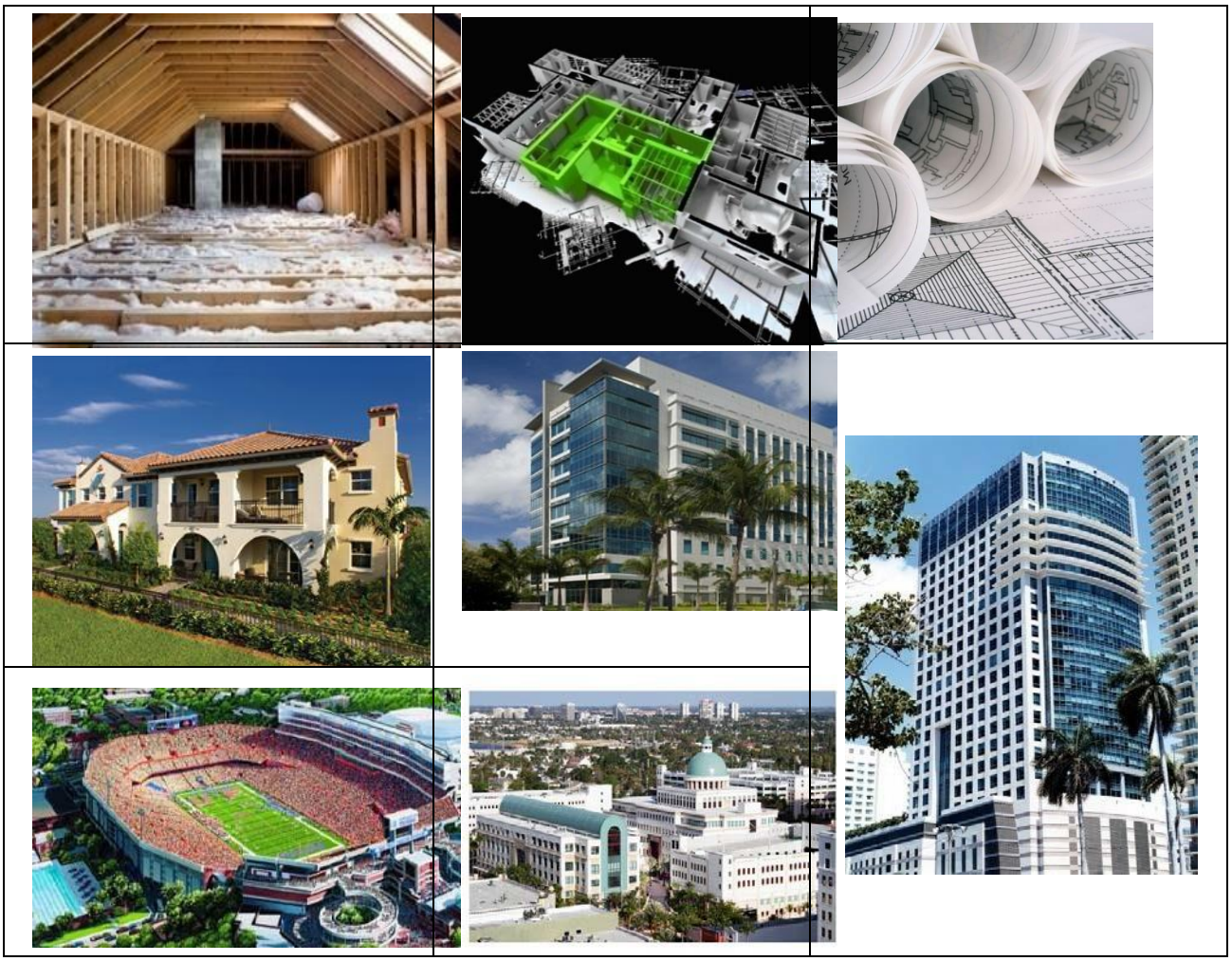
Energy Simulation Tool Approval Technical Assistance Manual
Florida Building Code, Energy Conservation, 6th Edition, 2017
Residential Performance Method



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Document Number: TAM-2017-1.0. June 29, 2017

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ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support of the following organizations and individuals:

Florida Department of Business and Professional Regulations: Office of Codes and Standards. The department provided funding for development of the Compliance Software Tool Assistance Manual.

JM Jadu Corp. This organization was responsible for writing the Energy Simulation Tool Approval Technical Assistance Manual - TAM – 2010.1. Some chapters (1-4 and 8) of this draft manual were adopted from the first version of the Technical Assistance Manual TAM – 2010.1 with some editing.

Florida Solar Energy Center was responsible for writing/updating the Energy Simulation Tool Approval Technical Assistance Manual - TAM – 2014.1. Performance compliance method of the Residential Energy Compliance Software Approval Assistance Manual (Section of Chapter 6) was adopted and updated from the previous version of the Technical Assistance Manual TAM – 2014.1.

Introduction

As part of the new Florida Building Code, Energy Conservation, 6th Edition (2017) the Florida Building Commission is charged with the responsibility of approving code compliance software tools.

This section of the Technical Assistance Manual explains the guidelines for approval of the residential performance method compliance tools (also referred to as compliance software programs) used to demonstrate compliance with the Florida Building Code, Energy Conservation—the "Energy Code" for residential building designs. A "compliance tool" is defined by the Energy Code as an approved software program or calculation-based methodology that projects the annual energy use of a building or calculation-based methodology that verifies the minimum prescriptive requirements and/or other procedures referred to in the code. Compliance software programs are used to demonstrate compliance with the Florida Building Code, Energy Conservation 6th Edition (2017) by the performance or prescriptive approaches for building design. Hereafter, the Florida Building Code, Energy Conservation, 6th Edition (2017) is referred as the "Florida Energy Code" or "FEC". The requirement for residential compliance by the Simulated Performance Alternative is specified in Section R405 of the 2017 Florida Energy Code.

The updates made to the performance method of the residential compliance software approval technical assistance manual includes changes required to make it consistent with the 2017 Florida Energy Code requirements. The updates include:

- input assumptions and equations,
- the mandatory requirements,
- acceptance criteria for autogenerated Florida *standard reference design* buildings,
- the performance method Vendor's compliance software evaluation spreadsheets; and
- performance compliance method sample report forms per the FEC Section R405.4 requirements.

6.5 Performance Method

6.5.1 Minimum Capabilities

Compliance software programs (energy simulation tools) shall be capable of calculating the annual energy consumption of all building elements that differ between the *standard reference design* and the *proposed design* and shall include the following capabilities (Section R405.6.1 of the Florida Energy Code).

- Computer generation of the *standard reference design* using only the input for the *proposed design*. The calculation procedure shall not allow the user to directly modify the building component characteristics of the *standard reference design.*
- Calculation of whole-building (as a single *zone*) sizing for the heating and cooling equipment in the *standard reference design* residence in accordance with Section R403.7 of the Florida Energy Code.
- Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating, and air-conditioning equipment based on climate and equipment sizing.

Based on Section R401.3, Section R402.4.1.2, Section R403.3.3, Section R405.4.2, Section R405.4.3, and Section R405.6.1 the software shall also be capable of producing printed reports to include the Energy Performance Level (EPL) display card; performance test reports for envelope leakage and air distribution system leakage as required; and form R405.5.2(1), a *Building Code official* inspection checklist listing each of the *proposed design* component characteristics determined by the analysis to provide compliance, along with their respective performance ratings (e.g., orientation, *R*-value, *U*-factor, SHGC, HSPF, AFUE, SEER, EF, etc.).

6.5.2 Compliance Report

Compliance software program provisions and overall stringency shall be as described in Section R405 of the Florida Energy Code. The software shall produce the following cover sheet for submittal with each code compliance application (vendor may change page number count based on their output). See report samples in Appendix R-5 of this Manual.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation Residential Performance Method Applications for compliance with the Florida Building Code, Energy Conservation, 6th Edition (2017) via the Residential performance method shall include:

1) This checklist;

2) A form R405 report that documents that the *proposed design* complies with Section R405.3 of the Florida Energy Code. This form shall include a summary page indicating home address, e-Ratio, and the pass or fail status along with summary areas and types of components, whether the home was simulated as a worst-case orientation, name and version of the compliance software tool, name of individual completing the compliance report (one page) and an input summary checklist that can be used for field verification (usually four pages/may be greater);

3) Energy Performance Level (EPL) Display Card (one page);

4) HVAC system sizing and selection based on ACCA Manual S or per exceptions provided in Section R403.7; and

5) Mandatory requirements (five pages).

Required prior to CO for the Performance method:

6) A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the Florida Building Code, Energy Conservation, 6th Edition (2017) with added checkboxes - one page);

7) A completed Envelope Leakage Test Report (usually one page); and

8) If Form R405-2017 indicates anything other than default duct leakage, then a completed Form R405 Duct Leakage Test Report (usually one page).

6.5.3 Climate Data for the Performance Method

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 site location.

6.5.4 Implementing Florida "Credit" Options for the Performance Method

6.5.4.1 Radiant Barrier and IRCC

When the specified code criteria is met, apply the emissivity to the underside of the roof decking if software is capable of accurately modeling interior radiation, or if not, apply an *R-value* to the roof decking of 6.77 for a radiant barrier and 2.185 for an IRCC, based on a standard *R-value* of 0.728 with no radiant coating.

6.5.4.2 Cool Roof Option

When the specified code criteria for the tested product is met, apply the roof reflectance provided to the roof surface. Otherwise, the default *roof reflectance* (0.04, i.e., *solar absorbance* of 0.96) is to be used.

6.5.4.3 Unvented Attic Option

Normally a vented attic joined to the conditioned space ceiling should be modeled. It has ventilation to the outside determined by a user entered (and reported) ventilation rate. The software should provide an option for a sealed (unvented attic) through one or more inputs (e.g., setting attic ventilation rate to none). The software should provide the user with the option to indicate insulation at the roof deck and gables and soffits through the same or more entries. The software must model the thermal behavior of attic space correctly under each condition and any ductwork in the attic must account for the attic conditions. Unless the air leakage rate of the sealed attic is tested, a default leakage rate of sealed attic spaces should be modeled as 0.12 times the rate used for attics with ventilation opening of 1/300.

6.5.4.4 Cross Ventilation Option

Normal open window ventilation shall be modeled at 5 air changes per hour, or adjusted based on open area (see Equation 6.5-1), whenever the following conditions are met:

- Outdoor temperature is between 71°F and 75°F
- Indoor temperature remains below 75°F

Use an algorithm that only allows ventilation to begin after some time period (for example, three hours) after heating or cooling has been called or until the outdoor temperature is reasonably below the cooling set point.

If modeling is done in a simple fashion for projects achieving the criteria in the Florida Energy Code, Section R405.7.4, increase the window ventilation from 5 air changes per hour to 7 air changes per hour. The ventilation condition (windows open or closed) shall be set to not change between midnight and 6 a.m. to reflect most typical operating conditions.

6.5.4.4.1 Programs Using DOE2 to Model Cross Ventilation

In DOE2-based software, apply the undocumented method of adding a -4 to the end of the schedule to allow DOE2 to determine typical conditions prior to opening windows:

VENTING = SCHEDULETHRU DEC 31 (ALL) (1, 24) (-4).

$$FVA = \left(0.25 \times \frac{A_w}{A_{cfa}}\right) \cdot (0.85 \times DisCoef) \qquad 6.5\text{-}1$$

Where:

FVA	=	the fraction of ventilation area
A_w	=	the sum of all the window areas in the conditioned part of the home
Acfa	=	the sum of all the conditioned floor areas in the home
DisCoef	=	the coefficient of the discharge rate of air, set to 0.60 for standard ventilation, 0.25 and 0.85 are factors for window area open and screens

In DOE2 programs, the vent method should be set to use the Sherman and Grimsrud method:

(VENT-METHOD = S-G) and the max vent rate should be set to 20 (MAX-VENT-RATE = 20). If other hourly modeling engines are used, they should use the model closet to the DOE2 method described here.

When the specified Florida Energy Code, Section R405.7.4 criteria for cross ventilation credit is met, the software should increase the window ventilation discharge coefficient from 0.6 to 0.75 compared to standard window ventilation.

