

FORMED METAL PORCELAIN ENAMELED SANITARY WARE

National Bureau of Standards
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COMMERCIAL STANDARD CS144-47

Effective Date for New Production from November 1, 1947



A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES DEPARTMENT OF COMMERCE

W. AVERELL HARRIMAN, Secretary

COMMODITY STANDARDS

Simplified Practice Recommendations and Commercial Standards are developed by manufacturers, distributors, and users in cooperation with the Commodity Standards Division ¹ of the National Bureau of Standards. The purpose of Simplified Practice Recommendations is to eliminate avoidable waste through the establishment of standards of practice for stock sizes and varieties of specific commodities that currently are in general production and demand. The purpose of Commercial Standards is to establish standard methods of test, rating, certification, and labeling of commodities, and to provide uniform bases for fair competition.

The adoption and use of a Simplified Practice Recommendation or Commercial Standard is voluntary. However, when reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

A Simplified Practice Recommendation or Commercial Standard originates with the proponent industry. The sponsors may be manufacturers, distributors, or users of the specific product. One of these three elements of industry submits to the Commodity Standards Division the necessary data to be used as the basis for developing a standard of practice. The Division, by means of assembled conferences or letter referenda, or both, assists the sponsor group in arriving at a tentative standard of practice and thereafter refers it to the other elements of the same industry for approval or for constructive criticism that will be helpful in making any necessary adjustments. The regular procedure of the Division assures continuous servicing of each effective Simplified Practice Recommendation and Commercial Standard, through review and revision, whenever, in the opinion of the industry, changing conditions warrant such action. Simplified Practice Recommendations and Commercial Standards are printed and made available by the Department of Commerce, through the Government Printing Office.

COMMERCIAL STANDARD FOR FORMED METAL PORCELAIN ENAMELED SANITARY WARE

On March 21, 1947, at the instance of the Formed Metal Plumbing Ware Association, the recommended Commercial Standard for Formed Metal Porcelain Enameled Sanitary Ware, proposed by the Formed Metal Plumbing Ware Association, and adjusted in accordance with comment from other interested organizations, was submitted to the trade for written acceptance. Those concerned have since accepted and approved the standard as shown herein.

Project Manager: A. S. BEST, Commodity Standards Division,
National Bureau of Standards.

Technical Adviser: W. N. HARRISON, Mineral Products Division,
National Bureau of Standards.

¹ Effective July 1, 1947, the Division of Simplified Practice, organized in 1921, and the Division of Trade Standards, organized in 1927, were combined to form the Commodity Standards Division. Since their organization, both of these Divisions have assisted many industries in the development of Simplified Practice Recommendations and Commercial Standards for a wide variety of commodities. A list of previously established Commercial Standards appears herein. A list of effective Simplified Practice Recommendations may be obtained from the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

COMMERCIAL STANDARD CS144-47

for

FORMED METAL PORCELAIN ENAMELED SANITARY WARE

PURPOSE

1. The purpose of this commercial standard is to establish standard specifications, definitions, inspection rules, and methods of tests for formed metal porcelain enameled sanitary ware, for the guidance of manufacturers, distributors, and users of this product. By general acceptance and use of the standard, and by certifying conformity with its requirements, essential quality is established, thereby promoting fair competition and greater consumer acceptance, to the mutual advantage of all concerned.

GENERAL REQUIREMENTS

2. *Material of base.*—Formed metal porcelain enameled sanitary ware shall be formed from sheet iron or steel of suitable cold drawing and porcelain enameling grade, with thickness not less than the minimum specified below for No. 14 gage, except as follows: Sinks or sink and tray combinations 42 inches in length or less, and bathtub aprons, may be No. 16 gage; other detachable or nonload-bearing aprons and panels may be made from lighter gages.

Gage number.....	No. 14	No. 16
Standard thickness, inch.....	0.0747	0.0598
Minimum thickness, inch.....	.069	.055

NOTE.—Gage numbers and thicknesses conform to the Manufacturers' Standard Gage for sheet metal, with commercial tolerances for minimum thicknesses.

3. *Porcelain enamel.*—Surfaces shall be coated with porcelain enamel, applied by the wet process, and thoroughly fused at or above a red heat to the metal base. Porcelain enamel shall be applied to all surfaces, visible as well as concealed. The cover coat on all surfaces normally visible after installation shall be acid-resisting porcelain enamel of uniform color. For white ware, the reflectance of the white cover coat shall be not less than 0.72 (72 percent) when determined as specified in paragraphs 14 and 15. The porcelain enamel, regardless of color, shall be glossy, smooth and free from craze, chips, or other flaws which affect the appearance or may affect the serviceability of the fixtures. Blemishes shall not exceed the number shown in table 1. Porcelain enamel shall pass successfully the lemon and citric acid tests specified in paragraphs 11 and 12. The acid-resisting portion of the porcelain enamel shall be not less than 0.005 inch thick, as determined by the method of test specified in paragraph 13.

TABLE 1.—Formed metal porcelain enameled sanitary ware—allowable blemishes for first quality ^a

Blemish	Size or appearance	Maximum number allowed per inspection window (3-in. diam.)	Maximum number allowed per fixture
Specks.....	{ Small.....	2	(b)
	{ Medium.....	1	8
	{ Large.....	1	2
Dimples.....		1	8
Lumps.....		1	8

^a See definitions, par. 7, and method of inspection, par. 8.^b Not to be counted.

4. *Dimensions and variations.*—Fixtures shall conform to the dimensions specified by the manufacturer, subject to a variation of not more than plus or minus $\frac{1}{8}$ inch, except when maximum and minimum limits are specified. Warpage of edges that set against the wall or floor shall not exceed $\frac{1}{16}$ inch per foot as determined by the method specified in paragraph 9. Warpage of all other edges shall not exceed $\frac{3}{32}$ inch per foot as determined by the same method.

5. *Rigidity.*—Fixtures shall withstand the test for rigidity specified in paragraph 16.

