



Perform Guard No. 6007

Subject: EPS with Perform Guard Testing - Material Properties

Date: January 2008

AFM has developed a proprietary treatment for Expanded Polystyrene (EPS) which makes EPS resistant to termites. AFM markets the product as Perform Guard®. Testing has been done both in the laboratory and field.

In addition to field and laboratory exposure tests, AFM has conducted plant processing procedures, physical property testing, and coordinated system compatibility studies. The Perform Guard EPS manufacturing is licensed by AFM. Please visit www.performguard.com for Licensed Companies.

Processing Procedures

AFM, in cooperative work with its licensed facilities, has developed the processing techniques for the manufacture of Perform Guard EPS product that meets or exceeds the requirements of ASTM C578, "Standard Specification For Rigid, Cellular Polystyrene Thermal Insulations".

Physical Tests

Underwriters Laboratories has evaluated EPS with Perform Guard for physical performance under appropriate ASTM Standards. Flexural Testing (ASTM C203) of Perform Guard EPS showed strengths equal to or greater than minimum standards. Compressive Testing (ASTM C165) showed strengths equal to or greater than minimum standards. Density Testing (ASTM C303) showed densities equal to or greater than minimum standards. Perform Guard EPS is a listed UL material.

In-Plant Testing

The Quality Assurance procedures of Perform Guard's Third Party Quality Control Program call for in-plant testing of each lot of material. These tests qualify daily production runs of Perform Guard to the critical standards of ASTM C578.

Fire Performance

AFM submitted Perform Guard samples to Underwriters Laboratories for fire evaluation. UL 723 "Test for Surface Burning Characteristics of Building Material" tests (also known as ASTM E84) were run. The results showed that Perform Guard has a similar flame spread and smoke developed rating, when compared to industry standard modified EPS.

Systems Compatibility

Compatibility studies by various adhesive manufacturers and independent laboratories have shown that adhesive laminations using Perform Guard do not differ from untreated EPS foam. Corrosion testing, using the Kesternich Cabinet procedure, has shown no corrosion to metal.

Note: Perform Guard has been tested against termites. A list of specific species on file. Perform Guard is not a barrier system, but should be used as a component in a total insect management program.



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Perform Guard No. 6008

Subject: EPS with Perform Guard and How it Works

Date: January 2008

Perform Guard is Expanded Polystyrene which is treated to resist termites. This product is produced by incorporating a naturally mined mineral into EPS. However, many individuals ask "How does it work?" and "Why is it effective?".

Basically, Perform Guard is designed to resist termites from creating a community within the insulation. It is also designed to limit tunneling through the Perform Guard material for extended periods. The borate derivative contained within the Perform Guard acts as a bacterial agent against the gut fauna that break down cellulose in termites. For the borate derivative to act effectively, the termites must ingest it or at a minimum, masticate (chew) the Perform Guard. Therefore, there may be some minor excavating of the Perform Guard.

The termites must come in contact with the material before they can determine that the material is treated. When this occurs, two scenarios follow: The termite may continue to excavate the material for some time, then succumb to the deleterious effects of the borate material... or the termite will elect to move away from the inhospitable environment presented by the Perform Guard.

Perform Guard is not a repellent, nor is it a contact insecticide. Through the life of the Perform Guard it is probable that the material will be visited from time to time. However, the borate additive prevents continued attacks and helps to retain the insulation's serviceability.

Note: Perform Guard has been tested against termites. A list of specific species on file. Perform Guard is not a barrier system, but should be used as a component in a total insect management program. Insects may enter in through other access areas.



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Perform Guard No. 6009

Subject: EPS with Perform Guard - Testing for mold Resistance

Date: January 2008

Perform Guard was subjected to accelerated moisture/mold exposure testing to gauge its degree of mold resistance. Testing was based upon ASTM D3273-00, "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber." This testing involves exposing the Perform Guard to mold in an high humidity environment, approximately 90% RH. In addition

to the testing of Perform Guard sample, samples of southern yellow pine were tested as a control. At the end of the 3 month test, the growth of mold (Trichoderma and Aspergillus) was obvious on the southern yellow pine. NO mold growth was present on the Perform Guard. Please also refer to Technical Bulletin eps. no 1004.