6.5.4.5 Whole House Fan Option

When the specified code criteria in R405.7.5 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 whole house fan unit, shall be included in the cooling energy performance when the unit runs. The software shall check to make sure the entered power use and cfm are within the range of current fans available. An air change rate of 20 air changes per hour shall be modeled during times when the whole house fan is operated or a larger value is entered by the user. The operation (on or off) of the unit shall not change from midnight to 6 a.m.

6.5.4.6 Ceiling Fan Credit

The software shall apply a 2% reduction in cooling energy use for the *proposed design* if the *proposed design* meets the criteria of section R405.7.6 of the code.

6.5.4.7 Water Heat Recovery Credit

The model should simulate a heat recovery unit. If the model is not capable of modeling a heat recovery unit, simply adjust the *Effectiveness Factor* (EF) of the main water heater using the factors in Table 6.5-1 (e.g., a 0.86 factor represents 14% savings) for annual energy use calculations.

Table 6.5-1 Heat recovery unit effectiveness factor

	North	Central	South
Effectiveness Factor	0.86	0.78	0.61

6.5.4.7.1 Programs Using DOE2 to Model Water Heat Recovery Credit

If using DOE-2, the COOL_WASTE_HEAT should be set to 0.07, the HEAT_WASTE_HEAT should be set to 0.09, and the DHW-TYPE = DESUPERHEAT.

6.5.4.8 Dedicated Heat Pump Option

To allow this option, the model has to be able to simulate a heat pump water heater. Also, the cooling dumped to the zone the heat pump water heater is located (e.g., garage) shall be added to the heat balance of that space.

6.5.4.9 Water Heating Load

The expected water heating load shall be calculated using Equation 6.5-2:

$$HW_{load} = GPD \times 8.3 \times (T_{set} - T_{main}) \cdot \frac{365}{1000} \qquad 6.5\text{-}2$$

Where:

HW_{load} = amount of heating needed in kBtu/year
GPD = gallons per day = $30 + 10 \times N_{br}$
N_{br} = the number of bedrooms in the house
T_{set} = hot water temperature set point = 120°F
T_{main} = temperature of entering water from Table 6.5-2 and 8.3 is the conversion for Btu/gallon and 365 is days in the year and 1000 is Btu/kBtu.

6.5.4.10 Solar Water Heating Option

The solar water heating effective efficiency for systems installed according to R403.5.6.2.1 shall be calculated using the following procedure.

First, calculate the effective solar efficiency:

$$ESE = SEF \cdot \left(a + (b \cdot N_{br}) + \left(c \cdot {N_{br}}^2\right)\right) \qquad 6.5\text{-}3$$

Where:

ESE = effective solar efficiency
SEF = the published Florida Solar Energy Factor
a,b,c = coefficients as given in Table 6.5-2 climate zone

Table 6.5-2 Coefficients of equation for calculating effectiveness of solar water heater

	a	B	c	Tmain (°F)
North	1.7595	-0.2767	0.0170	73.72
Central	1.9585	-0.3486	0.0212	77.88
South	2.2077	-0.4451	0.0287	82.13

The North, Central and South climate zone classification of Florida by counties for solar water heating efficiency calculation are provided in Table 6.5-3. The Florida climate zones classification map by counties came from (Kung, 2004). This classification was used when solar water heaters efficiency factors were originally developed.

Second, calculate the expected hot water heating load using Equation 6.5-2.

Third, estimate an expected standard electric resistance system annual energy use:

$$ESS_e = HW_{load} \times \frac{0.293}{EF_e} \quad 6.5\text{-}4$$

Where:

ESS_e = energy use of Standard System-Electric in kWh
HW_{load} = hot water load calculated in Equation 6.5-2
EF_e = 0.95

Fourth, calculate the expected solar system electric energy use according to Equation 6.5-5:

$$Solar_e = HW_{load} \times \frac{0.293}{ESE} \quad 6.5\text{-}5$$

Where:

$Solar_e$ = energy use of Solar System with Electric backup in kWh
HW_{load} = hot water load calculated in Equation 6.5-2
ESE = effective solar efficiency calculated in Equation 6.5-3

The fifth step is to calculate the solar fraction for electric and fossil fuel systems:

$$SE_e = \left(\frac{ESS_e - Solar_e}{ESS_e}\right) \quad 6.5\text{-}6$$

$$SF_f = SF_e \times \frac{EF_f}{0.90} \quad 6.5\text{-}7$$

Where:

SF_e = solar fraction for electric
SF_f = solar fraction for non-electric
EF_f = efficiency of the gas, propane, oil or other non-electric back up heater (fraction between 0 and 1)

This solar fraction can then be used to modify any annual detailed water heating algorithm that should be run for the non-solar backup as though there was no solar system.

$$ADHW = \left(ADHW_c - (1 - SF)\right) \quad 6.5\text{-}8$$

Where:

ADHW = annual hot water energy use for the proposed home
ADHW$_C$ = annual hot water energy use of the conventional, non-solar back-up system fully modeled
SF = the appropriate solar fraction,
SF_e or SF_f = calculated in the previous step

Table 6.5-3 Florida climate zones classification for solar water heating option

ID	County	Climate Zones	ID	County	Climate Zones
1	Alachua County	North	35	Lee County	South
2	Baker County	North	36	Leon County	North
3	Bay County	North	37	Levy County	Central
4	Bradford County	North	38	Liberty County	North
5	Brevard County	Central	39	Madison County	North
6	Broward County	South	40	Manatee County	Central
7	Calhoun County	North	41	Marion County	Central
8	Charlotte County	South	42	Martin County	South
9	Citrus County	Central	43	Miami-Dade County	South
10	Clay County	North	44	Monroe County	South
11	Collier County	South	45	Nassau County	North
12	Columbia County	North	46	Okaloosa County	North
13	DeSoto County	Central	47	Okeechobee County	Central
14	Dixie County	North	48	Orange County	Central
15	Duval County	North	49	Osceola County	Central
16	Escambia County	North	50	Palm Beach County	South
17	Flagler County	North	51	Pasco County	Central
18	Franklin County	North	52	Pinellas County	Central
19	Gadsden County	North	53	Polk County	Central
20	Gilchrist County	North	54	Putnam County	North
21	Glades County	South	55	St. Johns County	North
22	Gulf County	North	56	St. Lucie County	Central
23	Hamilton County	North	57	Santa Rosa County	North
24	Hardee County	Central	58	Sarasota County	Central
25	Hendry County	South	59	Seminole County	Central
26	Hernando County	Central	60	Sumter County	Central
27	Highlands County	Central	61	Suwannee County	North
28	Hillsborough County	Central	62	Taylor County	North
29	Holmes County	North	63	Union County	North
30	Indian River County	Central	64	Volusia County	Central
31	Jackson County	North	65	Wakulla County	North
32	Jefferson County	North	66	Walton County	North
33	Lafayette County	North	67	Washington County	North
34	Lake County	Central			

6.5.4.11 Multiple Heating Systems

The software must be capable of modeling homes that use dual fuels for space heating (for example natural gas furnace in one part of the home and an electric heat pump in another part), applying the appropriate reference heating system to the *standard reference design* home for that portion of the home. Where two or more systems of the same fuel and system type are installed with different levels of efficiency serving different parts of the house, a capacity-weighted performance rating may be used to determine compliance. Alternatively, the area served by each system may be modeled separately.

6.5.4.12 Multiple Cooling Systems

Where two or more systems of the same fuel and system type are installed with different levels of efficiency serving different parts of the house, a capacity-weighted performance rating may be used to determine compliance. Alternatively the area served by each system may be modeled separately.

6.5.4.13 Multiple Water Heating Systems

Where two or more water heating systems are installed with different levels of efficiency, a single efficiency weighted by bedrooms served may be calculated for determining compliance with this code. Alternatively, the area served by each system may be modeled separately.

6.5.5 Mechanical Ventilation

The software shall calculate the ASHRAE 62.2 ventilation requirement and not allow the home to pass the code if the mechanical ventilation value is exceeded, as stated in the 2017 Florida Building Code, Energy Conservation, 6th Edition Section R403.6.2 bullet item 1. The software shall account for the energy use of the mechanical ventilation fan itself and model the loads from the air brought into the house due to mechanical ventilation. The software shall check to make sure the entered power use and cfm entered are within the range of current ventilation fans available.

6.5.6 Residential Energy Performance Method Testing

This section specifies required tests that software designated as doing residential performance method compliance software shall conduct and submit.

Compliance software programs shall account for the energy performance effects of all of the characteristics described in section R405 of the Code.

The modeling procedures and assumptions described in this chapter apply to both the *standard reference design* and *proposed design*. The requirements for the *standard reference design* include those that the compliance software program shall apply to new features, altered existing features, unchanged existing features, or all of the above.

6.5.6.1 Residential Accuracy Test Overview

A specific version of HERS BESTEST for Florida was developed in request to DOE by the Florida Solar Energy Center (FSEC). In its request, FSEC noted that the Florida Building Energy– Efficiency Ratings Act of 1993 requires that Florida's rating system "be compatible with standard federal rating systems...where applicable...." The relevant proposed federal guidelines (DOE 10 CFR Part 437) will require that energy analysis tools used for energy ratings are tested according to the HERS BESTEST procedure.

The type of software testing used in this manual is based on inter-model comparisons and is one

portion of an overall validation methodology that was first developed by National Renewable Energy Laboratory (NREL) in 1983 (Judkoff et al., 1983/2008). The method has been further refined since then by NREL and others (Judkoff and Neymark 2006).

Comparative testing, as applied in the HERS Building Energy Simulation Test (HERS BESTEST) (Judkoff and Neymark 1995) and Florida HERS BESTEST (Judkoff and Neymark 1997) methods, includes a set of public domain reference programs that have already been subjected to extensive analytical, empirical, and inter-model testing.

6.5.6.2 Reference Test Cases

The software verification test suite found in Section 3.2 of the RESNET document "Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools" dated March 2014 shall be utilized to verify the accuracy of the program.

- Tier 1 of the "ASHRAE Standard 140-2011, Class II, Tier 1 building loads tests" and Florida HERS BESTEST as described below.
- The Florida Energy Code Reference Home AutoGen Tests shall be used to verify the ability of the software tool to automatically generate the Florida Building Code's *standard reference design* home. The test document is in Appendix R-5 of this manual.
- HVAC tests – These tests verify the accuracy and consistency with which software tools predict the performance of HVAC equipment, including furnaces, air conditioners and air source heat pumps.
- Duct distribution system efficiency tests – These tests verify the accuracy with which software tools calculate air distribution system losses. ASHRAE Standard 152 results are used as the basis of acceptance criteria for this test suite.
- Hot water system performance tests – these tests determine the ability of the software to accurately predict hot water system energy use.
- The Florida e-Ratio Method tests are intended to determine the ability of software compliance tools to accurately calculate the Florida Energy Code compliance e-Ratio given a set of *Standard Reference Design End Use Loads* (REUL), *Standard Reference Design End Use Energy Consumptions* (EC_r), *Proposed Home End Use Energy Consumptions* (EC_x), and the applicable manufacturer's equipment performance ratings (MEPR). The e-Ratio calculation procedure is given in *Florida Building Code, Energy Conservation, 6th Edition (2017) Appendix RC.*

The Tier 1 HERS BESTEST and Florida HERS BESTEST software verification test cases are found in the following documents:

- "Procedures for Verification of RESNET Accredited HERS Software Tools RESNET Publication No. 002-15" [includes ASHRAE Standard 140-2011, Class II, Tier 1 building loads tests] RESNET, July 2015. http://www.resnet.us/programs/Revised_RESNET_Pub_002-15.pdf.
- NREL/TP-472-7332a "Home Energy Rating System Building Energy Simulation Test (HERS BESTEST)," Volume 1 Tier 1 and Tier 2 Tests User's Manual, November 1995, Judkoff, Ron and Joel Neymark. http://www.nrel.gov/docs/legosti/fy96/7332a.pdf.
- NREL/TP-550-23124a "Home Energy Rating System Building Energy Simulation Test for Florida (Florida-HERS BESTEST)," Volume 1 Tier 1 and Tier 2 Tests User's

Manual, August 1997, Judkoff, Ron and Joel Neymark.
http://www.nrel.gov/docs/legosti/fy97/23124a.pdf.

