CS59-44
Textiles—Testing and Reporting

U. S. DEPARTMENT OF COMMERCE
JESSE H. JONES, Secretary
NATIONAL BUREAU OF STANDARDS
LYMAN J. BRIGGS, Director

TEXTILES—TESTING AND REPORTING

(Fourth Edition)

COMMERCIAL STANDARD CS59-44

(Supersedes CS59-41)

Effective as a Basis for Testing and Reporting
From February 20, 1944

A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON 1944

For sale by the Superintendent of Documents, Washington 25, D. C. - - - - Price 10 cents

PROMULGATION

of

COMMERCIAL STANDARD CS59-44

for

TEXTILES—TESTING AND REPORTING

(Fourth Edition)

On September 27, 1935, at the instance of the National Retail Dry Goods Association, a general conference of representative manufacturers, distributors, and users of woven dress fabrics, and commercial testing laboratories adopted a recommended commercial standard covering methods of testing and reporting these commodities, which was subsequently accepted by the trade and promulgated as Commercial Standard CS59-36.

In 1939 and 1941, upon recommendation of the standing committee to keep the standard abreast of progress, revisions were adopted and issued as CS59-39 and CS59-41, respectively. The latter revision broadened the scope to cover all woven textile fabrics and additional methods of test.

At the request of several trade associations and with the approval of the standing committee, the standard was again revised to cover textiles in general. This revision includes additional methods of test for bursting strength of knit fabrics and colorfastness to atmospheric gases, and changes in methods of testing and reporting on several of the methods covering colorfastness. The revision has since been accepted by the trade for promulgation by the United States Department of Commerce, through the National Bureau of Standards.

The standard is effective as a basis for testing and reporting from February 20, 1944.

Promulgation recommended.

I. J. Fairchild,
Chief, Division of Trade Standards.

Promulgated.

Lyman J. Briggs,
Director, National Bureau of Standards.

Promulgation approved.

Jesse H. Jones,
Secretary of Commerce.

TEXTILES—TESTING AND REPORTING

(FOURTH EDITION)

COMMERCIAL STANDARD CS59-44

CONTENTS

I. PURPOSE

1. The purpose is to provide standard methods of testing textiles from the standpoint of serviceability and a uniform basis for reporting results of tests. This standard is for the guidance of testing laboratories. Its use should eliminate

confusion resulting from a diversity of testing methods. It is expected that comparability and reproducibility of test results will be attained thereby for the benefit of producers, distributors, and users.

II. SCOPE

2. This standard provides methods for testing and reporting the breaking strength of woven fabrics; bursting strength of knit fabrics; colorfastness of textiles to chlorine, dry cleaning, crocking (rubbing), atmospheric gases, laundering, light, perspiration, and pressing (dry and wet); shrinkage in laundering and dry cleaning of woven fabrics; and yarn slippage of woven fabrics. The standard is intended primarily for testing of and reporting on textiles represented as having qualities covered by these tests, although it may be applied to textiles not so represented. The test methods relate to qualities which are of primary importance in some textiles, but which are not found and are not needed in all types of textiles.

III. GENERAL REQUIREMENTS

3. *Sampling.*—Normally, tests will be conducted and reports issued for the samples submitted, without reference to the method of sampling or size of lot represented. When reports are to be issued for given lots, the method of sampling and sizes of the lots represented shall be as agreed upon between the client and the testing laboratory.

4. *Size of sample.*—The sample selected for test purposes shall be of sufficient size for the tests required. For piece goods it is estimated that 2 square yards are required to make all of the tests prescribed herein.

5. *Kinds of tests required.*—Unless otherwise required by the client, the testing laboratory will conduct and report on all tests covered herein, in accordance with the following procedures.

6. *Interpretation of colorfastness test results.*

6a. The color of the tested specimen shall be compared by eye with the color of a piece of the original sample. In making the comparison the specimens shall be held in the same plane and about at the same angle under a daylight fluorescent lamp[1] or equivalent illumination.

6b. A specimen shall be considered to pass a given test when there is no appreciable change in color and also when there is no appreciable staining of the white cloth attached to it. "Appreciable change" shall be understood to mean a change that is immediately noticeable in comparing the tested sample with the original; "appreciable staining" shall be understood to mean staining which is immediately noticeable

[1] Daylight fluorescent lamp—20 watts, length 24 in., diameter 1 1/2 in., bulb T-12, approximate lamp ampere 0.35, approximate lamp volts 62, circuit voltage 110 to 125, lumen output at end of 100-hour operation 760, brightness 1,400-foot lamberts.

without comparing the white cloth attached to the tested specimen with a piece of the white cloth.

6c. If closer inspection or a change of angle of light is required to make apparent the slight change in color or staining, the change shall not be considered appreciable. Tested samples should be assigned the highest classification for which they qualify, although any sample may be assigned a lower classification than that for which it qualifies.

6d. In order that the system of evaluation based on "appreciable change" shall be properly safeguarded, it is necessary that several of the test procedures given herein be calibrated at frequent intervals by means of dyed standards of known characteristics.[2] Details concerning these dyed standards are included in the sections to which they apply and in section XX.

IV. BREAKING STRENGTH OF WOVEN FABRICS

Breaking strength shall be determined by the *grab method* unless one of the strip methods is specified.

1. GRAB METHOD

7. *Test specimens.*

7a. Twenty specimens, each 4 inches wide and not less than 6 inches long, are required for this test. Ten of these specimens shall be cut with their long sides parallel to the warp yarns (for warp breaking strength), and 10 specimens shall be cut with their long sides parallel to the filling yarns (for filling breaking strength) in such a manner that there will be five pairs of specimens in each direction, each pair of which will contain the same warp or filling yarns but no two pairs of which will contain the same yarns (warp or filling). No specimen shall be taken nearer the selvage than one-tenth the width of the material.

7b. Five specimens in each set, of which no two specimens contain the same yarns (warp or filling), shall be used for determining the breaking strength of the material under standard atmospheric conditions and the remaining specimens for determining the breaking strength of the material when wet.

8. *Testing machine.*

8a. A motor-driven pendulum machine or a constant rate-of-load machine shall be used.

8b. The faces of the front members of the jaws shall measure 1 by 1 inch, and the faces of the back members shall measure 1 inch in the direction of the application of the load and 2 inches or more perpendicular to the direction of the application of the load. The jaws shall have smooth, flat faces with edges very slightly rounded to prevent cutting, and they shall be pivoted to take the direction of the load force easily and smoothly.

8c. If a pendulum machine is used, it shall be of such capacity that when the specimen breaks, the angle between the

[2]Dyed standards are available from L. A. Olney, Lowell Textile Institute, Lowell, Mass., at a nominal cost.

pendulum and the vertical is between 9° and 45°. The jaws through which the load is applied shall move at a uniform rate of 12 ±1/2 inches per minute.

9. *Procedure.*

9a. *Standard conditions.*—One set of test specimens, as described in paragraph 7b, is placed in an atmosphere having a relative humidity of 65 percent at 70° F for at least 4 hours. A tolerance of ±2 percent is permitted in relative humidity and ±2° F in temperature. In cases of dispute, tests shall be conducted on test specimens which are in equilibrium with the foregoing standard atmosphere. The material is considered to be in equilibrium when it shows no progressive change in weight.

9b. *Breaking strength—standard conditions.*—The first set of test specimens prepared in accordance with paragraph 9a is tested for breaking strength as outlined in paragraph 9c.

9c. With the distance between the two pairs of jaws of the testing machine adjusted to 3 inches, the test specimen is placed symmetrically in the jaws with the long dimension parallel to and the short dimension at right angles to the direction of the application of the load. Caution shall be exercised to see that the same yarns are clamped by both pairs of jaws. If a specimen slips in the jaws, breaks in the jaws, breaks at the edges of the jaws, or, for any reason attributable to faulty operation, the results vary markedly from the average for the set, the result is disregarded, another specimen is taken and the result of its break included in the average.

9d. *Wet breaking strength.*—The second set of test specimens, as described in paragraph 7b, is immersed in water at room temperature for 2 hours or longer if necessary for the specimens to become thoroughly and completely wet. This action may be assisted by agitating the specimens in the water or by use of a wetting agent. The specimens are removed, one at a time, and tested immediately for breaking strength in accordance with the method outlined in paragraph 9c. The testing of the specimen shall be completed within 1 minute after its removal from the water.

9e. The breaking strength, standard conditions or wet, in the warp or filling direction is the average of the loads required to break the five specimens cut in that direction.

10. *Reporting breaking strength.*—The warp and filling breaking strengths, standard conditions and wet, shall be reported separately in pounds to the nearest whole number.

2. RAVELED-STRIP METHOD

11. The determination of and reporting on breaking strength by this method shall be made in accordance with the directions for the grab method (paragraphs 7 to 10, inclusive) with the following exceptions:

11a. *Test specimens.*—The specimens shall be 1 1/4 inches wide if there are 50 or more yarns per inch and 1 1/2 inches wide if there are less than 50 yarns per inch. Each specimen

shall be raveled to 1 inch in width by taking from each side approximately the same number of yarns.

11b. *Jaws.*—The jaws used on the testing machine shall have faces measuring 1 by 1 1/2 inches or more, the longer dimension being perpendicular to the direction of application of the load.

3. CUT-STRIP METHOD

[This method is applicable to heavily sized or coated fabrics]

12. The determination of and reporting on breaking strength by this method shall be made in accordance with the directions for the grab method (paragraphs 7 to 10, inclusive) with the following exceptions:

12a. *Test specimens.*—The specimens shall be cut 1 inch wide unless otherwise specified.

12b. *Jaws.*—The jaws used on the testing machine shall have faces measuring 1 by 1 1/2 inches or more, the longer dimension being perpendicular to the direction of application of the load.

V. BURSTING STRENGTH OF KNIT FABRICS

13. *Test specimens.*—At least 10 specimens are required, the smallest dimension of which is at least 0.5 inch greater than the outside diameter of the ring-clamp mechanism of the testing machine.

14. *Testing machine.*—A motor-driven pendulum machine equipped with a bursting attachment or a diaphragm-bursting tester shall be used.

14a. If a pendulum machine is used, it shall be of such capacity that when the specimen breaks, the angle between the pendulum and the vertical is between 9° and 45°. The ring-clamp through which the load is applied shall move at a uniform rate of 6 ±0.25 inches per minute.

14b. The attachment for making the bursting test on a pendulum machine shall be of such design that the specimen shall be held securely by a ring-clamp mechanism of 1.750 ±0.001 inches in internal diameter and that the center of the specimen shall be pressed against a polished steel ball 1.000 ±0.001 inch in diameter until it bursts. The direction of motion of the ring-clamp shall be at right angles to the initial plane of the specimen.

14c. The diaphragm-bursting tester shall be driven at a constant rate of speed which insures a uniform displacement of the pressure medium of 6 ±0.25 inches per minute. It shall be so constructed that the gages shall indicate the gross bursting pressure and the tare diaphragm pressure at the instant of rupture and until released by the operator.

14d. The pressure gage shall be of the Bourdon tube, maximum-hand type, having a dial at least 4.5 inches in diameter and accurate throughout the entire range of its scale to within a value equal to 0.25 percent of its maximum capacity. When the gage is calibrated it shall be mounted in the same relative position as on the bursting tester. If calibrated

with a dead-weight tester, the weight shall be spun slowly to insure free action of the piston.

14e. The surfaces between which the specimen is clamped shall be smooth, flat, and metallic, and any edge which might cause a cutting action shall be rounded to a radius of not over 1/64 inch. The ring-clamp shall have a circular aperture 1.200 ±0.001 inches in diameter. This aperture shall be coaxial with the opening of the diaphragm plate.

14f. Provision shall be made for applying to the specimen, before clamping, an initial tension which shall be uniform in all directions.

15. *Procedure.*

15a. *Standard conditions.*—The specimens, as described in paragraph 13, are placed in an atmosphere having a relative humidity of 65 percent at 70° F for at least 4 hours. A tolerance of ±2 percent is permitted in relative humidity and ±2° F in temperature. In cases of dispute, tests shall be conducted on test specimens which are in equilibrium with the foregoing standard atmosphere. The material is considered to be in equilibrium when it shows no progressive change in weight.

15b. The specimen under a tension which is uniform in all directions shall be clamped securely by the ring-clamp and pressure applied. The difference between the gross bursting pressure and the tare diaphragm pressure, when diaphragm-bursting testers are used, shall be the bursting strength of the specimen. The average bursting strength of the textile shall be the arithmetic mean of the results of the 10 tests.

16. *Reporting bursting strength.*—The bursting strength shall be reported in pounds to the nearest whole number.

VI. COLORFASTNESS TO CHLORINE OF COTTON, LINEN, AND RAYON TEXTILES

17. *Test specimens.*—At least four specimens of not less than 2 and not more than 6 g each are required for these tests.

18. *Apparatus.*—The Launder-Ometer or similar machine in which 1-pint preserve jars are held with their bases toward a horizontal shaft 2 inches from the center of rotation and the shaft rotated at a speed of 40 to 45 revolutions per minute shall be used.

19. *No. 1 test procedure.*

19a. One of the four specimens to be tested is thoroughly wet in distilled water at 80° ±5° F, or in the event that the test sample is water repellent it is wet in a 0.5-percent neutral soap solution at 80° ±5° F. The surplus solution is removed, and the specimen is then placed in a 1-pint glass jar containing 50 times its dry weight of a sodium hypochlorite solution containing 0.01 percent available chlorine

and adjusted to the required temperature, and having a hydrogen-ion concentration (pH) of 11.0 ±0.2.[3]

19b. The tightly capped jar is immediately placed in the apparatus, which is run for 1 hour from the time that the specimen was placed in the jar. During this time, the temperature of the water in the apparatus is maintained at 80° ±5° F.

19c. The specimen is removed from the jar and rinsed thoroughly in cold running tap water for 5 minutes, squeezing or agitating at intervals. The surplus water is removed by any convenient means, after which the specimen is placed in 50 times its dry weight of 0.5-percent sodium bisulfite solution at 80° ±5° F for 10 minutes, with occasional agitation. The specimen is then removed, and then again rinsed in cold running tap water for 5 minutes with occasional squeezing or agitation. After removal of the surplus water by any convenient means, the specimen is pressed dry between two layers of white cotton cloth with a flatiron having a temperature between 275° and 300° F.[4]

20. *No. 2 test procedure.*—One of the other specimens is subjected to the same test as outlined in paragraph 19, except that the sodium hypochlorite solution contains 0.1 percent available chlorine.

21. *No. 3 test procedure.*—One of the other specimens is subjected to the same test as outlined in paragraph 19, except that the sodium hypochlorite solution contains 0.2 percent available chlorine.

22. *No. 4 test procedure.*—One of the other specimens is subjected to the same test as outlined in paragraph 19, except that the sodium hypochlorite solution contains 0.3 percent available chlorine.

