Johns Manville
Industrial Insulation Group

Compressive Strengths of High-Temperature Thermal Insulation

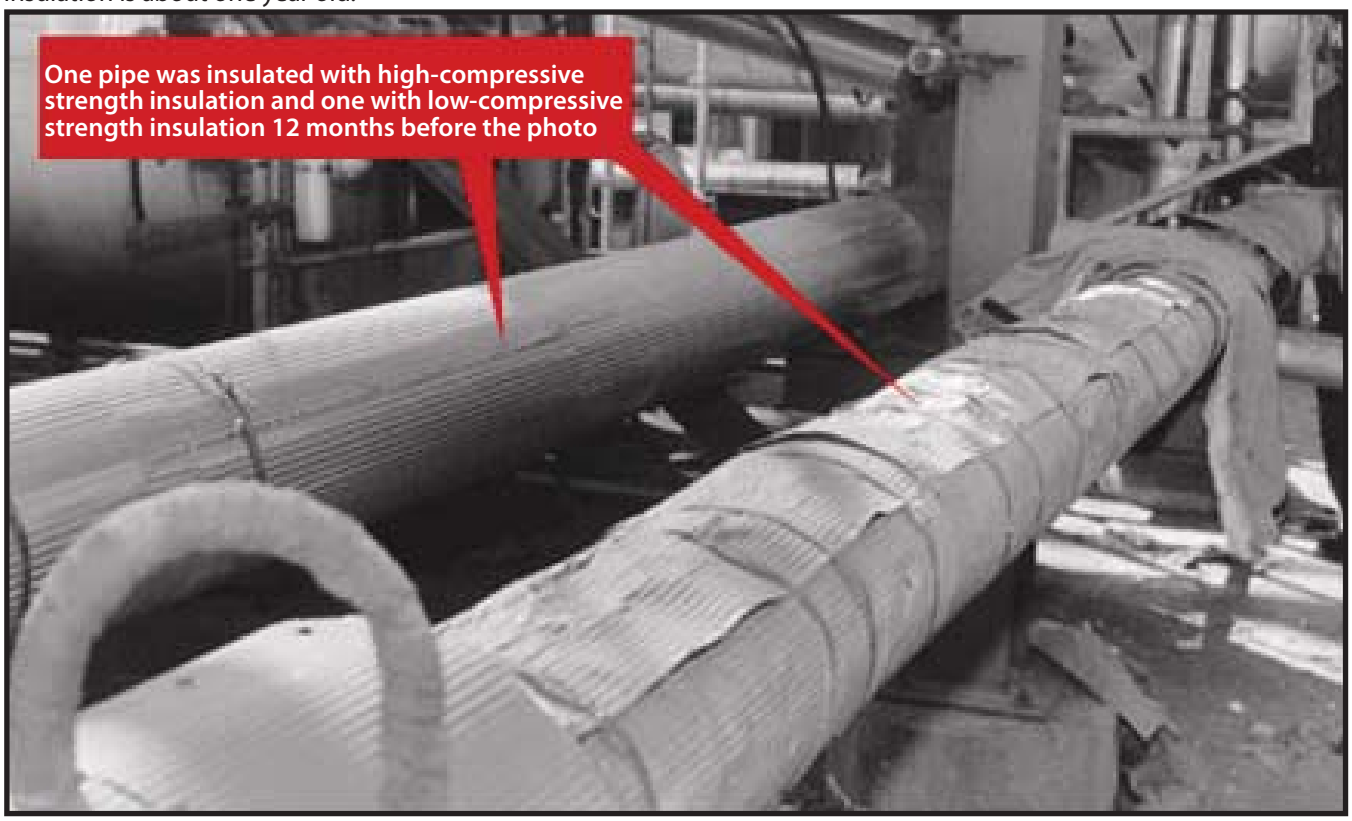
Technical Bulletin

COMPRESSIVE STRENGTHS OF HIGH-TEMPERATURE THERMAL INSULATION

The compressive strength of different types of high-temperature thermal insulation varies enormously. Furthermore, some insulations significantly degrade with temperature exposure. For this bulletin, "high-temperature" refers to insulations rated for continuous use on surfaces from 450˚F(232˚C) to 1200˚F(649˚C).

