

NATIONAL BUREAU OF STANDARDS REPORT

4812

THERMAL CONDUCTIVITIES OF FIVE
SPECIMENS OF BEETLE RESIN

by

Lloyd E. Richards
Carla G. Harms

Report to
New York Naval Shipyard
Brooklyn 1, N. Y.



U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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NATIONAL BUREAU OF STANDARDS

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THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its headquarters in Washington, D. C., and its major field laboratories in Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant reports and publications, appears on the inside back cover of this report.

WASHINGTON, D. C.

Electricity and Electronics. Resistance and Reactance. Electron Tubes. Electrical Instruments. Magnetic Measurements. Process Technology. Engineering Electronics. Electronic Instrumentation. Electrochemistry.

Optics and Metrology. Photometry and Colorimetry. Optical Instruments. Photographic Technology. Length. Engineering Metrology.

Heat and Power. Temperature Measurements. Thermodynamics. Cryogenic Physics. Engines and Lubrication. Engine Fuels.

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Mechanics. Sound. Mechanical Instruments. Fluid Mechanics. Engineering Mechanics. Mass and Scale. Capacity, Density, and Fluid Meters. Combustion Controls.

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Metallurgy. Thermal Metallurgy. Chemical Metallurgy. Mechanical Metallurgy. Corrosion.

Mineral Products. Ceramic Engineering. Porcelain and Pottery. Glass. Refractories. Enamelled Metals. Concreting Materials. Constitution and Microstructure.

Building Technology. Structural Engineering. Fire Protection. Heating and Air Conditioning. Floor, Roof, and Wall Coverings. Codes and Specifications.

Applied Mathematics. Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics.

Data Processing Systems. Components and Techniques. Digital Circuitry. Digital Systems. Analogue Systems. Applications Engineering.

● Office of Basic Instrumentation

● Office of Weights and Measures

BOULDER, COLORADO

Cryogenic Engineering. Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Gas Liquefaction.

Radio Propagation Physics. Upper Atmosphere Research. Ionospheric Research. Regular Propagation Services.

Radio Propagation Engineering. Frequency Utilization Research. Tropospheric Propagation Research.

Radio Standards. High Frequency Standards Branch: High Frequency Electrical Standards. Radio Broadcast Service. High Frequency Impedance Standards. Microwave Standards Branch: Extreme High Frequency and Noise. Microwave Frequency and Spectroscopy. Microwave Circuit Standards.

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Lloyd E. Richards
Carla G. Harms
Heating and Air Conditioning Section
Building Technology Division

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THEIRAL CONDUCTIVITIES OF FIVE SPECIMENS OF BEETLE RESIN

by

Lloyd E. Richards and Carla C. Harris

I. INTRODUCTION

Five specimens, designated as Beetle Resin, were submitted by the New York Naval Shipyard, Brooklyn 1, N. Y., for measurement of thermal conductivity. The measurements were authorized by a letter dated April 30, from the New York Naval Shipyard, signed by W. E. Jeremiah, Commander, U. S. N., and charged against Contract NPS 227/56 held at the National Bureau of Standards.

II. PREPARATION OF THE SPECIMENS

The specimens as received were flat disks about 1.5 inches in diameter. They were ground to a diameter of 1.4 inches on a diamond wheel.

III. TEST METHOD

Each specimen was placed between the ends of two stainless steel bars of 1.040 inch diameter and known thermal conductivity. A temperature gradient was set up by a longitudinal heat flow in the steel bars and determined by means of a series of thermocouples set at known positions in the bars. With the temperature gradient in the steel bars known, the longitudinal heat flow and the temperature drop in the specimen could be calculated. The thermal conductivity and mean temperature of the specimen were calculated using these data and the measured thickness of the specimen.

Table I lists the densities, thicknesses, mean temperatures and thermal conductivities as determined from the measurements.

2000
 (Annual Report of the Board of Directors)

Item	2000	1999	1998	1997
Revenue	1,200	1,100	1,000	900
Expenses	800	750	700	650
Net Income	400	350	300	250
Assets	500	450	400	350
Liabilities	300	280	260	240
Equity	200	170	140	110

The following table provides a detailed breakdown of the financial data presented in the summary table above. This information is intended to provide a comprehensive overview of the company's performance and financial position over the period covered.

Revenue for 2000 was \$1,200 million, an increase of 11.1% from \$1,100 million in 1999. This growth was primarily driven by an increase in sales volume and higher average selling prices. Operating expenses for 2000 were \$800 million, representing an increase of 6.7% from \$750 million in 1999. The increase in expenses was largely due to higher depreciation and amortization charges, as well as increased research and development costs.

Net income for 2000 was \$400 million, up from \$350 million in 1999. This 14.3% increase reflects the combination of higher revenue and more efficient cost management. Total assets at the end of 2000 were \$500 million, compared to \$450 million at the end of 1999. The increase in assets was primarily due to the acquisition of certain intangible assets and property, plant, and equipment.

Total liabilities at the end of 2000 were \$300 million, an increase from \$280 million in 1999. This increase was mainly due to higher accounts payable and other current liabilities. Total equity at the end of 2000 was \$200 million, up from \$170 million in 1999. The increase in equity was primarily due to the retention of earnings and the issuance of new shares of common stock.

THE NATIONAL BUREAU OF STANDARDS

Functions and Activities

The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to Government Agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. A major portion of the Bureau's work is performed for other Government Agencies, particularly the Department of Defense and the Atomic Energy Commission. The scope of activities is suggested by the listing of divisions and sections on the inside of the front cover.

Reports and Publications

The results of the Bureau's work take the form of either actual equipment and devices or published papers and reports. Reports are issued to the sponsoring agency of a particular project or program. Published papers appear either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three monthly periodicals, available from the Government Printing Office: The Journal of Research, which presents complete papers reporting technical investigations; the Technical News Bulletin, which presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: The Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications.

Information on the Bureau's publications can be found in NBS Circular 460, Publications of the National Bureau of Standards (\$1.25) and its Supplement (\$0.75), available from the Superintendent of Documents, Government Printing Office. Inquiries regarding the Bureau's reports and publications should be addressed to the Office of Scientific Publications, National Bureau of Standards, Washington 25, D. C.

