

FILE NAME: Kohler (KOH)

DATE: 1941 Aug

DOC#: KOH112

DOCUMENT DESCRIPTION: Bulletin - The American Ceramic Society

THE BULLETIN

OF THE AMERICAN CERAMIC SOCIETY

A Monthly Publication Devoted to Proceedings of The Society and Promotion of Cooperative Research of Technical, Scientific, and Art Questions

Volume 20

AUGUST, 1941

Number 8

PAPERS

DESCRIPTION OF HOT MODULUS OF RUPTURE AND HOT CRUSHING STRENGTH TESTS AND DISCUSSION OF RESULTS*

BY E. B. HUNT AND R. S. BRADLEY

ABSTRACT

The equipment and test procedures used to make modulus of rupture and crushing tests on refractory specimens at high temperatures are described and illustrated. The results of the tests at various temperatures are given for several types of fire-clay refractories and insulating firebrick.

I. Introduction

The tests ordinarily used to determine the strength of refractory materials are crushing strength, modulus of rupture at room temperature, and compression under load at high temperatures. Standard procedures for each of these tests, which have been accepted by the A.S.T.M., are designated as Methods of Tests C133-39 and C16-39T, respectively.

Test results are given frequently for crushing strength or modulus of rupture on samples which have been subjected to a prescribed heat treatment and then allowed to return to room temperature before testing. Although such results are interesting and valuable information has been obtained from them, they do not give any information as to the strength of these refractory materials while they were at this elevated temperature. Such information would be useful in the design of all high-temperature equipment, especially in the design of refractory shapes used in the construction of suspended arches and walls. This problem was considered to be of sufficient importance to justify the design of special equipment and the development of a test procedure.

II. Description of Equipment

(1) Modulus of Rupture

The furnace and test machine (see Figs. 1 and 2) were designed to withstand a total load of 24,000 lb. on either of the two test specimens at temperatures up to 2900°F. The steel frame supporting the hydraulic

jack is structurally independent of the furnace, and the total load applied to the test specimens is taken by this frame, which is above, below, and on each side of the furnace. Because this steel frame passes under the center bottom of the furnace, it is necessary to have outlets on each side for the furnace gases. The furnace is designed to permit the control of the temperature independently on each of the two test specimens, and it is fired with open-type gas burners (using 1000 B.t.u. natural gas at 4 lb. of pressure and air at 1 lb. of pressure).

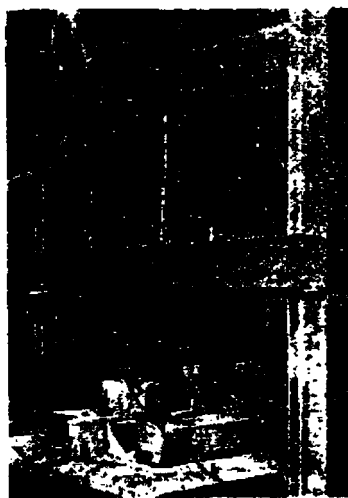


FIG. 1.

*Presented at the Forty-Third Annual Meeting, The American Ceramic Society, Baltimore, Md., April 1, 1941 (Refractories Division). Received April 2, 1941.

267

EXHIBIT

Castleman Dec - Pfulb v. AT&T

91

SC-CER-4230

ROSTER OF PAID CORPORATION MEMBERS

Abbé Engineering Co., New York, N. Y.
 Abingdon Sanitary Mfg. Co., Abingdon, Ill.
 A C Spark Plug Co., Flint, Mich.
 Adamston Flat Glass Co., Clarksburg, W. Va.
 Akron Porcelain Co., Akron, Ohio
 American Gas Assn., New York, N. Y.
 American Glass Corp., Greensburg, Pa.
 American Lava Corp., Chattanooga, Tenn.
 American Nepheline Corp., Rochester, N. Y.
 American Porcelain Enamel Co., Muskegon, Mich.
 American Potash & Chemical Corp., New York, N. Y.
 American Refractories Institute, Pittsburgh, Pa.
 American Rolling Mill Co., Middletown, Ohio
 American Stove Company, St. Louis, Mo.
 Amsler-Morton Co., Inc., Pittsburgh, Pa.
 Anchor Hocking Glass Corp., Lancaster, Ohio
 Arketex Ceramic Corp., Brazil, Ind.
 Armstrong Cork Co., Lancaster, Pa.
 Atlantic Terra Cotta Co., Perth Amboy, N. J.

