

OHIO COMMERCIAL ENERGY CODE COMPLIANCE METHODS (July 2019)

The Ohio Board of Building Standards recognizes that a number of methods and compliance tools have been developed to aid in determining energy code compliance for commercial (non-residential) buildings. Chapter 13, Section 1301.1.1 of the 2017 Ohio Building Code allows the use of either the 2012 International Energy Conservation Code (IECC) or the 2010 ASHRAE 90.1 to demonstrate compliance. Although not equivalent energy efficiency standards, the Board allows either standard to be used as long as there is no mixing and matching of provisions from each standard. Pick a standard and use that standard for the entire project.

Low-rise (≤ 3 story) buildings of Groups R-2, R-3, and R-4 occupancies are considered to be residential occupancies for the purpose of applying energy conservation standards. These buildings are outside the scope of the ASHRAE 90.1 standard, but within the scope of the residential chapters of the IECC. Therefore, the IECC is the only standard that can be used for low-rise residential buildings.

Note that the 2017 OBC Chapter 13 Section 1301.1.1 offers an exception for specific low-rise Group R-3 occupancies that currently allows the use of the 2019 RCO Sections 1101.2.2 through 1104 to demonstrate compliance. This exception was adopted when the 2013 RCO was still in effect. As a result, effective July 2019 when the 2019 RCO was adopted, these code sections are no longer accurate. The intent of this exception is to allow all methods except the OHBA prescriptive compliance option. The Board is in the process of amending the exception to allow all RCO methods, including the OHBA option as long as certain minimum equipment efficiency requirements have been met. Until the rule is adopted, the OHBA option is not permitted for Group R-3 occupancies.

Within each energy efficiency standard, there are multiple compliance methods. A flow chart that illustrates and outlines the many compliance methods is available on the Board's website. The following discussion describes the methods and compliance tools that are acceptable ways of demonstrating compliance with Chapter 13 of the 2017 Ohio Building Code (OBC):

Prescriptive Methods: These methods are, by far, the simplest and fastest method of demonstrating code compliance. However, they are also generally quite conservative, has several limitations and restrictions for its use, and sometimes, are not the most economical.

The user simply follows the predefined requirements listed in a table, or group of tables and the mandatory requirements specified in the code text. The table(s) lists the required R-values for fenestration (U-factor), skylights (U-factor), ceilings, walls, floors, basement walls, slabs, and crawl space walls, based on climate zones.

For low-rise Group R-2, R-3, and R-4 residential occupancies, Sections R402.1 through R402.5 of the 2012 International Energy Conservation Code (IECC) offer simplified predefined prescriptive envelope requirements that can be used to demonstrate compliance. For all other occupancies, Sections C402-C405 of the 2012 IECC and Sections 5.5 and Chapters 6-10 of the ASHRAE 90.1-2010 offer predefined prescriptive requirements for the envelope, mechanical, and lighting/electrical systems.

To demonstrate code compliance using the predefined prescriptive methods, one would simply identify on the construction documents which prescriptive method was selected and ensure that sections and elevations are provided that adequately illustrate and identify the climate zone; the glazing areas; insulation R-values, dimensions, and thicknesses; and equipment efficiencies that correspond to the requirements shown in the code. Additionally, the mandatory requirements must be identified on the

construction documents based upon the prescriptive method used to demonstrate compliance. The construction documents must then be submitted to the building department for approval.

Trade-off Method: This method is a very popular method of demonstrating energy code compliance. It is a bit more involved but less restrictive than the prescriptive method.

This method of compliance allows for limited building envelope component trade-offs. In other words, the user is permitted to reduce energy efficiencies of certain building envelope components as long as the efficiencies of other building envelope components are increased to compensate for the reductions. The idea is that the overall total building envelope UA as calculated, using a method consistent with the ASHRAE Handbook of Fundamentals, is less than or equal to the total UA as calculated by using the U-factors from the 2012 IECC Tables or the ASHRAE 90.1-2010 Tables and multiplying them by the corresponding areas of the components. This trade-off method, called the Total UA alternative and described in Section R402.1.4 of the 2012 IECC, can be used for low-rise Group R-2, R-3, and R-4 residential occupancies. Again, note that Chapter 13 of the OBC offers an exception for certain low-rise Group R-3 occupancies that allows the use of the trade-off methods found in the 2019 RCO Section 1102.1.5 or the 2018 IECC Section R402.1.5. For all other occupancies, Section 5.6 of the ASHRAE 90.1 allows for trade-offs between building envelope components.