6. *Marking.*—Labels shall be used only on such ware as conforms to the requirements for “first quality” as set forth in this commercial standard. The following uniform statement on labels, used in conjunction with the manufacturer’s name and address, is recommended:

The manufacturer declares this porcelain enameled plumbing fixture to be first quality and to meet the requirements and tests of Commercial Standard CS144-47, as developed by the trade under the procedure of the National Bureau of Standards, and issued by the United States Department of Commerce.

7. *Definitions* applicable to enameled formed metal ware are as follows:

Craze.—A crack in the enameled surface.

Dimple.—A slight depression in the enameled surface.

Inspection window.—A circle 3 inches in diameter cut from a small sheet of any flexible material such as rubber or paper, for convenience in sliding over irregular surfaces to determine segregation.

Lift.—An area of metal base from which the enamel has separated.

Lump.—A raised portion of enameled surface.

Pinhole.—A hole that extends through the enamel to the metal base.

Segregation.—A collection of blemishes within the inspection window greater than permitted by table 1.

Specks:

Small.—Particles of foreign matter that produce a colored portion of the surface $\frac{1}{100}$ to $\frac{1}{64}$ inch in maximum dimension.

Medium.—The same, except over $\frac{1}{64}$ to $\frac{1}{32}$ inch in maximum dimension.

Large.—The same, except over $\frac{1}{32}$ to $\frac{1}{16}$ inch in maximum dimension.

Waviness.—The appearance of irregular surface in the glaze. Some waviness in an enameled surface is unavoidable and is not cause for rejection.

METHODS OF INSPECTION AND TESTS

8. *Method of inspecting surfaces of enameled ware.*—Examine the fixture with the eyes of the observer about 2 feet from the surface observed. The light source shall be partially diffused daylight, supplemented, if necessary, with diffused artificial light, the total being of intensity approximating that usually available within a few feet of an outside window, but not in direct sunlight. No actual count or measure of blemishes should be attempted except in case of doubt, since with practice, dimensional limits and numbers can be readily gaged by the eye.

9. *Method of determining warpage.*—The fixture shall be placed on a flat surface so as to ascertain the amount of deviation from the horizontal plane at the edges of the fixture. If a feeler gage of thickness equal to the total allowable warpage will not slide under the fixture without forcing, the fixture satisfactorily comes within the warpage limitations. If the fixture will rock on two opposite high corners, the horizontal plane shall be determined by placing one feeler gage of the total warpage allowed under one low corner and forcing the fixture down on this gage. If a second feeler gage of the same thickness will not slide under the fixture at any other point, the fixture is not warped out of the horizontal plane by more than the specified tolerance and satisfactorily comes within the warpage limitations.

10. *Methods of determining acid resistance of enamel.*

10a. *Methods of test.*—Acid-resisting enamel shall be subjected either to the lemon test or to the citric-acid test, as specified below, but in cases of dispute the citric-acid test shall be the umpire test. The test for subsurface acid resistance may be made at the option of the purchasing agency or the inspector.

11. *Lemon test.*—A freshly cut half of a normally ripe lemon shall be applied to a cleaned area of the enameled ware, and after 24 hours at room temperature the lemon shall be removed and the surface washed with water and wiped dry. No effect on the enamel shall be visible upon careful inspection.

12. *Citric-acid test (umpire test).*—A fresh test solution made of 1 part citric-acid crystals to 10 parts water by weight shall be applied to the surface of the enamel for 15 minutes, at the end of which period, after washing and drying, no effect of the acid on the treated area shall be visible upon careful inspection. The ware and the acid solution shall have been stored for not less than 3 hours immediately preceding the tests in atmosphere at 80° F, plus or minus 10° F, and the tests shall be made under these conditions of temperature. The test solution shall be applied to clean areas in pools consisting of several drops, and covered with a watch glass to hold the solution in place.

13. *Test for subsurface acid resistance of enameled coatings on formed metal plumbing fixtures.*—The test is ordinarily made on a flat or nearly flat specimen 2 inches square cut from a fixture.

13a. Grind off the enamel so as to expose a smooth oblique section of the coating and part of the metal base. Specimens cut from the article may be ground along a cut edge. The oblique section of enamel shall be 1.0 cm, plus or minus 0.25 cm, wide. The abrasive used in

grinding shall pass a No. 150 sieve and shall be moistened during grinding.

13b. Mark the boundary between the original glossy surface and the treated surface of the enamel by a very narrow line, made with a ceramic underglaze pencil, and rub with a dry cloth until any marking on the glossy surface is removed. With the same marking agent, make three straight lines, as narrow as can be plainly seen, at intervals of 1 cm or more, across the oblique section of enamel, perpendicular to the boundary between the enamel and the exposed metal base. None of these lines shall be closer than $\frac{1}{2}$ inch to an edge of the specimen which was an edge of the original article. At each of these lines, measure the average width of the oblique section of enamel between the exposed metal base and the glossy enamel.

13c. Restore the gloss to the ground enamel surface by refiring just sufficiently to obtain a fire polish. The polished surface shall permit ready cleaning with a dry cloth, of marks made by a colored wax pencil.

13d. Apply the citric-acid test, as specified in paragraph 12, to the full width of the fire-polished oblique section. The cut specimens may be immersed in the test solution. After application of the test solution for 15 minutes, the treated surface shall be washed and dried.

13e. The entire oblique section shall be rubbed with a colored wax pencil, and the deposit of colored wax rubbed with a dry cloth. The acid-resistant portion of the enamel coating will have retained its fire polish in the acid solution, and the wax pencil deposit will be readily removed from it, but will remain on the etched portion of the cross section.