Babcock & Wilcox Co., New York, N. Y.
 Ball Brothers Co., Muncie, Ind.
 Baltimore Enamel & Novelty Co., Baltimore, Md.
 Bardin, Paul, e Hijos, Soc. Anon. Com., Buenos Aires,
 Argentina, South America
 Bausch & Lomb Optical Co., Rochester, N. Y.
 Belden Brick Co., Canton, Ohio
 Blue Ridge Glass Corp., Kingsport, Tenn.
 Bonnot Company, Canton, Ohio
 Braun Corp., Los Angeles, Calif.
 Brockway Glass Company, Inc., Brockway, Pa.
 Buck Glass Company, Baltimore, Md.
 Buffalo Pottery Co., Buffalo, N. Y.

Canadian General Electric Co., Ltd., Peterborough,
 Ontario, Canada
 Canton Stamping & Enameling Co., Canton, Ohio
 Carborundum Company, Niagara Falls, N. Y.
 Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
 Carr-Lowrey Glass Co., Baltimore, Md.
 Celo Mines, Inc., Burnsville, N. C.
 Central Silica Company, Zanesville, Ohio
 Ceramic Color & Chemical Mfg. Co., New Brighton, Pa.
 Ceramics Publishing Co., Inc., Newark, N. J.
 Certain-Teed Products Corp., Buffalo, N. Y.
 Champion Spark Plug Co., Detroit, Mich.
 Chattanooga Glass Co., Chattanooga, Tenn.
 Chicago Hardware Foundry Co., North Chicago, Ill.
 Chicago Pottery Co., Chicago, Ill.
 Chicago Vitreous Enamel Product Co., Cicero, Ill.
 Clark, N., & Sons, San Francisco, Calif.
 Colonial Insulator Co., Akron, Ohio
 Commercial Decal Products, Inc., East Liverpool, Ohio
 Consolidated Feldspar Corp., Trenton, N. J.
 Coors Porcelain Company, Golden, Colo.
 Corhart Refractories Co., Inc., Louisville, Ky.
 Corning Glass Works, Corning, N. Y.
 Crane Enamelware Company, Chattanooga, Tenn.
 Crooksville China Co., Crooksville, Ohio
 Crossley Machine Co., Trenton, N. J.
 Crossman Company, South Amboy, N. J.
 Crown Potteries Co., Evansville, Ind.

DeVilbiss Co., Toledo, Ohio
 Dixon, Joseph, Crucible Co., Jersey City, N. J.
 Drakenfeld, B. F., & Co., New York, N. Y.
 Du Pont de Nemours, E. I., & Co., R. & H. Chemicals
 Dept., Wilmington, Del.

Edgar Plastic Kaolin Co., Metuchen, N. J.
 Electric Auto-Lite Co., Fostoria, Ohio
 Electro Refractories & Alloys Corp., Buffalo, N. Y.

Empire Sheet & Tin Plate Co., Mansfield, Ohio
 Engelhard, Charles, Inc., Newark, N. J.
 English China Clays Sales Corp., New York, N. Y.
 Eureka Flint & Spar Co., Trenton, N. J.
 Exolon Company, Blasdel, N. Y.

Fabrica de Ladrillos Industriales y Refractarios, Mon-
 terrey, N. L., Mexico
 Fairfacts Company, Inc., Trenton, N. J.
 Federal Seaboard Terra Cotta Corp., Perth Amboy, N. J.
 Ferro Enamel Corp., Cleveland, Ohio
 Ferro Enamels (Australia) Pty. Ltd., Alexandria, N.S.W.,
 Australia
 Findlay Clay Products Co., Washington, Pa.
 Foote Mineral Co., Philadelphia, Pa.
 Fords Porcelain Works, Perth Amboy, N. J.
 Fostoria Glass Co., Moundsville, W. Va.
 Frazier-Simplex, Inc., Washington, Pa.

Garco Products, Inc., Butler, Pa.
 Gayner Glass Works, Salem, N. J.
 General Ceramics Co., New York, N. Y.
 General Electric Co., Lamp Dept., Pitney Glass Works,
 Nela Park, Cleveland, Ohio
 George, W. S., Pottery Co., East Palestine, Ohio
 Gillinder Brothers, Inc., Port Jervis, N. Y.
 Gladding, McBean & Co., Lincoln, Placer County, Calif.
 Gleason-Tiebout Glass Co., Maspeth, N. Y.
 Glenboig Union Fireclay Co., Ltd., Glenboig, Scotland
 Great Lakes Foundry Sand Co., Detroit, Mich.
 Great Lakes Steel Corp., Detroit, Mich.
 Green, A. P., Fire Brick Co., Mexico, Mo.

