Energy Simulation Tool Approval Technical Assistance Manual

2014 Florida Building Code, Energy Conservation

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Introduction

As part of the new Florida Building Code, Energy Conservation, 5th edition (2014) the Florida Building Commission is charged with the responsibility of approving code compliance software tools.

This Manual explains the guidelines for approval of the 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 and nonresidential 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 5th edition (2014) by the performance or prescriptive approaches for building design. Hereafter, the Florida Building Code, Energy Conservation, 5th edition (2014) is referred as the "Florida Energy Code" or "FEC". The Florida Building Code, Energy Conservation, 5th edition (2014) also allows the use of ASHRAE 90.1-2010 as an alternative option for commercial building compliance. ASHRAE 90.1-2010 compliance methods, which are alternative compliance options in the Florida Energy Code, are hereafter referred to as "ASHRAE 90.1". The requirement for residential compliance by the Simulated Performance Alternative is specified in Section R405 of the 2014 Florida Energy Code. The commercial (and residential high-rise) requirements for compliance are specified by 407 Total Building Performance of the Florida Energy Code, or as an alternate option, the Cost Budget Method of ASHRAE 90.1.

1. Overview of Process

The purpose of this Technical Assistance Manual ("this Manual") is to outline the Florida Building Commission's approval process for compliance software programs and to define the procedures, guidelines, and assumptions against which compliance software programs should be evaluated. The performance compliance requirements and procedures apply to both residential and nonresidential buildings. An alternative compliance procedure to that described in this document is acceptable as long as such alternative is approved by the Commission and designed to preserve the integrity of the performance Energy Code compliance process.

The reference procedures and method described in this Manual establish the basis of comparison for all Energy Code compliance software. The approval process, as outlined in this Manual, ensures that a minimum level of energy conservation is achieved regardless of the compliance software used. This is accomplished by:

- having candidate compliance software pass a series of industry standard tests;
- identifying minimum input that may be used to generate the Standard Reference
- design;
- defining standard reports output requirements; and
- describing the certification process for the compliance software vendor.

1.1 Special Terms and Definitions

There are other special terms that are used in this Manual. The Commission approves the use of compliance software programs for Energy Code compliance. Commission approval means that the

Commission accepts the applicant's certification that a compliance software program meets the requirements of the Energy Code and this Manual.

- ***Compliance*** - when a building design in an application for a building permit complies with the Florida Building Code and meets the requirements described for building design standards

- ***Compliance supplement*** - an independent user's manual for the compliance software program

- ***Florida Energy Code*** - the Florida Building Code – Energy Conservation 5th edition 2014

- ***ASHRAE 90.1*** - the ANSI/ASHRAE 90.1-2010 compliance procedure that is included as an alternative compliance method in the 2014 Florida Energy Code

- ***Energy simulation tool*** - defined by the Florida Building Code as an approved software program or calculation-based methodology that projects the annual energy use of a building

- ***Proposed Design*** - a description or computer representation of the proposed building used to estimate annual energy use for determining compliance based on total building performance or design energy cost

- ***Standard Reference Design (also referred to as baseline design or budget design)*** - a version of the Proposed Design that meets the minimum requirements of the Florida Energy Code and is used to determine the maximum annual energy use requirement for compliance based on total building performance

- ***Standard 140*** - the ANSI/ASHRAE Standard 140 – 2007 Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.

- ***Vendor*** - the proponent of a candidate compliance software program.

1.2 Approval Guidelines

For the vendor, the process of receiving approval of a compliance software program includes preparing an application, working with the Commission staff to answer questions from either Commission staff or the public, and providing any necessary additional information regarding the application. The application includes the four basic elements outlined below. The Commission staff evaluates the compliance software program based on the completeness of the application and its overall responsiveness to staff and public comment.

The basic requirements for approval include:

1) Minimum compliance capabilities:

Compliance software programs shall have all the required capabilities identified in the Florida Energy Code for commercial and residential sections. The requirement for residential compliance is specified in Chapter 4 Residential Energy Efficiency Sections R401- R405 of the Florida Energy Code. The nonresidential requirements are specified in Chapter 4 Commercial Energy Efficiency Section C401-C407 of the Florida Energy Code.

2) Accuracy of energy simulation tool:

The compliance software program shall demonstrate acceptable levels of accuracy by performing and passing the required certification tests discussed in Chapters 6 (residential section) and 7 (commercial section) of this Manual, as modified by the vendor to address Florida's specific climate conditions.

The compliance software program vendor performs the certification tests in Chapters 6 or 7, respectively, for residential or commercial projects. The vendor conducts the specified tests, evaluates the results, and certifies in writing that the compliance software program passes the tests. The Commission may perform spot checks and may require additional tests to verify that the proposed compliance software program is appropriate for Florida Energy Code compliance purposes.

When energy analysis techniques are compared, two potential sources of discrepancies could be 1) the differences in user interpretation when entering the building specifications, and 2) the differences in the compliance software program's algorithms (mathematical models) for estimating energy use. The approval tests minimize differences in interpretation by providing explicit detailed descriptions of the test buildings that must be analyzed.

3) User's Manual or help system:

The vendor shall develop a user's manual and/or help system that meets the specifications in Section 4 of this Manual.

4) Program support and reporting forms:

The vendor shall provide ongoing user and enforcement agency support, as described in Chapter 3 of this manual. In addition to explicit and technical criteria, Commission approval may also depend on the Commission's evaluation of:

- Enforceability in terms of reasonably simple, reliable, and rapid methods of verifying compliance;
- application of energy conservation features modeled by the compliance software;
- inputs used to characterize those features by the compliance software users; and dependability of the energy savings features modeled by the compliance software program.

1.3 Optional Capabilities

Optional capabilities are a special class of capabilities and user inputs that are not required of all compliance software, but may be included at the option of the vendor. Additional optional capabilities may be proposed by vendors. For both cases, the Commission reserves the right to disapprove the certification application for a specific optional capability if there is not compelling evidence presented in the public process showing that the optional capability is sufficiently accurate and suitable to be used for compliance with the Energy Code. In addition, energy conservation measures modeled by optional capabilities shall be capable of being verified by local enforcement agencies.

The Commission's purpose in approving additional optional capabilities is to accommodate new modeling algorithms and new technologies that have only begun to penetrate the market. Optional capabilities that evaluate measures already in relatively common use shall have their standard design for the measure based on the common construction practice for that measure; common practice is the inherent basis for all measures not explicitly regulated. For example, the Commission has no interest in an optional capability that evaluates the energy impacts of dirt on

windows unless a new technology produces substantial changes in this aspect of a building relative to buildings without this technology. The burden of proof that an optional capability should be approved lies with the vendor.

2. Types of Approval

This Manual addresses two types of compliance software program approval: full program approval (including amendments to programs that require approval), and approval of new program features and updates.

The Commission shall re-approve the compliance software if vendors make any change to their programs. These changes include:

- any compliance software change that affects the energy use calculations for compliance;
- the modeling capabilities for compliance;
- the format and/or content of compliance forms; or
- any other changes that would affect a building's compliance with the Energy Code.

Changes that do not affect compliance with the Energy Code, such as program changes to the user interface, may follow a simplified or streamlined procedure for approval of the changes. To comply with this simpler process, the compliance software program vendor shall a) certify to the Commission that the new program features do not affect the results of any calculations performed by the program, b) shall notify the Commission of all changes and, c) shall provide the Commission with one updated copy of the program and user's manual. Examples of such changes include fixing logical errors in computer program code that do not affect the numerical results (bug fixes) and new interfaces.

2.1 Full Approval of Compliance Software

The Commission requires program approval when a candidate compliance software program has never been previously approved by the Commission, when the compliance software vendor makes changes to the program algorithms, or when any other change occurs that in any way affects the compliance results. The Commission may also require that all currently approved compliance software programs be approved again whenever substantial revisions are made to the Energy Code or to the Commission's approval process.

The Commission may change the approval process and require that all compliance software programs be approved again for reasons including:

- If the Energy Code undergoes a major revision that alters the basic compliance process, then compliance software would have to be updated and re-approved for the new process.
- If new analytic capabilities become widespread use, then the Commission may declare them to be required compliance software capabilities and may require all compliance software vendors to update their programs and submit them for re-approval.

When re-approval is necessary, the Commission will notify all compliance software vendors of the timetable for renewal.

A compliance software program must be re-approved for new optional modeling capabilities when the vendor adds those optional capabilities. The vendor shall provide a list of the new optional capabilities and demonstrate that those capabilities are documented in revised user documentation. This may not include previously submitted computer runs.

Re-approval shall be accompanied by a cover letter explaining the type of amendment(s) requested and copies of other documents as necessary. The timetable for re-approval of amendments is the same as for full program approval.

2.2 Approval of New Features and Updates

Modifications to previously approved compliance software, including new features and program updates, are subject to the following procedure:

- The compliance software vendor shall prepare an addendum to the compliance supplement or compliance software user's manual when new features or updates affect the outcome or energy conservation measure choices, describing the changes to the compliance software. If the change is a new modeling capability, the addendum shall include instructions for using the new modeling capability for compliance. The compliance software vendor shall notify the Commission by letter of the change that has been made to the compliance software program. The letter shall describe in detail the nature of the change and why it is being made. The notification letter shall be included in the revised Compliance Supplement or compliance software user's manual.

- The compliance software vendor shall provide the Commission with an updated copy of the compliance software program and include any new forms created by the compliance software (or modifications to the reports).

- The Commission may approve the change, request additional information, reject the change, or require that the compliance software vendor make specific changes to either the Compliance Supplement addendum or the compliance software program itself.

- With Commission approval, the vendor may issue new copies of the compliance software with the Compliance Supplement addendum and notify compliance software program users and building officials.

2.3 Challenging Compliance Software Approval

Any challenge to software approval by the Florida Building Commission shall be in accordance with Chapter 120, Florida Statutes.

3. Vendor Requirements

Commission approval of compliance software is intended to provide flexibility in complying with the Energy Code. However, in achieving this flexibility, the compliance software program shall not degrade or evade the intent of the Energy Code to achieve the required level of energy conservation.

The vendor has the burden of proof to demonstrate the accuracy and reliability of the compliance software relative to the test methods and to demonstrate the conformance of the software to the requirements of this Manual and the Energy Code.

Each compliance software vendor shall meet all of the following requirements as part of the approval process and as part of an ongoing commitment to users of their particular compliance software.

3.1 Vendor Certification Statement

The vendor shall follow the procedure described in this document to certify to the Commission that the compliance software meets the requirements of the Florida Energy Code and the criteria in this document for:

- accuracy and reliability as compared to the standard tests;
- ability to generate the required Standard Reference Design from user inputs;
- suitability in terms of accurate calculation of the correct energy/cost budget, the printing of standardized reports; and
- documentation on how the program demonstrates compliance.

Availability to Commission

All compliance software vendors are required to submit at least one fully working program version of the compliance software to the Commission's staff and also to provide the Commission's Energy Technical Advisory Committee and interest groups access to the software for review during the approval process.

User Support

Software vendors shall provide technical support on how to use their program for energy code compliance calculations.

Compliance Software Demonstration

The Commission may request compliance software vendors to physically demonstrate their program's capabilities. One or more demonstrations may be requested before approval is granted. The Commission may hold one or more workshops with public and vendor participation to allow for public review of the vendor's application. Such workshops may identify problems or discrepancies that may necessitate revisions to the application.

3.2 Application Checklist

The compliance software application checklists are given separately for commercial and residential applications. It is possible for a vendor to apply for approval for a specific compliance method.

Therefore, for flexibility in the application processes, the checklist is summarized separately for commercial and residential applications.

Commercial Application Checklist

The following items shall be included in an application package submitted to the Commission for commercial code compliance software approval:

1. The cover sheet "Request for Approval" shown in Appendix A. The vendor shall sign the checklist, certifying that the compliance software meets the requirements, including accuracy and reliability when used to demonstrate compliance with the Florida Energy Code and the requirements of this Technical Assistance Manual.

2. Computer Run Reports
   The required format for building information reports is electronic Portable Document File (PDF). Reports shall be automatically generated by the software. Each page of the report shall have a header with the software name, revision, and date per the requirements of Section 7.4.

3. Compliance Supplement and User's Manual
   The vendor shall submit a complete copy of their compliance software program's user manual, including material on the use of the software for compliance purposes and an executable copy of the software for random verification.

4. For software supporting Performance Based Compliance:
   Performance Method Test Results Spreadsheet: The vendor shall submit the compliance software's evaluation spreadsheet file "***CommercialPerformanceMethodsResults.xls***" to the building commission. This spreadsheet file is designed to demonstrate the software's compliance using the performance based methods per the Florida Energy Code or ASHRAE 90.1 option for the test suite by climate zone. The spreadsheet contains the standard reference design building requirements and those generated by the vendor's software for the performance based methods. The compliance software vendor is responsible for generating and entering the software's reference design requirements and demonstrating that the compliance software results match the standard reference building design for each case of the test cases. The spreadsheet, details of the procedure, and compliance requirements are described in Section 7.3.1.

5. For software supporting Performance Based Compliance:
   ASHRAE Standard 140 Test Certification
   The compliance software provider shall submit a certificate to the commission indicating that the code compliance software engine meets the requirements of the Standard 140 tests.

6. For software supporting Prescriptive Based Compliance
   Prescriptive Method Test Results Spreadsheet: The vendor shall submit the compliance software's evaluation spreadsheet file "***CommercialPrescriptiveMethodsResults.xls"*** to the building commission. This spreadsheet is designed to demonstrate the software's compliance using the prescriptive compliance methods per the Florida Energy Code or ASHRAE 90.1 option for subset of the test suite by climate zone. The standard reference design prescriptive requirements are created based on the commercial code compliance requirements of the Florida Energy Code and ASHRAE 90.1 option. The compliance software vendor is responsible for

generating the software's prescriptive requirements and populating the columns next to the proposed design building element inputs for side-by-side comparison. Also, vendors must enter the "Pass" or "Fail" results of their software depending on whether the prescriptive requirement was met or not for each element of the test cases. The spreadsheet, details of the procedure, and compliance requirements are described in Section 7.3.2.

7. For software supporting Envelope Trade-Off Option Results Spreadsheet
   Envelope Trade-Off Option Results Spreadsheet: The Vendor shall submit the compliance software's evaluation spreadsheet file "**CommercialEnvelopeTradeOffMethodResults.xls**" to the building commission. The spreadsheet is designed to demonstrate the software's compliance using the Envelope Trade-Off Option method per the ASHRAE 90.1 by climate zone. The spreadsheet, details of the procedure, and compliance requirements are described in Section 7.3.3.

8. A letter describing any differences between the expected results or any other requirements listed in this document and their software.

Residential Application Checklist

The following items shall be included in an application package submitted to the Commission for residential code compliance software approval:

1. The cover sheet "Request for Approval" shown in Appendix A. The vendor shall sign the checklist, certifying that the compliance software meets the requirements, including accuracy and reliability when used to demonstrate compliance with the Florida Energy Code and the requirements of this Technical Assistance Manual.

2. Computer Run Reports
   The required format for building information reports is electronic Portable Document File (PDF). Reports will be automatically generated by the software based on the type of compliance chosen. Each page of the report will have a header with the software name, revision, and date. See report requirements in Section 6.2 through 6.5.

3. Compliance Supplement and User's Manual
   The vendor shall submit a complete copy of their compliance software program's user manual, including material on the use of the compliance software for compliance purposes and an executable copy of the compliance software program for random verification of compliance analyses.

4. Code Compliance Test Results Spreadsheets
   The vendor shall submit the compliance software's evaluation spreadsheet file(s) indicated in Chapter 6 for the compliance methods the software is to perform (up to three prescriptive and one performance method). The spreadsheet files are designed to demonstrate the software's compliance using the indicated method per the Florida Energy Code. Details in Sections 6.2 – 6.5 describe the tests and files to be completed.

5. A letter describing any differences between the expected results or any other requirements listed in this document and their software.

Where to Send Application

Two copies of the full application package should be sent to:

Florida Building Commission
1940 North Monroe Street
Tallahassee, Florida 32399

Following submittal of the application package, the Commission may request additional information. This additional information is often necessary due to complexity of compliance software. Failure to provide such information in a timely manner may be considered cause for rejection or disapproval of the application. A re-submission of a rejected or disapproved application will be considered a new application.

4. User's Manual and Help System Requirements

Each compliance software vendor is required to publish a supplement or an independent user's manual that explains how to use the software for compliance with the Energy Code. The manual may also be accessed in electronic form, either on the user's workstation or through the web. The document should deal with compliance procedures and user inputs to the compliance software. Both the program user's manual and help system should positively contribute to the user's ability and desire to comply with the Energy Code and to the enforcement agency's ease of verifying compliance. The Commission may reject a compliance software certification submittal whose user's manual and help system does not serve or meet these objectives.

In addition, the user's manual and help system should:

- describe the specific procedures for using the compliance software for compliance with the Energy Code;
- provide instructions for preparing the building input, using the correct inputs, and using each of the approved optional capabilities (or exceptional methods) for which the compliance software is approved; and
- explain how to generate the compliance reports and related compliance documentation. A sample of properly prepared compliance documentation shall be included as part of the manual or help system.

The compliance software user's manual and help system serve two major purposes:

- It helps building permit applicants and others use the software correctly. It also guides them in preparing complete compliance documentation to accompany building permit applications.
- It helps enforcement agency staff check permit applications for compliance with the Energy Code.

The compliance software user's manual and help system should contain a chapter or section on how to model buildings for compliance and how to prepare a building input file for a compliance run.

The following are examples of topics to include:

- what surfaces to model (exterior, interior floors, etc.);
- how to enter data about these surfaces;
- how to model exterior shading (fins, overhangs, etc.);
- appropriate zoning for compliance modeling;
- selection of correct occupancy types;
- how to model similar systems;
- how to model buildings or portions of a building with no heating or cooling;
- requirements for written justification and additional documentation on the plans and in the specifications for exceptional items; and
- program modeling limitations.

All program capabilities should be described in sufficient detail to eliminate possible confusion as to their appropriate use. While references to the compliance software program's regular user's

manual are acceptable, a complete listing of all inputs and/or commands necessary for compliance should be included in the compliance software program user's manual and help system.

The compliance software program user's manual and help system should include the following:

- description of the value or values associated with each input;
- restrictions on each variable;
- listing of the range beyond which inputs are unreasonable for any variable;
- description of options for any user-defined variable; and
- chapter or section that covers each output report.

Appendices, as needed, to provide any additional background information that is not crucial in explaining the basic functioning of the program for compliance.

For example:

- An appendix may contain variations of compliance forms as described above.
- An appendix may include a series of construction assembly forms to aid the compliance software program user.
- An appendix may reprint important sections of the manual that are crucial to modeling buildings correctly for compliance with the compliance software program.
- Although the organizational format is not fixed, all information contained in the compliance software program user's manual and help system should be easy to find through use of a table of contents, an index, or through a context sensitive help system.

4.1 Statement

The following statement shall appear, in a box, within the first several pages of the compliance software program user's manual and help system:

[Insert Name of Calculation Method] may be used to show compliance with the Florida Energy Code only when the following reference documents are readily available to the program user:

- Florida Energy Code
- Energy Simulation Tool Approval: Technical Assistance Manual (TAM 2014-1.0)

5. Managing User Inputs

This section addresses the processes of data entry and the validation of user input data that can be performed prior to and independent of the code compliance calculation and building energy simulation.

5.1 Building Descriptor Inputs and Restrictions

The building inputs in the software shall have restrictions based on the code compliance method and building type. If the software provides a means for the user to enter building descriptors listed as optional, then all input conditions and restrictions in the Florida Energy Code pertaining to those building descriptors shall be met.

Four levels of restrictions are specified for building descriptors:

1) The most limiting restriction is a prescribed value. This is an input that must be used in all instances, with no variation.
2) A critical default may be overridden, but when it is, the user must provide special documentation.
3) A default is provided for convenience and may be overridden by the user with no special documentation.
4) For many inputs, there are no restrictions.

Commercial Building Inputs Restrictions

All inputs shall conform to the input conditions and restrictions stated in Chapter 4 Commercial Energy Efficiency Section of the Florida Energy Code. The relevant sections are as follows:

- For building envelope inputs, restrictions shall be per Building Envelope Requirements Section C402 or ASHRAE 90.1 option.
- For building mechanical systems, the input restrictions shall be per Section C403 Building Mechanical Systems or ASHRAE 90.1 option.
- For service water heating, the input restrictions shall be per Section C404 Service Water Heating or ASHRAE 90.1 option.
- For electrical power and lighting systems, the input restrictions shall be per Section C405 Electrical Power and Lighting Systems or ASHRAE 90.1 option.
- For performance based methods compliance criteria, input restrictions shall be per Section C407 Total Building Performance or ASHRAE Cost Budget Section of ASHRAE 90.1 option.

Residential Building Inputs Restrictions

All inputs shall conform to the input conditions and restrictions stated in Chapter 4 Residential Energy Efficiency Section of the Florida Energy Code.

- For building envelope inputs, restrictions shall be per Building Envelope Requirements Section R402.
- For cooling, heating, controls, mechanical ventilation, ductwork, hot water, hot water distribution, systems serving multiple dwelling units and swimming pools, the input restrictions shall be per Section R403 Systems.

- For lighting, the input restrictions shall be per Section R404 Electrical Power and Lighting Systems.
- For performance-based methods compliance criteria, input restrictions shall be per Section R405 Total Building Performance.

5.2 User Interface

The compliance software is not required to provide a means for users to enter data for building descriptors designated as prescribed (e.g., thermostat set points) in Sections C407 and R405 of the Florida Energy Code. However, if the user is permitted to enter values for prescribed inputs (perhaps for other features the software offers), the software must enforce the prescribed value when making the code calculation and report.

No restrictions are specified for unsanctioned inputs (e.g., inside visible reflectance). If the software uses unsanctioned inputs, the software documentation or help system shall specify the applicability of the building descriptors, its definition, the units in which it is expressed, restrictions on input for the Proposed Design, and, if applicable, how the building descriptor is defined for the Standard Reference Design building.

Compliance software programs must allow the user to enter the proposed building parameters that are not prescribed (fixed) in the energy code. The software may assist the user in describing the proposed design by displaying typical values for building descriptors, provided deliberate action by the user is necessary before a displayed value is used.

Compulsory Input Checks

The compliance software shall check to ensure that valid entries have been made for all compulsory building descriptors (e.g., wall type) before the user is permitted to proceed with the next step in the compliance process. Sections C407 and R405 of the Florida Energy Code specifies the compulsory building descriptors.

Handling Missing Inputs

If a required input is missing or invalid, then the compliance software shall:

- notify the user that the input is missing;
- identify the input field(s) with missing or invalid data; and
- prevent the user from moving to the next step of the compliance process.

The software may provide additional information designed to help the user correct the deficiency.

Handling Invalid Input

When invalid data is entered, the compliance software shall:

- notify the user of the invalid input;
- identify the nonconforming input field; and
- prevent execution of the next step of the compliance process.

The compliance software may provide additional information designed to assist the user to correct the invalid data.

Handling Inconsistent Inputs

If the proposed design building fails a consistency check, the compliance software shall:

- notify the user that an inconsistency exists;
- identify the specific consistency check that has been failed;
- identify the inconsistent input fields, if feasible; and
- prevent execution of the next step of the compliance process.

The software may provide additional information designed to help the user correct the inconsistent input.

Validity Checks

The compliance software shall check all user inputs to ensure that the following conditions are met:

- Limits-Inputs not to exceed the minimums or maximums values for the parameters permitted by the simulation engine;
- Compliance Rule Limits - Inputs not to be outside the limits for the descriptors specified in the Florida Energy Code;
- Simulation Tool Discrete Options-Inputs correspond with valid discrete or list options for parameters available in the simulation engine; and
- Compliance Rule Discrete Options-Inputs correspond with valid discrete options provided for in the Florida Energy Code.

Consistency Checks

The consistency checks described above are intended to identify errors and oversights in user input and thereby help ensure that the building description is complete and interpretable by the energy analysis engine. Examples of consistency checks include that windows should not exceed the areas of wall where they are contained and that the necessary plant equipment has actually been connected to the secondary HVAC systems. The compliance software may include additional consistency checks provided these additional checks are clearly documented in the user documentation or online help.

6. Residential Energy Compliance Software Programs

6.1 General Requirements

The residential code has three prescriptive and one performance methodologies. Two prescriptive methods, the R-value and U-factor Alternative, compare the home's component thermal characteristics against prescriptive measures. Software may not be required for those prescriptive methods but some software vendors may choose to include the methodology. If software is created to comply with these methods, the guidelines of this TAM shall be used to submit documentation of accurate compliance to the Florida Building Commission.

The Total UA Alternative Method allows trade-offs between envelope components by comparing the sum of the area times U-factors against the sum of the same areas times code specified U-factors. Software designed to perform this calculation shall submit to the Florida Building Commission the test results and reports specified by this document.

The residential performance method of the Florida Energy code requires simulation results showing a proposed residence (*Proposed Design*) to have an annual normalized, modified energy load that is less than or equal to the annual energy load of the *Standard Reference Design* as specified in Section R405.3 of the Florida Energy Code. The *Standard Reference Design* and *Proposed Design* utilized by the energy simulation tool shall be configured and analyzed as specified in Table R405.5.2(1) of the Florida Energy Code. In accordance with Section R401.2 of the Florida Energy Code, compliance software programs shall designate that the mandatory Energy Code provisions are met as well as any relevant performance criteria in Section R405. The compliance software shall accept inputs that describe the thermal envelope and equipment for the *Proposed Design.* The software shall use the proposed building inputs to create a *Standard Reference Design* building based on the *Proposed Design* building.

If software is to be used to comply with the prescriptive or performance paths, there are reports that shall be produced and tests that the vendor shall make to indicate correct computation and reporting. The vendor shall enter the test homes (Prescriptive test home characteristics file), produce the reports, and complete the spreadsheet (Prescriptive Software Compliance Tests) for the prescriptive methods the software covers. There are six test homes, three with the Tampa climate representing climate zone 2 in the code (T01 –T03) and three for the Miami climate representing climate zone 2 in the code (M01 –M03). Each method requires a cover sheet, an EPL display card, and specific reports as indicated here and in the code. The building official shall require that an 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 non-presold 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 compliance for the building.

Software tools are expected to provide help within the software that pertains to aspects of the building code where code language provides specific guidelines for determining a value. For example, for insulation inputs the code section R402.1.2 shall be referenced: "Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to

compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films."

6.2 Prescriptive R-Value Method

6.2.1 Reports

Software including compliance by this prescriptive method shall produce a report that mimics Florida Building Code, Energy Conservation Form R402-2014 as found in Appendix R-2 of the code. This report shall include:

1) a name of the component consistent with those listed in Table R402.1.1 for each component (e.g., ceiling, mass walls, frame walls, etc.);
2) the area of the component with those thermal characteristics;
3) the insulation R-value (or for windows, skylights and doors U-factor) to be installed; and
4) a pass or fail indication for each item based on information provided in Table R402.1.1 for the climate zone selected. For fenestrations, the software shall consider the exceptions provided for skylights, impact glass, and exceptions listed in section R402.3 prior to indicating a failure. If any item fails, the report shall indicate that the home fails. The word "FAIL" shall be no smaller than 16-point font, be bold, and be in an obvious location. If the home meets all criteria of Table R402.1.1, the report shall state "User entries meet requirements of Table R402.1.1." The house also has to meet other requirements described in the codebook.

Along with the printout of the report, another page shall be printed to be submitted to the code official. This page shall include the following information (see Appendix R-2 for an example):

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation Residential R-Value Computation Prescriptive Method Applications for compliance with the Florida Building Code, Energy Conservation, 5th edition (2014) via the Residential R-value computation prescriptive method shall include:

1) this checklist;
2) Form R402-2014, which includes the parameters of Table 402.1.1 (two pages);
3) Energy Performance Level (EPL) Display Card (one page); and
4) mandatory requirements (three pages).

Required prior to CO for the R-value computation method:

5) a completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the Florida Building Code, Energy Conservation, 5th edition (2014) with added checkboxes - one page);
6) a completed Envelope Leakage Test Report (usually one page); and
7) a completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located with the building thermal envelope.

6.2.2 Software Testing for Building Commission Approval of the R-Value Method

A pdf file shall be prepared that includes the following:

1) software reports (Reports 1 – 3 listed above) for prescriptive test houses T01 – T03 and M01 – M03;
2) the completed R-Value Method portion of each tab in the spreadsheet with the software results for each test house (procedures are provided in Appendix R-2); and
3) if the results computed by the software fall outside the range indicated in the excel report and the vendor believes that their value is correct, they may include an explanation.

6.3 Prescriptive U-Factor Alternative

6.3.1 Prescriptive U-Factor Alternative Reports

If the software is to calculate the residential U-Factor Alternative method, it shall generate a report for code compliance submittal that includes:

For any assembly, list:

1) the U-factor and the ASHRAE methodology used to obtain the U-factor;
2) include the list of components and any inputs, such as conductivity, thickness, R-value relevant to developing a U-factor;
3) indicate if any of the assembly components are software defaults or user specified; and
4) for any assembly with different thermal paths (e.g., a wall with framing members, or concrete block walls with insulated cores), list the fraction of each used to compute the assembly U-factor.

If any assembly component U-factor is greater than shown on Table R402.1.3, then indicate the assembly has failed.

If any assembly component has failed, the word “FAIL” shall be shown no smaller than 16-point font, be bold, and be in an obvious location. If every assembly in the home is less than or equal to the U-factors listed in Table R402.1.3, the report shall state “User entries meet requirements of U-factor Alternative Table 402.1.3.” The house also has to meet other requirements described in the codebook.

The software name and version shall be printed on the report.

The software shall also provide a cover sheet for submittal that includes the following (vendor may change page number count based on their typical output):

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation Residential U-factor Alternative Prescriptive Method Applications for compliance with the Florida Building Code, Energy Conservation, 5th edition (2014) via the Residential U-factor Alternative prescriptive method shall include:

1) this checklist;
2) U-factor prescriptive report that includes the information in Table R402.1.3 (two pages);
3) a Summary Report of User Inputs (usually 4 pages/may be greater);
4) Energy Performance Level (EPL) Display Card (one page); and
5) mandatory requirements (three pages).

Required prior to CO for the prescriptive U-factor alternative method:

6) a completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the Florida Building Code, Energy Conservation, 5th edition (2014) with added checkboxes - one page);
7) a completed Envelope Leakage Test Report (usually one page); and
8) a completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located with the building thermal envelope.

6.3.2 Software Testing for Building Commission Approval of the Prescriptive U-Factor Alternative Method

A pdf file shall be prepared that includes the following:

1) software reports (Reports 1 – 4 listed above) for prescriptive test houses T01–T03 and M01–M03;
2) the completed U-factor Alternative portion of each tab in the spreadsheet with the software results for each test house (procedures are provided in Appendix R-3); and
3) if the results computed by the software fall outside the range indicated on the excel report and the vendor believes that their value is correct, they may include an explanation.