**Southern Yellow Pine
with Mold Growth**

**Perform Guard with
NO Mold Growth**



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Perform Guard No. 6010

Subject: EPS Perform Guard Testing

Date: January 2008

Perform Guard termite resistant expanded polystyrene (EPS) is recognized in code evaluation reports for below grade applications in regions of very heavy termite pressure. Perform Guard received this recognition through extensive below grade in-situ testing over a period of 5 years at three termite testing locations in the southern U.S. This bulletin provides a brief description of the testing along with pictures of the test results.

Three test plots were selected for the evaluation of Perform Guard. The test plots were located in Georgia and Mississippi. These plots are within the region defined as very heavy termite pressure by the model building codes. AFM contracted with a third party testing firm, Rich Mountain, to conduct all testing and report all test results.

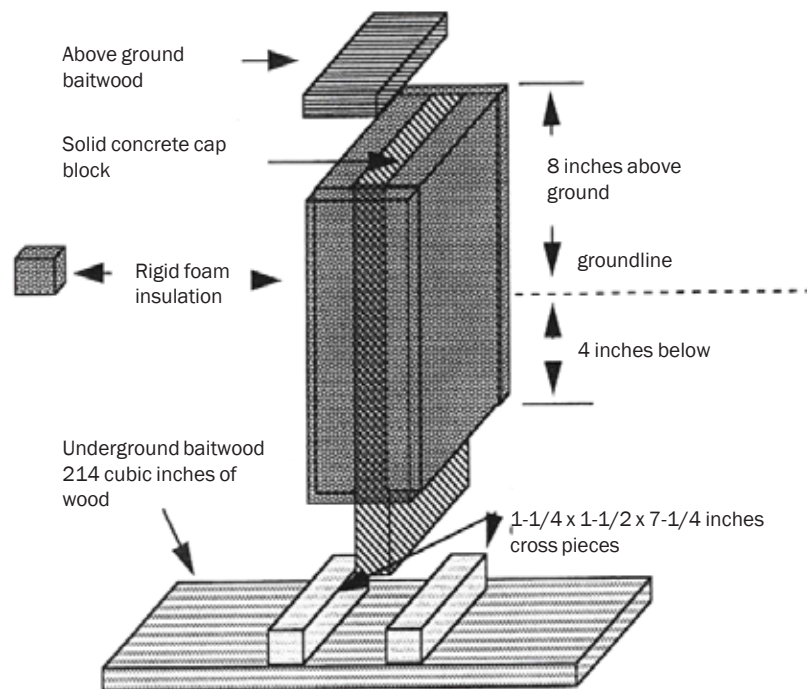
The testing was conducted following a test method developed jointly by Rich Mountain and AFM. The test method was modeled after AWPA E-7-93, "Standard Method Of Evaluating Wood Preservatives By Field Tests With Stakes." The testing consisted of EPS samples adhered with construction adhesives/sealants to a concrete block. This geometry was selected to mirror below grade insulation of concrete/masonry walls. The detailed test method is available from AFM upon request.

The samples geometry was such that the EPS were installed adjacent to below grade bait wood. This was intended to accelerate the exposure to termites by providing an large initial food source for the termites. A second piece of bait wood was installed above the sample to evaluate the extent that termites would excavate and tunnel through EPS.