Haeger Potteries, Inc., Dundee, Ill.
 Hall China Company, East Liverpool, Ohio
 Hancock Brick & Tile Co., Findlay, Ohio
 Hanley Company, Summerville, Pa.
 Hanovia Chemical & Mfg. Co., Newark, N. J.
 Hardinge Company, Inc., York, Pa.
 Harshaw Chemical Co., Cleveland, Ohio
 Hartford-Empire Co., Hartford, Conn.
 Haws Refractories Company, Johnstown, Pa.
 Hazel-Atlas Glass Co., Wheeling, W. Va.
 Hommel, O., Co., Pittsburgh, Pa.
 Houze, L. J., Convex Glass Co., Point Marion, Pa.
 Humphries Manufacturing Co., Mansfield, Ohio
 Hygrade Sylvania Corp., Emporium, Pa.

Illinois Clay Products Co., Joliet, Ill.
 Industrial Ceramic Products, Inc., Columbus, Ohio
 Ingram-Richardson Mfg. Company of Indiana, Inc.,
 Frankfort, Ind.
 International Clay Machinery Co., Dayton, Ohio
 International Smelting & Refining Co., Akron, Ohio
 Ironton Fire Brick Co., Columbia, S. C.
 Isolantite, Incorporated, Belleville, N. J.

Jova Brick Works, Roseton, N. Y.

Kaolin, Incorporated, Spruce Pine, N. C.
 Kentucky Clay Mining Co., Mayfield, Ky.
 Kentucky-Tennessee Clay Co., Mayfield, Ky.
 Knowles, Edwin M., China Co., Newell, W. Va.
 Kohler Company, Kohler, Wis.
 Koppers Company, Pittsburgh, Pa.
 Kraftile Company, Niles, Calif.

Laclede-Christy Clay Products Co., St. Louis, Mo.
 Lancaster Iron Works, Lancaster, Pa.
 Lapp Insulator Co., Inc., Le Roy, N. Y.
 Laughlin, Homer, China Co., Newell, W. Va.
 Lava Crucible Co. of Pittsburgh, Pittsburgh, Pa.

Lee Clay Products Company, Clearfield, Ky.
Libbey Glass Company, Toledo, Ohio
Libbey-Owens-Ford Glass Co., Toledo, Ohio
Locke Insulator Corp., Baltimore, Md.
Louthan Manufacturing Co., East Liverpool, Ohio
Lynch, A. J., & Co., Los Angeles, Calif.

Mansfield Sanitary Pottery, Inc., Perrysville, Ohio
Maryland Glass Corp., Baltimore, Md.
Maxson, Elwyn L., Los Angeles, Calif.
McHose, L. H., Inc., Perth Amboy, N. J.
McKee, Arthur G., & Co., Cleveland, Ohio
Metal & Thermit Corp., New York, N. Y.
Metro Glass Bottle Co., Jersey City, N. J.
Mexico Refractories Co., Mexico, Mo.
Mississippi Glass Co., New York, N. Y.
Mitchell Clay Mfg. Co., St. Louis, Mo.
Moore Enameling & Mfg. Co., West Lafayette, Ohio
Moore & Munger, New York, N. Y.
Mosaic Tile Company, Zanesville, Ohio
Mount Clemens Pottery Co., Mount Clemens, Mich.

National Engineering Co., Chicago, Ill.
National Fireproofing Corp., Pittsburgh, Pa.
National Gypsum Co., Clarence Center, N. Y.
National Industrial Sand Assn., Washington, D. C.
National Lead Co., Brooklyn, N. Y.
National Lime and Stone Co., Findlay, Ohio
New Castle Refractories Co., New Castle, Pa.
New Jersey Porcelain Co., Trenton, N. J.
New Jersey Pulverizing Co., New York, N. Y.
Nippon Gaiishi Kaishiki Kaisha, Nagoya, Japan
Nippon Toki Kaisha, Ltd., Nagoya, Japan
North American Refractories Co., Cleveland, Ohio
North Carolina Feldspar Corp., Erwin, Tenn.
Norton Company, Worcester, Mass.

Ohio Clay Co., Cleveland, Ohio
Ohio Hydrate & Supply Co., Woodville, Ohio
Ohio Insulator Company Div., Ohio Brass Co., Barberton, Ohio
Old Hickory Clay Co., Paducah, Ky.
Olean Tile Co., Olean, N. Y.
Onondaga Pottery Co., Syracuse, N. Y.
Orefraction, Inc., Pittsburgh, Pa.
Orton, Edward, Jr., Ceramic Foundation, Columbus, Ohio
Owens-Illinois Glass Co., Alton, Ill.
Owens-Illinois Pacific Coast Co., San Francisco, Calif.