6.5.7 Testing Procedures

Using the test cases identified in the reference documents in Section 6.5.6.2 above; simulate the cases as outlined in the reference documents. Record the results using the MS Excel spreadsheets listed in Table R5.3.1 and provided by the Commission.

A Software Vendor shall submit test results for Las Vegas, NV and Colorado Springs, CO (ASHRAE Standard 140) and for Orlando, FL (Florida - HERS BESTEST). The source and data of the reference test results used for comparison must be submitted with the application. Acceptance criteria for the Florida Energy Code Reference Home AutoGen Tests are provided in Table R5.3.1 in Appendix R-5.

Results Forms in MS Excel Spreadsheet format are available on the Florida Building Commission's website, www.floridabuilding.org for the verification tests specified in Section 6.5.6.2 above. Table 6.5-4 summarizes results spreadsheet forms and test types.

Table 6.5-4 Performance method software evaluation results

Results Forms	Test Type
ASHRAE-Std-140_results-form.xlsx	ASHARE Std 140-2011 Class II, Tier 1 Building Loads Tests, RESNET 2014
FL-HERS_BESTEST_results-form.xlsx	Florida HERS BESTEST, Judkoff, R. and J. Neymark 1997
Florida_AutoGen_results-form.xlsx	2017 Florida Energy Code Reference Home AutoGen Tests, See Appendix R-5
HVAC_results-form.xlsx	HVAC Tests, Section 4.3, RESNET 2014
DSE_results-form.xlsx	Duct Distribution System Efficiency (DSE), Section 4.4, RESNET 2014
DHW_results-form.xlsx	Hot Water System Performance Tests, Section 4.5 RESNET 2014
FL_eRatio_results.xlsx	Florida e-Ratio Test, See Appendix R-5

A software tool is considered as successfully passing when its results fall inside the maximum and minimum ranges provided by these results forms.

References

ANSI/ASHRAE Standard 140-2011. *Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs*. (2011). Atlanta, GA: American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

California Energy Commission's Residential Alternative Calculation Method (AC M) Approval Manual, 2008 Building Efficiency Standards, CEC-400-2008-002-CMF. Accessed June 2014: http://www.energy.ca.gov/2008publications/CEC-400-2008-002/CEC-400-2008-002-CMF.PDF

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RESNET .2014. "Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools. RESNET Publication No. 003-2014" [includes ASHRAE Standard 140-2011, Class II, Tier 1 building loads tests] RESNET. Accessed May 2017. http://www.resnet.us/professional/programs/RESNET_Pub_003-13_final.pdf.

State of Florida Building Commission, 2017 Florida Building Codes, Energy Conservation. Accessed June 2017: http://www.floridabuilding.org/c/default.aspx.

Kung, L. 2004. Instructional Supplemental Manual to Florida Energy Code, 2004. Division of Emergency Management, Florida Department of Community Affairs. http://www.floridabuilding.org/fbc/publications/energy/RIMch1-2_04.pdf.

Appendix R-5 Residential Performance Compliance

The software verification test suite found in Section 3.2 of the RESNET document "Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools" dated March 2014 shall be utilized to verify the accuracy of the program. Also, Tier 1 of the "ASHRAE Standard 140-2011, Class II, Tier 1 building loads tests" and Florida HERS BESTEST as described below. The Florida Energy Code Reference Home AutoGen Tests described in Appendix section R5.2 and R5.3 shall be used to verify the ability of the software tool to automatically generate the Florida Building Code's *standard reference design* home.

HVAC tests – The vendor shall also conduct HVAC tests that verify the accuracy and consistency with which software tools predict the performance of HVAC equipment, including furnaces, air conditioners and air source heat pumps. Duct distribution system efficiency tests will verify the accuracy with which software tools calculate air distribution system losses.

ASHRAE Standard 152 results are used as the basis of acceptance criteria for this test suite. Hot water system performance tests determine the ability of the software to accurately predict hot water system energy use. The Florida e-Ratio Method tests described in Appendix section R5.4 are intended to determine the ability of software compliance tools to accurately calculate the Florida Energy Code compliance e-Ratio given a set of *Standard Reference Design End Use Loads* (REUL), *Standard Reference Design End Use Energy Consumptions* (EC_r), *Proposed Home End Use Energy Consumptions* (EC_x) and the applicable Manufacturer's Equipment Performance Ratings (MEPR). The e-Ratio calculation procedure is given in 2017 Florida Building Code, Energy Conservation 6th Edition Appendix RC.

Using the test cases identified, simulate the cases as outlined in the reference documents. Record the results using the MS Excel spreadsheets listed in Table R-1 and provided by the Commission. A Software Vendor shall submit test results for Las Vegas, NV and Colorado Springs, CO (ASHRAE Standard 140) and for Orlando, FL (Florida- HERS BESTEST). The source and data of the reference test results used for comparison must be submitted with the application. Results Forms in MS Excel Spreadsheet listed in Table R-1 are available on the Florida Building Commission's website, www.floridabuilding.org for the verification tests specified.

Table R-1 Performance method software evaluation results

Results Forms	Test Type
ASHRAE-Std-140_Results-Form.xlsx	ASHARE Std 140-2011 Class II, Tier 1 Building Loads Tests, RESNET 2014
FL-HERS_BESTEST_results-form.xlsx	Florida HERS BESTEST, Judkoff, R. and J. Neymark 1997
Florida_AutoGen_results-form.xlsx	2017 Florida Energy Code Reference Home AutoGen Tests, See Appendix R-5
HVAC_results-form.xlsx	HVAC Tests, Section 4.3, RESNET 2014
DSE_results-form.xlsx	Duct Distribution System Efficiency (DSE), Section 4.4, RESNET 2014
DHW_results-form.xlsx	Hot Water System Performance Tests, Section 4.5 RESNET 2014
FL_e-ratio_results.xlsx	Florida e-Ratio Test, See Appendix R-5

R5.1 Minimum Test 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. If the reports required in the Technical Assistance Manual do not already include them, at a minimum, software tools applying for accreditation must report the following values for the *standard reference design*:

- 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.
- Overall solar-heat gain coefficient (SHGCo)[1] of the windows during heating.
- Overall solar-heat gain coefficient (SHGCo) of the windows during cooling.
- Wall solar absorptance and infrared emittance
- Roof solar absorptance and infrared emittance
- Total internal gains (including 20% latent) to the home (Btu/day)
- ACH50 for the home, as appropriate
- Attic net free ventilation area (ft^2)
- Crawlspace net free ventilation area (ft^2), if appropriate
- Exposed masonry floor area and carpet and pad R-value, if appropriate
- Heating system labeled ratings, including AFUE, COP, or HSPF, as appropriate.
- Cooling system labeled ratings, including SEER or EER, as appropriate.
- Thermostat schedule for heating and cooling

[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.

- 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}).[2]
- Mechanical ventilation kWh/yr., if appropriate

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*.

R5.2 Auto-generation Test Case Descriptions

Test Case1. Case L100 building configured as specified in ASHRAE 140-2011, Section 7, Class II Test Procedures, located in Tallahassee, FL, including a total of 3 bedrooms and the following mechanical equipment: gas furnace with AFUE = 82%, central air conditioning with SEER =14.0 and tankless gas water heater with EF = 0.83.

Test Case 2. 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 = 9.0 and SEER = 16.0 and 52 gallon heat pump water heater with EF = 2.20.

Test Case 3. Case L304 in Miami, configured as specified in the ASHRAE 140-2011, Section 7, Class II Test 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 and 40 gallon electric water heater with EF = 0.92.

Test Case 4. Case L324 configured as specified as in ASHRAE 140-2011, Section 7, Class II Test 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 and a 40 gallon gas water heater with EF = 0.67.

Test Case 5. Recreate or store the *standard reference design* created in Tests 1 through 4 as *proposed design* and simulate and evaluate them.

R5.3 Acceptance Criteria R5.3.1 Test Cases 1 - 4

For test cases 1 through 4 the values contained in Table R5.3.1 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.

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

Table R5.3.1 Acceptance Criteria for Test Cases 1 – 4

Standard Reference Design Building Component	Test 1	Test 2	Test 3	Test 4
Above-grade walls (Uo)	0.084	0.084	0.084	0.084
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
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	0.030	0.035	0.030
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	0.40	0.40	0.50	0.40
North window area* (ft^2)	57.71	57.71	57.71	50.02
South window area* (ft^2)	57.71	57.71	57.71	50.02
East window area* ft2)	57.71	57.71	57.71	50.02
West window area* (ft2)	57.71	57.71	57.71	50.02
Window U-Factor	0.40	0.40	0.50	0.40
Window SHGCo (heating)	0.217	0.217	0.217	0.217
Window SHGCo (cooling)	0.217	0.217	0.217	0.217
ACH50	7.0	7.0	7.0	7.0
Internal gains* (Btu/day)	66,840	66,840	62,736	107,572
Water heater gallons per day	60	60	50	70
Water heater set point temperature	120 F	120 F	120 F	120 F
Water heater efficiency rating	EF = 0.62	EF = 0.94	EF = 0.95	EF = 0.62
Labeled heating system efficiency rating	AFUE = 80%	HSPF = 8.2	HSPF = 8.2	AFUE = 80%
Labeled cooling system efficiency rating	SEER = 14.0	SEER = 14.0	SEER = 14.0	SEER = 14.0
Air Distribution System Efficiency	0.88	0.88	0.88	0.88
Thermostat Type	Manual	Manual	Manual	Manual
Heating thermostat settings	72 F (all hours)	72 F (all hours)	72 F (all hours)	72 F (all hours)
Cooling thermostat settings	75 F (all hours)	75 F (all hours)	75 F (all hours)	75 F (all hours)

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 Appendix RC 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 as shown in Table R5.3.2. 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.

Table R5.3.2 e-Ratio Test Acceptance Criteria for Test Cases 1 – 4

Standard Reference Design Building e-Ratio Test	Test 1	Test 2	Test 3	Test 4
e-Ratio Range	0.995 – 1.005	0.995 – 1.005	0.995 – 1.005	0.995 – 1.005

R5.4 Florida e-Ratio Method Tests

The Florida e-Ratio Method tests are intended to determine the ability of software compliance tools to accurately calculate the Florida Energy Code compliance *e-Ratio* given a set of *Standard Reference Design End Use Loads* (REUL), *Standard Reference Design End Use Energy Consumptions* (EC_r), *Proposed Home End Use Energy Consumptions* (EC_x) and the applicable Manufacturer's Equipment Performance Ratings (MEPR).

5.4.1. Minimum Reporting Requirements. At a minimum, all software tools must report the following values:

5.4.1.1. Standard Reference Design End Use Loads (REUL) to the nearest 0.1 MBtu
- i. Heating (MBtu)
- ii. Cooling (MBtu)
- iii. Hot water (MBtu)

5.4.1.2. Standard Reference Design End Use Energy Consumption (EC_r) to the nearest 0.1 MBtu
- i. Heating (MBtu)
- ii. Cooling (MBtu)
- iii. Hot Water (MBtu)

5.4.1.3. Proposed Home End Use Energy Consumption (EC_x) to the nearest 0.1 MBtu
- i. Heating (MBtu)
- ii. Cooling (MBtu)
- iii. Hot Water (MBtu)

5.4.1.4. Manufacturer's Equipment Performance Ratings (MEPR)
- i. Heating system (HSPF, COP, AFUE, or CAFUE)
- ii. Cooling system (SEER, EER or COP)
- iii. Hot Water system (EF or CEF)

5.4.2. Test Description. Florida Energy Code compliance for the following cases, located in Orlando, FL, shall be computed, reporting the values listed above.

5.4.2.1 Case L130A-01: Using the HERS BESTEST L130 case, create a 3-bedroom Proposed Home containing the following equipment:
- i. Heating system – electric HP with HSPF = 7.7
- ii. Cooling system – electric A/C with SEER = 13.0
- iii. Hot Water – 40 gal electric with EF = 0.92
- iv. All the equipment are to be located inside the conditioned space and heating and air conditioning ductwork are to be located in the conditioned space and have zero (0) air leakage.