23. *Reporting colorfastness to chlorine of cotton, linen, and rayon textiles.*

23a. *Class 0.*—Textiles which have been subjected to the No. 1 test and which show appreciable change in color shall

[3] Readily available domestic hypochlorite solutions, such as Clorox, Dazzle, Javex, etc., containing 4 to 6 percent of available chlorine and a pH between 9.8 and 12.8 may be used. The available chlorine content should be determined and the solution then diluted to the proper strength for testing, using a mixture of 5 parts of a 1-percent solution of sodium bicarbonate ($NaHCO_3$) and 95 parts of a 5-percent solution of sodium carbonate (Na_2CO_3), when the initial pH of the *undiluted* hypochlorite solution is between 11.2 and 12.8. This will produce a pH of 11.0 ±0.2 in the test solutions. When the initial pH of the *undiluted* hypochlorite solution is between 9.6 and 11.2, 10 ml of solution containing 10 g of sodium hydroxide (NaOH) per 100 g (of solution) should be added per liter of *undiluted* hypochlorite solution to bring the pH up to the range where the buffer will satisfactorily control the pH of the test solution.

[4] A 5- to 6-pound iron with a 1,000-watt heating unit is recommended in order to avoid large fluctuations in temperature. The temperature of the iron can be determined conveniently with the aid of a calibrated thermocouple, marking materials which melt at specific temperatures (Tempilstiks, as sold by Fisher Scientific Co. are available for temperatures from 125° to 300° F in 25° increments and from 300° to 700° F in 50° increments), a thermometer inserted in a well in the iron, or alloys melting at approximately 275° and 300° F. It must be remembered in using the third method that there may be considerable lag between the temperature indicated by the thermometer and the actual surface temperature of the iron; and in using the second, third, and fourth methods, that the iron may be cooled by contact with the cloth. Alloys of tin, lead, and bismuth in the proportions 16:25:16 and 9:18:4 melt at approximately 277° and 298° F, respectively. If small particles of these alloys are placed on the iron, the one alloy will melt and the other will not if the iron temperature is within the required range. Temperature indicators furnished as an integral part of some irons should be calibrated for accuracy.

be reported as having "Class 0 colorfastness to chlorine." Such textiles may not be expected to give satisfactory performance when washing compounds containing a small amount of available chlorine or when small amounts of Javelle water are used in home laundering.

23b. *Class 1.*—Textiles which have been subjected to the No. 1 test and which show no appreciable change in color shall be reported as having "Class 1 colorfastness to chlorine." Such textiles may be expected to give satisfactory performance when washing compounds containing a small amount of available chlorine or when small amounts of Javelle water are used in home laundering. This practice should be discouraged, however, as excessive use of chlorine or Javelle water will shorten the life of textiles. This classification has been set up for the purpose of indicating where these agents can be employed if necessary with the least danger.

23c. *Class 2.*—Textiles which have been subjected to the No. 2 test and which show no appreciable change in color shall be reported as having "Class 2 colorfastness to chlorine." Such textiles may be considered satisfactory for use in borders, trimmings, colored hems for sheets, or any other materials which, by reason of the large expanse of white material in relation to colored textiles, would be processed as white work in commercial laundries and so subjected to the action of chlorine.

23d. *Class 3.*—Textiles which have been subjected to the No. 3 test and which show no appreciable change in color shall be reported as having "Class 3 colorfastness to chlorine." Such textiles may be considered satisfactory for use where good fastness to chlorine is important.

23e. *Class 4.*—Textiles which have been subjected to the No. 4 test and which show no appreciable change in color shall be reported as having "Class 4 colorfastness to chlorine." Such textiles may be considered of excellent fastness to chlorine where such fastness is required.

VII. COLORFASTNESS TO DRY CLEANING

[For colorfastness to laundering, see sections X and XI]

24. *Test specimens.*

24a. At least two test specimens are required for this test. To each specimen are sewed or otherwise securely attached at one end 1-inch square pieces of white wool, desized cotton, silk, viscose rayon, and acetate rayon fabrics or a 1-inch square piece of composite test cloth.[5]

24b. Each specimen of cloth shall measure 2 by 4 inches, the longer dimension running in the direction of the warp. If one specimen of printed cloth does not include all of the

[5]This cloth consists of a lightweight worsted fabric into which are woven wool, cotton, silk, viscose rayon, and acetate rayon yarns in the order named. These yarns are woven close together in such a way as to form floats on one side of the fabric approximately 1/4 inch long and 1/16 inch wide, and each set of yarns is spaced approximately 1 1/4 inches apart (center to center). This type of cloth may be obtained from the American Woolen Co., Andover, Mass. (Style DD-8370, price May 1943, $2.87½ per yard, 60-inch width).

colors in the design, additional specimens shall be prepared in the same manner so that all of the colors are included. The white cloth shall be attached to the face of the printed cloth. A piece of the original sample shall be saved for comparison with the tested specimens.

24c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric, and specimens of the knitted fabric taken in accordance with instructions in paragraphs 24a and 24b. If the yarn or thread cannot be knit, the specimen shall consist of a braid 4 inches in length, made with two portions of the yarn to be tested and one portion of white wool, desized cotton, silk, viscose rayon, and acetate rayon yarns, or a strip of composite test cloth. A piece of the original knitted fabric or braids shall be saved for comparison with the tested specimens.

25. *Apparatus.*—A Launder-Ometer or similar machine in which 1-pint preserve jars are held with their bases toward a horizontal shaft 2 inches from the center of rotation and the shaft rotated at a speed of 40 to 45 revolutions per minute shall be used.

26. *Cleaning procedures.*

26a. *Cleaning, dry, procedure.*—Each specimen is placed in a 1-pint preserve jar containing the necessary volume of cleaning solution prepared by mixing together 50 ml of USP freshly distilled, neutralized[6] carbon tetrachloride or tetrachlorethylene for each gram of specimen and 0.6 ml of dry-cleaning soap for each gram of the specimen.[7] The jars are closed, placed in the machine, and the machine operated at room temperature for 25 minutes. The test specimens are then removed and the cleaning solution examined for discoloration resulting from bleeding. The liquor is then replaced by an identical volume of fresh, clean solvent without added soap. The test specimens are replaced in the jars. The jars are returned to the machine, which is then operated at room temperature for an additional 5 minutes. This last procedure is repeated three times. The test specimens are then removed from the jars, the surplus solvent removed by any convenient means, and the specimens permitted to dry at room temperature. One specimen is now rinsed twice in the machine for 5 minutes in distilled water at 80° ±5° F, using volumes identical with those used for the preceding treatments. The excess moisture is then removed by any convenient means, such as rolling between two layers of Turkish toweling or between two layers of absorbent paper. The test specimen is then dried at room temperature with the white cloth in direct contact with it. This specimen is pressed according to the method of paragraphs 27a or 27b, or if a pile fabric, steamed in accordance with paragraph 27c. The other specimen is treated further according to paragraph 26c.

[6] Neutrality shall be determined by mixing 5 ml of the carbon tetrachloride with 10 ml of distilled water and testing with methyl orange.

[7] The soap shall be made by dissolving 56 g of caustic potash (KOH) in 100 ml of water. The potassium hydroxide solution shall be poured slowly with constant stirring into a mixture of 340 g of oleic acid, 400 ml of Stoddard Solvent (Commercial Standard CS3-40 grade), and 100 ml of tertiary butyl alcohol or an equal quantity of butyl cellosolve.

26b. If the pressed specimen, as treated according to the procedure in the preceding paragraph shows appreciable change in color or appreciable staining of the white cloth, two additional specimens are taken (paragraph 24) and subjected to the same procedure except that Stoddard Solvent[8] shall be used in lieu of carbon tetrachloride or tetrachlorethylene.

26c. *Cleaning, wet, procedure.*[9]—The unpressed specimen from paragraph 26a is placed on a porcelain slab or piece of slate and wet with sufficient distilled water at a temperature of 90° to 100° F, containing 1 g of neutral soap per liter, to keep the fabric thoroughly wet for 15 minutes. The fabric is then rinsed by immersing it in a liter of distilled water at a temperature of 90° to 100° F for 5 minutes. Excess moisture is then removed from the sample by any convenient means, such as rolling between two layers of Turkish toweling or between two layers of absorbent paper and then dried in a current of cold air. This specimen is pressed according to the method of paragraph 27a or 27b, or if a pile fabric, steamed in accordance with paragraph 27c.

27. *Pressing.*—Either of the two methods outlined below may be used in the pressing of the specimen.

27a. *Hand pressing.*—When all the solvent has evaporated, the specimen is laid on a padded ironing board. The specimen is covered with a damp muslin press cloth, weighing from 4 to 4 1/2 ounces per square yard, previously saturated with water and wrung out so as to retain moisture equal to approximately 75 percent of its dry weight. It is then pressed with a flatiron having a temperature between 275° and 300° F[10] until dry. The specimen is allowed to lie on a smooth, horizontal surface for 1 hour, thereafter at room temperature.

27b. *Saturated steam pressing (for all fabrics except pile fabrics).*—When all the solvent has evaporated, the specimen is laid on a bed of a flat-bed press. The press shall be of a hothead or polished metal-top type for flat fabrics or a cloth-top press for rough crepe. The steam pressure of the saturated steam shall be between 60 and 65 pounds. The head of the machine is lowered and held in contact with the fabric. During this period, steam is admitted from the buck of the press for a period of from 5 to 10 seconds. The specimen is allowed to lie on a horizontal surface for 1 hour thereafter at room temperature.

27c. *Steaming (for pile fabrics).*—When all the solvent has evaporated from a pile fabric test specimen, cleaned according to paragraph 26, the specimen is spread out on a steam board or table[11] on a damp muslin press cloth weighing 4 to 4 1/2 ounces per square yard previously saturated with water and wrung out so as to retain moisture equal to approximately 75 percent of its weight. Steam is then turned on and allowed

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[8] This dry-cleaning fluid shall conform to all the requirements of "Stoddard Solvent, Commercial Standard CS3-40."

[9] This refers to the wet-cleaning procedure sometimes necessary in dry cleaning. It does not refer to laundering.

[10] See footnote 4, p. 7

[11] A steam board or table is a board or table of perforated metal, well padded with cotton or other absorbent material. The perforations are of suitable size and so spaced as to allow an even dispersion of steam through the padding.

to pass through the pile fabric for 2 minutes. The test piece is then cooled to room temperature and allowed to lie in a smooth horizontal position for 1 hour thereafter.

28. *Reporting colorfastness to dry cleaning.*

28a. *Class 0.*—Textiles which have been subjected to the cleaning, dry test with Stoddard Solvent (paragraph 26b) and which show appreciable change in color or appreciable staining of the white cloth shall be reported as having "Class 0 colorfastness to dry cleaning." Such textiles are not considered fast to dry cleaning. Any change in appearance aside from color shall be reported.

28b. *Class 1.*—Textiles which have been subjected to the cleaning, dry test with Stoddard Solvent (paragraph 26b) and which show no appreciable change in color and no appreciable staining of the white cloth but which do show appreciable change in color or appreciable staining of the white cloth when subjected to the cleaning, dry test with carbon tetrachloride or tetrachlorethylene (paragraph 26a) or to the cleaning, wet test (paragraph 26c) shall be reported as having "Class 1 colorfastness to dry cleaning." Such textiles may be expected to give satisfactory service when dry-cleaned with Stoddard Solvent unless subjected to the cleaning, wet, process necessary to remove stains not removable by the Stoddard Solvent. Any change in appearance aside from color shall be reported.

28c. *Class 2.*—Textiles which have been subjected to the cleaning, dry test with carbon tetrachloride or tetrachlorethylene (paragraph 26a) and which show no appreciable change in color and no appreciable staining of the white cloth but which show appreciable change in color or appreciable staining of the white cloth when subjected to the cleaning, wet test shall be reported as having "Class 2 colorfastness to dry cleaning." Such textiles may be expected to give satisfactory service when cleaned with Stoddard Solvent, carbon tetrachloride, or tetrachlorethylene, unless subjected to the cleaning, wet process necessary to remove stains not removable by the cleaning solvents. Any change in appearance other than color shall be reported.

28d. *Class 3.*—Textiles which have been subjected to the cleaning, dry and wet tests, with Stoddard Solvent and which show no appreciable change in color and no appreciable staining of the white cloth but which show appreciable change in color or appreciable staining of the white cloth when subjected to the cleaning, dry and wet tests, with carbon tetrachloride or tetrachlorethylene shall be reported as having "Class 3 colorfastness to dry cleaning." Such textiles may be expected to give satisfactory service when cleaned with Stoddard Solvent and when subjected to the cleaning, wet process necessary to remove stains not removable by the Stoddard Solvent. Any change in appearance aside from color shall be reported.

28e. *Class 4.*—Textiles which have been subjected to the cleaning, dry and wet tests, with carbon tetrachloride or tetrachlorethylene and which show no appreciable change in

color and no appreciable staining of the white cloth shall be reported as having "Class 4 colorfastness to dry cleaning." Such textiles may be expected to give satisfactory service when cleaned with Stoddard Solvent, carbon tetrachloride, or tetrachlorethylene and when subjected to the cleaning, wet process necessary to remove stains not removable by the cleaning solvents. Any change in appearance aside from color shall be reported.

VIII. COLORFASTNESS TO CROCKING (RUBBING)

29. *Test specimens.*

29a. At least two test specimens are required for this test.

29b. Each specimen of cloth shall measure about 2 by 5 inches, the longer dimension running in the direction of the warp. If one specimen of a printed cloth does not include all of the colors in the design, additional specimens shall be taken so that all of the colors are included. A piece of the original sample shall be saved for comparison with the tested specimens.

29c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric, and specimens of the knitted fabric shall be taken in accordance with instructions in paragraph 29b. If the yarn or thread cannot be knit, a specimen shall be smoothly and compactly wound on cardboard to present a surface 5 inches long by 1 inch wide. A piece of the original sample shall be saved for comparison with the tested specimens.

30. *Apparatus.*—A Crock Meter[12] or similar machine shall be used in which a square of bleached, unstarched, cotton cloth[13], held firmly over a so-called finger 5/8 inch (15 mm) diameter, is slid back and forth over the test specimen under a constant load of 32 ounces.

31. *Procedure.*

31a. *Dry cloth test.*—One of the test specimens is attached to the top of the board on which the "finger" rests. A square of the bleached, unstarched, cotton cloth is fastened to the "finger"; the "finger" is rested on the test specimen and slid back and forth 10 times, that is, 20 strokes, timed at the approximate rate of 2 strokes per second. The cotton cloth is removed from the finger and the degree of discoloration, if any, rated as less than, equal to, or greater than that corresponding to Munsell neutral 7.0. Discolored cotton cloth is then scrubbed (rubbed between the hands) for 3 minutes with a 0.5-percent soap solution (paragraph 40) at 120° ±5° F, rinsed in warm water (approximately 100° F), dried, and then examined again for discoloration.

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[12] Obtainable from the W. C. Durfee Co., 114 Federal Street Boston, Mass., or from L. A. Olney, chairman, Research Committee, AATCC, Lowell Textile Institute, Lowell, Mass.

[13] This cloth, in the grey, is a 5-yard, 39-inch, 96 X 100, lawn. Squares cut to size for use in the Crock Meter may be purchased in packages of 100 from L. A. Olney, Lowell Textile Institute, Lowell, Mass.

31b. *Wet cloth test.*—The preceding test is repeated on the other specimen with a dampened[14] piece of the same cloth.

32. *Soiled sample.*—If the white test cloth is discolored due to soil on the test specimen, then the crocking test shall be disregarded unless an original unsoiled specimen of the material can be obtained.

33. *Reporting colorfastness to crocking (rubbing).*—The colorfastness to crocking on dry cloth and on wet cloth should be reported separately.

