Technical Bulletin
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Resistance of ROCKWOOL Stone Wool Insulation to Termites

Construction materials used in North America, and more specifically in tropical and subtropical regions are exposed to severe risk of attack by subterranean termites. The Formosan subterranean termite (Coptotermes formosanus Shiraki) in particular, is a severe pest in this part of the world. Therefore, the ability of building materials, including insulation, to resist termite attack is a critical factor in architectural design and construction decisions.

As per the 2021 International Building Code (IBC) section 2603.8, and similarly to its older versions (2009, 2012, 2015 and 2018), with the exception of a few specific cases, extruded polystyrene (XPS), expanded polystyrene (EPS), polyisocyanurate and other foam plastics cannot be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below grade, and a minimum clearance of 6 inches (152 mm) is required for foam plastics installed above grade and exposed earth, in areas where the probability of termite infestation is "very heavy", as seen in Figure 1.

For these reasons, and in order to validate it as an appropriate solution, the resistance of ROCKWOOL stone wool insulation to Formosan subterranean termites was evaluated in a rigorous laboratory test, in accordance with ASTM D3345-74, "Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites", and the American Wood Protection Association (AWPA) Standard Method E1-09, "Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites".

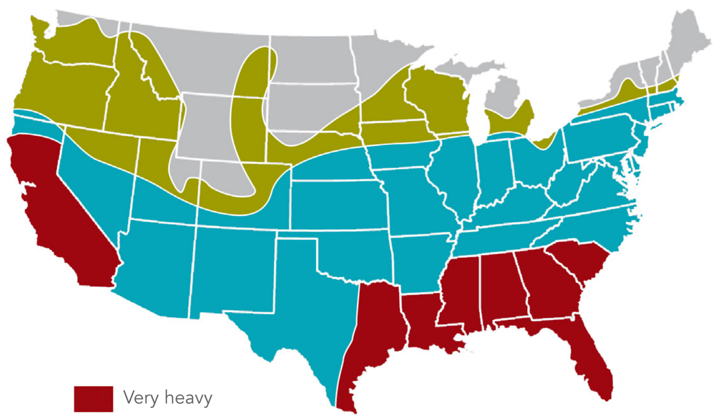

Figure 1: Termite infestion probability map adapted from IBC 2021

Test Method

The test method used in this study consists of a no-choice assay, in which termites are placed in individual jars with a single test wafer, which is then exposed to a group of 400 termites for a period of 28 days. This test is intended to represent severe termite exposure, using freshly collected termites from a field location immediately before the test, then kept in warm and humid conditions, which are optimal for their survival and feeding. No other food source is available to the termites, aside from the single test wafer. This test is designed to replicate real-world conditions as closely as possible and provide insights into the performance of the wafers under extreme termite exposure.

Test Samples

The termite resistance of stone wool insulation was compared to both untreated southern yellow pine and yellow pine treated with Alkaline Copper Quaternary Type D (ACQ-D) to a retention of 0.25 pcf, a standard preservative for wood. The test samples of stone wool insulation were cut to 1.0″ × 1.0″ × ½″ (25.4 mm x 25,4 mm x 12.7 mm) wafers, and both the treated and untreated southern yellow pine samples were cut to 1.0″ × 1.0″ × ¼″ (25.4 mm x 25,4 mm x 6.3 mm) wafers. To obtain their initial dry weights, the samples were dried in an oven at 194 °F (90 °C) for 24 hours and allowed to cool to ambient laboratory temperature in a desiccator for 1 hour before being weighed. Each dried sample was placed on a 1-¼″ ×

1-¼” (31.75 mm x 31.75 mm) square of aluminum foil on the surface of 0.33 lb (150 g) of damp silica sand, which was moistened with 1.01 oz (30 mL) distilled water, inside a screw-top jar.

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The Coptotermes formosanus Shiraki termites were collected from an active field colony at the Waimanalo Experiment Station of the College of Tropical Agriculture and Human Resources in Oahu, Hawaii, USA. 400 termites (360 workers and 40 soldiers, to approximate natural caste proportions in field colonies) were added to each test jar, with 5 replicate jars for each treatment. In addition to the test jars containing termites, the test also included control jars without termites (environmental control wafers). This was done to ensure that any weight changes observed in the wafers were due to termite attack, and not other factors such as moisture absorption or other environmental factors. The jars were then placed in a controlled-temperature cabinet at 80.6 °F (27 °C) for 28 days, as specified in the standard test methodology.

At the end of the 28 days test period, the percentage of termite mortality was recorded, and the wafers were rated visually according to a 0 to 10 scale. This scale is based on the standards specified in AWPA E1-09 and ASTM D3345-74, where a rating of 10 is sound, 9.5 has a trace of attack (surface nibbles permitted), 9 is a slight attack, 8 is a moderate attack, 7 is a moderate/severe attack with penetration of the wafer, 6 is a severe attack, 4 is a very severe attack, and 0 is total failure of the sample. Lastly, to obtain the final dry weights, the test samples were dried in an oven at 194 °F (90 °C) for 24 hours and then allowed to cool to ambient laboratory temperature in a desiccator for 1 hour before being weighed.

Results

In this study, the weight changes of the test samples exposed to termites were compared to those of the "environmental control" wafers to account for the potential effects of moisture that is not readily eliminated by a period of oven-drying and other variables on the weight of the samples. This allowed to determine the portion of the weight change that was due to termite feeding, rather than other factors. This measure, known as the Adjusted Mean Weight Loss, is considered to be a more accurate and reliable measure of termite feeding and resistance. Table 1 shows the Adjusted Mean Weight Loss for each of the test materials.

