

**INCH-POUND**

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## FEDERAL SPECIFICATION

## DETERGENT, GENERAL PURPOSE, LAUNDRY AND HAND DISHWASHING (GRANULAR)

This specification is 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 built synthetic detergents suitable for laundering cotton, synthetic, and woolen fabrics, and for hand dishwashing and general cleaning purposes (see 6.1).

1.2 Classification. The detergents shall be of the following types, as specified (see 6.2).

- Type I - Controlled sudsing and low phosphate
- Type II - Controlled sudsing and nonphosphate
- Type III - High sudsing and low phosphate

## 2. APPLICABLE DOCUMENTS

2.1 Government documents. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 7930

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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Federal Specifications:

L-P-378 - Plastic Sheet and Strip, Thin Gauge, Polyolefin  
 PPP-B-566 - Boxes, Folding, Paperboard  
 PPP-B-636 - Boxes, Shipping, Fiberboard  
 PPP-D-723 - Drums, Fiber

Federal Standards:

FED-STD-123 - Marking for Shipment (Civil Agencies)  
 FED-STD-536 - Soap and Soap-Products (Including Synthetic-Detergents); Sampling and Testing

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly 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 and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Standardization documents, standards, and commercial item descriptions, and the Index of Federal Specifications, from established distribution points in their agencies.)

Military Specification:

MIL-L-35078 - Load, Unit: Preparation of Semiperishable Substance Items; Clothing, Personal Equipment and Equipage

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes  
 MIL-STD-129 - Marking for Shipment and Storage  
 MIL-STD-147 - Palletized Unit Loads  
 MIL-STD-731 - Quality of Wood Members For Containers and Pallets

(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 activity.)

Federal Regulations:

- 16 CFR PART 1500 - Federal Hazardous Substances Act Regulations
- 29 CFR PART 1910 - Occupational Safety and Health Standards

(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 20402-0001. 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.

American Society for Testing and Materials (ASTM)

- D 460 - Sampling and Chemical Analysis of Soaps and Soap Products
- D 501 - Sampling and Chemical Analysis of Alkaline Detergents
- D 502 - Particle Size of Soaps and Other Detergents
- D 515 - Phosphorus in Water
- D 3951 - Standard Practice for Commercial Packaging

(Applications for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Material.

3.1.1 Type I. Type I laundry detergent shall contain a controlled sudsing, synthetic organic surfactant, (low) polyphosphates, silicates, and an antiredeposition agent. It may contain carbonates, foam controlling agents, mild perfume and tinting agents.

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3.1.2 Type II. Type II laundry detergent shall contain a controlled sudsing, synthetic organic surfactant, an antiredeposition agent, and builders other than phosphates. It may contain carbonates, and additional material for absorbing liquid nonionics such as urea, foam controlling agents, mild perfume and tinting agents. It shall not contain phosphates (see 4.2.1.1).

3.1.3 Type III. Type III laundry and general cleaning detergent shall contain a high sudsing, synthetic organic surfactant, (low) polyphosphates, silicates, and an antiredeposition agent. It may contain carbonate, foam stabilizer, tarnish inhibitors, tinting agents and mild perfume.

3.2 Form. The detergents shall be uniform in appearance in granular or pressed tablet form. Any caking or lumping of the granular form which occurs during normal storage shall be capable of being broken up by hand.

3.3 Odor. The detergents shall not have a kerosene-like, rancid, fishy, or acrid odor, and shall not impart such odors to fabrics washed in solutions of the detergent.

3.4 Composition, chemical and physical requirements. The detergents shall conform to the requirements shown in table I when tested as specified in 4.2.4.

