

P-D-220D
 August 6, 1979
 SUPERSEDING
 Fed. Spec. P-D-220C
 January 16, 1976

FEDERAL SPECIFICATION
 DETERGENT, GENERAL PURPOSE

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers commercially available concentrated, heavy-duty, nonabrasive, synthetic organic detergents for use in general purpose cleaning (see 6.1).

1.2 Classification.

1.2.1 Types. The detergent covered by this specification shall be of the following types, as specified (see 6.2).

Type I - Powder, flake, or granular form.

1-1/2 ounce - water-soluble plastic packet (200 packets per box).
 5 pound - can or box.
 25 pound - drum.
 300 pound - drum.

Type II - Liquid.

2 ounce - water-insoluble plastic envelope (288 envelopes per box).
 5-1/2 ounce - water-insoluble plastic envelope (120 envelopes per box).
 1 gallon - can or bottle.
 5 gallon - pail.
 55 gallon - drum.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Standard:

Fed. Test Method Std. No. 536 - Soap and Soap-Products (Including Synthetic Detergents); Sampling and Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

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(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Laws and Regulations:

16 CFR 1500 - Hazardous Substances and Articles; Administration and Enforcement Regulations.

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Materials.

3.1.1 Type I. Type I detergent shall be a clean, uniform, free-flowing powder, flakes, or granules except that each 1.5-ounce packet detergent shall contain 1.50 ± 0.03 ounces of granular detergent packaged in a premeasured water-soluble packet made of polyvinyl alcohol (see 4.4.8). The finished formulation shall meet the requirements as specified in section 3 and table I.

3.1.2 Type II. Type II detergent shall be a homogeneous liquid, free of sediments and suspended particles. It shall contain synthetic organic detergent(a) and foam stabilizer. Each 2.0-ounce envelope packet detergent shall contain 2.0 ± 0.04 ounces of detergent packaged in a premeasured water-insoluble plastic envelope (see 4.4.8). Each 5.5-ounce envelope detergent shall contain 5.5 ± 0.10 ounces of detergent packaged in a premeasured water-insoluble plastic envelope (see 4.4.8). The finished formulation shall meet the requirements as specified in section 3 and table I.

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3.2 pH value. The pH value of a 1.0 percent (by weight for type I and by volume for type II) distilled water solution of the detergent shall be not less than 8.0 nor more than 10.5, when tested as specified in 4.4.1.

3.3 Solubility in hard water. The detergent shall be completely soluble in water having a hardness of 20 grains per gallon, when tested as specified in 4.4.2.

3.4 Rinsing properties. The detergent shall be free-rinsing, when tested as specified in 4.4.3.

3.5 Cleaning efficiency.

3.5.1 Type I. A solution of 5 grams of detergent in 1 liter of synthetic hard water shall exhibit a cleaning efficiency of not less than 80 percent, when tested as described in 4.4.4.

3.5.2 Type II. A solution of 1/2 percent by volume (one-half volume of detergent to 99.5 volumes of synthetic hard water) shall exhibit a cleaning efficiency of not less than 80 percent, when tested as described in 4.4.4.

3.6 Deleterious action on painted surfaces. A 0.2 percent by weight solution of type I detergent or a 0.2 percent by volume solution of type II detergent shall not cause greater than one-half the loss of 60-degree specular gloss of painted surfaces caused by a 0.2 percent solution of trisodium phosphate, when tested as specified in 4.4.5.

3.7 Deleterious action on linoleum, asphalt, rubber, and vinyl asbestos tile flooring. A 2.0 percent by weight solution of type I detergent or a 2.0 percent by volume solution of type II detergent shall not cause any softening, swelling, cracking, or whitening or bleaching of the test specimens, when tested as specified in 4.4.6.

3.8 Synthetic detergent content. The content of the synthetic detergent in types I and II shall be not less than 20 percent, when tested as specified in 4.4.7.

3.9 Labeling (all types). The containers shall be labeled in accordance with the Federal Hazardous Substances Act. Each container of detergent of specified type shall be durably and legibly marked with precautions and directions for use.