13f. The acid-resistant band of enamel in the oblique section will be bounded on one side by the colored wax deposit, and on the other by the edge of the ceramic pencil mark adjacent to the original glossy surface of the enamel. Measure the width of this acid-resistant band at the three pencil marks along which the width of this total oblique section was previously measured, and compute the average width ratio of the acid-resistant portion to the total oblique section of enamel. All measurements on the oblique section shall be made with an accuracy of 0.1 mm, using a low-power microscope. Measure the total enamel thickness adjacent to the location of the measurements described above, using a Brenner magnetic thickness gage or other suitable means having an error less than 0.001 inch. Multiply the mean value for total thickness by the mean ratio of acid-resisting enamel to total enamel, determined as described above. The product gives the thickness of the acid-resisting portion of the enamel coating.

14. *Reflectance test for opaque white porcelain enamels.*²

14a. *Purpose.*—The purpose of the test is to determine what fraction of the daylight incident on a given specimen is diffusely reflected. The apparent reflectance of the specimen (for brevity, referred to herein as reflectance) is measured in such a way that the specularly reflected component is left out of account.³

14b. *Standard condition of test specimens to be measured.*—Specimens to be measured should be approximately white (or nonselective),

² This test was published March 1937 by the Porcelain Enamel Institute.

³ An instrument such as the multipurpose photoelectric reflectometer described in Research Paper RP1345, published in National Bureau of Standards Journal of Research, November 1940, will meet the specified conditions.

reasonably free from defects, including the wavy condition known as orange peel, and flat. If a specimen to be tested is not flat, it may be mechanically forced into a flat position during testing, when this is practicable.

14c. *Standard area to be measured and precision of determinations.*—An area not less than that of a circle 5 cm in diameter shall be measured in each reflectance determination. A determination shall comprise a sufficient number of readings so that the average can be reproduced in successive determinations within a spread of 0.005 (0.5 percent) reflectance.

14d. *Reflectance standards.*—The primary standard of comparison shall be magnesium oxide prepared in accordance with Letter Circular of the National Bureau of Standards, LC395. The secondary standards shall consist of enameled plaques that have been accurately calibrated against standard magnesium oxide at the National Bureau of Standards.

15. *Standard type reflectometer and conditions of reflectance measurement.*

15a. *Angular conditions of illuminating and viewing.*—The standard type of reflectometer shall provide for illumination in a direction approximately normal to the surface of the specimen. Furthermore, the source of light shall be located so that a line normal to the surface of the specimen and passing approximately through the center of the area under inspection will also pass through the center of the light source. Observations shall be made in a manner such that the center of the receiving element (eye or photo cell) receives light reflected at 45° from the approximate center of the observed surface of the specimen. Other conditions of illumination and viewing that are optically equivalent to these, such as interchanging the positions of the light source and receiving element, may be used.

15b. *Illuminant-observer spectral conditions.*—The combination of spectral distribution of energy of the illuminant and the spectral sensitivity of the observing element shall be equivalent to observation in average daylight by the human eye.

16. *Test for rigidity.*—With the fixture supported as in a normal installation, gently lower a weight of 300 pounds, plus or minus 10 pounds, on the fixture so as to center the weight horizontally within 5 inches of an outside corner, or within 5 inches of the middle front if the fixture is rounded in horizontal cross section. The weight shall be permitted to bear on an area of approximately 100 square inches, covered by a $\frac{1}{2}$ -inch thickness of sponge rubber or other suitable soft material, and a weight distribution board of the same area and $\frac{3}{4}$ to $1\frac{1}{2}$ inches thick. Allow weight to remain not less than 1 minute and not more than 10 minutes. After removal of the weight, there shall be no visible permanent deformation of the fixture or the supports furnished with it, and no cracking, chipping, or other damage to the enamel.

STANDING COMMITTEE

The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Each organization nominated its own representatives. Comment con-

cerning the standard and suggestions for revision may be addressed to any member of the committee or to the Commodity Standards Division, National Bureau of Standards, which acts as secretary for the committee.

E. P. CALKINS, Chairman

E. P. CALKINS, General Porcelain Enameling & Mfg. Co., Chicago 39, Ill.
 O. F. DEPPERMAN, Briggs Manufacturing Co., Detroit 11, Mich.
 JACQUES STANITZ, Mullins Manufacturing Corporation, Salem, Ohio.
 THOMAS B. RILEY, Norris Stamping and Manufacturing Co., Los Angeles 11, Calif.
 F. R. PORTER, Inland Steel Co., East Chicago, Ind.
 B. D. BRUCE, Chicago Vitreous Enamel Product Co., Cicero 50, Ill.
 T. SMITH TAYLOR, United States Testing Co., 1415 Park Avenue, Hoboken, N. J.
 G. A. BAEHR, (J. A. Hennessy, alternate), Sears, Roebuck & Co., Chicago 7, Ill.
 (representing Mail Order Association of America).
 R. V. FOWLER, Consolidated Supply Co., Portland 4, Oreg.
 J. L. MURPHY, New York 21, N. Y. (representing National Association of Master Plumbers).
 CHARLOTTE PAYNE, National Council of Women of the United States, New York 22, N. Y.
 ROBERT A. WOOD, Western Plumbing Officials Association, Los Angeles 32, Calif.

HISTORY OF PROJECT

A request for the cooperation of the National Bureau of Standards in the establishment of a commercial standard for formed metal porcelain enameled sanitary ware was received from the Formed Metal Plumbing Ware Association under date of May 11, 1945. A proposed draft of the standard was subsequently received from the Association. It included certain recommendations previously embodied in the Federal specification for formed metal plumbing fixtures, WW-P-542.

The proposed standard was circulated to representative manufacturers, distributors, testing laboratories, Government agencies, and user organizations on November 20, 1945, for comment. Following adjustment to suit the composite suggestions received, a revised draft was circulated on March 21, 1947, to the entire industry for acceptance. Upon receipt of signed acceptances representing more than a satisfactory majority of production volume, and in the absence of objections, the approval of the Commercial Standard, Formed Metal Porcelain Enameled Sanitary Ware, CS144-47, was announced on October 2, 1947.