TABLE I. Composition, chemical, and physical requirements

	Type I		Type II		Type III	
	Controlled sudsing phosphate Min.	Max.	Controlled sudsing phosphate Min.	Max.	High sudsing low phosphate Min.	Max.
Moisture and matter volatile at 105°C, percent	-	12.0	-	10.0	-	10.0
Surfactant, synthetic organic, percent	8.0	-	8.0	-	15.0	-
Chloroform soluble matter, percent	8.0	-	8.0	-	15.0	-
Free caustic content, percent as NaOH	-	1.0	-	-	-	1.0
Matter insoluble in hard water, percent	-	1.0	-	1.0	-	1.0
Total phosphates as P <sub>2</sub> O <sub>5</sub> , percent	-	20.0	-	-	-	20.0
Polyphosphates as P <sub>2</sub> O <sub>5</sub> , percent	14.0	-	-	-	14.0	-
Orthophosphates, as P <sub>2</sub> O <sub>5</sub> , percent	-	2.0	-	-	-	2.0
Silicates, as SiO <sub>2</sub> , percent	1.0	6.0	-	6.0	2.5	6.0
Antiredeposition agent, percent	-	1.0	-	1.0	-	1.0
Carbonate, as Na <sub>2</sub> CO <sub>3</sub> , percent	-	-	-	35	-	-
pH of 0.1 percent solution	9.5	11.5	6.0	11.0	9.0	11.0
Sudsing, mL of foam at 38°C	-	110	-	110	100	200
Bulk density, g/mL	0.3	-	0.3	-	0.2	-
Particle size (granular only)						
Material retained on a 1190-micron (No. 16) sieve, maximum	-	5.0	-	5.0	-	5.0
Material retained on a 88-micron (No. 170) sieve, minimum	95	-	95	-	95	-
Solubility in distilled water	Complete (see 3.3)		Complete (see 3.3)		Complete (see 3.3)	
Odor						

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3.5 Labeling. Unless otherwise specified (see 6.2), each unit container of detergent shall be durably and legibly marked on the outside with the following information and precautions, and shall conform to 16 CFR PART 1500 (see 2.1). Unless otherwise specified, directions for use shall be marked on the outside of each unit container, on cards which may be placed inside each unit container, or in a packet adhered to the outside of each unit container.

### 3.5.1 Type I.

#### Detergent, laundry, controlled sudsing, low phosphates

A heavy duty, controlled sudsing detergent intended for laundering cottons, cotton/polyester blends, and synthetic fabrics in soft and hard water in Army field and fixed laundries, institutional laundry washwheels, and home automatic fabric washing machines.

Caution: Not for use in dishwashing machines, or on aluminum surfaces. Do not use on aircraft surfaces.

For Army use - See instruction cards inside this container for special washing formulas.

3.5.1.1 Instruction cards. The instruction cards, approximately 4 inches by 6 inches, shall be printed with the following information:

3.5.1.2 For Army use. Print the following information on a separate card:

#### Army formulas - single - trailer laundry unit

Type I Detergent - For washing cottons, synthetic and cotton and synthetic blends in soft and hard water.

Operation	Water level (inches)	Time (minutes)	Water temperature (°F)	Supplies, 60 lb washer load
First suds	8	5	100	6 oz. detergent
Second suds	8	5	130	4 oz. detergent
Third suds	8	5	140	2 oz. detergent
Rinse	11	2	140	None
Rinse	11	2	120	None
Rinse	11	2	100	Sour - 2 oz.

3.5.2 Type II.Detergent, laundry (synthetic), controlled sudsing, nonphosphate

A mild, controlled sudsing detergent intended for laundering woolen and synthetic fabrics in soft and hard water, in field and fixed laundries, institutional laundry washwheels and home automatic fabric washing machines.

Caution: Not for use in dishwashing machines, or on aluminum surfaces. Do not use on aircraft surfaces.

For Army use: See instruction cards inside this container for special washing formulas.

3.5.2.1 For Army use. Print the following information on a separate card:Army formulas - single trailer laundry unit

Type II Detergent - For washing cottons, woolens, and synthetic blend fabrics in soft and hard waters.