5.4.2.2 Case L130A-02: Identical to Case L130A-01 except that the hot water heater is changed to a tankless natural gas with EF = 0.82.

5.4.2.3 Case L130A-03: Identical to Case L130A-01 except that the space heating system is changed to a natural gas furnace with AFUE = 78%.

5.4.2.4 Case L130A-04: Identical to Case L130A-01 except that the space heating system is changed to a high efficiency HP with SEER=17 and HSPF = 10.

5.4.2.5 Case L130A-05: Identical to Case L130A-01 except that the space heating system is changed to a high efficiency natural gas furnace with AFUE = 96%.

5.4.3. Acceptance Criteria. Using the calculation spreadsheet provided by the Florida Building Commission (FL_eRatio-results_form.xlsx), software tools shall demonstrate the following:

5.4.3.1 That reported *Standard Reference Design End Use Loads* (REULs) vary by less than 0.2% across all cases.

5.4.3.2 That the difference between the *e-Ratios* calculated by the software tool and the *e-Ratios* calculated by the results spreadsheet provided by the Florida Building Commission is less than 0.5% for all cases.

R5.5 Performance Reports

For each test case the following software produced reports are required (See section R5.7 for sample formats) in addition to any test specific reports mentioned above:

1) A Form R405 as described below
2) Energy Performance Level (EPL) Display Card
3) Mandatory requirements

Also, provide for one house only, the following reports:

4) A checklist of reports required and estimated pages
5) A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the 2017 Florida Building Code, Energy Conservation with added checkboxes - one page)
6) A completed Envelope Leakage Test Report, and
7) A completed Duct Leakage Test Report

R5.6 Software Output Report Requirements

In accordance with Section R405.4 of the Florida Building Code, Energy Conservation, the printout from computer programs approved by the Florida Building Commission for use as Energy Code compliance Form R405-2017 for residential applications shall contain all information required to determine Energy Code compliance for low-rise residential buildings, to include but not be limited to the following information. Compliance software program printout Form R405 should be consistent with the format described below. Sample associated forms for a checklist of forms expected; energy performance level display card, mandatory requirements, air barrier and insulation inspection component criteria checklist, air infiltration and duct testing are provided in Appendix R5.7.

A.1 An Administrative page of the printout should contain the following information:

- Form title and headings:
  - Form R405-2017
  - Florida Building Code, Energy Conservation
  - Residential Simulated Performance Alternative
- Project information box

- Project name
- Street address/city/state/zip
- Owner
- Design Location
- Builder Name
- Permit Office
- Jurisdiction
- County

- Summary of building components and features
  - New construction or existing
  - Single or multiple-family
  - Number of units should be 1
  - Number of bedrooms
  - Whether it is a worst-case calculation
  - Window U-factor, SHGC and area for all windows in the building. Highest U-factor and SHGC.
  - Floor type, insulation R-value and area (or perimeter if slab)
  - Wall type, insulation R-value and area by type of wall
  - Ceiling types, insulation R-value and area by type of ceiling
  - Duct location, R-value and type for supply, return and air handler
  - Cooling system type, capacity and efficiency
  - Heating system type, capacity and efficiency
  - Hot water system type, capacity and efficiency
  - Any conservation credits provided in the calculation per Section R405.7 of the Energy Code.

- Pass/Fail box
  - Percent glass to conditioned floor area
  - Total *proposed design* loads
  - Total *standard reference design* loads
  - Whether the building Passes or Fails Energy Code compliance

- Compliance certification box
  - Statement, signature and date by the individual completing the compliance report as follows:
    - Statement: "I hereby certify that the plans and specifications covered by this calculation are in compliance with the *Florida Building Code, Energy Conservation*."
      - PREPARED BY:_____
      - DATE:_____
  - Statement, signature and date by the owner of the building
    - Statement: "I hereby certify that this building, as designed, is in compliance with the *Florida Building Code, Energy Conservation*."
      - OWNER/AGENT:_____
      - DATE:_____

- Statement, signature and date by the code official reviewing the plans and compliance report:
  - Statement: "Review of the plans and specifications covered by this calculation indicates compliance with the *Florida Building Code, Energy Conservation*. Before construction is completed, this building will be inspected for compliance with Section 553.908, *Florida Statutes*."
    - BUILDING OFFICIAL:_____
    - DATE:_____

- Name and version of the compliance software tool

A.2 Description of the building. Input Data to be consistent with the plans may include, but not be limited to:

- Project information
- Climate zone information by design location
- Floor type, materials, area or perimeter, R-value
- Roof type, materials area, solar absorptance, testing radiant barrier system, pitch, other relevant information as required by Energy Code
- Ceiling type, materials, R-value, area, truss type, framing fraction
- Wall type, orientation, whether it is exterior or adjacent, R-value, area, sheathing, framing fraction solar absorptance
- Door type, orientation, U-factor, area
- Window type(s), orientation, U-factor, SHGC, area, overhang, separation, interior shading, screening or storm windows
- Infiltration of the building (SLA, CFM, ACH, ELA, EqLA) and forced ventilation of the building (supply CFM, exhaust CFM, run time, fan Watts)
- Garage area, insulation R-value if conditioned
- Cooling system type, efficiency, capacity, air flow, SHR, other relevant information
- Heating system type, efficiency, capacity, other relevant information
- Hot water system type, efficiency, capacity, any Energy Code-required credit requirements
- Duct and air handler location, R-value, area, leakage type and percent, Q_n, RLF
- Thermostat type and setting
- Ceiling fan use, if applicable

A.3 Energy Code Compliance Checklist may include, but not be limited to:

- Form name, compliance method
- Address and permit number of building permitted
- Infiltration reduction compliance summary checklist by component, Energy Code section, Energy Code requirements for said component and a space to be checked for Energy Code compliance for the following components:
  - Exterior windows & doors
  - Exterior & adjacent walls
  - Floors
  - Ceilings
  - Recessed lighting fixtures

- Multiple-story house requirements
- Any other infiltration requirements
- Other prescriptive measures checklist by component, Energy Code section and summary of requirement(s)
- Water heaters requirements

R5.7 Sample Performance Method Reports

The following reports are samples of reports expected. Although formats from software may vary, large variance is not recommended for ease of building officials.

FORM R405-2017

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
Simulated Performance Alternative (Performance) Method

Applications for compliance with the 2017 Florida Building Code, Energy Conservation via the residential Simulated Performance Method shall include:

- ☐ *This checklist*
- ☐ *A Form R405 report that documents that the Proposed Design complies with Section R405.3 of the Florida Energy Code. This form shall include a summary page indicating home address, e-ratio and the pass or fail status along with summary areas and types of components, whether the home was simulated as a worst-case orientation, name and version of the compliance software tool, name of individual completing the compliance report (one page) and an input summary checklist that can be used for field verification (usually four pages/may be greater).*
- ☐ *Energy Performance Level (EPL) Display Card (one page)*
- ☐ *HVAC system sizing and selection based on ACCA Manual S or per exceptions provided in Section R403.7*
- ☐ *Mandatory Requirements (five pages)*

Required prior to CO for the Performance Method:

- ☐ *Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 - one page)*
- ☐ *A completed Envelope Leakage Test Report (usually one page)*
- ☐ *If Form R405 duct leakage type indicates anything other than "default leakage", then a completed Form R405 Duct Leakage Test Report (usually one page)*

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FORM R405-2017

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Florida Department of Business and Professional Regulation - Residential Performance Method

Project Name:	Sample Addition	Builder Name:	BUILDER
Street:	123 Main Street	Permit Office:	Orlando
City, State, Zip:	Orlando , FL , 32922	Permit Number:	1234
Owner:	OWNER	Jurisdiction:	Orange County
Design Location:	FL, Orlando	County:	Orange (Florida Climate Zone 2)

1. New construction or existing	Addition
2. Single family or multiple family	Single-family
3. Number of units, if multiple family	1
4. Number of Bedrooms(Bdrms In Addition)	3(3)
5. Is this a worst case?	No
6. Conditioned floor area above grade (ft²)	500
Conditioned floor area below grade (ft²)	0

7. Windows(60.0 sqft.)	Description	Area
a. U-Factor:	Dbl, U=0.40	60.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	N/A	ft²
SHGC:		
c. U-Factor:	N/A	ft²
SHGC:		
d. U-Factor:	N/A	ft²
SHGC:		
Area Weighted Average Overhang Depth:		1.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types (500.0 sqft.)	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	500.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

9. Wall Types (360.0 sqft.)	Insulation	Area
a. Concrete Block - Int Insul, Exterior	R=6.0	360.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types (500.0 sqft.)	Insulation	Area
a. Under Attic (Vented)	R=30.0	500.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Attic, Ret: Attic, AH: Main	8	100

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	6.8	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	5.8	HSPF:8.20

14. Hot water systems - Replacement equipment
a. Electric — Cap: 40 gallons, EF: 0.970
b. Conservation features
None

15. Credits: None

Glass/Floor Area: 0.120

Total Proposed Modified Loads: XX.XX [calculated]
Total Baseline Loads: XX.XX [calculated]

PASS

I hereby certify that the plans and specifications covered by this calculation are in compliance with the Florida Energy Code.

PREPARED BY: _____
DATE: _____

I hereby certify that this building, as designed, is in compliance with the Florida Energy Code.

OWNER/AGENT: _____
DATE: _____

Review of the plans and specifications covered by this calculation indicates compliance with the Florida Energy Code. Before construction is completed this building will be inspected for compliance with Section 553.908 Florida Statutes.

BUILDING OFFICIAL: _____
DATE: _____

- **Compliance requires certification by the air handler unit manufacturer that the air handler enclosure qualifies as certified factory-sealed in accordance with R403.3.2.1.**
- **Compliance requires an Air Barrier and Insulation Inspection Checklist in accordance with R402.4.1.1 and if the addition is equal to or greater than 85 percent of the building thermal envelope it requires an envelope leakage test report with envelope leakage no greater than 7.0 ACH50 (R402.4.1.2).**
- **Compliance requires a roof absorptance test in accordance with R405.7.2**
- **Compliance with a proposed duct leakage Qn requires a Duct Leakage Test Report confirming duct leakage to outdoors, tested in accordance with ANSI/RESNET/ICC 380, is not greater than 0.030 Qn for whole house.**

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FORM R405-2017

PROJECT

Title:	Sample Addition	Bedrooms:	3	Address Type:	Street Address
Building Type:	User	Conditioned Area:	500	Lot #	
Owner:	OWNER	Total Stories:	1	Block/SubDivision:	
# of Units:	1	Worst Case:	No	PlatBook:	
Builder Name:	BUILDER	Rotate Angle:	0	Street:	123 Main Street
Permit Office:	Orlando	Cross Ventilation:		County:	Orange
Jurisdiction:	Orange County	Whole House Fan:		City, State, Zip:	Orlando , FL , 32922
Family Type:	Single-family				
New/Existing:	Addition				
Comment:					

CLIMATE

√	Design Location	TMY Site	Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	FL, Orlando	FL_ORLANDO_INTL_AR	2	41	91	70	75	526	44	Medium

BLOCKS

Number	Name	Area	Volume
1	Block1	500	4000

SPACES

Number	Name	Area	Volume	Kitchen	Occupants	Bedrooms	Infil ID	Finished	Cooled	Heated
1	Main	500	4000	Yes	4	3	1	Yes	Yes	Yes

FLOORS

√	#	Floor Type	Space	Perimeter	R-Value	Area		Tile	Wood	Carpet
_____	1	Slab-On-Grade Edge Insulatio	Main	45 ft	0	500 ft²	----	1	0	0

ROOF

√	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	SA Tested	Emitt	Emitt Tested	Deck Insul.	Pitch (deg)
_____	1	Hip	Composition shingles	542 ft²	0 ft²	Light	0.75	Yes	0.9	No	0	22.6

ATTIC

√	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
_____	1	Full attic	Vented	300	500 ft²	N	N

CEILING

√	#	Ceiling Type	Space	R-Value	Ins Type	Area	Framing Frac	Truss Type
_____	1	Under Attic (Vented)	Main	30	Blown	500 ft²	0.11	Wood

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FORM R405-2017

WALLS

√	#	Ornt	Adjacent To	Wall Type	Space	Cavity R-Value	Width Ft	Width In	Height Ft	Height In	Area	Sheathing R-Value	Framing Fraction	Solar Absor	Below Grade%
___	1	SE	Exterior	Concrete Block - Int Insul	Main	6	20		8		160.0 ft²		0	0.6	0
___	2	SW	Exterior	Concrete Block - Int Insul	Main	6	25		8		200.0 ft²		0	0.6	0

DOORS

√	#	Ornt	Door Type	Space	Storms	U-Value	Width Ft	Width In	Height Ft	Height In	Area
_____	1	SE	Wood	Main	None	.2	2.8		6.7		18.8 ft²

WINDOWS

Orientation shown is the entered, Proposed orientation.

