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# REPORT ON

# HOT SURFACE PERFORMANCE

FOR

einsulation

6"-THICK FIBERGLASS PIPE INSULATION

TESTED AT 850 $^{O}$F

DETERMINED USING ASTM C411 AND C447

FOR COMPLIANCE TO C547

PREPARED FOR
einsulation.com, Inc.
508 North Second Street
Fairfield, IA 52556

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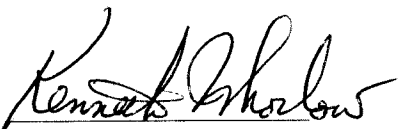
Reported by 
Kenneth Whorlow
President

**Project:** Determine the hot surface performance of einsulation, 6" Thick Fiberglass Pipe Insulation. The testing was conducted by requested of Anano Verma on purchase order number USCO146/TUTCO/03, item 1, dated June 24, 2005.

**Samples:** The material is described as: einsulation. The sample was a 6 N 3 Fiberglass pipe insulation with ASJ on the outer surface. The 6 inch thickness was in a double layer and the inner layer was not jacketed.

**Test Methods:** The ASTM C 411 (Hot Surface Performance - Pipe Insulation) test procedure was used for the test. The test was conducted at 850 °F hot surface temperature continuing the test for 96-hours. The C411 test criteria of examination are cracking, delamination, flaming, glowing, smoldering, smoke, and warpage.

ASTM C547-03 (Standard Specification for Mineral Fiber Pipe Insulation) places additional requirements for hot surface performance testing. Section 11.1.6 of the specification requires a 6" thickness, "slapped on" a preheated test pipe with interior temperature rise measurements at 1" increments in accord with C447 section 8.1.6. In addition, section 11.1.7 requires the "Sag Resistance" be measured with a maximum allowable 5% change.

**Procedure:** The pipe insulation was installed on the hot pipe as a double layer using the tape seam on the ASJ outer layer to secure the insulation around the pipe . The 1/2" wide, screw hose claps were not used. The sides of the pipe were not restrained in any way. The hot surface temperature of the pipe was controlled at 850 °F using a digital controller and monitored using a data logger during the 96 hour test.

**Results:** The C447 Hot Surface Performance test measures the interior temperature rise at the hot surface, 1 inch, 2 inch, 3 inch, 4 inch, 5 inch, and cold surface. The material passed the requirement of 200F maximum over the pipe start temperature (850 + 200 = 1050F). The material had very little interior exothermic heat rise. Figure 1 is a graph of the thermocouple temperatures at the 1 inch increments. The highest temperatures at all depths were reached between approximately 200 to 230 minutes after the material was installed on the pipe and did not exceed the hot surface temperature.

After 96-hours exposure at 850 °F, the results of the six sag measurements along the top of the pipe were all identical and had an average change of 2.06% and a maximum change of 2.06% of the 6 inch starting thickness. The material meets the requirement of C547 of a maximum of 5% change.

The C411 observations were as follows:
1. Visual examination during the initial heating period showed fuming and out-gassing, with considerable odor as the organic binder was volatilized.
2. Visual examination during the initial heating period and during the test showed no flaming, glowing, or smoldering.
3. The material is fibrous and does not crack. There was no apparent cold or hot surface cracking or de-lamination at any time during or after the test.
4. The material remained strong and easily handleable after the test.

# ASTM C447 Hot Surface Performance

einsulation