Operation	Water Level	Time (min.)	Temperature (°F)	Supplies 60 lb. washer load
Suds	High	5	90	6 oz. - Detergent
Suds	High	5	90	4 oz. - Detergent
Rinse	High	2	90	None
Rinse	High	2	90	None
Rinse	High	2	90	2 oz. - Sour

3.5.3 Type III.Detergent (High sudsing, low phosphate)

Each container of detergent shall be durably and legibly marked with the following information, precautions, and directions for use:

A nonabrasive detergent for use in hard and soft water for the manual washing of glassware, dishes and clothing, and for the general maintenance and cleaning of floors (except wood), painted surfaces, and kitchen utensils.

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Caution: Not for use in mechanical dishwashers,  
or on aluminum surfaces.  
Do not use on aircraft surfaces.

DIRECTIONS FOR USE:

Dishes, glassware, silverware: Add 1/2 to 1 ounce of detergent to each gallon of warm water (110° F) used. Wash in usual manner. Prepare fresh wash solution when wash water becomes dirty. Rinse in clean hot water (180° F). Air-dry, do not use towels.

Kitchen utensils: Add 6 ounces of detergent to each 5 gallons of warm water (110° F) used. WASH KITCHEN UTENSILS AS SOON AS POSSIBLE AFTER USE. Wash in usual manner. For hard to remove stains use scouring powder. Prepare fresh wash solution when wash water becomes dirty. Rinse in clean hot water (180° F). Air-dry, do not use towels.

Painted surfaces and floors (except wood): Add 1/2 to 1 ounce of detergent to each gallon of warm water (110° F) used. Increase the amount of detergent, but not to exceed 4 ounces of detergent to each gallon of warm water, if required to clean in hard water solution or to clean heavily soiled surfaces. Prepare fresh wash solution when cleaning solution becomes dirty. Rinse the washed surfaces with fresh water to remove loosened soil.

Laundering (hand): Add 1 ounce of detergent to each gallon of warm water (110° F) used. Wash in usual manner. Rinse thoroughly.

Laundering (top-loading washers): To start with, add 1 cup of detergent to washing machine. In subsequent launderings, use more or less detergent, depending upon the hardness of water and the amount of soil on the clothing. Use sufficient detergent to obtain a good rich covering of suds during the wash cycle.

3.6 Workmanship. The finished product shall be clean, uniform in color and texture, free flowing, and free from foreign matter. The finished product shall also conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels.

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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

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4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Certificate of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine validity of the certification.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.2.1.1 Component and material certification. A certificate of compliance may be acceptable as evidence that the type II detergent does contain phosphates (see 3.1.2).

4.2.2 End item examination. The detergent in containers shall be examined for the defects listed below. The lot shall consist of the detergent manufactured in one batch. The lot size shall be expressed in units of filled containers of the same capacity. The sample unit shall be one filled container. The inspection level shall be S-3, and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Odor	Kerosene-like, rancid, fishy, or acrid
Appearance	Presence of foreign material Not uniform Contains agglomerates, cakes, or lumps which cannot be readily broken up by hand Not clean

4.2.3 Net weight examination. The detergent in containers shall be examined for net weight. The lot size shall be expressed in units of filled containers of the same capacity. The sample unit shall be one filled

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container. The inspection level shall be S-3. The lot shall be rejected if the sample unit average net weight is less than that specified or less than indicated on the containers.

4.2.4 End item testing. The end item shall be tested for the characteristics specified in table II. For purposes of sampling, the lot shall be expressed in pounds of detergent of the same type, manufactured as a single batch, and offered for inspection at one time. All tests specified in table II, except moisture, shall be made on a composite sample.

a. The sample for composite testing shall be 2 pounds of detergent obtained by combining equal portions selected at random throughout the lot. The number of portions of product to make up the composite shall be as indicated below. The composite sample shall be prepared, thoroughly mixed, and immediately placed in a clean, dry, airtight container marked with identifying lot number and date. Care shall be taken to prevent contamination or alteration of the composite during sampling, weighing, and storing.

b. The sample unit for the moisture test shall be a 1-ounce sample. The number of sample units of detergent shall be as indicated below. Each sample unit shall be placed in an individual 1-ounce glass, airtight, and watertight jar covered and sealed to prevent any change in moisture.