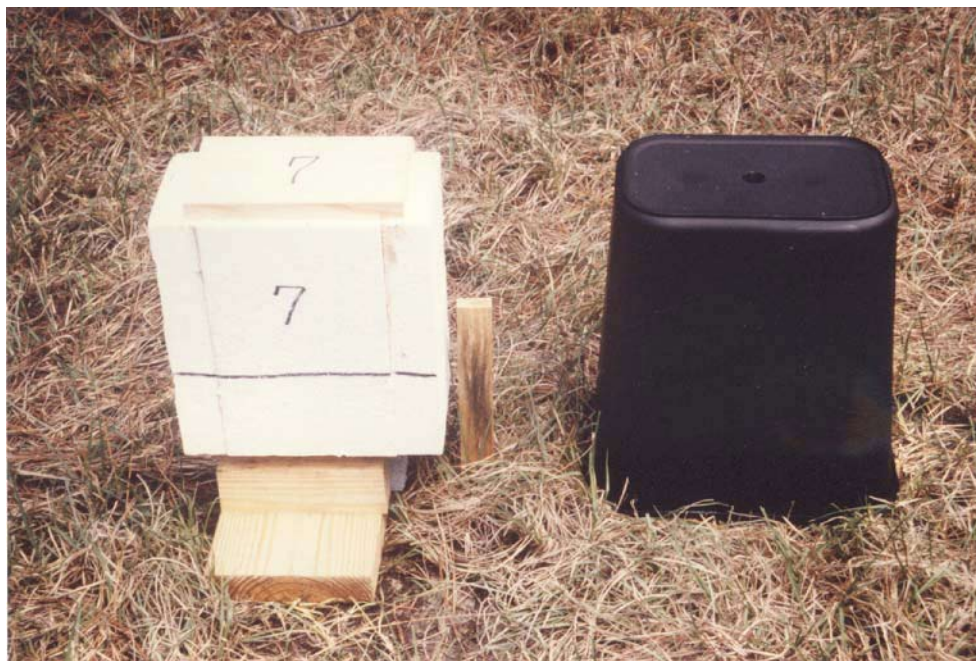
Attached to this bulletin are pictures from our testing. These include the sample fixture geometry, test plots, and cross sections of excavated EPS samples.

The performance of the Perform Guard sample is quite dramatic when compared to untreated EPS. Untreated EPS shows very obvious damage resulting from extensive excavation and tunneling. In contrast, Perform Guard shows very little damage.

The extensive testing conducted on Perform Guard has led to Perform Guard being the only rigid foam recognized for application in areas of heavy termite pressure.



TEST FIXTURE - replicates below ground applications.



TEST FIXTURE - Prior to installation showing underground baitwood base to attract termites to site. Canister cover to protect termite activity.



Field installation of test textures - Stone County, Mississippi.



Field installation of test textures - Griffin, Georgia.



#45 TEST FIXTURE - Examination of of non-treated EPS after 3 years exposure. Highland Site, Mississippi.



#45 TEST FIXTURE - cut open to reveal extensive termite damage.



#45 TEST FIXTURE - Close-up shows extensive termite damage.



#45 TEST FIXTURE - Close-up shows active termites.



#45 TEST FIXTURE - Close-up shows nesting infestation of termites.



#45 TEST FIXTURE - Close-up shows termite nesting galleries formed in non-treated EPS.



**#64 TEST FIXTURE - Examination of Perform Guard EPS after 3 years exposure.
Highland site, Mississippi.**



#64 TEST FIXTURE - cut open to reveal limited termite damage.



#64 TEST FIXTURE - Close-up shows no termite damage.



#64 TEST FIXTURE - Close-up shows slight termite damage.



**#64 TEST FIXTURE -
Perform Guard EPS and
R-Control Do-All-Ply.**

**#45 Test Fixture -
Non-Treated EPS and
standard construction
adhesives.**



#64 and #45 TEST FIXTURES - Close-up comparison.



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Perform Guard No. 6011

Subject: EPS with Perform Guard and Building Code Compliance

Date: January 2008

Perform Guard termite resistant expanded polystyrene (EPS) is recognized in building code evaluation reports for below grade applications in regions of very heavy termite pressure. This bulletin provides a description of the testing required by the International Code Council Evaluation Service (ICC ES) to achieve this recognition.

The ICC ES requirements to recognize a foam plastic insulation as termite resistant are detailed in the "EVALUATION GUIDELINE FOR TERMITE-RESISTANT FOAM PLASTICS," also known as EG 239. A summary of the testing requirements of EG239 are as follows:

- Testing shall be in accordance with AWWA E-7, "Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes", modified to suit the intended application of the termite-resistant foam plastic.
- Testing shall be representative of the final installed product.
- Test assemblies shall be exposed to a minimum of three termite test plots.
- Minimum of five replicates for each assembly type per test plot.
- Assemblies shall be arranged in a randomized complete block design within the plots.