33a. *Class 0.*—Textiles which yield a discoloration of the white cloth in the crocking test equal to or greater than that corresponding to Munsell neutral 7.0, but which discoloration does not disappear after scrubbing (paragraph 31a) shall be reported as having "Class 0 colorfastness to crocking." Such textiles are not considered fast to crocking and materials coming in contact with them may be expected to be discolored.

33b. *Class 1.*—Textiles which yield a discoloration of the white cloth in the crocking test less than that corresponding to Munsell neutral 7.0, but which discoloration does not disappear after scrubbing (paragraph 31a) shall be reported as having "Class 1 colorfastness to crocking." Such textiles show some discoloration of white or light-colored fabrics with which they come in contact and are not considered satisfactory where this discoloration would prove to be objectionable.

33c. *Class 2.*—Textiles which yield a discoloration of the white cloth in the crocking test equal to or greater than that corresponding to Munsell neutral 7.0, but which discoloration disappears after scrubbing (paragraph 31a) shall be reported as having "Class 2 colorfastness to crocking." Such textiles show some discoloration of white or light-colored fabrics with which they come in contact but this discoloration is removable with soap and water.

33d. *Class 3.*—Textiles which yield a discoloration of the white cloth in the crocking test less than that corresponding to Munsell neutral 7.0, but which discoloration disappears after scrubbing (paragraph 31a) shall be reported as having "Class 3 colorfastness to crocking." Such textiles may show slight discoloration of white or light-colored fabrics with which they come in contact, but this discoloration is removable with soap and water.

33e. *Class 4.*—Textiles from which no appreciable discoloration of the white cloth has been obtained in the crocking test shall be reported as having "Class 4 colorfastness to crocking." Such textiles are considered fast to crocking and may be expected to give excellent service where resistance to crocking is important.

IX. COLORFASTNESS TO ATMOSPHERIC GASES

34. *Test specimens.*

[14] Test cloth wet out thoroughly, squeezed, and then passed through a wringer between two sheets of filter paper.

34a. At least four test specimens, two "control samples",[15] AF1 and AF2 (paragraph 95)[16], and a sample of the "standard of fading"[17] are required for this test. If each specimen of a printed cloth does not include all the colors in the design, additional sets of specimens shall be taken so that all of the colors are included. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric. If the yarn or thread cannot be knit, the specimen shall be smoothly and compactly wound on cardboard to present a surface 5 inches long by 1 inch wide. A piece of the original sample shall be reserved for comparison with the tested specimens. The test specimens shall be marked with the numbers 1, 2, 3, and 4, and where more than one specimen is required, the sets shall be so marked, each set containing all the colors in the sample being tested.

34b. Specimen 1 shall be retained in its original condition; specimen 2 shall be subjected to the washing and drying procedures outlined in paragraph 43;[18] specimen 3 shall be subjected to the dry-cleaning and drying procedures with Stoddard Solvent, as outlined in paragraph 26a; specimen 4 shall be subjected to the dry-cleaning and drying procedures with carbon tetrachloride or tetrachlorethylene, as outlined in paragraph 26a.

35. *Apparatus.*[19]—The apparatus shall consist of an enclosed metal chamber connected by a metal pipe to a lighted gas burner in such a manner that the burned gases from the burner pass directly through the chamber. Either natural or manufactured gas may be employed. Any gas burner may be used, and either luminous (yellow) or a blue-green flame is suitable, although the latter is to be preferred in order to avoid the

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[15] The supply of the "control samples," being sensitive to atmospheric gases, should be kept in a closed container and protected from strong light. Samples of the dyed control samples are available from L. A. Olney, Lowell Textile Institute, Lowell, Mass., for a nominal sum.

[16] The fabric used for the control samples may be of any construction of acetate rayon. The fabric is first scoured with a 0.25-percent soap solution (paragraph 40) at 150° ±5° F to remove size or finish, and then rinsed thoroughly in warm water. A dyebath is prepared by mixing the required amount of dye (based on the weight of the scoured fabric), with at least twice its weight of soap and adding water heated to 160° ±5° F. The dyebath is now diluted with water to 50 times the weight of the dry fabric. The fabric is entered into the dyebath at 120° F, and the bath is heated slowly to 180° to 190° F and continued at that temperature for 45 to 60 minutes. The fabric is then rinsed in warm water and dried.

[17] The "standard of fading" is a sample of fabric dyed with vat dyes to a color corresponding to that which control sample AF1 became after exposure in air for 6 months in three different locations in southern New Jersey. Samples of the standard of fading may be obtained from L. A. Olney, Lowell Textile Institute, Lowell, Mass., for a nominal sum.

[18] The treatment before testing is intended to show whether the fabric has been treated with an inhibitor to provide protection against gas fading. All the inhibitors at present available are soluble in water and are therefore removed by the soap solution. On the other hand they are not soluble in the ordinary dry-cleaning solvents and fabrics treated with suitable inhibitors shall withstand several dry cleanings without losing their resistance to gas fading (if the dry-cleaning operation does not include a cleaning, wet procedure). The inhibitors lose their efficiency if the fabrics come into frequent contact with perspiration.

[19] Any equipment in which the test samples can be exposed to air, which is passed through the flame of a lighted gas burner, will serve satisfactorily. Special forms of a suitable apparatus are illustrated in the American Dyestuff Reporter, July 22, 1940, p. 360-369. Complete exposure chamber can be purchased from the Continental Dye Metal Works, 145 W. 24th St., New York, N.Y., for approximately $50 (price January 1943)

formation of soot. A wire screen placed above the flame at a distance which causes it to be heated somewhere between a red and a white heat will increase the percentage of oxides of nitrogen (the color-destroying gases) produced by the burning gas and will thereby accelerate fading of the samples.

36. *Procedure.*—A portion of each test specimen measuring at least 1 inch square, marked with its corresponding number, shall be suspended freely in the chamber, together with the control samples. The gas flame shall be adjusted so that the temperature in the chamber does not exceed 140° F. The specimen shall remain in the chamber until control sample AF1 when removed and placed for 20 seconds under a flatiron heated to 210° to 230° F[20] shows a complete change of color corresponding to that of the standard of fading. All specimens shall then be removed from the chamber, placed for 20 seconds under a flatiron heated to 210° to 230° F, allowed to lie in the air for 15 minutes, and then compared with the respective unexposed specimens from which each was cut.

37. *Reporting colorfastness to atmospheric gases.*

37a. Each of the specimens tested shall be reported for colorfastness as evaluated herein.

37b. *Class 0.*—A specimen which, when compared with the unexposed part of the specimen from which it was cut, shows change in color as much as or more than that shown by control sample AF1 shall be reported as having "Class 0 colorfastness to atmospheric gases." Such textiles are definitely sensitive to atmospheric gases.

37c. *Class 1.*—A specimen which, when compared with the unexposed part of the specimen from which it was cut, shows change in color less than that shown by control sample AF1, but greater than that shown by sample AF2, shall be reported as having "Class 1 colorfastness to atmospheric gases." Such textiles may be expected to have moderate resistance to atmospheric gases.

37d. *Class 2.*—A specimen which, when compared with the unexposed part of the specimen from which it was cut shows change in color no greater than that shown by control sample AF2, shall be reported as having "Class 2 colorfastness to atmospheric gases." Such textiles may be expected to have good resistance to atmospheric gases.

37e. *Class 3.*—A specimen which, when compared with the unexposed part of the specimen from which it was cut, shows no appreciable change in color, shall be reported as having "Class 3 colorfastness to atmospheric gases." Such textiles may be expected to have excellent resistance to atmospheric gases.

X. COLORFASTNESS TO LAUNDERING OF COTTON, LINEN, AND RAYON TEXTILES

38. *Test specimens.*

[20] Same as footnote 4, page 7, except as to temperature, and proportion of tin, lead, and bismuth should suit individual case.

38a. At least four test specimens are required for this test. To each of these four specimens is sewed or otherwise securely attached at one end a piece of unsized, bleached, unmercerized cotton cloth, preferably 80/80, of equal size. If desired, a sample of composite test cloth[21], 1-inch square, may be used in tests 1 and 2.

38b. Each specimen of cloth shall measure about 2 by 4 inches, the longer dimension running in the direction of the warp. If one specimen of a printed cloth does not include all the colors in the design, additional specimens shall be prepared in the same manner so that all the colors are included. The white cloth shall be attached to the face of the printed cloths. A piece of the original sample shall be saved for comparison with the tested specimens.

38c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric, and specimens of the knitted fabric taken according to instructions in paragraphs 38a and 38b. If the yarn or thread cannot be knit, the specimens shall consist of a braid 4 inches in length made with two portions of the yarn to be tested and one portion of unsized, bleached, unmercerized cotton yarns, or a strip of composite test cloth may be used in tests Nos. 1 and 2. A piece of the original knitted fabric or braid shall be saved for comparison with the tested specimens.

39. *Water.*—Total hardness of the water shall not exceed 35 parts per million calculated as calcium carbonate.

40. *Soap.*

40a. A good grade of neutral soap shall be used. The soap shall be as free as commercially practicable of rosin and of all substances other than true soap, except that the moisture content may be about 12 percent. The soap shall be of a light uniform color and free of disagreeable odors.

40b. Soap solutions shall be made up on the basis of 88 percent soap, 5 g per liter being the standard soap solution for all tests.

41. *Chlorine.*—Hypochlorite of soda solution as sold for laundry use is suitable for the test requiring chlorine. The amount of available chlorine must be determined by chemical analysis at frequent intervals as the strength of the solution changes on standing.

42. *Washing machine.*[22]—A Launder-Ometer or similar machine in which 1-pint preserve jars are held with their bases toward a horizontal shaft 2 inches from the center of rotation and the shaft rotated at a speed of 40 to 45 revolutions per minute shall be used. Provision shall be made for maintaining the initial temperature of the jars by rotating them in a water bath that can be heated.

43. *No. 1 test procedure.*

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[21] See footnote 5, p. 8.

[22] In order to be certain that the test procedures are being carried out properly, they should be calibrated by means of Dyed Standards of known characteristics. Each dyed standard, CW1, CW2, CW3, and CW4 should be given the test corresponding to its number. The test procedures shall be considered to be satisfactory when CW1 shows an appreciable change in test 1, CW2 shows a very slight change but which is not an appreciable change in test 2, and CW3 and CW4 do not show an appreciable change in their respective tests. See section XX for further information on dyed standards.

43a. The specimen to be tested is placed in a 1-pint glass jar containing 100 ml of a 0.5-percent soap solution heated to 105° F and ten 3/8-inch rubber balls.

43b. The jar is then closed and placed in the washing machine (paragraph 42), which is half-filled with water at 105° F. The machine is operated for 30 minutes, maintaining the temperature at 105° ±2° F. The jar is emptied and the specimen rinsed by shaking it vigorously for 1 minute with 100 ml of water at 105° F. This rinse is repeated with a change of water. The jar is then emptied and the specimen rinsed for 2 minutes with 100 ml of water at 80° F, containing 0.05 percent of acetic acid. The jar is then emptied and the specimen rinsed for 2 minutes with water at 80° F, hydroextracted or wrung and dried by pressing the specimen in contact with the white cloth with a flatiron having a temperature between 275° and 300° F[23] with the white cloth uppermost.

44. *No. 2 test procedure.*

44a. The specimen to be tested is placed in a 1-pint glass jar containing 100 ml of a 0.5-percent soap solution heated to 120° F and ten 3/8-inch rubber balls.

44b. The jar is then closed and placed in the washing machine (paragraph 42), which is half-filled with water at 120° F. The machine is operated for 30 minutes, maintaining the temperature of 120° F ±2° F. The jar is emptied and the specimen rinsed by shaking it vigorously for 1 minute with 100 ml of water at 105° F. This rinse is repeated with a change of water. The jar is then emptied and the specimen rinsed for 2 minutes with 100 ml of water at 80° F, containing 0.05 percent of acetic acid. The jar is then emptied and the specimen rinsed for 2 minutes with water at 80° F, hydroextracted or wrung, and dried by pressing the specimen in contact with the white cloth with a flatiron having a temperature between 275° and 300° F[24] with the white cloth uppermost.

45. *No. 3 test procedure.*[25]

45a. The specimen to be tested is placed in a 1-pint glass jar[26] containing 100 ml of a 0.5-percent soap solution and 0.2-percent anhydrous sodium carbonate (soda ash) solution heated to 160° F and ten 3/8-inch rubber balls.

45b. The jar is then closed and placed in the washing machine (paragraph 42), which is half-filled with water at 160° F. The machine is operated for 45 minutes, maintaining the temperature at 160° ±2° F. The jar is emptied and the specimen rinsed by shaking it vigorously for 1 minute with 100 ml of water at 105° F. This rinse is repeated with a change of water. The jar is then emptied and the specimen rinsed for

[23] See footnote 4, p. 7.

[24] See footnote 4, p. 7.

[25] It has been recently recognized that Launder-Ometer test procedures, Nos. 3 and 4, are not sufficient to identify the colorfastness of dyes which may have been improperly applied. Work is actively in progress looking toward the development of a suitable test method for inclusion in this standard.

[26] For the No. 3 and No. 4 tests it is advisable to preheat the glass jars and contents in a water bath before entering in the Launder-Ometer to avoid breakage and as an aid to more easily obtain working temperatures.

2 minutes with 100 ml of water at 80° F containing 0.05 percent of acetic acid. The jar is then emptied and the specimen rinsed for 2 minutes with water at 80° F, hydroextracted or wrung and dried by pressing the specimen in contact with the white cloth with a flatiron having a temperature between 275° and 300° F,[27] with the white cloth uppermost.

46. *No. 4 test procedure.*[28]

46a. The specimen to be tested is placed in a 1-pint glass jar[29] containing 100 ml of a 0.5-percent soap and 0.2-percent anhydrous sodium carbonate solution heated to 180° F and ten 3/8-inch rubber balls.[30] An addition of 1 ml of a 1-percent available chlorine solution of sodium hypochlorite shall be made just before placing the test specimen in the glass jar.

46b. The jar is then immediately closed and placed in the washing machine (paragraph 42), which is already half-filled with water at 180° to 185° F. The machine is operated for 45 minutes, maintaining the temperature as above. The jar is emptied and the specimen rinsed by shaking it vigorously for 1 minute with 100 ml of water at 105° F. This rinse is repeated with a change of water. The jar is then emptied and the specimen rinsed for 2 minutes with 100 ml of water at 80° F containing 0.05 percent of acetic acid. The jar is then emptied and the specimen rinsed for 2 minutes with water at 80° F, hydroextracted or wrung, and dried by pressing the specimen in contact with the white cloth with a flatiron having a temperature between 275° and 300° F,[31] with the white cloth uppermost.

TABLE 1.—*Tabulation of testing methods for colorfastness to laundering of cotton, linen, and rayon textiles*

Test No.	Temperature	Soap	Sodium carbonate	Available chlorine	Time
	°F	%	%	%	min
1.....	105	0.5	None	None	30
2.....	120	.5	None	None	30
3.....	160	.5	0.2	None	45
4.....	180-185	.5	.2	0.01	45

47. *Reporting colorfastness to laundering of cotton, linen, and rayon textiles.*

47a. *Class 0.*—Cotton, linen, and rayon textiles which have been subjected to the No. 1 test and which show either an appreciable change in color or an appreciable staining of the attached white cloth shall be reported as having "Class 0 colorfastness to laundering." Such textiles are not generally considered to be launderable. Under special washing

[27] See footnote 4, p. 7.
[28] See footnote 25, p. 17.
[29] See footnote 26, p. 17.
[30] Fresh or new rubber balls may react with chlorine, thereby vitiating the results of the test. Such balls shall be given a preliminary washing in the prescribed solution as outlined in paragraph 46a before being used for testing purposes.
[31] See footnote 4, p. 7.

conditions, however, some of them may be laundered. Some change in color or staining or both may be expected.

