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Mr. Patrick D. Gredys
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**Thermal Resistance Calculations of Fox Blocks Insulated Concrete Forms
CTLGroup Project No. 312132**

Dear Mr. Gredys:

At your request, CTLGroup has performed calculations to determine the thermal resistance (R-value) of three fully constructed Fox Blocks Insulated Concrete Form (ICF) system walls (www.foxblocks.com) distributed by Airlite Plastics Company. The walls are designated as 4, 6, and 8 in. and are based on the thickness of the concrete core in the ICF.

BLOCK CONFIGURATION AND THERMAL PROPERTIES

Thermal resistance calculations were performed in accordance with procedures in Chapters 25 and 26 in the *ASHRAE Handbook – 2009 Fundamentals* and *ASHRAE Standard 90.1-2007 – Energy Standard for Buildings Except Low-Rise Residential Buildings*. The constructed Fox Blocks ICF wall system is an insulated concrete form system wall with expanded polystyrene insulation panels on either side of a concrete core. The 4, 6, and 8 in. designations refer to the thicknesses of the concrete core. Based on the information provided by you, the insulation panels are flat and are 2-5/8 in. thick on each side of the concrete for all three walls. The nominal density of the expanded polystyrene insulation, provided by you, is 1.5 pcf with a corresponding thermal conductivity of 0.247 Btu.in./hr.ft².°F provided in an Intertek test report dated July 6, 2009. The concrete is assumed to have a thermal conductivity of 16 Btu.in./hr.ft².°F.

The inside surface of the wall is assumed to be finished with ½-in. gypsum wallboard with an R-value of 0.45 hr.ft².°F/Btu. The outside surface is assumed to be finished with 5/16 in. fiber cement board siding, with an R-value of 0.18 hr.ft².°F/Btu.

The Fox Blocks have injection molded plastic ties made from polypropylene (PP) regrind resin.¹ These are used to connect the two insulation panels before concrete placement. These ties penetrate the concrete in a completed wall. The thermal effect of the webs is not included in the calculations because they do not significantly affect results. Previous work at CTLGroup has shown that nonmetallic materials penetrating concrete do not have a measurable affect on the thermal resistance of an insulated concrete wall when they represent a small cross sectional area.

¹ http://www.foxblocks.com/product_info/6_straight.shtml

THERMAL RESISTANCE

Tables 1 presents the calculations of the R-values for the 4, 6, and 8-in. systems.

Table 1 – Calculated Thermal Resistance of Constructed Fox Blocks™ ICF System Walls

Component	Thermal Resistance, hr·ft ² ·°F/Btu		
	4 in.	6 in.	8 in.
Interior air film	0.68	0.68	0.68
Gypsum wallboard, ½ in.	0.45	0.45	0.45
Insulation, two 2-5/8-in. panels	21.26	21.26	21.26
Concrete core, 4, 6, or 8 in.	0.25	0.38	0.50
Fiber cement siding	0.18	0.18	0.18
Exterior air film (15 mph wind)	0.17	0.17	0.17
Total R-value	23.0	23.1	23.2

The total thermal resistance (R-value) of the walls are 23.0, 23.1 and 23.2 hr·ft²·°F/Btu for the 4, 6, and 8 in. assemblies, respectively. The thermal transmittance (U-factor) is the inverse of the total R-value and is equal to 0.043 Btu/hr·ft²·°F for all three assemblies.

If an interior finish with a higher R-value is used, the additional rating of the interior finish above 0.45 may be added to the total R-value of the system. If a siding with a higher R-value is used, the additional rating of the siding above 0.18 may be added to the total R-value of the system.

Please contact me if you have any questions.

Sincerely,



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