√	#	Ornt	Wall ID	Frame	Panes	NFRC	U-Factor	SHGC	Area	Overhang Depth	Overhang Separation	Int Shade	Screening
_____	1	SE	1	Metal	Low-E Double	Yes	0.4	0.25	30.0 ft²	1 ft 0 in	1 ft 0 in	HERS 2006	None
_____	2	SW	2	Metal	Low-E Double	Yes	0.4	0.25	30.0 ft²	1 ft 0 in	1 ft 0 in	HERS 2006	None

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50
1	Wholehouse	Proposed ACH(50)	.000254	333.3	18.3	34.42	.1855	5

HEATING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Block	Ducts
_____	1	Electric Heat Pump	None	HSPF:8.2	5.84 kBtu/hr	1	sys#1

COOLING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Block	Ducts
_____	1	Central Unit	None	SEER: 14	6.78 kBtu/hr	210 cfm	0.75	1	sys#1

HOT WATER SYSTEM

√	#	System Type	SubType	Location	EF	Cap	Use	SetPnt	Conservation
_____	1	Electric	None	Main	0.97	40 gal	60 gal	120 deg	None

SOLAR HOT WATER SYSTEM

√	FSEC Cert #	Company Name	System Model #	Collector Model #	Collector Area	Storage Volume	FEF
_____	None	None			ft²		

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FORM R405-2017

DUCTS

√	#	Supply Location	Supply R-Value	Supply Area	Return Location	Return Area	Leakage Type	Air Handler	CFM 25 TOT	CFM25 OUT	QN	RLF	HVAC # Heat	HVAC # Cool
_____	1	Attic	8	100 ft²	Attic	25 ft²	Proposed Qn	Main	--- cfm	15.0 cfm	0.03	0.60	1	1

TEMPERATURES

Programable Thermostat: N

Ceiling Fans:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cooling	[ ]	[ ]	[ ]	[ ]	[ ]	[X]	[X]	[X]	[X]	[ ]	[ ]	[ ]
Heating	[X]	[X]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[X]	[X]
Venting	[ ]	[ ]	[X]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[X]	[X]	[ ]

Thermostat Schedule: HERS 2006 Reference

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68
Heating (WEH)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68

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FORM R405-2017

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [calculated]

The lower the EnergyPerformance Index, the more efficient the home.

123 Main Street, Orlando, FL, 32922

1. New construction or existing		Addition
2. Single family or multiple family		Single-family
3. Number of units, if multiple family		1
4. Number of Bedrooms		3(3)
5. Is this a worst case?		No
6. Conditioned floor area (ft²)		500
7. Windows**	Description	Area
a. U-Factor: SHGC:	Dbl, U=0.40 SHGC=0.25	60.00 ft²
b. U-Factor: SHGC:	N/A	ft²
c. U-Factor: SHGC:	N/A	ft²
d. U-Factor: SHGC:	N/A	ft²
Area Weighted Average Overhang Depth:		1.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	500.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

9. Wall Types	Insulation	Area
a. Concrete Block - Int Insul, Exterior	R=6.0	360.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types	Insulation	Area
a. Under Attic (Vented)	R=30.0	500.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Attic, Ret: Attic, AH: Main	8	100

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	6.8	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	5.8	HSPF:8.20

14. Hot water systems - Replacement equipment
a. Electric — Cap: 40 gallons, EF: 0.97
b. Conservation features
None

15. Credits: None

I certify that this home has complied with the Florida Energy Efficiency Code for Building Construction through the above energy saving features which will be installed (or exceeded) in this home before final inspection. Otherwise, a new EPL Display Card will be completed based on installed Code compliant features.

Builder Signature: _____ Date: _____

Address of New Home: _____ City/FL Zip: _____

*Note: This is not a Building Energy Rating. If your Index is below 70, your home may qualify for energy efficient mortgage (EEM) incentives if you obtain a Florida EnergyGauge Rating. Contact the EnergyGauge Hotline at (321) 638-1492 or see the EnergyGauge web site at energygauge.com for information and a list of certified Raters. For information about the Florida Building Code, Energy Conservation, contact the Florida Building Commission's support staff.

**Label required by Section R303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

MM/DD/YY HH:MM [AM/PM] ** Software Title and Version Here ** - Section R405.4.1 Compliant Software Page 1 of 1

FORM R405-2017

Florida Department of Business and Professional Regulations
Residential Whole Building Performance Method

ADDRESS: 123 Main Street
Orlando, FL, 32922

PERMIT #:

MANDATORY REQUIREMENTS - See individual code sections for full details.

SECTION R401 GENERAL

R401.2 Compliance. Projects shall comply with one of the following:

2. Section R405 and the provisions of Sections R401 through R404 labeled "Mandatory."

R401.3 Energy performance level (EPL) display card (Mandatory). The building official shall require that an energy performance level (EPL) display card be completed and certified by the builder to be accurate and correct before final approval of the building for occupancy. Florida law (Section 553.9085, *Florida Statutes*) requires the EPL display card to be included as an addendum to each sales contract for both presold and nonpresold residential buildings. The EPL display card contains information indicating the energy performance level and efficiencies of components installed in a dwelling unit. The building official shall verify that the EPL display card completed and signed by the builder accurately reflects the plans and specifications submitted to demonstrate code compliance for the building. A copy of the EPL display card can be found in Appendix RD.

R402.4 Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

Exception: Dwelling units of R-2 Occupancies and multiple attached single family dwellings shall be permitted to comply with Section C402.5.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation. The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding seven air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380 and reported at a pressure of 0.2 inch w.g. (50 pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), *Florida Statutes,* or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i) or an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

Exception: Testing is not required for additions, alterations, renovations, or repairs, of the building thermal envelope of existing buildings in which the new construction is less than 85 percent of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

R402.4.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace. Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907.

R402.4.3 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and *listed* and *labeled* by the manufacturer.

Exception: Site-built windows, skylights and doors.

FORM R405-2017

R402.4.4 Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall *R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the *Florida Building Code, Residential*.

R402.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and *labeled* as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

SECTION R403 SYSTEMS

R403.1 Controls.

R403.1.1 Thermostat provision (Mandatory). At least one thermostat shall be provided for each separate heating and cooling system.

R403.1.3 Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

R403.3.2 Sealing (Mandatory). All ducts, air handlers, filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts or plenum chambers, shall be constructed and sealed in accordance with Section C403.2.9.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria below.

Duct tightness shall be verified by testing in accordance with ANSI/RESNET/ICC 380 by either individuals as defined in Section 553.993(5) or (7), *Florida Statutes*, or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i), *Florida Statutes*, to be "substantially leak free" in accordance with Section R403.3.3.

R403.3.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

R403.3.3 Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. All registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.
2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.5 Building cavities (Mandatory). Building framing cavities shall not be used as ducts or plenums.

R403.4 Mechanical system piping insulation (Mandatory). Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

R403.4.1 Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

R403.5.1 Heated water circulation and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily accessible.

R403.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosiphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

R403.5.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

R403.5.5 Heat traps (Mandatory). Storage water heaters not equipped with integral heat traps and having vertical pipe risers shall have heat traps installed on both the inlets and outlets. External heat traps shall consist of either a commercially available heat trap or a downward and upward bend of at least 3 ½ inches (89 mm) in the hot water distribution line and cold water line located as close as possible to the storage tank.

R403.5.6 Water heater efficiencies (Mandatory).

R403.5.6.1 Storage water heater temperature controls.

403.5.6.1.1 Automatic controls. Service water-heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. The minimum temperature setting range shall be from 100°F to 140°F (38°C to 60°C).

R403.5.6.1.2 Shut down. A separate switch or a clearly marked circuit breaker shall be provided to permit the power supplied to electric service systems to be turned off. A separate valve shall be provided to permit the energy supplied to the main burner(s) of combustion types of service water-heating systems to be turned off.

R403.5.6.2 Water-heating equipment. Water-heating equipment installed in residential units shall meet the minimum efficiencies of Table C404.2 in Chapter 4 of the *Florida Building Code, Energy Conservation,* Commercial Provisions, for the type of equipment installed. Equipment used to provide heating functions as part of a combination system shall satisfy all stated requirements for the appropriate water-heating category. Solar water heaters shall meet the criteria of Section R403.5.6.2.1.

R403.5.6.2.1 Solar water-heating systems. Solar systems for domestic hot water production are rated by the annual solar energy factor of the system. The solar energy factor of a system shall be determined from the Florida Solar Energy Center Directory of Certified Solar Systems. Solar collectors shall be tested in accordance with ISO Standard 9806, *Test Methods for Solar Collectors,* and SRCC Standard TM-1, *Solar Domestic Hot Water System and Component Test Protocol.* Collectors in installed solar water-heating systems should meet the following criteria:

1. Be installed with a tilt angle between 10 degrees and 40 degrees of the horizontal; and
2. Be installed at an orientation within 45 degrees of true south.

R403.6 Mechanical ventilation (Mandatory). The building shall be provided with ventilation that meets the requirements of the *Florida Building Code, Residential,* or *Florida Building Code, Mechanical*, as applicable, or with other approved means of ventilation including: Natural, Infiltration or Mechanical means. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.1 Whole-house mechanical ventilation system fan efficacy. When installed to function as a whole-house mechanical ventilation system, fans shall meet the efficacy requirements of Table R403.6.1.

Exception: Where whole-house mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.

R403.6.2 Ventilation air. Residential buildings designed to be operated at a positive indoor pressure or for mechanical ventilation shall meet the following criteria:

1. The design air change per hour minimums for residential buildings in ASHRAE 62.2, *Ventilation for Acceptable Indoor Air Quality*, shall be the maxi- mum rates allowed for residential applications.
2. No ventilation or air-conditioning system make-up air shall be provided to conditioned space from attics, crawlspaces, attached enclosed garages or outdoor spaces adjacent to swimming pools or spas.
3. If ventilation air is drawn from enclosed space(s), then the walls of the space(s) from which air is drawn shall be insulated to a minimum of R-11 and the ceiling shall be insulated to a minimum of R-19, space permitting, or R-10 otherwise.

R403.7 Heating and cooling equipment (Mandatory).

R403.7.1 Equipment sizing. Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on the equipment loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies, based on building loads for the directional orientation of the building. The manufacturer and model number of the outdoor and indoor units (if split system) shall be submitted along with the sensible and total cooling capacities at the design conditions described in Section R302.1. This Code does not allow designer safety factors, provisions for future expansion or other factors that affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

TABLE R403.6.1
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY[a] (CFM/WATT)	AIRFLOW RATE MAXIMUM (CFM)
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.
a. When tested in accordance with HVI Standard 916

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R403.7.1.1 Cooling equipment capacity. Cooling only equipment shall be selected so that its total capacity is not less than the calculated total load but not more than 1.15 times greater than the total load calculated according to the procedure selected in Section 403.7, or the closest available size provided by the manufacturer's product lines. The corresponding latent capacity of the equipment shall not be less than the calculated latent load.

The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacturer's expanded performance data shall be used to select cooling-only equipment. This selection shall be based on the outdoor design dry-bulb temperature for the load calculation (or entering water temperature for water-source equipment), the blower CFM provided by the expanded performance data, the design value for entering wet-bulb temperature and the design value for entering dry-bulb temperature.

Design values for entering wet-bulb and dry-bulb temperatures shall be for the indoor dry bulb and relative humidity used for the load calculation and shall be adjusted for return side gains if the return duct(s) is installed in an unconditioned space.

