REM/*Rate* v15 Review

9/22/14

Purpose

This document includes the results of limited testing and verification of the REM/*Rate* v15.0 software submitted as a simulation tool for demonstrating compliance with Section 405 of the 2010 FL Building Code, Energy Conservation. The testing was limited to some of the basic requirements due to time constraints and did not fully cover all aspects of the 2010 FL Building Code or the TAM.

FL Code 2010 Technical Assistance Manual (TAM)

APPENDIX C - Florida Energy Code Standard Reference Design Auto-Generation Tests

- It appears as though the reference home can be exported to an Access database file, however, without labels this does not allow for the verifier or code official to readily verify the correct reference home is generated in accordance to the requirements of Table B-1.1.2(1) for use in the FL Code 2010 performance calculation. As a result the software does not appear to satisfy the requirements of Section C.1 Minimum Reporting Requirements. Additionally, a verifier does not have the capability to view the reference home and perform a 2010 FL Code calculation to verify the e-ratio of 1.00 or the Total Proposed Modified Loads should equal the Total Baseline Loads as required by the TAM.

6.1.1 Climate Data – From the TAM: The compliance software program shall perform simulations using hourly values of climate data, such as temperature and humidity, derived from TMY3 (Typical Meteorological Year) climate data. The compliance software program shall calculate solar radiation on exterior surfaces on an hourly basis from the values of direct normal irradiance and diffuse horizontal irradiance contained in the climate data, taking ground reflectance into account. Climate criteria for the performance-based building code compliance methods are determined by climate data from all Florida TMY3 weather data collection stations. Energy Code calculations shall use the data collection site for the nearest city with respect to the building's location. Not clear that REM/*Rate* does this.

6.1.2 Florida "Credit" options – Software does not appear to provide the following inputs.

405.6.2 Cool Roof Option

- The software does not provide the user a tested solar absorptance or reflectance input. Thus all entered values in the software are applied to the calculation based on color of roof without any user verification of having the tested results. Without this input the error checking is left up to the Code official to catch.
    - The requirement states:

405.6.2 Installation criteria for homes claiming the cool roof option.
The cool roof option may be claimed where the roof to be installed has a tested solar reflectance of greater than 4 percent when evaluated in accordance with ASTM methods E 903, C 1549, E 1918 or CRRC Method #1. Emittance values provided by the roofing manufacturer in accordance with ASTM C 1371 shall be used when available. In cases where the appropriate data are not known, emittance shall be the same as the Standard Reference Design. Testing of a qualifying sample of the roofing material shall be performed by an approved independent laboratory with these results provided by the manufacturer.

6.1.2.4 Cross Ventilation Option

- REM/*Rate* does include a natural ventilation option, but does not include the Florida Code cross ventilation credit.

6.1.2.5 Whole House Fan Option

- The software seems to give a higher than expected benefit when a home includes a whole house fan (e.g., a 6.6% savings, where EnergyGauge gives 2.7%). Does REM/*Rate* include the energy use of the whole house fan as indicated in the TAM?

    - The requirement states:
      405.6.5 Installation criteria for homes using the whole house fan option.
      The whole house fan option may be used if the following criteria have been met.

      1. The whole house fan has been sized to provide a minimum of 20 air changes per hour for the entire house.

      2. The fan installed shall have a free air cfm rating of at least three times the square footage of the conditioned area of the house.

      3. To ensure adequate air exhaust, the house attic shall have gable, ridge or wind turbine vents whose total opening area is equal to four times the ceiling cutout area for the whole house fan. Soffit vents shall not be included in the exhaust vent area.

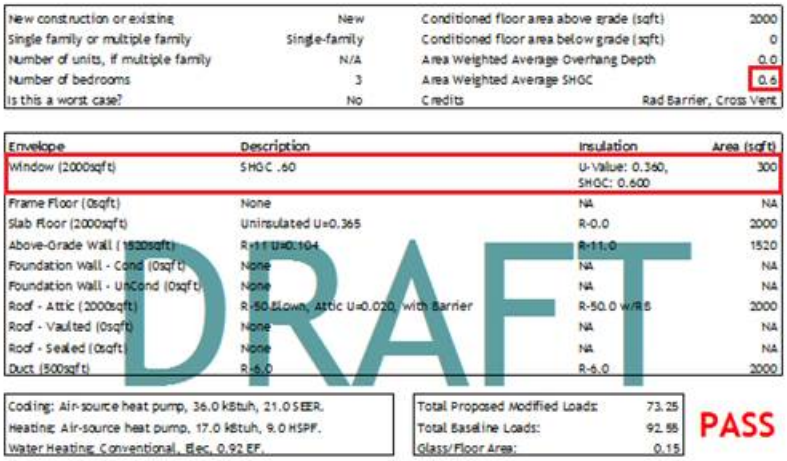
    - From the TAM: When the specified code criteria for whole house fan is met, either a default of 300W per hour, or a user specified and reported energy use value from the installed unit, shall be included in the cooling energy performance when the unit runs. An air change rate of 15 air changes per hour shall be modeled during times when the whole house fan is operated. The operation (on or off) of the unit shall not change from midnight to 6am.