6.4 Prescriptive Total UA Alternative method

6.4.1 Prescriptive Total UA Alternative Reports

The software shall allow entries of the home's components and/or assemblies and areas. The software shall calculate the baseline Total UA (maximum allowed value by code) by using the same building component areas (walls, windows, floors, etc.) of the proposed home, but with U-factors from Table R402.1.3.

If the software is to calculate the residential total UA Alternative method, it must generate a report for code compliance submittal that includes these items:

For any assembly, list:

1) the area and overall U-factor and the ASHRAE methodology used to obtain the U-factor;
2) include the list of components and any inputs, such as conductivity and thickness, relevant to developing a U-factor;
3) indicate if any of the assembly components are software defaults or user specified;
4) for any assembly with multiple thermal paths (e.g., a wall with framing members, or block walls with fill in concrete blocks), list the fraction of each used to compute the assembly U-factor; and
5) show the Total UA of the proposed home and the baseline Total UA next to one another.

If the Total UA is greater than the baseline Total UA, the word “FAIL” shall be shown no smaller than 16 -point font, be bold, and be in a very obvious location. If the home Total UA calculated according to the code is equal or less than the Baseline UA using values in Table R402.1.3, the report shall state “User entries meet requirements of Total UA”. The house also has to meet other requirements described in the codebook.

The software name and version shall be printed on the report.

The software shall also provide a cover sheet for submittal that includes the following (vendor may change page number count based on their typical output):

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation Residential Total UA Prescriptive Method Applications for compliance with the Florida Building Code, Energy Conservation, 5th edition (2014) via the Residential Total UA Alternative prescriptive method shall include:

1) this checklist;
2) total UA Report including Total UA Alternative Prescriptive Requirements Checklist (two pages);
3) Input Summary Report (usually 4 pages/may be greater);
4) Energy Performance Level (EPL) Display Card (one page); and
5) mandatory requirements (three pages).

Required prior to CO for the Total UA method:

6) a completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the Florida Building Code, Energy Conservation, 5th edition (2014) with added checkboxes - one page);
7) a completed Envelope Leakage Test Report (usually one page); and
8) a completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located with the building thermal envelope.

6.4.2 Software Testing for Building Commission Approval of the Prescriptive UA Alternative Method

A pdf file shall be prepared that includes the following:

1) software reports (reports 1-4 listed above) for prescriptive test houses T01–T03 and M01–M03;
2) the completed Total UA portion of each tab in the spreadsheet with the software results for each test house (procedures are provided in Appendix R-4); and
3) if the results computed by the software fall outside the range indicated on the excel report and the vendor believes that their value is correct, they may include an explanation.

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 R403.6 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.

- Printed reports to include a cover sheet; 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 R405.4.2 of the Florida Energy Code. The software shall produce the following cover sheet for submittal with each report (vendor may change page number count based on their typical output).

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, 5th edition (2014) via the Residential performance method shall include:

1) this checklist;
2) a Form 405 (see minimum required format in Appendix R-5 of this Manual) 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 (1 Page) and an input summary checklist that can be used for field verification) (usually 4 pages/may be greater);
3) Energy Performance Level (EPL) Display Card (one page); and
4) mandatory requirements (three pages).

Required prior to CO for the Total UA method:

5) a completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the Florida Building Code, Energy Conservation, 5th edition (2014) with added checkboxes - one page);
6) a completed Envelope Leakage Test Report (usually one page); and
7) if Form 405-2014 indicates anything other than default duct leakage, then a completed Form 405 Duct Leakage Rest 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 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 zero). 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.

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 6-1), 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 = SCHEDULE THRU DEC 31 (ALL) (1,24) (-4).

$$FVA = \left(0.25 \times \frac{A_w}{A_{cfa}} \right) \cdot \left(0.85 \times Discoef \right) \qquad \textbf{6 - 1}$$

Where:

FVA = the fraction of ventilation area
A_w = the sum of all the window areas in the conditioned part of the home
A_{cfa} = the sum of all the conditioned 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 code 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 6-1 (e.g., a 0.84 factor represents 16% savings) for annual energy use calculations.

Table 6-1 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 Solar Water Heating Option

The solar water heating effective efficiency for systems installed according to R403.4.4.2.1 shall be calculated using the following procedure.

First, calculate the effective solar efficiency:

$$ESE = SEF \cdot \left(a + \left(b \cdot Bedrooms\right) + \left(c \cdot Bedrooms^2\right)\right) \qquad 6 - 2$$

Where:

ESE = effective solar efficiency
SEF = the published Florida Solar Energy Factor
Bedrooms = the number of bedrooms in the house
a,b,c = coefficients as given in Table 6-2 by climate zone

Table 6-2 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

Second, calculate the expected load:

$$HW_{load} = GPD \times 8.3 \times (T_{set} - T_{main}) \cdot \frac{365}{1000} \qquad 6 - 3$$

Where:

HW_{load} = amount of heating needed in kBtu/year
GPD = gallons per day = 30+10*Bedrooms
T_{set} = temperature set point = 120°F for 2014 Florida code
T_{main} = temperature of entering water from Table 6-2 and
8.3 is the conversion for Btu/gallon and 365 is days in the year and 1000 is Btu/kBtu.

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

$$ESS_e = HW_{load} \times \frac{0.293}{EF_e} \qquad 6 - 4$$

Where:

ESS_e = energy use of Standard System-Electric in kWh
HW_{load} = hot water load calculated in Equation 6-3
EF_e = 0.92

Fourth, calculate the expected solar system electric energy use according to Equation 6-5:

$$Solar_e = HW_{load} \times \frac{0.293}{ESE} \qquad 6 - 5$$

Where:

$Solar_e$ = energy use of Solar System with Electric backup in kWh
HW_{load} = hot water load calculated in Equation 6-3
ESE = effective solar efficiency calculated in Equation 6-2

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

$$SE_e = \left(\frac{ESS_e - Solar_e}{ESS_e} \right) \qquad 6 - 6$$

$$SF_f = SF_e \frac{EF_f}{0.90} \qquad 6 - 7$$

Where:

SFe = solar fraction for electric
SFf = solar fraction for non-electric
EFf = 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.

$$ADHW = \left(ADHW_c - (1 - SF) \right) \qquad 6 - 8$$

Where:

ADHW = is the annual hot water energy use for the proposed home
ADHWc = is the annual hot water energy use of the conventional, non-solar back-up system fully modeled
SF = is the appropriate solar fraction,
SFe or SFf = calculated in the previous step

6.5.4.10 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 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.

6.5.4.11 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.

6.5.4.12 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 ventilation requirement and not allow the home to pass the code if the mechanical ventilation value is exceeded, as stated in Florida Building Code,

Energy Conservation, R403.5.2 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 features described in section R405 of the Code. Table R405.5.2(2) of the Code has a blank (or "---") for the Distribution system components located in unconditioned space / FORCED AIR SYSTEMS field. Since untested ducts are allowed for Section R405 compliance software vendors are requested to use "0.80".

The modeling procedures and assumptions described in this chapter apply to both the Standard Reference Design and Proposed Design. The requirements for the standard 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 2.2 of the RESNET document "Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools" dated September 2007 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 C 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 eRatio Method tests are intended to determine the ability of software compliance tools to accurately calculate the Florida Energy Code compliance eRatio 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 eRatio calculation procedure is given in *Florida Building Code, Energy Conservation, 5th edition (2014) Appendix B.*

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.13-002" [includes ASHRAE Standard 140-2011, Class II, Tier 1 building loads tests] RESNET, 2013 http://www.resnet.us/programs/RESNET_Pub_13-002_clean.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

6.5.7 Testing Procedures

Using the test cases identified in the reference documents in 6.4.2 above, simulate the cases as outlined in the reference documents.

Record the results using the MS Excel spreadsheets provided by the Commission (see below). 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 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 6.4.2 above.

The Forms are:
Florida AutoGen_results-form.xls
ASHRAE 140_results-form.xls
FL-HERS_BESTEST_results-form.xls
HVAC_results-form.xls
DSE_results-form.xls
DHW_results-form.xls
FL_e-ratio_results.xls

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

6.6 Submitting Software for Approval by the Building Commission

The software vendor shall include a cover sheet that indicates the software name and pertinent edition/version numbers. If the vendor offers many versions of the software and only some of those versions will calculate energy code compliance, then the submittal must indicate which names, versions, etc. will meet the requirements of their submittal.

The cover page shall also include what type of code compliance the software is designed to handle with a checkbox completed for those items the software covers and leaving the checkbox blank for those items not covered by the software. See the appendix A of this manual for a template.

Commercial Energy Efficiency Code Compliance

FEC Prescriptive Method
FEC Total Building Performance Method
ASHRAE Prescriptive Method
ASHRAE Energy Cost Budget Method
ASHRAE Envelope Trade-off Option Method

Residential Energy Efficiency Code Compliance

Prescriptive R-value method
Prescriptive U-factor Alternative method
Prescriptive Total UA Alternative method
Performance Method

7. Commercial Energy Compliance Software

7.1 Requirements Summary

The 2014 Florida Energy Code allows five methods of compliance for commercial buildings namely,

1. FEC Prescriptive Method
2. FEC Total Building Performance Method
3. ASHRAE Prescriptive Method
4. ASHRAE Envelope Trade-off Method
5. ASHRAE Energy Cost Budget Method

Required Tests

Compliance software may cover one or more of the commercial code compliance calculation methods listed above. As a result, vendors must comply with the appropriate test(s) designed to verify calculations for each of the methods. Following are the required tests based on the compliance methods supported.

1. FEC Prescriptive Method: Vendor must validate software against tests described in Section 7.3.2.
2. FEC Total Building Performance Method: Vendor must validate software against tests described in Section 7.3.1.
3. ASHRAE Prescriptive Method: Vendor must validate software against tests described in Section 7.3.2.
4. ASHRAE Envelope Trade-off Method: Vendor must validate software against tests described in Section 7.3.3.
5. ASHRAE Energy Cost Budget Method: Vendor must validate software against tests described in Section 7.3.1.

Additional Requirements for Performance Methods

In addition to the above, vendors supporting the FEC Total Building Performance Method and/or the ASHRAE Energy Cost Budget Method must run their software against ASHRAE Standard 140 suite of tests. Modeling guidelines and software requirements for these two performance methods are given in the FEC Section C407 and Section 11 of ASHRAE 90.1, respectively. Vendors must demonstrate that they conform to the requirements stipulated in those sections.

7.2 Commercial Code Verification Tests

Several prototype test cases have been developed to assist in the validation of Vendors' software. First, a description of the several test cases are given, followed by their applicability to the different compliance methodology.

7.2.1 Prototype Building Test Cases

These set of test suites were formulated to test and verify that the compliance software correctly applied the restrictions and rules per the Florida Energy Code or ASHRAE 90.1 options. The test suite prototype building geometry and some of the inputs assumptions were adopted from COMENT Manual 2010 - *Commercial Buildings Energy Modeling Guidelines and Procedures*. The other inputs of the proposed prototype buildings were formulated based on realistic

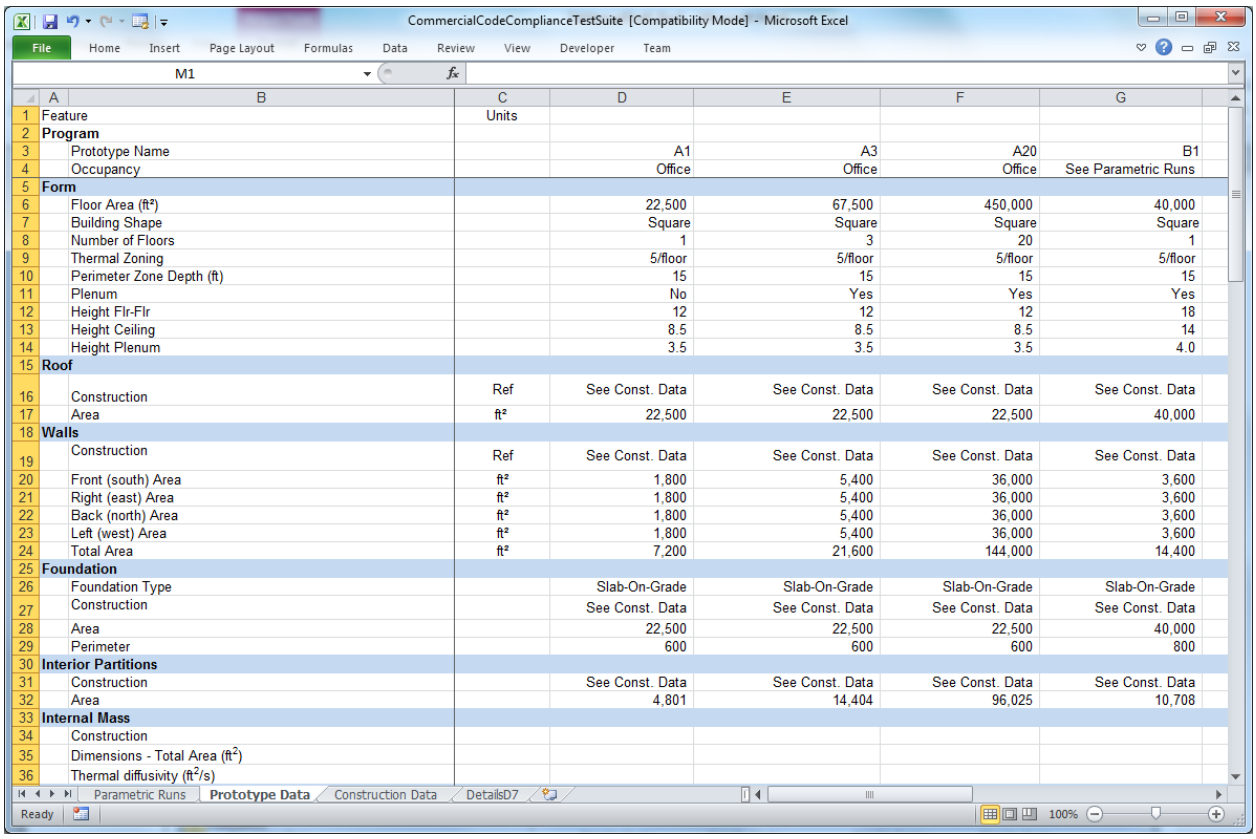
assumptions, and every effort was made such that the most important aspects of the code compliance calculations were accommodated. Seven proposed prototype buildings listed in Table 7-1 labeled as A1, A3, A20, B1, C1, D7 and E1 were designed for commercial code Compliance Software evaluation purposes. The numeric suffixes in the building labels stand for the number of stories. Each test case should be tested for the two Florida climate zones 1 (Miami-Dade) and 2 (Orlando) weather data.

Table 7-1 Proposed Prototype Buildings for Compliance Software Evaluation

Test Suite Buildings	Application	Number of Floors	Total Floor Size, ft^2
A1	Office	1	22,500
A3	Office	3	67,500
A20	Office	20	450,000
B1	Retail, Supermarket	1	40,000
C1	Manufacturing, Warehouse	1	160,000
D7	Mixed use: Retail, office, and Multifamily	7	179,400
E1	Mixed use: Retail, and Warehouse	1	90,000

The seven prototype buildings inputs summary is provided in the accompanying spreadsheet workbook file named "***CommercialCodeComplianceTestSuite.xls***". A snapshot of the prototype building inputs from this spreadsheet file is shown in Figure 7-1. In this workbook, there are four worksheets: "*Parametric Run*", "*Prototype Data*", "*Construction Data*", and "*DetailsD7*". The "*Parametric Runs*" worksheet summarizes the simulation runs and test case required for each prototype building, the "*Prototype Data*" worksheet summarizes the proposed building inputs data that includes building geometry, lighting and equipment electric power density, HVAC type, and efficiencies, the "*Construction Data*" worksheet summarizes the proposed prototype building construction material layer defined for each envelope assembly, and the "*DetailsD7*" worksheet summarizes additional information of the mixed use prototype building D7. *The prototype buildings are oriented towards true north with the front side facing south. In all the test suite buildings, multi-layer construction is represented by an equivalent single layer construction for simplicity*.

In addition to this summary, descriptions of the building geometry, HVAC system, service hot water system, lightings, electric power, and other inputs of the proposed prototype building test suite are provided next.



	Feature	Units				
2	**Program**					
3	Prototype Name		A1	A3	A20	B1
4	Occupancy		Office	Office	Office	See Parametric Runs
5	**Form**					
6	Floor Area (ft²)		22,500	67,500	450,000	40,000
7	Building Shape		Square	Square	Square	Square
8	Number of Floors		1	3	20	1
9	Thermal Zoning		5/floor	5/floor	5/floor	5/floor
10	Perimeter Zone Depth (ft)		15	15	15	15
11	Plenum		No	Yes	Yes	Yes
12	Height Flr-Flr		12	12	12	18
13	Height Ceiling		8.5	8.5	8.5	14
14	Height Plenum		3.5	3.5	3.5	4.0
15	**Roof**					
16	Construction	Ref	See Const. Data	See Const. Data	See Const. Data	See Const. Data
17	Area	ft²	22,500	22,500	22,500	40,000
18	**Walls**					
19	Construction	Ref	See Const. Data	See Const. Data	See Const. Data	See Const. Data
20	Front (south) Area	ft²	1,800	5,400	36,000	3,600
21	Right (east) Area	ft²	1,800	5,400	36,000	3,600
22	Back (north) Area	ft²	1,800	5,400	36,000	3,600
23	Left (west) Area	ft²	1,800	5,400	36,000	3,600
24	Total Area	ft²	7,200	21,600	144,000	14,400
25	**Foundation**					
26	Foundation Type		Slab-On-Grade	Slab-On-Grade	Slab-On-Grade	Slab-On-Grade
27	Construction		See Const. Data	See Const. Data	See Const. Data	See Const. Data
28	Area		22,500	22,500	22,500	40,000
29	Perimeter		600	600	600	800
30	**Interior Partitions**					
31	Construction		See Const. Data	See Const. Data	See Const. Data	See Const. Data
32	Area		4,801	14,404	96,025	10,708
33	**Internal Mass**					
34	Construction					
35	Dimensions - Total Area (ft^2)					
36	Thermal diffusivity (ft^2/s)					

Figure 7-1 Proposed Prototype Buildings Test Suite Input Data

Prototype Building A1

Prototype building A1 has a 22,500 ft² floor plan area, is single story, has an aspect ratio of 1.0, and has 550 ft² of fenestration area on each orientation for every floor. The building is divided into five thermal zones: four 15 ft. deep perimeter zones and an interior zone. The prototype building A1 is designed for office use and is shown in Figure 7-2. It has a 12 ft. total height; 8 ft. 6 in. ceiling height and 3 ft. 6 in. plenum height. The fenestration consists of 10 ft. by 5 ft. 6 in. windows spaced equally around the perimeter at 15 ft. There are 10 windows on each side of the building orientation. The window-to-wall ratio (WWR) is 30.6%. The building is built from wood framed exterior wall, gypsum board interior walls, unheated slab-on-grade floor, and flat built-in roof with insulation entirely above deck construction. The unheated slab-on-grade floor has an F-factor of 0.70 Btu/h-ft-°F. The fenestration is nonmetal fixed framing with reflective double glazing. The proposed prototype building has a distributed skylights installed over the interior zone and has a total skylight area of 2,250 ft², which is 10.0% of the building roof area. The skylights glass assembly has a U-factor and SHGC of 1.0 and 0.25, respectively. The opaque surfaces construction materials and surface properties of prototype building A1 are summarized in Table 7-2 and Table 7-3. Thermal zones internal gain components: electric equipment plug load, lighting, and occupancy density for the prototype building A1 are summarized in Table 7-4. This building has continuous lighting dimming and daylighting sensing automatic controls capable of reducing the power of general lighting up to 25% of the maximum allowed.

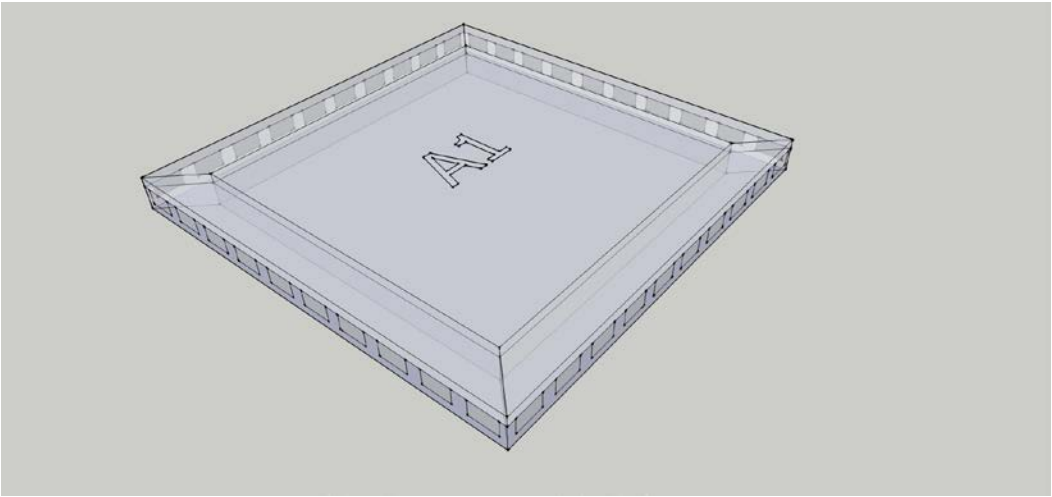


Figure 7-2 Prototype Building A1

Table 7-2 Construction Materials for Prototype Building A1

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
Built-in Wood Framed Wall	7.87	0.46	26.1	0.23	17.11
Ceiling					
Ceiling Gypsum	0.50	1.11	49.0	0.20	0.45
Roof					
Built-in Roof	6.77	0.37	22.5	0.22	18.30
Partition Wall					
Gypsum Board Partition Wall	1.00	1.11	50.0	0.20	0.90
Floor					
Slab-on-Grade	4.00	9.08	140.0	0.20	0.44

Table 7-3 Thermal and Optical Properties of Prototype Building A1

	External Wall	Roof	Floor
Thermal Mass, (Btu/ft^2·°F)	3.94	2.79	9.33
Solar Reflectance, (-)	0.65	0.60	-
Solar Absorptance, (-)	0.35	0.40	-
Emittance, (-)	0.90	0.90	-

Table 7-4 Internal Gain Components of Prototype Building A1

Internal Heat Gain Components	Prototype Building A1
Interior Lighting Desnity, (W/ft^2)	0.75
Equipment Plug Load, (W/ft2)	1.00
Occupancy, People/1000 ft^2	5.0

Exterior lighting for lighting zone 3 on the building front side only: Exterior lighting base site allowance of 750 W and 0.64 W/linear ft. allowance for walk ways around the front side of the building yields 846 W total exterior lighting power. The exterior lighting is on only when there is no sunlight and is controlled with a timer switch or photo-sensor.

Prototype Building A1: Proposed HVAC System

Each thermal zone is served by a single zone packaged air conditioner and electric furnace. Each packaged single zone AC has a cooling rated SEER value of 19.0 Btu/W-h if the cooling capacity is less than 65 kBtu/h or else has a cooling rated EER value of 12.8 Btu/W-h if the cooling capacity is greater or equal to 65 kBtu/h. The electric furnace thermal efficiency is assumed to be 100%. Each zone is served with a constant speed fan of 60% fan efficiency and 90% electric motor efficiency. Service hot water is provided with storage electric water. There are two hot water storage units of 80 gallons each. Add air economizer depending on climate zone and cooling capacity of the individual fan coil units. The minimum ventilation air requirement per unit floor area for prototype office building A1 is 0.10 cfm/ft^2. Air infiltration through envelope (walls, fenestration and skylight) normalized per unit gross area of the exterior walls for prototype building A1 is estimated to be 0.0177 cfm/ft^2 at a pressure difference of 0.016 inch w.g.

Prototype Building A3

Prototype building A3 has a 22,500 ft² floor plan area, is three stories, has an aspect ratio of 1.0, and has 550ft² of fenestration area per floor on each orientation. Each floor has five thermal zones; four 15 ft. deep perimeter zones and an internal zone. In total, there are 15 thermal zones. The prototype building A3 is designed for office use and is shown in Figure 7-3. It has a 12 floor-to-floor height and a plenum with a height of 3 ft. 6 in. Ceiling height is 8 ft. 6 in. The fenestration consists of 10 ft by 5 ft. 6 in. windows spaced equally around the perimeter at 15 ft. There are 10 windows per floor on each side building orientation. The window-to-wall ratio (WWR) is 30.6%**.** The fenestration has fixed metal frames and reflective double glazing. The building does not have any skylights. The building is constructed from a steel-framed exterior wall, gypsum board interior walls, unheated slab-on-grade floor, and flat built-in roof with insulation entirely above deck construction. The unheated slab-on-grade floor has an F-factor of 0.70 Btu/h-ft.-°F. The opaque surfaces construction materials and surface properties of the prototype building A3 are given in Table 7-5 and Table 7-6. Internal gain components: electric equipment plug load, lighting, and occupancy density for the prototype building A3 are summarized in Table 7-7.

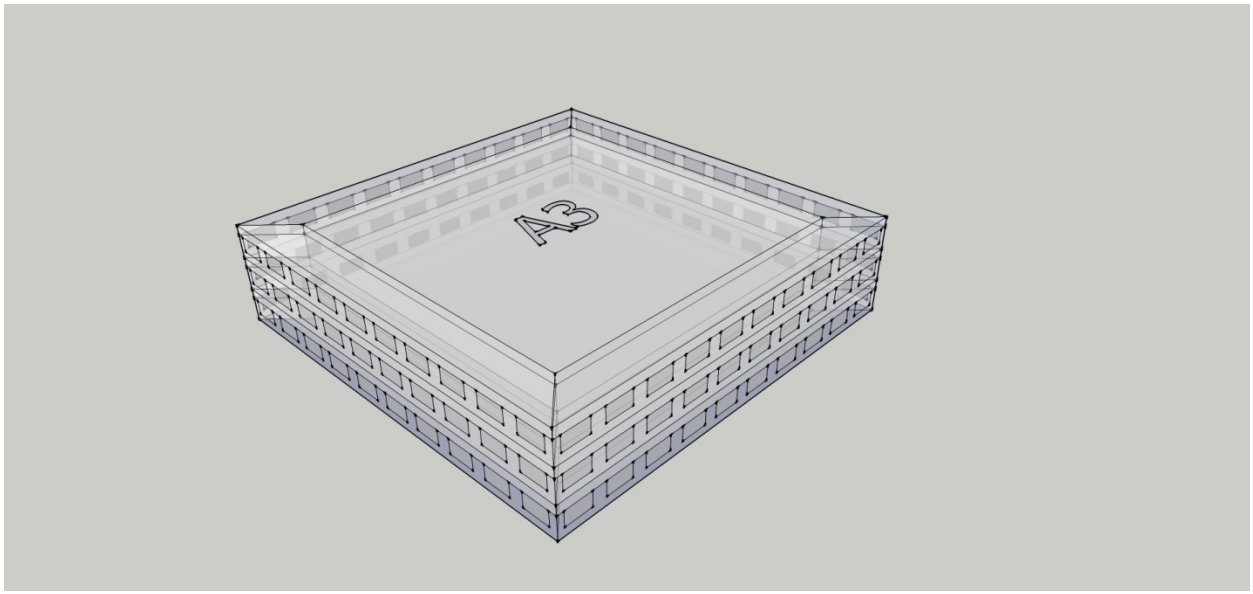


Figure 7-3 Prototype Building A3

Table 7-5 Construction Materials of Prototype Building A3

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
Composite stell-framed Wall	8.27	0.54	20.5	0.22	15.31
Ceiling					
Gypsum	0.50	1.11	49.0	0.20	0.45
Roof					
Composite Roof	6.46	0.35	23.9	0.21	18.46
Internal Floor					
Int-Floor	8.27	0.62	74.9	0.19	13.34
Partition Wall					
Gypsum Board	1.00	1.11	50.0	0.20	0.90
Floor					
Slab-on-grade	4.00	9.08	140.0	0.20	0.44

Table 7-6 Thermal and Optical Properties of Prototype Building A3

	External Wall	Roof	Int-Floor	Floor
Thermal Mass, (Btu/ft^2·°F)	3.11	2.70	9.81	9.33
Solar Reflectance, (-)	0.65	0.60	-	-
Solar Absorptance, (-)	0.35	0.40	-	-
Emittance, (-)	0.90	0.90	-	-

Table 7-7 Internal Gain Components of Prototype Building A3

Internal Heat Gain Components	Prototype Building A3
Interior Lighting Desnity, (W/ft^2)	0.75
Equipment Plug Load, (W/ft2)	1.00
Occupancy, People/1000 ft^2	5.0
Elevators, Quantity = 2 , Motor Efficiency 88%, Peak Power Each (HP)	7.5

Exterior lighting for lighting zone 3 on the building front side only: Exterior lighting base site allowance of 750 W and 0.64 W/linear ft. allowance for walk ways around the front side of the building yields 846 W total exterior lighting power. The exterior lighting is on only when there is no sunlight and is controlled with a timer switch or photo-sensor.

Prototype Building A3: Proposed HVAC System

Each floor is served by a packaged VAV air conditioner with gas furnace. Each zone is served with terminal air distribution units with gas reheat coil. The system has a cooling rated EER value of 12.8 Btu/W-h. The gas furnace efficiency is 80%. Each VAV system is equipped with a variable speed supply air fan of 60% fan efficiency and 90% electric motor efficiency. Service hot water is provided with condensing gas water heater. There are two hot water storage units of 80 gallons each for every floor. Add air economizer depending on climate zone and cooling capacity of the individual fan coil unit. The minimum ventilation air requirement per unit floor area for prototype office building A3 is 0.10 cfm/ft^2. Air infiltration through envelope (walls, fenestration, and skylight) normalized per unit gross area of the exterior walls for prototype building A3 is estimated to be 0.0052 cfm/ft^2 at a pressure difference of 0.016 inch w.g.

Prototype Building A20

Prototype building A20 has a 22,500 ft² floor plan area, is twenty stories, has an aspect ratio of 1.0, and has 1,275 ft² of fenestration area on each orientation for every floor. Each floor has five thermal zones; four 15 ft. deep perimeter zones and an internal zone. In total, there are 100 thermal zones. The prototype building A20 is designed for office use and is shown in Figure 7-4. It has a 12 floor-to-floor height and a plenum with a height of 3 ft. 6 in. Ceiling height is 8 ft. 6 in. The fenestration has floor-to-ceiling glass on all sides of the building. The window-wall ratio (WWR) is 70.8%. The fenestration is made from fixed metal frames and reflective double glazing. The building does not have any skylight. The building is constructed from a steel-framed exterior wall, gypsum board interior walls, unheated slab-on-grade floor, and flat built-in roof with insulation entirely above deck construction. The unheated slab-on-grade floor has an F-factor of 0.70 Btu/h-ft-°F. The opaque surfaces construction materials and surface properties of prototype building A20 are summarized in Table 7-8 and Table 7-9. Internal gain components: electric equipment plug load, lighting, and occupancy density for the prototype building A20 are provided in Table **7-10**.