47b. *Class 1.*—Cotton, linen, and rayon textiles which have been subjected to the No. 1 test and which show no appreciable change in color and no appreciable staining of the white cloth shall be reported as having "Class 1 colorfastness to laundering." Such textiles are considered launderable only in very careful laundering at lukewarm temperatures (when the temperature does not exceed wrist heat), when no alkali or chlorine is present and when the material is not dried out-of-doors.

47c. *Class 2.*—Cotton, linen, and rayon textiles which have been subjected to the No. 2 test and which show no appreciable change in color and no appreciable staining of the attached white cloth shall be reported as having "Class 2 colorfastness to laundering." Such textiles are considered launderable in home or commercial laundries under careful methods where the temperature does not exceed 120° F, when no alkali or chlorine is present, and when the material is not dried in direct sunlight.

47d. *Class 3.*—Cotton, linen, and rayon textiles which have been subjected to the No. 3 test and which show no appreciable change in color and no appreciable staining of the attached white cloth shall be reported as having "Class 3 colorfastness to laundering." Such textiles may be expected to give satisfactory performance in normal commercial or home laundering processes for these fibers, when boiling temperatures are not employed, when chlorine is not used, and when the material is not dried in direct sunlight.

47e. *Class 4.*—Cotton, linen, and rayon textiles, which have been subjected to the No. 4 test and which show no appreciable change in color and no appreciable staining of the attached white cloth shall be reported as having "Class 4 colorfastness to laundering." Such textiles are considered of superior fastness to home or commercial laundering processes for these fibers, as the severity of this test permits the use of only those dyestuffs having the greatest resistance to fading. It must be remembered, however, that there is no protection implied in this classification against the excessive use of chlorine in washing or the repeated effects of drying in direct sunlight.

XI. COLORFASTNESS TO LAUNDERING OF TEXTILES OTHER THAN COTTON, LINEN, AND RAYON

48. *Test specimen.*

48a. At least one test specimen is required for this test. To it are sewed or otherwise securely attached at one end 1-inch square pieces of white wool, desized cotton, silk, viscose rayon, and acetate rayon fabrics or a 1-inch square piece of composite test cloth.[32]

[32] See footnote 5, p. 8.

48b. Each specimen of cloth shall measure about 2 by 4 inches, the longer dimension running in the direction of the warp. If one specimen of a printed cloth does not include all of the colors in the design, additional specimens shall be prepared in the same manner so that all the colors are included. The white cloth shall be attached to the face of the printed cloths. A piece of the original sample shall be saved for comparison with the tested specimens.

48c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric and specimens of the knitted fabric taken according to instructions in paragraphs 48a and 48b. If the yarn or thread cannot be knit, the specimen shall consist of a braid 4 inches in length made with two portions of the yarn to be tested and one portion of white wool, desized cotton, silk, viscose rayon, and acetate rayon yarns, or a strip of composite test cloth. A piece of the original knitted fabric or braid shall be saved for comparison with the tested specimens.

49. *Washing machine.*[33]—A Launder-Ometer or similar machine, in which 1-pint preserve jars are held with their bases toward a horizontal shaft 2 inches from the center of rotation, and the shaft rotated at a speed of 40 to 45 revolutions per minute, shall be used. Provisions shall be made for maintaining the initial temperature of the jars by rotating them in a water bath which can be heated.

50. *Washing procedure.*—The specimen to be tested is placed in a 1-pint preserve jar to which is added 300 ml of a solution containing 0.5 percent of neutral soap in soft water heated to 100° ±2° F. The jar is then closed and placed in the machine, which is half-filled with water at 100° ±2° F. The machine is operated for 30 minutes. It shall be heated to maintain a constant temperature of 100° ±2° F. The specimen is then removed from the jar, rinsed in three changes of water at 100° ±2° F, rolled in a dry towel or absorbent cotton cloth to remove excess moisture, spread on a padded ironing board, and pressed in contact with the white cloth until dry with a flatiron having a temperature between 275° and 300° F,[34] with the white cloth uppermost. Textiles containing wool shall be air dried, and only those which are ironed normally shall be pressed, as stated, under a dampened cloth. The specimen is allowed to lie on a smooth, horizontal surface for 1 hour at room temperature.

51. *Reporting colorfastness to laundering of textiles other than cotton, linen, and rayon.*

51a. *Class 0.*—Textiles other than cotton, linen, and rayon which have been subjected to the above test, and which show either an appreciable change in color or an appreciable staining of the white cloth shall be reported as having "Class 0 colorfastness to laundering." Such textiles are considered not to be launderable even in very careful laundering.

51b. *Class 1.*—Textiles other than cotton, linen, and rayon which have been subjected to the above test and which show

[33] See footnote 22, p. 16.
[34] See footnote 4, p. 7.

no appreciable change in color and no appreciable staining of the white cloth shall be reported as having "Class 1 colorfastness to laundering." Such textiles may be expected to give satisfactory performance in careful home or commercial laundering when the temperature does not exceed wrist heat and when the textiles are not dried out-of-doors.

XII. COLORFASTNESS TO LIGHT

52. *Test specimens.*

52a. One or preferably two specimens shall be prepared from the textile to be tested. Fabrics shall be cut to required size. If a specimen of printed cloth does not include all of the colors in the design, additional specimens shall be prepared so that all of the colors are included. Yarns and threads shall be wound on frames and fiber masses shall be made into flat pads.

52b. Each test specimen shall measure about 2 1/2 by 3 inches, the longer dimension running in the direction of the warp of fabrics, lengthwise of yarns, and where possible, lengthwise of the fibers in a pad. A piece of the original sample shall be saved for comparison with the tested specimens.

53. *Apparatus.*

53a. The apparatus for this test shall be that described herein or a calibrated equivalent. A suitable fading lamp consists of a carbon arc enclosed in Pyrex glass, which shall be well cleaned every 24 hours of use, operated on a direct current of approximately 12 to 14 amperes or 60-cycle alternating current of approximately 15 to 17 amperes with 140 volts across the arc. The voltage of the power line to the apparatus is 208 to 250 volts. The distance from arc to specimens is 10 inches, and the specimens shall preferably rotate about the arc to insure uniformity of exposure. The air about the specimens during exposure shall be humidified and its temperature shall be automatically controlled. The relative humidity of the air in the apparatus filled with specimens and operating normally (i.e. for a sufficient period of time to reach temperature equilibrium) shall not exceed 50 percent and its temperature shall not exceed 105° F. The relative humidity and temperature shall be measured in a plane perpendicular to the axis of the arc passing through the point where the two carbons meet when fresh carbons are inserted, at the same distance from the center of the arc as the surface of the specimens. The temperature shall be measured with a mercury thermometer with the bulb fully exposed to the radiation of the arc. The apparatus shall be considered to be operating satisfactorily providing

standard sample L3 (paragraph 97) does not fade appreciably with 5 hours exposure, but does fade appreciably with 10 hours exposure;

standard sample L5 (paragraph 97) does not fade appreciably with 20 hours exposure, but does fade appreciably with 40 hours exposure;

standard sample L7 (paragraph 97) does not fade appreciably with 80 hours exposure, but does fade appreciably with 160 hours exposure.

Standard samples L4, L6, and L8 (paragraph 97) will be available for calibration of the operation of the apparatus, if desired, at 20, 80, and 320-hours exposure, respectively.

53b. To determine the degree of fading of standard samples, place the exposed and a corresponding unexposed sample in the same plane in such a position that somewhat diffused daylight, either standard artificial daylight or light from a northern sky, falls equally on both at an angle of about 45°. Look squarely at the surfaces rather than from a position at an angle to the surfaces.

53c. Other fading apparatus than that described in paragraph 53a, calibrated to produce equivalent results in the fading of the standard samples, may be used.

54. *Procedure.*

54a. Each specimen shall be placed between opaque covers that will shield it from light except for an area of about 1 5/8 by 2 inches, which shall be open to the air on both sides. The specimen so protected shall be exposed in the apparatus described above for a period of 10, 20, 40, 80, 160, or 320 hours, depending upon its fastness. The longest period of exposure it will withstand without an "appreciable" change in color shall be determined. The results of preliminary observations made when the specimen is removed momentarily from the apparatus shall be confirmed after the specimen has been allowed to lie in the dark at room temperature for at least 2 hours.

54b. In examining the results of tests, the exposed portion shall be cut out inside of the line left by the edge of the aperture in the covers, and the exposed portion shall then be mounted on a similar portion of the original untested sample. The interpretation of appreciable change (paragraph 6b) shall be determined on that comparison.

55. *Reporting colorfastness to light.*

55a. *Class 0.*—Textiles which show an appreciable change in color after exposure to light in the apparatus (paragraph 53) for 10 hours shall be reported as having "Class 0 colorfastness to light." Such textiles are not considered satisfactory for use where any degree of fastness to light is desirable.

55b. *Class 1.*—Textiles which show no appreciable change in color after exposure to light in the apparatus (paragraph 53) for 10 hours shall be reported as having "Class 1 colorfastness to light." Such textiles are considered satisfactory for use only when fastness to light is not important but when some little fastness is desirable.

55c. *Class 2.*—Textiles which show no appreciable change in color after exposure to light in the apparatus (paragraph 53) for 20 hours shall be reported as having "Class 2 colorfastness to light." Such textiles are considered satisfactory for use where moderate fastness to light is desirable but not of major importance.

55d. *Class 3.*—Textiles which show no appreciable change in color after exposure to light in the apparatus (paragraph 53) for 40 hours shall be reported as having "Class 3 colorfastness to light." Such textiles may be expected to give satisfactory performance where good fastness to light is essential.

55e. *Class 4.*—Textiles which show no appreciable change in color after exposure to light in the apparatus (paragraph 53) for 80 hours shall be reported as having "Class 4 colorfastness to light." Such textiles are considered of superior fastness to light and may be used where superior fastness to light is of major importance. Because of the severity of this test, the range of colors obtainable in this classification is limited.

55f. Textiles which show no appreciable change in color after exposure to light in the apparatus (paragraph 53) for 160 or more hours as specified shall be reported as having "Class 5 ——— (Number of hours specified) colorfastness to light." Such textiles are considered of superlative fastness to light and may be used for any purpose where the corresponding specified extreme fastness to light is required. The range of colors obtainable in this classification is extremely limited.

XIII. COLORFASTNESS TO PERSPIRATION

56. *Test specimens.*

56a. Two specimens of the fabric, of sufficient length that when rolled lengthwise and inserted in the glass tube, as described below, the roll will fit the bore of the tube, are required for this test.

56b. Each specimen shall measure about 2 inches wide. If one specimen of a printed textile does not include all the colors in the design, additional specimens shall be taken so that all the colors are included. One piece of composite test cloth[35] of the same dimensions is required for each specimen being tested. A piece of the original sample shall be saved for comparison with the tested specimens.

56c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric and specimens of the knitted fabric taken according to instructions in paragraph 56b. If the yarn or thread cannot be knit, the specimen shall consist of a compact, smooth braid. A piece of the original knitted fabric or braid shall be saved for comparison with the tested specimens.

57. *Reagents.*—Two solutions are required as follows:

ACID SOLUTION

10 g of sodium chloride.
1 g of lactic acid, USP 85 percent.
1 g of disodium orthophosphate anhydrous.
Make up to 1 liter with distilled water.

[35] See footnote 5, p. 8.

ALKALINE SOLUTION

10 g of sodium chloride.
4 g of ammonium carbonate, USP.
1 g of disodium orthophosphate anhydrous.
Make up to 1 liter with distilled water.

58. *Procedure.*

58a. One of the test specimens and a similar sized piece of composite test cloth are thoroughly wet with the acid solution. The amount of solution left in the specimens should be in such a ratio that when the roll weighs dry 2 1/2 g, the total weight will be between 6 and 8 g, depending on the construction of the specimen. The two pieces are then rolled together with the fabric to be tested on the inside. The test cloth is placed against the face of the printed specimens. The other test specimen is prepared in a similar manner, except that the pieces are wet thoroughly with the alkaline solution.

58b. Each roll is then placed in a glass tube, one end of which is closed, leaving one-third of each roll projecting, the other two-thirds of the roll being protected from evaporation. The glass tube should be 15 to 20 mm (approximately 19/32 to 25/32 inch) in diameter; a length of 60 to 75 mm (approximately 2 3/8 to 2 15/16 inches) is convenient.

58c. The tubes are placed in an oven maintained at a temperature of 100° ±2° F. The specimens are allowed to remain in the oven until dry. No specimen shall be rinsed after drying.

58d. The degree of discoloration of the test cloth, if any, is rated as less than, equal to or greater than that corresponding to Munsell neutral 7.0. Discolored test cloth is then scrubbed (rubbed between the hands) for 3 minutes with a 0.5-percent soap solution (paragraph 40) at 120° ±5° F, and then examined again for discoloration.

59. *Reporting colorfastness to perspiration.*

59a. *Class 0.*—Textiles which have been subjected to the above test and which show appreciable change in color or which yield to discoloration of the white cloth greater than that corresponding to Munsell neutral 7.0, but which discoloration does not disappear after scrubbing (paragraph 58d) shall be reported as having "Class 0 colorfastness to normal perspiration." Such textiles may be expected to be unsatisfactory where any resistance of the color to normal perspiration is required.

59b. *Class 1.*—Textiles which have been subjected to the above test and which show no appreciable change in color but yield a discoloration of the white cloth equal to or less than that corresponding to Munsell neutral 7.0, which is not removable after scrubbing (paragraph 58d), shall be reported as having "Class 1 colorfastness to normal perspiration." Such textiles show some discoloration of white or light-colored textiles with which they may come in contact, and this discoloration will not be removable with soap and water.

59c. *Class 2.*—Textiles which have been subjected to the above test, and which show no appreciable change in color but

appreciable staining of the test cloth which disappears after scrubbing (paragraph 58d) shall be reported as having "Class 2 colorfastness to normal perspiration." Such textiles show some discoloration of white or light-colored textiles with which they may come in contact, but this discoloration will be removable with soap and water.

59d. *Class 3.*—Textiles which have been subjected to the above test and which show no appreciable change in color and no appreciable staining of the test cloth, shall be reported as having "Class 3 colorfastness to normal perspiration." Such textiles may be expected to give excellent service where resistance of the color to normal perspiration is important.

XIV. COLORFASTNESS TO PRESSING, DRY AND WET, OF COTTON AND LINEN TEXTILES

60. *Test specimens.*

60a. At least two test specimens are required for these tests. One of these specimens is covered with a piece of bleached unsized cloth which has been wet and thoroughly wrung out.

60b. Each specimen of cloth shall measure about 2 by 4 inches, the longer dimension running in the direction of the warp. If one specimen of a printed cloth does not include all the colors in the design, additional specimens shall be prepared in the same manner so that all the colors are included. The white cloth shall be attached to the face of the printed cloths. A piece of the original sample shall be saved for comparison with the tested specimens.