FL Code 2010 Requirements

Window SHGC

- REM/*Rate* Form 405-10 should indicate "fail" for an average SHGC higher than 0.5 but shows "pass" (as shown in the example below with an average SHGC of 0.6). Overhangs were at 0 for the example run. While an interim Mandatory Requirements screen does indicate SHGC failure, REM/*Rate* still allows Form 405 to be viewed and printed with a PASS indicated.
    - The requirement states:
      402.5 Maximum fenestration SHGC (Mandatory).
      The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 shall be 0.50.

      Exception: If the window area-weighted average overhang depth for the entire dwelling unit is 4.0 feet or greater, the area-weighted average maximum SHGC requirement of 0.50 does not need to be met.



New construction or existing	New	Conditioned floor area above grade (sqft)	2000
Single family or multiple family	Single-family	Conditioned floor area below grade (sqft)	0
Number of units, if multiple family	N/A	Area Weighted Average Overhang Depth	0.0
Number of bedrooms	3	Area Weighted Average SHGC	0.6
Is this a worst case?	No	Credits	Rad Barrier, Cross Vent

Envelope	Description	Insulation	Area (sqft)
Window (2000sqft)	SHGC .60	U-Value: 0.360, SHGC: 0.600	300
Frame Floor (0sqft)	None	NA	NA
Slab Floor (2000sqft)	Uninsulated U=0.365	R-0.0	2000
Above-Grade Wall (1520sqft)	R-11 U=0.104	R-11.0	1520
Foundation Wall - Cond (0sqft)	None	NA	NA
Foundation Wall - UnCond (0sqft)	None	NA	NA
Roof - Attic (2000sqft)	R-50 Blown, Attic U=0.020, with Barrier	R-50.0 w/R8	2000
Roof - Vaulted (0sqft)	None	NA	NA
Roof - Sealed (0sqft)	None	NA	NA
Duct (500sqft)	R-6.0	R-6.0	2000

Cooling: Air-source heat pump, 36.0 kBtuh, 21.0 SEER.
Heating: Air-source heat pump, 17.0 kBtuh, 9.0 HSPF.
Water Heating: Conventional, Elec, 0.92 EF.

Total Proposed Modified Loads:	73.25
Total Baseline Loads:	92.55
Glass/Floor Area:	0.15

PASS

Duct Leakage

- What duct system efficiency (DSE) is used for default ducts in the Proposed Home?

    - The default duct leakage options in the software are: leaky uninsulated, RESNET/HERS default, or proposed reduced leakage. Total Proposed Modified Loads vary significantly between the three options. FL Code 2010 requires the proposed home to include a DSE of 0.88 except when duct leakage is tested. The table below illustrates the Total Proposed Modified Loads for each default leakage selection in REM/*Rate*. None of these indicate testing is required.

DUCT LEAKAGE TYPE	TOTAL PROPOSED MODIFIED LOADS	TOTAL BASELINE LOADS
Leaky uninsulated	78.22	78.32

RESNET/HERS default	71.83	78.32
Proposed reduced leakage	68.74	78.32

Proposed Home Generation

- The FL Code 2010 Proposed Home is not viewable to allow a code official to verify the proposed home is generated according to the requirements of Appendix B Table B-1.1.2(1) for use in the FL Code 2010 performance calculation.

Adjacent Shading Inputs

- Total Proposed Modified Loads changes with the selection of adjacent shading. FL Building Code has only allowed permanent shading while REM/*Rate* Adjacent Shading includes trees and shrubs, nearby buildings and land forms according to their Help system.

Form 405 -10

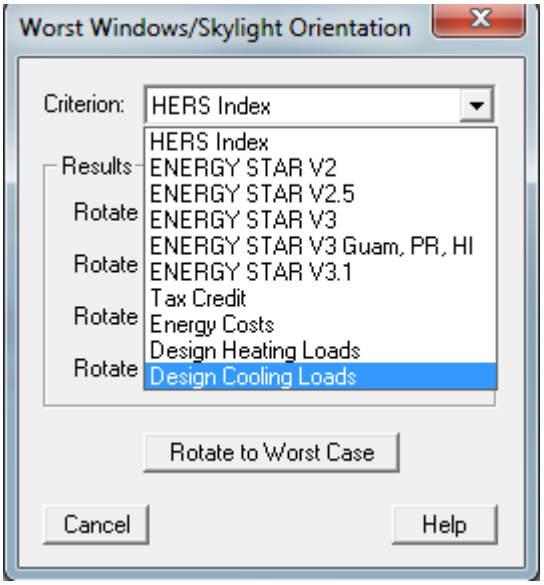
- Form 405-2010 does not include the Florida Seal.

Lighting and Refrigerator Inputs

- In REM/*Rate* the lighting and refrigerator inputs change both the Total Proposed Modified Loads and Total Baseline Loads; however, these inputs should not be used in the calculations. (Refer to Appendix B Table B-1.1.2(1) which indicates a fixed Internal Gains based on square footage and bedrooms.)

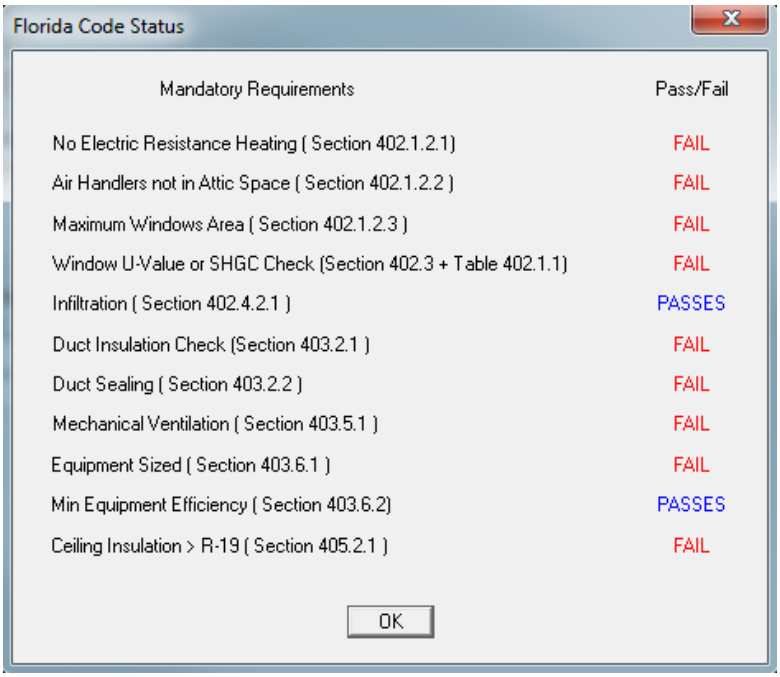
Worst Case

- Does not appear to make any difference to the Total Proposed Modified Loads when selected on Florida Code input screen.
- Does not provide a FL Code 2010 option under tools.



Mandatory Requirements Screen

- REM/*Rate* provides a Mandatory Requirements screen when calculating Performance (Form 405) compliance; however, a number of the requirements it lists are prescriptive, not required for Performance compliance.



FL Code 2010 Reports

Air Barrier and Insulation Inspection Component Criteria Checklist

- Report is not labeled with 2010 FL Code to identify the version.

Air Distribution System Test Report

- Report is not labeled with 2010 FL Code to identify the version.

Envelope Leakage Test Report

- Report is not labeled with 2010 FL Code to identify the version.

EPL Card

- Report is not labeled with 2010 FL Code to identify the version.

Florida REM Rate Revisions from 14.5 Staff Review/Comments of Energy Compliance Software letter which includes REM Rate feedback

The following items are from the Florida REM Rate Revisions document provided with the v14.5 software submissions.

39. The software does not provide an input for the user to identify a roof solar absorptance or reflectance has been tested according to the ASTM standard but provides credit anyhow.

- REM/*Rate* Answer - This is set via the roof color setting under the ceiling/roof summary inputs.
- The REM/*Rate* software does not have a solar absorptance or reflectance input. There are four roof options; Reflective, Light, Medium, Dark
- This does not satisfy the requirement for solar reflectance above 0.04 to be tested. The requirements state:

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General Concerns

- The user can currently perform calculations and generate reports with just a single wall input.
- Wall inputs do not have a cardinal orientation indicating less accuracy for solar gains.