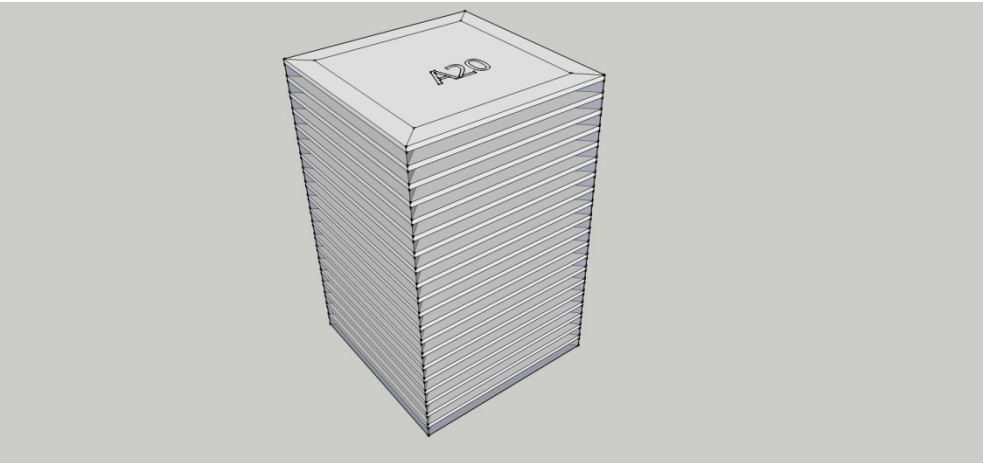


Figure 7-4 Prototype Building A20

Table 7-8 Construction Materials of Prototype Building A20

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
Composite steel-framed Wall	8.27	0.54	20.5	0.22	15.31
Ceiling					
Gypsum	0.50	1.11	49.0	0.20	0.45
Roof					
Composite Roof	6.46	0.35	23.9	0.21	18.46
Internal Floor					
Int-Floor	8.27	0.62	74.9	0.19	13.34
Partition Wall					
Gypsum Board	1.00	1.11	50.0	0.20	0.90
Floor					
Slab-on-grade	4.00	9.08	140.0	0.20	0.44

Table 7-9 Thermal and Optical Properties of Prototype Building A20

	External Wall	Roof	Int-Floor	Floor
Thermal Mass, (Btu/ft^2·°F)	3.11	2.70	9.81	9.33
Solar Reflectance, (-)	0.65	0.60	-	-
Solar Absorptance, (-)	0.35	0.40	-	-
Emittance, (-)	0.90	0.90	-	-

Exterior lighting for high activity commercial district (lighting zone 4) on the building front side only: Exterior lighting base site allowance of 1300 W and 0.8 W/linear ft. allowance for walk ways around the front side of the building yields 1420 W total exterior lighting power. The exterior lighting is on only when there is no sunlight and is controlled with a timer switch or photo-sensor.

Table 7-10 Internal Gain Components of Prototype Building A20

Internal Heat Gain Components	Prototype Building A20
Interior Lighting Desnity, (W/ft^2)	0.75
Equipment Plug Load, (W/ft2)	1.00
Occupancy, People/1000 ft^2	5.0
Elevators, Quantity = 6, Motor Efficiency 92%, Peak Power Each (HP)	20.0

Prototype Building A20: Proposed HVAC System

Each floor is served with a central chilled water VAV system with reheat, and with return plenum zones. Each zone is served with a terminal air distribution unit that has hot water reheat coil. The chiller has an AHRI rated cooling COP of 5.86 (=0.60 kW/ton). The chiller is water cooled and has an electrically operated centrifugal compressor; chiller cooling water loop is controlled using a central cooling tower. Hot water is provided using a central hot water oil-fired boiler with 90% thermal efficiency. Each VAV system is equipped with a variable speed supply air fan of 60% fan efficiency and 90% electric motor efficiency. Service hot water is provided by the central hot water gas boiler. Add air economizer depending on climate zone and cooling capacity of the individual fan coil unit. Minimum ventilation air requirement per unit floor area for prototype office building A20 is 0.10 cfm/ft^2. Air infiltration through envelope (walls, fenestration and skylight) normalized

per unit gross area of the exterior walls for prototype building A20 is estimated to be 0.0061 cfm/ft^2 at a pressure difference of 0.016 inch w.g.

Prototype Building B1

Prototype building B1 has a 40,000 ft² floor plan area, is single story, has an aspect ratio of 1.0, and has 640 ft² of fenestration area on the front side only. The building is divided into five zones: four 15 ft. deep perimeter zones and an internal zone. The prototype building B1 is designed for Retail or Supermarket application and is shown in Figure 7-5. It has an 18 ft. height and a plenum with a height of 4 ft. Ceiling height is 14 ft. The window-wall ratio (WWR) of the front side (south) is 17.78%. The fenestration has fixed metal frames and uncoated double glazing. The front side of the building has a horizontal overhang located at the top of the glazing that extends a distance of 8 ft. This proposed prototype building has distributed Skylights installed over the interior (core) zone and has a total skylight area of 2,000 ft², which is 5.0% of the building roof area. The skylights glass has a U-factor and SHGC of 1.0 and 0.25, respectively. The building is constructed from CMU blocks exterior wall, gypsum board interior walls, unheated slab-on-grade floor, and flat built-in roof with insulation entirely above deck constructions. The unheated slab-on-grade floor has an F-factor of 0.70 Btu/h-ft-°F. The opaque surfaces construction materials and surface properties of prototype building B1 are summarized in Table 7-11 and Table 7-12. Internal gain components: electric equipment plug load, lighting and occupancy density for the prototype building B1 are provided in Table 7-13. This prototype building has stepped multi-level lighting dimming and daylighting sensing automatic controls capable of reducing the power of general lighting up to 30% of the maximum allowed.

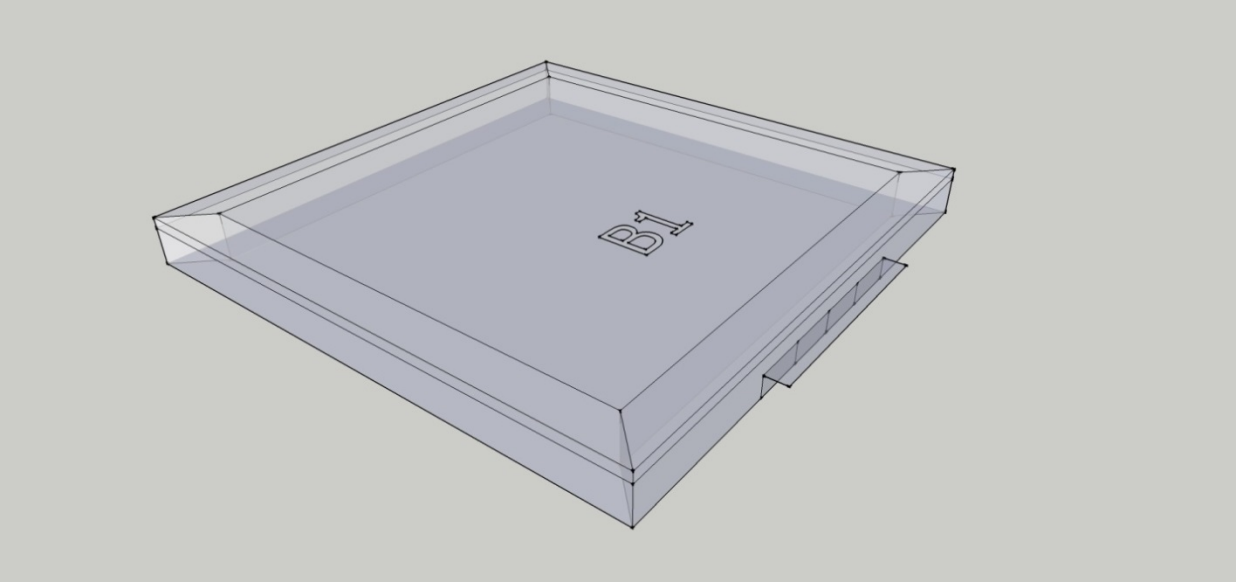


Figure 7-5 Prototype Building B1

Table 7-11 Construction Materials of Prototype Building B1

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
CMU Mass Wall	10.00	5.06	129.0	0.20	1.98
Ceiling					
Gypsum Board	0.50	1.11	49.0	0.20	0.45
Roof					
Composite Roof	6.90	0.32	23.4	0.21	21.56
Partition Wall					
Gypsum Board	1.00	1.11	50.0	0.20	0.90
Floor					
Slab-on-grade	4.30	2.61	127.9	0.18	1.65

Table 7-12 Thermal and Optical Properties of Prototype Building B1

Properties	External Wall	Roof	Slab-on-Grade Floor
Thermal Mass, (Btu/ft^2·°F)	21.50	2.83	8.25
Solar Reflectance, (-)	0.65	0.60	-
Solar Absorptance, (-)	0.35	0.40	-
Emittance, (-)	0.90	0.90	-

Exterior lighting for light industrial or neighborhood business area (lighting zone 2) on the building front side only: Exterior lighting base site allowance of 600 W and 0.56 W/linear ft. allowance for walk ways around the front side of the building yields 712 W total exterior lighting power. The exterior lighting is on only when there is no sunlight and is controlled with a timer switch or photo-sensor.

Table 7-13 Internal Gain Components of Prototype Building B1

Internal Heat Gain Components	Retail	Supermarket
Interior Lighting Desnity, (W/ft^2)	1.90	1.90
Equipment Plug Load, (W/ft2)	0.90	1.14
Occupancy, People/1000 ft^2	13.10	7.24
Refrigerators Power Density, (W/ft^2)	-	0.14

Prototype Building B1: Proposed HVAC System

Each zone is served with a packed air-source heat pump and electric supplemental heater or a packaged air conditioner with electric furnace. Each packaged heat pump or packaged air conditioner unit has a rated SEER value of 17.0 Btu/W-h if the cooling capacity is less than 65.0 kBtu/h, or else has a cooling rated EER value of 12.6 Btu/W-h if the cooling capacity is greater or equal to 65.0 kBtu/h. The heat pump has a rated HSPF value of 8.4 Btu/W-h if the cooling capacity of the heat pump is less than 65.0 kBtu/h, or else has heating rated COP of 3.5 at 47°F dry-bulb and 43°F wet-bulb outdoor air temperature if the cooling capacity of the heat pump is greater or equal to 65.0 kBtu/h. The air-conditioner electric furnace has 100% thermal efficiency. Each packaged heat pump is equipped with a variable speed supply air fan of 60% fan efficiency and 90% electric

motor efficiency. Service hot water is provided with storage electric water heater. There are two hot water storage units of 80 gallons each. Add air economizer depending on climate zone and cooling capacity of the individual fan coil unit. The minimum ventilation air requirement per unit floor area for supermarket and retail buildings is 0.27 cfm/ft^2. Air infiltration through envelope (walls, fenestration, and skylight) normalized per unit gross area of the exterior walls for prototype B1 building is estimated to be 0.0092 cfm/ft^2 at a pressure difference of 0.016 inch w.g.

Prototype Building C1

Prototype building C1 has a 160,000 ft² floor plan area, is single story, has an aspect ratio of 1.0, and has 1,280 ft² of fenestration area on the front side only. The building is divided into five zones: four 15 ft. deep perimeter zones and an internal zone. The prototype building C1 is designed for Manufacturing or Warehouse application and is shown in Figure 7-6. It has a 24 ft. height and has no plenum. The window-wall ratio (WWR) of front side (south) is 13.33%. The fenestration has fixed metal frames and uncoated double glazing. This proposed prototype building has distributed skylights installed over the interior (core) zone and has a total skylight area of 3,200 ft², which is 2.0% of the building roof area. The skylights glass has a U-factor and SHGC of 1.0 and 0.25, respectively. The front side has a horizontal overhang located at the top of the glazing that extends a distance of 8 ft. The building is constructed from CMU blocks exterior wall, gypsum board interior walls, unheated slab-on-grade floor, and flat built-in roof with insulation entirely above deck construction. The unheated slab-on-grade floor has an F-factor of 0.70 Btu/h-ft-°F. The opaque surfaces construction materials and surface properties of prototype building C1 are summarized in Table 7-14 and Table 7-15. Internal gain components: electric equipment plug load, lighting and occupancy density for the prototype building C1 are provided in Table 7-16. This prototype building has stepped multi-level lighting dimming and daylighting sensing automatic controls capable of reducing the power of general lighting up to 30% of the maximum allowed.

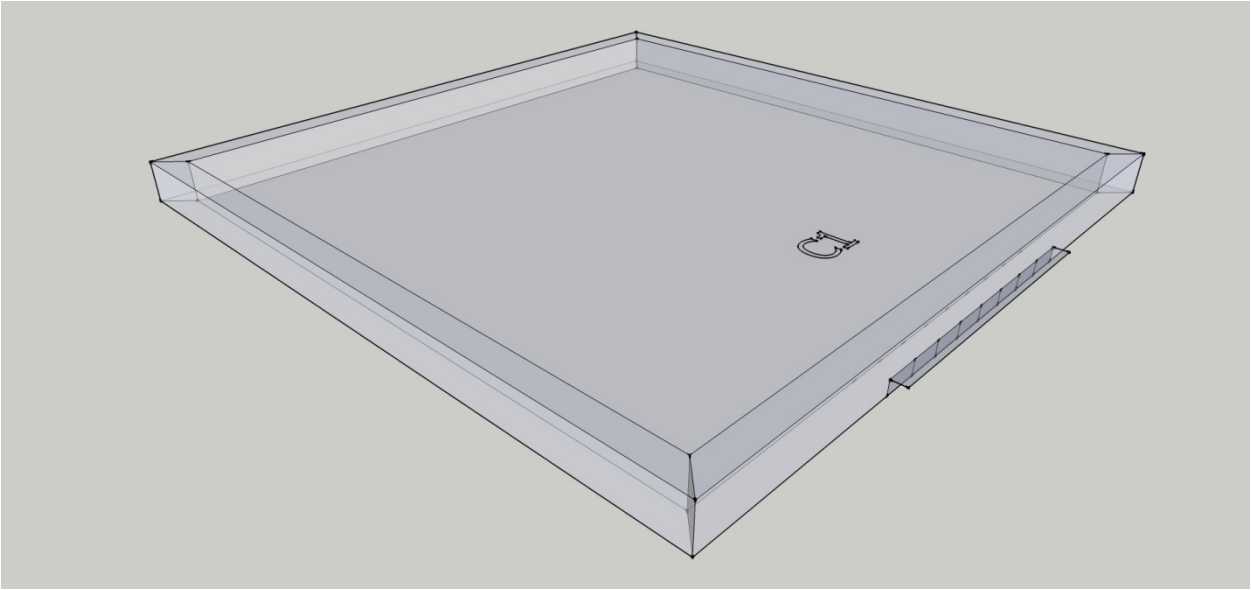


Figure 7-6 Prototype Building C1

Table 7-14 Construction Materials of Prototype Building C1

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
CMU Mass Wall	10.0	5.06	129.0	0.20	1.98
Roof					
Composite Roof	6.9	0.32	23.4	0.21	21.56
Partition Wall					
Gypsum Board	1.0	1.11	50.0	0.20	0.90
Floor					
Slab-on-grade	4.3	2.61	127.9	0.18	1.65

Table 7-15 Thermal and Optical Properties of Prototype Building C1

Properties	External Wall	Roof	Slab-on-Grade Floor
Thermal Mass, (Btu/ft^2·°F)	21.50	2.83	8.25
Solar Reflectance, (-)	0.65	0.60	-
Solar Absorptance, (-)	0.35	0.40	-
Emittance, (-)	0.90	0.90	-

Table 7-16 Internal Gain Components of Prototype Building C1

Internal Heat Gain Components	Manufacturing	Warehouse
Interior Lighting Desnity, (W/ft^2)	1.00	0.58
Equipment Plug Load, (W/ft2)	1.60	1.00
Occupancy, People/1000 ft^2	1.33	0.10

Exterior lighting for light industrial or neighborhood business area (lighting zone 2) on the building front side only: Exterior lighting base site allowance of 600 W and 0.56 W/linear ft. allowance for walk ways around the front side of the building yields 824 W total exterior lighting power. The exterior lighting is on only when there is no sunlight and is controlled with a timer switch or photo-sensor.

Prototype Building C1: Proposed HVAC System

Each zone is served with a packed air-conditioner and gas furnace or air-source heat pump with electric supplemental heater. Each packaged air-conditioner and heat pump unit has a cooling rated SEER value of 15.0 Btu/W-h if the cooling capacity is less than 65.0 kBtu/h or else has a cooling rated EER of 12.2 Btu/W-h if the cooling capacity is greater or equal to 65.0 kBtu/h. The gas furnace has a thermal efficiency of 90%. The heat pump has a rated HSPF of 8.2 Btu/W-h if the cooling capacity of the heat pump is less than 65.0 kBtu/h or else has a heating rated COP of 3.4 at 47°F dry-bulb and 43°F wet-bulb outdoor air temperature if the cooling capacity of the heat pump is greater or equal to 65.0 kBtu/h. Each packaged air-conditioner and heat pump unit has a variable speed supply air fan of 60% fan efficiency and 90% electric motor efficiency. Service hot water is provided with a condensing gas water heater. There are three 80-gallon hot water storage units. Add an air economizer depending on climate zone and cooling capacity of the individual fan coil unit. The minimum ventilation air requirement per unit floor area for Manufacturing and

Warehouse buildings is 0.12 cfm/ft^2 and 0.05 cfm/ft^2, respectively. Air infiltration through envelope (walls, fenestration, and skylight) normalized per unit gross area of the exterior walls for prototype building C1 is estimated to be 0.0073 cfm/ft^2 at a pressure difference of 0.016 inch w.g.

Prototype Building D7

The prototype D7 building is a mixed use seven above ground stories with retail on the first level, office space on levels two and three, and four stories of multi-family housing over the office. Prototype D7 is created by modifying the case study building used in the User's Manual for ASHRAE Standard 90.1-2004. The building's footprint is 150 ft x 90 ft with the long axis oriented due east-west. The prototype building D7 is shown in Figure 7-7. The first floor contains retail spaces with large display windows that have horizontal overhangs projecting 10 ft on the south, east, and west exposures. The second and third floors contain offices that have similarly oriented overhangs, although the overhangs project only 5 ft. Floors four through seven are apartments. To provide more daylight and fresh air, the four floors of apartments have two 20 ft x 30 ft notches taken out of the floor plan; therefore, these levels have 1,200 ft² less floor area than floors one, two, and three. The building also has an unconditioned stairwell. The building construction is steel-framed exterior wall, gypsum board interior walls, unheated slab-on-grade floor and flat built-in roof with insulation entirely above deck construction. The unheated slab-on-grade floor has F-factor of 0.70 Btu/h-ft-°F. The opaque surfaces construction materials and surface properties of prototype building D7 are summarized in Table 7-17 and Table 7-18. The fenestrations have double glazing and thermally broken metal frames. Only the fenestrations on the residential levels are operable. The Prototype proposed building D7 window-to-wall ratio and fenestration U-value and SHGC are given in Table 7-19. The lighting power and equipment electric power densities used in the different sections of the prototype building D7 are summarized in. The perimeter zones of the office have automatic daylight dimming controls.

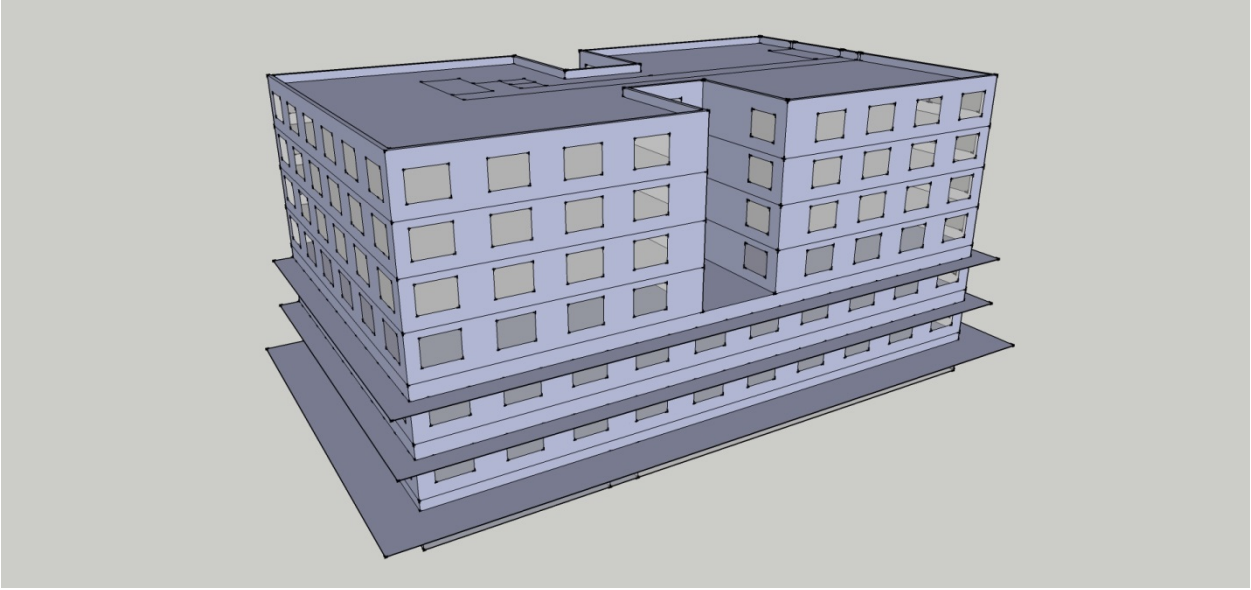


Figure 7-7 Prototype Building D7

Table 7-17 Construction Materials of Prototype Building D7

Layers (outer to inner)	Thickness, in	Conductivity Btu-in/(h·ft^2·°F)	Density lbm/ft^3	Specific heat Btu/(lbm·°F)	Thermal Resistance (h·ft^2·°F)/Btu
External Wall					
Composite steel-framed Wall	11.54	0.67	40.8	0.23	17.33
Ceiling					
Gypsum	0.50	1.11	49.0	0.20	0.45
Roof					
Composite Roof	6.46	0.35	23.9	0.21	18.62
Internal Floor					
Int-Floor	8.35	0.62	74.9	0.19	13.37
Partition Wall					
Gypsum Board	1.00	1.11	50.0	0.20	0.90
Floor					
Slab-on-grade	4.00	9.08	140.0	0.20	0.44

Table 7-18 Thermal and Optical Properties of Prototype Building D7

	External Wall	Roof	Int-Floor	Floor
Thermal Mass, (Btu/ft^2·°F)	9.02	2.70	9.90	9.33
Solar Reflectance, (-)	0.65	0.60	-	-
Solar Absorptance, (-)	0.35	0.40	-	-
Emittance, (-)	0.90	0.90	-	-

Table 7-19 Surface Areas and Fenestration Properties of Prototype Building D7

Space Category	Orientation	Wall Area, ft^2	Window Area, ft^2	Window-Wall-Ratio	Climate Zone 1 U-Value/SHGC	Climate Zone 2 U-Value/SHGC
Residential	North	6,600	1,728		1.00/0.25	0.60/0.25
	Non-North	30,360	4,800		1.00/0.25	0.60/0.25
Residential Total		36,960	6,528	17.66%		
Nonresidential						
Retail	North	1,700	560		0.90/0.56	0.60/0.56
Office	North	3,700	960		0.90/0.25	0.60/0.25
Retail	Non-North	3,972	2,574		0.90/0.56	0.60/0.56
Office	Non-North	8,140	2,112		0.90/0.40	0.60/0.40
Nonresidential Total		17,512	6,206	35.44%		

Exterior Lighting for high activity commercial district (lighting zone 4) on the building front side only; exterior lighting base site allowance of 1300 W and 0.8 W/linear ft allowance for walk ways around the front side of the building yields 1420 W total exterior lighting power. The exterior lighting is on only when the sun is off controlled with time switch or photo-sensor. There are two elevators serving the offices and apartment units. The peak electric power draw of each elevator motor is 15 HP and electric motor efficiency of 90%.

Table 7-20 Lighting and Equipment Electric Power of Prototype Building D7

Area Description	Area, ft^2	Lighting Power		Equipment Power	
		Watts	W/ft^2	Watts	W/ft^2
Retail	11,300	15,594	1.38	16,950	1.50
Office	27,000	31,320	1.16	27,000	1.00
Apartment Units	43,600	71,940	1.65	71,940	1.65
Multi-family Hallway	5,600	4,480	0.80	3,920	0.70
Totals	87,500	123,334	1.41	119,810	1.37

Prototype Building D7: Proposed HVAC System

A variable air volume (VAV) air-handling system served by a centrifugal chiller and a boiler provides space conditioning in the office levels. The retail spaces and apartments are served by a four-pipe fan coil system so that they can be independently shut down if the stores' and apartments' operating hours differ significantly from the offices. The chiller has a water cooled condenser and has an electrically operated reciprocating compressor with an AHRI rated cooling COP of 5.68 (0.62 kW/ton). These items, along with a central gas boiler, serve all of the cooling loads and heating loads in the building. Service hot water is provided with a central hot water gas boiler of 86% thermal efficiency. Add air economizer depending on climate zone and cooling capacity of the individual fan coil unit for the retail and office floors. Table 7-21 summarizes the occupant density and minimum outdoor air requirement per unit floor area for ventilation for prototype building D7. Air infiltration through envelope (walls, fenestration, and skylight) normalized per unit gross area of the exterior walls for prototype building D7 is estimated to be 0.0057 cfm/ft^2 for retail, 0.0051 cfm/ft^2 for office, and 0.0049 cfm/ft^2 for multifamily blocks at a pressure difference of 0.016 inch w.g.

Table 7-21 Occupancy and Minimum Ventilation Air Requirement of Prototype Building D7

Area Description	Area, ft^2	Occupancy		Ventilation Air Requirement	
		Persons	Persons / 1000 ft^2	cfm	cfm/ft^2
Retail	11,300	148	13.10	3,051	0.27
Office	27,000	135	5.00	2,700	0.10
Apartment Units	43,600	115	2.64	2,180	0.05
Multi-family Hallway	5,600	-	-	280	0.05
Totals	87,500	398	4.55	8,211	0.09

Prototype Building E1

A single story, 90,000 ft² floor area mass building was designed to serve 25% retail showroom and 75% warehouse. This test building was created by modifying an example building described in ASHRAE Standard 190.1-2007 User's Manual. Changes were made to the fenestration products, skylights, and door construction to make the example building applicable to the Florida climate design scenario. The building is 200 ft. by 450 ft. with the long axis running east-west. The showroom is on the west end of the building, as shown in Figure 7-8. The exterior wall height is 20 ft at the showroom area and 30 ft at the warehouse. The walls of the warehouse and the showroom are constructed of solid concrete (tilt-up) with an interior furring space with R-11 insulation and have *U-Factor* of 0.078. Vertical fenestration is located only in the showroom. The west facade has six windows, each measuring 20 ft wide by 10 ft high for a total of 1,200 ft² of fenestration. Both

the south and north sides of the showroom have two windows also 10x20 ft. The fenestration has an NFRC rated U-factor of 0.90, an SHGC of 0.60 and a light transmission of 0.70.

There are five loading doors on the south side of the building. Each is 20 ft wide by 10 ft high and is insulated with a tested *U-factor* for the entire door (not just the insulated section) of 0.28. The building's walls are 8 inch-thick solid concrete. The walls of the building's showroom area are insulated with R-13 on the inside. The insulation is supported by metal clips installed at 24 inches on center. The concrete walls in the warehouse portion of the building are not insulated and have *U-Factor* of 0.55. The roofs of both the showroom area and the warehouse are insulated with R-15 rigid foam installed entirely above the structural deck for Climate Zone 1 test (Miami-Dade, FL) and R-20 rigid foam installed entirely above the structural deck for Climate Zone 2 test (Orlando, FL).

The floor is assumed to be slab-on grade with no-insulation and to be modeled using F-Factor calculation method with F-Factor of 0.70 Btu/(h-ft-°F). The sales showroom has 20 ft^2 Skylight is with curve and made from glass. Treat the warehouse as semi-heated space category.

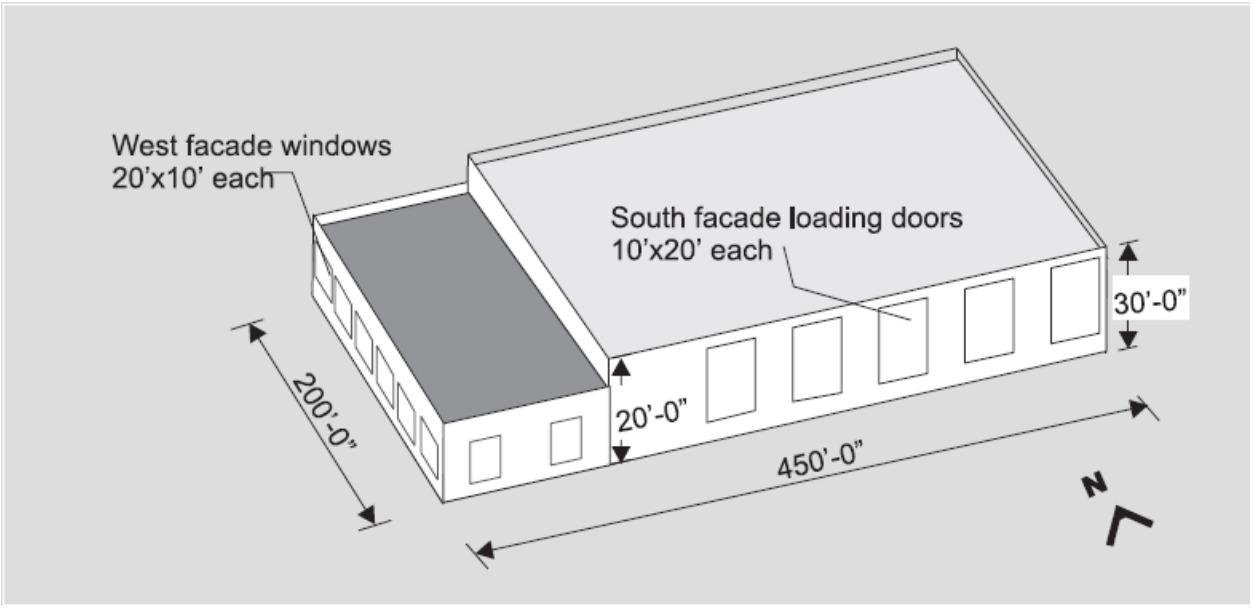


Figure 7-8 Envelope Trade-Off Option Test Building (Source: ASHRAE 90.1-2007 User's Manual)

Prototype Buildings used for Performance Methods (FEC & ASHRAE)

Prototype buildings A1, A3, A20, B1, C1, and D7 are used for validating the performance methods. Each of these buildings was tested for climate zone 1 and 2.