The assemblies are inspected annually along with wood monitoring stakes to ensure that the plots are providing sufficient and uniform exposure to termites. After 36 months of exposure, the test assemblies are destructively evaluated for termite damage. After the 36 months of exposure, the termite-resistant foam plastic shall have no more than 5 percent damage. Control or non treated samples shall also be evaluated to confirm termite damage.

The development of EG239 was in response to language in the model codes. For example, Section 320.5 of the 2006 International Residential Code (IRC) states: "In areas where the probability of termite infestation is "very heavy" ... extruded and expanded polystyrene, polyisocyanurate and

other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundation located below grade."

Thus, the use of foam plastics is restricted from use in areas of "very heavy" termite exposure. However, included in the IRC is language for exceptions to the restriction. Specifically, exception 2 states that: "When in addition to the requirements of R320.1, an approved method of protecting the foam plastic and structure from subterranean termite damage is provided."

Perform Guard has been evaluated by the ICC ES in accordance with EG239 under exception 2 of section R320.1 of the IRC. As a result, Perform Guard has been recognized in the AFM evaluation report, ESR-1006. ESR-1006 section 4.5 provides for the special use of Perform Guard in wood construction in areas of very heavy termite infestation. The evaluation report language of section 4.5 is "Perform Guard® boards are termite-resistant and are not restricted under Section R320.5 of the IRC or Section 2603.8 of the IBC."

Subsequently, Perform Guard may be used in regions of "very heavy" termite exposure.

The Perform Guard treatment is for the protection of the insulation integrity and does not provide protection for the structure. A pest control operator should be contacted for protection of the structure in accordance with the IRC or IBC. Methods of protection may be chemical soil treatment, pressure preservative treated wood, naturally termite resistant wood, physical barriers, or any combination of these methods.



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Perform Guard No. 6012

Subject: Perform Guard EPS - Termite Resistance Testing Update

Date: January 2008

AFM developed a full scale research program in the 1990's to determine the effectiveness of Perform Guard when exposed to termites.

Some historical research had been previously conducted on foam plastic insulation but these were small scale laboratory tests and could not be anticipated to match performance in real world applications. Small scale laboratory tests do not replicate the below grade installation geometry of insulation nor do they typically provide the necessary time exposure of field installations.

Other research has also been published on borate treated expanded polystyrene, but these are either at dosage levels not commensurate with Perform Guard or do not meet the requirements of the International Code Council Evaluation Service (ICC ES) for termite resistant foam plastics (Evaluation Guide 239). The requirements of the ICC ES evaluation guide include:

- Testing shall be conducted for at least 3 years
- Testing shall be in accordance with AWPA E-7, "Standard Method of Evaluating Wood Preservatives by Field Tests with Stakes", modified to suit the intended application of the termite resistant foam plastic.
- Testing shall be representative of the final installed product.
- Test assemblies shall be exposed to a minimum of three termite test plots.
- Minimum of five replicates for each assembly type per test plot.

Based upon these requirements, the AFM program was developed to ensure that the test data was not limited to a laboratory testing, but instead a full scale test program of samples installed in heavy termite regions of the U.S. Foam-Control contracted with a third party researcher to conduct

the testing. The testing consisted of evaluating Perform Guard at three test sites. One test site was located in the USDA research forest in Athens, Georgia. Two additional test sites were located near Gulfport, MS. At each test site, a minimum of 10 samples of Foam-Control EPS with Perform Guard were evaluated. Foam-Control worked to ensure that the testing fully complied with ICC ES Evaluation Guide 239.

Upon completion of the test program, AFM submitted the complete test data to ICC ES for evaluation. ICC ES has subsequently published Evaluation Service Report (ESR) number ESR-1006 which includes recognition of Foam-Control EPS with Perform Guard as a termite resistant insulation.

A summary of the third party research data from the AFM program was submitted to the peer reviewed Forest Products Journal for publication. The paper met the stringent requirements of peer review and has been published in the March 2005 issue of the Forest Products Journal. A copy of the article is attached to this technical bulletin.

The attached test were conducted under severe exposure conditions that are intended to exceed actual exposure conditions. Regardless of application area, Perform Guard should be installed following the Perform Guard below grade Application Guide.



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