

Date: September 11, 2014

To: Galo LeBron and Dean Potter, Co-Chairs, RESNET Quality Improvement Task Force

From: Dave Roberts and Philip Fairey, Co-Chairs, RESNET Quality Improvement Working Group – Software Fixes

Subject: Recommendations of the Quality Improvement Working Group – Software Fixes

Our working group has completed its mission:

The mandate of the working group is to develop options for:

- *Establish limits on input variables for whole-house ventilations systems in the RESNET Standards*
- *Determine 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*

Find attached our recommended modifications to RESNET Publication No. 13-002 *Procedures for Verification of RESNET Accredited HERS Software Tools*. The modification adds Section 5 which addresses the input variable limits and requirements for software to produce errors and warnings and associated flags for inclusion in the registry.

In addition, our working group recommends that procedures be developed to address how QA Providers handle ratings that generate the flags specified in the attached document. RESNET Publication No. 13-002 is not the appropriate place to address this, but our working group identified this as a need.

Proposed Modification to RESNET Publication No. 13-002

Add new Section 5 as follows:

5. User Input Verification Requirements

Accredited software tools shall be required to verify the reasonableness and internal consistency of certain user inputs as specified by this Section. Accredited software tools shall generate user warnings, software errors that prohibit further calculation and National Building Registry flags as specified by this Section.

5.1. Building Attribute Verification

The software inputs for building attributes specified in Table 5.1(1) shall be verified by accredited software tools. Where the Action listed in Table 5.1(1) is 'Error' accredited software tools shall not complete the rating calculations until the input error is remediated. Where the Action is 'Warning' the accredited software tools shall store a warning flag in the building input file that is specific to the attribute and that can be transmitted to the RESNET National Building Registry when the building file is submitted for registration.

Table 5.1(1) Building attribute verification limits and required actions

Building Attribute	Limits	Action
Number of bedrooms	$\leq (\text{CFA}-120) / 70$	Error
Stories above grade	$1 \leq \text{SAG} \leq 4$	Error
Average ceiling height	$7 \leq (\text{Volume} / \text{CFA}) \leq 15$	Warning
Below grade slab floors	$\Rightarrow 1$ below grade wall	Warning
Below grade walls	$\Rightarrow 1$ below grade slab floor	Warning
Crawlspace perimeter (ft)	$1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$	Warning
Basement perimeter (ft)	$1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$	Warning
Slab on grade perimeter (ft)	$1 \leq \text{perimeter} \leq (\text{EFA}^{0.5} * 7)$	Warning
Foundation wall height (ft)	$0 < \text{height} \leq 20$	Warning
Basement wall depth (ft)	$2 \leq \text{depth} \leq (\text{wall height} - 0.5)$	Warning
Uncond. foundation space	$\Rightarrow 1$ floor above foundation space	Error
Enclosure floor area	\leq enclosure ceiling area	Warning
Exposed floor area	\leq conditioned floor area	Error
Exposed gross wall area	$27 \leq (\text{EGWA} / (\text{CFA} * \text{NCS})^{0.5}) \leq 105$	Warning
Above grade gross wall area	\geq door area + window area	Error
Rating date	\leq current date	Error

Acronyms:

CFA = Conditioned Floor Area (total)

SAG = Stories Above Grade

EFA = Enclosure Floor Area of the specific building attribute

EGWA = Exposed Gross Wall Area (total)

NCS = Number of conditioned stories including conditioned basements

5.2. Mechanical Ventilation System Verification

5.2.1. Accredited software tools shall verify that mechanical ventilation fan energy use values are within the bounds specified in Table 5.1(1). Where the limits provided by Table 5.2(1) are exceeded, accredited software tools shall store a warning flag in the building input file that is specific to the system type and that can be transmitted to the RESNET National Building Registry when the building file is submitted for registration.

Table 5.2(1) Mechanical ventilation system fan energy consumption limits

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

5.2.2. For the purposes of calculating the impacts of whole-house ventilation systems in the Rated Home, accredited software tools shall ensure that the time-averaged ventilation rate is equal to or greater than the minimum allowed by Section 4.2, ANSI/RESNET 301-2014, regardless of the user's entry.¹

5.3. Appliance Verification

5.3.1. Clothes washers and clothes dryers

Accredited software tools shall verify that user inputs for clothes washers and clothes dryers do not exceed the limits specified by Table 5.3(1). Accredited software tools shall provide user warnings where these limits are exceeded. In all cases, where the limits provided by Table 5.3(1) are exceeded, accredited software tools shall store a warning flag in the building input file that is specific to the attribute and that can be transmitted to the RESNET National Building Registry when the building file is submitted for registration.

Table 5.3(1) Clothes washer and clothes dryer input limits

Attribute	Limits	Action
Clothes washers (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

¹ For example, if the whole house ventilation fan requirement is 50 cfm continuous and the whole house ventilation system is intermittent with a 33% duty cycle (typical of a fan cycler system), the ventilation rate during the 33% duty cycle must be 150 cfm for the Rated Home calculations. Software users can be warned of this requirement (and its implementation in the software) but shall not be allowed to override it.