Thermal Resistance Values for Compressed Fiberglass Batts

The R-values for compressible fiberglass batts decrease as the batt is compressed. The installation of a batt insulation in a cavity that is partly filled with foam will be less than the full-thickness R-value for the batt. A correlation for R as a function of thickness, full-thickness density, and thickness at which the label value for R is achieved has been published. (Graves and Yarbrough, *J. of Thermal Insulation* 15 248-260 (1992). The correlation that was developed has been used to calculate the thermal resistance of three types of fiberglass batts installed in a cavity partly filled with spray-applied foam with a nominal thermal resistivity (R-per-inch) of 6.0 $ft^2 \cdot h \cdot °F/Btu \cdot in$.

The input parameters for the calculation for R 11, R 13, and R 15 batts were initial densities of 0.6, 0.8, and 1.5 lb_m/ft^3, respectively. The label thickness in all three cases was 3.5 inches. The compressed thicknesses, therefore, were 3.5 minus the thickness of the foam.

The results of this analysis are shown in the following five figures. The first three figures show the total R-value achieved by combinations of foam and fiberglass batt and the R-value contribution of the compressed batt. This calculation is based on compression of a batt insulation designed to deliver the specified R at the thickness 3.5 inches. Figure 1 shows results for a R 11 batt installed with foam in a nominal 2x4 frame-wall cavity. Figures 2 and 3 show similar results for R 13 and R 15 batt insulations.

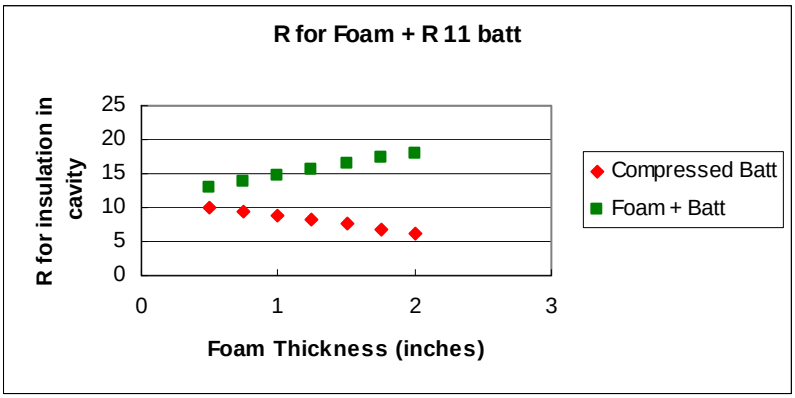

Figure 1. R-Values for R 11 Batt Insulation with Foam

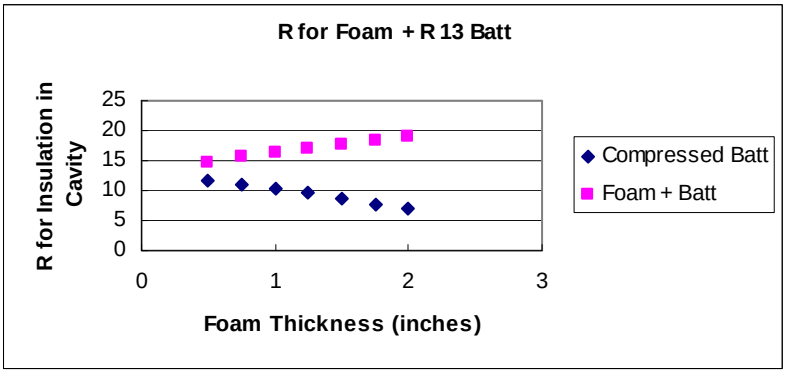

Figure 2. R-Values for R 13 Batt Insulation with Foam

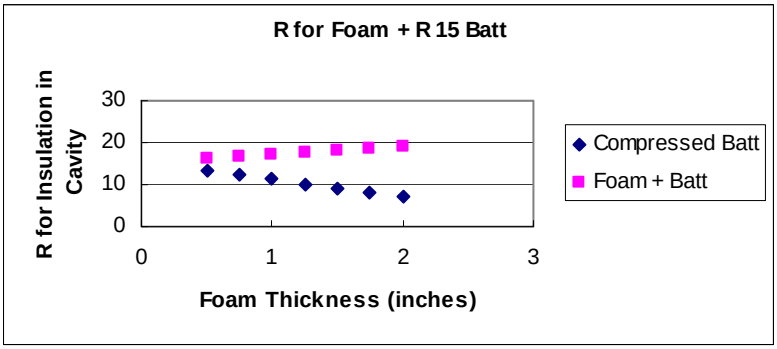

Figure 3. R-Values for R 15 Batt Insulation with Foam

The calculated R-values for the three batt types are compared in Figure 4 as a function of the foam thickness in the 3.5-inch cavity containing foam and fiberglass batt. The data set includes R 11, R 13, and R 15 at foam thickness zero since this is the label value for batt insulation.