Exceptions:

1. Attached single- and multiple-family residential equipment sizing may be selected so that its cooling capacity is less than the calculated total sensible load but not less than 80 percent of that load.
2. When signed and sealed by a Florida-registered engineer, in attached single- and multiple-family units, the capacity of equipment may be sized in accordance with good design practice.

R403.7.1.2 Heating equipment capacity.

R403.7.1.2.1 Heat pumps. Heat pump sizing shall be based on the cooling requirements as calculated according to Section R403.7.1.1, and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load even if the design heating load is 1.15 times greater than the design cooling load.

R403.7.1.2.2 Electric resistance furnaces. Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.7.1.

R403.7.1.2.3 Fossil fuel heating equipment. The capacity of fossil fuel heating equipment with natural draft atmospheric burners shall not be less than the design load calculated in accordance with Section R403.7.1.

R403.7.1.3 Extra capacity required for special occasions. Residences requiring excess cooling or heating equipment capacity on an intermittent basis, such as anticipated additional loads caused by major entertainment events, shall have equipment sized or controlled to prevent continuous space cooling or heating within that space by one or more of the following options:

1. A separate cooling or heating system is utilized to provide cooling or heating to the major entertainment areas.
2. A variable capacity system sized for optimum performance during base load periods is utilized.

R403.8 Systems serving multiple dwelling units (Mandatory). Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the IECC—Commercial Provisions in lieu of Section R403.

R403.9 Snow melt and ice system controls (Mandatory). Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F (10°C), and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F (4.8°C).

R403.10 Pools and permanent spa energy consumption (Mandatory). The energy consumption of pools and permanent spas shall be in accordance with Sections R403.10.1 through R403.10.5.

R403.10.1 Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the set- ting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

R403.10.2 Time switches. Time switches or other control methods that can automatically turn off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.
3. Where pumps are powered exclusively from onsite renewable generation.

R403.10.3 Covers. Outdoor heated swimming pools and outdoor permanent spas shall be equipped with a vapor- retardant cover on or at the water surface or a liquid cover or other means proven to reduce heat loss.

Exception: Where more than 70 percent of the energy for heating, computed over an operation season, is from site-recovered energy, such as from a heat pump or solar energy source, covers or other vapor-retardant means shall not be required.

R403.10.4 Gas- and oil-fired pool and spa heaters. All gas- and oil-fired pool and spa heaters shall have a mini- mum thermal efficiency of 82 percent for heaters manufactured on or after April 16, 2013, when tested in accordance with ANSI Z 21.56. Pool heaters fired by natural or LP gas shall not have continuously burning pilot lights.

R403.10.5 Heat pump pool heaters. Heat pump pool heaters shall have a minimum COP of 4.0 when tested in accordance with AHRI 1160, Table 2, Standard Rating Conditions-Low Air Temperature. A test report from an independent laboratory is required to verify procedure compliance. Geothermal swimming pool heat pumps are not required to meet this standard.

R403.11 Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-14.

SECTION R404

ELECTRICAL POWER AND LIGHTING SYSTEMS

R404.1 Lighting equipment (Mandatory). Not less than 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or not less than 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

Exception: Low-voltage lighting.

R404.1.1 Lighting equipment (Mandatory). Fuel gas lighting systems shall not have continuously burning pilot lights.

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TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Sample Addition	Builder Name:	BUILDER
Street:	123 Main Street	Permit Office:	
City, State, Zip:	Orlando, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window/door jambs and framing, and skylights and framing shall be sealed.	
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors (including above garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extends from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.	
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.	
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

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FORM R405-2017 Envelope Leakage Test Report Performance Method

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report
Performance Method

Project Name:	Addition	Builder Name:	BUILDER
Street:	123 Main Street	Permit Office:	Orlando Downtown
City, State, Zip:	Orlando, FL, 32922	Permit Number:	1234
Design Location:	FL, Orlando	Jurisdiction:	Orange County
Cond. Floor Area:	500 sq.ft.	Cond. Volume:	4000 cu ft.

Envelope Leakage Test Results

Regression Data:

C: _____ n: _____ R: _____

Single or Multi Point Test Data

	HOUSE PRESSURE	FLOW:
1	Pa	cfm
2	Pa	cfm
3	Pa	cfm
4	Pa	cfm
5	Pa	cfm
6	Pa	cfm

Leakage Characteristics

Required ACH(50) from FORM R405-2017 : _____

Tested ACH(50)* : _____

*Tested leakage must be less than or equal to the required ACH(50) shown on Form R405-2017 for this building. If the tested ACH(50) is less than 3 the building must have a mechanical ventilation system.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 7 air changes per hour in Climate Zones 1 and 2. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), Florida Statutes or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i) or an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

I hereby certify that the above envelope leakage performance results demonstrate compliance with Florida Energy Code requirements in accordance with Section R402.4.1.2.

SIGNATURE: _____

PRINTED NAME: _____

DATE: _____

Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), Florida Statutes or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i) or an approved third party. A written report of the results of the test shall be signed by the third party conducting the test and provided to the code official.

BUILDING OFFICIAL: _____

DATE: _____

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FORM R405-2017 Duct Leakage Test Report Performance Method

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Duct Leakage Test Report
Performance Method

Project Name:	Sample Addition	Builder Name:	Builder
Street:	123 Main Street	Permit Office:	Orlando Downtown
City, State, Zip:	Orlando , FL , 32922	Permit Number:	1234
Design Location:	FL, Orlando	Jurisdiction:	Orange County
		Duct Test Time:	Post Construction

Required Duct Leakage from FORM R405-2017 : _____ Qn (Out)

Duct Leakage Test Results

CFM25 Duct Leakage Test Values

Line	System	Outside Duct Leakage
1	System 1	_____ CFM25(Out)
2	System 2	_____ CFM25(Out)
3	System 3	_____ CFM25(Out)
4	System 4	_____ CFM25(Out)
5	**Tested Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____ **Q_n (Out)***

*Tested Qn (Out) must be less than or equal to the required Qn (Out).

I certify the tested duct leakage to outside, Q_n, is less than or equal to the proposed duct leakage Qn specified on FORM R405-2017.

SIGNATURE: _____

PRINTED NAME: _____

DATE: _____

Duct tightness shall be verified by testing to ANSI/RESNET/ICC 380 by either individuals as defined in Section 553.993(5) or (7), Florida Statutes, or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i), Florida Statutes.

BUILDING OFFICIAL: _____

DATE: _____

FORM R405-2017

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
Simulated Performance Alternative (Performance) Method

Applications for compliance with the 2017 Florida Building Code, Energy Conservation via the residential Simulated Performance Method shall include:

- ☐ *This checklist*
- ☐ *A Form R405 report that documents that the Proposed Design complies with Section R405.3 of the Florida Energy Code. This form shall include a summary page indicating home address, e-ratio and the pass or fail status along with summary areas and types of components, whether the home was simulated as a worst-case orientation, name and version of the compliance software tool, name of individual completing the compliance report (one page) and an input summary checklist that can be used for field verification (usually four pages/may be greater).*
- ☐ *Energy Performance Level (EPL) Display Card (one page)*
- ☐ *HVAC system sizing and selection based on ACCA Manual S or per exceptions provided in Section R403.7*
- ☐ *Mandatory Requirements (five pages)*

Required prior to CO for the Performance Method:

- ☐ *Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 - one page)*
- ☐ *A completed Envelope Leakage Test Report (usually one page)*
- ☐ *If Form R405 duct leakage type indicates anything other than "default leakage", then a completed Form R405 Duct Leakage Test Report (usually one page)*

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SINGLE FAMILY HOME - SAMPLE FORM

FORM R405-2017

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Florida Department of Business and Professional Regulation - Residential Performance Method

Project Name:	Single Family Home	Builder Name:	Builder
Street:	456 Main Street	Permit Office:	Orlando Downtown
City, State, Zip:	Orlando , FL , 32922	Permit Number:	456789
Owner:	Owner	Jurisdiction:	Orange County
Design Location:	FL, Orlando	County::	Orange (Florida Climate Zone 2)

1. New construction or existing	New (From Plans)
2. Single family or multiple family	Single-family
3. Number of units, if multiple family	1
4. Number of Bedrooms	6
5. Is this a worst case?	No
6. Conditioned floor area above grade (ft²)	2400
Conditioned floor area below grade (ft²)	0

7. Windows(398.0 sqft.)	Description	Area
a. U-Factor:	Dbl, U=0.35	374.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Gbl, default	24.00 ft²
SHGC:	Clear, default	
c. U-Factor:	N/A	ft²
SHGC:		
d. U-Factor:	N/A	ft²
SHGC:		
Area Weighted Average Overhang Depth:		2.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types (2400.0 sqft.)	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	1200.00 ft²
b. Floor Over Other Space	R=0.0	1200.00 ft²
c. N/A	R=	ft²

9. Wall Types (2320.0 sqft.)	Insulation	Area
a. Frame - Wood, Exterior	R=13.0	1200.00 ft²
b. Concrete Block - Int Insul, Exterior	R=6.0	944.00 ft²
c. Frame - Wood, Adjacent	R=13.0	176.00 ft²
d. N/A	R=	ft²

10. Ceiling Types (1200.0 sqft.)	Insulation	Area
a. Under Attic (Vented)	R=30.0	1200.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Main, Ret: Main, AH: Main	6	240
b. Sup: Attic, Ret: Attic, AH: 2nd Floor	6	240

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	20.0	SEER:14.00
b. Central Unit	18.0	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	20.0	HSPF:8.20
b. Natural Gas Furnace	18.0	AFUE:0.78

14. Hot water systems	
a. Electric	Cap: 50 gallons
	EF: 0.930
b. Conservation features	
None	
15. Credits	None

Glass/Floor Area: 0.166

Total Proposed Modified Loads: XX.XX [calculated]

Total Baseline Loads: XX.XX [calculated]

PASS

I hereby certify that the plans and specifications covered by this calculation are in compliance with the Florida Energy Code.

PREPARED BY: _____

DATE: _____

I hereby certify that this building, as designed, is in compliance with the Florida Energy Code.

OWNER/AGENT: _____

DATE: _____

Review of the plans and specifications covered by this calculation indicates compliance with the Florida Energy Code. Before construction is completed this building will be inspected for compliance with Section 553.908 Florida Statutes.

BUILDING OFFICIAL: _____

DATE: _____

- **Compliance requires certification by the air handler unit manufacturer that the air handler enclosure qualifies as certified factory-sealed in accordance with R403.3.2.1.**
- **Compliance requires an Air Barrier and Insulation Inspection Checklist in accordance with R402.4.1.1 and this project requires an envelope leakage test report with envelope leakage no greater than 5.0 ACH50 (R402.4.1.2).**
- **Compliance requires a roof absorptance test and a roof emittance test in accordance with R405.7.2**
- **Compliance with a proposed duct leakage Qn requires a Duct Leakage Test Report confirming duct leakage to outdoors, tested in accordance with ANSI/RESNET/ICC 380, is not greater than 0.030 Qn for whole house.**

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SINGLE FAMILY HOME - SAMPLE FORM

FORM R405-2017

PROJECT

Title:	Single Family Home	Bedrooms:	6	Address Type:	Street Address
Building Type:	User	Conditioned Area:	2400	Lot #	
Owner:	Owner	Total Stories:	2	Block/SubDivision:	
# of Units:	1	Worst Case:	No	PlatBook:	
Builder Name:	Builder	Rotate Angle:	0	Street:	456 Main Street
Permit Office:	Orlando Downtown	Cross Ventilation:		County:	Orange
Jurisdiction:	Orange County	Whole House Fan:		City, State, Zip:	Orlando , FL , 32922
Family Type:	Single-family				
New/Existing:	New (From Plans)				
Comment:	Single Family Example				

CLIMATE

√	Design Location	TMY Site	Zone	Design Temp 97.5 %	Design Temp 2.5 %	Int Design Temp Winter	Int Design Temp Summer	Heating Degree Days	Design Moisture	Daily Temp Range
_____	FL, Orlando	FL_ORLANDO_INTL_AR	2	41	91	70	75	526	44	Medium

