AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT		NBS REPORT
1000-30-4830	January 19, 1954	3063

THERMAL CONDUCTIVITY MEASUREMENTS OF THREE RUBBER-LIKE MATERIALS

by

Thomas W. Watson
Henry E. Robinson
Heating and Air Conditioning Section
Building Technology Division

to

Office of The Quartermaster General
Department of The Army

NBS

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

The publication, reprinting, or reproduction of this report in whole or in part, is prohibited unless permission is obtained in writing from the Office of the Director, National Bureau of Standards. Such permission is not needed, however, by an agency for which a report has been specifically prepared if that agency wishes to reproduce additional copies for that particular report for its own use.

Approved for public release by the Director of the National Institute of Standards and Technology (NIST) on October 9, 2015.

I. INTRODUCTION

At the request of the Office of The Quartermaster General, reference File QMGRJ 095, letter dated September 28, 1953, thermal conductivity measurements were made on three rubber-like materials to determine their insulation value.

2. MATERIALS

Sample No.	Size	Description
1	Two 8x8x0.4 inch	Tan low density Arctic rubber
2	Two 8x8x0.5 inch	Green Ensolite 122523
3	Two 8x8x0.4 inch	Tan high density Arctic rubber

3. 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-F-321b and of ASTM C177-45.

4. RESULTS

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

A plot of thermal conductivity of the specimens at 30°F mean temperature (K_{30}, BTU/hrft^2 (deg F/inch) versus density lb/ft^3 is shown in Figure 2. Data from NBS Report 2547 are included with the data of the present report, as a matter of interest. It is to be noted that the conductivity is approximately proportional to the density, especially at the lower densities.

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/hr ft^2 (deg F/inch)
1	63.5	10.0	0.415	49.4	0.318
	29.9	10.2	.407	49.9	.310
2	62.6	11.6	.538	35.0	.368
	29.7	11.6	.536	37.1	.356
3	63.6	23.9	.429	47.0	.521
	30.1	23.9	.428	48.1	.499

* Thickness of specimens as tested necessary to obtain good thermal contact with the test plates. The same total pressure (about 10 pounds 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.