All test reports shall contain the individual values used in expressing the final results. The failure of the composite sample to meet the requirements specified for any characteristics listed in table II, or the failure of any sample unit to meet the moisture requirement shall constitute failure of the test and the lot sampled.

<u>Lot size (pounds)</u>	<u>Sample size (sample unit)</u>
800 or less	2
801 up to and including 22,000	3
22,001 or more	5

TABLE II. End item tests

Characteristic	Specification reference		Number of de-terminations	Results reported as:	
	Require-ment	Test method		Pass or fail	Numerically to nearest
Moisture and matter volatile at 105°C, percent	3.4	4.3.1	2 <u>1/</u>	-	0.1 percent
Surfactant, synthetic organic, percent	3.4	<u>2/</u>	-	-	0.1 percent
Chloroform soluble matter, percent	3.4	4.3.2	2	-	0.2 percent
Free caustic content, percent as NaOH (types I and III)	3.4	4.3.3	2	-	0.1 percent
Matter insoluble in hard water, percent	3.4	4.3.4	2	-	0.1 percent
Total phosphates, as P <sub>2</sub> O <sub>5</sub> percent (types I and III)	3.4	4.3.5	2	-	0.1 percent
Orthophosphates, as P <sub>2</sub> O <sub>5</sub> percent (types I and III)	3.4	4.3.5.1	2	-	0.1 percent
Polyphosphates, as P <sub>2</sub> O <sub>5</sub> percent (types I and III)	3.4	4.3.5.2	2	-	0.1 percent
Silicates as SiO <sub>2</sub> percent	3.4	4.3.6	2	-	0.1 percent
Antiredeposition agent	3.4	<u>2/</u>	-	-	0.1 percent
Carbonate, as Na <sub>2</sub> CO <sub>3</sub> percent (type II)	3.4	4.3.7	2	-	0.1 percent

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TABLE II. End item tests (cont'd)

Characteristic	Specification reference		Number of de-terminations	Results reported as:	
	Require-ment	Test method		Pass or fail	Numerically to nearest
pH of 0.1 percent solution	3.4	4.3.8	2	-	0.1 pH
Sudsing, mL of foam at 38°C	3.4	4.3.9	2	-	1 mL
Bulk density, g/mL	3.4	4.3.10	2	-	0.01 g/mL
Particle size	3.4	4.3.11	-	-	-
Solubility in distilled water	3.4	4.3.12	-	-	-

1/ Number of determinations per sample unit.

2/ Unless otherwise specified, a certificate of compliance is required and will be acceptable for the stated requirement.

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4.2.5 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2, and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Container	Not as specified
Marking (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Any component missing, damaged, or not as specified
Workmanship	Inadequate application of components, such as: incomplete closure of container flaps, improper taping, loose strapping, or inadequate stapling Bulged or distorted container
Content	Number of unit packs per shipping container is more or less than required Number of ounces per unit pack is more or less than required <u>1/</u>
Weight	Quantity of product per interior package or shipping container not of the weight specified

1/ For this defect one unit pack from each container in the sample shall be examined.

4.2.6 Palletization examination. The fully packaged and palletized end items shall be examined for the defects listed below. The lot size shall be expressed in unit of palletized unit loads. The sample unit shall be one palletized unit load, fully packaged. The inspection level shall be S-1, and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

<u>Examine</u>	<u>Defect</u>
Palletization	Pallet pattern not as specified Interlocking of loads not as specified Load not bonded as specified
Weight	Exceeds maximum load limits
Marking	Omitted; incorrect; incomplete; illegible; of improper size, location, sequence, or method of application

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### 4.3 Methods of inspection.

4.3.1 Moisture and matter volatile at 105°C. Determination shall be in accordance with the Matter Volatile at 105°C (oven method) method in ASTM D 460.

