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THERMAL CONDUCTIVITY MEASUREMENTS OF EIGHT RUBBER-LIKE MATERIALS

by

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to

Office of The Quartermaster General
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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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I. INTRODUCTION

At the request of the Office of The Quartermaster General, reference File QMGRJ 095, letter dated March 18, 1953, thermal conductivity measurements were made on eight rubber-like materials to determine their insulation value.

II. MATERIALS

Sample No.	Size	Description
1	Two 8x8x0.3 inch	Oliver drab ensolite
2	One 8x8x0.4 inch	Black artic rubber
3	Two 8x8x0.2 inch	Light neoprene
4	One 8x8x0.5 inch	Green ensolite
5	One 8x7.6x0.5 inch	Black arctic rubber
6	One 8x6.5x0.4 inch	Black arctic rubber (higher density)
7	One 8x8x0.8 inch	Gray PVC
8	One 8x8x0.9 inch	White PVC
*9	One 4x4x1.1 inch	Green Royalite (U.S. Rubber Co.)

* Sample was not suitable in size for measurement of its thermal conductivity.

III. TEST METHOD AND PROCEDURE

The thermal conductivity of the specimens was measured in an 8-inch guarded hot-plate apparatus conforming with the requirements of Fed. Spec. LLL-I-321b and of ASTM C177-45.

IV. RESULTS

A summary of the test data is given in Table 1 and a plot of thermal conductivity versus mean temperature is shown in Fig. 1.

3. [illegible]

In the process of the 90-lbs on the [illegible] Tower, [illegible] file [illegible] [illegible], lesson based [illegible] 1A, 1B[illegible], [illegible] [illegible] [illegible]

TABLE 1

Specimen	Mean Temp. of Spec., F	Density as Tested lb/ft^3	*Thickness as tested inch	Temp. gradient in spec. deg F/inch	Thermal Conductivity BTU/hrft^2 (deg F/inch)
1	66.6	5.4	0.326	65.2	0.253
	29.2	5.7	.308	71.8	.231
2	66.1	7.6	.411	49.2	.290
	29.3	7.9	.392	50.6	.276
3	66.1	8.6	.258	77.8	.258
	29.2	9.1	.243	83.4	.244
4	66.4	15.1	.528	39.2	.434
	28.9	15.1	.531	36.9	.424
5	66.7	18.2	.479	48.0	.524
	29.0	18.4	.474	43.1	.514
6	66.7	25.0	.419	50.9	.646
	29.1	24.9	.419	48.4	.627
7	67.8	4.8	.774	38.5	.266
8	67.4	4.2	.930	25.1	.262
9	-	5.6**	-	-	-

* Thickness of specimens as tested, necessary to obtain good thermal contact with the test plates. The same total pressure (about 10 lbs on 64 sq.in.) was applied on each specimen during the tests at high and low mean temperatures. The different thicknesses observed were apparently due to dimensional changes with mean temperature.

** Material was not tested but density was calculated.

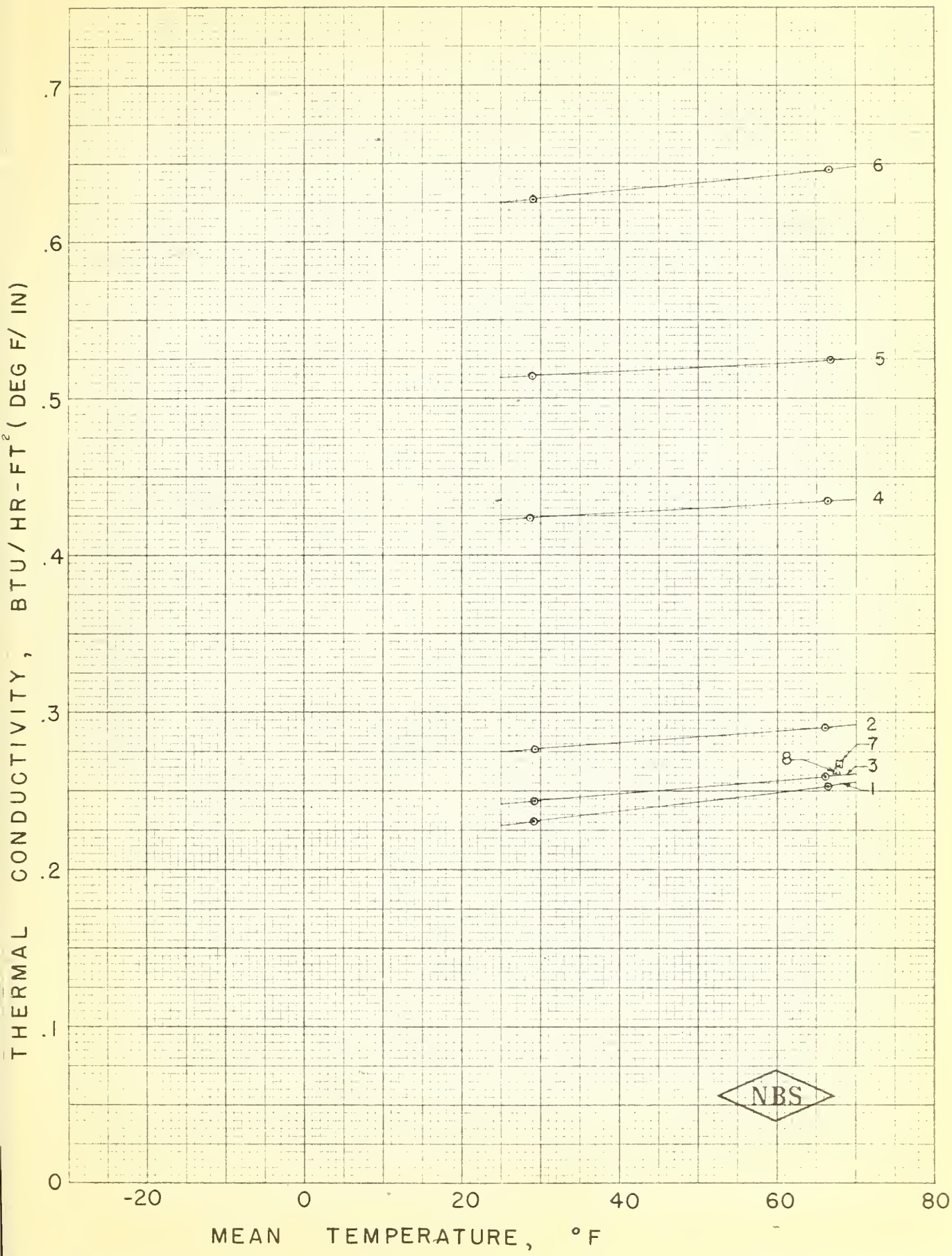
THERMAL CONDUCTIVITY, BTU/HR-FT^2(DEG F/IN)
.7
.6
.5
.4
.3
.2
.1
0
-20
0
20
40
60
80
MEAN TEMPERATURE, °F
6
5
4
2
7
8
3
1
NBS

FIG. 1

STAPLES