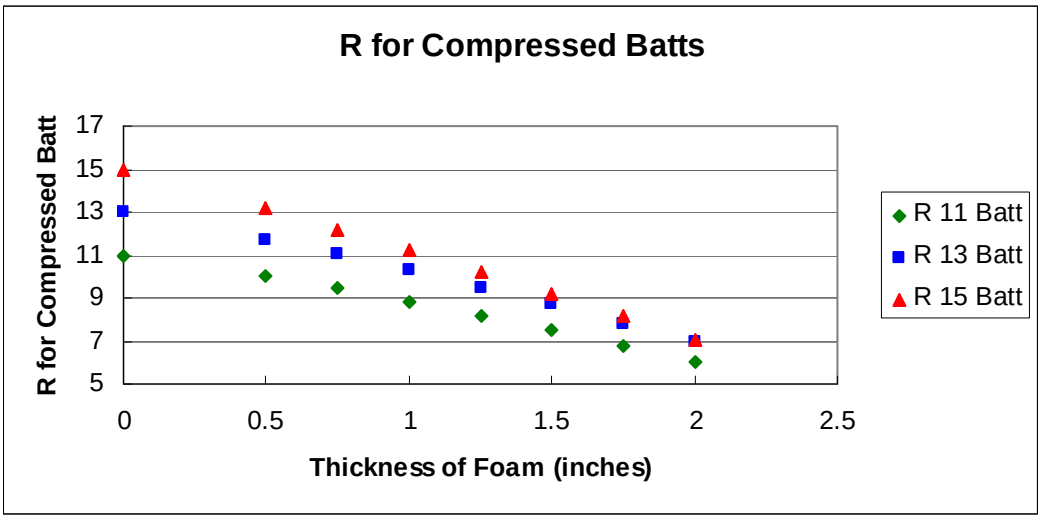

Figure 4. R-Values for Compressed Fiberglass Batts

The calculated R-Values for the composite foam-batt cavity insulation are shown together in Figure 5. The curves tend to converge because the density of the fiberglass is high when the foam thickness passes 1.5 inches and the apparent thermal conductivity and thickness is about the same for all three types of batts.

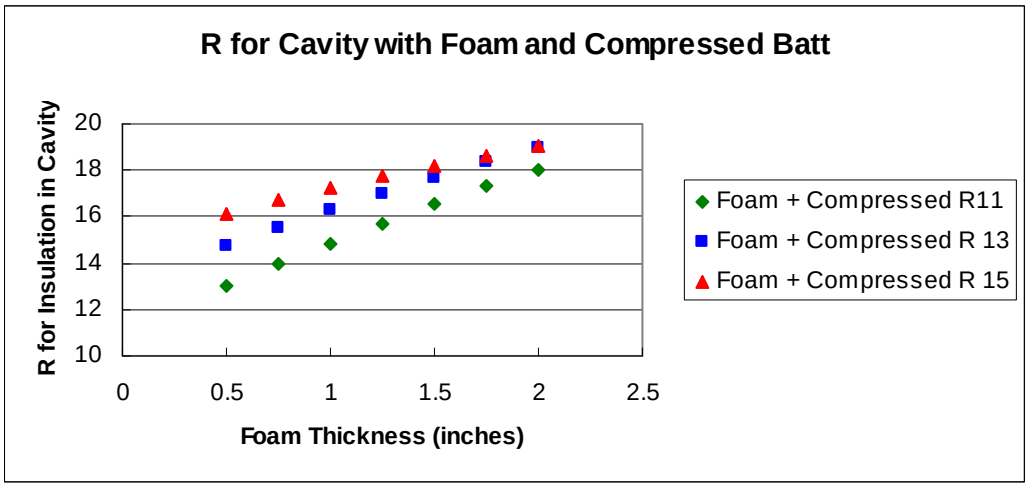

Figure 5. Foam and Three Types of Batts in a Nominal 2x4 Cavity

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March 3, 2008