BLOCKS

Number	Name	Area	Volume
1	Zone 1	1200	9600
2	Zone 2	1200	9600

SPACES

Number	Name	Area	Volume	Kitchen	Occupants	Bedrooms	Infil ID	Finished	Cooled	Heated
1	Main	1200	9600	Yes	3.5	3	1	Yes	Yes	Yes
2	2nd Floor	1200	9600	No	3.5	3	1	Yes	Yes	Yes

FLOORS

√	#	Floor Type	Space	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet
_____	1	Slab-On-Grade Edge Insulatio	Main	140 ft	0	1200 ft²	----	0.2	0	0.8
_____	2	Floor Over Other Space	2nd Floor	----	----	1200 ft²	0	0	0	1

ROOF

√	#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	SA Tested	Emitt	Emitt Tested	Deck Insul.	Pitch (deg)
_____	1	Hip	Composition shingles	1300 ft²	0 ft²	White	0.85	Yes	0.9	Yes	0	22.6

ATTIC

√	#	Type	Ventilation	Vent Ratio (1 in)	Area	RBS	IRCC
_____	1	Full attic	Vented	300	1200 ft²	N	N

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FORM R405-2017

CEILING

√	#	Ceiling Type	Space	R-Value	Ins Type	Area	Framing Frac	Truss Type
_____	1	Under Attic (Vented)	Main	30	Blown	1200 ft²	0.11	Wood

WALLS

√	#	Ornt	Adjacent To	Wall Type	Space	Cavity R-Value	Width Ft	Width In	Height Ft	Height In	Area	Sheathing R-Value	Framing Fraction	Solar Absor	Below Grade%
____	1	N	Exterior	Concrete Block - Int Insul	Main	6	40		8		320.0 ft²		0	0.5	0
____	2	E	Exterior	Concrete Block - Int Insul	Main	6	30		8		240.0 ft²		0	0.5	0
____	3	S	Exterior	Concrete Block - Int Insul	Main	6	40		8		320.0 ft²		0	0.5	0
____	4	W	Exterior	Concrete Block - Int Insul	Main	6	8		8		64.0 ft²		0	0.5	0
____	5	N	Garage	Frame - Wood	Main	13	22		8		176.0 ft²		0	0.01	0
____	6	N	Exterior	Frame - Wood	2nd Floor	13	40		8		320.0 ft²		0.23	0.5	0
____	7	E	Exterior	Frame - Wood	2nd Floor	13	30		8		240.0 ft²		0	0.5	0
____	8	S	Exterior	Frame - Wood	2nd Floor	13	40		8		320.0 ft²		0	0.5	0
____	9	W	Exterior	Frame - Wood	2nd Floor	13	40		8		320.0 ft²		0	0.5	0

DOORS

√	#	Ornt	Door Type	Space	Storms	U-Value	Width Ft	Width In	Height Ft	Height In	Area
_____	1	N	Wood	Main	None	.2	3		6	8	20 ft²
_____	2	S	Wood	Main	None	.2	3		6	8	20 ft²

WINDOWS

Orientation shown is the entered, Proposed orientation.

√	#	Ornt	Wall ID	Frame	Panes	NFRC	U-Factor	SHGC	Overhang Area	Overhang Depth	Overhang Separation	Int Shade	Screening
_____	1	N	1	Vinyl	Low-E Double	Yes	0.35	0.25	48.0 ft²	2 ft 0 in	10 ft 4 in	Drapes/blinds	None
_____	2	N	1	None	Glazed Block	Yes	0.35	0.25	24.0 ft²	2 ft 0 in	0 ft 0 in	Drapes/blinds	None
_____	3	E	2	Vinyl	Low-E Double	Yes	0.35	0.25	24.0 ft²	2 ft 0 in	10 ft 4 in	Drapes/blinds	None
_____	4	E	2	Vinyl	Low-E Double	Yes	0.35	0.25	24.0 ft²	2 ft 0 in	10 ft 4 in	Drapes/blinds	None
_____	5	S	3	Vinyl	Low-E Double	Yes	0.35	0.25	18.0 ft²	2 ft 0 in	10 ft 40 in	Drapes/blinds	None
_____	6	S	3	Vinyl	Low-E Double	Yes	0.35	0.25	40.0 ft²	2 ft 0 in	10 ft 4 in	Drapes/blinds	None
_____	7	N	1	Vinyl	Low-E Double	Yes	0.35	0.25	16.0 ft²	2 ft 0 in	10 ft 4 in	Drapes/blinds	None
_____	8	N	1	Vinyl	Low-E Double	Yes	0.35	0.25	36.0 ft²	2 ft 0 in	1 ft 4 in	Drapes/blinds	None
_____	9	N	6	Vinyl	Low-E Double	Yes	0.35	0.25	48.0 ft²	2 ft 0 in	1 ft 4 in	Drapes/blinds	None
_____	10	E	7	Vinyl	Low-E Double	Yes	0.35	0.25	48.0 ft²	2 ft 0 in	1 ft 4 in	Drapes/blinds	None
_____	11	S	8	Vinyl	Low-E Double	Yes	0.35	0.25	48.0 ft²	2 ft 0 in	1 ft 4 in	Drapes/blinds	None
_____	12	W	9	Vinyl	Low-E Double	Yes	0.35	0.25	24.0 ft²	2 ft 0 in	1 ft 4 in	Drapes/blinds	None

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FORM R405-2017

GARAGE

√	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation
_____	1	385 ft²	385 ft²	64 ft	8 ft	1

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50
1	Wholehouse	Proposed ACH(50)	.000254	1600	87.84	165.19	.2284	5

HEATING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Block	Ducts
_____	1	Electric Heat Pump	None	HSPF:8.2	20 kBtu/hr	1	sys#1
_____	2	Natural Gas Furnace	None	AFUE:0.78	18 kBtu/hr	2	sys#2

COOLING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Block	Ducts
_____	1	Central Unit	None	SEER: 14	20 kBtu/hr	600 cfm	0.75	1	sys#1
_____	2	Central Unit	None	SEER: 14	18 kBtu/hr	540 cfm	0.75	2	sys#2

HOT WATER SYSTEM

√	#	System Type	SubType	Location	EF	Cap	Use	SetPnt	Conservation
_____	1	Electric	None	Garage	0.93	50 gal	90 gal	120 deg	None

SOLAR HOT WATER SYSTEM

√	FSEC Cert #	Company Name	System Model #	Collector Model #	Collector Area	Storage Volume	FEF
_____	None	None			ft²		

DUCTS

√	#	---- Supply ---- Location	R-Value	Area	--- Return --- Location	Area	Leakage Type	Air Handler	CFM 25 TOT	CFM25 OUT	QN	RLF	HVAC # Heat	Cool
_____	1	Main	6	240 ft²	Main	60 ft²	Proposed Qn	Main	--- cfm	36.0 cfm	0.03	0.60	1	1
_____	2	Attic	6	240 ft²	Attic	60 ft²	Proposed Qn	2nd Floor	--- cfm	36.0 cfm	0.03	0.60	2	2

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FORM R405-2014

TEMPERATURES

Programable Thermostat: N

Ceiling Fans:

Cooling	[ ] Jan	[ ] Feb	[ ] Mar	[ ] Apr	[ ] May	[X] Jun	[X] Jul	[X] Aug	[X] Sep	[ ] Oct	[ ] Nov	[ ] Dec
Heating	[X] Jan	[X] Feb	[X] Mar	[ ] Apr	[ ] May	[ ] Jun	[ ] Jul	[ ] Aug	[ ] Sep	[ ] Oct	[X] Nov	[X] Dec
Venting	[ ] Jan	[ ] Feb	[X] Mar	[X] Apr	[ ] May	[ ] Jun	[ ] Jul	[ ] Aug	[ ] Sep	[X] Oct	[X] Nov	[ ] Dec

Thermostat Schedule: HERS 2006 Reference

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Cooling (WEH)	AM	78	78	78	78	78	78	78	78	78	78	78	78
	PM	78	78	78	78	78	78	78	78	78	78	78	78
Heating (WD)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68
Heating (WEH)	AM	68	68	68	68	68	68	68	68	68	68	68	68
	PM	68	68	68	68	68	68	68	68	68	68	68	68

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FORM R405-2017

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [calculated]

The lower the EnergyPerformance Index, the more efficient the home.

456 Main Street, Orlando, FL, 32922

1. New construction or existing	New (From Plans)
2. Single family or multiple family	Single-family
3. Number of units, if multiple family	1
4. Number of Bedrooms	6
5. Is this a worst case?	No
6. Conditioned floor area (ft²)	2400

7. Windows**	Description	Area
a. U-Factor:	Dbl, U=0.35	374.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Gbl, default	24.00 ft²
SHGC:	Clear, default	
c. U-Factor:	N/A	ft²
SHGC:		
d. U-Factor:	N/A	ft²
SHGC:		
Area Weighted Average Overhang Depth:		2.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	1200.00 ft²
b. Floor Over Other Space	R=0.0	1200.00 ft²
c. N/A	R=	ft²

9. Wall Types	Insulation	Area
a. Frame - Wood, Exterior	R=13.0	1200.00 ft²
b. Concrete Block - Int Insul, Exterior	R=6.0	944.00 ft²
c. Frame - Wood, Adjacent	R=13.0	176.00 ft²
d. N/A	R=	ft²

10. Ceiling Types	Insulation	Area
a. Under Attic (Vented)	R=30.0	1200.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Main, Ret: Main, AH: Main	6	240
b. Sup: Attic, Ret: Attic, AH: 2nd Floor	6	240

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	20.0	SEER:14.00
b. Central Unit	18.0	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	20.0	HSPF:8.20
b. Natural Gas Furnace	18.0	AFUE:0.78

14. Hot water systems
a. Electric — Cap: 50 gallons, EF: 0.93
b. Conservation features: None

15. Credits: None

I certify that this home has complied with the Florida Energy Efficiency Code for Building Construction through the above energy saving features which will be installed (or exceeded) in this home before final inspection. Otherwise, a new EPL Display Card will be completed based on installed Code compliant features.

Builder Signature: _____ Date: _____

Address of New Home: _____ City/FL Zip: _____

*Note: This is not a Building Energy Rating. If your Index is below 70, your home may qualify for energy efficient mortgage (EEM) incentives if you obtain a Florida EnergyGauge Rating. Contact the EnergyGauge Hotline at (321) 638-1492 or see the EnergyGauge web site at energygauge.com for information and a list of certified Raters. For information about the Florida Building Code, Energy Conservation, contact the Florida Building Commission's support staff.

**Label required by Section R303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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FORM R405-2017

Florida Department of Business and Professional Regulations
Residential Whole Building Performance Method

ADDRESS: 123 Main Street
Orlando, FL, 32922

PERMIT #:

MANDATORY REQUIREMENTS - See individual code sections for full details.

SECTION R401 GENERAL

R401.2 Compliance. Projects shall comply with one of the following:

2. Section R405 and the provisions of Sections R401 through R404 labeled "Mandatory."

R401.3 Energy performance level (EPL) display card (Mandatory). The building official shall require that an energy performance level (EPL) display card be completed and certified by the builder to be accurate and correct before final approval of the building for occupancy. Florida law (Section 553.9085, *Florida Statutes*) requires the EPL display card to be included as an addendum to each sales contract for both presold and nonpresold residential buildings. The EPL display card contains information indicating the energy performance level and efficiencies of components installed in a dwelling unit. The building official shall verify that the EPL display card completed and signed by the builder accurately reflects the plans and specifications submitted to demonstrate code compliance for the building. A copy of the EPL display card can be found in Appendix RD.

R402.4 Air leakage (Mandatory). The *building thermal envelope* shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

Exception: Dwelling units of R-2 Occupancies and multiple attached single family dwellings shall be permitted to comply with Section C402.5.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation. The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding seven air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380 and reported at a pressure of 0.2 inch w.g. (50 pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), *Florida Statutes,* or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i) or an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

Exception: Testing is not required for additions, alterations, renovations, or repairs, of the building thermal envelope of existing buildings in which the new construction is less than 85 percent of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

R402.4.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace. Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907.

R402.4.3 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and *listed* and *labeled* by the manufacturer.

Exception: Site-built windows, skylights and doors.

R402.4.4 Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall *R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the *Florida Building Code, Residential*.

R402.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and *labeled* as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

SECTION R403 SYSTEMS

R403.1 Controls.