60c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric and specimens of the knitted fabric taken according to instructions in paragraphs 60a and 60b. If the yarn or thread cannot be knit, the specimen shall consist of a compact, smooth braid. A piece of the original knitted fabric or braid shall be saved for comparison with the tested specimens.

61. *Procedure.*

61a. *Dry pressing.*—The material to be tested is ironed while dry for 5 seconds at 425° F[36] and then allowed to lie in the dark at room temperature for 1 hour or until natural moisture is regained.

61b. *Wet pressing.*—The other test specimen is covered with the wet cloth and ironed immediately for 10 seconds at 350° F[37] and allowed to lie in the dark room at room temperature for 1 hour or until natural moisture is regained.

62. *Reporting colorfastness to dry pressing of cotton and linen textiles.*

62a. *Class 0.*—Cotton and linen textiles which have been subjected to the dry-pressing test and which show appreciable change in color 1 hour and 24 hours after pressing shall be

[36] See footnote 4, p. 7, except as to temperature and proportion of tin, lead, and bismuth to suit individual case.

[37] See footnote 4, p. 7, except as to temperature and proportion of tin, lead, and bismuth to suit individual case.

reported as having "Class 0 colorfastness to dry pressing." Such textiles may be expected to be unsatisfactory where resistance of the color to dry pressing is required.

62b. *Class 1.*—Cotton and linen textiles which have been subjected to the dry-pressing test and which show appreciable change in color 1 hour but no appreciable change 24 hours after pressing, shall be reported as having "Class 1 colorfastness to dry pressing." Such textiles show some change in color, but the original color will be regained within 24 hours.

62c. *Class 2.*—Cotton and linen textiles which have been subjected to the dry-pressing test and which show no appreciable change in color 1 hour after pressing shall be reported as "Class 2 colorfastness to dry pressing." Such textiles may be expected to give excellent service where resistance of the color to pressing, dry, is important.

63. *Reporting colorfastness to wet pressing of cotton and linen textiles.*

63a. *Class 0.*—Cotton and linen textiles which have been subjected to the wet-pressing test and which show appreciable change in color 1 hour and 24 hours after pressing or appreciable staining of the white fabric shall be reported as having "Class 0 colorfastness to wet pressing." Such textiles may be expected to be unsatisfactory where resistance of the color to pressing, wet, is required.

63b. *Class 1.*—Cotton and linen textiles which have been subjected to the wet-pressing test and which show appreciable change in color 1 hour but no appreciable change 24 hours after pressing and no appreciable staining of the white fabric, shall be reported as having "Class 1 colorfastness to wet pressing." Such textiles show some change in color, but the original color will be restored within 24 hours.

63c. *Class 2.*—Cotton and linen textiles which have been subjected to the wet-pressing test and which show no appreciable change in color 1 hour after pressing, and no appreciable staining of the white fabric shall be reported as having "Class 2 colorfastness to wet pressing." Such textiles may be expected to give excellent service where resistance of the color to pressing, wet, is important.

XV. COLORFASTNESS TO PRESSING, DRY AND WET, OF TEXTILES OTHER THAN COTTON AND LINEN

64. *Test specimens.*

64a. At least two test specimens are required for these tests. To one of these specimens (woolen and worsted specimens excepted) are sewed pieces of white wool, desized cotton, silk, viscose rayon, and acetate rayon fabrics or a piece of composite test cloth[38] of equivalent size.

64b. Each specimen of cloth shall measure about 2 by 4 inches, the longer dimension running in the direction of the warp. If one specimen of a printed cloth does not include all the colors in the design, additional specimens shall be

[38] See footnote 5, p. 8.

prepared in the same manner so that all the colors are included. The white cloth shall be attached to the face of the printed cloths. A piece of the original sample shall be saved for comparison with the tested specimen.

64c. Yarns and threads to be tested shall be knit, using a plain stitch to make a compact, smooth fabric and specimens of the knitted fabric prepared in accordance with the instructions in paragraphs 64a and 64b. If the yarn or thread cannot be knit, the specimens shall consist of a compact, smooth braid. A piece of the original knitted fabric or braid shall be saved for comparison with the tested specimen.

65. *Procedure.*

65a. *Dry pressing.*—The test specimen without the sewed-on white fabrics is pressed for 10 seconds with a flatiron having a temperature between 275° and 300° F[39] and allowed to rest for 1 hour. The specimen so pressed is compared with the original sample not pressed.

65b. *Wet pressing.*—The other test specimen is thoroughly wetted (woolens and worsteds are not wetted but a piece of composite test cloth is thoroughly wetted, the surplus water shaken off, placed face down on the other dry test specimen) and pressed until dry on a pad permeable to steam with a flatiron having a temperature between 275° and 300° F[40] and allowed to rest for 1 hour. The specimen so pressed is compared with the original sample not pressed, and the white fabrics are examined for staining.

66. *Reporting colorfastness to dry pressing of textiles other than cotton and linen.*

66a. *Class 0.*—Textiles other than cotton and linen which have been subjected to the dry-pressing test and which show appreciable change in color 1 hour and 24 hours after pressing shall be reported as having "Class 0 colorfastness to dry pressing." Such textiles may be expected to be unsatisfactory where resistance of the color to pressing, dry, is required.

66b. *Class 1.*—Textiles other than cotton and linen which have been subjected to the dry-pressing test and which show appreciable change in color 1 hour but no appreciable change 24 hours after pressing shall be reported as having "Class 1 colorfastness to dry pressing." Such textiles show some change in color but the original color will be regained within 24 hours.

66c. *Class 2.*—Textiles other than cotton and linen which have been subjected to the dry-pressing test and which show no appreciable change in color 1 hour after pressing shall be reported as having "Class 2 colorfastness to dry pressing." Such textiles may be expected to give excellent service where resistance of the color to pressing, dry, is important.

67. *Reporting colorfastness to wet pressing of textiles other than cotton and linen.*

67a. *Class 0.*—Textiles other than cotton and linen which have been subjected to the wet-pressing test and which show

[39] See footnote 4, p. 7.
[40] See footnote 4, p. 7.

appreciable change in color 1 hour or 24 hours after pressing or appreciable staining of the white fabrics shall be reported as having "Class 0 colorfastness to wet pressing." Such textiles are expected to be unsatisfactory where resistance of the color to pressing, wet, is required.

67b. *Class 1.*—Textiles other than cotton and linen which have been subjected to the wet-pressing test and which show appreciable change in color 1 hour but no appreciable change 24 hours after pressing and no appreciable staining of the white fabrics shall be reported as having "Class 1 colorfastness to wet pressing." Such textiles show some change in color, but the original color will be restored within 24 hours.

67c. *Class 2.*—Textiles other than cotton and linen which have been subjected to the wet-pressing test and which show no appreciable change in color one hour after pressing, and no appreciable staining of the white fabrics, shall be reported as having "Class 2 colorfastness to wet pressing." Such textiles may be expected to give excellent service where resistance of the color to pressing, wet, is important.

XVI. SHRINKAGE IN DRY CLEANING OF WOVEN FABRICS

[For shrinkage in laundering see sections XVII and XVIII]

68. *Test specimens.*—Two specimens are required, one for shrinkage in cleaning, dry, the other for cleaning, wet. The specimens shall be taken no nearer the selvage than one-tenth the width of the fabric. Each shall measure at least 12 by 12 inches. A 10-inch square whose sides are placed parallel with the warp and filling, respectively, of the specimen is outlined on it preferably with the aid of a rigid templet. The corners and midpoints of each side of the square are marked either with indelible ink applied with a fine pen, with a fine thread sewed into the fabric, or by 1/16-inch holes punched in the fabric.

69. *Apparatus.*—The apparatus used shall consist of a cylinder, preferably of metal approximately 13 inches high, having a diameter of about 8 3/4 inches (capacity 3 gallons). The cylinder shall be mounted in a vertical position on an axis, which is inclined 50° to the axis of the cylinder, and rotated about this axis at a speed of 45 to 50 revolutions per minute.

70. *Cleaning procedures.*

70a. *Cleaning, dry, procedure.*—The apparatus is filled approximately one-third with Stoddard Solvent,[41] to which is added 270 ml of dry-cleaning soap.[42] The two specimens and sufficient suitable worsted cloth,[43] in pieces approximately 12 by 12 inches to make a total dry load of 1 pound are placed in the apparatus. It is operated for 25 minutes. The solution is poured out, the apparatus is refilled approximately

[41] See footnote 8, p. 10.
[42] See footnote 7, p. 9.
[43] Worsted cloth of plain weave, 8 to 8.5 ounces per linear yard, 58 inches wide, is suitable for this purpose, and may be obtained from the Arlington Mills, Lawrence, Mass.

one-third with fresh Stoddard Solvent without soap, and the apparatus is operated for an additional 5 minutes. The procedure described in the preceding sentence is repeated three times. The test specimens are then removed. The excess solvent is removed from the specimens by any convenient means, such as rolling them between two layers of Turkish toweling or between two layers of absorbent paper, and one specimen permitted to dry at room temperature. The second specimen is then laid out on a horizontal surface, such as a muslin-covered frame or screen; wrinkles are removed by gently pressing with the palm of the hand; and the specimen is dried at room temperature. This specimen is pressed according to the method of paragraph 71a or 71b, or if a pile fabric, steamed in accordance with paragraph 71c. The other specimen is treated further according to paragraph 70b.

70b. *Cleaning, wet, procedure.*[44]—The unpressed specimen mentioned in paragraph 70a is placed on a porcelain slab or piece of slate, and made wet with sufficient distilled water at a temperature of 90° to 100° F, containing 1 g of neutral soap per liter, to keep the fabric wetted thoroughly for 15 minutes. The fabric is then rinsed by immersing it in a liter of distilled water for 5 minutes, removed without squeezing, laid out on a horizontal surface, such as a muslin-covered frame or screen, and allowed to dry at room temperature. This specimen is pressed according to the method of paragraph 71a or 71b or, if a pile fabric, steamed in accordance with paragraph 71c.

71. *Pressing.*—Either of the two methods outlined below may be used in pressing the specimen.

71a. *Hand pressing.*[45]—When all the solvent has evaporated the specimen is laid on a padded ironing board, care being taken to avoid any strain during handling. The specimen is covered with a damp muslin press cloth, weighing 4 to 4 1/2 ounces per square yard, previously saturated with water and wrung out so as to retain moisture equal to approximately 75 percent of its dry weight. It is then pressed with a flat-iron having a temperature between 275° and 300° F[46] at the point until dry. The specimen is allowed to lie on a smooth horizontal surface for 1 hour thereafter at room temperature.

71b. *Saturated steam pressing (for all fabrics except pile fabrics).*[47]—When all the solvent has evaporated, the specimen is laid on the bed of a flat-bed press, care being taken to avoid any strain during handling. The press shall be of a hot-head or a polished-metal-top type for flat fabrics or a cloth-type press for rough crepes. The steam pressure shall be between 60 and 65 pounds. The head of the machine is lowered and held in contact with the fabric. During this period the steam is admitted from the buck of the press for a period

[44] See footnote 9, p. 10.

[45] It has been disclosed that as far as handling the fabric during pressing is concerned this method is not generally accepted for woolens and worsteds. When an acceptable test procedure for holding woolen and worsted fabrics during pressing is developed, it will be offered for inclusion in this standard.

[46] See footnote 4, p. 7.

[47] See footnote 45, p. 29.

of from 5 to 10 seconds. The specimen is allowed to lie on a horizontal surface for 1 hour, thereafter at room temperature.

71c. *Steaming (for pile fabrics).*—When all the solvent has evaporated from a pile fabric test specimen cleaned according to paragraph 70, the specimen is spread out on a steam board or table[48] on a damp muslin press cloth, weighing 4 to 4 1/2 ounces per square yard, previously saturated with water and wrung out so as to retain moisture equal to approximately 75 percent of its weight. Steam is then turned on and allowed to pass through the pile fabric for 2 minutes. The test piece is then cooled to room temperature and allowed to lie in a smooth, horizontal position for 1 hour thereafter.

72. *Shrinkage.*—The distances marked in each direction on the specimens are then measured. The average changes in dimensions in the warp and in the filling directions for each specimen are calculated. These are designated the warp and filling shrinkages, respectively, of the specimens.

73. *Reporting shrinkage in cleaning, dry and wet.*

73a. The warp and filling shrinkages in "cleaning, dry" shall be reported separately, in percent, to the nearest whole number.

73b. The warp and filling shrinkages in "cleaning, wet" shall be reported separately, in percent, to the nearest whole number.

XVII. SHRINKAGE IN LAUNDERING OF COTTON AND LINEN WOVEN FABRICS

74. *Test specimen.*—One test specimen at least 20 inches square or at least 20 inches in length by the full width of the material is required for this test. There are marked off accurately on the specimen, in both the warp and filling directions, three 18-inch lengths, or longer when the size of the specimen permits, spaced at least 6 inches apart, at least 1 inch from all edges of the specimen, and not nearer the selvage than one-tenth the width of the fabric. Suitable marks are obtained with indelible ink applied with a fine pen or stamp, or fine threads sewed into the fabric. Care shall be taken to see that the distances are parallel with the yarns.

75. *Washing machine.*—The washing shall be carried out in a reversing wash wheel of the cylindrical type. A suitable type of machine for this test is one having a 20- or 24-inch wheel and taking a load of about 3 pounds of dry wash. Provision shall be made for adding water to the wheel at the designated temperature and for heating directly in the wheel, preferably by means of live steam.

76. *Washing procedure.*

76a. *Standard load.*—A load which is normal for the machine used is washed at one time. The load may be made up of test specimens and additional cloth as required. The amount of wash solution or rinse water shall be normal for the machine and in any event sufficient to cover the samples.

[48] See footnote 11, p. 10.

Usually an amount weighing about 50 times the weight of dry cloth will be sufficient.

76b. *Soap solution.*—Sufficient laundry soap, of good grade to give a good running suds, shall be used. As a convenience, the soap may be dissolved in water prior to adding it to the wheel. A stock solution may be prepared by dissolving 1 pound of soap in 1 gallon of hot water. When cool, this forms a thick homogeneous jelly, which may be added to the wheel as required.

76c. *Washing.*—The wash wheel is kept running continuously for 60 minutes from the start of this test. The wet cloth samples will thus be tumbled in the machine while the latter is being drained and filled. This is essential. Each operation should be carried out without delay.

76d. The specimen to be tested and such additional cloth as is necessary to make up the load are placed in the wash wheel, which is then started running and the time noted. The required amount of water, at a temperature not exceeding 100° F, and of soap are then added. The temperature is then raised to 212° F, preferably by injecting live steam into the wheel, and the heat then turned off. When the wheel has run for 40 minutes from the time it was started, the soap solution is drained off, the wheel filled to the proper level with water, and the temperature of the water raised to 140° F. At the end of 45 minutes from the start of the test, the water is again drawn off. The wheel is filled again to the proper level with water and its temperature raised to 140° F. At the end of 55 minutes from the start of the test, the water is drawn off and the wheel allowed to run without further additions to complete the full 60 minutes of operation, tumbling the wet samples in the wheel while the water drains. The specimens are removed from the wheel and the excess water squeezed from them by hand. Do not wring the specimens by hand or by means of squeeze rolls, as either method may distort the material and give unsatisfactory results. The specimens are then placed horizontally on a screen or ventilated surface to dry. Do not hang the specimens vertically to dry. If a heated drying chamber is available, the specimens are dried therein, otherwise, in a current of air at room temperature from an electric fan. When the specimens are dry, they are laid out smoothly, without stretching, on a table, dampened, and allowed to lie for 5 minutes.