The popular component trade-off software tools, COMcheck and REScheck, are commonly used to demonstrate compliance and are available for free on the website of the U.S. Department of Energy (DOE), Building Energy Codes Program (BECP), at www.energycodes.gov. The COMcheck and REScheck software tools have been developed by the Pacific Northwest National Laboratory (PNNL) for the DOE and performs all required calculations based on user-provided insulation R-values and areas.

Performance Method: This method is the most detailed and time consuming of the compliance methods. However, this method also allows for more flexibility because it evaluates the big picture, it treats the entire building as a system, not just an evaluation of the individual components. It takes into account many more variables that affect energy efficiency such as building and window orientation, shading coefficients, types of mechanical equipment and lighting/power systems and offers credit for renewable energy sources such as solar, fuel cells, thermal energy storage. This method is one of the only method that can be used to show energy compliance when using nontraditional or unusual building design features or components. It works by comparing the proposed building design to that of a known building design of acceptable annual energy usage. The known design is that of a building that was constructed using the prescriptive tables. The proposed building is acceptable if it can be demonstrated that the proposed design is at least as energy efficient as the known design. Section R405 of the 2012 IECC offers a performance method called the Simulated Performance Alternative approach that can be used for low-rise Group R-2, R-3, and R-4 residential occupancies. Again, note that Chapter 13 of the OBC offers an exception for certain low-rise Group R-3 occupancies that allows the use of the 2019 RCO or the 2018 IECC Simulated Performance Alternative approaches found in the 2019 RCO Section 1105 or the 2018 IECC Section 405. Additionally, a new performance method, the ERI method, found in Section 1105 of the 2019 RCO and Section R406 of the 2018 IECC can be used for certain qualifying low-rise Group R-3 occupancy buildings. For all other occupancies, Section C407 of the 2012 IECC offers a Total Building Performance approach and Chapter 11 of the ASHRAE 90.1-2010 offers the Energy Cost Budget Method whole building performance option.

Due to the complexity of the performance method analysis, various software developers, manufacturer's representatives and governmental agencies have developed software packages that may be used to demonstrate compliance. Ekotrope, REM/Rate, DOE-2, and EnergyGauge USA are a few of the

acceptable software packages available on the market to demonstrate compliance using the Simulated Performance Method for residential buildings. For the Total Building Performance Approach (Section C407 of the 2012 IECC) and the Energy Cost Budget Method (Chapter 11 of ASHRAE 90.1-2010), DOE-2, BLAST, EnergyPlus, ESP-r, Energy-10, Trane Trace, and Carrier HAP are a few of the acceptable software packages available on the market to demonstrate compliance.

To demonstrate code compliance using a performance method, one would identify on the construction documents which Performance Alternative approach is being used and identify the developer and the specific edition of the software that is being used to demonstrate compliance. Ensure that sections and elevations are provided that adequately illustrate and identify the climate zone; the fenestration areas and U-values; insulation R-values, dimensions, and thicknesses; equipment and lighting details that correspond to the requirements shown in the code. The construction documents are required to be coordinated and match the inputs entered into the compliance software. The construction documents, a copy of the software input values, and the compliance report are required to be submitted to the building department for approval.

In all cases, when using a software tool, the user must be careful to input into the software the specific edition of the energy code referenced by the OBC (i.e. 2012 edition of the IECC or the 2010 edition of the ASHRAE 90.1). Remember the old cliché...Garbage in =Garbage out! All of these software packages should have the ability to print out data input and compliance reports (which indicate the specific edition of the referenced energy code) that can be submitted to the building department for approval.

The Board of Building Standards staff is available to answer any questions concerning these compliance options. Call (614) 644-2613.

For specific technical questions related to the use and development of the COMcheck and REScheck software tools referenced in this document, we would recommend reading the COMcheck and REScheck Technical Support Documents which are available for download on the www.energycodes.gov website.