Prototype Buildings used for Prescriptive Methods (FEC & ASHRAE)

For the prescriptive commercial code compliance software evaluation two prototype buildings A1 and C1 were used. Each of these buildings was tested for climate zone 1 and 2, and prototype building C1 was tested for two different HVAC system types and two building application types. In total there are six test cases for the prescriptive method evaluation.

Prototype Building for ASHRAE Envelope Trade-Off Option (ASHRAE)

For the envelope trade-off option commercial code compliance software evaluation prototype building E1 only was used. This building was tested for climate zone 1 and 2.

7.3 Software Evaluation Procedure

The code compliance calculation procedure depends on the compliance method selected; five commercial code compliance methods are covered in this manual. The prescriptive methods check whether the minimum requirements of the code are met or not. And it produces "Pass" or "Fail" results for every required building element. Whereas the total building performance and the energy cost budget methods, in addition to meeting the mandatory and some of the minimum requirements, require running simulations of the proposed design and the standard reference design buildings to determine and compare the annual total energy costs. The envelope trade off method requires the envelope performance factor of the proposed building to be less than or equal to the standard reference building performance factors. The envelope performance factors are determined using empirical equations and pre-calculated coefficients to estimate the performance of the individual envelope component type. The compliance software vendor applying for verification shall provide the results of the prototype building test suite runs demonstrating that their software generates the minimum requirements of the standard reference design building. The test suite inputs descriptions are provided in Sections 7.2.1.

Commercial code compliance software evaluation step-by-step procedures are explained for the performance, prescriptive and envelope trade-off option methods next.

7.3.1 Performance Based Method Evaluation Procedure

The performance based method evaluation is designed to verify whether compliance software is capable of generating the standard reference design building inputs using only the proposed design data. There are sixteen test cases for the performance methods based on six prototype buildings described in Section 7.2.1. Each test case was designed to capture a possible practical design scenario. The spreadsheet workbook file named "***CommercialPerformanceMethodsResults.xls***" contains the standard reference design building data for performance based test methods for each of the prototype building test cases created based on the minimum requirements of the Florida Energy Code and ASHRAE 90.1 option. There are two set of data for each test case and climate zone; one based on the Florida Code and another based on ASHRAE 90.1 option. The standard reference building data created for each prototype building type is populated in a single worksheet. The performance method results in this spreadsheet workbook were designed for side-by-side comparison of the standard reference design and those to be generated by the compliance software. A snapshot of the prototype building A1 performance based test method standard reference design minimum requirements for the Florida Energy Code (FEC) and ASHRAE 90.1 are shown in Figure 7-9.

Column "B" represents the component type, column "C" represents the building component description, column "D" represents the units of the building components, column "E" tells whether a component requirement is a maximum value or a minimum value, and column "F" is place holder for component sizing values. HVAC and service water systems require sizing results for specifying the standard minimum efficiency requirements. Where entering sizing values are required nominal values are provided. Vendors shall use sizing values determined by their compliance software. In addition to the standard reference design data, the spreadsheet "***CommercialPerformanceMethodsResults.xls***" contains place holder for the corresponding values

to be generated by the compliance software for each prototype building test case by climate zone. Column "G" and "I" are place holders for the standard reference design inputs created per the standard ASHRAE 90.1 option and the Florida Energy Code (FEC), respectively. Column "H" and "J" in the worksheet "Prototype A1" are place holders for the reference building input requirements to be generated by the compliance software and filled by the vendor. For instance, for prototype building A1, the compliance software reference results generated using ASHRAE 90.1 option for climate zone 1 will be populated in column "H" and shall match the standard reference design minimum requirements data set in Column "G". Similarly, the compliance software's reference design results generated using the Florida Energy Code (FEC) for climate zone 1 will be populated in column "J" by the software vendors and shall match the standard reference design minimum requirements data set in Column "I". For the performance based compliance methods envelope requirements are based on *U-values* for wall and roofs and *F-Factor* method for slab-on-grade floors.

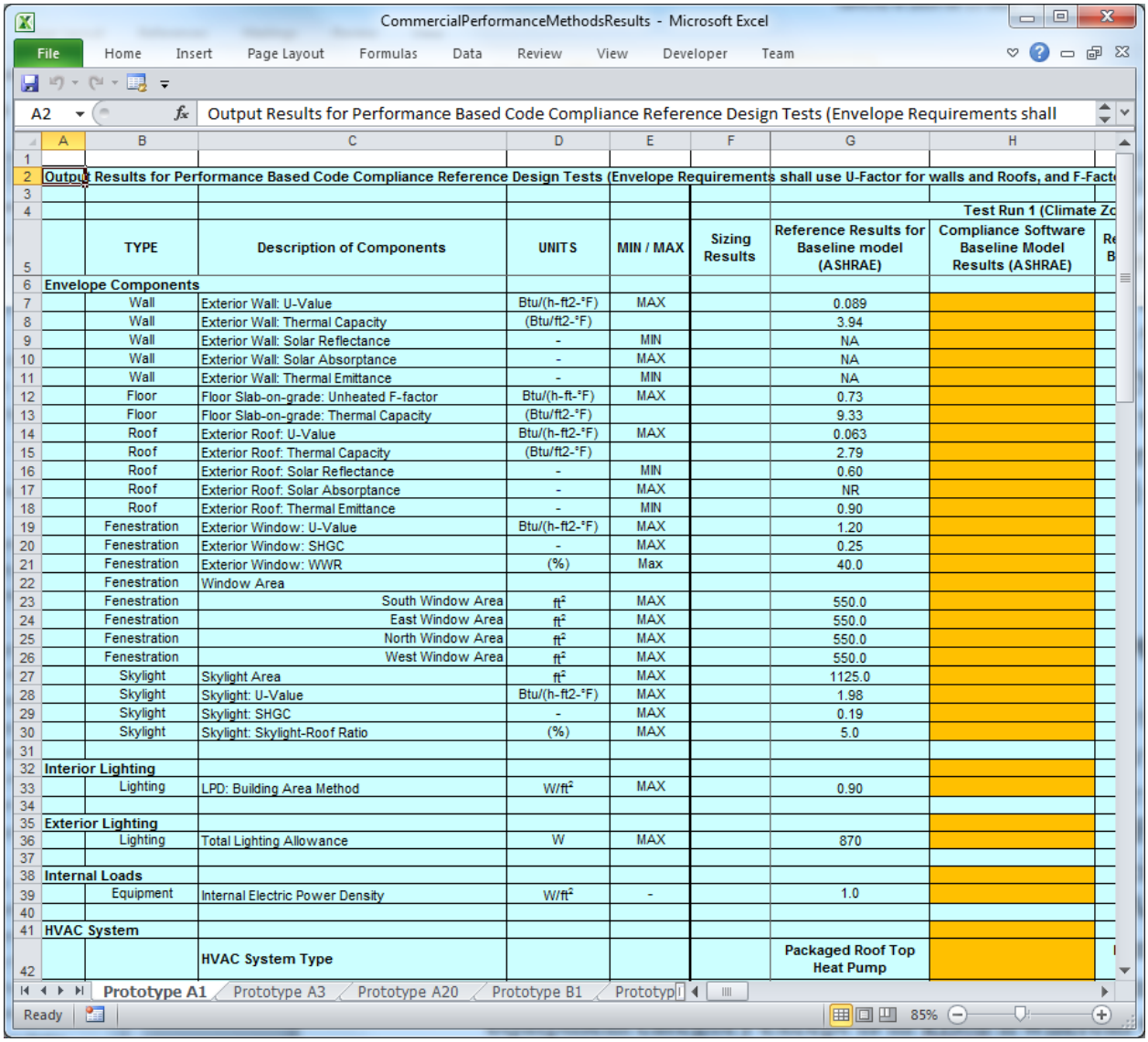


Figure 7-9 Performance method envelope requirements for prototype building A1

The standard reference building HVAC and service hot water systems minimum efficiency requirements depend on the capacity and system type. Therefore, a separate capacity entry raw is

required for each compliance method by climate zone; one for ASHRAE 90.1 option and another for the Florida Energy Code (FEC) as shown in Figure 7-10. For every equipment type the software vendors are expected to enter the capacity under the designated cell depending on the compliance method and climate zone. Then the VBA code in the spreadsheet automatically populates the standard reference design minimum efficiency requirement based on the specified capacity in the appropriate cell addresses. The units of capacity for all cooling and heating equipment category except is in kBtu/h whereas Chillers use tons.

It is possible that different compliance software may yield slightly different sizing results due to variation in some of the underlying assumptions. The sizing values provided in this spreadsheet are nominal and shall not be used, instead each vendor shall enter the sizing results generated their own software. The sizing values in the cells between rows 49 – 62 in column "F" in Figure 7-10, represents capacity of a cooling Fan Coil unit for climate zone 1 determined using the standard reference building data of the ASHRAE 90.1 option and the Florida Energy Code (FEC). The software vendors shall enter their sizing results by overriding the nominal values shown in the cells in "Yellow" background. The cooling capacities shown between cell rows 66-97, which are linked to the capacities in the cells above, are used to determine the air-economizer requirements per the standards. Only when the standard reference building data provided in this spreadsheet workbook and the corresponding reference design data generated by the vendor's software match that the software is said to have met the State of Florida commercial code compliance software requirement. The compliance software evaluation is performed and approved by the Florida Building Commission.

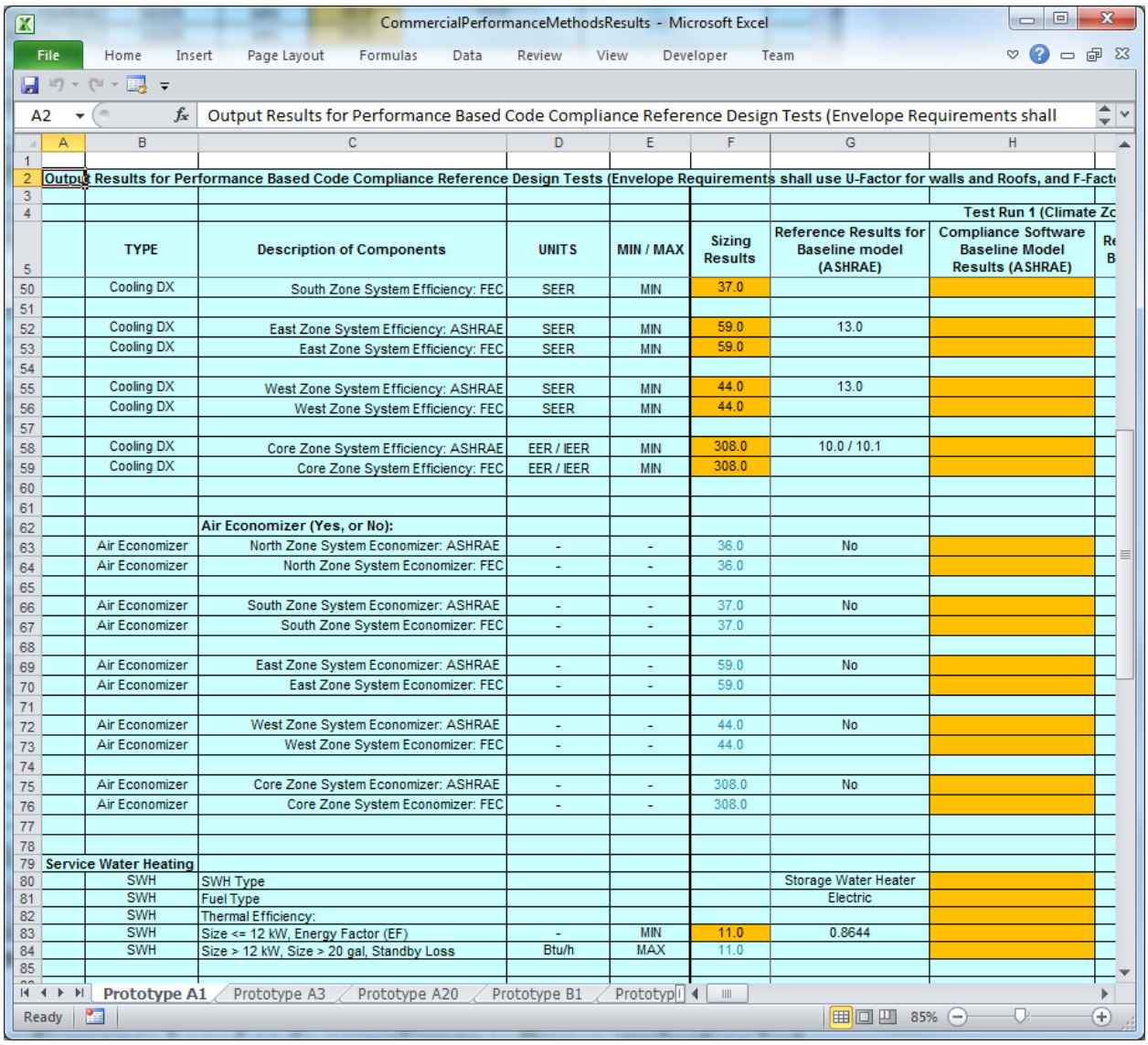


Figure 7-10 Performance method HVAC requirements for prototype building A1

There are sixteen test cases for the performance based code compliance software evaluation but there are two sets of results; one for the Florida Energy Code and another set for ASHRAE 90.1 option. In total there are going to be 32 sets of results to be submitted to the Florida Building Commission for performance method commercial code compliance software evaluation.

7.3.2 Prescriptive Method Evaluation Procedure

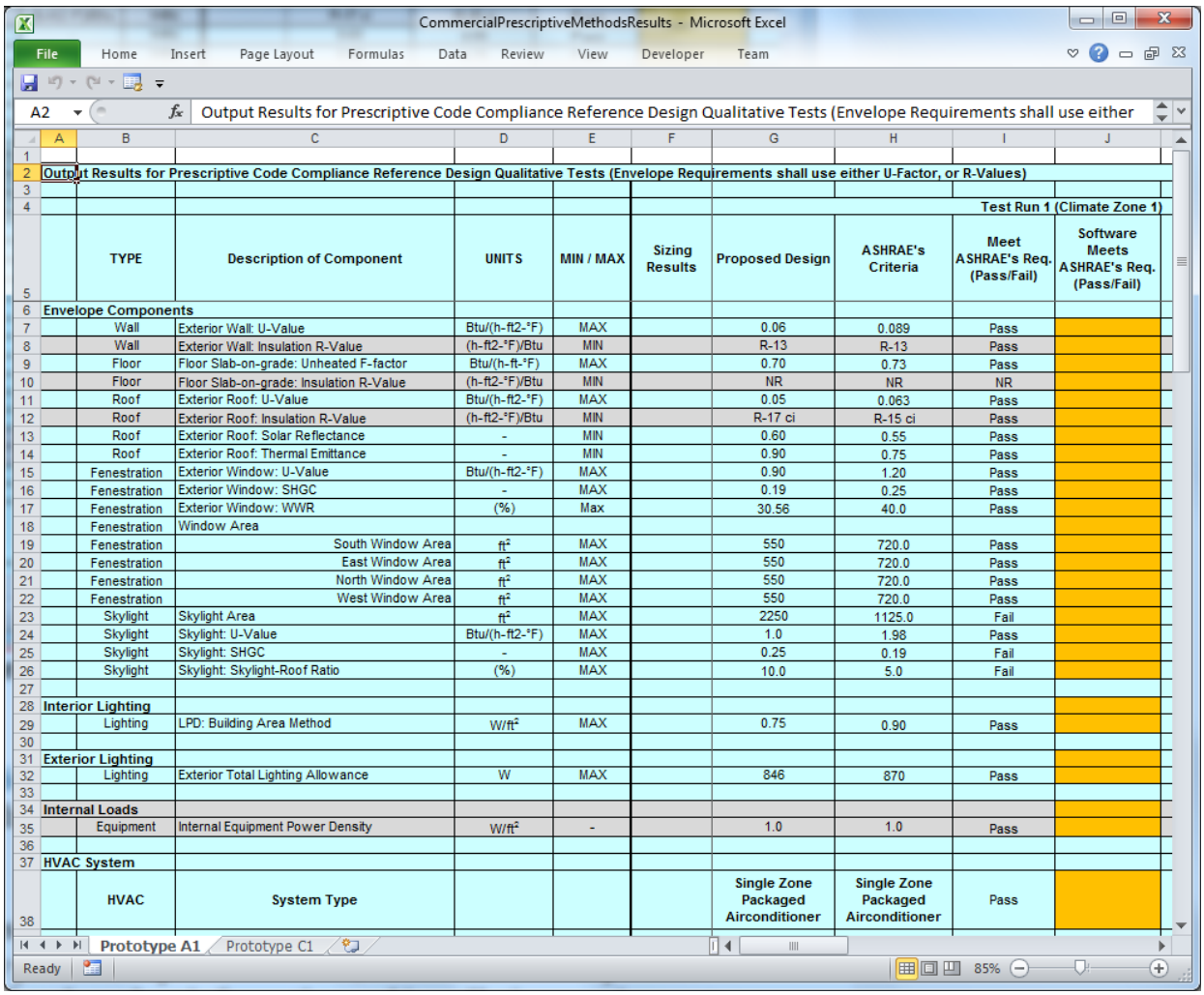
The prescriptive method evaluation is designed to verify whether compliance software is capable of conducting prescriptive method of commercial code compliance calculations. Prototype buildings A1 and C1 only were used for the prescriptive methods code compliance software evaluation. The prototype buildings used for the prescriptive methods are described in Section 7.2. The prescriptive code compliance calculation evaluation is performed using the results in the spreadsheet workbook "***CommercialPrescriptiveMethodsResults.xls***". This spreadsheet workbook file contains the proposed design building inputs and the standard reference design for the two prescriptive methods for each of the test cases by climate zone. The standard reference design prescriptive requirements are created for the Florida Energy Code (FEC) and ASHARE 90.1 option based on the minimum requirements of the two standards. The standard reference design building

data created along with the proposed design building input data for the each prescriptive test cases of a prototype building are populated in a single worksheet. This worksheet is designed for side-by-side comparison of the proposed design building inputs to the standard reference design building prescriptive code compliance minimum requirements.

The compliance software vendor shall generate list of the proposed design building elements input and the corresponding prescriptive method minimum requirements along with the decision reached and populate the results in the respective worksheet. The decision is a "Pass" or "Fail" depending on whether the proposed design input value of a building element meet standard reference minimum prescriptive requirement or not. Snapshot of the proposed prototype building A1 inputs and the prescriptive method test results are shown in Figure **7-11**. Column "G" contains the proposed design building input data and column "H" and column "K" hold the prescriptive methods standard reference requirements for climate zone 1 based on ASHARE 90.1 option and the Florida Energy Code (FEC), respectively. The standard reference design minimum requirement "Pass" or "Fail" results in column "I" and "L" are created as reference for evaluation purpose only. Column "J" and "M" are place holders for the "Pass" or "Fail" decisions to be generated by the compliance software vendor for this evaluation. The prescriptive methods standard reference requirements in column "J" and "M", which are to be generated and entered by the compliance software vendor, are expected to be identical to that of column "I" and "L", respectively.

There are similar set of results in the worksheet named "Prototype C1" for the prototype test building C1. There are two set of test cases; one for Manufacturing building and another for Warehouse building application type. Each building application type is tested for Florida Energy Code and ASHRAE 90.1 compliance options and the two climate zones. There are eight set of prescription test results for prototype building C1 whereas for Prototype Building A1 there are only four set of prescriptive compliance test results. In total there will be twelve sets of prescriptive method commercial code compliance test results to be submitted to the Florida Building Commission for a vendor software evaluation.

For the prescriptive compliance methods building envelope requirements are based on either *U-values* and *F-Factors* or *R-values* but either method shall be used consistently throughout for each test case.



CommercialPrescriptiveMethodsResults - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer Team

A2 Output Results for Prescriptive Code Compliance Reference Design Qualitative Tests (Envelope Requirements shall use either

	A	B	C	D	E	F	G	H	I	J
1										
2	Output Results for Prescriptive Code Compliance Reference Design Qualitative Tests (Envelope Requirements shall use either U-Factor, or R-Values)									
3										
4									Test Run 1 (Climate Zone 1)	
5		TYPE	Description of Component	UNITS	MIN / MAX	Sizing Results	Proposed Design	ASHRAE's Criteria	Meet ASHRAE's Req. (Pass/Fail)	Software Meets ASHRAE's Req. (Pass/Fail)
6	Envelope Components									
7		Wall	Exterior Wall: U-Value	Btu/(h-ft2-°F)	MAX		0.06	0.089	Pass	
8		Wall	Exterior Wall: Insulation R-Value	(h-ft2-°F)/Btu	MIN		R-13	R-13	Pass	
9		Floor	Floor Slab-on-grade: Unheated F-factor	Btu/(h-ft-°F)	MAX		0.70	0.73	Pass	
10		Floor	Floor Slab-on-grade: Insulation R-Value	(h-ft2-°F)/Btu	MIN		NR	NR	NR	
11		Roof	Exterior Roof: U-Value	Btu/(h-ft2-°F)	MAX		0.05	0.063	Pass	
12		Roof	Exterior Roof: Insulation R-Value	(h-ft2-°F)/Btu	MIN		R-17 ci	R-15 ci	Pass	
13		Roof	Exterior Roof: Solar Reflectance	-	MIN		0.60	0.55	Pass	
14		Roof	Exterior Roof: Thermal Emittance	-	MIN		0.90	0.75	Pass	
15		Fenestration	Exterior Window: U-Value	Btu/(h-ft2-°F)	MAX		0.90	1.20	Pass	
16		Fenestration	Exterior Window: SHGC	-	MAX		0.19	0.25	Pass	
17		Fenestration	Exterior Window: WWR	(%)	Max		30.56	40.0	Pass	
18		Fenestration	Window Area							
19		Fenestration	South Window Area	ft²	MAX		550	720.0	Pass	
20		Fenestration	East Window Area	ft²	MAX		550	720.0	Pass	
21		Fenestration	North Window Area	ft²	MAX		550	720.0	Pass	
22		Fenestration	West Window Area	ft²	MAX		550	720.0	Pass	
23		Skylight	Skylight Area	ft²	MAX		2250	1125.0	Fail	
24		Skylight	Skylight: U-Value	Btu/(h-ft2-°F)	MAX		1.0	1.98	Pass	
25		Skylight	Skylight: SHGC	-	MAX		0.25	0.19	Fail	
26		Skylight	Skylight: Skylight-Roof Ratio	(%)	MAX		10.0	5.0	Fail	
27										
28	Interior Lighting									
29		Lighting	LPD: Building Area Method	W/ft²	MAX		0.75	0.90	Pass	
30										
31	Exterior Lighting									
32		Lighting	Exterior Total Lighting Allowance	W	MAX		846	870	Pass	
33										
34	Internal Loads									
35		Equipment	Internal Equipment Power Density	W/ft²	-		1.0	1.0	Pass	
36										
37	HVAC System									
38		HVAC	System Type				Single Zone Packaged Airconditioner	Single Zone Packaged Airconditioner	Pass	

Prototype A1 Prototype C1

Ready 85%

Figure 7-11 Prescriptive method compliance requirements for prototype building A1

7.3.3 Envelope Trade-Off Option Method Evaluation Procedure

The building envelope complies with the Building Envelope Trade-Off Option method of the standard ASHRAE 90.1 if:

a. The proposed building satisfies the provisions of ASHRAE 90.1: the general requirements per Section 5.1, the mandatory provisions per Section 5.4, submittals of compliance documentations per Section 5.7 and product information and installation requirements per Section 5.8; and,
b. The *envelope performance factor* of the proposed building is less than or equal to the *envelope performance factor* of the standard reference design building.

In addition to the above requirement, the following items shall be satisfied:

- The *envelope performance factor* considers only the *building envelope* components.
- Schedules of operation, lighting power, equipment power, occupant density, and mechanical system shall be the same for both the proposed building and the budget building.
- The *envelope performance factor* shall be calculated using the procedures of *Normative Appendix C* of ASHRAE 90.1 option.

Using the test case identified for the Envelope Trade-Off option method in Section 7.2.1 run the code compliance calculation using vendor's compliance software. Record the ASHRAE Building Envelope Trade-Off Option code compliance method reports in the spreadsheet "CommercialEnvelopeTradeOffMethodResults.xls".

A snapshot of the Envelope trade-off option compliance results spreadsheet for Miami, Florida is shown in **Figure 7-12**. This spreadsheet contains the compliance summary of *Envelope Performance Factors (EPF)* generated for each element of the proposed and standard reference buildings, and summary of the proposed building inputs for verification. The software vendor shall submit test results for Miami-Dade, FL and Orland, FL climate zones. The envelope trade-off code compliance simulation shall be performed for building's north facade oriented due true north only instead of averaging the results obtained by rotating the proposed building by 90, 180, and 270 angles. The reference results, which are generated using the EnvStd 6.0 program, are used as acceptance criteria for the ASHRAE Envelope Trade-Off Option Method. The EnvStd 6.0 program comes with ASHRAE Standard 90.1-2007 User's Manual.

Vendors of compliance software shall record the results of their compliance simulation results side by side to the reference results in the spreadsheet. There are two results worksheets in this workbook "Miami_ClimateZone1" and "Orlando_ClimateZone2" representing the Envelope Trade-Off Option code compliance calculation results for Miami and Orlando, Florida. The only differences between the Miami and Orlando test runs inputs are the roof insulation level and climate zone.

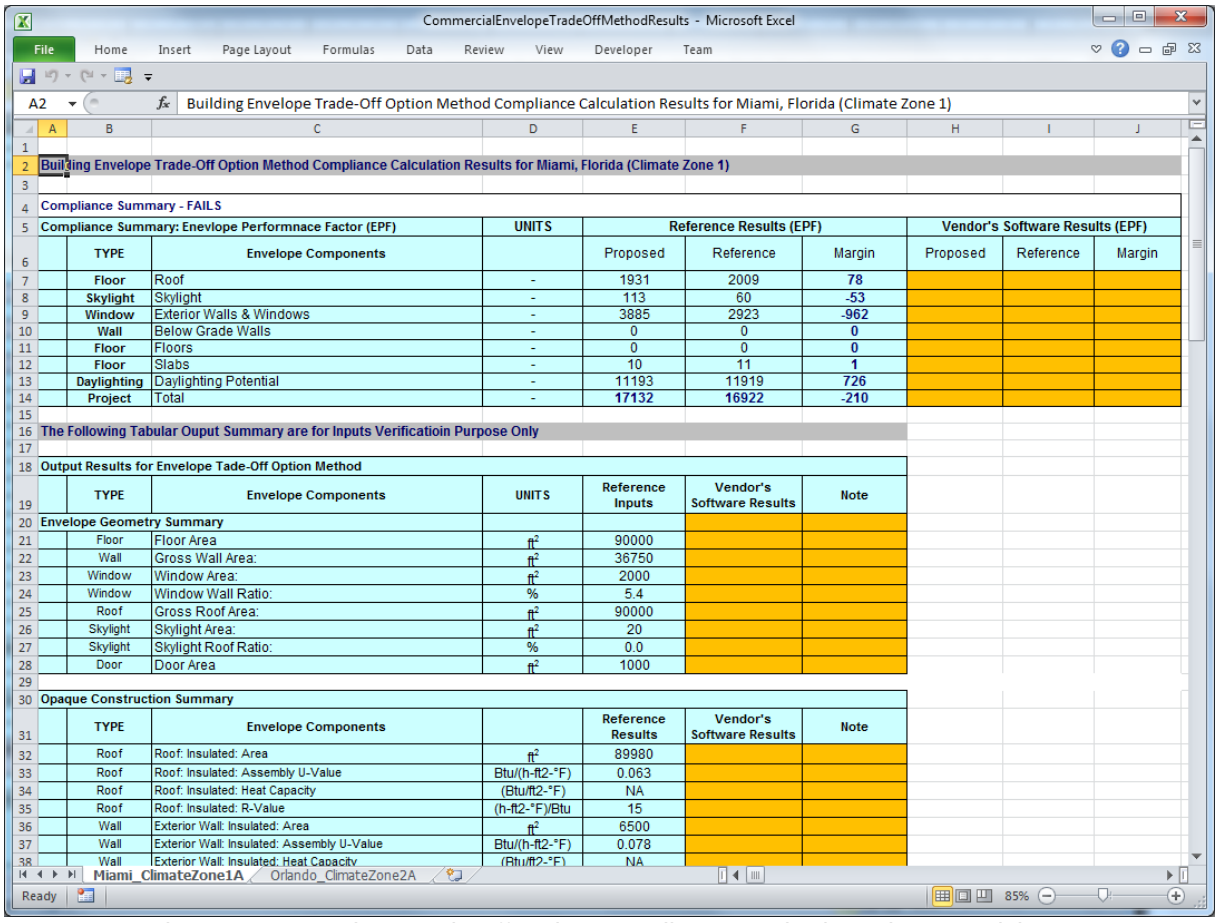


Figure 7-12 Envelope trade-off option compliance method results spreadsheet

7.4 Documentation and Compliance Report

Compliance documentation includes the forms, reports and other information that is submitted to the building department with an application for a building permit. The purpose of the compliance documentation is to enable the compliance examiner to verify that software meets the Florida Energy Code requirements.

Compliance Report

The compliance software shall generate a report that documents and compares the annual energy costs of *proposed design building* and the standard *reference design building* for performance-based compliance methods that complies with Section C401.2 and C407.4 of the Florida Energy Code, or Section 11.1.5 of ASHRAE 90.1 option. The required formats for building information reports are electronic Portable Document File (PDF) and hard copy. Both report formats shall be automatically generated by the compliance software. *Report information details that need to be entailed in the different section of the report forms are shown in Appendix C as guides.*

Forms General Requirements

- Minimum Required Content and Format shall be per Appendix C
- Name of the individual completing the compliance report
- Name and version of the compliance software tool

Performance Based Methods Report

The compliance software output report information submitted for the Total Building Performance Method or the Energy Cost Budget Method shall include the following:

- The annual total energy costs of the reference (budget) design building and the proposed design building.
- A check list of the energy-related features included in the proposed design and on which compliance with the provisions of Sections C401.2 and C407.4 of the Florida Energy Code, or Section 11.3.1 of ASHRAE 90.1 option shall be performed. This list shall document all energy features that differ between the models used in the reference (budget) design building and the proposed design building calculations.
- The input and output report(s) from the compliance software tool shall include a breakdown of energy usage by at least the following components: lights, internal equipment loads, service water heating equipment, space heating equipment, space cooling and heat rejection equipment, fans, and other HVAC equipment (such as pumps). The output reports shall also show the annual load unmet hours for both the proposed design building and reference (budget) design building.
- Explanation of any error message noted in the compliance software output.
- Addition documentation as required by code official described in Section C407.4.2 of the Florida Energy Code.