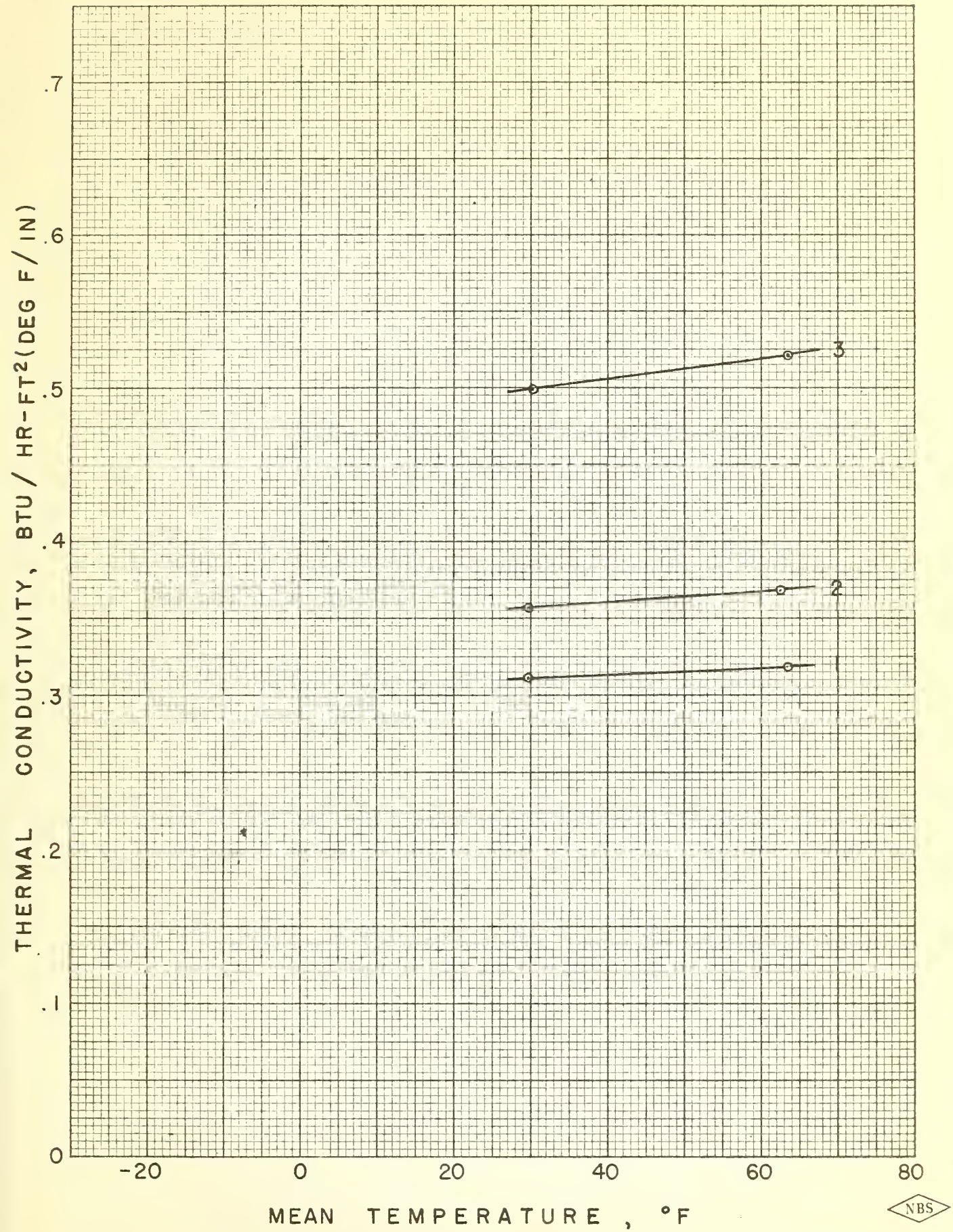

THERMAL CONDUCTIVITY, BTU / HR-FT²(DEG F / IN)
.7
.6
.5
.4
.3
.2
.1
0
-20
0
20
40
60
80
MEAN TEMPERATURE , °F
3
2
1
NBS

FIGURE 1

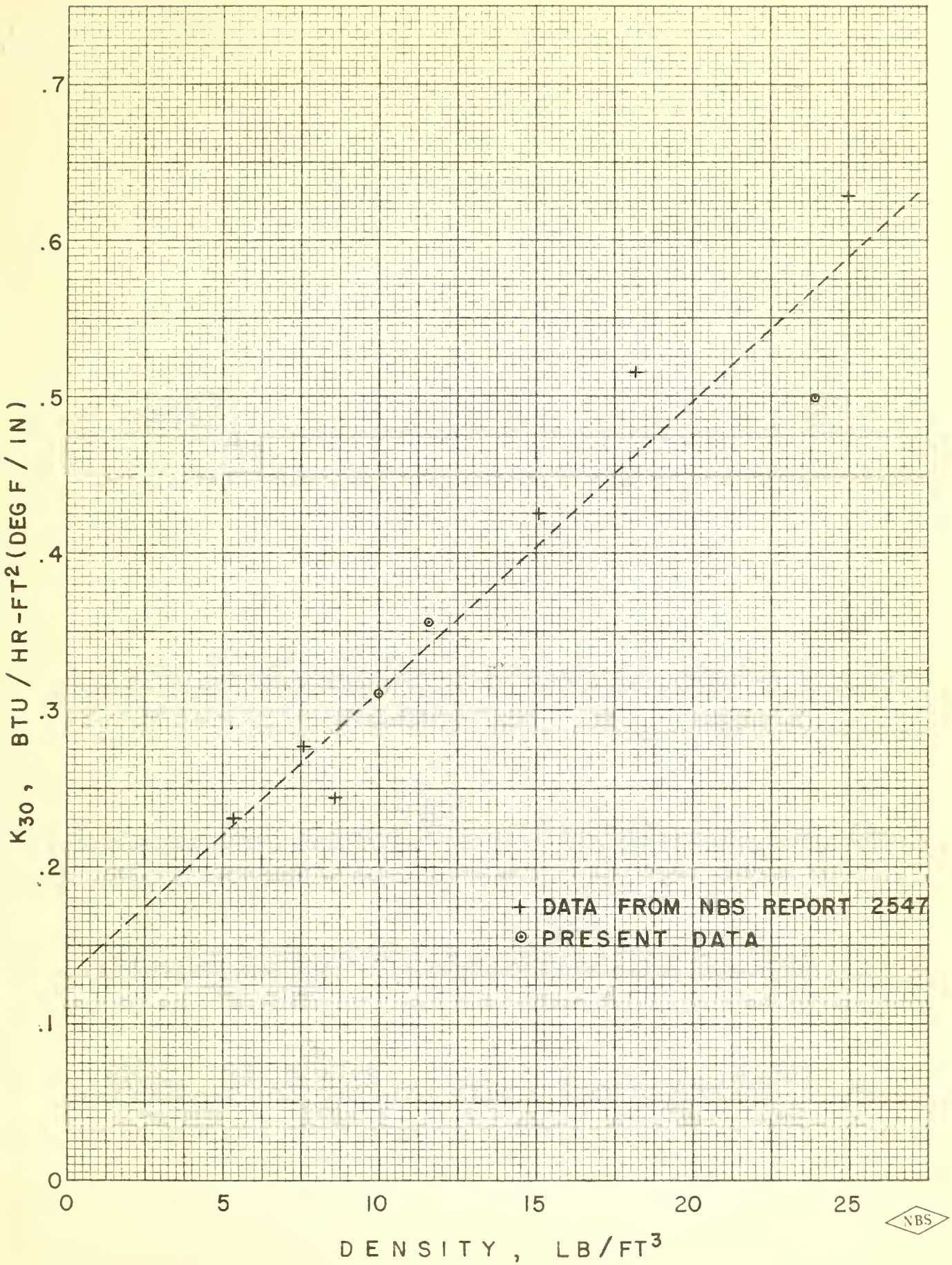

.7
.6
.5
.4
.3
.2
.1
0
0
5
10
15
20
25
K_{30}, BTU / HR-FT^2 (DEG F / IN)
DENSITY, LB/FT^3
+ DATA FROM NBS REPORT 2547
⊙ PRESENT DATA
NBS

FIGURE 2