4.3.2 Chloroform-soluble matter. Grind approximately 30 g of the detergent with a mortar and pestle. Weigh to the nearest mg 20 g of the ground detergent and mix with approximately 80 g of clean, dry sand (20-30 mesh Ottawa sand) and place into a 43 by 123 mm extraction thimble (Whatman). Place a thin layer of sand at the top of the detergent-sand mixture. Place the thimble and contents in a Soxhlet extraction apparatus and extract with chloroform, U.S.P. grade, for 16 hours. For type I and type III detergents, transfer the chloroform extract quantitatively to a tared beaker and evaporate the chloroform on a steam bath until the odor of chloroform disappears. For type II detergent, cool the chloroform extract solution to room temperature. If the chloroform extract solution contains any insoluble matter, filter the solution through filter paper (No. 1 Whatman or equal) into a beaker tared with glass beads. Wash filter paper with three 20-mL portions of fresh chloroform. Add washing to filtrate. Place beaker and contents on a steam bath until the odor of chloroform disappears. Dry the beaker and chloroform soluble residue in an oven ( $105^{\circ} \pm 2^{\circ}\text{C}$ ) for 30 minutes, cool in desiccator and weigh. Calculate the percent chloroform-soluble matter as follows:

$$\text{Percent chloroform-soluble matter} = \frac{\text{Weight of residue} \times 100}{\text{Weight of detergent sample}}$$

CAUTION: Operations with chloroform shall be conducted using an effective fume hood to limit exposure to chloroform as required by 29 CFR PART 1910, subpart Z-Toxic and Hazardous Substances, Table Z-1 (see 2.1).

4.3.3 Free caustic. Determination of free caustic as NaOH shall be in accordance with the Free Alkali method in ASTM D 460.

4.3.4 Matter insoluble in hard water. Dissolve approximately 0.6 g of the laundry detergent in 250 mL of 300 ppm hard water (see 4.3.4.1). Heat the solution to  $60 \pm 1^{\circ}\text{C}$  while stirring and allow to cool for 1 hour while covered. If turbidity is present or undissolved matter remains, filter the solution through a tared Gooch or fritted glass crucible and wash the precipitate three times with 20-mL portions of the hard water. Dry in an oven at  $105 \pm 2^{\circ}\text{C}$  to constant weight. Make a blank determination and subtract the increase in weight of the blank from the increased weight due to the precipitate. Any increase in weight greater than 1 percent of the sample weight shall constitute a failure.

4.3.4.1 Hard water stock solution. Hard water stock solution shall be prepared by dissolving  $3.544 \pm 0.002$  g calcium chloride dihydrate ( $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ ) and  $1.194 \pm 0.002$  g magnesium chloride hexahydrate ( $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ ) in about 800 mL of distilled or deionized water. Dilute to a volume of 1 L with distilled water. This solution contains 3000 ppm hardness (expressed as calcium carbonate). Dilute 100 mL of the hard water stock solution to 1 L with distilled water. This solution contains 300 ppm hardness (expressed as calcium carbonate).

#### 4.3.4.2 Calculation.

Percent matter insoluble in hard water =  $\frac{\text{Weight of precipitate}}{\text{Sample weight}} \times 100$

4.3.5 Total phosphates (as  $\text{P}_2\text{O}_5$ ). Make a 1.0-percent solution of the detergent in distilled water. Pipet a 4-mL aliquot into a 1000-mL volumetric flask and fill to volume with distilled water. This will be a 10 ppm solution of phosphate species for a detergent sample containing 25 percent phosphate. Dilute further to 1 ppm solution. Determine the total phosphate in accordance with ASTM D 515 method B, Colorimetric Amino Reduction.

4.3.5.1 Orthophosphates. Follow the dilution procedure in 4.3.5 and then determine the orthophosphates in accordance with ASTM D 515 method B, Colorimetric Amino Reduction.

