct Systems - Heating

Duct Systems - Heating - Colorado Springs

Test	Description & Duct Loc'n	Leakage	Rval
HVAC3a	Gas Furnace cond. space	0%	R0
HVAC3b	Gas Furnace basement	0%	R0
HVAC3c	Gas Furnace basement	0%	R4.2
HVAC3d	Gas Furnace basement	250 cfm ₂₅	R4.2

Purpose: Determine expected heating energy impacts associated with duct placement, leakage and insulation cases.

Test 3e-h: Duct Systems - Cooling

Duct Systems - Cooling - Las Vegas

Test	Description & Duct Loc'n	Leakage	Rval
HVAC3a	Air Cooled AC cond. space	0%	R0
HVAC3b	Air Cooled AC attic	0%	R0
HVAC3c	Air Cooled AC attic	0%	R4.2
HVAC3d	Air Cooled AC attic	250 cfm ₂₅	R4.2

Purpose: Determine expected cooling energy impacts associated with duct placement, leakage and insulation cases.

Test 4: Programmable T'stat

Gas Heating System - Colorado Springs

Test	System	Tstat Type
HVAC4a	78% AFUE Furnace	Non-Programmable
HVAC4b	78% AFUE Furnace	Programmable

Purpose: Determine expected heating energy impacts associated with 5 degree setback assumption associated with programmable thermostat.

Test 5: Domestic Hot Water

40 gal. Gas Domestic Hot Water - Colorado Springs

Test	DHW Efficiency	#Bedrooms
HVAC5a	0.56 EF	2
HVAC5b	0.56 EF	4
HVAC5b	0.62 EF	2

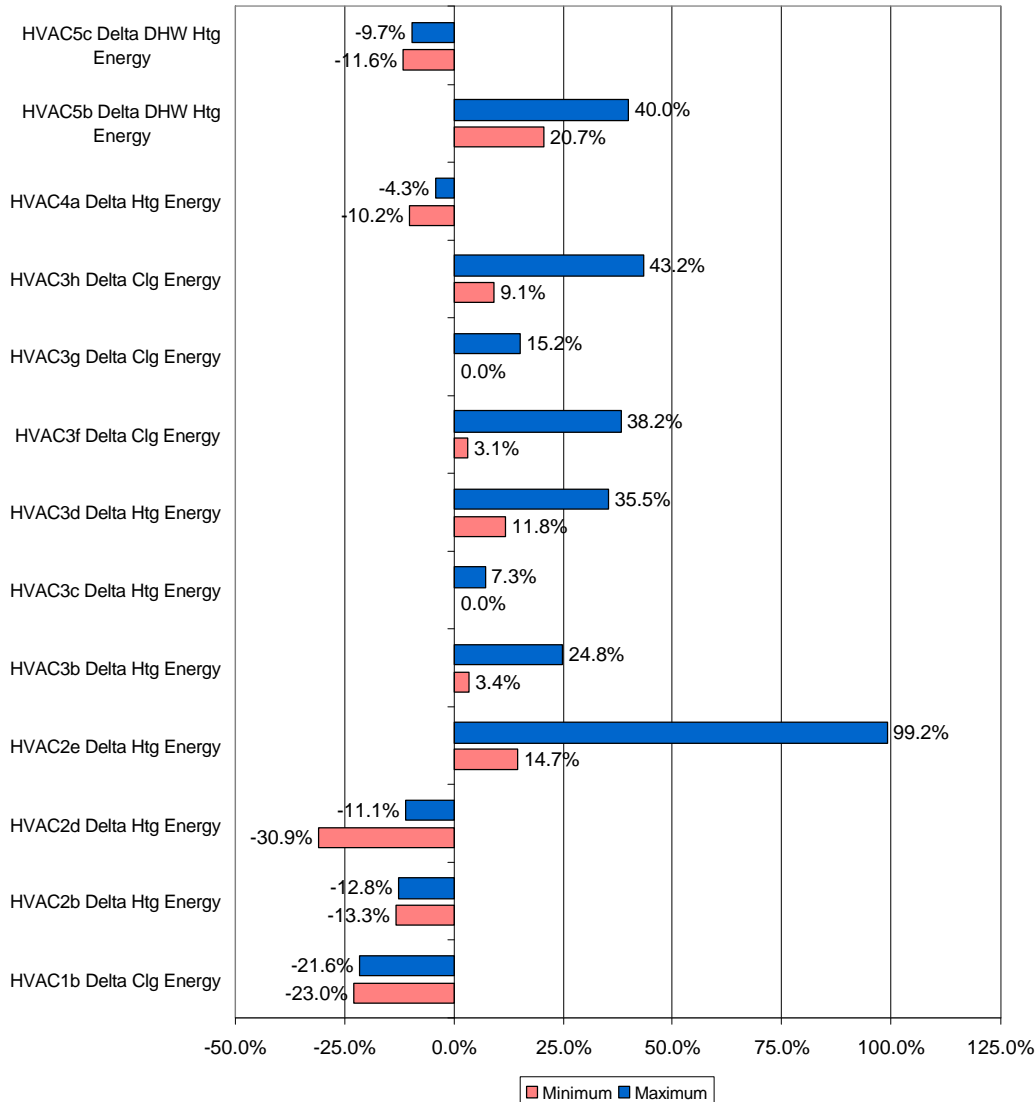
Purpose: Determine expected domestic hot water energy impacts associated with varying number of bedrooms and the energy factor.

Current Status

- All tools have submitted initial results
- Updated set of assumptions to force uniformity in conversions, controls (yesterday).
- Generate second round of test results by end of March
- Agree on acceptance criteria

Initial Testing Results

RESNET HERS HVAC Testing Results



The Need for a Standard

- Wide Range of Results
- Assumptions related to efficiency conversions, air flow, heating control varied significantly
- Heat pumps and duct losses are particularly problematic
- Stay tuned