77. *Pressing.*—Either one of the two methods described below may be used in pressing the specimen. Whichever method of pressing is used, the specimen is allowed to cool before being measured again.

77a. *Hand pressing.*—The specimen is laid on a padded ironing table, all noticeable wrinkles are carefully smoothed out, and the specimen is pressed by raising and lowering the iron. Do not slide the iron back and forth on the specimen, as this may distort the cloth. The iron temperature shall be between 275° and 300° F[49] at the point.

[49] See footnote 4, p. 7.

77b. *Machine pressing.*—The specimen is laid on the bed of the press, all noticeable wrinkles are carefully smoothed out, and the specimen is pressed by lowering the head of the machine. The specimen is removed from the bed of the machine in such a manner as to cause no strain on the cloth.

78. *Shrinkage.*—The distances marked in each direction on the specimens are then measured. The average changes in dimensions in the warp and in the filling directions for each specimen are calculated. These are designated the warp and filling shrinkages, respectively, of the specimens.

79. *Reporting shrinkage in laundering of cotton and linen fabrics.*—The warp and filling shrinkages shall be reported separately in percent, to the nearest whole number.

XVIII. SHRINKAGE IN LAUNDERING OF WOVEN FABRICS OTHER THAN COTTON AND LINEN

80. *Test specimen.*—One test specimen, not less than 12 by 12 inches, is required for this test. It shall be taken no nearer the selvage than one-tenth the width of the fabric. A 10-inch square, whose sides are placed parallel with the warp and filling, respectively, of the specimen is outlined on it preferably with the help of a rigid templet. The corners and midpoints of each side of the square are marked either with indelible ink applied with a fine pen or with a fine thread sewed into the fabric.

81. *Washing machine.*—The apparatus used shall consist of a cylinder, preferably of metal, approximately 13 inches high, having a diameter of about 8 3/4 inches (capacity 3 gallons). The cylinder shall be mounted in a vertical position on an axis, which is inclined 50° to the axis of the cylinder and rotated about this axis at a speed of 45 to 50 revolutions per minute.

82. *Washing procedure.*—The machine is filled approximately one-third full of a solution containing 0.5 percent of neutral soap in soft water heated to 100° ±2° F. A specimen, prepared as in paragraph 80, and sufficient suitable worsted cloth[50] in pieces approximately 12 by 12 inches to make a total dry load of 1 pound are placed in the machine. The machine is operated for 30 minutes. The specimen is then removed and rinsed in three changes of water at 100° ±2° F.

83. *Pressing corresponding to household practice.*—The specimen is rolled in a dry towel or absorbent cotton cloth to remove excess moisture, spread on a padded ironing board, and pressed until dry with a flatiron having a temperature between 275° and 300° F[51] at the point. During pressing, the operator shall exert the tension usual in hand ironing, tending to reshape and restore the specimen to its original size and shape, as is done in home pressing. The specimen is allowed to lie on a smooth, horizontal surface for 1 hour thereafter at room temperature.

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[50] See footnote 43, p. 28.
[51] See footnote 4, p. 7.

84. *Shrinkage.*—The distances marked in each direction on the specimens are then measured. The average changes in dimensions in the warp and in the filling directions for each specimen are calculated. These are designated the warp and filling shrinkages, respectively, of the specimens.

85. *Reporting shrinkage in laundering of fabrics other than cotton and linen.*—The warp and filling shrinkages shall be reported, in percent, to the nearest whole number.

XIX. RESISTANCE TO YARN SLIPPAGE OF WOVEN FABRICS

86. *Test specimens.*—Three test specimens, each 4 inches wide by at least 14 inches long, shall be cut from a sample in its original condition and also from a sample which has been laundered (see paragraph 82), or cleaned, dry or wet (see paragraph 70), or both, depending upon the intended use of the materials, with the long dimension in the direction of the yarns upon which the slippage is to be determined. If less force is required to slip the filling yarns on the warp yarns, the 14-inch dimension shall be across the filling. However, if less force is required to slip the warp yarns on the filling yarns, then the 14-inch dimension shall be across the warp. Generally the direction of pull for least resistance to yarn slippage is determinable by the thumb and finger method. However, where that method does not suffice, the direction of pull shall be determined from the results of tests of two preliminary specimens (one cut in each direction).

87. *Preparation of specimens.*

87a. Each specimen is folded back upon itself so that the distance from the fold to one end measures at least 4 inches and to the other end, at least 10 inches, care being taken to have the fold parallel to the crosswise yarns. About 1/2 inch from the fold, a seam is sewed parallel with the crosswise yarns. The fold is cut either before or after making the seam.

87b. (A satisfactory procedure to obtain a correct seam, when the fabric is such that a yarn can be drawn, is to draw out a crosswise yarn 4 inches from one end to mark the fold and then cut the specimen along the drawn yarn. The cloth guide attachment on the sewing machine is set for 1/2 inch and the fold or cut edges alined with it for sewing the seam.)

87c. The seam is sewed with a plain stitch (stitch type 301, Federal Specification DDD-S-751) with 00 white, mercerized, cotton thread, 14 stitches to the inch, under uniform tension and as near perpendicular to the filling or warp yarns as possible. The approximate needle diameter shall be 0.030 inch.

88. *Testing machine.*

88a. A motor-driven pendulum machine shall be used.

88b. The faces of the front members of the jaws shall measure 1 by 1 inch, and the faces of the back members shall be 1 inch in the direction of the application of the load and 2 inches or more perpendicular to the direction of the application of the load. If the resistance to yarn slippage is

less than 10 pounds, the faces of the front members of the jaws shall be 1 by 2 inches. The jaws shall have smooth, flat faces, with edges very slightly rounded to prevent cutting, and they should be pivoted to take the direction of loading force easily and smoothly.

88c. The maximum capacity of the machine shall not exceed 55 pounds (25 kg). The jaws through which the load is applied shall move at a uniform speed of 12 ±1/2 inches per minute.

88d. The machine shall be provided with an autographic recording device to trace a load-elongation curve.

88e. In order to obtain proper alignment, it has been found helpful, after gripping the specimen in the upper jaw, to attach to the lower end of the specimen an auxiliary 6-ounce clamp having jaws at least 4 inches wide.

89. *Conditioning.*—The test specimen is placed in an atmosphere having a relative humidity of 65 percent at 70° F for at least 4 hours. A tolerance of ±2 percent is permitted in relative humidity and ±2° F in temperature. In cases of dispute, tests shall be conducted on test specimens which are in equilibrium with the foregoing standard atmosphere. Material is considered to be in equilibrium when it shows no progressive change in weight.

90. *Fabric elongation.*

90a. With the distance between the two pairs of jaws of the testing machine adjusted to 3 inches, the prepared test specimen, with the long portion uppermost, is placed symmetrically in the upper jaws so that the long dimension of the 10-inch part of the specimen is parallel to the direction of application of the load, and clamped so that the seam is at least 3 inches below the lower edge of the lower jaw. The 6-ounce clamp, when used, is attached to the specimen at a point beneath the lower jaw so that a uniform tension of that amount will be applied when the lower jaw is clamped tight.

90b. The load-elongation curve is obtained up to the breaking load or up to 55 pounds if the specimen breaks at a higher load. This is the load-elongation curve for the fabric.

91. *Seam elongation.*—The test specimen is inserted symmetrically in the machine so that the seam is in a position parallel to the jaws and midway between the upper and lower jaws in a similar manner to the procedure in paragraph 90a. The seam-elongation curve is recorded on the same record sheet used for recording the load-elongation curve.

92. *Resistance to yarn slippage.*

92a. The load per inch of width at which the elongations of the fabric and the seam differ by 1/4 inch more than the difference in the elongations at a load of 1 pound, is designated the resistance to yarn slippage.

92b. The resistance to yarn slippage of the cloth in either direction is the average of tests on three specimens. (When using the 2-inch front jaws, the results obtained are divided by 2 to obtain the resistance to yarn slippage.) If a specimen slips in the jaws, breaks in the jaws, breaks at the edges of the jaws, or for any reason attributable to faulty operation a result differs markedly from the average

for the set, that result is disregarded, another specimen taken and the result of this test included in the average. If the fabric or the seam breaks before 1/4-inch slippage occurs, the reported slippage is the breaking load.

92c. The resistance to yarn slippage may be obtained from the load-elongation curves by placing the points of a pair of dividers on the two curves at the points corresponding to a load of 1 pound. Increase the distance between the ends of the dividers by an amount corresponding to 1/4-inch elongation and find the load at which the curves are separated by this distance.

93. *Reporting resistance to yarn slippage.*—The resistance to yarn slippage shall be reported in pounds to the nearest whole number and the report shall state whether the results are based on fabrics in their original condition, after being cleaned dry or wet, or after being laundered.

XX. STANDARD DYEINGS (STANDARD SAMPLES)

94. *Control and standard samples.*—The control samples prescribed for colorfastness to atmospheric gases and standard samples prescribed for judging the satisfactory operation of fading lamps and the method of test of colorfastness to laundering were chosen from among the standard dyeings of American Association of Textile Chemists and Colorists. They can be obtained from L. A. Olney, chairman, Research Committee, AATCC, Lowell Textile Institute, Lowell, Mass., at a nominal cost.

95. *Colorfastness to atmospheric gases.*

Control sample AF1.—1.0 percent Celanthrene Brilliant Blue FFS. (See 1943 Year Book, AATCC, p. 275.)

Control sample AF2.—0.6 percent Eastone Blue BB. (See 1943 Year Book, AATCC, p. 275.)

96. *Colorfastness to laundering of cotton, linen, and rayon textiles.*

Standard sample CW1.—2.0 percent Diamine Fast Blue FFB; Prototype 71; dyed on cotton. (See 1943 Year Book, AATCC, p. 184.)

Standard sample CW2.—4.0 percent Primuline conc., diazotized and developed with betanaphthol; C.I. 812; dyed on cotton. (See 1943 Year Book, AATCC, p. 184.)

Standard sample CW3.—2.0 percent Vat Blue 2BD, 100 percent powder; C.I. 1184; dyed on cotton. (See 1943 Year Book, AATCC, p. 184.)

Standard sample CW4.—2.5 percent Vat Violet BN, 100 percent powder; C.I. 1163; dyed on cotton. (See 1943 Year Book, AATCC, p. 184.)

97. *Colorfastness to light.*[52]

[52] These standard dyeings have recently been developed and adopted by AATCC to replace those which have appeared in the previous issues of this standard. The new standards are made from two lots of wool, each dyed with a single dyestuff and blended in the proportions indicated above to give the desired fastness for each class.

Standard Sample L3.—40 percent wool dyed with 0.4 percent Erio Chrome Azurol B (Colour Index 720) and 60 percent wool dyed with 3.0 percent Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

Standard Sample L4.—28.3 percent wool dyed with 0.4 percent Erio Chrome Azurol B (Colour Index 720) and 71.7 percent wool dyed with 3.0 percent Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

Standard Sample L5.—14.2 percent wool dyed with 0.4 percent Erio Chrome Azurol B (Colour Index 720) and 85.8 percent wool dyed with 3.0 percent Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

Standard Sample L6.—7.1 percent wool dyed with 0.4 percent Erio Chrome Azurol B (Colour Index 720) and 92.9 percent wool dyed with 3.0 percent Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

Standard Sample L7.—5 percent wool dyed with 0.4 percent Erio Chrome Azurol B (Colour Index 720) and 95.0 percent wool dyed with 3.0 Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

Standard Sample L8.—100 percent wool dyed with 3.0 percent Indigosol Blue AGG. (See 1943 Year Book, AATCC, p. 212.)

XXI. WARRANTY

98. The following illustrates the manner in which a laboratory may certify complete compliance with the commercial standard. Laboratories complying with the methods of testing and reporting as recorded in the standard may be readily identified by the following statement on their reports:

> The_____warrants that the results given in this report were obtained in accordance with Textiles—Testing and Reporting, Commercial Standard CS59-44, as issued by the National Bureau of Standards of the U. S. Department of Commerce.
>
> or
>
> This test report is based on Textiles—Testing and Reporting, Commercial Standard CS59-44, as issued by the National Bureau of Standards of the U. S. Department of Commerce.

XXII. NOTES

99. *Breaking strength, standard conditions.*—The test method outlined herein for determining the breaking strength of woven fabrics under standard atmospheric conditions is in agreement with all essential requirements of Standard General Methods of Testing Woven Textile Fabrics as issued by the American Society for Testing Materials (ASTM Designation D39-39), and approved as American Standard L5-1939 by the American Standards Association; and Textiles, General Specifications, Test Methods, Federal Specification CCC-T-191a, April 23, 1937.

100. *Breaking strength, wet.*—The test method outlined herein for determining the breaking strength of woven fabrics in the wet state is in agreement with all essential requirements of Standard Method of Test for Strength of Rayon Woven

Fabric When Wet, as issued by the American Society for Testing Materials (ASTM Designation D415-38).

101. *Bursting strength.*—The test method outlined herein for determining the bursting strength of knit textiles is in agreement with all essential requirements of Standard Method of Testing and Tolerances for Knit Goods, as issued by the American Society for Testing Materials (ASTM Designation D231-39).

102. *Colorfastness to chlorine.*—The test method outlined herein for colorfastness to chlorine complies in all essential requirements with Fastness to Chlorine of Dyed or Printed Cotton (Tentative Method) as given on page 186 of the 1943 Year Book of the American Association of Textile Chemists and Colorists.

103. *Colorfastness to crocking (rubbing).*—The test method outlined herein for colorfastness to crocking (rubbing) complies in all essential requirements with Fastness to Rubbing (Crocking) as given in the 1943 Year Book of the American Association of Textile Chemists and Colorists, Colorfastness Specifications for Dyed or Printed Cotton or Linen Piece or Woven Materials, approved by the National Association of Finishers of Textile Fabrics, October 10, 1939, and Textiles, General Specifications, Test Methods, Federal Specification CCC-T-191a, April 23, 1937.

104. *Colorfastness to atmospheric gases.*—The test method for determining colorfastness to atmospheric gases outlined herein complies in all essential requirements with Fastness to Atmospheric Gases of Dyes on Cellulose Acetate Rayon (Tentative Method) as given on pages 272-275 of the 1943 Year Book of the American Association of Textile Chemists and Colorists.

105. *Colorfastness to laundering of cotton, linen, and rayon textiles.*—The test method for determining colorfastness to laundering of cotton, linen, and rayon textiles outlined herein complies in all essential requirements with Standard Method of Test for Colorfastness to Commercial Laundering and to Domestic Washing of Cotton and Linen Textiles, as given in the 1943 Year Book of the American Association of Textile Chemists and Colorists, and Colorfastness Specifications for Dyed or Printed Cotton or Linen Piece or Woven Materials, approved by the National Association of Finishers of Textile Fabrics, October 10, 1939.

