MVA R+D 1990
4-1.1

HOT PIPE TEST

This test came about through the effort of the Kaylo people to market a single layer insulation for 1200° service.

It is a simulated service test for one-surface heat shrinkage wherein lime-silica pipe covering is installed on a metal pipe which is heated to the desired temperature for 24 hours or longer. Due to the shape of the pipe covering, warpage is prevented, and shrinkage is reflected in transverse and longitudinal cracks on the hot surface.

The test is entirely visual and is effected by the size and thickness of insulation, tightness of fit on the pipe, temperature of the pipe, conductivity and hardness of the insulation, and whether single or double layer insulation is run.

Kaylo 3 x 3-1/2 Double Layer at 1200°F

Brittleness of Kaylo (due to the short fiber used) is shown by cracks which extend entirely through the 3 x 2 inner layer of insulation. Longitudinal cracks are caused by too snug a fit on the metal pipe.

Cracks in the Kaylo 7 x 1-1/2 outer layer are equal to cracks in Kaylo single layer hot-piped at 600°F.

At the start of the test, black smoke was given off from the Kaylo material, from the oil used in their pan cast process.

K & M Kaytherm 4 x 2 Shiplap at 1083°

Only four sections of K & M Kaytherm pipe covering have ever been received, in spite of requests to K & M for additional material.

It is believed that these four sections were laboratory samples which were hand-made for Johns-Manville conductivity tests.

While some cracks show after 1083°, the Kaytherm pipe covering appears to be serviceable as a single layer insulation.[1]

Kaytherm block is autoclaved in manufacture to produce a 1500° service insulation which is softer and shrinks less at 1200° than standard lime-silica. It may be that the Kaytherm pipe covering was processed in the same way.

Pabco Caltherm 5 x 3 Double Layer at 1228°

The 5 x 1-1/2 inner layer shows a crazing at 1228° which indicates that the temperature limit is close to 1228°. However, the material appears to be serviceable at 1200°.

Ruberoid Calsilite 5 x 3 Double Layer at 1194°

Both the 5 x 1-1/2 inner layer and 8 x 1-1/2 outer layer appear to be serviceable.

1. However the Kaytherm pipe covering had a bad conductivity curve at elevated temperatures.

PLAINTIFF'S EXHIBIT K-1513

DEFENDANT'S EXHIBIT OE-84

Johns-Manville Standard Thermobestos 3 x 3-1/2 Double Layer at 1200°

The 3 x 2 inner layer has several transverse hair-line cracks which do not extend through the insulation. No longitudinal cracks appear since the size of the pipe covering was designed to allow for metal pipe expansion and insulation shrinkage. The inner layer has a distinct red color from the oxidation of the amosite fiber used in manufacture. No cracks or color change appear in the outer layer.

Johns-Manville 1.4 Thermobestos 3 x 2 Inner Layer at 1200°

Only one transverse crack appeared in several sections which were run.

Johns-Manville Superex 5 x 1-1/2 at 1284°

Johns-Manville Superex was hot-piped to show the effect of temperature on single layer insulation. Several transverse cracks appeared.