



# TEXAS DEPARTMENT OF LICENSING AND REGULATION

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## Industrialized Housing and Buildings

### Technical Bulletin

#### IHB TB 17-03 – Hot Box Method of Determining the U-Factor of Wall Assemblies with Formed Steel Panels – Commercial Buildings

Applicable Code: 2015 International Energy Conservation Code (IECC) and ASHRAE 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings

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Wall assemblies constructed of interlocking formed metal panels, such as shown in the figures below, with insulation in the cavities and metal sheathing attached to the “open” side, are not recognized in the common wall types of the IECC, ASHRAE 90.1, or the COMcheck energy compliance software most often used to determine the energy compliance of buildings in the modular industry. Buildings that use this type of wall assembly require the use of energy compliance software such as COMcheck to determine compliance with the energy code, and COMcheck requires the use of “Other” as the applicable wall type.



Figure 1

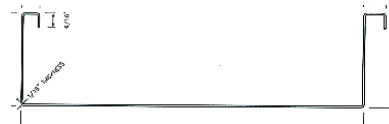


Figure 2

When you select “Other” as the wall type in COMcheck, you must enter the overall U-Factor of the above-grade wall assembly. The U-Factor of the assembly can be determined by testing or calculations in accordance with the 2015 IECC, the ASHRAE *Fundamentals Handbook*, or the appendices of the 2013 ASHRAE 90.1. The method of justification of the U-Factor, whether by testing or calculations, must be included in the approved documents. This bulletin will discuss how to determine the U-Factor of the assembly through testing and the limitations of this method.

Footnote b of Table C402.1.4 of the IECC, “Opaque Thermal Envelope Assembly Maximum Requirements, U-Factor Method,” allows the U-factor of the assembly to be determined through testing in accordance with ASTM C1363 (hot box test method). U-Factors based on the hot box test report can then be entered in the U-Factor field for the “Other” wall assembly type in COMcheck.

The R-value of continuous insulation is also allowed to be added or subtracted from the original tested design in accordance with footnote b of IECC Table C402.1.4. Note that, except for the continuous insulation, the wall assembly must otherwise be constructed exactly as shown in the test report (metal panels, cavity insulation, cavity depth, air gaps, etc.).

For example, assume the ASTM C1363 test (hot box test) is performed on a wall assembly consisting of the following parts (see Figure 1 above):

- Exterior interlocking wall panel of formed metal (see Figure 2 above for example)
- R-13 fiberglass insulation in the cavity
- 1-½” thick continuous foam plastic insulation board (R-value = 9.8) attached to the formed rib/leg of the panel
- Interior metal panel attached through the continuous insulation to the formed rib/leg of the interlocking panel

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Assume that the tested R-value of the assembly is 14.5, making the U-Factor of the assembly 0.069 or  $1/R$ . If your wall assembly matches the test assembly exactly, then you enter the 0.069 U-Factor into the U-Factor field in COMcheck for the “*Other*” wall types.

Based on footnote b, you can also choose to increase or decrease the continuous foam board insulation. In this example, increase the 1-½” thick foam insulation board, with an R-value of 9.8, to 2” thick foam insulation board, with an R-value of 13. The new U-Factor of the wall assembly is calculated as  $1/R$ , where  $R = 14.5 - 9.8 + 13 = 17.7$ . The final U-Factor of the wall assembly =  $1/17.7 = 0.057$ .

**DON'T FORGET THE FOLLOWING WHEN USING THIS METHOD:**

1. Testing of the hot box assembly must be by an IAS accredited testing laboratory and the laboratory must be accredited to perform the test
2. Foam plastic insulation must be separated from the interior of the building by a 15-minute thermal barrier (equivalent to ½” gypsum board) unless there is a listing on the foam board that specifically shows the thermal barrier is not required