Insulation compressive strength can be a very important design consideration. The greater the compressive strength, the more durable the insulation. High-compressive strength material can resist damage by foot traffic, vibration, and various forms of external pressure. Under similar conditions, the higher strength material will last longer, perform better and prevent moisture intrusion. Insulation materials with low compressive strength most often do not fully recover following compression, resulting in reduced thermal performance.

Figure 1 - Two insulated pipes, one with high-compressive strength insulation and another with low-compressive strength insulation. Both have been subjected to foot traffic and other forms of external pressure. The difference is evident. The insulation is about one year old.



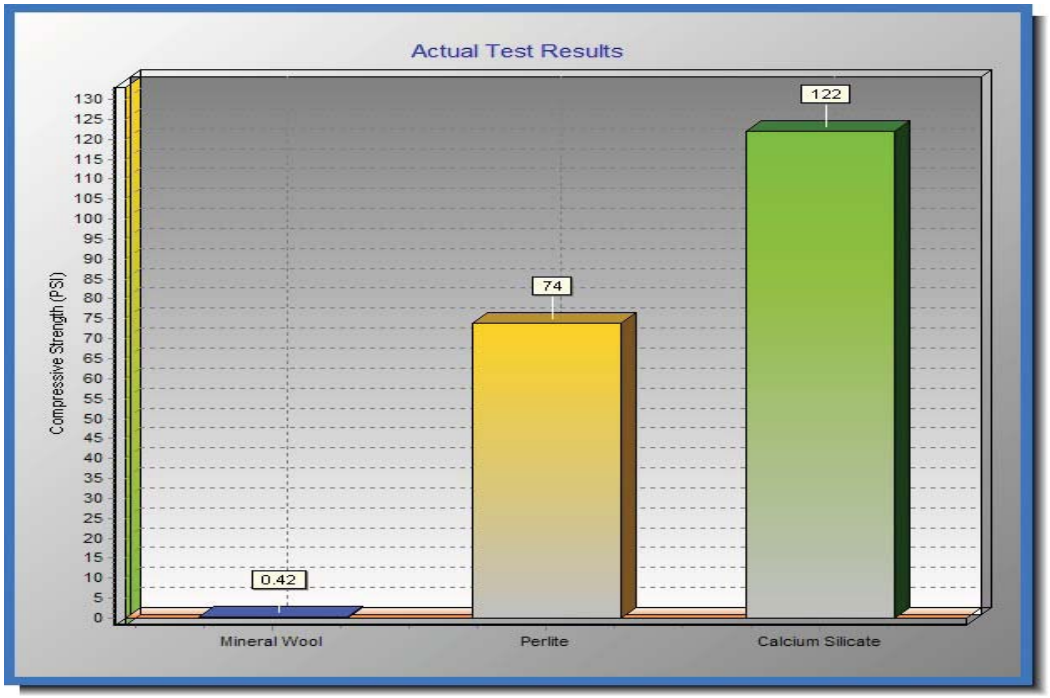
Johns Manville
Industrial Insulation Group

COMPRESSIVE STRENGTHS OF HIGH-TEMPERATURE THERMAL INSULATION

A common test to measure compression strength is applying pressure on the surface of the insulation until a % of compression is attained. We have performed this test on material "out-of-the-box" and material exposed to various service temperatures.

"OUT-OF-THE-BOX" MEASURES

Industrial Insulation Group's Thermo-12 Gold® Calcium Silicate insulation requires more than 100 psi to reach a 5% compression. This is the highest of any commercially available thermal insulation rated for use to 1200˚F. Perlite also has a high compressive strength, although not quite as high, requiring 74 psi to reach 5% compression. Mineral wool with a nominal 8 pcf density reaches 5% compression with only 0.42 psi. This is shown in Figure 2. These "out-of-the-box" results show Thermo-12 Gold has more than 250 times the compressive strength of mineral wool.



A good example is the amount of force required to compress pipe insulation. Figure 3 shows the change in thickness when compressed. The photos demonstrate the real difference in the ability of the insulation to support weigh. Industrial Insulation Group's Thermo-12 Gold on the right side does not change thickness when a 120 pound load is applied to an area representing a foot print. The mineral wool on the left compresses significantly.