Prescriptive Methods Report

The compliance software shall generate a report that documents the minimum and mandatory requirements of Chapter 4 of the Florida Energy Code or ASHRAE 90.1 option. It is to be noted that the Florida Energy Code includes ANSI/ASHRAE Standard 90.1-2010 code compliance method as an alternative option. Prescriptive method test is a “Pass” or a “Fail” check for the mandatory and required building elements by comparing the proposed design values to the

minimum requirements of the reference standard. The prescriptive compliance report shall include list of required building elements containing *the proposed design value*, the *standard reference design minimum requirement as a criteria*, and the "Pass" or "Fail" results in a tabular format. The prescriptive requirement shall be categorized by Building Envelope, Lighting, HVAC system and Serve Hot Water.

8. Alternative Compliance Software Tests

Sections 6.5.6.2 and 7.2 of this manual identify a series of tests to verify that compliance software accurately demonstrate compliance. A compliance software program vendor may propose alternate tests when the vendor believes that one or more of the standard tests are not adequate for the compliance software program under consideration. The Commission will evaluate the alternate tests and will accept them if they are found to reflect acceptable engineering techniques.

If alternate tests are accepted by the Commission, the tests will be available for use by all compliance software programs. An alternate test will coexist with the standard test presented in this Manual until the Manual is revised. When a new version of this Manual is produced, the alternative test may be substituted for the current test or may continue to coexist with the original test.

References

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APPENDIX A
Cover sheet for request for approval by the Florida Building Commission as a Compliance Software tool

Date of Submittal:

Software Company:

Contact Person:

Contact email:

Contact Phone number:

Name of Product (If marketed under different editions or names list all that apply):

Version Number:

Code Compliance Methods this software calculates:

Commercial Energy Efficiency Code Compliance

- ☐ FEC Prescriptive Method
- ☐ FEC Total Building Performance Method
- ☐ ASHRAE Prescriptive Method
- ☐ ASHRAE Envelope Trade-off Option Method
- ☐ ASHRAE Energy Cost Budget Method

Residential Energy Efficiency Code Compliance

- ☐ Prescriptive R-value Method
- ☐ Prescriptive U-factor Alternative Method
- ☐ Prescriptive Total UA Alternative Method
- ☐ Performance Method

As an official of the software company named above, I certify the software listed meets the requirements of the Florida Building Code, Energy Conservation 2014 for the methods indicated and that this submittal includes the required documentation as given in the Energy Simulation Tool Approval – Technical Assistance Manual or as requested by the Florida Building Commission:

_____ _____

Signature Date

_____ _____

Printed Name Title

APPENDIX R

Appendix R-1 Testing and Reporting
Appendix R-2 Prescriptive R-Value Method
Appendix R-3 Prescriptive U-Factor Alternative Method
Appendix R-4 Prescriptive Total UA Alternative Method
Appendix R-5 Performance Method

Appendix R-1 Testing and Reporting Overview

For software to be approved it must submit test results and reports as required by the method of compliance the software is designed to accomplish. There are three prescriptive and one performance method.

Submissions for approval shall include the cover sheet from appendix A, the spreadsheet file or files listed under each method and the reports listed. Details for each test and reports are in appendices in R-2 – R-5.

Appendix R-2 Prescriptive R-Value Method

The software must produce a completed Form R402-2014. To comply, the software must report on the results of six houses described in Appendix R-2.3. Although there are few calculations required for this compliance method, the software must accurately calculate the average window U-factor and SHGC according to the code including any exceptions.

R2.1 Testing

The software vendor shall download and complete the file titled "Residential Prescriptive Compliance Test 2014." The file has six yellow-highlighted tabs, one for each house. On each tab is a section for R-Value method (the top of the spreadsheet). Complete each yellow highlighted field. If the value entered is the expected value or result, the green highlighted field adjacent will indicated "Pass." There is also a box indicating if the software would indicate if the home passes compliance. Again, indicate what the software indicated. If the value is expected the green field will indicate "Pass." For a house where the expected result is that the home fails to comply, the entered choice of "Fails" will yield a "Pass." Each yellow highlighted field must be accurate in order for the software to pass the test. If the results computed by the software fall outside the range indicated on the excel report and the vendor believes that their value is correct they may include an explanation. If submitting for multiple prescriptive methods, submit just one spreadsheet file, completing each prescriptive block of entries for each method seeking software approval. Save the file with the name "Residential Prescriptive Compliance Test 2014 –[software name]."

R2.2 Reporting Test Results

A pdf file shall be prepared and labeled "R-Value Reports from [software name]." It shall include the required reports for house T01, followed by T02, T03, M01, M02 and M03. Sample report formats are provided in section R2.4. For each house include the following:

1) Form R402-2014 which includes the parameters of Table R402.1.1
2) Energy Performance Level (EPL) Display Card
3) Mandatory requirements

For house T01 also include the following reports from the software:

4) A checklist of expected reports and number of pages in each
5) A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
6) A completed Envelope Leakage Test Report (usually one page), and
7) A completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located with the building thermal envelope

R2.3 Prescriptive Home Characteristics for Testing

The following six pages describe the six test houses. These test houses are used for each prescriptive method. The software must be run for each of the six test homes. Three homes are for climate zone 2 (Tampa) and three are for climate zone 1 (Miami). Each of the tests is designed to test one or more features of the software.

Prescriptive Test: House T01 (Pr-T01) Characteristics – Location: Tampa, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Slab-on-grade Floor	50x40 perimeter	No insulation
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[1] –flat under attic	2000 ft^2	R 38
Skylight	10 ft^2	U = 0.65 SHGC=0.25
Wall 1 –faces North, CBS[2]	50 ft wide x 10 ft high	R6 insulated on inside
Door 1 -	24 ft^2	U = 0.40
Window 1 – Vinyl Frame Low-e Double	75 ft^2	U = 0.40 SHGC=0.25
Wall 2 –faces East, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 2 – Vinyl Frame Low-e Double	75 ft^2	U = 0.40 SHGC=0.25
Wall 3 –faces South, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 3 – Vinyl Frame Low-e Double	15 ft^2	U = 0.40 SHGC=0.25
Wall 4 –faces South, Wood[3] 2x4 framing fraction =0.25	10 ft wide x 10 ft high	R13
Window 4 – Vinyl Frame Low-e Double	60 ft^2	U = 0.40 SHGC=0.25
Wall 5 –faces West, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 5 – Vinyl Frame Low-e Double	75 ft^2	U = 0.40 SHGC=0.25
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R8 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction
Air Handler – in conditioned space	21,000 Btu/hr	Leakage no more than 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Attic air, R38 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[2] CBS layers from outside: stucco, lathe, 8" normal density hollow core concrete block, 1 inch R6 insulation board, ¾" airspace with furring at 16" on center, and ½" drywall. Solar absorbtance = 0.5.
[3] Wood frame wall layers from outside: stucco, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

Prescriptive Test: House T02 (Pr-T02) Characteristics – Location: Tampa, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom **red type illustrates rows with differences from T01**

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Slab-on-grade Floor	50x40 perimeter	No insulation
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[1] –flat under attic	2000 ft^2	R 38
Skylight	10 ft^2	U = 0.65 SHGC=0.25
Wall 1 –faces North, CBS[2]	50 ft wide x 10 ft high	R6 insulated on inside
Door 1	24 ft^2	U = 0.80
Window 1 – Metal Frame Double Clear	75 ft^2	U = 0.68 SHGC=0.46
Wall 2 –faces East, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 2 – Vinyl Frame Low-e Double	75 ft^2	U = 0.27 SHGC=0.17
Wall 3 –faces South, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 3 – Metal Frame, Single Pane	15 ft^2	U = 1.2 SHGC=0.80
Wall 4 –faces South, Wood[3] 2x4 framing fraction =0.25	10 ft wide x 10 ft high	R13
Window 4 – Vinyl Frame Low-e Double	60 ft^2	U = 0.27 SHGC=0.17
Wall 5 –faces West, CBS	40 ft wide x 10 ft high	R6 insulated on inside
Window 5 – Vinyl Frame Low-e Double	75 ft^2	U = 0.27 SHGC=0.17
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R8 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction
Air Handler – in conditioned space	21,000 Btu/hr	Leakage no more than 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Attic air, R38 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[2] CBS layers from outside: stucco, lathe, 8" normal density hollow core concrete block, 1 inch R6 insulation board, ¾" airspace with furring at 16" on center, and ½" drywall. Solar absorbtance = 0.5.
[3] Wood frame wall layers from outside: stucco, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

Prescriptive Test: House T03 (Pr-T03) Characteristics – Location: Tampa, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom **red type illustrates rows with differences from T01**

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Slab-on-grade Floor	50x40 perimeter	No insulation
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[1] –flat under attic	2000 ft^2	R 30
Skylight	10 ft^2	U = 0.65 SHGC=0.25
Wall 1 –faces North, Wood Frame[2]	50 ft wide x 10 ft high	R13 + R5
Door 1 -	24 ft^2	U = 0.40
Window 1 – Vinyl Frame Low-e Double	75 ft^2	U = 0.35 SHGC=0.25
Wall 2 –faces East, Wood Frame	40 ft wide x 10 ft high	R13 + R5
Window 2 – Vinyl Frame Low-e Double	75 ft^2	U = 0.35 SHGC=0.25
Wall 3 –faces South, Wood Frame	40 ft wide x 10 ft high	R13 + R5
Window 3 – Metal Frame, Single Pane	15 ft^2	U = 1.2 SHGC=0.80
Wall 4 –faces South, Wood Frame	10 ft wide x 10 ft high	R13 + R5
Window 4 – Vinyl Frame Low-e Double	60 ft^2	U = 0.35 SHGC=0.25
Wall 5 –faces West, Wood Frame	40 ft wide x 10 ft high	R13 + R5
Window 5 – Vinyl Frame Low-e Double	75 ft^2	U = 0.35 SHGC=0.25
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R8 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction test
Air Handler – in conditioned space	21,000 Btu/hr	Rated Leakage no more than 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Attic air, R30 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[2] Wood frame wall layers from outside: synthetic stucco applied over R5 rigid insulation, #30 asphalt building paper, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

Prescriptive Test: House M01 (Pr-M01) Characteristics – Location: Miami, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Slab-on-grade Floor	50x40 perimeter	No insulation
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[1] –flat under attic	2000 ft^2	R 30
Skylight	10 ft^2	U = 0.75 SHGC=0.25
Wall 1 –faces North, CBS[2]	50 ft wide x 10 ft high	R4 insulated on inside
Door 1 -	24 ft^2	U = 0.65
Window 1 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Wall 2 –faces East, CBS	40 ft wide x 10 ft high	R4 insulated on inside
Window 2 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Wall 3 –faces South, CBS	40 ft wide x 10 ft high	R4 insulated on inside
Window 3 – Vinyl Frame Low-e Double	15 ft^2	U = 0.65 SHGC=0.25
Wall 4 –faces South, Wood[3] 2x4 framing fraction =0.25	10 ft wide x 10 ft high	R13
Window 4 – Vinyl Frame Low-e Double	60 ft^2	U = 0.65 SHGC=0.25
Wall 5 –faces West, CBS	40 ft wide x 10 ft high	R4 insulated on inside
Window 5 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R8 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction
Air Handler – in conditioned space	21,000 Btu/hr	Leakage no more than 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Attic air, R38 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[2] CBS layers from outside: stucco, lathe, 8" normal density hollow core concrete block, ¾" R4 insulation board, ¾" airspace with furring at 16" on center, and ½" drywall. Solar absorbtance = 0.5.
[3] Wood frame wall layers from outside: stucco, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

Prescriptive Test: House M02 (Pr-M02) Characteristics – Location: Miami, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom **red type illustrates rows with differences from M01**

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Raised Floor[1]	2000 ft^2	R 19
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[2] –flat under attic	2000 ft^2	R 30
Skylight	10 ft^2	U = 0.75 SHGC=0.25
Wall 1 –faces North, Steel Frame[3]	50 ft wide x 10 ft high	R13
Door 1 -	24 ft^2	U = 0.65
Window 1 – Vinyl Frame Impact Resistance Glass	75 ft^2	U = 0.75 SHGC=0.25
Wall 2 –faces South, Steel Frame	40 ft wide x 10 ft high	R13
Window 2 – Vinyl Frame Impact Resistance Glass	75 ft^2	U = 0.75 SHGC=0.25
Wall 3 –faces South, Steel Frame	40 ft wide x 10 ft high	R13
Window 3 – Vinyl Frame Impact Resistance Glass	15 ft^2	U = 0.75 SHGC=0.25
Wall 4 –faces South, Wood[4] 2x4	10 ft wide x 10 ft high	R13
Window 4 – Vinyl Frame Impact Resistance Glass	60 ft^2	U = 0.75 SHGC=0.25
Wall 5 –faces West, Steel Frame	40 ft wide x 10 ft high	R13
Window 5 – Vinyl Frame Impact Resistance Glass	75 ft^2	U = 0.75 SHGC=0.25
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R8 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction
Air Handler – in conditioned space	21,000 Btu/hr	Rated leakage < 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Air, R19 batt insulation and 2x6 trusses with 15% framing fraction, ¾" plywood, R2 carpet
[2] Layers from outside: Attic air, R38 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[3] Steel frame wall layers from outside: stucco, ½" exterior plywood, 2x4 steel frame 16" on center, with R-13 fiberglass batt insulation, and ½" drywall. Solar absorbtance = 0.5.
[4] Wood frame wall layers from outside: stucco, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

Prescriptive Test: House M03 (Pr-M03) Characteristics – Location: Miami, Florida
Single Family Detached Home with No Attached Garage
Single Story, Three bedroom **red type illustrates rows with differences from M01**

Parameter	Size	Efficiency Level
Conditioned Floor Area	2000 ft^2	NA
Slab-on-grade Floor	50x40 perimeter	No insulation
Roof – gable type- 5 in 12 slope No overhangs	2167 ft^2 above 2000 ft^2 conditioned space	0.75 solar absorptance
Ceiling[1] –flat under attic	2000 ft^2	R 30
Skylight	10 ft^2	U = 0.75 SHGC=0.25
Wall 1 –faces North, CBS[2]	50 ft wide x 10 ft high	R4 and insulated core
Door 1 -	24 ft^2	U = 0.65
Window 1 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Wall 2 –faces East, CBS	40 ft wide x 10 ft high	R4 and insulated core
Window 2 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Wall 3 –faces South, CBS	40 ft wide x 10 ft high	R4 and insulated core
Window 3 – Vinyl Frame Low-e Double	15 ft^2	U = 0.65 SHGC=0.25
Wall 4 –faces South, Wood[3] 2x4 framing fraction =0.25	10 ft wide x 10 ft high	R13
Window 4 – Vinyl Frame Low-e Double	60 ft^2	U = 0.65 SHGC=0.25
Wall 5 –faces West, CBS	40 ft wide x 10 ft high	R4 and insulated core
Window 5 – Vinyl Frame Low-e Double	75 ft^2	U = 0.65 SHGC=0.25
Infiltration	House Volume = 2000 ft^2 x 10 ft height = 20,000ft^3	ACH50 = 5
Heating – heat pump	21,000 Btu/hr	HSPF = 8.2
Cooling – heat pump	21,000 Btu/hr	SEER = 14
Ducts – supply in attic	400 ft2	R6 insulation
Ducts – return in conditioned space	100 ft2	R6 insulation
Duct Tightness		Leakage = 0.04 cfm/square foot post construction
Air Handler – in conditioned space	21,000 Btu/hr	Leakage no more than 2% of air flow rate
Mechanical Ventilation	None	N/A
Hot Water System - electric	50 gallon	EF=0.95
All Hot Water Lines	Runs 10 - 35 feet	R3 insulation
Hot Water Circulation -none	NA	NA
Lighting	100 installed fixtures	75 fixtures compact fluorescent
Pool and Spa - none	NA	NA

[1] Layers from outside: Attic air, R30 batt insulation with 2x4 framing with 7% framing fraction, ½" drywall
[2] CBS layers from outside: stucco, lathe, 8" normal density perlite insulated core concrete block, ¾" R4 insulation board, ¾" airspace with furring at 16" on center, and ½" drywall. Solar absorbtance = 0.5.
[3] Wood frame wall layers from outside: stucco, ½" exterior plywood, 2x4 frame with R-13 fiberglass batt insulation with a 25% total framing fraction, and ½" drywall. Solar absorbtance = 0.5.

R2.4 Sample Reports for the Prescriptive R-value method

The following sample reports show recommended formats.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
Residential R-Value Computation Prescriptive Method

Applications for compliance with the 2014 Florida Building Code, Energy Conservation via the Residential R-Value computation prescriptive method shall include:

- ☐ This Checklist
- ☐ Form R402-2014 which includes the parameters of Table 402.1.1 (two pages)
- ☐ Energy Performance Level (EPL) Display Card (one page)
- ☐ Mandatory requirements (three pages)

Required prior to CO for the R-Value computation method:

- ☐ A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
- ☐ A building air leakage has been tested then a completed Envelope Leakage Test Report (usually one page)
- ☐ A completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located within the building thermal envelope.

Florida Building Code, Energy Conservation

Residential Building Thermal Envelope Approach

FORM R402-2014 **Climate Zone 2**

Scope: Compliance with Section 402.1.1 of the *Florida Building Code, Energy Conservation*, shall be demonstrated by the use of Form R402 for single and multiple-family residences of three stories or less in height, additions to existing residential buildings, renovations, and building systems in existing buildings, as applicable. To comply, a building must meet or exceed all of the energy efficiency requirements on Table R402A and all applicable mandatory requirements summarized in Table R402B of this form. If a building does not comply with this method, or by the UA Alternative method, it may still comply under Section R405 of the *Florida Building Code, Energy Conservation.*

PROJECT NAME:	House T01 (Pr-T01) Characteristics	BUILDER:
AND ADDRESS:	100 Main Street	PERMITTING OFFICE:
	Tampa FL 32922	JURISDICTION NUMBER:
OWNER:	OWNER	PERMIT NUMBER:

General Instructions:

1. Fill in all the applicable spaces of the "To Be Installed" column on Table R402A with the information requested. All "To Be Installed" values must be equal to or more efficient than the required levels.
2. Complete page 1 based on the "To Be Installed" column information.
3. Read the requirements of Table R402B and check each box to indicate your intent to comply with all applicable items.
4. Read, sign and date the "Prepared By" certification statement at the bottom of page 1. The owner or owner's agent must also sign and date the form.

				Check
1.	New construction, addition, or existing building		1. New (From Plans)	_____
2.	Single-family detached or multiple-family attached		2. Single-family	_____
3.	If multiple-family, number of units covered by this submission		3. 1	_____
4.	Is this a worst case? (yes/no)		4. No	_____
5.	Conditioned floor area (sq. ft.)		5. 2000	_____
6.	Windows, type and area:			
	a)	U-factor:	6a. 0.40	_____
	b)	Solar Heat Gain Coefficient (SHGC):	6b. 0.25	_____
	c)	Area:	6c. 310	_____
7.	Skylights, type and area:			
	a)	U-factor:	7a. 0.65	_____
	b)	Solar Heat Gain Coefficient (SHGC):	7b. 0.25	_____
8.	Floor type, area or perimeter, and insulation:			
	a)	Slab-on-grade (R-value)	8a. 0	_____
	b)	Wood, raised (R-value)	8b. Not applicable	_____
	c)	Wood, common (R-value)	8c. Not applicable	_____
	d)	Concrete, raised (R-value)	8d. Not applicable	_____
	e)	Concrete, common (R-value)	8e. Not applicable	_____
9.	Wall type, area and insulation:			
	a)	Exterior: 1. Wood frame (Insulation R-value)	9a1. 13	_____
		2. Masonry (Insulation R-value)	9a2. 6	_____
	b)	Adjacent: 1. Wood frame (Insulation R-value)	9b1. Not applicable	_____
		2. Masonry (Insulation R-value)	9b2. Not applicable	_____
10.	Ceiling type and insulation			
	a)	Attic (Insulation R-value)	10a. 38	_____
	b)	Single assembly (Insulation R-value)	10b. Not applicable	_____
11.	Air distribution system:			
	a)	Duct location, insulation	11a. Attic, R-8	_____
	b)	AHU location	11b. Main	_____
	c)	Total duct Leakage, Test report attached	11c. 3 cfm/100 s.f.	Yes ☐ No ☐
12.	Cooling system:	a) Type	12a. Central Unit	_____
		b) Efficiency	12b. 14 SEER	_____
13.	Heating system:	a) Type	13a. Electric Heat Pump	_____
		b) Efficiency	13b. 8.2 HSPF	_____
14.	HVAC sizing calculation: attached		14. Verify attachment	Yes ☐ No ☐
15.	Water heating system:	a) Type	15a. Electric	_____
		b) Efficiency	15b. 0.95	_____

I hereby certify that the plans and specifications covered by this form are in compliance with the *Florida Building Code, Energy Conservation*.

PREPARED BY:_____DATE:_____

I hereby certify that this building is in compliance with the *Florida Building Code, Energy Conservation*.

OWNER/AGENT:_____DATE:_____

Review of plans and specifications covered by this form indicate compliance with the *Florida Building Code, Energy Conservation*. Before construction is complete, this building will be inspected for compliance in accordance with Section 553.908, F.S.

CODE OFFICIAL:_____DATE:_____

Table R402A FailCount = 0

BUILDING COMPONENT	PRESCRIPTIVE REQUIREMENTS[1]		INSTALLED VALUES
	Climate Zone 1	Climate Zone 2	
Windows Skylights	U-factor = 0.65[2] SHGC = 0.25 U-factor = 0.75 SHGC = 0.30	U-factor = 0.40[2] SHGC = 0.25 U-factor = 0.65 SHGC = 0.30	U-factor = 0.40 SHGC = 0.25 U-factor = 0.65 SHGC = 0.25
Doors: Exterior door	U-factor = 0.65[3]	U-factor = 0.40[3]	U-factor = 0.40
Floors: Slab-on-Grade Over unconditioned spaces[4]	 NR R-13	 NR R-13	 R-value =
Walls: Ext. and Adj. Frame Mass Insulation on wall interior: Insulation on wall exterior:	 R-13 R-4 R-3	 R-13 R-6 R-4	 R-value = 13 R-value = 6 R-value =
Ceilings:	R=30	R=38	R-value = 38
Air infiltration:	Blower door test is required on the building envelope to verify leakage ≤ 5 ACH; test report provided to code official.		Total leakage = 5 ACH Test report attached? Yes ☐ No ☐
Air distribution system[5]: Air handling unit Duct R-value Air leakage[5]: Duct test Ducts in conditioned space	 Not allowed in attic R-value ≥ R-8 (supply in attics) or ≥R-6 (all other duct locations). Post-construction test: Total leakage ≤ 4 cfm/100 s.f. Rough-in test: Total leakage ≤ 3 cfm/100 s.f. Test not required if all ducts and AHU are in conditioned space		 Location: Attic R-value = 8 Total leakage = 4 cfm/100 s.f. Test report attached? Yes ☐ No ☐ Location: Unconditioned
Air conditioning systems: Central system ≤ 65,000 Btu/h Room unit or PTAC Other:	Minimum federal standard required by NAECA[6] SEER 14.0 EER [from Table C403.2.3(3)] See Tables C403.2.3(1)-(11)		 SEER = 14 EER =
Heating system: Heating Pump ≤ 65,000 Btu/h Gas Furnace, non-weatherized Oil Furnace, non-weatherized Other:	Minimum federal standard required by NAECA[6] HSPF 8.2 AFUE 80% AFUE 83%		 HSPF = 8.2 AFUE = AFUE =
Water heating system (storage type): Electric[7] Gas fired[8] Other (describe):	Minimum federal standard required by NAECA[6] Before 4/16/15; 40 gal: EF = 0.92, 50 gal: EF = 0.90 As of 4/16/15; 40 gal: EF = 0.95, 50 gal: EF = 0.95 Before 4/16/15; 40 gal: EF = 0.59, 50 gal: EF = 0.58 As of 4/16/15; 40 gal: EF = 0.62, 50 gal: EF = 0.60		 Gallons = 50 EF = 0.95 Gallons = EF =

NR = No requirement.

(1) Each component present in the As Proposed home must meet or exceed each of the applicable performance criteria in order to comply with this code using this method.

(2) For impact rated fenestration complying with Section R301.2.1.2 of the *Florida building Code, Residential* or Section 1609.1.2 of the *Florida Building Code, Building* the minimum U-factor shall be 0.75 in Climate Zone 1 and 0.65 in Climate Zone 2. An area-weighted average of U-factor and SHGC shall be accepted to meet the requirements, or up to 15 square feet of glazed fenestration area are exempted from the U-factor and SHGC requirement based on Section R402.3.1, 402.3.2 and R403.3.3.

(3) One side-hinged opaque door assembly up to 24 square feet is exempted from this U-factor requirement.

(4) R-values are for insulation material only as applied in accordance with manufacturers' installation instructions. For mass walls the "interior of wall" requirement must be met except if at least 50 percent of the insulation required for the "exterior of wall" is installed exterior of, or integral to, the wall.

(5) Ducts & AHU installed "substantially leak free" per Section R403.2.2. Test required by an energy rater certified in accordance with *Section 553.99, Florida Statues*, or as authorized by *Florida Statutes*. The total leakage test is not required for ducts and air handlers located entirely within the thermal envelope.

(6) Minimum efficiencies are those set by the *National Appliance Energy Conservation Act of 1987* for typical residential equipment and are subject to NAECA rules and regulations. For other types of equipment, see Tables C403.2.3 (1-11) of the Commercial Provisions of the *Florida Building Code, Energy Conservation*.

(7) For other electric storage volumes ≥ 55, min. EF = 2.057 – (0.00113 * volume).

(8) For other natural gas storage volumes ≥ 55, min. EF = 0.8012 – (0.00078 * volume).

TABLE 402B MANDATORY REQUIREMENTS			
Component	**Section**	**Summary of Requirement(s)**	**Check**
Air leakage	402.4	To be caulked, gasketed, weatherstripped or otherwise sealed per Table R402.4.1.1. Recessed lighting: IC-rated as having ≤ 2.0 cfm tested to ASTM E 283. Windows and doors: 0.3 cfm/sq.ft. (swinging doors: 0.5 cfm/sf) when tested to NFRC 400 or AAMA/WDMA/DSA 101/I.S. 2/A440. Fireplaces: Tight-fitting flue dampers & outdoor combustion air.	
Programmable thermostat	403.1.2	Where forced-air furnace is primary system, programmable thermostat is required.	
Air distribution system	403.2.2 403.2.4	Ducts shall be tested to Section 803 of the RESNET standards by an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*. Air handling units are not allowed in attics.	
Water heaters	403.4	Comply with efficiencies in Table C404.2. Hot water pipes insulated to ≥ R-3 to kitchen outlets, other cases. Circulating systems to have an automatic or accessible manual OFF switch. Heat trap required for vertical pipe risers.	
Swimming pools & spas	403.9	Spas and heated pools must have vapor-retardant covers or a liquid cover or other means proven to reduce heat loss except if 70% of heat from site-recovered energy. Off/timer switch required. Gas heaters minimum thermal efficiency is 82%. Heat pump pool heaters minimum COP is 4.0.	
Cooling/heating equipment	403.6	Sizing calculation performed & attached. Special occasion cooling or heating capacity requires separate system or variable capacity system.	
Lighting equipment	404.1	At least 75% of permanently installed lighting fixtures shall be high-efficacy lamps.	

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [calculated]

The lower the Energy Performance Index, the more efficient the home.

100 Main Street, Tampa, 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		3
5. Is this a worst case?		No
6. Conditioned floor area (ft²)		2000
7. Windows**	Description	Area
a. U-Factor:	Dbl, U=0.40	225.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Dbl, U=0.65	75.00 ft²
SHGC:	SHGC=0.25	
c. U-Factor:	Dbl, U=0.65	10.00 ft²
SHGC:	SHGC=0.25	
d. U-Factor:	N/A	ft²
SHGC:		
Area Weighted Average Overhang Depth:		0.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	2000.00 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	1700.00 ft²
b. Frame - Wood, Exterior	R=13.0	100.00 ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types	Insulation	Area
a. Under Attic (Vented)	R=38.0	2000.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Attic, Ret: Main, AH: Main	6	400

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	30.0	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	30.0	HSPF:8.20

14. Hot water systems	
a. Electric	Cap: 50 gallons EF: 0.9
b. Conservation features None	
15. Credits	Pstat

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 303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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

ADDRESS: 100 Main Street
Tampa, FL, 32922

PERMIT #:

MANDATORY REQUIREMENTS - See individual code sections for full details.

- ☐ **401.3 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 Statues] 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 compliance for the building. A copy of the EPL display card can be found in Appendix C.
- ☐ **R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.1 through R402.4.4.
  - o **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 402.4.1.1, 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 of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official,* testing shall be conducted by 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.
  - o **R402.4.2 Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.
  - o **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.
  - o **R402.4.4 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 E 283 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.

    Exception: Site-built windows, skylights and doors.
- ☐ **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.
- ☐ **R403.2.2 Sealing (Mandatory).** All ducts, air handlers, and filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts and plenum chambers, shall be constructed and sealed in accordance with Section C403.2.7.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria by post-construction or rough-in testing below.

  Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*, to be "substantially leak free" by either of the following:

  1. Post-construction test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

  2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

  Exceptions:

  1. The total leakage test is not required for ducts and air handlers located entirely within the building envelope.

  2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

- **R403.2.2.1 Sealed air handler.** Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

☐ **R403.2.3 Building Cavities (Mandatory).** Building framing cavities shall not be used as ducts or plenums.

☐ **R403.3 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.,

- R403.3.1 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.

☐ **R403.4.1 Circulating hot water systems (Mandatory).** Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot-water circulating pump when the system is not in use.

☐ **R403.4.3 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.

☐ **R403.4.4 Water heater efficiencies (Mandatory).** Water heater efficiencies

- **R403.4.4.1 Storage water heater temperature controls**
  - **R403.4.4.1.1 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).
  - **R403.4.4.1.2 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.
- **R403.4.4.2 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 met the criteria Section R403.4.4.2.1.
  - **R403.4.4.2.1 Solar water heating system.** 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.

☐ **R403.5 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. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- **R403.5.1 Whole-house mechanical ventilation system fan efficacy.** Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.5.1.

  Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.
- **R403.5.2 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, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications.
  2. No ventilation or air-conditioned system make air shall be provided to conditioned space from attics, crawlspaces, attached closed garages or outdoor spaces adjacent to swimming pools or spas.
  3. If ventilation air is drawn from enclosed spaces(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 or R-19, space permitting, or R-10 otherwise.

☐ **R403.6 Heating and cooling equipment (Mandatory).** The following sections are mandatory for cooling and heating equipment.

- **R403.6.1 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 which affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.
- **R403.6.1.1 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 403.6, 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.

- **R403.6.1.1 Cooling equipment capacity. (continued)** The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacture's expanded performance data shall be used to select cooling-only equipment. This selection 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 temperature 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 multi-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 multi-family units, the capacity of equipment may be sized in accordance with good design practice.

- **R403.6.1.2 Heating equipment capacity**
  - **R403.6.1.2.1 Heat pumps.** Heat pumps sizing shall be based on the cooling requirements as calculated according to Section R403.6.1.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load.
  - **R403.6.1.2.2 Electric resistance furnaces.** Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.6.1.
  - **R403.6.1.2.3 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 R403.6.1.
- **R403.6.1.3 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.