DIRECTIONS FOR USE: The manufacturer's recommended dilutions and "Directions For Use" shall be clearly shown on the label.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein.

4.2 Quality conformance inspection. Sampling for inspection and acceptance shall be performed in accordance with MIL-STD-105. The end item shall be examined in accordance with the classification of defects, inspection levels, and acceptable quality levels (AQL's) set forth below.

4.2.1 Examination of the end item container for defects in appearance of detergent. An examination shall be made to determine compliance with requirements under 3.1. The inspection level shall be S-2 with an AQL of 2.5 percent defective.

4.2.2 Examination of the preparation for delivery. An examination shall be made to determine compliance with the requirements of section 5. The sample unit shall be one shipping container fully prepared for delivery. The inspection level shall be S-2 with an AQL of 4.0 expressed in terms of percent defective.

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4.3 Testing the end item. The end item shall be tested for characteristics as indicated in 4.4. Each individual determination shall meet the requirements. The lot shall be considered unacceptable if any test fails.

4.4 Test methods.

4.4.1 pH value. Make a 1.0 percent solution of the detergent in freshly boiled and cooled (room temperature) distilled water, as specified in 3.3, and mix. Determine the pH value of this solution to the nearest 0.1 unit at room temperature ($23^{\circ} \pm 3^{\circ}$ C) by means of a suitable pH meter which employs the glass electrode. No correction for sodium ion concentration is necessary.

4.4.2 Solubility in hard water. To 5.0 gram (type I) or 5.0 ml (type II) of detergent, add sufficient synthetic hard water (see 4.4.3.1) to make 100 ml of solution. The solution shall be maintained at room temperature ($23^{\circ} \pm 3^{\circ}$ C) and stirred vigorously for 5 minutes. The solution shall be inspected immediately for undissolved material.

4.4.3 Rinsing properties.

4.4.3.1 Synthetic hard water (300 ppm hardness). Prepare synthetic hard water to the following formula:

0.264 gram/liter $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$
0.295 gram/liter $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

The hard water salts shall be transferred quantitatively to a 1 liter volumetric flask and dissolved in a small portion of distilled water. Dilute to the mark with distilled water.

4.4.3.2 Procedure (synthetic hard water). Dissolve 2.0 grams (type I) or 2.0 ml (type II) of the detergent as completely as possible in 98 ml of synthetic hard water at room temperature ($23^{\circ} \pm 3^{\circ}$ C), in a very clean 250-ml Erlenmeyer flask. Stopper the flask and shake vigorously for 1 minute. Pour out the solution. Rinse the flask by the same procedures, using three 75-ml portions of synthetic hard water alone. Invert the flask, allow to dry, and examine for any residue not rinsed from the interior. The flask shall contain no more residue after being dried than a similar flask allowed to dry after rinsing with synthetic hard water alone.

4.4.4 Cleaning efficiency. The cleaning efficiency for each sample shall be determined on three panels in accordance with method 6701 of Fed. Test Method Std. No. 536.

4.4.5 Deleterious action on painted surfaces.

4.4.5.1 Measurement of specular gloss. Gloss shall be determined using a glossmeter in accordance with the manufacturer's directions.

4.4.5.2 Test panels. Stainless steel, aluminum, or glass panels, approximately 3 x 6 x 1/16 inches (7.6 x 15.2 x 0.16 cm), shall be used. The panel shall be prepared by applying (brush or spray) one coat of each of the following paints: (1) enamel undercoat, white, as the first coat; (2) enamel, semigloss, white, with a 60° gloss of 40 to 60 as the final coat. A drying time of not less than 24 hours between coats and a minimum of not less than 24 hours after the application of the final coat shall be allowed. When tests are to be made on panels that have been used, roughen the surfaces (to obtain good adhesion) before applying the final coat (60° gloss-40-60, white). Allow the final coat to dry for 2 days.