The results of the visual examination, shown in Figure 1, presented a significant difference in the level of termite attack between the untreated southern yellow pine wafers and the ACQ-D treated pine wafers. Over the 28-day test period, the untreated pine wafers were severely attacked by termites, with a mean visual rating of 2.4 and an adjusted mean weight loss of 50.92 %. By contrast, the ACQ-D treated pine wafers showed only minor evidence of termite attack, with a mean visual rating of 8.6 and an adjusted mean weight loss of 4.85 %. The stone wool insulation wafers, meanwhile, showed no significant damage from termites, with a mean visual rating of 9.6 and an adjusted mean weight loss of only 1.22 %, exceeding the rating of the preservative treated wood. In fact, it is possible that the minor weight loss observed in the stone wool insulation samples was due to the separation and loss of a few wool fibers during handling and cleaning process, rather than termite feeding.

The stone wool insulation was initially investigated by the termites, but was then covered with sand, which is a behavior typically exhibited by termites when they encounter an undesirable food source. After this initial investigation, the stone wool wafers were largely ignored by the termites and remained untouched for the remainder of the test. By contrast, the ACQ-D treated wood samples showed deeper scars and even minor penetrations from termite feeding.

Table 1: Test Results from Test Report No. RAD-5860 “Termite Resistance Test on Mineral Fiber Insulation”

Test Samples	Adjusted Mean Weight Loss %	Termite Mortality Rate %	Mean Visual Rating (Scale 1-10)
Stone Wool Wafer	1.22 %	27.40 %	9.6
Treated Pine Wafer	4.85 %	38.60 %	8.6
Untreated Pine Wafer	50.92 %	2.00 %	2.4

Conclusion

The third-party laboratory concluded that "in terms of termite resistance, the [stone] wool insulation performed excellently in a rigorous test, and met or exceeded the performance of the standard preservative treated wood". Stone wool insulation can therefore be considered an appropriate insulation material for use under conditions of high termite hazard. In particular, stone wool insulation is a suitable solution in areas of very heavy probability of termite infestation, where the use of foam plastic in below grade applications is restricted by the building code.

ICC-ES Evaluation Report ESR-3773
Comfortboard® 80 and Comfortboard® 110 have been evaluated by the International Code Council Evaluation Services. These products have been tested in accordance with ASTM D3345 and AWPA E1 for termite resistance and may be used in areas where the probability of termite infestation is defined as "very heavy."

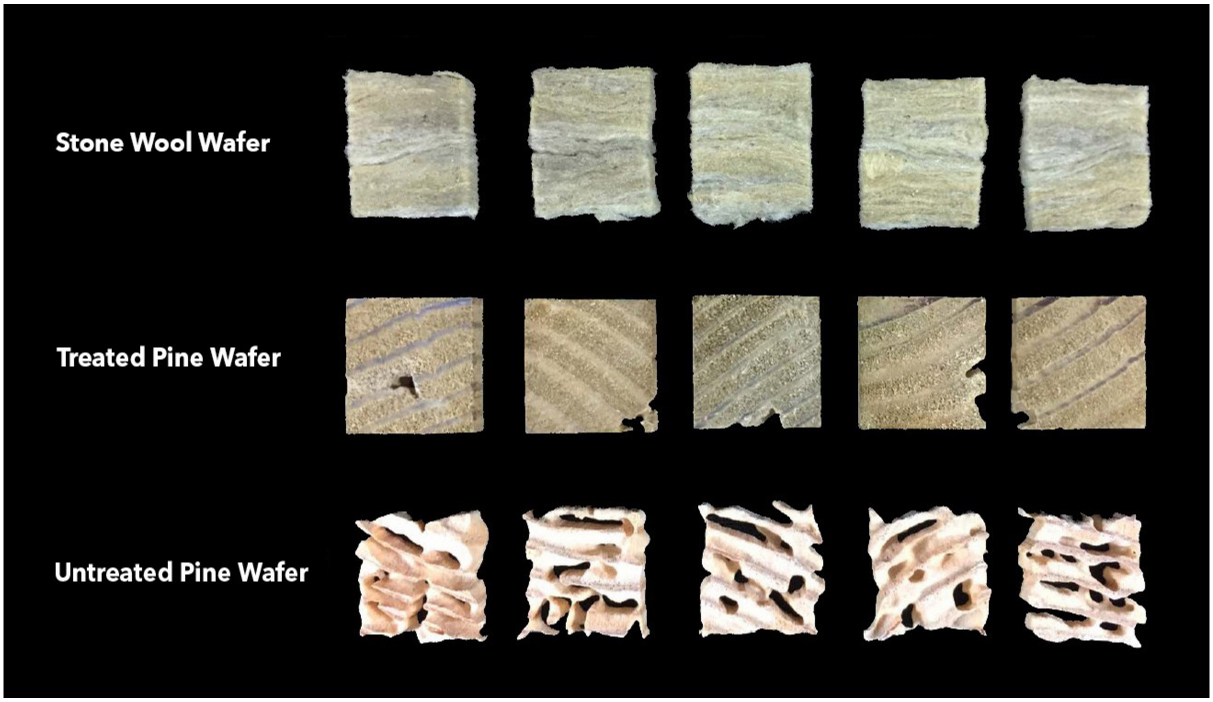

Figure 2: Wafers after 28 days of exposure to termites. RADCO Test Report No. RAD-5860 "Termite Resistance Test on Mineral Fiber Insulation"

The full study is detailed in RADCO Test Report No. RAD-5860 "Termite Resistance Test on Mineral Fiber Insulation" from 11/28/2016.

To get in touch with the ROCKWOOL Technical Services team, visit rockwool.com/north-america/contact/ or call at 1-877-823-9790

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