- **R403.7 Systems serving multiple dwelling units (Mandatory).** Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the Commercial Provisions in lieu of Section R403.

- **R403.8 Snow melt 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 55°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

- **R403.9 Swimming pools, inground spas and portable spas (Mandatory).** The energy requirements for residential pools and inground spas shall be as specified in Sections R403.9.1 through R403.9.3 and in accordance with ANSI/APSP-15. The energy requirements for portable spas shall be in accordance with ANSI/APSP-14.
  - **R403.9.1 Pool and spa heaters.** All pool heaters shall be equipped with a readily accessible on-off switch that is mounted outside the heater to allow shutting off the heater without adjusting the thermostat setting.
    - **R403.9.1.1 Gas and oil-fired pool and spa heaters.** All gas- and oil-fired pool and space heaters shall have a minimum 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 gas or LP gas shall not have continuously burning pilot lights.
    - **R403.9.1.2 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.
  - **R403.9.2 Time switches.** Time switches or other control method that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on all heaters and pumps. Heaters, pumps and motors that have built in timers shall be deemed in compliance with this equipment.
    - Exceptions:

      1. Where public health standards require 24-hour pump operations.
      2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.
      3. Where pumps are powered exclusively from on-site renewable generation.
  - **R403.9.3 Covers.** Heated swimming pools and inground permanently installed 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: Outdoor pools deriving over 70 percent of the energy for heating from site-recovered energy, such as a heat pump or solar energy source computed over an operating season.

- **R404.1 Lighting equipment (Mandatory).** A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of permanently installed lighting fixtures shall contain only high efficacy lamps.

  Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.
  - **R404.1.1 Lighting equipment (Mandatory).** Fuel gas lighting systems shall not have continuously burning pilot lights.

TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Sample Addition	Builder Name:	BUILDER
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

COMPONENT	CRITERIA	CHECK
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous 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.	
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top or exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.	
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	
Rim joists	Rim joists are insulated and include an air barrier.	
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	
Shafts, penetrations	Duct shafts, utility penetrations, and flue shaft openings 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 spaces.	
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 air tight, IC rated, and sealed to the drywall.	
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	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating 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 sub-floor or drywall.	
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.	

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report

Project Name:	Sample Addition	Builder:	Builder
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Design Location:	FL, Orlando	Jurisdiction:	

Envelope Leakage Test Results

Regression Data:

C:_____ n:_____ R:_____

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

CFM (50): _____

ELA: _____

EqLA: _____

ACH: _____

ACH (50): _____

SLA: _____

402.4.1.2 Testing option. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climates Zones 1 and 3, 3 air changes per hour in Climates Zones 3 through 8. Testing shall be conducted with a blower door at a pressure or 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the parting 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 openings 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 402.4.1.2.

Signature: _____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Where required by the code official, testing shall be conducted by 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: _____

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Air Distribution System Test Report

Prescriptive Method

Project Name: Sample Addition	Builder: Builder
Street: 100 Main Street	Permit Office:
City, State, Zip: Tampa, FL, 32922	Permit Number:
Design Location: FL, Orlando	Jurisdiction:
	Duct Test Time: [Rough in or Post Construction]

Air Distribution System Leakage Test Results

CFM25 Air Distribution System Leakage Test Values		
Line	System	Total Duct Leakage
1	System 1	_____cfm25(Total)
2	System 2	_____cfm25(Total)
3	System 3	_____cfm25(Total)
4	System 4	_____cfm25(Total)
5	**Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____**(Q_n Total)** To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed Qn Total must be less than or equal to 0.03.

I hereby certify that the above duct testing performance results demonstrate compliance with the Florida Energy Code requirements in accordance with Section 403.2.2.

Signature:_____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, Florida Statutes, or as authorized by Florida Statutes, to be "substantially leak free."

BUILDING OFFICIAL: _____

DATE: _____

Appendix R-3 Prescriptive U-Factor Alternative Method

The software must produce a report that compares the U-factors of the entered house against those that are in Table R402.1.3. To comply, the software must report on the results of six houses described in R-2.3. The U-factors shall be inclusive of the framing fractions and other materials. The software must accurately calculate the average window U-factor and SHGC according to the code, including any exceptions.

R3.1 Testing

The software vendor shall download and complete the spreadsheet file titled "Residential Prescriptive Compliance Test 2014." The file has six yellow-highlightedtabs, one for each house. On each tab is a section for U-Factor Alternative Method. It is the second block of entries on each page –scroll down past the R-Value method. Complete each yellow highlighted field. If the value entered is the expected value or result, the green highlighted field adjacent will indicated "Pass." There is also a box indicating if the software would indicate if the home passes compliance. Again, indicate what the software indicated. If the value is expected the green field will indicate "Pass." For a house where the expected result is that the home fails to comply, the entered choice of "Fails" will yield a "Pass." Each yellow highlighted field must be accurate in order for the software to pass the test. If the results computed by the software fall outside the range indicated on the excel report and the vendor believes that their value is correct they may include an explanation. If submitting for multiple prescriptive methods, submit just one spreadsheet file, completing each prescriptive block of entries for each method seeking software approval. Save the file with the name "Residential Prescriptive Compliance Test 2014 –[software name]."

R3.2 Reporting Test Results

A pdf file shall be prepared and labeled "U-Factor Reports from [software name]." It shall include the required reports for house T01, followed by T02, T03, M01, M02 and M03. Sample report formats are provided in section R3.3. For each house include the following:

1) U-factor prescriptive report that includes the information in Table R402.1.3 for the home
2) A Summary Report of User Inputs
3) Energy Performance Level (EPL) Display Card
4) Mandatory requirements

For house T01 also include the following reports from the software:

5) A checklist of reports to be submitted
6) A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
7) A completed Envelope Leakage Test Report (usually one page), and

R3.3 Sample Reports for the Prescriptive U-factor Alternative Method

The following sample reports show recommended formats.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
Residential U-Factor Alternative Prescriptive Method

Applications for compliance with the 2014 Florida Building Code, Energy Conservation via the residential U-Factor Alternative Prescriptive method shall include:

- ☐ This checklist
- ☐ U-Factor Report including U-Factor Alternative Prescriptive Requirements Checklist (two pages)
- ☐ Input Summary Report (usually 4 pages/may be greater)
- ☐ Energy Performance Level (EPL) Display Card (one page)
- ☐ Mandatory requirements (three pages)

Required prior to CO for the U-Factor Alternative method:

- ☐ A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
- ☐ A building air leakage has been tested then a completed Envelope Leakage Test Report (usually one page)
- ☐ A completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located within the building thermal envelope.

Florida Building Code, Energy Conservation

U-Factor Prescriptive Method

Climate Zone 2

Scope: Compliance with Section 402.1.3 of the *Florida Building Code, Energy Conservation*, shall be demonstrated by the use of the U-Factor Alternative Report for single- and multiple-family residences of three stories or less in height, additions to existing residential buildings, renovations to existing residential buildings, new heating, cooling, and water heating systems in existing buildings, as applicable. To comply, a building must meet or exceed all of the energy efficiency requirements in the mandatory requirements. If a building does not comply with this method, or R-Value or UA Alternate Method, it may still comply under Section 405 of the *Florida Building Code, Energy Conservation.*

PROJECT NAME: AND ADDRESS:	House T01 (Pr-T01) Characteristics	BUILDER:
	Anyplace	PERMITTING OFFICE:
	Tampa FL	JURISDICTION NUMBER:
OWNER:	Energy Gauge	PERMIT NUMBER:

General Instructions:

1. New construction which incorporates air handlers located in attics cannot comply using this method.
2. Fill in all the applicable spaces of the "To Be Installed" column on Table U-Factor with the information requested. All "To Be Installed" U-Factor values must be equal to or lower (more efficient) than the required levels.
3. Complete page 1 based on the "To Be Installed" column information.
4. Read the mandatory requirements and check each box to indicate your intent to comply with all applicable items.
5. Read, sign and date the "Prepared By" certification statement at the bottom of page 1. The owner or owner's agent must also sign and date the form.

			Check
1.	New construction, addition, or existing building	1. New (From Plans)	
2.	Single-family detached or multiple-family attached	2. Single-family	
3.	If multiple-family, number of units covered by this submission	3. 1	
4.	Is this a worst case? (yes/no)	4. No	
5.	Conditioned floor area (sq. ft.)	5. 2000	
6.	Glass type and area:		
	a) U-factor	6a. 0.40	
	b) SHGC	6b. 0.25	
	c) Glass area	6c. 310	
7.	Percentage of glass to floor area	7. 15.5	
8.	Floor type, area or perimeter, and insulation:		
	a) Slab-on-grade	8a.	
	b) Wood, raised	8b. 0	
	c) Wood, common	8c. 0	
	d) Concrete, raised	8d. 0	
	e) Concrete, common	8e. 0	
9.	Wall type, area and insulation:		
	a) Exterior: 1. Wood frame	9a1.	
	2. Masonry	9a2. 0.116	
	b) Adjacent: 1. Wood frame	9b1. 0	
	2. Masonry	9b2. 0	
10.	Ceiling type, area and insulation		
	a) Attic	10a. 0.030	
	b) Single assembly	10b.	
11.	Air distribution system: Duct insulation, location, Qn Total		
	a) Duct location, insulation	11a. Unconditioned Attic	
	b) AHU location	11b. Main	
	c) Duct Leakage, Test report attached (yes/no)	11c. Substantially LeakFree	
12.	Cooling system: a) Type	12a. Central Unit	
	b) Efficiency	12b. 14	
13.	Heating system: a) Type	13a. Electric Heat Pump	
	b) Efficiency	13b. 8.2 HSPF	
14.	HVAC sizing calculation: attached	14. Verify attachment	
15.	Water heating system: a) Type	15a. Electric	
	b) Efficiency	15b. 0.9	

I hereby certify that the plans and specifications covered by this form are in compliance with the Florida energy code. PREPARED BY:_____ Date_____ I hereby certify that this building is in compliance with the Florida energy code. OWNER/AGENT:_____ Date_____	Review of the plans and specifications covered by this form indicate compliance with the Florida energy code. Before construction is complete, this building will be inspected for compliance in accordance with Section 553.908, F.S. CODE OFFICIAL:_____ Date_____

Compliance Table U-Factor

BUILDING COMPONENT	PRESCRIPTIVE REQUIREMENTS[1]		INSTALLED VALUES
	Climate Zone 1	**Climate Zone 2**	
Windows Skylights	U-factor = 0.50 SHGC = 0.25 U-factor = 0.75 SHGC = 0.30	U-factor = 0.40 SHGC = 0.25 U-factor = 0.65 SHGC = 0.30	U-factor = 0.40 SHGC = 0.25 U-factor = 0.65 SHGC = 0.25
Doors: Exterior door	U-factor = 0.50	U-factor = 0.40	U-factor = 0.40
Floors: Slab-on-Grade Over unconditioned spaces	 NR U-factor = 0.64	 NR U-factor = 0.064	 U-factor =
Walls: Ext. and Adj. Frame Mass	 U-factor = 0.082 U-factor = 0.197	 U-factor = 0.082 U-factor = 0.165	 R U-factor = U-factor = 0.116
Ceilings:	U-factor =	U-factor =	U-factor = 0.030
Air infiltration:	Blower door test is required on the building envelope to verify leakage ≤ 5 ACH; test report provided to code official.		Total leakage = 5 ACH Test report attached? Yes ☐ No ☐
Air distribution system[2]: Air handling unit Duct R-value Air leakage[5]: Duct test Ducts in conditioned space	 Not allowed in attic R-value ≥ R-8 (supply in attics) or ≥R-6 (all other duct locations). Post-construction test: Total leakage ≤ 4 cfm/100 sq. ft. Rough-in test: Total leakage ≤ 3 cfm/100 sq. ft. Test not required if all ducts and AHU are in conditioned space		 Location: Attic R-value = 8 Total leakage = 4 cfm/100 sq. ft. Test report attached? Yes ☐ No ☐ Location: Unconditioned
Air conditioning systems: Central system ≤ 65,000 Btu/h Room unit or PTAC Other:	Minimum federal standard required by NAECA[3] SEER 14.0 EER [from Table C403.2.3(3)] See Tables C403.2.3(1)-(11)		 SEER = 14 EER =
Heating system: Heating Pump ≤ 65,000 Btu/h Gas Furnace, non-weatherized Oil Furnace, non-weatherized Other:	Minimum federal standard required by NAECA[3] HSPF 8.2 AFUE 80% AFUE 83%		 HSPF = 8.2 AFUE = AFUE =
Water heating system (storage type): Electric[4] Gas fired[5] Other (describe):	Minimum federal standard required by NAECA[3] Before 4/16/15; 40 gal: EF = 0.92, 50 gal: EF = 0.90 As of 4/16/15; 40 gal: EF = 0.95, 50 gal: EF = 0.95 Before 4/16/15; 40 gal: EF = 0.59, 50 gal: EF = 0.58 As of 4/16/15; 40 gal: EF = 0.62, 50 gal: EF = 0.60		 Gallons = 50 EF = 0.95 Gallons = EF =

NR = No requirement.

(1) Each component present in the As Proposed home must meet or exceed each of the applicable performance criteria in order to comply with this code using this method.

(2) Ducts & AHU installed "substantially leak free" per Section R403.2.2. Test required by an energy rater certified in accordance with *Section 553.99, Florida Statues*, or as authorized by *Florida Statutes*. The total leakage test is not required for ducts and air handlers located entirely within the thermal envelope.

(3) Minimum efficiencies are those set by the *National Appliance Energy Conservation Act of 1987* for typical residential equipment and are subject to NAECA rules and regulations. For other types of equipment, see Tables C403.2.3 (1-11) of the Commercial Provisions of the *Florida Building Code, Energy Conservation*.

(4) For other electric storage volumes ≥ 55, min. EF = 2.057 – (0.00113 * volume).

(5) For other natural gas storage volumes ≥ 55, min. EF = 0.8012 – (0.00078 * volume).

Building Input Summary Report

PROJECT

Title:	House T01 (Pr-T01) Characte	Bedrooms:	3	Address Type:	Street Address
Building Type:	User	Bathrooms:	3	Lot #	
Owner:	Energy Gauge	Conditioned Area:	2000 sq. ft.	Block/SubDivision :	
# of Units:	1	Total Stories:	1	Platbook:	
Builder Name:		Worst Case:	No	Street:	567 Main Street
Permit Office:		Rotate Angle:	90	County:	Hillsborough
Jurisdiction:		Cross Ventilation:	No	City, State, Zip:	Tampa , FL
Family Type:	Single-family	Whole House Fan:	No		
New/Existing:	New (From Plans)	Terrain:	Suburban		
Year Construct:	2015	Shielding:	Suburban		
Comment:	Florida Code Example				

CLIMATE

Design Location	Tmy Site	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, Tampa	FL_TAMPA_INTERNATIONAL_AP	39	91	70	75	645.5	54	Medium

UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	$/Unit
Electricity	kWh	MyFloridaAverage	0	0.12
Natural Gas	Therm	MyFloridaAverage	0	1.72
Fuel Oil	Gallon	Florida Default	0	1.1
Propane	Gallon	Florida Default	0	1.4

SURROUNDINGS

Ornt	Type	Shade Trees Height	Shade Trees Width	Shade Trees Distance	Adjacent Buildings Exist	Adjacent Buildings Height	Adjacent Buildings Width	Adjacent Buildings Distance
N	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
S	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft

BLOCKS

Number	Name	Area	Volume
1	Block1	2000	16000

SPACES

Number	Name	Area	Volume	Kitchen	Occupants	Bedrooms	Finished	Cooled	Heated
1	Main	2000	16000	Yes	4	3	Yes	Yes	Yes

FLOORS

#	Floor Type	Space	Perimeter	R-Value	Area		Tile	Wood	Carpet
1	Slab-On-Grade Edge Insulation	Main	180 ft	0	2000 ft²	----	0.2	0	0.8

Building Input Summary Report

ROOF

#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	SA Tested	Emitt	Emitt Tested	Deck Insul.	Pitch (deg)
1	Gable or shed	Composition shingles	2166 ft²	416 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	2000 ft²	N	N

CEILING

#	Ceiling Type	Space	R-Value	Area	Framing Fraction	Truss Type
1	Under Attic ()	Main	38	2000 ft²	0.11	Wood

WALLS

Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.

#	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=>E	Exterior	Concrete Block - Int Insul	Main	6	50		10		500.0 ft²	0	0	0.6	0
2	E=>S	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.6	0
3	S=>W	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.6	0
4	S=>W	Exterior	Frame - Wood	Main	13	10		10		100.0 ft²	0	0.25	0.6	0
5	W=>N	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.01	0

DOORS

#	Ornt	Door Type	Space	Storms	U-Value	Width Ft	Width In	Height Ft	Height In	Area
1	N=>E	Wood	Main	None	.4	3	6	6	10	23.9 ft²

WINDOWS

#	Ornt	Wall ID	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Overhang Separation	Interior Shade	Screening
1	N=>E	1	Vinyl	Low-E Double	Yes	0.4	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
2	E=>S	2	Vinyl	Low-E Double	Yes	0.4	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
3	S=>W	3	Vinyl	Low-E Double	Yes	0.4	0.25	N	15.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
4	S=>W	4	Vinyl	Low-E Double	Yes	0.4	0.25	N	60.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
5	W=>N	5	Vinyl	Low-E Double	Yes	0.65	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
6	N=>E	Skylt	Metal	Double (Tinted)	Yes	0.65	0.25	N	10.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	Space(s)
1	Wholehouse	Proposed ACH(50)	.000254	1333.3	73.2	137.66	.1906	5	All

MASS

Mass Type	Area	Thickness	Furniture Fraction	Space
No Added Mass	0 ft²	0 ft	0.3	Main

Building Input Summary Report

HEATING SYSTEM

#	System Type	Subtype	Efficiency	Capacity	Geothermal HeatPump Entry	Power	Volt.	Curr	Ducts	Block
1	Electric Heat Pump	None	HSPF:8.2	30 kBtu/hr		0	0	0	sys#1	1

COOLING SYSTEM

#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ducts	Block
1	Central Unit	Split	SEER:14	30 kBtu/hr	900 cfm	0.75	sys#1	1

HOT WATER SYSTEM

#	System Type	SubType	Location	EF	Cap	Use	SetPnt	Credits
1	Electric	None	Main	0.9	50 gal	60 gal	120 deg	None

SOLAR HOT WATER

Collector Type	Collector Tilt	Azimuth	Surface Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy

DUCTS

DUCT #	Supply Location	Supply R-Value	Supply Area	Return Location	Return Area	Return R-Value	Leakage Type	Air Handler	CFM 25 TOT	CFM25 OUT	QN	RLF	HVAC # Heat	HVAC # Cool
1	Attic	8	400 ft²	Main	100 ft²	6	Proposed Qn	Main	--- cfm	--- cfm	0.03	0.60	1	1

TEMPERATURES

Programmable Thermostat: Y Ceiling Fans: N

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

Thermostat Schedule: 2014 FL Code

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Cooling (WEH)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Heating (WD)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72
Heating (WEH)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72

Building Input Summary Report

APPLIANCES & LIGHTING

Appliance Schedule: HERS 2006 Reference

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.33	0.33	0.33	0.33	0.33
% Released: 100	PM	0.33	0.33	0.33	0.33	0.33	1	0.9	0.9	0.9	0.9	0.9	0.65
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 60	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 60	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Dryer	AM	0.2	0.1	0.05	0.05	0.05	0.075	0.2	0.375	0.5	0.8	0.95	1
% Released: 10	PM	0.875	0.85	0.8	0.625	0.625	0.6	0.575	0.55	0.625	0.7	0.65	0.375
Annual Use: 891 kWh/Yr		Peak Value: 200 Watts											
Lighting	AM	0.16	0.15	0.16	0.18	0.23	0.45	0.4	0.26	0.19	0.16	0.12	0.11
% Released: 90	PM	0.16	0.17	0.25	0.27	0.34	0.55	0.55	0.88	1	0.86	0.51	0.28
Annual Use: 2055 kWh/Yr		Peak Value: 671 Watts											
Miscellaneous	AM	0.48	0.47	0.47	0.47	0.47	0.47	0.64	0.71	0.67	0.61	0.55	0.53
% Released: 90	PM	0.52	0.5	0.5	0.5	0.59	0.73	0.79	0.99	1	0.96	0.77	0.55
Annual Use: 2768 kWh/Yr		Peak Value: 508 Watts											
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											
Range	AM	0.057	0.057	0.057	0.057	0.057	0.114	0.171	0.286	0.343	0.343	0.343	0.4
% Released: 100	PM	0.457	0.343	0.286	0.4	0.571	1	0.857	0.429	0.286	0.229	0.171	0.114
Annual Use: 447 kWh/Yr		Peak Value: 165 Watts											
Refrigeration	AM	0.85	0.78	0.75	0.73	0.73	0.73	0.75	0.75	0.8	0.8	0.8	0.8
% Released: 100	PM	0.88	0.85	0.85	0.83	0.88	0.95	1	0.98	0.95	0.93	0.9	0.85
Annual Use: 775 kWh/Yr		Peak Value: 106 Watts											
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 0	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr		Peak Value: 0 Watts											

REFRIGERATORS

ID	Type	Screen	Location	Quantity	Vol	FrZ. Vol	Make	Model	Schedule	kWhPerYr
1		Energy Guide	Main	1			GE	GTH18C		383.0046

CLOTHES WASHERS

ID	Type	Screen	Location	Capacity	Make	Model	Schedule	LoadsPerYr
1	Clothes	Energy Guide	Main	2.2	GE	GTUP240		(invalid)

CLOTHES DRYERS

ID	Type	Screen	Location	Capacity	Fuel Type	Make	Model	Schedule	LoadsPerYr
1	Dryers	Default New	Main		Electricity				

Building Input Summary Report

DISHWASHERS

ID	Type	Screen	Location	Capacity	Vintage	Make	Model	Schedule	kWhPerYr
1	Dishwash	Energy Guide	Main	12		EGgener	EGgener		286.6666

RANGE OVEN

ID	Type	Screen	Location	Type	Fueltype	Make	Model	Cooktop	Oven
1	Ranges	Default New	Main	CooktopOven C	Electric			Electric Fl	Not Conv

HARD WIRED LIGHTING

ID	Type	Screen	Location	Total#	Qualify#	Comp Fl	All Other FL	txtBulbtype	Schedule	Watts per bulb
1	Hard-Wir	By Count - Qualify	Main	13	13	0	13			
2	Hard-Wir	By Count - Qualify	Exterior	1	1					

MISC ELECTRICAL LOADS

ID	Type	Screen	Item	Quantity	Catagory	Operating	Location	Schedule	Off Standby
1	Misc Elec	Simple Default		1		1	Main	HERS2011	1

CEILING FANS

ID	Type	Screen	Default New	cfm/per/watt
1	CeilingFa	Label Available	Standard	87
2	CeilingFa	Label Available	Standard	87
3	CeilingFa	Label Available	Standard	87

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [calculated]

The lower the Energy Performance Index, the more efficient the home.

100 Main Street, Tampa, 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		3
5. Is this a worst case?		No
6. Conditioned floor area (ft²)		2000
7. Windows**	Description	Area
a. U-Factor:	Dbl, U=0.40	225.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Dbl, U=0.65	75.00 ft²
SHGC:	SHGC=0.25	
c. U-Factor:	Dbl, U=0.65	10.00 ft²
SHGC:	SHGC=0.25	
d. U-Factor:	N/A	ft²
SHGC:		
Area Weighted Average Overhang Depth:		0.000 ft.
Area Weighted Average SHGC:		0.250

8. Floor Types	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	2000.00 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	1700.00 ft²
b. Frame - Wood, Exterior	R=13.0	100.00 ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types	Insulation	Area
a. Under Attic (Vented)	R=38.0	2000.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts	R	ft²
a. Sup: Attic, Ret: Main, AH: Main	6	400

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	30.0	SEER:14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	30.0	HSPF:8.20

14. Hot water systems	
a. Electric	Cap: 50 gallons EF: 0.9
b. Conservation features None	
15. Credits	Pstat

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 303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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

ADDRESS: 100 Main Street PERMIT #:
Tampa, FL, 32922

MANDATORY REQUIREMENTS - See individual code sections for full details.

- ☐ **401.3 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 Statues] 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 compliance for the building. A copy of the EPL display card can be found in Appendix C.
- ☐ **R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.1 through R402.4.4.
  - o **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 402.4.1.1, 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 of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official,* testing shall be conducted by 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.
  - o **R402.4.2 Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.
  - o **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.
  - o **R402.4.4 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 E 283 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.

    Exception: Site-built windows, skylights and doors.
- ☐ **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.
- ☐ **R403.2.2 Sealing (Mandatory).** All ducts, air handlers, and filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts and plenum chambers, shall be constructed and sealed in accordance with Section C403.2.7.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria by post-construction or rough-in testing below.

  Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*, to be "substantially leak free" by either of the following:

  1. Post-construction test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

  2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

  Exceptions:

  1. The total leakage test is not required for ducts and air handlers located entirely within the building envelope.

  2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

- **R403.2.2.1 Sealed air handler.** Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

☐ **R403.2.3 Building Cavities (Mandatory).** Building framing cavities shall not be used as ducts or plenums.

☐ **R403.3 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.,

- R403.3.1 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.

☐ **R403.4.1 Circulating hot water systems (Mandatory).** Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot-water circulating pump when the system is not in use.

☐ **R403.4.3 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.

☐ **R403.4.4 Water heater efficiencies (Mandatory).** Water heater efficiencies

- **R403.4.4.1 Storage water heater temperature controls**
  - **R403.4.4.1.1 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).
  - **R403.4.4.1.2 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.
- **R403.4.4.2 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 met the criteria Section R403.4.4.2.1.
  - **R403.4.4.2.1 Solar water heating system.** 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.

☐ **R403.5 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. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- **R403.5.1 Whole-house mechanical ventilation system fan efficacy.** Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.5.1.

  Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.
- **R403.5.2 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, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications.
  2. No ventilation or air-conditioned system make air shall be provided to conditioned space from attics, crawlspaces, attached closed garages or outdoor spaces adjacent to swimming pools or spas.
  3. If ventilation air is drawn from enclosed spaces(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 or R-19, space permitting, or R-10 otherwise.

☐ **R403.6 Heating and cooling equipment (Mandatory).** The following sections are mandatory for cooling and heating equipment.

- **R403.6.1 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 which affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.
- **R403.6.1.1 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 403.6, 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.

- **R403.6.1.1 Cooling equipment capacity. (continued)** The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacture's expanded performance data shall be used to select cooling-only equipment. This selection 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 temperature 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 multi-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 multi-family units, the capacity of equipment may be sized in accordance with good design practice.

- **R403.6.1.2 Heating equipment capacity**
  - **R403.6.1.2.1 Heat pumps.** Heat pumps sizing shall be based on the cooling requirements as calculated according to Section R403.6.1.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load.
  - **R403.6.1.2.2 Electric resistance furnaces.** Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.6.1.
  - **R403.6.1.2.3 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 R403.6.1.
- **R403.6.1.3 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.

- **R403.7 Systems serving multiple dwelling units (Mandatory).** Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the Commercial Provisions in lieu of Section R403.
- **R403.8 Snow melt 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 55°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.
- **R403.9 Swimming pools, inground spas and portable spas (Mandatory).** The energy requirements for residential pools and inground spas shall be as specified in Sections R403.9.1 through R403.9.3 and in accordance with ANSI/APSP-15. The energy requirements for portable spas shall be in accordance with ANSI/APSP-14.
  - **R403.9.1 Pool and spa heaters.** All pool heaters shall be equipped with a readily accessible on-off switch that is mounted outside the heater to allow shutting off the heater without adjusting the thermostat setting.
    - **R403.9.1.1 Gas and oil-fired pool and spa heaters.** All gas- and oil-fired pool and space heaters shall have a minimum 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 gas or LP gas shall not have continuously burning pilot lights.
    - **R403.9.1.2 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.
  - **R403.9.2 Time switches.** Time switches or other control method that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on all heaters and pumps. Heaters, pumps and motors that have built in timers shall be deemed in compliance with this equipment.
    - Exceptions:
      1. Where public health standards require 24-hour pump operations.
      2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.
      3. Where pumps are powered exclusively from on-site renewable generation.
  - **R403.9.3 Covers.** Heated swimming pools and inground permanently installed 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: Outdoor pools deriving over 70 percent of the energy for heating from site-recovered energy, such as a heat pump or solar energy source computed over an operating season.
- **R404.1 Lighting equipment (Mandatory).** A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of permanently installed lighting fixtures shall contain only high efficacy lamps.

  Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.
  - **R404.1.1 Lighting equipment (Mandatory).** Fuel gas lighting systems shall not have continuously burning pilot lights.

TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Sample Addition	Builder Name:	BUILDER
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

COMPONENT	CRITERIA	CHECK
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous 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.	
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top or exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.	
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	
Rim joists	Rim joists are insulated and include an air barrier.	
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	
Shafts, penetrations	Duct shafts, utility penetrations, and flue shaft openings 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 spaces.	
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 air tight, IC rated, and sealed to the drywall.	
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	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating 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 sub-floor or drywall.	
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.	

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report

Project Name:	Sample Addition	Builder:	Builder
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Design Location:	FL, Orlando	Jurisdiction:	

Envelope Leakage Test Results

Regression Data:

C:_____ n:_____ R:_____

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

CFM (50): _____

ELA: _____

EqLA: _____

ACH: _____

ACH (50): _____

SLA: _____

402.4.1.2 Testing option. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climates Zones 1 and 3, 3 air changes per hour in Climates Zones 3 through 8. Testing shall be conducted with a blower door at a pressure or 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the parting 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 openings 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 402.4.1.2.

Signature: _____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Where required by the code official, testing shall be conducted by 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: _____

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Air Distribution System Test Report

Prescriptive Method

Project Name: Sample Addition Street: 100 Main Street City, State, Zip: Tampa, FL, 32922 Design Location: FL, Orlando	Builder: Permit Office: Permit Number: Jurisdiction: Duct Test Time: [Rough in or Post Construction]

Air Distribution System Leakage Test Results

CFM25 Air Distribution System Leakage Test Values		
Line	System	Total Duct Leakage
1	System 1	_____cfm25(Total)
2	System 2	_____cfm25(Total)
3	System 3	_____cfm25(Total)
4	System 4	_____cfm25(Total)
5	**Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____**(Q_n Total)** To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed Qn Total must be less than or equal to 0.03.

I hereby certify that the above duct testing performance results demonstrate compliance with the Florida Energy Code requirements in accordance with Section 403.2.2.

Signature:_____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, Florida Statutes, or as authorized by Florida Statutes, to be "substantially leak free."

BUILDING OFFICIAL: _____

DATE: _____

Appendix R-4 Prescriptive Total UA Alternative Method

The software must produce a report that compares the UA of the entered home to the total UA based on the same areas and the U values given in Table R402.1.3 of the code. To comply, the software must report on the results of six houses described in R-2.3. The U-factors shall be inclusive of the framing fractions and other materials. The software must accurately calculate the average window U-factor and SHGC according to the code, including any exceptions.