4.3.5.2 Polyphosphates. Determine total phosphates and ortho-phosphates as required in 4.3.5 and 4.3.5.1 respectively; Polyphosphates = total phosphates - ortho-phosphates.

4.3.6 Silicates (as  $\text{SiO}_2$ ). Determination shall be in accordance with the Silica Present in Alkaline Silicates method of ASTM D 460.

4.3.7 Carbonate (as  $\text{Na}_2\text{CO}_3$ ). Determination shall be in accordance with the Carbonate as Sodium Carbonate ( $\text{Na}_2\text{CO}_3$ ) procedure in ASTM D 501.

#### 4.3.8 pH determination.

4.3.8.1 Apparatus. A pH meter having a sensitivity and readability of 0.05 pH units shall be used. The meter equipped with a glass electrode shall be standardized with a standard buffer solution of pH 10.0.

4.3.8.2 Procedure. Prepare a 0.1-percent solution of the detergent in freshly boiled distilled of deionized water which has been cooled to room temperature ( $25 \pm 1^\circ\text{C}$ ). Measure the pH of the detergent solution at room temperature and report the hydrogen (ion) concentration of the solution to the nearest 0.1 pH. Do not correct the results for sodium ion concentration.

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4.3.9 Sudsing. Determine the sudsing property of the detergents in accordance with Method 2001 of FED-STD-536, with the following modifications:

Dissolve  $2.0 \pm 0.01$  g of detergent in 1 L of distilled or deionized water at  $60 \pm 4^\circ\text{C}$  taking care not to generate a foam. Immerse (for 10 minutes) a 250-mL unstoppered graduated cylinder up to the 150-mL graduation mark in a water bath maintained at  $38 \pm 2^\circ\text{C}$ . Carefully pour 50 mL of the detergent solution into the preheated graduated cylinder and allow to remain in the bath for 10 minutes prior to shaking. Stopper the graduated cylinder and hold the stopper to prevent the stopper from loosening due to internal pressure build-up, and proceed as directed in Method 2001.

4.3.10 Bulk density. Weigh  $50.0 \pm 0.01$  g of detergent into a 250-mL graduated cylinder from which the lip has been removed. Stopper the graduate and pass a closely fitting glass or metal sleeve, about 3 inches long, over it. Clamp the sleeve to a ringstand. Place a large rubber stopper under the cylinder and adjust the sleeve so that the graduate will be 10 cm above the rubber stopper when the base of the graduate touches the lower edge of the sleeve, then release. Continue raising and dropping the graduate until 20 cycles are complete. Read the volume of the detergent to the nearest milliliter and calculate the bulk density in grams per milliliter.

4.3.10.1 Calculation. Calculation of the bulk density:

$$\text{Bulk density, grams per milliliter} = \frac{50.0}{\text{volume}}$$

4.3.11 Particle size. Determine particle size according with ASTM D 502.

4.3.12 Solubility. To 1.0 g of detergent, add sufficient distilled water to make 100 mL of solution. This solution shall be maintained at room temperature ( $25 \pm 2^\circ\text{C}$ ), and stirred vigorously for 5 minutes. The solution shall be inspected immediately for undissolved material. Presence of undissolved material will constitute a failure.

## 5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial (see 6.2).

5.1.1 Level A preservation.

5.1.1.1 Twenty and forty-nine ounce quantities. Twenty (20) or forty-nine (49) ounces of detergent of one type only shall be unit packed in a paperboard box conforming to variety 2, style 1, type A, class b of PPP-B-566. The box shall be closed in accordance with the appendix to PPP-B-566. Alternatively, the box shall be the type normally used by the contractor.

5.1.1.2 Twenty-five, fifty, and two hundred-pound quantities. Twenty-five (25), fifty (50), and two hundred (200) pounds of detergent are considered bulk quantities and do not require unit packing.

