TL-0003 — BITUTHENE® Performance Testing Technical Letter

Whenever a product is tested it is, of course, beneficial to utilize widely recognized specifications, test methods or procedures. Many times, however, specifications or test methods will characterize the material itself but will require expert interpretation to determine how the material will perform.

BITUTHENE®waterproofing membranes are examples of materials which can be identified through recognized test methods, but certain performance evaluation requires adaptation of test procedures, or development of new tests. As a result, GCP has adopted several test methods designed to identify specific performance characteristics which are relevant to in-place performance.

Crack Cycling (ASTM C 836)

To simulate the problem of a crack developing and opening in cold weather, two concrete blocks approximately 2 in. x 3 in. x 2 in. (50 mm x 75 mm x 50 mm) were either primed or conditioned. BITUTHENE®membrane was applied across the two blocks when they were butted together, representing a hairline crack.

These blocks were cut in such a way that they could be fitted in a compression-extension machine, as required for durability testing of sealing compounds in Federal Specification TT-S-00227E and Federal Specification TT-S-00230C. The assembly was then placed in a freezer and the test was conducted at either -25°F (-32°C) or -45°F (-43°C). The blocks were pulled apart at a rate of 0.125 in. (3 mm) per hour. The test was run for 100 cycles by opening the crack to 0.125 in. (3 mm), then allowing it to relax before being opened again.

There was no effect on the BITUTHENE®membranes. The rubberized asphalt cushion allows the tough polyethylene film to stretch over a large area rather than at a point just over the crack. While we would not expect cracks of this magnitude in properly designed structures, the tests show that BITUTHENE®membrane remains pliable at very low temperatures and can function extremely well under these adverse conditions.

Joint Cycling (ASTM C 836, modified)

Tests were performed using the same procedure as described in the crack cycling test, but an expansion joint was simulated by using foamed plastic to space the two blocks 1 in. (25 mm) apart. This joint assembly was cycled by compressing to 0.75 in. (20 mm), then opening to 1.25 in. (30 mm) at -15°F (-19°C). The assembly was cycled over 1,000 times with no visible effect. BITUTHENE®waterproofing membranes will perform their function during constant cycling of properly designed and sealed joints.

Adhesion to Substrate (ASTM D 903, modified)

Adhesion to primed or conditioned concrete has been tested under a variety of conditions. A test method was developed by modifying the procedure in Federal Specification TT-S-00230C. Blocks of concrete 4 in. x 8 in. (100 mm x 200 mm) were used. These were either primed or conditioned, then a 3 in. x 8 in. (75 mm x 200 mm) membrane strip was applied and rolled with a standard weight. About 2 in. (50 mm) of membrane was left free with release paper so that this end was gripped when installed in a testing machine.

After storage under various conditions such as di?erent temperatures, the blocks were placed in a clamp. The free end of the membrane was inserted in a gripping device and pulled in a testing machine such as an Instron, Scott or Dillon tester.

The results of extensive testing have shown that the adhesion actually increases over a period of several days, after which it remains quite constant regardless of the type of conditions.

Increase in adhesion with time is quite noticeable on application of the product in the field. At 70°F (24°C) the membrane immediately after application can be peeled back without difficulty, but within 15 minutes in the warm sun, it is difficult to remove. The adhesive bond increases more rapidly at higher temperatures.

Resistance to Hydrostatic Pressure (ASTM D 5385)

Some other properties, such as adhesion and flexibility, are being tested as part of the testing for the ability of BITUTHENE®waterproofing membranes to withstand water pressure.

For this test a chamber has been designed and built with two open sides into which a 8 in. x 16 in. (200 mm x 400 mm) block of concrete can be fitted and sealed. The chamber can then be filled with water and the pressure can be regulated.

Blocks were either primed or conditioned. BITUTHENE®membrane was applied to the 8 in. x 16 in. (200 mm x 400 mm) surface at a temperature of 40°F (4°C). An overlap was made on the BITUTHENE®membrane and the block was then intentionally cracked to a width of 0.125 in. (3 mm). Pressure was increased to the equivalent of 231 ft (70 m) of water. No leakage occurred.

Compression Deflection

Engineers sometimes need to know how BITUTHENE®waterproofing membrane will perform under high compressive loads, where the membrane is placed under load bearing walls or columns.

To simulate conditions where BITUTHENE®membrane is applied under a wall or column, BITUTHENE®membrane was placed in a cylinder and pressure was increased. Pressures recorded for various amounts of deflection (percent of compression of BITUTHENE®membrane) are as follows:

DEFLECTION	FORCE LBF/IN.^{2}(MPA)	FORCE LBF/FT.^{2}(KN/M^2)
10%	99 (.68)	14,256 (683)
15%	196 (1.35)	28,224 (1351)

20%	317 (2.19)	45,648 (2186)
25%	437 (3.01)	62,928 (3013)
30%	532 (3.69)	76,608 (3689)

Extremely high pressures are needed to deflect BITUTHENE®membrane. For reference, the force exerted by the weight of a concrete slab is approximately 150 lbs/ft^3 (2400 kg/m^3).

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for consideration, investigation and verification by the user, but we do not warrant the results to be obtained. Please read all statements, recommendations and suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use that would infringe any patent, copyright or other third-party right.

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Last Updated: 2023-06-28
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