Verifying the Quality of HERS Ratings

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Agenda

- Context & goals
- Methodology
- Interesting results
  - Oncor Electric Delivery: 2004-2007
  - Rocky Mountain Power: 2006-2007
- Tips: QAQC made easy & fun
- Evolution
- Discussion

Context – Oncor Electric Delivery

- Piloted in 2001, launched in 2002
- 1 rater, 44 homes in 2002
- Today: >30 raters and > 60,000 homes cumulatively
- Oncor provides training & builder incentives, reports savings based in part on rater-reported HERS Indices
- QAQC started in 2004

Context – Rocky Mountain Power

- Launched in 2005
- Today: ~6,000 homes
- RMP provides trainings, pays builder incentives
- QAQC started in 2006

Goals

- Validate the accuracy of rater-reported information for utilities and builders, and
- Strengthen the integrity of the ENERGY STAR label and the HERS rating process by:
  - Identifying inconsistencies in local interpretations of national RESNET Standards (and in practices on which the Standards are silent);
  - Identifying compliance challenges for builders;
  - Establishing a continuous improvement mechanism; and
  - Encouraging raters to develop best practices and industry standards.

Methodology

- Scope
- Goals
- Priority objective could be:
  - Identify areas for improvement
  - Evaluate progress

Methodology – sample selection

- Size is governed by scope & goal above
- Selection
  - Assess building and rating practices throughout the market
  - Stratify by rater first, then builder
    - Roughly proportional
    - Get homes qualified individually and under sampling protocols

Methodology – data collection

- Site inspection and testing
  - Visual inspection
    - Orientation
    - Attic (hatch) insulation
    - DHW/HVAC model numbers & location
    - Appliance efficiencies
    - CFL installation
  - TBC inspections
  - HVAC QI
  - Infiltration testing
  - Duct leakage testing
  - Pictures

Methodology – data collection (cont'd)

- Building plans
- Rater data files
- Online system

Methodology – analysis

- Baseline study
  - Attic insulation depth
  - Attic insulation material
  - Attic insulation type
  - Basement or crawlspace conditioning
  - Programmable thermostat installation
- ARI-verified SEER
- TBC analysis
- Plan takeoff analysis
  - Conditioned floor area
  - WFA
  - Foundation type
  - Number of conditioned stories above grade

Methodology – analysis (cont'd)

- Duct leakage analysis
  - 6 CFA threshold
- HERS analysis
  - HERS > 85 (formerly HERS < 86 in 2004-5, HERS < 87 in 2006)
  - Discrepancies: (QAQC HERS)-(Rater HERS) > 2 (formerly .5)

Interesting Results

Oncor Electric Delivery

2004-2007

Oncor – attic insulation

- 2004: 14 of 289 homes had no attic insulation (5%)
  - Need to remediate quickly!
- Improvement
  - Adopted 72 hour QAQC window to facilitate remediation
  - 2005: 2 of 299 lacked attic insulation (only 1 lacked completely lacked) (1%)
  - 2006: 1 of 308 lacked insulation (~0%)
  - 2007: 0 of 273

Oncor – TBC compliance (2007)

Oncor – climate location

- 2004: 1/3 of homes used questionable weather files
  - Inconsistent assignments among raters for same locations
  - Select a weather file for a location based on the correct climate zone or based on the closest location regardless of climate zone?
  - Ambiguity over who should determine the appropriate site (code officials, RESNET, EPA?)
- Improvement
  - Discussed with TX HERO, RESNET
  - Additional weather files and TX HERO guidance have clarified process

Oncor – ARI-verified SEER

	2006	2007
Total discrepancies (% of homes)	28%	15%
Rater over-reported SEER (% of homes)	2%	6%
Rater under-reported SEER (% of homes)	26%	9%

- Highly influential measure, but ARI database is difficult to use
- After 2006, discussed with TX HERO and began requiring ARI reference # in online system

Oncor – HERS scores & indices

	2004	2005	2006	2007
HERS variance discrepancies	22%	18%	31%	32%
Tolerance	0.5	0.5	0.5	2
QAQC HERS better than Rater (% of discrepancies)	17%	81%	79%	31%
QAQC HERS worse than Rater (% of discrepancies)	83%	19%	21%	69%

- "Discrepancies" occur when variance exceeds the tolerance
- Effect on impacts?

Oncor – HERS scores & indices (cont'd)

- One idea: effect of sampled home submissions?

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QAQC HERS worse than Rater (% of discrepancies)	83%	19%	21%	69%
Sampled homes (% of discrepancies)	-	-	67%	42%
Confirmed ratings (% of discrepancies)	-	-	33%	58%

Oncor – HERS scores & indices (cont'd)

- Another: effect of REM/Rate updates?

Very preliminary observations!	
% of Indices that changed from v12.3 to v12.4 to v12.43 (N=38)	100%
% of changes that improved Index in v12.43	100%
% of Indices that changed from v12.43 to v12.61 (N=20)	100%
% of changes that improved Index in v12.61	100%

- More fully evaluate REM/Rate update effect in 2008
- Consider separate treatment of sampled homes
- Program design implications?