EFFECTIVE DATE

Having been passed through the regular procedure of the Commodity Standards Division, and approved by the acceptors hereinafter listed, this Commercial Standard was issued by the United States Department of Commerce, effective from November 1, 1947.

Edwin W. Ely,
Chief, Commodity Standards Division.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date.....

Commodity Standards Division,
National Bureau of Standards,
Washington 25, D. C.

Gentlemen:

We believe that the Commercial Standard CS144-47 constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

production ¹ distribution ¹ purchase ¹ testing ¹

of formed metal porcelain enameled sanitary ware. We reserve the right to depart from it as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer

(In ink)

Kindly typewrite or print the following lines)

Name and title of above officer

Organization

(Fill in exactly as it should be listed)

Street address

City, zone, and State

¹ Underscore which one. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade associations, trade papers, etc., desiring to record their general support, the words "General Support" should be added after the signature.

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold: first, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active valid opposition, the success of the project is announced. If, however, in the opinion of the Standing Committee or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

The organizations listed below have individually accepted this standard for use as far as practicable in the production, distribution, testing, or purchase of formed metal porcelain enameled sanitary ware. In accepting the standard they reserved the right to depart therefrom as they individually deem advisable. It is expected that articles which actually comply with the requirements of this standard in all respects will be regularly identified or labeled as conforming thereto, and that purchasers will require such specific evidence of conformity.

ASSOCIATIONS

(General Support)

American Specification Institute, Chicago, Ill.
Building Officials of America, Inc., Washington, D. C.
Dairymen's League Co-operative Association, Inc., New York, N. Y.
Formed Metal Plumbing Ware Association, Chicago, Ill.
National Association of Master Plumbers, New York, N. Y.
National Council of Women of the United States, New York, N. Y.
Saginaw Association of Master Plumbers, Saginaw, Mich.
Western Plumbing Officials Association, Los Angeles, Calif.

FIRMS AND OTHER INTERESTS

Adams, Franklin O., Tampa, Fla.
Adams, T. J., Richmond, Va.
Agnews State Hospital, Agnew, Calif.
Alert Pipe & Supply Co., Bay City, Mich.
Allen Plumbing Supply Co., Allentown, Pa.
Alliance Ware, Inc., Alliance, Ohio.
American Central Division, Avco Manufacturing Corp., Commersville, Ind.
American College of Surgeons, Chicago, Ill.
American Plumbers Supply Co., The, Toledo, Ohio.
American Plumbing & Steam Supply Co., Tacoma, Wash.
Andalusia Manufacturing Co., Andalusia, Ala.
Anderson, James & Son, Richmond, Ky.
Andresen, H. D., Mound, Minn.
Annand & Kennedy, Portland, Oreg.
Asheim & Wilkins, Bridgeport, Conn.
Bailey-Farrell Co., Pittsburgh, Pa.
Baker Manufacturing Co., Omaha, Nebr.
Balph, W. G., Co., Pittsburgh, Pa.
Baltimore Bureau of Plans & Surveys, Division of Architecture, Baltimore, Md.
Basche-Sage Hardware Co., Baker, Oreg.
Bass, J. P. & Son Co., Fulton, Mo. (general support).
Baumer, Herbert, Columbus, Ohio.
Beith Co., New York, N. Y.
Bell Hardware, Little Genesee, N. Y.
Bethlehem Plumbing Supply Co., Bethlehem, Pa.
Beuth, John B., Moberly, Md.
Bicht, Harry H., Pottsville, Pa.
Biggs-Kurtz Hardware Co., The, Grand Junction, Colo.
Birdsall, W. A. & Co., Linden, N. J.
Birmingham, City of, Birmingham, Ala.
Blackwell-Wielandy Co., St. Louis, Mo.
Boehm, George A., New York, N. Y.
Bogner, Harry, West Allis, Wis.
Bohn & Kern Supply Co., Zanesville, Ohio.
Bovard, William R., Kansas City, Mo., (general support).
Brady, S. D., Franklin, Pa.
Branson, F. M., & Son, La Crosse, Wis.
Brazier, Clarence W., New York, N. Y.
Bridgeport Brass Co., Bridgeport, Conn., (general support).
Briggs Manufacturing Co., Plumbing Ware Division, Detroit, Mich.

Bristol Supply Co., St. Joseph, Mo.
Brooks-Borg, Des Moines, Iowa.
Brown, Floyd W., Minneapolis, Minn., (general support).
Brown, W. J., Cedar Rapids, Iowa.
Brown, P. J., Co., Chicago, Ill.
Brown, Wheelock, Harris, Stevens, Inc., New York, N. Y.
Brust & Brust, Milwaukee, Wis.
Bucky, Fred W., Jr., Jacksonville, Fla.
Buffalo, City of, Architectural Service, Department of Public Works, Buffalo, N. Y.
Butner Plumbing & Heating Co., Roanoke, Va.
California, University of, Berkeley, Calif.
Camlet, J. Thomas, Passaic, N. J.
Canfield Supply Co., Kingston, N. Y.
Canton Supply Co., The, Canton, Ohio.
Capitol Supply Co., Lincoln, Nebr.
Careva Co., Inc., The, York, Pa.
Carstens Brothers, Ackley, Iowa.
Case, W. A., & Son Manufacturing Co., Detroit, Mich., and Buffalo, N. Y.
Cedar Rapids Pump & Supply Co., Cedar Rapids, Iowa.
Chandler Co., Cedar Rapids, Iowa.
Chapin, Rollin B., Minneapolis, Minn. (general support).
Cincinnati, City of, Department of Purchasing, Cincinnati, Ohio.
Cleveland Co., Lynchburg, Va.
Cleveland, City of, Cleveland, Ohio.
Coffin, R. V., Seattle, Wash.
Columbia Pipe & Supply Co., Chicago, Ill.
Connecticut Plumbing Supply Co., Stamford, Conn.
Connor Co., Peoria, Ill.
Conrad & Cummings, Binghamton, N. Y.
Consolidated Supply Co., Portland, Oreg.
Cook Supply Co., Oklahoma City, Okla.
Coolidge, Shepley, Bulfinch & Abbott, Boston, Mass.
Cram & Ferguson, Boston, Mass.
Crane Co., Chicago, Ill.
Daizel Plumbing Supplies, San Francisco, Calif.
Danser Hardware & Supply Co., Weston, W. Va.
DeJarnette, Charles Wagner, Des Moines, Iowa. (general support).
Dean, F. W., Boonville, N. Y.
Detroit, City of, Engineer's Office, Detroit, Mich.
Detroit Brass & Malleable Works, Detroit, Mich. (general support).
Detroit Testing Laboratory, The, Detroit, Mich.
Dorsett, J. E. H., Plumbing & Heating Co., Lakeland, Fla.
Douglas, John, Co., The, Cincinnati, Ohio.
Duluth Plumbing Supplies Co., Duluth, Minn.
Ellis, Sol & Sons, Inc., Chicago, Ill.
Emery Industries, Inc., Cincinnati, Ohio.
Emkay Plumbing Supply Co., Inc., Brooklyn, N. Y.
Enamel Products Co., The, Cleveland, Ohio.
Federal Huber Co., Chicago, Ill.
Flannagan, Eric G., Henderson, N. C.
Fleck Co., Camden, N. J.
Fritz, Charles F., Freeport, N. Y.
Furer, Wm. C., Honolulu, Hawaii.
Geck Plumbing & Heating Supply Co., Rochester, N. Y.
General Panel Corp. of California, Burbank, Calif.