h.4.5.3 Procedure. Prepare 1 liter each of a solution of trisodium phosphate (sodium phosphate, tribasic anhydrous) and a solution of the cleaning compound under test at concentrations of 2 grams per liter in distilled water. Measure the specular gloss of two panels and then immerse one panel in each of these solutions, kept at room temperature, for 1 hour. Remove the panels, rinse thoroughly in distilled water, and dry at room temperature for at least 1 hour. Again measure the specular gloss of each panel. The percentage decrease in gloss of the portion of the panel immersed, compared with the gloss of the same panel before immersion, shall be reported for the compound under test and for the trisodium phosphate.

h.4.6 Deleterious action on linoleum, asphalt, rubber, and vinyl-asbestos tile flooring.

h.4.6.1 Test panels. These panels shall be as specified below:

White linoleum panels - 2 X 4 X 1/8 inches (5.1 X 10.2 X 0.32 cm).
 Black asphalt panels - 2 X 4 X 1/8 inches (5.1 X 10.2 X 0.32 cm).
 Black rubber tile panels - 2 X 4 X 1/8 inches (5.1 X 10.2 X 0.32 cm).
 Black vinyl-asbestos tile panels - 2 X 4 X 1/8 inches (5.1 X 10.2 X 0.32 cm).

h.4.6.2 Procedure. Pour 150 ml of the cleaning compound solution, at the concentrations specified in 3.7, into each of the four 250-ml beakers. Immerse one panel of each type in the beakers containing the cleaning solution. Allow the panels to remain in the solution at room temperature ($25^{\circ} \pm 2^{\circ}$ C) for 16 hours. At the end of this time, remove the panels, rinse thoroughly with distilled water, and dry at room temperature for at least 1 hour. Examine for softening, swelling, cracking, bleaching, and discoloration.

h.4.7 Synthetic detergent content. Weigh, in an aluminum pan, 100.0 grams of washed and ignited sand and 10.0 grams of the product to the nearest 0.01 gram. Mix sand and product and place pan and contents in an air oven at a temperature of $105^{\circ} \pm 2^{\circ}$ C ($221^{\circ} \pm 4^{\circ}$ F) for 4 hours. Quantitatively transfer the dry sand-product to a Soxhlet extraction apparatus. Weigh to the nearest 0.01 gram a 300-ml extraction flask tared with five glass beads. To the flask add about 200 ml of chloroform and extract for about 8 hours. Evaporate the chloroform from the extraction flask on a steam bath and dry flask to constant weight in an air circulating oven at $105^{\circ} \pm 2^{\circ}$ C ($221^{\circ} \pm 4^{\circ}$ F). Determine weight of chloroform extract and calculate the synthetic detergent content:

$$\text{Percent synthetic detergents} = \frac{\text{Weight of chloroform extract} \times 100}{\text{Weight of sample}}$$

h.4.8 Packet or envelope product weight (all types). Three detergent packets or envelopes shall be weighed to the nearest 0.01 ounce. The product shall be removed or drained for 15 minutes, if it is a liquid, from the packet or envelope, and the packet or envelope shall be reweighed. The difference in weight shall fall between the limits of 3.1.1 and 3.1.2.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or commercial, as specified (see 6.2).

5.1.1 Level A. Unit container.

5.1.1.1 Type I. A 5-pound quantity of detergent shall be packaged in a can. The can shall be closed. Alternatively, a 5-pound quantity of detergent shall be packaged in a box commonly used by the industry for this item. The 1-1/2 ounce packets and the 25- and 300-pound quantities do not require packaging (see table I).

5.1.1.2 Type II. One gallon of detergent shall be packaged in a can. The can shall be closed. Alternatively, 1 gallon of detergent shall be packaged in a high density (min. 0.95) polyethylene bottle with a handle and a closure with a protective recloseable feature. The 2-ounce envelopes, the 5-1/2 ounce envelopes, the 5-gallon quantity, and the 55-gallon quantity do not require packaging (see table I).

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5.1.2 Commercial. The detergent shall be packaged in bottles, boxes, cans, pails, or drums, as applicable, in accordance with normal commercial practice. The complete package shall be designed to protect the item against damage during shipment, handling, and storage.