Pacific Clay Products, Los Angeles, Calif.
Pacific Coast Borax Co., New York, N. Y.
Pacific Tile & Porcelain Co., Los Angeles, Calif.
Paper Makers Importing Co., Inc., Easton, Pa.
Pass & Seymour, Inc., Solvay, N. Y.
Pennsylvania Pulverizing Co., Lewistown, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Pfaudler Company, Rochester, N. Y.
Pittsburgh Plate Glass Co., Creighton, Pa.
Porcelain Enamel & Mfg. Co., Baltimore, Md.
Porcelain Products, Inc., Findlay, Ohio
Portsmouth Clay Products Co., Portsmouth, Ohio
Potters Supply Co., East Liverpool, Ohio
Precision Grinding Wheel Co., Philadelphia, Pa.

Quigley Company, Inc., New York, N. Y.

Ramite Co., Chicago, Ill.
Ransome Concrete Machinery Co., Dunellen, N. J.
Remmey, Richard C., Son Co., Philadelphia, Pa.

Republic Steel Corp., Youngstown, Ohio
Rickman & Rappe, Köln-Kalk, Germany
Riddell, W. A., Co., Bucyrus, Ohio
Roseville Pottery Co., Zanesville, Ohio
Ross-Tacony Crucible Co., Philadelphia, Pa.
Rundle Manufacturing Co., Milwaukee, Wis.
Rustless Iron Co., Ltd., Keighley, England

Safety Grinding Wheel & Machine Co., Springfield, Ohio
San Miguel Brewery, Inc., Manila, P. I.
Schundler, F. E., & Co., Inc., Joliet, Ill.
Seagram, Joseph E., & Sons, Inc., Louisville, Ky.
Shenango Pottery Company, New Castle, Pa.
Simonds Worden White Co., Dayton, Ohio
Smith & Stone, Ltd., Georgetown, Ontario, Canada
Solvay Process Company, Syracuse, N. Y.
Spinks, H. C., Clay Co., Newport, Ky.
Square D Company, Detroit, Mich.
Standard Brick and Tile Corp., Evansville, Ind.
Standard Lime & Stone Co., Baltimore, Md.
Standard Sanitary Mfg. Co., Louisville, Ky.
Star Porcelain Co., Trenton, N. J.
Stark Brick Co., Canton, Ohio
Stauffer Chemical Co., Inc., New York, N. Y.
Steele, J. C., & Sons, Statesville, N. C.
Sterling Grinding Wheel Co., Tiffin, Ohio
Structural Clay Products Institute, Washington, D. C.
Stupakoff Laboratories, Inc., Latrobe, Pa.
Summitville Face Brick Co., Summitville, Ohio
Sur Enamel & Stamping Works, Ltd., Calcutta, India
Surface Combustion Corp., Toledo, Ohio
Swindell Brothers, Baltimore, Md.
Swindell-Dressler Corp., Pittsburgh, Pa.

Taylor, Smith, & Taylor Co., Chester, W. Va.
Texas Mining & Smelting Co., Laredo, Texas
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
Toyo Toki Kaisha, Kokura City, Japan
Trenton Potteries Co., Trenton, N. J.
Twyford, Limited, Stoke-on-Trent, England
Tyler, W. S., Company, Cleveland, Ohio

Union Electrical Porcelain Works, Inc., Trenton, N. J.
United Clay Mines Corp., Trenton, N. J.
United Glass Bottle Mfrs., Ltd., London, England
United States Gypsum Co., Chicago, Ill.
Universal Clay Products Co., Sandusky, Ohio
Universal Dental Co., Philadelphia, Pa.
Universal Sanitary Mfg. Co., New Castle, Pa.

Vanderbilt, R. T., Company, New York, N. Y.
Vereeniging Brick & Tile Co., Ltd., Vereeniging, Transvaal, South Africa
Vesuvius Crucible Co., Swissvale, Pa.
Victor Insulators, Inc., Victor, N. Y.
Vitrefrax Corporation, Los Angeles, Calif.
Vitreous Steel Products Co., Cleveland, Ohio
Vitre Manufacturing Co., Pittsburgh, Pa.

Wallace China Co., Ltd., Huntington Park, Calif.
Waltham Grinding Wheel Co., Waltham, Mass.
Washington Porcelain Co., Washington, N. J.
Wayne Laboratories, Waynesboro, Pa.
Western Brick Co., Danville, Ill.
Western Electric Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Derry, Pa.
West Virginia Brick Co., Charleston, W. Va.
Wheeling Steel Corp., Yorkville, Ohio
Wisconsin Porcelain Co., Sun Prairie, Wis.

CORPORATION MEMBERSHIPS ARE PROFITABLE INVESTMENTS