- General Porcelain Enameling & Manufacturing Co., Chicago, Ill.
- Goodin Co., Minneapolis, Minn.
- Grady Plumbing Co., Carbondale, Ill.
- Green, Raymond C., & Co., Jenkintown, Pa.
- Green's Ready-Built Homes, Inc., Rockford, Ill.
- Hahn, Stanley W., Chicago, Ill.
- Hajoca Corp., Philadelphia, Pa.
- Hama, J. D., Plumbing & Heating Co., Chicago, Ill.
- Hannaford, Samuel, & Sons, Cincinnati, Ohio.
- Haralson & Mott, Fort Smith, Ark.
- Hasness, Carlisle D., Harrisburg, Pa.
- Haxby & Bissell, J. S., Belair Associate, Minneapolis, Minn.
- Heffley Co., The, Battle Creek, Mich.
- Herzog Supply Co., Kingston, N. Y.
- Hess, Charles, Co., New York, N. Y.
- Hodgdon, Charles, San Gabriel, Calif.
- Holsman-Holsman & Klekamp, Chicago, Ill.
- Hope, Frank L., Jr., San Diego, Calif.
- Hoppe, M. F., Washington, D. C. (general support).
- Hospital Bureau of Standards & Supplies, Inc., New York, N. Y.
- Houston Ready-Cut House Co., Houston, Tex.
- Howell, Leslie D., Portland, Ore. (general support).
- Hubbard, S. B., Co., The, Jacksonville, Fla.
- Hughes Supply Co., The, Mansfield, Ohio.
- Hunting Co., The, Rochester, N. Y.
- Illinois, University of, Department of Architecture, Urbana, Ill. (general support).
- Industrial Supply Co., Terre Haute, Ind.
- Ingersoll Steel Division, Borg-Warner Corp., Chicago, Ill.
- Ingram-Richardson Manufacturing Co. of Indiana, Inc., Frankfort, Ind.
- Intermountain Consumers' Service, Inc., Denver, Colo.
- Ivey, Edwin J., Inc., Seattle, Wash.
- Jardine-Plumbing Co., The, Chillicothe, Ohio.
- Jefferson Supply Co., Pine Bluff, Ark.
- Johns Hopkins Hospital, The, Baltimore, Md.
- Johnson, A. W., Co., Texarkana, Ark.
- Johnson, J. D., Co., Pensacola, Fla.
- Johnson Hardware Co., Clarksburg, W. Va.
- Jones, Kay Co., Pendleton, Ore.
- Kahn, Albert, Associated Architects & Engineers, Inc., Detroit, Mich.
- Kalish Supply Co., Chicago, Ill.
- Kalispell Mercantile Co., Kalispell, Mont.
- Kamen Supply Co., Inc., Wichita, Kans.
- Keich & O'Brien, Warren, Ohio.
- Keiser-Van Leer Co., The, Bloomington, Ill.
- Kelley, Frederic P., Millington, N. J.
- Kennedy Co., The, Cleveland, Ohio.
- Kilham, Hopkins & Greeley, Boston, Mass.
- Knapp Supply Co., The, Muncie, Ind.
- Kohn, Robert D. & Chas. Butler, New York, N. Y.
- Koller Bros. Co., The, Cleveland, Ohio.
- Kubias, F., & Co., Cedar Rapids, Iowa.
- Kurtz, L. H., Co., Des Moines, Iowa.
- Kyle, Herbert S., Charleston, W. Va. (general support).
- La Crosse Plumbing Supply Co., La Crosse, Wis.
- Lansing Supply Co., Lansing, Mich.
- Laughlin, Thomas, Co., The, Portland, Maine.
- Law, Law, Potter & Nyström, Madison, Wis.
- Lebanon Plumbing Supply Co., Lebanon, Pa.
- Lee, W. H., Philadelphia, Pa.
- Levine, Ernest, New Brunswick, N. J.
- Levy, Will, St. Louis, Mo.
- Lewis, J. B., Portland, Ore.
- Loeb, Laurence M., White Plains, N. Y.
- Lovatt, George I., Philadelphia, Pa.
- Mahood, Alex. B., Bluefield, W. Va.
- Malone Plumbing Supply Co., Pittsburgh, Pa.
- Manhattan Plumbing Supply Co., Jersey City, N. J.
- Mann, A. R., Hutchinson, Kans.
- Marion Supply Co., The, Marion, Ohio.
- Martin, Edgar, Chicago, Ill.
- Mason, George D., & Co., Detroit, Mich.
- Master Plumber & Heating Contractor Magazine, Brooklyn, N. Y.
- Mauran, Russell, Crowell & Mullgardt, St. Louis, Mo.
- May Co., Moline, Ill.
- May Supply Co., Anderson, Ind.
- McArdle & Walsh, Inc., Baltimore, Md.
- McDonald, A. Y., Manufacturing Co., Dubuque, Iowa.
- Meehanical Construction Corp., Hibbing, Minn.
- Mereo, Inc., Cincinnati, Ohio.
- Mesher Supply Co., Seattle, Wash., and Portland, Ore.
- Meyer, F. & J., New York, N. Y.
- Michigan Supply Co., Lansing, Mich.
- Mid-West Supply Co., Chicago, Ill.
- Miller & Vrydagh, Terre Haute, Ind.
- Milwaukee Plumbing & Heating Supply Co., Milwaukee, Wis.
- Miner Supply Co., Red Bank, N. J.
- Mission Pipe & Supply Co., San Diego, Calif.
- Moore Dry Dock Co., Oakland, Calif.
- Mooser, William, San Francisco, Calif.
- Mott Co. of Pennsylvania, Philadelphia, Pa.
- Mueller, Hair & Hetterich, Hamilton, Ohio.
- Muhlenberg Brothers, Reading, Pa.
- Mullins Manufacturing Corp., Warren, Ohio.
- Murphy Supply Co., Green Bay, Wis.
- Murray Corp. of America, The, Scranton, Pa.
- Mutual Manufacturing & Supply Co., The, Cincinnati, Ohio.
- Nebraska, University of, Lincoln, Nebr.
- Nelson, Albert L., St. Louis, Mo.
- Norris Stamping & Manufacturing Co., Los Angeles, Calif.
- North End Plumbing & Heating Contractor, Towson, Md.
- Northern Indiana Supply Co., The, Kokomo, Ind.
- Oakland Plumbing Supply Co., Oakland, Calif.
- Officer, Gwynn, Lafayette, Calif.
- Oklahoma, University of, Norman, Okla.
- Orange Memorial Hospital, Orange, N. J.
- Pacific Plumbers Supply Co., Los Angeles, Calif.
- Palmer Supply Co., Seattle, Wash.
- Parkton Compound Boiler Co., Clarks Summit, Pa.
- Paterson General Hospital, Paterson, N. J.
- Patzig Testing Laboratories, Des Moines, Iowa.
- Peerless Missouri Co., St. Louis, Mo.
- Pehrson, G. A., & Associates, Spokane, Wash.
- Pennsylvania Hospital, Philadelphia, Pa.
- Pennsylvania Reading Supply Co., Reading, Pa.
- Pepper, Geo. W., Jr., Philadelphia, Pa.
- Pittsburgh, City of, Department of Supplies, Pittsburgh, Pa.
- Plumbers & Factory Supplies, Inc., Columbus, Ohio.
- Plumber's Supply Co., Louisville, Ky.
- Plumbers' Supply Co., New Bedford, Mass.
- Plumbing Wholesale Co., Jackson, Miss.
- Puritan Sanitary Supply Co., Inc., Cambridge, Mass.
- Reading Foundry & Supply Co., Reading, Pa.
- Reese & Co., Coudersport, Pa.
- Reeves-Wiedeman Co., Kansas City, Mo.
- Reid, William H., Jr., Billings, Mont.
- Resnikoff, Abraham, New York, N. Y.
- Rhodes, Harry A., Rensselaer, N. Y.
- Richardson, Alfred, Nelsonville, Ohio.
- Riggs, Lutha Maria, Santa Barbara, Calif.
- Ritchie, James H., & Associates, Boston, Mass.
- Riverside Supply Co., Inc., Evansville, Ind.
- Roberts-Hamilton Co., Minneapolis, Minn.
- Robertshaw, Milton M., West Orange, N. J.
- Robertson Plumbing Co., Mineral Wells, Tex.
- Rochester Board of Education, Rochester, N. Y.
- Roosevelt, W. A., Co., La Crosse, Wis.
- Ross Willoughby Co., The, Columbus, Ohio.
- St. Luke's Hospital, Bethlehem, Pa.
- Sanitary Plumbing Co., Redlands, Calif.
- Schmidt, Garden & Erikson, Chicago, Ill.
- Sears, Roebuck & Co., Chicago, Ill.
- Seashore Supply Co., Atlantic City, N. J.
- Seattle Plumbing Supply Co., Seattle, Wash.
- Shivers, W. M., Plumbing Supply Co., Houston, Tex.
- Simpson, W. H., Inc., Olean, N. Y.
- Sirrine, J. E., & Co., Greenville, S. C.
- Sleeper, Harold R., New York, N. Y.
- Smolka, Mortimer H., New York, N. Y.
- Southside Plumbing & Heating Maintenance, Freeport, N. Y.
- Spangler Plumbing Co., Birmingham, Ala.
- Spangler & Witthoefft, Reading, Calif.
- Speakman Co., Wilmington, Del. (general support).

