

**JOHNS-MANVILLE RESEARCH
AND ENGINEERING CENTER**

Report No. 432-Int-747

Date May 18, 1970

Title: HARBISON WALKER HARD FACED BLOCK INSULATION AND J-M SUPEREX - SG - Thermal Conductance

Requested by: K. F. Greene (IID 2608 Complete IN-96)

REC'D	MAY 20 '70	W. K. H. 322	REFER TO	JOC	JEN	LMH	SEW	EBH	WCE	FILE
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Summary

The thermal conductance of a SUPEREX - SG block insulation was up to 15 per cent lower than that of a sample of Harbison Walker Hard Faced Block. Both insulations were 2.1-in. thick.

Material

Samples of Harbison Walker (H-W) Hard Faced Block Insulation, a composite of mineral wool block and a nominal 1/2-in. pressed mineral fiber board for use in blast furnace stoves were submitted (NB 3988, p 124). Also received was a J-M SUPEREX - SG sample composed of SUPEREX 1900 and SPIN-GLASS 1000 designed for the same use.

The H-W product claims include these features; lightweight, ease of application, surface adjusts to irregularities, resistant to impact compression and moisture, non-corrosive and incombustible, provide relief for stresses caused by expansion and a greater insulating value than calcined diatomaceous earth.

The claimed physical properties include 1800F maximum service temperature limit, density of 15 lb per cu. ft. Flexural strength 40 lb/sq in. and linear change after heating at 1800F - less than 3 per cent.

Tests

The thermal conductivities of the separate components (A. - mineral wool block and B. - pressed mineral fiber board) were measured in Rapid Heat Meter thermal conductivity apparatus over a 300 to 1000F mean temperature range.

The composite H-W product and the sample of J-M SUPEREX - SG composite were tested at temperatures up to 1800F hot face on an electric hot plate, using a woven heat meter at the cold face. In the H-W product the pressed mineral wool board is at the hot face, and in the SUPEREX - SG product the SUPEREX is at the hot face. With this arrangement the thermal conductance of a thick composite can be determined at higher temperatures, extending the capability of heat meter type apparatus.

Results

The thermal conductance (C) of the composite J-M SUPEREX - Glass Fiber sample block (2.1-in. thick) was up to 15 per cent lower than that of Harbison Walker Hard Faced Block Insulation.

PLAINTIFF'S
EXHIBIT
K-1551

DEFENDANT'S
EXHIBIT

OE-122

**JOHNS-MANVILLE RESEARCH
AND ENGINEERING CENTER**

Report No. 432-Int-747

Page 2

The SUPEREX-SG J-M block showed a separation of the two components after heating and the SUPEREX was warped. The H-W block did not delaminate, but the hard faced portion was easily indented by thumb pressure.

The conductances of the composite insulations were measured on an electric hot plate with a calibrated heat meter at the cold faces of the samples for determination of the heat flow. This mode was used for the first time to provide a method of test of thick insulations at high temperatures. The conductances yielded by the test are in good order. The conductivities of the component measured at the same time can also be calculated. The "k" values so measured and calculated in this test are approximate. It is believed that with more exacting ways of locating the innerface thermocouples that reliable "k" as well as overall "C" values can be measured by this test method.

Reported by P. J. Behory per J. N. A.
P. J. Behory
Materials Evaluation Section

Thermal Conductance by J. N. Anderson
J. N. Anderson
Materials Evaluation Section

br

cc: F. L. Pundsack
J. P. Leineweber
Attn: S. Speil
L. R. Blair
W. K. Hesse ✓
J. O. Collins
K. F. Greene
R. H. Neisel
J. N. Anderson
P. J. Behory
K. L. Kinder
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APPENDIX

Table 1

Thermal Conductivity of H-W
Hard Faced Block Insulation Components
in Rapid Heat Meter Apparatus

	Density Pcf	Thermal Conductivity Btu Per hr sq ft (F/in.) Mean Temp - F			
		400	600	800	1000
Mineral Wool Block	15.1	0.45	0.57	0.71	0.87
Pressed Mineral Wool Board (This Hard Face portion at the Hot Face)	21.4	0.50	0.57	0.66	0.81

APPENDIX

Table II

Thermal Conductance of H-W Hard
Faced Block and J-M SUPEREX-SG
Block - Tested As Composites

	H- W	J-M
Size - in.	24 x 24	24 x 24
Weight - lb/ft ²	2.11	1.95
Thickness - in.	2.1	2.1
Thermal Conductance (C) Btu per hr sq ft		
Mean Temp F		
400	0.21	0.22
600	0.24	0.24
800	0.29	0.27
1000	0.37	0.32
1200	0.47	0.40
1300	0.53	0.46

Thermal Conductivity (k)
of Components As Measured
in the Test of the Composite

	H-W		J-M	
	Mineral Wool Block	Pressed Mineral Wool Board (At Hot Face)	SPIN-GLAS 1000	SUPEREX At Hot Face
Thickness - in.	1.4	0.7	0.8	1.3
"k" Btu Per hr sq ft (F/in.) at Mean Temp				
200	0.33	0.32	0.23	0.68
400	0.43	0.40	0.37	0.69
600	0.54	0.49	0.53	0.71
800	0.66	0.60	0.74	0.73
1000	0.80	0.71	1.10	0.76
1200	0.95	0.84	-	0.80
1400	-	1.00	-	0.85
1600	-	1.21	-	-