R3.1 Testing

The software vendor shall download and complete the spreadsheet file titled "Residential Prescriptive Compliance Test 2014." The file has six yellow-highlighted tabs, one for each house. On each tab is a section for Total UA Alternative Method. It is the third block of entries on each page –scroll down past the R-Value and U-Factor methods. Complete each yellow highlighted field. If the value entered is the expected value or result, the green highlighted field adjacent will indicated "Pass." There is also a box indicating if the software would indicate if the home passes compliance. Again, indicate what the software indicated. If the value is expected the green field will indicate "Pass." For a house where the expected result is that the home fails to comply, the entered choice of "Fails" will yield a "Pass." Each yellow highlighted field must be accurate in order for the software to pass the test. If the results computed by the software fall outside the range indicated on the excel report and the vendor believes that their value is correct they may include an explanation. If submitting for multiple prescriptive methods, submit just one spreadsheet file, completing each prescriptive block of entries for each method seeking software approval. Save the file with the name "Residential Prescriptive Compliance Test 2014 –[software name]."

R3.2 Reporting Test Results

A pdf file shall be prepared and labeled "U-Factor Reports from [software name]." It shall include the required reports for house T01, followed by T02, T03, M01, M02 and M03. Sample report formats are provided in section R3.3. For each house include the following:

1) U-factor prescriptive report that includes the information in Table R402.1.3 for the home
2) A Summary Report of User Inputs
3) Energy Performance Level (EPL) Display Card
4) Mandatory requirements

For house T01 also include the following reports from the software:

5) A checklist of reports to be submitted
6) A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table R402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
7) A completed Envelope Leakage Test Report (usually one page), and

R3.3 Sample Reports for the Prescriptive Total UA Alternative Method

The following sample reports show recommended formats.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

Florida Department of Business and Professional Regulation
Residential Total UA Alternative Prescriptive Method

Applications for compliance with the 2014 Florida Building Code, Energy Conservation via the residential Total UA Alternative Prescriptive method shall include:

- ☐ This checklist
- ☐ Total UA Report including Total UA Alternative Prescriptive Requirements Checklist (two pages)
- ☐ Input Summary Report (usually 4 pages/may be greater)
- ☐ Energy Performance Level (EPL) Display Card (one page)
- ☐ Mandatory requirements (three pages)

Required prior to CO for the Total UA Alternative method:

- ☐ A completed Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 of the 2014 Florida Building Code, Energy Conservation with added checkboxes - one page)
- ☐ A building air leakage has been tested then a completed Envelope Leakage Test Report (usually one page)
- ☐ A completed Air Distribution System Test Report (usually one page), unless all duct work and air handler units are located within the building thermal envelope.

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Florida Department of Business and Professional Regulation - Residential Total UA Method

Project Name:	House T01 (Pr-T01) Characteristics	Builder Name:	
Street:	567 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL	Permit Number:	
Owner:	Energy Gauge	Jurisdiction:	
Design Location:	FL, Tampa		

1. New construction or existing	New (From Plans)	4. Number of Bedrooms	3
2. Single family or multiple family	Single-family	5. Conditioned floor area above grade (ft^2)	2000
3. Number of units, if multiple family		6. Conditioned floor area below grade (ft^2)	0

Proposed UA

Windows	126.5
Doors	9.6
Walls	170.4
Floor	0.0
Ceiling	49.6
Overall UA	**356.1**

Baseline UA

Windows	126.5
Doors	9.6
Walls	204.3
Floor	0.0
Ceiling	59.7
Overall UA	**400.1**

Compliance Criteria

Overall UA	400.1	PASS	
Window-to-Floor Area	15.5%	N/A	
Window SHGC Area Weighted	0.250	PASS	
Duct and Air Handler Location	Attic	PASS	Duct testing required unless ducts and air handler units in interior.
Duct leakage total	MUST	TEST	Duct leakage total must be tested as substantially leak free
Roof Reflectance	0.25	PASS	
Wall Area (ft^2)	1476.1	PASS	
Ceiling Area (ft^2)	2000.0	PASS	
Floor Area (ft^2)	2000.0	PASS	
Common Wall Mass R		N/A	There are no common mass walls in this building
Common Wall Frame R		N/A	There are no common frame walls in this building
Common Floor Low R		N/A	There are no common floors in this building
Common Ceiling Low R		N/A	There are no common ceilings in this building
Window Area (ft^2)	310.0		
Door Area (ft^2)	24.0		

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: _____

Air infiltration:	Blower door test is required on the building envelope to verify leakage ≤ 5 ACH; test report provided to code official.	Total leakage = 5 ACH Test report attached? Yes ☐ No ☐
Air distribution system[1]: Air handling unit Duct R-value Air leakage[5]: Duct test Ducts in conditioned space	 Not allowed in attic R-value ≥ R-8 (supply in attics) or ≥R-6 (all other duct locations). Post-construction test: Total leakage ≤ 4 cfm/100 s.f. Rough-in test: Total leakage ≤ 3 cfm/100 s.f. Test not required if all ducts and AHU are in conditioned space	 Location: Attic R-value = 8 Total leakage = 4 cfm/100 s.f. Test report attached? Yes ☐ No ☐ Location: Unconditioned
Air conditioning systems: Central system ≤ 65,000 Btu/h Room unit or PTAC Other:	Minimum federal standard required by NAECA[6] SEER 14.0 EER [from Table C403.2.3(3)] See Tables C403.2.3(1)-(11)	 SEER = 14 EER =
Heating system: Heating Pump ≤ 65,000 Btu/h Gas Furnace, non-weatherized Oil Furnace, non-weatherized Other:	Minimum federal standard required by NAECA[2] HSPF 8.2 AFUE 80% AFUE 83%	 HSPF = 8.2 AFUE = AFUE =
Water heating system (storage type): Electric[3] Gas fired[4] Other (describe):	Minimum federal standard required by NAECA[2] Before 4/16/15; 40 gal: EF = 0.92, 50 gal: EF = 0.90 As of 4/16/15; 40 gal: EF = 0.95, 50 gal: EF = 0.95 Before 4/16/15; 40 gal: EF = 0.59, 50 gal: EF = 0.58 As of 4/16/15; 40 gal: EF = 0.62, 50 gal: EF = 0.60	 Gallons = 50 EF = 0.95 Gallons = EF =

NR = No requirement.

(1) Ducts & AHU installed "substantially leak free" per Section R403.2.2. Test required by an energy rater certified in accordance with *Section 553.99, Florida Statues*, or as authorized by *Florida Statutes*. The total leakage test is not required for ducts and air handlers located entirely within the thermal envelope.

(2) Minimum efficiencies are those set by the *National Appliance Energy Conservation Act of 1987* for typical residential equipment and are subject to NAECA rules and regulations. For other types of equipment, see Tables C403.2.3 (1-11) of the Commercial Provisions of the *Florida Building Code, Energy Conservation*.

(3) For other electric storage volumes ≥ 55, min. EF = 2.057 – (0.00113 * volume).

(4) For other natural gas storage volumes ≥ 55, min. EF = 0.8012 – (0.00078 * volume).

Building Input Summary Report

PROJECT

Title:	House T01 (Pr-T01) Characte	Bedrooms:	3	Address Type:	Street Address
Building Type:	User	Bathrooms:	3	Lot #	
Owner:	Energy Gauge	Conditioned Area:	2000 sq. ft.	Block/SubDivision :	
# of Units:	1	Total Stories:	1	Platbook:	
Builder Name:		Worst Case:	No	Street:	567 Main Street
Permit Office:		Rotate Angle:	90	County:	Hillsborough
Jurisdiction:		Cross Ventilation:	No	City, State, Zip:	Tampa , FL
Family Type:	Single-family	Whole House Fan:	No		
New/Existing:	New (From Plans)	Terrain:	Suburban		
Year Construct:	2015	Shielding:	Suburban		
Comment:	Florida Code Example				

CLIMATE

Design Location	Tmy Site	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, Tampa	FL_TAMPA_INTERNATIONAL_AP	39	91	70	75	645.5	54	Medium

UTILITY RATES

Fuel	Unit	Utility Name	Monthly Fixed Cost	$/Unit
Electricity	kWh	MyFloridaAverage	0	0.12
Natural Gas	Therm	MyFloridaAverage	0	1.72
Fuel Oil	Gallon	Florida Default	0	1.1
Propane	Gallon	Florida Default	0	1.4

SURROUNDINGS

Ornt	Type	Shade Trees Height	Shade Trees Width	Shade Trees Distance	Exist	Adjacent Buildings Height	Adjacent Buildings Width	Adjacent Buildings Distance
N	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
NE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
E	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
SE	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
S	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
SW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
W	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft
NW	None	0 ft	0 ft	0 ft		0 ft	0 ft	0 ft

BLOCKS

Number	Name	Area	Volume
1	Block1	2000	16000

SPACES

Number	Name	Area	Volume	Kitchen	Occupants	Bedrooms	Finished	Cooled	Heated
1	Main	2000	16000	Yes	4	3	Yes	Yes	Yes

FLOORS

#	Floor Type	Space	Perimeter	R-Value	Area		Tile	Wood	Carpet
1	Slab-On-Grade Edge Insulation	Main	180 ft	0	2000 ft²	----	0.2	0	0.8

Building Input Summary Report

ROOF

#	Type	Materials	Roof Area	Gable Area	Roof Color	Solar Absor.	SA Tested	Emitt	Emitt Tested	Deck Insul.	Pitch (deg)
1	Gable or shed	Composition shingles	2166 ft²	416 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	2000 ft²	N	N

CEILING

#	Ceiling Type	Space	R-Value	Area	Framing Fraction	Truss Type
1	Under Attic ()	Main	38	2000 ft²	0.11	Wood

WALLS

Wall orientation below is as entered. Actual orientation is modified by rotate angle shown in "Project" section above.

#	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=>E	Exterior	Concrete Block - Int Insul	Main	6	50		10		500.0 ft²	0	0	0.6	0
2	E=>S	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.6	0
3	S=>W	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.6	0
4	S=>W	Exterior	Frame - Wood	Main	13	10		10		100.0 ft²	0	0.25	0.6	0
5	W=>N	Exterior	Concrete Block - Int Insul	Main	6	40		10		400.0 ft²	0	0	0.01	0

DOORS

#	Ornt	Door Type	Space	Storms	U-Value	Width Ft	Width In	Height Ft	Height In	Area
1	N=>E	Wood	Main	None	.4	3	6	6	10	23.9 ft²

WINDOWS

#	Ornt	Wall ID	Frame	Panes	NFRC	U-Factor	SHGC	Storm	Area	Overhang Depth	Overhang Separation	Interior Shade	Screening
1	N=>E	1	Vinyl	Low-E Double	Yes	0.4	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
2	I	2	Vinyl	Low-E Double	Yes	0.4	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
3	S=>W	3	Vinyl	Low-E Double	Yes	0.4	0.25	N	15.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
4	S=>W	4	Vinyl	Low-E Double	Yes	0.4	0.25	N	60.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
5	W=>N	5	Vinyl	Low-E Double	Yes	0.65	0.25	N	75.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None
6	N=>E	Skylt	Metal	Double (Tinted)	Yes	0.65	0.25	N	10.0 ft²	0 ft 0 in	0 ft 0 in	Drapes/blinds	None

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50	Space(s)
1	Wholehouse	Proposed ACH(50)	.000254	1333.3	73.2	137.66	.1906	5	All

MASS

Mass Type	Area	Thickness	Furniture Fraction	Space
No Added Mass	0 ft²	0 ft	0.3	Main

Building Input Summary Report

HEATING SYSTEM

#	System Type	Subtype	Efficiency	Capacity	Geothermal HeatPump Entry	Power	Volt.	Curr	Ducts	Block
1	Electric Heat Pump	None	HSPF:8.2	30 kBtu/hr		0	0	0	sys#1	1

COOLING SYSTEM

#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Ducts	Block
1	Central Unit	Split	SEER:14	30 kBtu/hr	900 cfm	0.75	sys#1	1

HOT WATER SYSTEM

#	System Type	SubType	Location	EF	Cap	Use	SetPnt	Credits
1	Electric	None	Main	0.9	50 gal	60 gal	120 deg	None

SOLAR HOT WATER

Collector Type	Collector Tilt	Azimuth	Surface Area	Loss Coef.	Absorp. Prod.	Trans Corr.	Tank Volume	Tank U-Value	Tank Surf Area	Heat Exch Eff	PV Pumped	Pump Energy

DUCTS

DUCT #	Supply Location	Supply R-Value	Supply Area	Return Location	Return Area	Return R-Value	Leakage Type	Air Handler	CFM 25 TOT	CFM25 OUT	QN	RLF	HVAC # Heat	HVAC # Cool
1	Attic	8	400 ft²	Main	100 ft²	6	Proposed Qn	Main	--- cfm	--- cfm	0.03	0.60	1	1

TEMPERATURES

Programmable Thermostat: Y Ceiling Fans: N

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

Thermostat Schedule: 2014 FL Code

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Cooling (WEH)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Heating (WD)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72
Heating (WEH)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72

Building Input Summary Report

APPLIANCES & LIGHTING

Appliance Schedule: HERS 2006 Reference

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Ceiling Fans (Summer)	AM	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.33	0.33	0.33	0.33	0.33
% Released: 100	PM	0.33	0.33	0.33	0.33	0.33	1	0.9	0.9	0.9	0.9	0.9	0.65
Annual Use: 0 kWh/Yr				Peak Value: 0 Watts									
Clothes Washer	AM	0.105	0.081	0.046	0.046	0.081	0.128	0.256	0.57	0.849	1	0.977	0.872
% Released: 60	PM	0.779	0.698	0.605	0.57	0.581	0.57	0.57	0.57	0.57	0.488	0.43	0.198
Annual Use: 0 kWh/Yr				Peak Value: 0 Watts									
Dishwasher	AM	0.139	0.05	0.028	0.024	0.029	0.09	0.169	0.303	0.541	0.594	0.502	0.443
% Released: 60	PM	0.377	0.396	0.335	0.323	0.344	0.448	0.791	1	0.8	0.597	0.383	0.281
Annual Use: 0 kWh/Yr				Peak Value: 0 Watts									
Dryer	AM	0.2	0.1	0.05	0.05	0.05	0.075	0.2	0.375	0.5	0.8	0.95	1
% Released: 10	PM	0.875	0.85	0.8	0.625	0.625	0.6	0.575	0.55	0.625	0.7	0.65	0.375
Annual Use: 891 kWh/Yr				Peak Value: 200 Watts									
Lighting	AM	0.16	0.15	0.16	0.18	0.23	0.45	0.4	0.26	0.19	0.16	0.12	0.11
% Released: 90	PM	0.16	0.17	0.25	0.27	0.34	0.55	0.55	0.88	1	0.86	0.51	0.28
Annual Use: 2055 kWh/Yr				Peak Value: 671 Watts									
Miscellaneous	AM	0.48	0.47	0.47	0.47	0.47	0.47	0.64	0.71	0.67	0.61	0.55	0.53
% Released: 90	PM	0.52	0.5	0.5	0.5	0.59	0.73	0.79	0.99	1	0.96	0.77	0.55
Annual Use: 2768 kWh/Yr				Peak Value: 508 Watts									
Pool Pump	AM	0	0	0	0	0	0	0	0	0	1	1	1
% Released: 0	PM	1	1	1	1	0	0	0	0	0	0	0	0
Annual Use: 0 kWh/Yr				Peak Value: 0 Watts									
Range	AM	0.057	0.057	0.057	0.057	0.057	0.114	0.171	0.286	0.343	0.343	0.343	0.4
% Released: 100	PM	0.457	0.343	0.286	0.4	0.571	1	0.857	0.429	0.286	0.229	0.171	0.114
Annual Use: 447 kWh/Yr				Peak Value: 165 Watts									
Refrigeration	AM	0.85	0.78	0.75	0.73	0.73	0.73	0.75	0.75	0.8	0.8	0.8	0.8
% Released: 100	PM	0.88	0.85	0.85	0.83	0.88	0.95	1	0.98	0.95	0.93	0.9	0.85
Annual Use: 775 kWh/Yr				Peak Value: 106 Watts									
Well Pump	AM	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1
% Released: 0	PM	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Use: 0 kWh/Yr				Peak Value: 0 Watts									

REFRIGERATORS

ID	Type	Screen	Location	Quantity	Vol	FrZ. Vol	Make	Model	Schedule	kWhPerYr
1		Energy Guide	Main	1			GE	GTH18C		383.0046

CLOTHES WASHERS

ID	Type	Screen	Location	Capacity	Make	Model	Schedule	LoadsPerYr
1	Clothes	Energy Guide	Main	2.2	GE	GTUP240		(invalid)

CLOTHES DRYERS

ID	Type	Screen	Location	Capacity	Fuel Type	Make	Model	Schedule	LoadsPerYr
1	Dryers	Default New	Main		Electricity				

Building Input Summary Report

DISHWASHERS

ID	Type	Screen	Location	Capacity	Vintage	Make	Model	Schedule	kWhPerYr
1	Dishwash	Energy Guide	Main	12		EGgener	EGgener		286.6666

RANGE OVEN

ID	Type	Screen	Location	Type	Fueltype	Make	Model	Cooktop	Oven
1	Ranges	Default New	Main	CooktopOven C	Electric			Electric Fl	Not Conv

HARD WIRED LIGHTING

ID	Type	Screen	Location	Total#	Qualify#	Comp Fl	All Other FL	txtBulbtype	Schedule	Watts per bulb
1	Hard-Wir	By Count - Qualify	Main	13	13	0	13			
2	Hard-Wir	By Count - Qualify	Exterior	1	1					

MISC ELECTRICAL LOADS

ID	Type	Screen	Item	Quantity	Catagory	Operating	Location	Schedule	Off Standby
1	Misc Elec	Simple Default		1		1	Main	HERS2011	1

CEILING FANS

ID	Type	Screen	Default New	cfm/per/watt
1	CeilingFa	Label Available	Standard	87
2	CeilingFa	Label Available	Standard	87
3	CeilingFa	Label Available	Standard	87

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [calculated]

The lower the Energy Performance Index, the more efficient the home.

100 Main Street, Tampa, 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	3
5. Is this a worst case?	No
6. Conditioned floor area (ft²)	2000

7. Windows**

	Description	Area
a. U-Factor:	Dbl, U=0.40	225.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Dbl, U=0.65	75.00 ft²
SHGC:	SHGC=0.25	
c. U-Factor:	Dbl, U=0.65	10.00 ft²
SHGC:	SHGC=0.25	
d. U-Factor:	N/A	ft²
SHGC:		

Area Weighted Average Overhang Depth: 0.000 ft.

Area Weighted Average SHGC: 0.250

8. Floor Types

	Insulation	Area
a. Slab-On-Grade Edge Insulation	R=0.0	2000.00 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	1700.00 ft²
b. Frame - Wood, Exterior	R=13.0	100.00 ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types

	Insulation	Area
a. Under Attic (Vented)	R=38.0	2000.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²

11. Ducts

	R	ft²
a. Sup: Attic, Ret: Main, AH: Main	6	400

12. Cooling systems

	kBtu/hr	Efficiency
a. Central Unit	30.0	SEER:14.00

13. Heating systems

	kBtu/hr	Efficiency
a. Electric Heat Pump	30.0	HSPF:8.20

14. Hot water systems

a. Electric — Cap: 50 gallons, EF: 0.9

b. Conservation features: None

15. Credits: Pstat

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 303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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

ADDRESS: 100 Main Street
Tampa, FL, 32922

PERMIT #:

MANDATORY REQUIREMENTS - See individual code sections for full details.

- ☐ **401.3 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 Statues] 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 compliance for the building. A copy of the EPL display card can be found in Appendix C.
- ☐ **R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.1 through R402.4.4.
  - o **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 402.4.1.1, 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 of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official,* testing shall be conducted by 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.
  - o **R402.4.2 Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.
  - o **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.
  - o **R402.4.4 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 E 283 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.

    Exception: Site-built windows, skylights and doors.
- ☐ **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.
- ☐ **R403.2.2 Sealing (Mandatory).** All ducts, air handlers, and filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts and plenum chambers, shall be constructed and sealed in accordance with Section C403.2.7.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria by post-construction or rough-in testing below.

  Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*, to be "substantially leak free" by either of the following:

  1. Post-construction test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

  2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

  Exceptions:

  1. The total leakage test is not required for ducts and air handlers located entirely within the building envelope.

  2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

- **R403.2.2.1 Sealed air handler.** Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

☐ **R403.2.3 Building Cavities (Mandatory).** Building framing cavities shall not be used as ducts or plenums.

☐ **R403.3 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.,

- R403.3.1 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.

☐ **R403.4.1 Circulating hot water systems (Mandatory).** Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot-water circulating pump when the system is not in use.

☐ **R403.4.3 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.

☐ **R403.4.4 Water heater efficiencies (Mandatory).** Water heater efficiencies

- **R403.4.4.1 Storage water heater temperature controls**
  - **R403.4.4.1.1 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).
  - **R403.4.4.1.2 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.
- **R403.4.4.2 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 met the criteria Section R403.4.4.2.1.
  - **R403.4.4.2.1 Solar water heating system.** 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.

☐ **R403.5 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. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- **R403.5.1 Whole-house mechanical ventilation system fan efficacy.** Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.5.1.

  Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.
- **R403.5.2 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, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications.
  2. No ventilation or air-conditioned system make air shall be provided to conditioned space from attics, crawlspaces, attached closed garages or outdoor spaces adjacent to swimming pools or spas.
  3. If ventilation air is drawn from enclosed spaces(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 or R-19, space permitting, or R-10 otherwise.

☐ **R403.6 Heating and cooling equipment (Mandatory).** The following sections are mandatory for cooling and heating equipment.

- **R403.6.1 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 which affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.
- **R403.6.1.1 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 403.6, 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.

- **R403.6.1.1 Cooling equipment capacity. (continued)** The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacture's expanded performance data shall be used to select cooling-only equipment. This selection 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 temperature 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 multi-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 multi-family units, the capacity of equipment may be sized in accordance with good design practice.

- **R403.6.1.2 Heating equipment capacity**
  - **R403.6.1.2.1 Heat pumps.** Heat pumps sizing shall be based on the cooling requirements as calculated according to Section R403.6.1.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load.
  - **R403.6.1.2.2 Electric resistance furnaces.** Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.6.1.
  - **R403.6.1.2.3 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 R403.6.1.
- **R403.6.1.3 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.

- **R403.7 Systems serving multiple dwelling units (Mandatory).** Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the Commercial Provisions in lieu of Section R403.
- **R403.8 Snow melt 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 55°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.
- **R403.9 Swimming pools, inground spas and portable spas (Mandatory).** The energy requirements for residential pools and inground spas shall be as specified in Sections R403.9.1 through R403.9.3 and in accordance with ANSI/APSP-15. The energy requirements for portable spas shall be in accordance with ANSI/APSP-14.
  - **R403.9.1 Pool and spa heaters.** All pool heaters shall be equipped with a readily accessible on-off switch that is mounted outside the heater to allow shutting off the heater without adjusting the thermostat setting.
    - **R403.9.1.1 Gas and oil-fired pool and spa heaters.** All gas- and oil-fired pool and space heaters shall have a minimum 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 gas or LP gas shall not have continuously burning pilot lights.
    - **R403.9.1.2 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.
  - **R403.9.2 Time switches.** Time switches or other control method that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on all heaters and pumps. Heaters, pumps and motors that have built in timers shall be deemed in compliance with this equipment.
    - Exceptions:

      1. Where public health standards require 24-hour pump operations.
      2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.
      3. Where pumps are powered exclusively from on-site renewable generation.
  - **R403.9.3 Covers.** Heated swimming pools and inground permanently installed 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: Outdoor pools deriving over 70 percent of the energy for heating from site-recovered energy, such as a heat pump or solar energy source computed over an operating season.
- **R404.1 Lighting equipment (Mandatory).** A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of permanently installed lighting fixtures shall contain only high efficacy lamps.

  Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.
  - **R404.1.1 Lighting equipment (Mandatory).** Fuel gas lighting systems shall not have continuously burning pilot lights.

TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Sample Addition	Builder Name:	BUILDER
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

COMPONENT	CRITERIA	CHECK
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous 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.	
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top or exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.	
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	
Rim joists	Rim joists are insulated and include an air barrier.	
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	
Shafts, penetrations	Duct shafts, utility penetrations, and flue shaft openings 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 spaces.	
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 air tight, IC rated, and sealed to the drywall.	
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	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating 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 sub-floor or drywall.	
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.	

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report

Project Name:	Sample Addition	Builder:	Builder
Street:	100 Main Street	Permit Office:	
City, State, Zip:	Tampa, FL, 32922	Permit Number:	
Design Location:	FL, Orlando	Jurisdiction:	

Envelope Leakage Test Results

Regression Data:

C:_____ n:_____ R:_____

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

CFM (50): _____

ELA: _____

EqLA: _____

ACH: _____

ACH (50): _____

SLA: _____

402.4.1.2 Testing option. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climates Zones 1 and 3, 3 air changes per hour in Climates Zones 3 through 8. Testing shall be conducted with a blower door at a pressure or 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the parting 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 openings 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 402.4.1.2.

Signature: _____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Where required by the code official, testing shall be conducted by 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: _____

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Air Distribution System Test Report
Prescriptive Method

Project Name: Sample Addition	Builder: Builder
Street: 100 Main Street	Permit Office:
City, State, Zip: Tampa, FL, 32922	Permit Number:
Design Location: FL, Orlando	Jurisdiction:
	Duct Test Time: [Rough in or Post Construction]

Air Distribution System Leakage Test Results

CFM25 Air Distribution System Leakage Test Values		
Line	System	Total Duct Leakage
1	System 1	_____cfm25(Total)
2	System 2	_____cfm25(Total)
3	System 3	_____cfm25(Total)
4	System 4	_____cfm25(Total)
5	**Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____**(Q_n Total)** To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed Qn Total must be less than or equal to 0.03.

I hereby certify that the above duct testing performance results demonstrate compliance with the Florida Energy Code requirements in accordance with Section 403.2.2.

Signature:_____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, Florida Statutes, or as authorized by Florida Statutes, to be "substantially leak free."

BUILDING OFFICIAL: _____

DATE: _____

Appendix R-5 Residential Performance Compliance (Revised 2014)

The software verification test suite found in Section 2.2 of the RESNET document "Procedures for Verification of International Energy Conservation Code Performance Path Calculation Tools" dated September 2007 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 eRatio 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 eRatio 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 eRatio calculation procedure is given in 2014 Florida Building Code, Energy Conservation Appendix B.

Using the test cases identified, simulate the cases as outlined in the reference documents.

Record the results using the MS Excel spreadsheets provided by the Commission (see below). 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 format are available on the Florida Building Commission's website, www.floridabuilding.org for the verification tests specified.

The Forms are:

Florida AutoGen_results-form.xls
ASHRAE 140_results-form.xls
FL-HERS_BESTEST_results-form.xls
HVAC_results-form.xls

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 ($SHGC_O$)[1] of the windows during heating.
- Overall solar-heat gain coefficient ($SHGC_O$) 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)
- CFM50 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
- 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

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

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

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.

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 (U_o)	0.082	0.082	0.082	0.082
Above-grade wall solar absorptance (α)	0.75	0.75	0.75	0.75
Above-grade wall infrared emittance (ε)	0.90	0.90	0.90	0.90
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

Standard Reference Design Building Component	Test 1	Test 2	Test 3	Test 4
East window area* ft^2)	57.71	57.71	57.71	50.02
West window area* (ft^2)	57.71	57.71	57.71	50.02
Window U-Factor	0.40	0.40	0.50	0.40
Window SHGC$_O$ (heating)	0.217	0.217	0.217	0.217
Window SHGC$_O$ (cooling)	0.217	0.217	0.217	0.217
CFM50	5.0	5.0	5.0	5.0
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	72 F (all	72 F (all hours)
Cooling thermostat settings	75 F (all hours)	75 F (all	75 F (all	75 F (all hours)

R5.3.2 Test Case 5.

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

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

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

R5.4 Florida eRatio Method Tests

The Florida eRatio Method tests are intended to determine the ability of software compliance tools to accurately calculate the Florida Energy Code compliance eRatio 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 L100A-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 L100A-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 L100A-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 L100A-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.xls), software tools shall demonstrate the following:

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

5.4.3.2 That the difference between the eRatios calculated by the software tool and the eRatios 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 2014 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 R405-2014 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, mandatory requirements, 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 R405-2014
  - 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
    - Permit number
    - Jurisdiction
- Summary of building components and features
    - New construction or existing
    - Single- or multiple-family
    - Number of units, if multiple family
    - Number of bedrooms
    - Whether it is a worst-case calculation
    - Window U-factor. SHGC and area for all windows in the building
    - 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-value, 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.

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

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

Applications for compliance with the 2014 Florida Building Code, Energy Conservation via the residential Simulated Performance Method shall include:

- ☐ This checklist
- ☐ A Form 405 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 (1 page) and an input summary checklist that can be used for field verification (usually 4 pages/may be greater)
- ☐ Energy Performance Level (EPL) Display Card (one page)
- ☐ Mandatory Requirements (three pages)

Required prior to CO for the Performance Method:

- ☐ Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 - one page)
- ☐ A completed Envelope Leakage Test Report (usually one page)
- ☐ If Form 405 indicates anything other than default duct leakage, then a completed Form 405 Duct Leakage Test Report (usually one page)

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:	
City, State, Zip:	Orlando, FL, 32922	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

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(Bedrms In Addition)	3(1)
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 sq. ft.)	Description	Area
a. U-Factor: SHGC:	Dbl, U=0.35 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:		0.350

8. Floor Types (500.0 sq. ft.)	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 (405.0 sq. ft.)	Insulation	Area
a. Concrete Block - Int Insul, Exterior	R=6.0	405.00 ft²
b. N/A	R=	ft²
c. N/A	R=	ft²
d. N/A	R=	ft²

10. Ceiling Types (500.0 sq. ft.)	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	6	100

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	8.8	SEER: 14.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	6.5	HSPF: 8.20

14. Hot water systems - None (Baseline assumed)
a. Electric — Cap: N/A EF: 0.97
b. Conservation features None

15. Credits — Pstat

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: _____

PROJECT

Title:	Sample Addition	Bedrooms:	3	Address Type:	Street Address
Building Type:	FLProp2014	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:		Cross Ventilation:		County:	Orange
Jurisdiction:		Whole House Fan:		City, State, Zip:	Orlando, FL, 32922
Family Type:	Single-family				
New/Existing:	Addition				
Comment:					

CLIMATE

√	Design Location	TMY Site	IECC 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	75	70	526	44	Medium

BLOCKS

Number	Name	Area	Volume
1	Block1	500	4000

SPACES

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

FLOORS

√	#	Floor Type	Room	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	Medium	0.96	No	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	Area	Framing Frac	Truss Type
	1	Under Attic (Vented)	Main	30	500 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	SE	Exterior	Concrete Block - Int Insul	Main	6	20		9		180 ft²		0	0.6	0
	2	SW	Exterior	Concrete Block - Int Insul	Main	6	25		9		225 ft²		0	0.6	0

DOORS

√	#	Ornt	Door Type	Space	Storm	U-Value	Width Ft	Width In	Height Ft	Height In	Area
	1	SE	Wood	Main	None	0.20000	2.8		6.7		18.75999

WINDOWS

Orientation shown is the entered, Proposed orientation.