Specification Record, Chicago, Ill.
 Spiegel, Inc., Chicago, Ill.
 Staub & Rather, Houston, Tex.
 Stoetzel, Ralph, Chicago, Ill.
 Stokes & Allyn, Portland, Oreg.
 Streeter, Daniel D., Brooklyn, N. Y.
 Suiter, H. A., Plumbing Co., Oskaloosa, Iowa.
 Swank Hardware Co., The, Johnstown, Pa.
 Sweet's Catalog Service, New York, N. Y. (general support).
 Taub Plumbing Supply Co., Inc., Newark, N. J.
 Taylor, Ellery Kirke, Haddonfield, N. J.
 Taylor, Ellis Wing, Los Angeles, Calif.
 Temple, Seth J.-Arthur Temple, Davenport, Iowa.
 Thorne, Henry Calder, Ithaca, N. Y.
 Triangle Wholesale Supply, Inc., Muncie, Ind.
 Trimble & Lutz Supply Co., Wheeling, W. Va.
 Trumbull Plumbing Supply Co., Inc., Warren, Ohio.
 Umbenhaver, W. E., Newark, N. J.
 United States Housing Corp., Washington, D. C.
 United States Testing Co., Inc., Hoboken, N. J.
 Universal Sanitary Mfg. Co., New Castle, Pa.
 Universal Supply Co., The, Newark, Ohio.
 Valley Plumbing & Heating Supply Co., Menasha, Wis.
 Van Camp Hardware & Iron Co., Indianapolis, Ind.
 Van Denberg Supply Co., Rockford, Ill.
 Virginia Polytechnic Institute, Blacksburg, Va. (general support).
 Vogel, P. A., & Sons Co., Louisville, Ky.
 Voorhees, Walker, Foley & Smith, New York, N. Y.
 Wantagh Plumbing Co., Wantagh, N. Y.
 Warren Balderston Co., Trenton, N. J.