Figure 3 - Change in insulation thickness when a 120 pound load is applied.

Left: Mineral Wool

Right: Thermo-12 Gold Calcium Silicate

Compressive Strengths of High-Temperature Thermal Insulation

Technical Bulletin

SERVICE TEMPERATURE MEASURES

After exposure to 1200˚F, the compressive strength of Thermo-12 Gold and Sproule WR-1200® do not measurably change. In contrast, mineral wool insulation degrades after exposure to temperatures above 450˚F and the loss of strength above 700˚F is significant. Applying 120 lbs. (0.83psi) on a square foot of insulation has no visible effect on Thermo-12 Gold exposed to 1200˚F. Nominal 8pcf mineral wool exposed to the same temperature will compress 25% to 45% depending on the manufacturer. Figures 4 and 5 below illustrate this compression behavior.

Figure 4 - The mineral wool on the left side of the photo is unconditioned.

The mineral wool on the right side has been heated to 1200°F and the load is 120 pounds per square foot as advertised in the product submittal sheet.

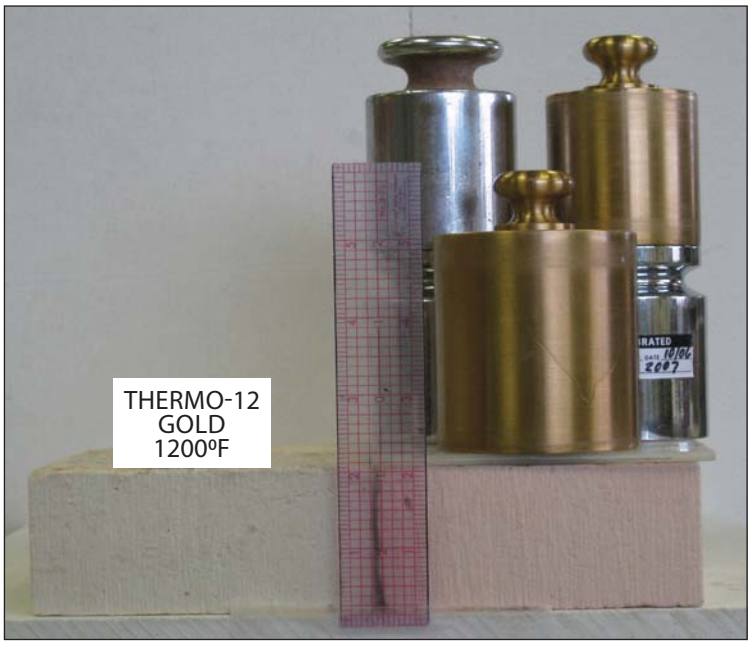


Figure 5 - Thermo-12 Gold Calcium Silicate on the left side is unconditioned insulation.

The insulation on the right side has been heated to 1200˚F and the load is 120 pcf. The load is the same as the previous photo.

Johns Manville
Industrial Insulation Group

Compressive Strengths of High-Temperature Thermal Insulation

Technical Bulletin

COMPRESSIVE STRENGTHS OF HIGH-TEMPERATURE THERMAL INSULATION

CONCLUSION

Industrial Insulation Group's Thermo-12 Gold Calcium Silicate insulation is significantly less compressive than mineral wool for "out-of-the-box" material and more so after being exposed to service temperature. The greater the temperature exposure, the greater the compression ratio between these products. Good compression strength translates to sustained thermal performance, less energy consumption, consistent process control, safety around hot surfaces, less moisture intrusion due to damage to the weather barrier, and reduced corrosion under insulation (CUI).

Before specifying the type of high temperature insulation for a job, it will do you well to first consider insulation compressive strength and durability. When compression strength is a design criterion, the clear choice is Thermo-12 Gold Calcium Silicate high-temperature insulation.

CUSTOMER SERVICE
TECHNICAL & GENERAL INFORMATION
(800) 866-3234

Johns Manville
Industrial Insulation Group
2100 LINE STREET • BRUNSWICK, GA 31520

IND-TB011 01-15 (Replaces IIG-TB011 08-12)