R403.1.1 Thermostat provision (Mandatory). At least one thermostat shall be provided for each separate heating and cooling system.

R403.1.3 Heat pump supplementary heat (Mandatory). Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

R403.3.2 Sealing (Mandatory). All ducts, air handlers, filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts or plenum chambers, shall be constructed and sealed in accordance with Section C403.2.9.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria below.

Duct tightness shall be verified by testing in accordance with ANSI/RESNET/ICC 380 by either individuals as defined in Section 553.993(5) or (7), *Florida Statutes*, or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i), *Florida Statutes*, to be "substantially leak free" in accordance with Section R403.3.3.

R403.3.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

R403.3.3 Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. All registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.
2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

R403.3.5 Building cavities (Mandatory). Building framing cavities shall not be used as ducts or plenums.

R403.4 Mechanical system piping insulation (Mandatory). Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

R403.4.1 Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

R403.5.1 Heated water circulation and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily accessible.

R403.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosiphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

R403.5.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

R403.5.5 Heat traps (Mandatory). Storage water heaters not equipped with integral heat traps and having vertical pipe risers shall have heat traps installed on both the inlets and outlets. External heat traps shall consist of either a commercially available heat trap or a downward and upward bend of at least 3 ½ inches (89 mm) in the hot water distribution line and cold water line located as close as possible to the storage tank.

R403.5.6 Water heater efficiencies (Mandatory).

R403.5.6.1 Storage water heater temperature controls.

403.5.6.1.1 Automatic controls. Service water-heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. The minimum temperature setting range shall be from 100°F to 140°F (38°C to 60°C).

R403.5.6.1.2 Shut down. A separate switch or a clearly marked circuit breaker shall be provided to permit the power supplied to electric service systems to be turned off. A separate valve shall be provided to permit the energy supplied to the main burner(s) of combustion types of service water-heating systems to be turned off.

R403.5.6.2 Water-heating equipment. Water-heating equipment installed in residential units shall meet the minimum efficiencies of Table C404.2 in Chapter 4 of the *Florida Building Code, Energy Conservation,* Commercial Provisions, for the type of equipment installed. Equipment used to provide heating functions as part of a combination system shall satisfy all stated requirements for the appropriate water-heating category. Solar water heaters shall meet the criteria of Section R403.5.6.2.1.

R403.5.6.2.1 Solar water-heating systems. Solar systems for domestic hot water production are rated by the annual solar energy factor of the system. The solar energy factor of a system shall be determined from the Florida Solar Energy Center Directory of Certified Solar Systems. Solar collectors shall be tested in accordance with ISO Standard 9806, *Test Methods for Solar Collectors,* and SRCC Standard TM-1, *Solar Domestic Hot Water System and Component Test Protocol.* Collectors in installed solar water-heating systems should meet the following criteria:

1. Be installed with a tilt angle between 10 degrees and 40 degrees of the horizontal; and
2. Be installed at an orientation within 45 degrees of true south.

R403.6 Mechanical ventilation (Mandatory). The building shall be provided with ventilation that meets the requirements of the *Florida Building Code, Residential,* or *Florida Building Code, Mechanical*, as applicable, or with other approved means of ventilation including: Natural, Infiltration or Mechanical means. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.1 Whole-house mechanical ventilation system fan efficacy. When installed to function as a whole-house mechanical ventilation system, fans shall meet the efficacy requirements of Table R403.6.1.

Exception: Where whole-house mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.

R403.6.2 Ventilation air. Residential buildings designed to be operated at a positive indoor pressure or for mechanical ventilation shall meet the following criteria:

1. The design air change per hour minimums for residential buildings in ASHRAE 62.2, *Ventilation for Acceptable Indoor Air Quality*, shall be the maxi- mum rates allowed for residential applications.
2. No ventilation or air-conditioning system make-up air shall be provided to conditioned space from attics, crawlspaces, attached enclosed garages or outdoor spaces adjacent to swimming pools or spas.
3. If ventilation air is drawn from enclosed space(s), then the walls of the space(s) from which air is drawn shall be insulated to a minimum of R-11 and the ceiling shall be insulated to a minimum of R-19, space permitting, or R-10 otherwise.

R403.7 Heating and cooling equipment (Mandatory).

R403.7.1 Equipment sizing. Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on the equipment loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies, based on building loads for the directional orientation of the building. The manufacturer and model number of the outdoor and indoor units (if split system) shall be submitted along with the sensible and total cooling capacities at the design conditions described in Section R302.1. This Code does not allow designer safety factors, provisions for future expansion or other factors that affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

TABLE R403.6.1
WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY[a] (CFM/WATT)	AIRFLOW RATE MAXIMUM (CFM)
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.
a. When tested in accordance with HVI Standard 916

R403.7.1.1 Cooling equipment capacity. Cooling only equipment shall be selected so that its total capacity is not less than the calculated total load but not more than 1.15 times greater than the total load calculated according to the procedure selected in Section 403.7, or the closest available size provided by the manufacturer's product lines. The corresponding latent capacity of the equipment shall not be less than the calculated latent load.

The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacturer's expanded performance data shall be used to select cooling-only equipment. This selection shall be based on the outdoor design dry-bulb temperature for the load calculation (or entering water temperature for water-source equipment), the blower CFM provided by the expanded performance data, the design value for entering wet-bulb temperature and the design value for entering dry-bulb temperature.

Design values for entering wet-bulb and dry-bulb temperatures shall be for the indoor dry bulb and relative humidity used for the load calculation and shall be adjusted for return side gains if the return duct(s) is installed in an unconditioned space.

Exceptions:

1. Attached single- and multiple-family residential equipment sizing may be selected so that its cooling capacity is less than the calculated total sensible load but not less than 80 percent of that load.
2. When signed and sealed by a Florida-registered engineer, in attached single- and multiple-family units, the capacity of equipment may be sized in accordance with good design practice.

R403.7.1.2 Heating equipment capacity.

R403.7.1.2.1 Heat pumps. Heat pump sizing shall be based on the cooling requirements as calculated according to Section R403.7.1.1, and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load even if the design heating load is 1.15 times greater than the design cooling load.

R403.7.1.2.2 Electric resistance furnaces. Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.7.1.

R403.7.1.2.3 Fossil fuel heating equipment. The capacity of fossil fuel heating equipment with natural draft atmospheric burners shall not be less than the design load calculated in accordance with Section R403.7.1.

R403.7.1.3 Extra capacity required for special occasions. Residences requiring excess cooling or heating equipment capacity on an intermittent basis, such as anticipated additional loads caused by major entertainment events, shall have equipment sized or controlled to prevent continuous space cooling or heating within that space by one or more of the following options:

1. A separate cooling or heating system is utilized to provide cooling or heating to the major entertainment areas.
2. A variable capacity system sized for optimum performance during base load periods is utilized.

R403.8 Systems serving multiple dwelling units (Mandatory). Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the IECC—Commercial Provisions in lieu of Section R403.

R403.9 Snow melt and ice system controls (Mandatory). Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F (10°C), and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F (4.8°C).

R403.10 Pools and permanent spa energy consumption (Mandatory). The energy consumption of pools and permanent spas shall be in accordance with Sections R403.10.1 through R403.10.5.

R403.10.1 Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the set- ting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

R403.10.2 Time switches. Time switches or other control methods that can automatically turn off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.
3. Where pumps are powered exclusively from onsite renewable generation.

R403.10.3 Covers. Outdoor heated swimming pools and outdoor permanent spas shall be equipped with a vapor- retardant cover on or at the water surface or a liquid cover or other means proven to reduce heat loss.

Exception: Where more than 70 percent of the energy for heating, computed over an operation season, is from site-recovered energy, such as from a heat pump or solar energy source, covers or other vapor-retardant means shall not be required.

R403.10.4 Gas- and oil-fired pool and spa heaters. All gas- and oil-fired pool and spa heaters shall have a mini- mum thermal efficiency of 82 percent for heaters manufactured on or after April 16, 2013, when tested in accordance with ANSI Z 21.56. Pool heaters fired by natural or LP gas shall not have continuously burning pilot lights.

R403.10.5 Heat pump pool heaters. Heat pump pool heaters shall have a minimum COP of 4.0 when tested in accordance with AHRI 1160, Table 2, Standard Rating Conditions-Low Air Temperature. A test report from an independent laboratory is required to verify procedure compliance. Geothermal swimming pool heat pumps are not required to meet this standard.

R403.11 Portable spas (Mandatory). The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-14.

SECTION R404

ELECTRICAL POWER AND LIGHTING SYSTEMS

R404.1 Lighting equipment (Mandatory). Not less than 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or not less than 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

Exception: Low-voltage lighting.

R404.1.1 Lighting equipment (Mandatory). Fuel gas lighting systems shall not have continuously burning pilot lights.

FORM R405-2017

TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Single Family Home	Builder Name:	BUILDER
Street:	456 Main Street	Permit Office:	
City, State, Zip:	Orlando, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window/door jambs and framing, and skylights and framing shall be sealed.	
Rim joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors (including above garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extends from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.	
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.	
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

MM/DD/YY HH:MM [AM/PM] ** Software Title and Version Here ** Section 405.4.1 Compliant Software Page 1 of 1

FORM R405-2017 Envelope Leakage Test Report Performance Method

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report
Performance Method

Project Name:	Single Family Home	Builder Name:	BUILDER
Street:	456 Main Street	Permit Office:	Orlando Downtown
City, State, Zip:	Orlando, FL, 32922	Permit Number:	456789
Design Location:	FL, Orlando	Jurisdiction:	Orange County
Cond. Floor Area:	2400 sq.ft.	Cond. Volume:	19200 cu ft.

Envelope Leakage Test Results

Regression Data:

C: _____ n: _____ R: _____

Single or Multi Point Test Data

	HOUSE PRESSURE	FLOW:
1	Pa	cfm
2	Pa	cfm
3	Pa	cfm
4	Pa	cfm
5	Pa	cfm
6	Pa	cfm

Leakage Characteristics

Required ACH(50) from FORM R405-2017 : _____

Tested ACH(50)* : _____

*Tested leakage must be less than or equal to the required ACH(50) shown on Form R405-2017 for this building. If the tested ACH(50) is less than 3 the building must have a mechanical ventilation system.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 7 air changes per hour in Climate Zones 1 and 2. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), Florida Statutes or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i) or an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

I hereby certify that the above envelope leakage performance results demonstrate compliance with Florida Energy Code requirements in accordance with Section R402.4.1.2.

SIGNATURE: _____

PRINTED NAME: _____

DATE: _____

Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), Florida Statutes or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i) or an approved third party. A written report of the results of the test shall be signed by the third party conducting the test and provided to the code official.

BUILDING OFFICIAL: _____

DATE: _____

MM/DD/YY HH:MM [AM/PM] ** Software Title and Version Here ** - Section R405.4.1 Compliant Software Page 1 of 1

FORM R405-2017 Duct Leakage Test Report Performance Method

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Duct Leakage Test Report
Performance Method

Project Name:	Single Family Home	Builder Name:	Builder
Street:	456 Main Street	Permit Office:	Orlando Downtown
City, State, Zip:	Orlando , FL , 32922	Permit Number:	456789
Design Location:	FL, Orlando	Jurisdiction:	Orange County
		Duct Test Time:	Post Construction

Required Duct Leakage from FORM R405-2017 : _____ Qn (Out)

Duct Leakage Test Results

CFM25 Duct Leakage Test Values

Line	System	Outside Duct Leakage
1	System 1	_____ CFM25(Out)
2	System 2	_____ CFM25(Out)
3	System 3	_____ CFM25(Out)
4	System 4	_____ CFM25(Out)
5	**Tested Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____ **Q_n (Out)***

*Tested Qn (Out) must be less than or equal to the required Qn (Out).

I certify the tested duct leakage to outside, Q_n, is less than or equal to the proposed duct leakage Qn specified on FORM R405-2017.

SIGNATURE: _____

PRINTED NAME: _____

DATE: _____

Duct tightness shall be verified by testing to ANSI/RESNET/ICC 380 by either individuals as defined in Section 553.993(5) or (7), Florida Statutes, or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i), Florida Statutes.

BUILDING OFFICIAL: _____

DATE: _____