Weatherhead Co., The, Cleveland, Ohio.
 Weber, C. L., & Co., Inc., Philadelphia, Pa.
 Weekes, John & Son Co., Watertown, N. Y.
 Weil Bros. Inc., New York, N. Y.
 Welch, Carroll E., Huntington, N. Y.
 West, Albert E., Boston, Mass.
 Western Metal Supply Co., San Diego, Calif.
 Whitney & Ford Co., Chicago, Ill.
 Wilkins Pipe & Supply Co., Peoria, Ill.
 Wisconsin River Supply Co., Wausau, Wis.
 Wood, Edward J., & Son, Clarksburg, W. Va.
 Woolcock Plumbing & Heating Co., Niagara Falls, N. Y.
 Woolley, W. P., Portland, Oreg.
 Wright & Wright, Detroit, Mich. (general support).
 Zimmer Supply Co., Youngstown, Ohio.
 Zimmerman, A. C., Los Angeles, Calif.

UNITED STATES GOVERNMENT

Agriculture, Department of, Washington, D. C.
 Army, Department of the, Washington, D. C.
 Federal Housing Administration, Washington, D. C.
 Federal Works Agency, Public Buildings Administration, Washington, D. C.
 Housing & Home Finance Agency, Washington, D. C. (general support).
 Interior, Department of the, Office of Indian Affairs, Washington, D. C.
 Justice, Department of, Bureau of Supplies, Construction Division, Washington, D. C.
 Veterans' Administration, Washington, D. C.

COMMERCIAL STANDARDS

CS No.

- 0-40. Commercial standards and their value to business (third edition).
- 1-42. Clinical thermometers (third edition).
- 2-30. Mopsticks.
- 3-40. Stoddard solvent (third edition).
- 4-29. Staple porcelain (all-clay) plumbing fixtures.
- 5-46. Pipe nipples; brass, copper, steel and wrought-iron (second edition).
- 6-31. Wrought-iron pipe nipples (second edition). Superseded by CS5-46.
- 7-29. Standard weight malleable iron or steel screwed unions.
- 8-41. Gage blanks (third edition).
- 9-33. Builders' template hardware (second edition).
- 10-29. Brass pipe nipples. Superseded by CS5-46.
- 11-41. Moisture regains of cotton yarns (second edition).
- 12-40. Fuel oils (fifth edition).
- 13-44. Dress patterns (fourth edition).
- 14-43. Boys' button-on waists, shirts, junior and sport shirts (made from woven fabrics) (third edition).
- 15-46. Men's pajama sizes (made from woven fabrics) (third edition).
- 16-29. Wall paper.
- 17-47. Diamond core drill fittings (fourth edition).
- 18-29. Hickory golf shafts.
- 19-32. Foundry patterns of wood (second edition).
- 20-47. Staple vitreous-china plumbing fixtures (fourth edition).
- 21-39. Interchangeable ground-glass joints, stopcocks, and stoppers (fourth edition).
- 22-40. Builders' hardware (nontemplate) (second edition).
- 23-30. Feldspar.
- 24-43. Screw threads and tap-drill sizes.
- 25-30. Special screw threads. Superseded by CS24-43.
- 26-30. Aromatic red-cedar closet lining.
- 27-36. Mirrors (second edition).
- 28-46. Cotton-fabric tents, tarpaulins and covers (second edition).
- 29-31. Staple seats for water-closet bowls.
- 30-31. Colors for sanitary ware.
- 31-38. Wood shingles (fourth edition).
- 32-31. Cotton cloth for rubber and pyroxylin coating.
- 33-43. Knit underwear (exclusive of rayon) (second edition).
- 34-31. Bag, case, and strap leather.
- 35-47. Hardwood plywood (third edition).
- 36-33. Fourdrinier wire cloth (second edition).
- 37-31. Steel bone plates and screws.
- 38-32. Hospital rubber sheeting.
- 39-37. Wool and part wool blankets (second edition). (Withdrawn as commercial standard, July 14, 1941).
- 40-32. Surgeons' rubber gloves.
- 41-32. Surgeons' latex gloves.
- 42-43. Structural fiber insulating board (third edition).
- 43-32. Grading of sulphonated oils.
- 44-32. Apple wraps.
- 45-47. Douglas fir plywood (seventh edition).
- 46-40. Hosiery lengths and sizes (third edition).
- 47-34. Marking of gold-filled and rolled-gold-plate articles other than watchcases.
- 48-40. Domestic burners for Pennsylvania anthracite (underfired type) (second edition).
- 49-34. Chip board, laminated chip board, and miscellaneous boards for bookbinding purposes.
- 50-34. Binders board for bookbinding and other purposes.
- 51-35. Marking articles made of silver in combination with gold.

CS No.