Interesting Results

Rocky Mountain Power

2006-2007

RMP – air barrier definition

- Rigid vs. flexible air barriers
- RMP facilitated local rater discussions
- Consensus guidance document provided working definition of acceptable air barriers and examples

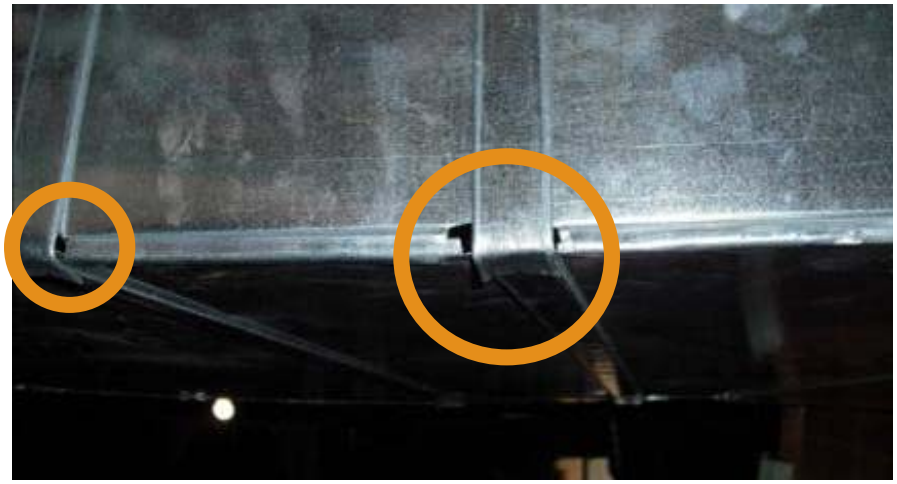
RMP – HVAC QI

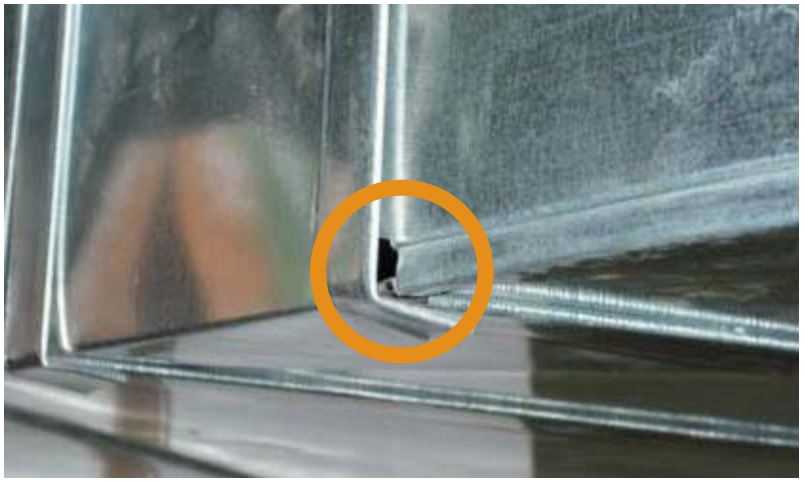
- 2006: Visual inspections
  - Ducts predominantly in conditioned space (draped walls) – waives duct testing requirement
  - Highly inconsistent duct sealing practices (incl. tape and silicone)
  - Infrequent test failures indicated by rater data files
  - Needed diagnostic evaluation
- 2007: Diagnostic testing
  - 10 homes tested
  - Duct leakage was more than 6 CFA in 7
  - Failing homes had leakages from 9 to 35 CFA

RMP – HVAC QI (cont'd)

Starting to think about it!

RMP – HVAC QI (cont'd)





RMP – conditioned floor area

	2006	2007
QAQC area vs. Rater area (% of rater area)	4%	7%
QAQC area > Rater area (% of homes)	34%	69%
QAQC area < Rater area (% of homes)	65%	31%
Range of difference (in QAQC area as a % of rater area)	52% smaller to 48% larger	37% smaller to 119% larger

- Classification of basements
- Cold storage
- Align program definition with in-field practices

RMP – low-e windows

- 2006
  - ~50% of basements had low-e glass (regardless of conditioning)
  - Low-e glass required by code
  - Often supplied by different vendor
  - Worked with builders & raters to ensure delivery & inspection
- 2007
  - 75% of basements had low-e glass (regardless of conditioning)

RMP – Insulation installation

- 2006: Attic insulation inspection
- Fiberglass-batt wall insulation could be significantly improved
  - Encouraged use of blown-in insulation based on more consistently high installation quality
- In some cases, knee-wall insulation was missing, poorly installed, or had detached
- Incidentally: Batts used as basement ceiling insulation were never in contact with the sub-floor above

RMP – Insulation installation (cont'd)

Detached air barrier compromises alignment

RMP – Insulation installation (cont'd)

RMP – Insulation installation (cont'd)

- 2007: TBC inspections (post 7/1/2007)
- Dramatic improvement over 2006
  - Knee-wall insulation installation greatly improved
  - "Acceptable minor defects" were not being failed if builder demonstrated progress, as allowed by TBC
  - Observed improvement over the course of 2007 inspections
- Opportunities for improvement
  - Attic hatch insulation and gaskets
  - Insulated floors above garages
  - Walls behind shower/tubs

Closing thoughts

Tips & Evolution

Tips: QAQC made easy & fun

- Take pictures of the homes
- Ask questions, then collect data
- Use a camera to record important information about the homes
- Provide a value-added service to participants
  - If something needs to be remediated, contact the rater ASAP
  - Contact the builder with structural issues
- Generate visual representations of the QAQC'd homes
- Schedule around the production calendar

Evolution

- Value of multiyear studies
- Responsiveness to emergent trends
- Program changes promote inconsistent processes

Acknowledgments

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Discussion

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