√	#	Ornt	Frame	Panes	Impact	NFRC	U-Factor	SHGC	Storms	Area	Overhang Depth	Overhang Separation	Int Shade	Screening
	1	SE	Metal	Low-E Double	Y	Yes	0.40	0.25	N	30 ft²	1 ft 0 in	1 ft 0 in	HERS 2006	None
	2	SW	Metal	Low-E Double	Y	Yes	0.40	0.25	N	30 ft²	1 ft 0 in	1 ft 0 in	HERS 2006	None

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50
1	BySpaces	Proposed ACH(50)	0.00032	1845	101.3	190.5	0.238	5.000

HEATING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Block	Ducts
	1	Electric Heat Pump	None	HSPF: 8.2	6.5 kBtu/hr	1	sys#1

COOLING SYSTEM

√	#	System Type	Subtype	Efficiency	Capacity	Air Flow	SHR	Block	Ducts
	1	Central Unit	Split	SEER: 14	8.8 kBtu/hr	360 cfm	0.75	1	sys#1

HOT WATER SYSTEM

√	#	System Type	EF	Cap	Use	SetPnt	Conservation
	1	Electric	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		

DUCTS

√	#	---- Supply ---- Location	R-Value	Area	---- Return ---- Location	R-Value	Area	Leakage Type	Air Handler	CFM 25 Out	Percent Leakage	Qn	RLF	HVAC # Heat	HVAC # Cool
_____	1	Attic	8	100 ft²	Attic	6	25 ft²	Proposed Qn	Main		0.00 %	0.03	0.60	1	1

TEMPERATURES

Programmable Thermostat: Y Ceiling Fans: N

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

Thermostat Schedule: 2014 FL Code

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Cooling (WEH)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Heating (WD)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72
Heating (WED)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [Calculated]

The lower the Energy Performance 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 (1)
5.	Is this a worst case?	No
6.	Conditioned floor area (ft²)	500

7. Windows**	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:		ft²
SHGC:		
Area Weighted Average Overhang Depth:		2.000 ft.
Area Weighted Average SHGC:		0.406

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=0.0	f t ²

9. Wall Types	Insulation	Area
a. Concrete Block – Int Insul. Exterior	R=5.0	405.00 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	Insulation	Area
a. Sup: Main, Ret: Main, AH: Main	R-8, R-6	240 ft²

12. Cooling systems	kBtu/hr	Efficiency
a. Central Unit	20.0	SEER: 13.00
b. Central Unit	18.0	SEER: 13.00

13. Heating systems	kBtu/hr	Efficiency
a. Electric Heat Pump	20.0	HSPF: 7.70
b. Natural Gas Furnace	18.0	AFUE: 0.78

14. Hot water systems	
a. Electric	Cap: 50 gallons EF: 0.9
b. Conservation features None	
15. Credits	Pstat

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 303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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

ADDRESS: 123 Main Street PERMIT #:
Orlando, FL, 32922

MANDATORY REQUIREMENTS - See individual code sections for full details.

- **401.3 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 Statues] 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 compliance for the building. A copy of the EPL display card can be found in Appendix C.
- **R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.1 through R402.4.4.
  - **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 402.4.1.1, 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 of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official,* testing shall be conducted by 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.
  - **R402.4.2 Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.
  - **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.
  - **R402.4.4 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 E 283 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.

    Exception: Site-built windows, skylights and doors.
- **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.
- **R403.2.2 Sealing (Mandatory).** All ducts, air handlers, and filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts and plenum chambers, shall be constructed and sealed in accordance with Section C403.2.7.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria by post-construction or rough-in testing below.

  Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*, to be "substantially leak free" by either of the following:

  1. Post-construction test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
  2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

     Exceptions:

     1. The total leakage test is not required for ducts and air handlers located entirely within the building envelope.
     2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

MANDATORY REQUIREMENTS - (Continued)

- **R403.2.2.1 Sealed air handler.** Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

☐ **R403.2.3 Building Cavities (Mandatory).** Building framing cavities shall not be used as ducts or plenums.

☐ **R403.3 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.,

- **R403.3.1 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.

☐ **R403.4.1 Circulating hot water systems (Mandatory).** Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot-water circulating pump when the system is not in use.

☐ **R403.4.3 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.

☐ **R403.4.4 Water heater efficiencies (Mandatory).** Water heater efficiencies

- **R403.4.4.1 Storage water heater temperature controls**
  - **R403.4.4.1.1 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).
  - **R403.4.4.1.2 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.
- **R403.4.4.2 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 met the criteria Section R403.4.4.2.1.
  - **R403.4.4.2.1 Solar water heating system.** 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.

☐ **R403.5 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. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- **R403.5.1 Whole-house mechanical ventilation system fan efficacy.** Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.5.1.

  Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.
- **R403.5.2 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, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications.
  2. No ventilation or air-conditioned system make air shall be provided to conditioned space from attics, crawlspaces, attached closed garages or outdoor spaces adjacent to swimming pools or spas.
  3. If ventilation air is drawn from enclosed spaces(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 or R-19, space permitting, or R-10 otherwise.

☐ **R403.6 Heating and cooling equipment (Mandatory).** The following sections are mandatory for cooling and heating equipment.

- **R403.6.1 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 which affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.
- **R403.6.1.1 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 403.6, 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.

MANDATORY REQUIREMENTS - (Continued)

- **R403.6.1.1 Cooling equipment capacity. (continued)** The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacture's expanded performance data shall be used to select cooling-only equipment. This selection 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 temperature 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 multi-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 multi-family units, the capacity of equipment may be sized in accordance with good design practice.

- **R403.6.1.2 Heating equipment capacity**
  - **R403.6.1.2.1 Heat pumps.** Heat pumps sizing shall be based on the cooling requirements as calculated according to Section R403.6.1.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load.
  - **R403.6.1.2.2 Electric resistance furnaces.** Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.6.1.
  - **R403.6.1.2.3 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 R403.6.1.

- **R403.6.1.3 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.

☐ **R403.7 Systems serving multiple dwelling units (Mandatory).** Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the Commercial Provisions in lieu of Section R403.

☐ **R403.8 Snow melt 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 55°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

☐ **R403.9 Swimming pools, inground spas and portable spas (Mandatory).** The energy requirements for residential pools and inground spas shall be as specified in Sections R403.9.1 through R403.9.3 and in accordance with ANSI/APSP-15. The energy requirements for portable spas shall be in accordance with ANSI/APSP-14.

- **R403.9.1 Pool and spa heaters.** All pool heaters shall be equipped with a readily accessible on-off switch that is mounted outside the heater to allow shutting off the heater without adjusting the thermostat setting.
  - **R403.9.1.1 Gas and oil-fired pool and spa heaters.** All gas- and oil-fired pool and space heaters shall have a minimum 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 gas or LP gas shall not have continuously burning pilot lights.
  - **R403.9.1.2 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.

- **R403.9.2 Time switches.** Time switches or other control method that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on all heaters and pumps. Heaters, pumps and motors that have built in timers shall be deemed in compliance with this equipment.
  - **Exceptions:**
    1. Where public health standards require 24-hour pump operations.
    2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.
    3. Where pumps are powered exclusively from on-site renewable generation.

- **R403.9.3 Covers.** Heated swimming pools and inground permanently installed 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:** Outdoor pools deriving over 70 percent of the energy for heating from site-recovered energy, such as a heat pump or solar energy source computed over an operating season.

☐ **RR404.1 Lighting equipment (Mandatory).** A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of permanently installed lighting fixtures shall contain only high efficacy lamps.

Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.

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

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	CRITERIA	CHECK
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous 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.	
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top or exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.	
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	
Rim joists	Rim joists are insulated and include an air barrier.	
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	
Shafts, penetrations	Duct shafts, utility penetrations, and flue shaft openings 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 spaces.	
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 air tight, IC rated, and sealed to the drywall.	
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	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating 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 sub-floor or drywall.	
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.	

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report

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

Envelope Leakage Test Results

Regression Data:

C:_____ n:_____ R:_____

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

CFM (50): _____

ELA: _____

EqLA: _____

ACH: _____

ACH (50): _____

SLA: _____

402.4.1.2 Testing option. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climates Zones 1 and 3, 3 air changes per hour in Climates Zones 3 through 8. Testing shall be conducted with a blower door at a pressure or 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the parting 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 openings 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 402.4.1.2.

Signature: _____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Where required by the code official, testing shall be conducted by 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: _____

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Form 405 Duct Leakage Test Report

Performance Method

Project Name: Sample Addition	Builder: Builder
Street: 123 Main Street	Permit Office:
City, State, Zip: Orlando, FL, 32922	Permit Number:
Design Location: FL, Orlando	Jurisdiction:
	Duct Test Time: [Rough in or Post Construction]

Duct Leakage Test Results

CFM25 Air Distribution System Leakage Test Values		
Line	System	Total Duct Leakage
1	System 1	_____cfm25(Total)
2	System 2	_____cfm25(Total)
3	System 3	_____cfm25(Total)
4	System 4	_____cfm25(Total)
5	**Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____**(Q_n Total)** To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed Qn Total must be less than or equal to 0.03.

I hereby certify that the above duct testing performance results demonstrate compliance with the Florida Energy Code requirements in accordance with Section 403.2.2.

Signature:_____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, Florida Statutes, or as authorized by Florida Statutes, to be "substantially leak free."

BUILDING OFFICIAL: _____

DATE: _____

RESIDENTIAL ENERGY CONSERVATION CODE DOCUMENTATION CHECKLIST

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

Applications for compliance with the 2014 Florida Building Code, Energy Conservation via the residential Simulated Performance Method shall include:

- ☐ This checklist
- ☐ A Form 405 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 (1 page) and an input summary checklist that can be used for field verification (usually 4 pages/may be greater)
- ☐ Energy Performance Level (EPL) Display Card (one page)
- ☐ Mandatory Requirements (three pages)

Required prior to CO for the Performance Method:

- ☐ Air Barrier and Insulation Inspection Component Criteria checklist (Table 402.4.1.1 - one page)
- ☐ A completed Envelope Leakage Test Report (usually one page)
- ☐ If Form 405 indicates anything other than default duct leakage, then a completed Form 405 Duct Leakage Test Report (usually one page)

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:	
City, State, Zip:	Orlando , FL , 32922-	Permit Number:	
Owner:	OWNER	Jurisdiction:	
Design Location:	FL, Orlando		

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 (416.0 sq. ft.)	Description		Area	
a. U-Factor:	Dbl, U=0.35		276.00 ft²	
SHGC:	SHGC=0.25			
b. U-Factor:	Dbl, U=0.35		40.00 ft²	
SHGC:	SHGC=0.25			
c. U-Factor:	Dbl, U=0.35		40.00 ft²	
SHGC:	SHGC=0.25			
d. U-Factor:	other (see details)		60.00 ft²	
SHGC:	other (see details)			
Area Weighted Average Overhang Depth:			2.000 ft.	
Area Weighted Average SHGC:			0.25	
8. Floor Types (2400.0 sq. ft.)		Insulation	Area	
a. Slab-On-Grade Edge Insulation		R=0.0	1200.00 ft²	
b. Interior Floor		R=0.0	1200.00 ft²	
c. N/A		R=	ft²	

9. Wall Types (2350.0 sq. ft.)	Insulation	Area	
a. Frame - Wood, Exterior	R=13.0	1230.00 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 sq. ft.)	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		8	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: 0.82	
14. Hot water systems			
a. Electric		Cap: 50 gallons	
		EF: 0.97	
b. Conservation features			
None			
15. Credits		Pstat	

Glass/Floor Area: 0.173

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 403.2.2.1.1.**
- **Compliance requires an envelope leakage test report, by a Florida Class 1 Rater, in accordance with Table B-1.1.2.**
- **Compliance requires a roof absorptance test and a roof emittance test in accordance with 405.6.2**
- **Compliance requires an air distribution system test report, by a Florida Class 1 Rater, confirming system leakage to outdoors tested at 25 pascals pressure difference in accordance with 403.2.2.1. is not greater than (36 cfm:Duct#1) (36 cfm:Duct#2)**

PROJECT

Title:	Single family home	Bedrooms:	6	Address Type:	Street Address
Building Type:	FLProp2014	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:		Cross Ventilation:	No	County:	Orange
Jurisdiction:		Whole House Fan:	No	City, State, Zip:	Orlando , FL , 32922-
Family Type:	Single-family				
New/Existing:	New (From Plans)				
Comment:	High Performance Florida Home				

CLIMATE

√	Design Location	TMY Site	IECC 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	75	70	526	44	Medium

BLOCKS

Number	Name	Area	Volume
1	Zone1	1200	9600
2	Zone2	1200	9600

SPACES

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

FLOORS

√	#	Floor Type	Room	Perimeter	Perimeter R-Value	Area	Joist R-Value	Tile	Wood	Carpet
	1	Slab-On-Grade Edge Insulatio	Main	140 ft	0	1 ft²	----	0.2	0	0.8
	2	Interior Floor	2nd Floor	----	----	1 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	150	1200 ft²	N	N

CEILING

√	#	Ceiling Type	Space	R-Value	Area	Framing Frac	Truss Type
	1	Under Attic (Vented)	2nd Floor	30	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 ft²	0	0	0.5	0
	2	E	Exterior	Concrete Block - Int Insul	Main	6	30		8		240 ft²	0	0	0.5	0
	3	S	Exterior	Concrete Block - Int Insul	Main	6	40		8		320 ft²	0	0	0.5	0
	4	W	Exterior	Concrete Block - Int Insul	Main	6	8		8		64 ft²	0	0	0.5	0
	5	W	Garage	Frame - Wood	Main	13	22		8		176 ft²	0	0	0.01	0
	6	N	Exterior	Frame - Wood	2nd Floor	13	40		9		360 ft²	0	0.23	0.5	0
	7	E	Exterior	Frame - Wood	2nd Floor	13	30		9		270 ft²	0	0.23	0.5	0
	8	S	Exterior	Frame - Wood	2nd Floor	13	40		9		360 ft²	0	0.23	0.5	0
	9	W	Exterior	Frame - Wood	2nd Floor	13	30		8		240 ft²	0	0.23	0.5	0

DOORS

√	#	Ornt	Door Type	Space	Storms	U-Value	Width Ft	Width In	Height Ft	Height In	Area
	1	N	Insulated	Main	None	0.2	3		6	8	20 ft²
	2	S	Insulated	Main	None	0.2	3		6	8	20 ft²

WINDOWS

Orientation shown is the entered, Proposed orientation.

√	#	Ornt	Frame	Panes	Impact	NFRC	U-Factor	SHGC	Storms	Area	Overhang Depth	Overhang Separation	Int Shade	Screening
	1	N	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	48 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	2	N	None	Glazed Block	N	No	0.35	0.25	N	24 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	3	E	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	24 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	4	E	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	24 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	5	S	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	36 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	6	S	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	40 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	7	W	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	16 ft²	2 ft 0 in	10 ft 4 in	HERS 2006	None
	8	N	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	36 ft²	2 ft 0 in	1 ft 4 in	HERS 2006	None
	9	E	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	48 ft²	2 ft 0 in	1 ft 4 in	HERS 2006	None
	10	S	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	48 ft²	2 ft 0 in	1 ft 4 in	HERS 2006	None
	11	S	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	48 ft²	2 ft 0 in	1 ft 4 in	HERS 2006	None
	12	W	Vinyl	Low-E Double	N	Yes	0.35	0.25	N	24 ft²	2 ft 0 in	1 ft 4 in	HERS 2006	None

GARAGE

√	#	Floor Area	Ceiling Area	Exposed Wall Perimeter	Avg. Wall Height	Exposed Wall Insulation
	1	384 ft²	384 ft²	64 ft.	8 ft.	13

INFILTRATION

#	Scope	Method	SLA	CFM 50	ELA	EqLA	ACH	ACH 50
1	BySpaces	Proposed ACH(50)	0.000360	1845	101.3	190.5	0.238	5.000

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: 0.83	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	EF	Cap	Use	SetPnt	Conservation
	1	Electric	0.97	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	R-Value	Area	Leakage Type	Air Handler	CFM 25	Percent Leakage	Qn	RLF	HVAC # Heat	HVAC # Cool
	1	Main	6	240 ft²	Main	6	60 ft²	Proposed Qn	Main	30.0 cfm	6.00 %	0.03	0.50	1	1
	2	Attic	8	240 ft²	Attic	6	60 ft²	Proposed Qn	2nd Floor	30.0 cfm	6.67 %	0.03	0.50	2	2

TEMPERATURES

Programmable Thermostat: Y Ceiling Fans: N

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

Thermostat Schedule: 2014 FL Code

Schedule Type		Hours 1	2	3	4	5	6	7	8	9	10	11	12
Cooling (WD)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Cooling (WEH)	AM	75	75	75	75	75	75	75	75	75	75	75	75
	PM	75	75	75	75	75	75	75	75	75	75	75	75
Heating (WD)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72
Heating (WED)	AM	72	72	72	72	72	72	72	72	72	72	72	72
	PM	72	72	72	72	72	72	72	72	72	72	72	72

ENERGY PERFORMANCE LEVEL (EPL) DISPLAY CARD

ESTIMATED ENERGY PERFORMANCE INDEX* = XX [Calculated]

The lower the Energy Performance 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	276.00 ft²
SHGC:	SHGC=0.25	
b. U-Factor:	Dbl, U=0.35	40.00 ft²
SHGC :	SHGC=0.25	
c. U-Factor:	Dbl, U=0.35	40.00 ft²
SHGC :	SHGC=0.25	
d. U-Factor: other (see details)		60.00 ft²
SHGC : other (see details)		
Area Weighted Average Overhang Depth:		2.000 ft.
Area Weighted Average SHGC:		0.406

8. Floor Types	Insulation	Area
a. Slab-On-Grade Edge Insulation		1200.00 ft²
b. Floor Over Other Space	R=0.0	1200.00 ft²
c. N/A R=		f t ²

9. Wall Types
   a. Frame - Wood, Exterior — Insulation R=13.0 1230.00 ft² R=5.0 944.00 ft²
   b. Concrete Block - Int Insul, Exterior — R=13.0 176.00 ft²
   c. Frame - Wood, Adjacent — R= f t ²
   d. N/A — Insulation Area R=30.0 1200.00 ft²

10. Ceiling Types — R= f t ²
   a. Under Attic (Vented) — R = f t ²
   b. N/A
   c. N/A

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

12. Cooling systems	k B t u / h r	Efficiency
a. Central Unit	20.0	SEER:14.00
b. Central Unit	18.0	SEER:14.00

13. Heating systems	k B t u / h r	Efficiency
a. Electric Heat Pump	20.0	HSPF:8.20
b. Natural Gas Furnace	18.0	AFUE:0.83

14. Hot water systems
   a. Electric — Cap: 50 gallons EF: 0.9
   b. Conservation features — Pstat
      None

15. Credits

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 303.1.3 of the Florida Building Code, Energy Conservation, if not DEFAULT.

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

ADDRESS: 123 Main Street PERMIT #:
Orlando, FL, 32922

MANDATORY REQUIREMENTS - See individual code sections for full details.

- **401.3 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 Statues] 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 compliance for the building. A copy of the EPL display card can be found in Appendix C.
- **R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.1 through R402.4.4.
  - **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 402.4.1.1, 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 of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official,* testing shall be conducted by 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.
  - **R402.4.2 Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.
  - **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.
  - **R402.4.4 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 E 283 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.

    Exception: Site-built windows, skylights and doors.
- **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.
- **R403.2.2 Sealing (Mandatory).** All ducts, air handlers, and filter boxes and building cavities that form the primary air containment passageways for air distribution systems shall be considered ducts and plenum chambers, shall be constructed and sealed in accordance with Section C403.2.7.2 of the Commercial Provisions of this code and shall be shown to meet duct tightness criteria by post-construction or rough-in testing below.

  Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, *Florida Statutes*, or as authorized by *Florida Statutes*, to be "substantially leak free" by either of the following:

  1. Post-construction test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
  2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

     Exceptions:

     1. The total leakage test is not required for ducts and air handlers located entirely within the building envelope.
     2. Duct testing is not mandatory for buildings complying by Section 405 of this code.

MANDATORY REQUIREMENTS - (Continued)

- **R403.2.2.1 Sealed air handler.** Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

☐ **R403.2.3 Building Cavities (Mandatory).** Building framing cavities shall not be used as ducts or plenums.

☐ **R403.3 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.,

- **R403.3.1 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.

☐ **R403.4.1 Circulating hot water systems (Mandatory).** Circulating hot water systems shall be provided with an automatic or readily accessible manual switch that can turn off the hot-water circulating pump when the system is not in use.

☐ **R403.4.3 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.

☐ **R403.4.4 Water heater efficiencies (Mandatory).** Water heater efficiencies

- **R403.4.4.1 Storage water heater temperature controls**
  - **R403.4.4.1.1 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).
  - **R403.4.4.1.2 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.
- **R403.4.4.2 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 met the criteria Section R403.4.4.2.1.
  - **R403.4.4.2.1 Solar water heating system.** 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.

☐ **R403.5 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. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- **R403.5.1 Whole-house mechanical ventilation system fan efficacy.** Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.5.1.

  Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.
- **R403.5.2 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, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications.
  2. No ventilation or air-conditioned system make air shall be provided to conditioned space from attics, crawlspaces, attached closed garages or outdoor spaces adjacent to swimming pools or spas.
  3. If ventilation air is drawn from enclosed spaces(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 or R-19, space permitting, or R-10 otherwise.

☐ **R403.6 Heating and cooling equipment (Mandatory).** The following sections are mandatory for cooling and heating equipment.

- **R403.6.1 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 which affect equipment sizing. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.
- **R403.6.1.1 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 403.6, 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.

MANDATORY REQUIREMENTS - (Continued)

- **R403.6.1.1 Cooling equipment capacity. (continued)** The published value for AHRI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacture's expanded performance data shall be used to select cooling-only equipment. This selection 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 temperature 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 multi-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 multi-family units, the capacity of equipment may be sized in accordance with good design practice.

- **R403.6.1.2 Heating equipment capacity**

  - **R403.6.1.2.1 Heat pumps.** Heat pumps sizing shall be based on the cooling requirements as calculated according to Section R403.6.1.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load.
  - **R403.6.1.2.2 Electric resistance furnaces.** Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section R403.6.1.
  - **R403.6.1.2.3 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 R403.6.1.

- **R403.6.1.3 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.

☐ **R403.7 Systems serving multiple dwelling units (Mandatory).** Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the Commercial Provisions in lieu of Section R403.

☐ **R403.8 Snow melt 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 55°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

☐ **R403.9 Swimming pools, inground spas and portable spas (Mandatory).** The energy requirements for residential pools and inground spas shall be as specified in Sections R403.9.1 through R403.9.3 and in accordance with ANSI/APSP-15. The energy requirements for portable spas shall be in accordance with ANSI/APSP-14.

- **R403.9.1 Pool and spa heaters.** All pool heaters shall be equipped with a readily accessible on-off switch that is mounted outside the heater to allow shutting off the heater without adjusting the thermostat setting.

  - **R403.9.1.1 Gas and oil-fired pool and spa heaters.** All gas- and oil-fired pool and space heaters shall have a minimum 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 gas or LP gas shall not have continuously burning pilot lights.
  - **R403.9.1.2 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.

- **R403.9.2 Time switches.** Time switches or other control method that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on all heaters and pumps. Heaters, pumps and motors that have built in timers shall be deemed in compliance with this equipment.

  - **Exceptions:**

    1. Where public health standards require 24-hour pump operations.
    2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.
    3. Where pumps are powered exclusively from on-site renewable generation.

- **R403.9.3 Covers.** Heated swimming pools and inground permanently installed 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:** Outdoor pools deriving over 70 percent of the energy for heating from site-recovered energy, such as a heat pump or solar energy source computed over an operating season.

☐ **RR404.1 Lighting equipment (Mandatory).** A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of permanently installed lighting fixtures shall contain only high efficacy lamps.

Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.

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

TABLE 402.4.1.1

AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

Project Name:	Sample Addition	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	CRITERIA	CHECK
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous 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.	
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top or exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.	
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	
Rim joists	Rim joists are insulated and include an air barrier.	
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	
Shafts, penetrations	Duct shafts, utility penetrations, and flue shaft openings 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 spaces.	
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 air tight, IC rated, and sealed to the drywall.	
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	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating 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 sub-floor or drywall.	
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.	

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Envelope Leakage Test Report

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

Envelope Leakage Test Results

Regression Data:

C:_____ n:_____ R:_____

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

CFM (50): _____

ELA: _____

EqLA: _____

ACH: _____

ACH (50): _____

SLA: _____

402.4.1.2 Testing option. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climates Zones 1 and 3, 3 air changes per hour in Climates Zones 3 through 8. Testing shall be conducted with a blower door at a pressure or 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the parting 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 openings 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 402.4.1.2.

Signature: _____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Where required by the code official, testing shall be conducted by 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: _____

FLORIDA ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

Form 405 Duct Leakage Test Report

Performance Method

Project Name: Sample Addition	Builder: Builder
Street: 123 Main Street	Permit Office:
City, State, Zip: Orlando, FL, 32922	Permit Number:
Design Location: FL, Orlando	Jurisdiction:
	Duct Test Time: [Rough in or Post Construction]

Duct Leakage Test Results

CFM25 Air Distribution System Leakage Test Values		
Line	System	Total Duct Leakage
1	System 1	_____cfm25(Total)
2	System 2	_____cfm25(Total)
3	System 3	_____cfm25(Total)
4	System 4	_____cfm25(Total)
5	**Total House Duct System Leakage**	Sum lines 1-4 _____ Divide by _____ (Total Conditioned Floor Area) = _____**(Q_n Total)** To qualify as "substantially leak free" Qn Total must be less than or equal to 0.04 if air handler unit is installed. If air handler unit is not installed Qn Total must be less than or equal to 0.03.

I hereby certify that the above duct testing performance results demonstrate compliance with the Florida Energy Code requirements in accordance with Section 403.2.2.

Signature:_____

Printed Name: _____

Florida Rater Certification #: _____

Date: _____

Duct tightness shall be verified by testing to Section 803 of the RESNET Standards by either an energy rater certified in accordance with Section 553.99, Florida Statutes, or as authorized by Florida Statutes, to be "substantially leak free."

BUILDING OFFICIAL: _____

DATE: _____

APPENDIX C
Commercial and High-Rise Residential
Minimum Required Content and Format

In accordance with Section C407.4.1 of the 2014 Florida Building Code, Energy Conservation, the printout from computer programs approved by the Florida Building Commission for use as Commercial Energy Code compliance for commercial and high-rise residential applications shall contain all information required to determine Energy Code compliance for said buildings, to include but not be limited to the following information. Compliance software program printout Forms should be consistent with the format described below should contain, but not be limited to, the following information and be consistent with the format described below.

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

- Form Title and Headings:
  - Florida Building Code, Energy Conservation and other suitable clarifying titles

- Project Information Box
  - Project Name
  - Street Address/city/state/zip
  - Type of Building (occupancy)
  - Class of Building (new, renovation, etc.)
  - Conditioned Floor Area
  - Number of Stories
  - Owner
  - Design Location
  - Builder Name
  - Permit Office/Jurisdiction
  - Permit Number

C.2 Output Data

- Climate Zone

The software output data depends on the compliance method. Apart from the common output s three options are summarized to choose depending on the compliance method:

- Building End Uses: Proposed Design vs. Standard Reference Design (Performance Method only)
  - Electricity
  - Natural Gas
  - Area Lights
  - Space Cooling
  - Space Heating
  - Vent Fans
  - Miscellaneous Equipment

- Pumps & Miscellaneous

- Envelope Prescriptive Compliance: Proposed Design vs. Standard Reference Design Pass or Fail for each building envelope elements categorized by zone or space (Prescriptive Method only)
  - Building Envelope Element (Proposed Design, Required/Criteria, Pass or Fail Results)
    - Windows (SHGC, U-Factor, EPF)
    - Window-Wall-Ratio (WWR)
    - Exterior Walls (U-Factor, or R-Value)
    - Floors (U-Factor, or F-Factor)
    - Below Grade Walls (U-Factor, or C-Factor)

- Envelope Trade-Off Option Compliance: Proposed Design vs. Standard Reference Design Envelope Performance Factor (EPF) for each building envelope elements (Envelope Trade-Off Option Method only)
  - Building Envelope Element : EPF (Proposed Design, Required/Criteria, Pass or Fail Results)
    - Roof (EPF)
    - Skylight (EPF)
    - Exterior Walls and Windows (EPF)
    - Below Grade Walls (EPF)
    - Floors (EPF)
    - Slabs (EPF)
    - Daylight Potential (EPF)
    - Total (EPF)

The following are common to the three compliance methods

- External lighting compliance
- Lighting controls compliance
- System report compliance
- Plant compliance
- Water Heater Compliance
- Piping system Compliance
- Other Required Compliance Requirements

C.3 Compliance Summary

- Whether the building Passes or Fails Energy Code compliance
- The summary depends on the compliance method. Three options are provide depending on the compliance method:
  - Gross Energy Cost (in dollars): Performance Methods only
  - Envelope Prescriptive Compliance (Pass or Fail): Prescriptive Methods only
  - Envelope Performance Factor (EPF): Building Envelope Trade-Off Option Method only

The following are common to the three compliance methods

- Lighting Controls
- External Lighting
- HVAC System
- Plant
- Water Heating System
- Piping Systems
- Inspection Checklist

- Any conservation credits provided in the calculation per Section C407.5.2.4 of the Florida Energy Code.

- 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:_____
  - Where Florida law requires a design to be performed by a registered design professional, said design professional shall certify compliance of building by signing and providing their registration number:
    - Architect:_____ Registration No.:_____
    - Electrical Designer:_____ Registration No:_____
    - Lighting Designer:_____ Registration No:_____
    - Mechanical Designer:_____ Registration No:_____
    - Plumbing Designer:_____ Registration No:_____
  - 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 Energy Code. 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

C.4 Input data

Description of the building; data to be consistent with the plans may include, but not be limited to:

- Project Information
  - Zones
  - Spaces
  - Lighting
  - Walls
  - Windows
  - Doors
  - Roofs
  - Skylights
  - Floors
  - Systems
  - Plant
  - Water heaters
  - Exterior lighting
  - Piping
  - Fenestration used
  - Materials used
  - Constructs used

C.5 Energy Code Compliance Checklist

- Form name, compliance method
- Address and permit number of building permitted
- Other prescriptive measures checklist by component, Energy Code section and summary of requirement(s)

C.6 Other forms that may be required by the Florida Building Commission.