- 52-35. Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).
- 53-35. Colors and finishes for cast stone.
- 54-35. Mattresses for hospitals.
- 55-35. Mattresses for institutions.
- 56-41. Oak flooring (second edition).
- 57-40. Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings (second edition).
- 58-36. Woven elastic fabrics for use in overalls (overall elastic webbing).
- 59-44. Textiles—testing and reporting (fourth edition).
- 60-36. Hardwood dimension lumber.
- 61-37. Wood-slat venetian blinds.
- 62-38. Colors for kitchen accessories.
- 63-38. Colors for bathroom accessories.
- 64-37. Walnut veneers.
- 65-43. Methods of analysis and of reporting fiber composition of textile products (second edition).
- 66-38. Marking of articles made wholly or in part of platinum.
- 67-38. Marking articles made of karat gold.
- 68-38. Liquid hypochlorite disinfectant, deodorant, and germicide.
- 69-38. Pine-oil disinfectant.
- 70-41. Phenolic disinfectant (emulsifying type) (second edition) (published with CS71-41).
- 71-41. Phenolic disinfectant (soluble type) (second edition) (published with CS70-41).
- 72-38. Household insecticide (liquid-spray type).
- 73-45. Old growth Douglas-fir standard stock doors (third edition).
- 74-39. Solid hardwood wall paneling.
- 75-42. Automatic mechanical-draft oil burners designed for domestic installations (second edition).
- 76-39. Hardwood interior trim and molding.
- 77-40. Sanitary cast-iron enameled ware.
- 78-40. Ground-and-polished lenses for sun glasses (second edition) (published with CS79-40).
- 79-40. Blown, drawn, and dropped lenses for sun glasses (second edition) (published with CS78-40).
- 80-41. Electric direction-signal systems other than semaphore type for commercial and other vehicles subject to special motor-vehicle laws (after market).
- 81-41. Adverse-weather lamps for vehicles (after market).
- 82-41. Inner-controlled spotlamps for vehicles (after market).
- 83-41. Clearance, marker, and identification lamps for vehicles (after market).
- 84-41. Electric tail lamps for vehicles (after market).
- 85-41. Electric license-plate lamps for vehicles (after market).
- 86-41. Electric stop lamps for vehicles (after market).
- 87-41. Red electric warning lanterns.
- 88-41. Liquid burning flares.
- 89-40. Hardwood stair treads and risers.
- 90- . (Reserved for power shovels and cranes).
- 91-41. Factory-fitted Douglas-fir entrance doors.
- 92-41. Cedar, cypress and redwood tank stock lumber.
- 93-41. Portable electric drills (exclusive of high frequency).
- 94-41. Calking lead.
- 95-41. Lead pipe.
- 96-41. Lead traps and bends.
- 97-42. Electric supplementary driving and passing lamps for vehicles (after market).
- 98-42. Artists' oil paints.
- 99-42. Gas floor furnaces—gravity circulating type.

CS No.	CS No.
100-47. Porcelain-enameled steel utensils (third edition).	121-45. Women's slip sizes (woven fabrics).
101-43. Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.	122-45. Western hemlock plywood.
102- (Reserved for Diesel and fuel-oil engines).	123-45. Grading of diamond powder.
103-42. Cotton and rayon velour (jacquard and plain).	(E) 124-45. ¹ Master disks.
104-46. Warm-air furnaces equipped with vaporizing pot-type oil burners (second edition).	125-47. Prefabricated homes (second edition).
105-43. Mineral wool; loose granulated, or felted form, in low-temperature installations.	126-45. Tank mounted air compressors.
106-44. Boys' pajama sizes (woven fabrics) (second edition).	127-45. Self-contained mechanically refrigerated drinking water coolers.
107-45. Commercial electric-refrigeration condensing units (second edition). (Withdrawn as commercial standard September 4, 1947.)	128-45. Men's sport shirt sizes—woven fabrics (other than those marked with regular neckband sizes).
108-43. Treading automobile and truck tires.	129-47. Materials for safety wearing apparel (second edition).
109-44. Solid-fuel-burning forced-air furnaces.	130-46. Color materials for art education in schools.
110-43. Tire repairs—vulcanized (passenger, truck, and bus tires).	131-46. Industrial mineral wool products, all types—testing and reporting.
111-43. Earthenware (vitreous-glazed) plumbing fixtures.	132-46. Hardware cloth.
112-43. Homogeneous fiber wallboard.	133-46. Woven wire netting.
113-44. Oil-burning floor furnaces equipped with vaporizing pot-type burners.	134-46. Cast aluminum cooking utensils (metal composition).
114-43. Hospital sheeting for mattress protection.	135-46. Men's shirt sizes (exclusive of work shirts).
115-44. Porcelain-enameled tanks for domestic use.	136-46. Blankets for hospitals (wool, and wool and cotton).
116-44. Bituminized-fibre drain and sewer pipe.	137-46. Size measurements for men's and boys' shorts (woven fabrics).
117-44. Mineral wool; blankets, blocks, insulating cement, and pipe insulation for heated industrial equipment.	138-47. Insect wire screening.
118-44. Marking of jewelry and novelties of silver.	139-47. Work gloves.
(E) 119-45. ¹ Dial indicators (for linear measurements).	140-47. Convector: testing and rating.
120-46. Standard stock ponderosa pine doors (second edition).	141-47. Sine bars, blocks, plates, and fixtures.
	142-47. Automotive lifts.
	143-47. Standard strength and extra strength perforated clay pipe.
	144-47. Formed metal porcelain enameled sanitary ware.
	145-47. Testing and rating hand-fired hot water supply boilers.
	146-47. Gowns for hospital patients.
	147-47. Colors for molded urea plastics.

NOTICE.—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice may secure copies of the above standards, while the supply lasts, by addressing the National Bureau of Standards, Washington 25, D. C.

¹ Where "(E)" precedes the CS number, it indicates an emergency commercial standard, drafted under war conditions with a view toward early revision.

