



FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

RESNET National Registry: Kicking it up a Notch

RESNET Building Performance Conference

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Philip Fairey



Background

- RESNET Quality Improvement Task Force established by Board of Directors as result of recommendations of HERS Index Consistency Task force
- Three key Quality Improvement recommendations:
 - Enhanced Quality Assurance of Raters
 - Consistent Information and Training
 - **Software Program Improvement**



Software QI Recommendations

- Establish limits to input variables for whole-house ventilations systems in the RESNET Standards
- Establish a task group to determine reasonable bounds checks that can be incorporated into software to limit or warn users when input values are beyond reasonable limits
- Enhance rating software tools to enable QAD flags to be set for internal inconsistencies that should be checked prior to entering a building file into RESNET registry
- Modify RESNET registry XML schema to include reporting of QAD flags



Working Group on Software Fixes

- Co-Chairs
 - Philip Fairey, FSEC
 - Dave Roberts, NREL
- Members
 - Brett Dillon, IBS Advisors
 - Joel Gilbert, Apogee
 - Mark Jansen, Energy Efficient Homes Midwest
 - Cy Kilbourn, Ekotrope
 - Rob Salcido, NORESKO



Process

- Public comments solicited
- WG discussed, categorized and prioritized comments
 - Software Input control
 - Training
 - Standards
- Highest Priority items
 - Mechanical Ventilation System Inputs
 - Geometry input bounds
 - Clothes washer/dryer input bounds
- Public comments on specific software intricacies handled by software vendors.



Whole-House Ventilation Systems

If table limits are exceeded, software must generate a warning flag that is stored in the building file and that is reported in XML Registry file.

System Type	Exhaust fan	Supply fan	System total
Exhaust	=> 0.12 W/cfm	n/a	=> 0.12 W/cfm
Supply	n/a	=> 0.12 W/cfm	=> 0.12 W/cfm
Balanced	=> 0.12 W/cfm	=> 0.12 W/cfm	=> 0.24 W/cfm
ERV	n/a	n/a	=> 0.48 W/cfm
Central Fan Integrated Supply (CFIS - fan cyclor or similar):			
PSC motor (SEER <= 13; AFUE <= 90%)			=> 0.48 W/cfm
ECM motor (SEER => 15; AFUE => 92%)			=> 0.36 W/cfm



Building Attribute Verification

- **5 Error Conditions:** Software must not allow calculations to be completed until error condition is corrected
 1. $\text{Nbr} \leq (\text{CFA}-120)/70$
 2. At least 1 floor above unconditioned foundation space
 3. Exposed floor area \leq Conditioned floor area
 4. Above grade gross wall area \geq door area + window area
 5. Rating date \leq current date



Building Attribute Verification

- **11 Warning Conditions:** Software must generate flag that is included in building file and that is reported in XML Registry file
 1. Stories above grade: $1 \leq \text{Stories AG} \Rightarrow 4$
 2. Average ceiling height: $7 \leq (\text{Volume}/\text{CFA}) \leq 15$
 3. Below grade slab floor: $\Rightarrow 1$ below grade wall
 4. Below grade wall: $\Rightarrow 1$ below grade slab floor
 5. Crawlspace perimeter: $1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$
EFA = Enclosure Floor Area of the specific building attribute



Building Attribute Verification

6. Basement perimeter: $1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$
7. SOG perimeter: $1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$
8. Foundation wall height: $0 < \text{height} \leq 20$
9. Basement wall depth: $2 \leq \text{depth} \leq (\text{wall height} - 0.5)$
10. Enclosure floor area \leq enclosure ceiling area
11. Exposed gross wall area: $27 \leq (\text{EGWA}/(\text{CFA} * \text{NCS})^{0.5}) \leq 105$

EGWA = exposed gross wall area

CFA = conditioned floor area

NCS = number of conditioned stories, including basements



Clothes Washer/Dryer Inputs

If table limits are exceeded, software must generate a warning flag that is stored in the building file and that is reported in XML Registry file.

Attribute	Limits	Action
Clothes washer (kWh/y)	$(21 * \text{Nbr} + 73) > \text{CWkWh} > (4.7 * \text{Nbr} + 16.4)$	Warning
Electric dryers (kWh/y)	$(163 * \text{Nbr} + 577) > \text{eCDkWh} > (62 * \text{Nbr} + 220)$	Warning
Gas dryers (therms/y)	$(5.9 * \text{Nbr} + 20.6) > \text{gCDtherms} > (2.2 * \text{Nbr} + 7.9)$	Warning
Gas dryers (kWh/y)	$(12.9 * \text{Nbr} + 45.5) > \text{gCDkWh} > (4.9 * \text{Nbr} + 17.4)$	Warning
Hot water savings (gpd)	$\text{HWgpdSave} < (0.59 * \text{Nbr} + 2.1)$	Warning



Implementation

- Addition of Section 5, *User Input Verification Requirements*, in RESNET Publication No. 002-15
 - Approved by Board of Directors December 17, 2014
 - If necessary, can be modified by Board of Directors
- Requires RESNET-accredited software to provide for the implementation of these software improvements
- Updated XML software reporting effective with August 1, 2015 versions of accredited software verification testing.



XML Schema Updates

Three new main elements – no change to existing schema elements

- New *Energy Efficiency Program* (EEP) element
 - EPA version control and revised reporting
 - ZERH reporting
 - Other EEP
- New *Building Characteristic Data* element required by Board to assist in MLS and Appraisal Institute data management
- New *Software Quality Improvement* element containing warning flag reporting as specified in previous slides and RESNET Publication No. 002-15.



Energy Efficiency Partner Programs

- EPA ENERGY STAR program
 - Program version number
 - Qualification scores
 - Verifier certifications
- DOE Zero Energy Ready Homes (ZERH)
 - Partner ID
 - Registered Builder
 - Qualification scores
 - Verifier certifications
- Other EEP program qualified
 - Program name (currently unverified)



Building Characteristic Data

- Building input files are stored as single ASCII file rather than discreet data fields
 - Input files can be downloaded and read by the generating software
 - But input files would have to be parsed to obtain any building component information
- New Building Characteristic data fields defined to allow discreet data storage of certain building attributes.



Envelope Characteristics

- Thermal characteristics of each envelope component (e.g. walls, ceilings, floors, doors, windows)

$$U_o = (\sum (U_i * A_i)) / A \text{ for } i = 1, n$$

$$A = \sum A_i \text{ for } i = 1, n$$

- Overall Enclosure UA

$$UA = \text{Floor } (U_o * A) + \text{Ceiling } (U_o * A) + \text{Wall } (U_o * A) \\ + \text{Window } (U_o * A) + \text{Door } (U_o * A)$$



Other Building Characteristics

- HVAC systems
 - Heating
 - Cooling
 - Mechanical ventilation
 - Dehumidification
- Lighting and appliances
 - Qualifying lighting
 - Refrigerators
 - Dishwashers
 - Clothes washers
 - Clothes dryers
 - Ceiling fans



Other Building Characteristics

- Hot water systems
- Measured enclosure tightness
- Duct systems
- Added energy features
 - On-site power production
 - Solar hot water
 - DWHR
 - HRU
- Whole Home energy designations
 - ENERGY STAR Home qualified
 - Zero Energy Ready Home qualified





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Questions?

