



August 10, 2012

Freeze-Thaw Evaluation of Concrete Cloth

Objective

Determination of the flexural strength of Concrete Cloth exposed to 200 cycles of freeze-thaw action.

Procedure

The flexural strength of cured Concrete Cloth was determined per the standard ASTM C1185, "Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards." In preparing the freeze/thaw test samples, in order to represent extreme water exposure/curing conditions, Concrete Cloth specimens were exposed to incremental wetting at a slope of 45^o, and another specimen was fully submerged in a horizontal orientation for 24 hours. Slope 45^o samples were obtained by incrementally wetting a 62" X 42" sheet of Concrete Cloth™ over a 45 degree slope surface until saturation, while fully submerged samples were prepared by submerging a concrete cloth of dimensions 62" X 42" under water for 24 hours. In both the cases, after the initial wetting and curing, the specimens were transferred to a moist room (with ~100% RH) for further curing. After 28 days of moist curing, two sections of Concrete Cloth™ (6" x 42") were extracted from the curing 62" X 42" sheets. Using a hand-held, dry-cut saw the sections were cut from the cloth. The extracted sections of cured cloth (6" x 42") were then formed in to 4" X 12" samples for flexural testing purposes. A diamond-tipped, wet-cut saw was used to fabricate flexural testing samples. To avoid edge effects, each 4" X 12" sample was extracted from the center while the edges were discarded. Flexural test samples were split into two sets of three, of which one set was subjected to freeze/thaw action while the other set served as a control that was kept under water. In preparation for freeze/thaw cycling, samples were sealed per the requirements of ASTM C1185, Section 12.3.3. The sealed samples were then subjected to 50, 100 and 200 cycles of freeze/thaw action after which they were centrally loaded to determine their flexural strength.

As per ASTM C1185, three point bending tests were performed on the individual 4" X 12" samples to determine their flexural strengths. The flexural tests were performed on a universal testing machine with displacement controlled loading (0.2 in/min). During the tests, load versus displacement data was recorded over a central deflection of 2 in., which was later utilized to calculate the flexural strength of samples. Strength was evaluated using two distinct failure peak loads that were recorded during the test, one at the beginning of the test illustrating the initial break of the cementitious material, and the other a maxima over the entire curve. Average flexural strength of the samples subjected to 50, 100 and 200 freeze/thaw cycles are listed in the table below. Flexural strength values for initial peak load and secondary peak load are included.

Test Results

Freeze/Thaw Cycles	Avg. Flexural Strength Based on Initial Peak (psi)	Avg. Flexural Strength Based on Secondary Peak (psi)
50 Cycles	586 <i>4.0 (MPa)</i>	632
100 Cycles	567 <i>3.9</i>	651
200 Cycles	578 <i>4.0</i>	641

Interpretation

The freeze-thaw test results indicate that the Concrete Cloth material demonstrates excellent freeze-thaw resistance through the 200 cycles tested. The average flexural strength values for the freeze/thaw specimens are greater than the values published on the Milliken® Concrete Cloth™ data sheet.