APPENDIX C

Florida Energy Code Standard Reference Design Auto-Generation Tests

This section contains the Standard Reference Design auto-generation test suite for Florida Energy Code performance compliance tools. The test cases in this proposed test suite are designed to verify that software tools automatically generate accurate Standard Reference Designs given only the building information from the Proposed Design.

C.1 Minimum Reporting Requirements

Software tools applying for verification shall provide evidence that their software meets the requirements of this test suite. The software tool provider or software vendor is responsible for producing the documentation needed to show that the software has been verified through this test suite. In some cases, the data needed to verify accuracy is of no interest or value to the end-user of the software, but in any case, the software tool must generate it. At a minimum, software tools applying for accreditation must report the following values for the Standard Reference Design:

1. Areas and overall U-factors (or R-values in the case of slab-on-grade construction) for all building components, including ceilings, walls, floors, windows (by orientation) and doors.
2. Overall solar-heat gain coefficient ($SHGC_o$)[1] of the windows during heating.
3. Overall solar-heat gain coefficient ($SHGC_o$) of the windows during cooling.
4. Wall solar absorptance and infrared emittance
5. Roof solar absorptance and infrared emittance
6. Total internal gains (including 20% latent) to the home (Btu/day)
7. Specific leakage area (SLA) for the building, by zone or as SLA_o[2], as appropriate
8. Attic net free ventilation area (ft^2)
9. Crawlspace net free ventilation area (ft^2), if appropriate
10. Exposed masonry floor area and carpet and pad R-value, if appropriate
11. Heating system labeled ratings, including AFUE, COP, or HSPF, as appropriate.
12. Cooling system labeled ratings, including SEER or EER, as appropriate.
13. Thermostat schedule for heating and cooling
14. Air distribution system characteristics, including locations of all supply and return ducts and the air handler units, supply and return duct R-values, and supply and return duct air leakage values (in cfm_{25}).[3]
15. Mechanical ventilation kWh/yr., if appropriate

---

[1] The overall solar heat gain coefficient ($SHGC_o$) of a fenestration is defined as the solar heat gain coefficient (SHGC) of the fenestration product taken in combination with the interior shade fraction for the fenestration.

[2] SLA_o is the floor-area weighted specific leakage area of a home where the different building zones (e.g. basement and living zones) have different specific leakage areas.

[3] cfm_{25} = cubic feet per minute of air leakage to outdoors at a pressure difference between the duct interior and outdoors of 25 Pa.

Software tools must have the ability to recreate or store the test case Standard Reference Designs as if they were Proposed Design such that they also can be simulated and evaluated as the Proposed Design.

C.2 Auto-generation Test Case Descriptions

Test Case1. HERS BESTEST case L100 building configured as specified in the HERS BESTEST procedures, located in Tallahassee, FL, including a total of 3 bedrooms and the following mechanical equipment: gas furnace with AFUE = 82% and central air conditioning with SEER = 11.0.

Test Case 2. HERS BESTEST case L100 configured on an un-vented crawlspace with R-7 crawlspace wall insulation, located in Orlando, FL, including a total of 3 bedrooms and the following mechanical equipment: electric heat pump with HSPF = 7.5 and SEER = 12.0.

Test Case 3. HERS BESTEST case L304 in Miami, configured as specified in the HERS BESTEST procedures, located in Miami, FL, including a total of 2 bedrooms and the following mechanical equipment: electric strip heating with COP = 1.0 and central air conditioner with SEER = 15.0.

Test Case 4. HERS BESTEST case L324 configured as specified as in the HERS BESTEST procedures, located in Jacksonville, FL, including a total of 4 bedrooms and the following mechanical equipment: gas furnace with AFUE = 95% and no air conditioning.

Test Case 5. Recreate or store the Standard Reference Design created in Tests 1 through 4 as Proposed Design and simulate and evaluate them.

C.3 Acceptance Criteria

C.3.1 Test Cases 1 – 4.

For test cases 1 through 4 the values contained in Table C.3.1 shall be used as the acceptance criteria for software tool accreditation. For Standard Reference Design building components marked by an asterisk (*), the acceptance criteria may include a range equal to ± 0.05% of the listed value. For all other Standard Reference Design components the listed values are exact.

Table C.3.1 Acceptance Criteria for Test Cases 1 – 4

Standard Reference Design Building Component	Test 1	Test 2	Test 3	Test 4
Above-grade walls (U_o)	0.082	0.082	0.082	0.082
Above-grade wall solar absorptance (α)	0.75	0.75	0.75	0.75
Above-grade wall infrared emittance (ε)	0.90	0.90	0.90	0.90

Standard Reference Design Building Component	Test 1	Test 2	Test 3	Test 4
Basement walls (U_o)	n/a	n/a	n/a	0.36
Above-grade floors (U_o)	0.064	0.064	n/a	n/a
Slab insulation R-Value	n/a	n/a	0	0
Ceilings (U_o)	0.030	0.035	0.035	0.035
Roof solar absorptance (α)	0.75	0.75	0.75	0.75
Roof infrared emittance (ε)	0.90	0.90	0.90	0.90
Attic vent area* (ft^2)	5.13	5.13	5.13	5.13
Crawlspace vent area* (ft^2)	n/a	10.26	n/a	n/a
Exposed masonry floor area* (ft^2)	n/a	n/a	307.8	307.8
Carpet & Pad R-Value	n/a	n/a	2.0	2.0
Door Area (ft^2)	40	40	40	40
Door U-Factor	0.75	0.75	0.75	0.75
North window area* (ft^2)	69.26	69.26	69.26	102.63
South window area* (ft^2)	69.26	69.26	69.26	102.63
East window area* (ft^2)	69.26	69.26	69.26	102.63
West window area* (ft^2)	69.26	69.26	69.26	102.63
Window U-Factor	0.75	0.75	0.75	0.75
Window $SHGC_o$ (heating)	0.34	0.34	0.34	0.34
Window $SHGC_o$ (cooling)	0.28	0.28	0.28	0.28
SLA_o (ft^2/ft^2)	0.00036	0.00036	0.00036	0.00036
Internal gains* (Btu/day)	71,167	71,167	62,605	103,014
Labeled heating system efficiency rating	AFUE = 78%	HSPF = 7.7	HSPF = 7.7	AFUE = 78%
Labeled cooling system efficiency rating	SEER = 13.0	SEER = 13.0	SEER = 13.0	SEER = 13.0

Standard Reference Design Building Component	Test 1	Test 2	Test 3	Test 4
Air Distribution System Efficiency	0.80	0.80	0.80	0.80
Thermostat Type	Manual	Manual	Manual	Manual
Heating thermostat settings	68 F (all hours)	68 F (all hours)	68 F (all hours)	68 F (all hours)
Cooling thermostat settings	78 F (all hours)	78 F (all hours)	78 F (all hours)	78 F (all hours)

C.3.2 Test Case 5.

Test case 5 requires that each of the Standard Reference Design for test cases 1-4 be stored or recreated in the software tool as Proposed Design and simulated as any other Proposed Design would be simulated. If the resulting Proposed Design is correctly configured to be identical to its appropriate Standard Reference Design, code compliance calculations arising from normal operation of the software tool should produce virtually identical scoring criteria for both the Standard Reference Design and the Proposed Design for this round of tests. For test case 5, the e-Ratio shall be calculated separately using the simulation results for heating, cooling, hot water and the other provisions of Section B-1.1.3 of the Florida Energy Code as follows:

e-Ratio = (Proposed Design normalized modified loads) / (Standard Reference Design loads)

Acceptance criteria for these calculations shall be ± 0.5% of 1.00. Thus, for each of the preceding test cases (1-4), the e-Ratio resulting from these software tool simulations and the subsequent e-Ratio calculations shall be greater than or equal to 0.995 and less than or equal to 1.005.