TABLE I. Quantities per container

Package	Unit container	Shipping container
Type I packet (1-1/2 ounce)	none	200 packets
Can or box	5 pounds	12 containers
Drum	none	25 pounds 300 pounds
Type II envelope		
2 ounce	none	288 envelopes
5-1/2 ounce	none	120 envelopes
Can or bottle	1 gallon	6 containers
Pails	none	5 gallons
Drums	none	55 gallons

5.2 Packing. Packing shall be level A or commercial, as specified (see 6.2).

5.2.1 Level A. Shipping container.

5.2.1.1 Type I, detergent in packets. Two hundred packets shall be packed in a fiberboard box made from weather-resistant fiberboard with a bursting test strength of not less than 275 pounds per square inch. The box flaps shall be secured with water-resistant adhesive applied to not less than 75 percent of the surface area of contact between the flaps, or with 3-inch wide waterproof tape applied to the full length of the seams and extending over the ends not less than 3 inches. Alternatively, wirebound, cleated plywood, or nailed wood boxes shall be acceptable shipping containers when lined with a waterproof barrier material. The barrier material shall be sealed at the edges with waterproof tape or adhesive. The box shall be provided with a bag liner fabricated of plastic sheet 0.003 inch (7.6 mm) thick. The liner shall be securely closed.

5.2.1.2 Type II in envelopes. Two hundred and eighty-eight 2-ounce envelopes or 120 5-1/2 ounce envelopes shall be packed in a fiberboard box made from weather-resistant fiberboard with a bursting test strength of not less than 275 pounds per square inch. The box flaps shall be secured with water-resistant adhesive applied to not less than 75 percent of the surface area of contact between the flaps, or with 3-inch wide waterproof tape applied to the full length of the seams and extending over the ends not less than 3 inches. Alternatively, wirebound, cleated plywood, or nailed wood boxes shall be acceptable shipping containers when lined with a waterproof barrier material. The barrier material shall be sealed at the edges with waterproof tape or adhesive.

5.2.1.3 Cans. Six 1-gallon or twelve 5-gallon cans shall be packed in a box specified in 5.2.1.2.

5.2.1.4 Boxes. Twelve 5-pound boxes shall be packed in a box as specified in 5.2.1.2.

5.2.1.5 Bottles. Six 1-gallon bottles shall be packed in a box as specified in 5.2.1.2. In addition, the box shall be fitted with partitions, dividers, or separators which are 3/8 inch + 1/4 inch higher than the bottles.

5.2.1.6 Pails. Five gallons of type II detergent shall be packed in a pail.

5.2.1.7 Type I in drums. Twenty-five pound or 300-pound quantity shall be packed in a drum.

5.2.1.8 Type II in drums. Fifty-five gallon quantity shall be packed in a drum.

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5.2.2 Commercial. The packaged detergent shall be packed in fiberboard boxes, excluding the 5- or 55-gallon drums. The detergent, including the 5- and 55-gallon drums, shall be packed to insure delivery at destination, to provide for redistribution by the initial receiving activity, and shall be acceptable by common carrier under the National Motor Freight Classification and Uniform Freight Classification. Five-gallon pails or 55-gallon drums need no further packing.

5.3 Marking. Marking shall be as specified in the contract or purchase order (see 6.2).

6. NOTES

6.1 Intended use. The detergent concentrate covered by this specification is intended for use in hard and soft water for general maintenance and cleaning of floors, walls, and woodwork. It is a nonabrasive cleaner and is safe to use on painted surfaces, linoleums, asphalt, rubber, and vinyl-asbestos tile flooring. This detergent is not intended for use on aircraft surfaces.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2.1).
- (c) Packaging and packing required (see 5.1 and 5.2).
- (d) Marking required (see 5.4).

6.3 Basis of purchase. Type I should be purchased by net weight and type II by net volume.

MILITARY INTEREST:

DOD has waived coordination of this document until further notice.

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-PSS
VA-DMS

Preparing activities:

GSA-PSS

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein.