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NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT

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THERMAL CONDUCTIVITY MEASUREMENTS OF TWO PAPERBOARD MATERIALS

by

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to

Department of The Army
Office of The Quartermaster General
Washington 25, D.C.

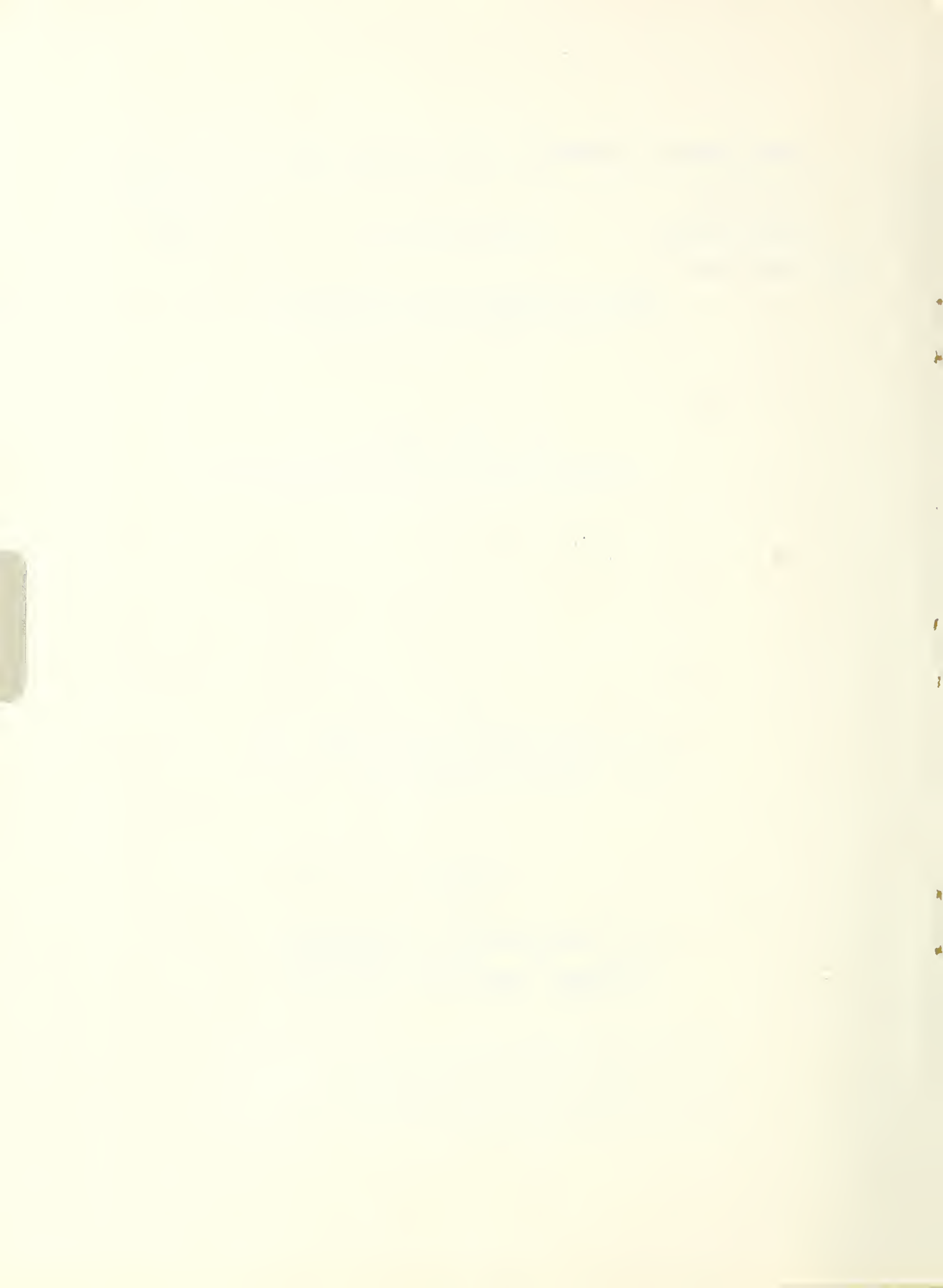


U. S. DEPARTMENT OF COMMERCE NATIONAL BUREAU OF STANDARDS

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1. INTRODUCTION

At the request of the Office of The Quartermaster General, reference File QSGX 400.112, letter dated March 15, 1954, thermal conductivity measurements were made on two paperboard materials to determine their insulation value.

2. MATERIALS

<u>Sample No.</u>	<u>Test Specimen</u>	<u>Description</u>
1	Two 6x6x1 inch specimens each consisting of 11 layers of paperboard, average thickness of paperboard 0.067 inch.	Paperboard material manufactured by Daylord Container Corporation, St. Louis, Mo.
2	Two 6x6x1 inch specimens each consisting of 10 pieces of paperboard, average thickness of paperboard 0.100 inch.	Paperboard material manufactured by the Container Corporation of America, Chicago, Ill.

III. TEST METHOD AND EQUIPMENT

The thermal conductivity of the specimens was measured in an 8-inch guarded hot-plate apparatus conforming with the requirements of Fed. Spec. 101-7-321b and of ASTM C177-45.

ARTICLE I

Section 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

SECTION 1

House of Representatives	Senate
<p>Representatives and Electors in each State shall have one Vote.</p> <p>Representatives and Electors in each State shall have one Vote.</p>	<p>Two Senators from each State.</p> <p>Two Senators from each State.</p>

SECTION 2

The House of Representatives shall be composed of Members chosen every second Year by the People of the several States, and the Electors in each State shall have one Vote.

specimens were made by piling together several plies of the paperboard material to obtain a thickness of approximately one-inch. The material was tested as received without drying. In the case of sample No. 2, the waxed surfaces of the paperboard faced the gold plate during the test. No wax was observed on any of the faces of sample No. 1.

4. RESULTS

A summary of the test data is given in Table 4 and a plot of thermal conductivity versus lead temperature is shown in Figure 1. Since the lowest lead temperature at which a determination could be made was about 43°F, extrapolation of the data by straight lines to lower temperatures involves some approximation. However, it is believed that within the accuracy required for practical purposes, such extrapolation would be permissible.

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TABLE 1

Specimen	Mean temp. of spec. °F	Density as tested lb/ft	Thickness as tested inch	Temp. gradient in spec. deg F/inch	Thermal conductivity Btu/hr ft (deg F/inch)	Thermal conductance of one ply Btu/hr ft ² (deg F)
1 (11 plies)	68.9	43.1	0.977	43.2	0.560	6.31
	40.4	43.1	.978	43.0	.530	6.05
2 (10 plies)	70.0	46.9	.997	44.3	.625	6.27
	40.8	46.9	.997	42.2	.593	5.95

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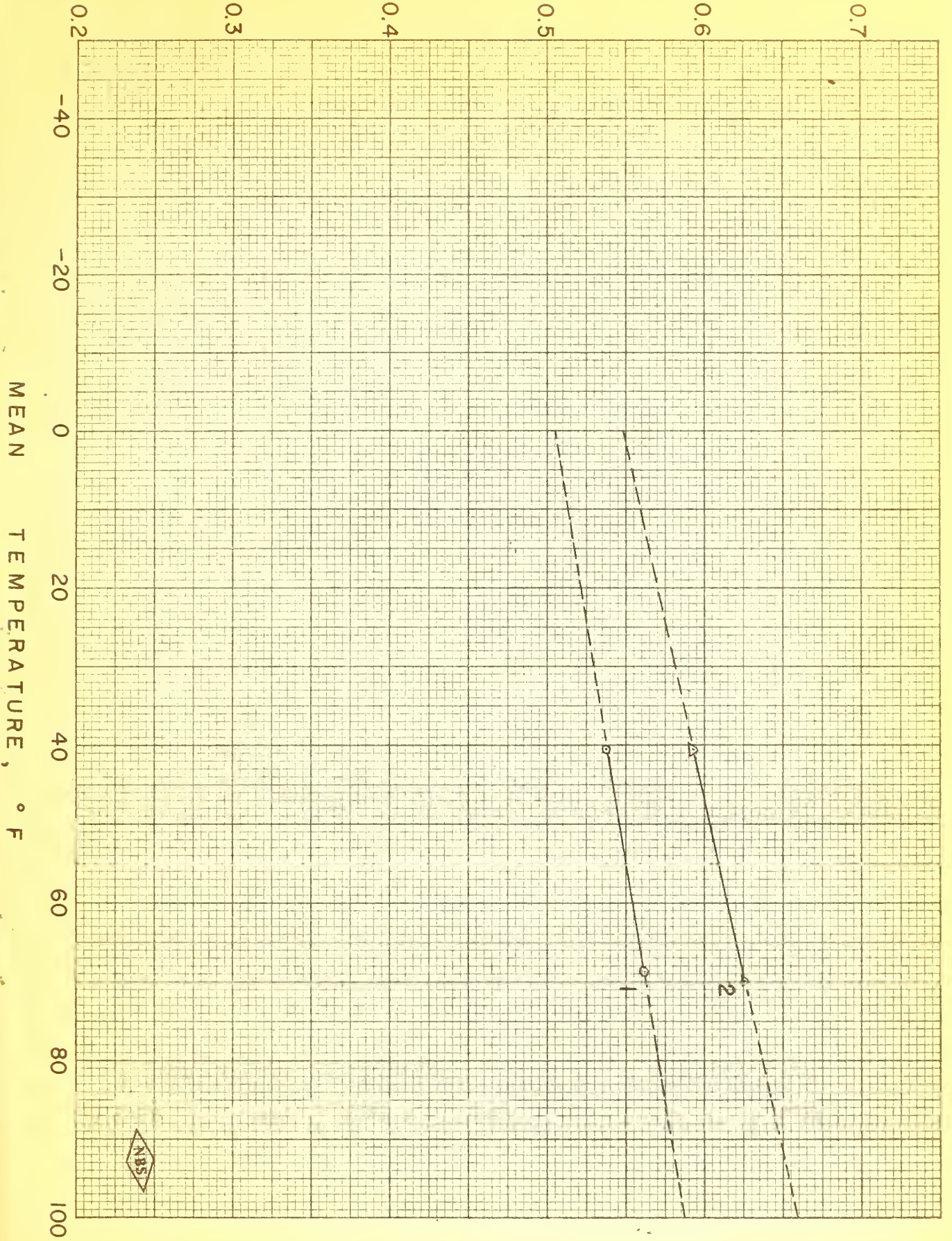
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THERMAL CONDUCTIVITY, BTU / HR-FT² (DEG F/IN)



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FIGURE 1

