OHIO RESIDENTIAL 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 residential buildings. 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 are acceptable ways of demonstrating compliance with Chapter 11 of the 2019 Residential Code of Ohio (RCO):

Prescriptive Methods: These methods are, by far, the simplest and fastest methods of demonstrating code compliance. However, they are also generally quite conservative, have 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. Sections R402.1 through R402.5 of the 2018 International Energy Conservation Code (IECC) offer simplified predefined prescriptive envelope requirements (see IECC Table R402.1.2) that can be used for one-, two-, and three-family dwellings. Similarly, Sections 1101.14 through 1104 of the 2019 RCO Chapter 11 offer predefined prescriptive envelope requirements that can also be used (see RCO Table 1102.1.2). These 2018 IECC-based RCO options have been Ohiomodified. Finally, two other uniquely Ohio prescriptive options are found in the 2019 RCO Chapter 11, Section 1112, the Ohio Home Builders Association (OHBA) Alternative Energy Code Options (see RCO Table 1112.2.1).

To demonstrate code compliance using a predefined prescriptive method, one would 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 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 submitted to the building department for approval.

Trade-off Method: This method may be the most 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 an "Equivalent U-Factor" table and multiplying them by the corresponding areas of the components. This trade-off method, called the Total UA alternative and described in Section R402.1.5 of the 2018 IECC and Section 1102.1.5 of the 2019 RCO, can be used as an alternative to the prescriptive methods for one-, two-, and three family dwellings.

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

To demonstrate code compliance using a trade-off method, one would identify on the construction documents that REScheck or another acceptable software is being used to demonstrate compliance and 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 REScheck (or other) software report, and the compliance certificate are required to be submitted to the building department for approval.

Simulated 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 methods 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.   The 2019 RCO Section 1105 and the 2018 IECC

Section R405 offer a performance method called the Simulated Performance Alternative approach that can be used for one-, two-, and three-family dwellings as an acceptable alternative to the prescriptive or trade-off methods.

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.

To demonstrate code compliance using a performance method, one would identify on the construction documents that the Simulated 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.

Energy Rating Index (ERI) Method: Unlike the Simulated Performance Method which does not allow for HVAC trade-offs, the ERI method is a true performance path which allows tradeoffs for all building components and systems such as HVAC, lighting, domestic appliances, and on-site power production. The ERI sets a target index value that the proposed home must meet, after analysis, based upon climate zone.

Like the Simulated Performance Method, it works by comparing the proposed building design (the rated design) to that of a known building design (the reference design) which uses the 2006 IECC as the reference in the ERI calculation. This is almost identical to the HERS rating index which many energy raters have been familiar with for years. The ERI is a scale from 0-100, with a rated home of zero being equal to a net zero energy use home and a rated home with an ERI of 100 being equal to a reference home meeting the 2006 IECC. The lower the ERI, the more efficient the home.

Also like the Simulated Performance Method, software packages are used to evaluate and calculate the ERI for a home in accordance with a standard referenced in the IECC, the ANSI/RESNET/ICC Standard 301. Ekotrope, REM/Rate, and EnergyGauge are a few of the acceptable software tools available on the market to demonstrate compliance using the ERI Method.

To demonstrate code compliance using the ERI method, one would identify on the construction documents that the ERI method 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. A projected rating report is required to be submitted during the plan review process, then after construction and field testing, a confirmed rating report is required to be submitted to the building department before the certificate of occupancy is issued.

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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 RCO (i.e. 2018 edition of the IECC). 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 REScheck software tool referenced in this document, we would recommend reading the REScheck Technical Support Document which is available for download on the www.energycodes.gov website.