106. *Colorfastness to light.*—The test method outlined herein for colorfastness to light complies in all essential requirements with Fastness to Light of Textiles, as given in the 1943 Year Book of the American Association of Textile Chemists and Colorists; Standard Method of Test for Colorfastness of Colored Textiles to Light as issued by the American Society for Testing Materials (ASTM Designation D506-41); Colorfastness Specifications for Dyed or Printed Cotton or Linen Piece or Woven Materials, approved by the National Association of Finishers of Textile Fabrics, October 10, 1939 and Textiles, General Specifications, Test Methods, Federal Specification CCC-T-191a, April 23, 1937.

107. *Colorfastness to perspiration.*—The test method outlined herein for colorfastness to perspiration complies in all essential requirements with Fastness to Perspiration of Dyed Textiles as given in the 1943 Year Book of the American Association of Textile Chemists and Colorists; Colorfastness Specifications for Dyed or Printed Cotton or Linen Piece or Woven Materials, approved by the National Association of Finishers of Textile Fabrics, October 10, 1939; and Textiles, General Specifications, Test Methods, Federal Specification CCC-T-191a, April 23, 1937.

108. *Colorfastness to pressing, dry and wet, of cotton and linen textiles.*—The test methods outlined herein for colorfastness to pressing, dry, and pressing, wet, comply in all essential requirements with Colorfastness Specifications for Dyed or Printed Cotton or Linen Piece or Woven Materials, approved by the National Association of Finishers of Textile Fabrics, October 10, 1939.

109. *Shrinkage in laundering of cotton and linen fabrics.*—The test method outlined herein for the shrinkage in laundering of cotton and linen fabrics complies in all essential requirements with the method for Determining Shrinkage in Washable Woven Cotton Fabrics as given in the 1943 Year Book of the American Association of Textile Chemists and Colorists; Standard Method of Test for Shrinkage in Laundering of Woven Cotton Cloth as issued by the American Society for Testing Materials (ASTM Designation D437-36) and approved as American Standard L10-1936 by the American Standards Association; and Textiles, General Specifications, Test Methods, Federal Specification CCC-T-191a, April 23, 1937.

110. *Resistance to yarn slippage.*—The test method outlined herein for resistance to yarn slippage complies in all essential requirements with Standard Method of Test for Resistance to Yarn Slippage in Silk, Rayon, and Silk-Rayon Woven Fabrics (ASTM Designation D434-42), as issued by the American Society for Testing Materials.

EFFECTIVE DATE

111. The standard is effective as a basis for testing and reporting from February 20, 1944.

STANDING COMMITTEE

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

T. L. Blanke (chairman), National Retail Dry Goods Association, 101 West 31st Street New York 1, N. Y.

I. A. Agree, National Dress Manufacturers Association, 1450 Broadway, New York, N. Y.

HUGH CHRISTISON, Arlington Mills, 500 Broadway, Lawrence, Mass. Representing National Association of Wool Manufacturers.
C. W. DORN, J. C. Penney Co., Inc., 330 West 34th Street, New York, 1, N. Y. Representing National Retail Dry Goods Association.
D. E. DOUTY, United States Testing Co., Inc., 1415 Park Avenue, Hoboken, N. J.
EARLE M. EDGERTON, Pacific Mills, 214 Church Street, New York, N. Y. Representing National Association of Finishers of Textile Fabrics and Textile Fabrics Association.
CHARLES K. EVERETT, The Cotton-Textile Institute, 320 Broadway, New York, N. Y.
EPHRAIM FREEDMAN, R. H. Macy & Co., 34th and Broadway, New York, N. Y. Representing Committee D-13, American Society for Testing Materials.
MARY DECK HALE, National Association of Dyers and Cleaners, 7901 Georgia Avenue, Silver Spring, Md.
HERBERT H. HATCH, Hatch Textile Research, 25 E 26th Street, New York, 10, N. Y.
A. J. KELLNER, United States Testing Co., Inc., 1415 Park Avenue, Hoboken, N. J., Alternate: Martin H. Gurley, Gustavus J. Esselen, Inc., 857 Boylston St., Boston, Mass. Representing American Council of Commercial Laboratories.
HARRY LEVINE, Textile Testing and Research Laboratories, 24 West 26th Street, New York 10, N. Y. Representing American Association of Textile Technologists.
GERALD C. MACDONALD, Montgomery Ward & Co., Chicago, Ill.
PAULINE BEERY MACK, Ellen H. Richards Institute, The Pennsylvania State College, State College, Pa.
FRED MUELLER, Stunzi Sons Silk Co., 1400 Broadway, New York, N. Y. Representing National Federation of Textiles, Inc.
RUTH O'BRIEN, Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, Washington 25, D. C. Representing American Home Economics Association.
CHARLOTTE PAYNE, National Council of Women of the United States, Inc., 501 Madison Avenue, New York 22, N. Y.
ETHEL L. PHELPS, University of Minnesota, University Farm, St. Paul, Minn.
LAURA E. PRATT, Sears, Roebuck & Co., Chicago 7, Ill.
BERTIL A. RYBERG, Lowell Textile Institute, Lowell, Mass. Representing American Association of Textile Chemists and Colorists.
CHARLES L. SIMON, Industrial By-Products and Research Corp., Gimbel Building, 8th and Market Streets, Philadelphia, Pa.
A. H. SKINNER, Carson Pirie Scott & Co., 366 West Adams Street, Chicago, Ill. Representing Wholesale Dry Goods Institute.
FRANK STUTZ, Better Fabrics Testing Bureau, Inc., 101 West 31st Street, New York 1, N. Y.
ARTHUR R. WACHTER, American Viscose Corporation, 350-5th Avenue, New York, N. Y.
HERBERT A. EHRMAN (secretary), Division of Trade Standards, National Bureau of Standards, Washington 25, D. C.

HISTORY OF PROJECT

113. On February 28, 1935, the National Retail Dry Goods Association requested the cooperation of the National Bureau of Standards in developing and establishing a commercial standard on methods of testing and reporting woven dress fabrics as a basis for adjusting differences of opinion between the various interests of the dress industry as to the causes of consumer complaints.

114. A preliminary draft of a proposed commercial standard, prepared by a committee representing textile testing laboratories was considered at two public conferences. The adopted adjusted draft, after acceptance by a satisfactory majority

of the independent textile testing volume, was promulgated as CS59-36, effective from April 15, 1936.

115. *First revision.*—A revision of the standard to include methods covering colorfastness to perspiration and wet pressing, and several changes in the other methods, approved by the standing committee, was accepted by the trade and promulgated as CS59-39, effective from June 24, 1939.

116. *Second revision.*—Two leading textile associations proposed another revision to include a method for colorfastness to chlorine, adjustments in the methods for colorfastness to laundering and pressing of cotton and linen fabrics, and judging degrees of colorfastness on an "appreciable change" basis. The title was changed to Woven Textile Fabrics—Testing and Reporting. Following approval by the Standing Committee and acceptance by a satisfactory majority, this revision was promulgated as CS59-41, effective from March 28, 1941.

117. *Third revision.*—The third revision, including methods for bursting strength of knit fabrics and colorfastness to atmospheric gases; and modifications in the methods for colorfastness to laundering of rayon fabrics, crocking, perspiration, and dry cleaning, approved by the standing committee after two supplemental changes, was accepted by a large majority of independent textile testing volume and announcement of the effective date of the revision, CS59-44, was issued on January 20, 1944.

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 _____

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

Gentlemen:

Having considered the statements on the reverse side of this sheet, we accept the Commercial Standard CS59-44 as our standard of practice for the testing and reporting of textiles, with which we are directly concerned as a

Fabric manufacturer[1] Fabric commodity manufacturer[1] Testing laboratory[1]

Distributor[1] Consumer[1]

We will assist in securing its general recognition and use, and will cooperate with the Standing Committee to effect revisions of the standard when necessary.

Signature of individual 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 and State _____

[1]Please designate which group you represent by drawing lines through the other four. Please file separate acceptances for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade papers, colleges, etc., desiring to record their general approval, the words "in principle" should be added after the signature.

(Cut on this line)

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

118. The organizations and individuals listed below have accepted this specification as their standard of practice in the testing and reporting of textiles. Such endorsement does not signify that they may not find it necessary to deviate from the standard, nor does it signify that the testing laboratories so listed guarantee all of their test reports to conform with the requirements of this standard. Therefore specific evidence of conformity should be obtained where required.

ASSOCIATIONS

American Association of Textile Chemists & Colorists, Lowell, Mass.. (In principle.)
American Council of Commercial Laboratories, New York, N. Y. (In principle.)
Bradford Dyeing Assn., (U.S.A.), Westerly, R. I.
Cotton-Textile Institute, Inc., The, New York, N. Y. (In principle.)
Infants & Childrens Coat Assn., New York, N. Y.
National Association of Dyers & Cleaners, Silver Spring, Md.
National Association of Institutional Laundry Managers, Upper Darby, Pa.
National Association of Negro Tailors, Designers, Dressmakers & Dry Cleaners, Burlington, N. C.
National Council of Women of the United States, New York, N. Y. (In principle.)
National Dress Manufacturers' Association, Inc., New York, N. Y.
National Retail Dry Goods Assn., New York, N. Y. (In principle.)
Ohio State Association of Dyers & Cleaners, Columbus, Ohio. (In principle.)
Pacific Coast Garment Manufacturers Association, San Francisco, Calif.
Pennsylvania Association of Dyers & Cleaners, Sharon, Pa.
Suburban Laundryowners Association, West Chester, Pa.
Textile Brokers Association of New York, New York, N. Y.
Wholesale Dry Goods Institute, Inc., The, New York, N. Y.

FIRMS

Abraham & Straus, Brooklyn, N. Y.
Abramson's, Flushing, N. Y.
Ackemann Bros., Inc., Elgin, Ill.
Agawam Dye Works, Inc., Lowell, Mass.
Alaska, University of, Department of Chemistry, College, Alaska. (In principle.)
Alms & Doepke Co., The, Cincinnati, Ohio.
Althouse Chemical Co., Reading, Pa.
Amarillo Laundry & Dry Cleaners, Amarillo, Tex.
American Bemberg Corporation, New York, N. Y. (In principle.)
American Cleaners, Moorhead, Minn.
American Cyanamid Co., Calco Chemical Division, Bound Brook, N. J.
American Machine & Metals, Inc., Riehle Testing Machine Division, East Moline, Ill. (In principle.)
American Viscose Corporation, Marcus Hook, Pa.
Apparel Arts, New York, N. Y. (In principle.)
Apponaug Co., The, Apponaug, R. I.
Arcade-Sunshine Co., Inc., Washington, D. C.
Aridye Corporation, Fair Lawn, N. J.
Arkwright, Inc., New York, N. Y.
Atlas Electric Devices Co., Chicago, Ill.
Atlas Powder Co., Zapon-Keratol Division, Stamford, Conn.
B-B Stores, Inc., Logansport, Ind.
Ball Stores, Inc., Muncie, Ind.
Balloon Dye Works, San Diego, Calif. (In principle.)
Barber Asphalt Corporation, Barber, N. J.
Barber, Ernest, Paterson, N. J.
Barnett Woolen Mills, Milwaukee, Wis.
Beck Cleaners & Dyers, Inc., Rochester, N. Y.
Belmar Dye Works, Long Island City, N. Y.
Belmont Woolen Yarn Mills, Woonsocket, R. I.
Bemidji Woolen Mills, Bemidji, Minn.
Better Fabrics Testing Bureau, New York, N. Y.
Bibb Manufacturing Co., Macon, Ga.
Boston Store, Inc., The, Colorado Springs, Colo.
Boston Store, Milwaukee, Wis.
Botany Worsted Mills, Passaic, N. J.
Bradenton Woman's Club, Bradenton, Fla.
Bradford Durfee Textile School, Fall River, Mass.
Bradshaw-Diehl Co., Hungtington, W. Va.
Brampton Woolen Co., Newport, N. H.
Broadway Department Store, Inc., Los Angeles, Calif.
Brooklyn Textile Dyeing Co., Inc., Brooklyn, N. Y.
Brooks Co., Betty, Hungtington Park, Calif.
Bryson Co., A., Ware, Mass.
Buckley Brothers Co., Inc., New York, N. Y.
Burlington Mills Corporation, New York, N. Y.
Burns Co., W. H., Philadelphia, Pa.
Bush Woolen Mills Co., The, Dresden, Ohio.
Caledonian Dye Works, Philadelphia, Pa.
Callaway Mills, La Grange, Ga.
Capitol Barg Dry Cleaning Co., The, Cincinnati, Ohio.
Carbic Color & Chemical Co., Inc., New York, N. Y.
Carter Fabrics Corporation, Shelby, N. C.
Case School of Applied Science, Materials Testing Laboratory, Cleveland, Ohio. (In principle.)
Casper-Troy Laundry Co., Casper, Wyo.
Catoir Silk Co., West New York, N. J.
Central Co-operative Wholesale, Superior, Wis.
Chambers-Fisher Co., Bozeman, Mont.
Chemical Manufacturing Co., Inc., Ashland, Mass.
Ciba Co., Inc., New York, N. Y. (In principle.)
Cleveland Cloth Mills, Shelby, N. C.
Clothing Trade Journal, The, Morris Plains, N. J. (In principle.)
Cluett, Peabody & Co., Inc., Troy, N. Y.
College Cleaners & Dyers, Corvallis, Oreg.
Collins & Aikman Corporation, New York, N. Y.
Columbus Manufacturing Co., Columbus, Ga.
Comins & Co., Inc., Rochdale, Mass.
Cone Export & Commission Co., New York, N. Y.
Conner, Frank E., Morgantown, W. Va.
Consolidated Trimming Corporation, New York, N. Y.
Coppin Co., John R., The, Covington, Ky.
Consumers' Testing Laboratories, Philadelphia, Pa.
Continental Mills, Lewiston, Maine.
Coolidge Cleansers, Inc., Watertown, Mass.
Corcoran & Co., Inc., J. H., Cambridge, Mass.
Cox & Fuller, New York, N. Y.
Crawford Laundry Co., The, Bridgeport, Conn. (In principle.)
Crystal Springs Bleachery, Inc., Chickamauga, Ga.
Cusack Professional Laundry-Dry Cleaners, Sioux City, Iowa.
Deering Milliken & Co., Inc., New York, N. Y.
Delite Fabrics, Inc., Pawcatuck, Conn. (P.O. Westerly, R.I.)
Delta Finishing Co., Philadelphia, Pa.
Dependable Cleaning & Laundry Co., Cleveland, Ohio.
Derbes, George, Pottsville, Pa.
Derby Co., The, Lawrence, Mass.
Detroit Testing Laboratory, The, Detroit, Mich. (In principle.)
Detroit, University of, Detroit, Mich.

