Technical Bulletin

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Re: Water uptake of ROCKWOOL™ stone wool insulation in exterior wall applications

Building science fundamentals for water control

Building science fundamentals explains the importance of rain water control for wall assemblies via deflection, drainage and drying[1]. In a wall assembly, the cladding acts as the primary control function against rain water. Assemblies that use exterior insulation are often rainscreen assemblies where the air space behind the cladding act as a drainage layer and promote drying when ventilated appropriately. Furthermore, the use of ROCKWOOL™ stone wool exterior insulation which is vapor permeable will act as supplementary drainage, in combination with appropriate flashing details.

Claims against stone wool insulation

The performance of stone wool insulation products used as exterior insulation is oftentimes a concern among the design community. This is usually based on false pretence from some in the industry that claim vapor permeable stone wool insulation will absorb a large amount of moisture and not dry appropriately. Most of the test methods referenced by the foam plastic industry often require full insulation submersion in water. However, these test methods are not indicative of actual in-situ performance of insulation in a wall system where the insulation should not be installed under submersion, and where only a limited amount water will reach the surface of the insulation.

Importantly, if after installation the insulation is sitting in bulk-water and lacks drainage capability, the insulation should be removed and replaced regardless of the insulation type including foam plastic insulation. In this situation, the problem is usually a design and/or installation failure and not a failure of the intended insulation performance (i.e. as thermal protection). For example, the exterior insulation is installed between z-girts where the girt is installed in a method that promotes the pooling of bulk-water.

Water uptake testing of stone wool insulation

Stone wool insulation is a hydrophobic and non-hygroscopic, vapor and air permeable insulation intended to perform as the thermal control layer within an assembly. During the manufacturing process, stone wool fibres are coated with a water-repellent oil which enhances its capacity to resist water absorption and increases drainage potential. When in a wall assembly, designed and installed in accordance to rain water control fundamentals, over 85% of the rain water that hits the assembly will deflect off the cladding. This includes open-joint cladding assemblies often specified in a rainscreen system. Furthermore, from the limited water that reaches the surface of the insulation, only a thin layer of the insulation gets wetted and has been demonstrated to dry within hours. For more information, refer to Drainage Balance Test and Wall Comparison research study.

[1] Information reference: https://www.buildingscience.com/documents/digests/bsd-013-rain-control-in-buildings.

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As described, full immersion insulation testing, such as ASTM C209, is not an appropriate test method to compare the performance of stone wool insulation. Full immersion, for any duration of time, is simply not a practical or realistic application of stone wool. Although still extreme, testing the insulation water uptake when in contact with water is more suggestive of in-situ performance. With this, a modified ASTM C67 Part 10[2] test was conducted by an independent third-party laboratory[3]. Three 12"x12" (305 mm 305 mm) ROCKWOOL™ stone wool insulation samples were tested: 3" (76 mm) Cavityrock®, 2" (52 mm) Comfortboard™ 80, and 2" (52 mm) Comfortboard™ 110.

The insulation samples were placed in direct surface contact with water for 24hrs. Once the samples were removed from the water, they were held for 5 seconds to allow for the liquid water to run off the surface, and then weighed. A total of 14 samples were tested, approximately 4 for each insulation type. The averaged results for each insulation type are noted in Table 1.

Conclusion

Table 1: Average total water storage of insulation samples after 24hr water uptake test

	Total Measured Water Storage [g/m²]	[lb/ft²]	Storage of Dry Weight [%]
Cavityrock®	187	0.04	3.2
Comfortboard™ 80	252	0.05	3.8
Comfortboard ™ 110	200	0.04	2.0

As noted in the table, the total measured storage was minimal for all insulation types. While this test does not allow for drainage and drying as would occur in-situ, this water would be expected to dry within hours, especially in a rainscreen application. In addition, one of the Cavityrock samples was tested twice. In addition, Figure 1 demonstrates that after 24hrs only the very bottom surface of the sample is wetted with no water distribution within the sample. As this test is in a horizontal application with full surface contact with water, it can confidently be said that in a wall application, stone wool insulation would not see excess water absorption should rainwater reach the surface of the insulation.

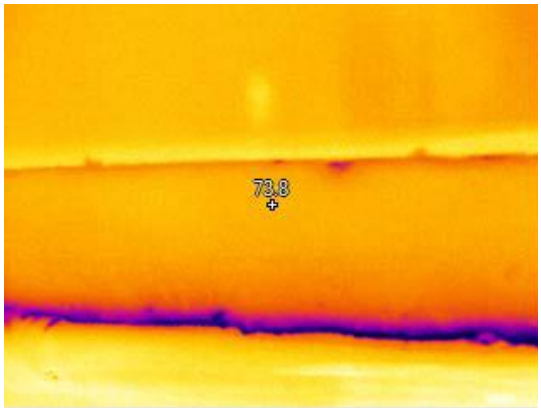

Figure 1: Thermal image of 2" (52 mm) Comfortboard™ 80 sample after 24hr water uptake test

[2] The referenced ASTM C67 method is intended for masonry samples to characterize and compare the water absorption of masonry in continuous surface contact with water and was modified to be used with stone wool insulation.
[3] Testing was conducted by RDH Building Science, formerly Building Science Consulting Inc.

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