Deuser's, Inc., Dayton, Ohio.
Dewey Co., A. G., Quechee, Vt.
Dickey & Sons, Inc., W. J., Oella, Md.
Dominion Silk Dyeing & Finishing Co., Ltd., Drummondville, Quebec, Canada.
Du Pont de Nemours & Co., E. I., Organic Chemicals Department, Dyestuffs Division, Wilmington, Del.
Dumbarton Woolen Mills, Dexter, Maine and Sangerville, Maine.
Duplan Corporation, The, New York, N. Y.
Eagle & Sons, S., Selma, Ala.
East End Cleaners, Duluth, Minn.
Edgewater Dyeing & Finishing Co., Philadelphia, Pa. (In principle.)
Ekroth Laboratories, Inc., Brooklyn, N. Y.
Elder & Johnston Co., The, Dayton, Ohio.
Electric Cleaners, Eugene, Oreg.
Elmira Weaving Co., Elmira, N. Y.
Emery-Bird-Thayer Co., Kansas City, Mo.
Empire Color & Chemical Co., New York, N. Y.
Empire Piece Dyeing & Finishing Co., Paterson, N. J.
Enro Shirt Co., Inc., The, Louisville, Ky.
Esselen, Inc., Gustavus J., Boston, Mass.
Evansville White Swan Laundry, Inc., Evansville, Ind.
Fair, The, Chicago, Ill.
Fair Lawn Finishing Co., Fair Lawn, N. J.
Fandel Co., St. Cloud, Minn.
Fenton Cleaners & Dyers, Inc., Columbus, Ohio. (In principle.)
Fenton United Cleaning & Dyeing Co., The, Cincinnati, Ohio. (In principle.)
Field & Co., Marshall, Chicago, Ill.
Fifth Street Store, The, Los Angeles, Calif.
Florida, University of, Gainesville, Fla.
Fontaine Converting Works, Martinsville, Va.
Foster Finishing Products Co., Philadelphia, Pa.
Fox, Wells & Warren, New York, N. Y.
Frankford Worsted Mills, Philadelphia, Pa.
Franklin Process Co., Providence, R. I.
Freedlander Co., H., Wooster, Ohio.
French Textile School, A., Atlanta, Ga.
Froehling & Robertson, Inc., Richmond, Va.
Fruit of the Loom, Inc., Providence, R. I.
Furchgott's, Inc., Jacksonville, Fla.
Gable Co., The William F., Altoona, Pa.
Galli & Son Ribbon Dyers, J., Paterson, N. J.
Garfinckel & Co., Julius, Washington, D. C.
Geigy Co., Inc., New York, N. Y.
General Dyestuff Corporation, New York, N. Y.
Geneva Fabrics, Inc., Paterson, N. J.
Glasgo Finishing Co., Glasgo, Conn.
Glenlyon Print Works, (Sayles Finishing Plants, Inc.), Phillipsdale, R. I.
Globe Dye Works Co., Philadelphia, Pa.
Globe Woven Belting Co., Inc., Buffalo, N. Y.
Goodwin Co., Inc., The, Connellsville, Pa.
Gossett Mills—Finishing Plant, Anderson, S. C.
Grays Harbor Dye Works, Aberdeen, Wash.
Great Lakes Thread Co., Detroit, Mich.
Greenville Finishing Co., Inc., Greenville, R. I.
Griffin Laundry & Dry Cleaning Co., Griffin, Ga.
Guerin Mills, Inc., Woonsocket, R. I.
Guyan Mills, Inc., Valley Falls, R. I.
Hagwood's Laundry & Dry Cleaners, Portsmouth, Va. (In principle.)
Hallmark Laboratories, The, Jamestown, N. Y.
Harodite Finishing Co., The, North Dighton, Mass.
Hatch Textile Research, New York, N. Y.
Hathaway Manufacturing Co., New Bedford, Mass.
Hawkeye Laundry Co., Boone, Iowa.
Heck Silk Co., E. Stroudsburg, Pa.
Hellwig Silk Dyeing Co., The, Philadelphia, Pa.
Herbert Manufacturing Co., New York, N. Y.
Hess, Goldsmith & Co., Inc., New York, N. Y.
Hibbing Laundering & Cleaning Co., Hibbing, Minn.
Hochstadter Laboratories, Inc., New York, N. Y.
Hogan Inc., Daniel, Savannah, Ga.
Hovey Co., C. F., Boston, Mass.
Howard & Barber Co., The, Derby, Conn.
Hubbard Textile Consulting Bureau, C. C., Silver Spring, Md.
Illinois Institute of Technology, Chicago, Ill.
Independent Cleaners, Inc., Racine, Wis.
Indianapolis Bleaching Co., (Branch of Bemis Bro. Bag Co.), Indianapolis, Ind.
Industrial By-Products & Research Corporation, Philadelphia, Pa.
Iowa State College, Ames, Iowa. (In principle.)
Ix & Sons, Inc., Frank, New York, N. Y.
Johnson City Steam Laundry, Johnson City, Tenn.
Jonasson's, Pittsburgh, Pa.
Kansas State College, Manhattan, Kans.
Katz, N. E., Meridian, Miss.
Kaufmann Department Stores, Inc., Pittsburgh, Pa.
Kohler's, Inc., Youngstown, Ohio.
Kraus Cleaners, Memphis, Tenn.
Krout & Fite Manufacturing Co., Philadelphia, Pa.
Lafayette College, Easton, Pa.
Landers Corporation, The, Toledo, Ohio.
Lane Cotton Mills Co., New Orleans, La.
Lansburgh & Bro., Washington, D. C.
Lanza Silk Dyeing Co., Paterson, N. J.
Laughlin Textile Mills, Inc., Waterford, N. Y.
Laurens Cotton Mills, Laurens, S. C.
Lazarus & Co., The F. & R., Columbus, Ohio.
Leaksville Woolen Mills, Inc., The, Charlotte, N. C.
Leeds College of Technology, Leeds, Yorkshire, England. (In principle.)
Leomar Processing Corporation, Providence, R. I.
Leonard & Co., W. C., Saranac Lake, N. Y.
Liebovitz & Sons, Inc., S., New York, N. Y.
Lincoln Bleachery & Dye Works, Lonsdale, R. I.
Lintz Department Store, Guthrie, Okla.
Lit Brothers, Philadelphia, Pa.
Loebl Dye Works, Inc., Roanoke, Va.
Loeser & Co., Inc., Frederick, Brooklyn, N. Y.
Lovemans, Inc., Chattanooga, Tenn.
Lux Laboratories, The, Cambridge, Mass. (In principle.)
Magnolia Cotton Mill Co., Magnolia, Ark.
Maine Mills Laboratory, Lewiston, Maine.
Manville Jenckes Corporation, Manville, R. I.
Mary Hardin-Baylor College, Belton, Tex. (In principle.)
Mayfair Cleaning Co., Cleveland, Ohio.
McLean Co., Andrew, Passaic, N. J.
McNerney Dry Cleaners, Hutchinson, Kans.
Meigs & Co., Inc., Bridgeport, Conn.
Merrimack Manufacturing Co., Lowell, Mass.
Methuen International Mills, Methuen, Mass.
Meyers-Arnold Co., Greenville, S. C.
Miller & Paine, Lincoln, Nebr.
Miller & Rhoads, Richmond, Va.
Miner Laboratories, Chicago, Ill.
Moggio Mill, Peter, Allentown, Pa.
Montgomery Ward & Co., Chicago, Ill.
Moore Co., Harry C., Nevada, Mo.
Munro Drycleaning Co., Beaumont, Tex. (In principle.)
Munsingwear, Inc., Minneapolis, Minn.
Nachman's Department Store, Inc., Newport News, Va.
Nashua Manufacturing Co., Nashua, N. H.
National Research Council, Textile Laboratory, Ottawa, Ontario, Canada.
Nebraska, University of, College of Agriculture, Lincoln, Nebr.
New Bedford Textile School, New Bedford, Mass.
New Hampshire, University of, Durham, N. H.
New Orleans, Inc., Better Business Bureau of, New Orleans, La. (In principle.)
New York Testing Laboratories, Inc., New York, N. Y.
Newburgh Bleachery, Newburgh, N. Y.
Nicetown Dye Works, Bridesburg, Philadelphia, Pa.
Norfolk Testing Laboratories, Inc., Norfolk, Va.
Nyanza Color & Chemical Co., Inc., New York, N. Y.
Ohio Wesleyan University, Delaware, Ohio.
Oregon State College, Mechanical Engineering Department, Materials Testing Laboratory, Corvallis, Oreg.
Oser & Co., M., Chico, Calif.
Pacific Mills, New York, N. Y.
Pacific Mills, Worsted Division, Lawrence, Mass.
Packard Dresses, Inc., New York, N. Y.
Pansy Weaving Mills, Central Falls, R. I.
Pantorium, Inc., Omaha, Nebr.
Parisian Cleansers, Inc., Lynn, Mass.
Patterson & Son, C. W., Findlay, Ohio.
Patzig Testing Laboratories, Des Moines, Iowa.
Pease Laboratories, Inc., New York, N. Y.
Peck & Peck, New York, N. Y.
Peerless Cleaners & Dyers, Inc., Edwardsville, Ill.
Penney Co., Inc., J. C., New York, N. Y.
Pennsylvania State College, The, State College, Pa.
Pepperell Manufacturing Co., Lewiston Division, Lewiston, Maine.
Pepperell Manufacturing Co., Inc., Boston, Mass.
Phoenix Cleaners, Inc., Rockford, Ill.
Phoenix Silk Corporation, Allentown, Pa.
Pittsburgh Mercantile Co., Pittsburgh, Pa.

Pittsburgh Testing Laboratory, Pittsburgh, Pa.
Pittsburgh, University of, Research Bureau of Retail Training, Pittsburgh, Pa.
Polsky Co., The A., Akron, Ohio.
Pomeroy's, Inc., Reading, Pa.
Premier Thread Co., Central Falls, R. I.
Price Co., Inc., Roswell, N. Mex.
Prince Lauten Corporation, New York, N. Y.
Purdue University, Lafayette, Ind. (In principle.)
Purdy Testing Laboratories, W. S., New York, N. Y.
Puritan Piece Dye Works, Paterson, N. J.
Quality Dry Cleaners, Lakeland, Fla.
Rankin Dry Goods Co., Inc., Santa Ana, Calif.
Rhode Island State College, Kingston, R. I. (In principle.)
Ridley Cleaners, Inc., Detroit, Mich.
Riegel Textile Corporation, New York, N. Y.
Rinso Laboratories, The, Cambridge, Mass. (In principle.)
Riverside & Dan River Cotton Mills, Inc., Danville, Va.
Roanoke Mills Co., Roanoke Rapids, N. C.
Robeson Department Store, F. K., Champaign, Ill.
Robb & Moody, Richmond, Va.
Robinson Co., J. W., Los Angeles, Calif.
Robinson Manufacturing Co., Oxford, Maine.
Rohm & Haas Co., Inc., Philadelphia, Pa.
Rosemary Sales, New York, N. Y.
Ross Cleaners, Columbus, Ohio.
Russell Manufacturing Co., The, Alexander City, Ala., and Middletown, Conn.
S.Q.R. Store, The, Anaheim, Calif.
Sacramento, Better Business Bureau of Sacramento, Calif. (In principle.)
Sadtler & Son, Inc., Samuel P., Philadelphia, Pa.
Saint Louis Sampling & Testing Works, Saint Louis, Mo.
Salem College, Winston-Salem, N. C.
Sallada Fabrics, Annandale, N. J.
San Souci Co., J. O., Providence, R. I.
Sandoz Chemical Works, Inc., New York, N. Y.
Sawyer & Son Co., The H. M., E. Cambridge, Mass.
Scheuer & Co., New York, N. Y.
Schneierson & Sons, Inc., I., New York, N. Y.
Schwarzenbach-Huber Co., The, New York, N. Y.
Scranton Better Business Bureau, Scranton, Pa. (In principle.)
Sears, Roebuck & Co., Chicago, Ill.
Shelby Cotton Mills, Shelby, N. C.
Shull's Dry Cleaning Works, York, Pa.
Sigal & Sons, H. B., Bethlehem, Pa.
Skidmore College, Saratoga Springs, N. Y. (In principle.)
Skinner & Sons, William, New York, N. Y. and Holyoke, Mass.
Slater & Sons, Inc., S., Shelby, N. C.
Smith Co., Timothy, Boston, Mass.
Snell, Inc., Foster D., Brooklyn, N. Y.
Snow White Bleachery, Inc., Royersford, Pa.
South Dakota State College, Brookings, S. Dak. (In principle.)
Spiess Co., Joseph, Elgin, Ill.
Standard Dyestuff Corporation, Paterson, N. J.
Stein, Hall & Co., Inc., Charlotte, N. C., Providence, R. I. and New York, N. Y.
Steinam Co., Inc., A., New York, N. Y.
Stevens & Sons Co., M. T., North Andover, Mass.
Stewart Dry Goods Co., Inc., The, Louisville, Ky.
Stillman & Van Siclen, Inc., New York, N. Y.
Stohn Inc., Carl, East Taunton, Mass.
Straka's Joliet Cleaners & Dyers, Joliet, Ill.
Strasburger & Siegel, Baltimore, Md.
Sullivan & Sons Manufacturing Co., Inc., J., Philadelphia, Pa.
Sutherland Co., A. B., Lawrence, Mass.
Swift Service Stores, Inc., Cleveland, Ohio.
Talon, Inc., Meadville, Pa.
Texas Technological College, Lubbock, Tex.
Textile Testing Laboratory, Dallas, Texas.
Textile Testing & Research Laboratories, New York, N. Y.
Textileather Corporation, Toledo, Ohio.
Thies Dyeing Mills, Inc., West Warwick, R. I.
Tip Top Cleaners, Springfield, Mass.
Tompkins Dry Goods Co., Middletown, N. Y.
Trion Co., The, Trion, Ga.
Troy Dry Cleaning Co., Fort Wayne, Ind.
Tubize Chatillon Corporation, New York, N. Y.
Tufts College, Medford, Mass. (In principle.)
Twining Laboratories, The, Fresno, Calif.
Underwood Superior Cleaners, W. Palm Beach, Fla.
Union Bleachery, Greenville, S. C.
United Merchants & Manufacturers Management Corporation, New York, N. Y.
United States Finishing Co., Norwich, Conn.
United States Testing Co., Inc., Hoboken, N. J. (In principle.)
Vaucanson Silk Mills, Inc., New York, N. Y.
Velveray Corporation, New York, N. Y.
Vermont Cleansing Co., Burlington, Vt.
Vermont Woolen Corporation, N. Montpelier, Vt.
Vermont Woolen Mills, Inc., New York, N. Y.
Wallis Cleaning Service, Tucson, Ariz. (In principle.)
Walther Manufacturing Co., Inc., Philadelphia, Pa.
Wamsutta Mills, New Bedford, Mass.
Wannalancit Textile Co., Lowell, Mass.
Ware Shoals Manufacturing Co., Ware Shoals, S. C.
Warshaw & Sons, Inc., H., New York, N. Y.
Washington, University of, Seattle, Wash.
Wausau Laundry & Cleaners Co., Wausau, Wis.
Weems Laundry Co., Quincy, Ill.
Welek & Co., Inc., Chas F., Saint Louis, Mo.
Wellington Sears Co., New York, N. Y.
Wertheimer, Inc., L., New York, N. Y.
Widder Bros., New York, N. Y.
Wieboldt Stores, Inc., Chicago, Ill.
Wilton Woolen Co., Wilton, Maine.
Winona Cleaning Works, Winona, Minn.
Worcester Woolen Mills, Cherry Valley, Mass..
Worumbo Manufacturing Co., Lisbon Falls, Maine.
Yankee Cleaners, Pontiac, Ill.
Yates Bleachery Co., Flintstone, Ga.
Zenith, Cleaners & Launderers, Dallas, Tex. (In principle.)

U. S. GOVERNMENT

U. S. C. G. Section Base Laundry, Ketchikan, Alaska.
War Department, Washington, D. C.