5.1.2 Commercial preservation. The detergent shall be preserved in accordance with ASTM D 3951.

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

5.2.1 Level A packing.

5.2.1.1 Twenty ounce and forty-nine ounce quantities. Twenty-four 20-ounce unit packs or twelve 49-ounce unit packs of detergent of one type only, preserved as specified in 5.1, shall be packed in a shipping container conforming to style RSC, grade V2s of PPP-B-636. The box shall be closed, water-proofed and reinforced in accordance with the appendix to PPP-B-636, except that the inspection shall be in accordance with 4.2.5. Boxes shall be arranged in unit loads in accordance with MIL-L-35078 for the type and class of load specified (see 6.2). Strapping shall be limited to nonmetallic strapping, except for type II, class F loads.

5.2.1.2 Twenty-five, fifty, and two hundred-pound quantities. Unless otherwise specified (see 6.2), twenty-five (25), fifty (50), and two hundred (200) pound quantities shall be packed in a drum conforming to type III, grade A, class 1 of PPP-D-723. The drum shall be fitted with a polyethylene bag liner not less than 0.002 inch thick conforming to type I, class 1, grade A, finish 1 of L-P-378, and shall be slightly larger than the inside of the drum. A suitable heat seal method shall be used for the seams and closure. The seams and closure shall comply with the heat seal strength of L-P-378. Alternatively, the polyethylene film bag liner shall be secured and closed to prevent sifting of the product.

5.2.2 Commercial packing. Detergent preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Palletization. When specified (see 6.2), detergent of one type only, packed as specified in 5.2, shall be palletized in accordance with load type Ia, XIIa, XIIb or XIII (as applicable) of MIL-STD-147. Pallet types shall be type I (4-way entry), type IV or type V in accordance with MIL-STD-147. Pallets shall be fabricated from wood groups I, II, III or IV of MIL-STD-731. Each prepared load shall be bonded with straps in accordance with bonding means C and D or film bonding means F or G (as applicable). The load type I pallet patterns shall be in accordance with the appendix of MIL-STD-147.

5.4 Marking.

5.4.1 Civil agencies. Unit packs and shipping containers shall be marked in accordance with 3.5, 5.4.3 and FED-STD-123 or ASTM D 3951, as applicable.

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5.4.2 Military requirements. Unit packs, shipping containers, and palletized unit loads shall be marked in accordance with 3.5, 5.4.3, and MIL-STD-129 or ASTM D 3951, as applicable.

5.4.3 Additional marking. In addition to the labeling specified in 3.5, the shipping container shall be marked with the following legend:

NOT FOR USE IN MECHANICAL DISHWASHERS

Unless otherwise specified in the contract or purchase order, the interior package and shipping container shall be labeled in accordance with 16 CFR PART 1500.

## 6. NOTES

6.1 Intended use. Types I and II detergents are intended for use in institutional type laundry washwheels and household type automatic fabric washing machines where controlled sudsing detergents are required.

Type I laundry detergent containing alkaline salts and hard water sequestering agent is intended for laundering cottons, synthetic and cotton and synthetic blends in soft and hard water.

Type II laundry detergent, neutral or mildly alkaline, is intended for laundering woolens and colored durable press fabrics in soft and hard water.

Type III detergent, a high sudsing detergent, is intended for the manual washing of dishes and clothing and for use in some top loading fabric washing machines, and for general cleaning purposes.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Type of detergent required (see 1.2).
- c. Labeling required (see 3.5).
- d. Preservation and packing required (see 5.1 and 5.2).
- e. Quantity of detergent desired per shipping container (see 5.1.1).
- f. Type and class of unit load required (see 5.2.1.1).
- f. When palletization is required (see 5.3).

6.3 Basis of purchase. The detergent shall be purchased by net weight.

6.4 Subject term (key word) listing.

General cleaning  
Washing dishes  
Synthetic detergent  
Washing machine

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MILITARY INTERESTS:

Custodians

Army - GL  
Navy - YD  
Air Force - 99

Review Activities.

Army - MD  
Air Force - 84

User Activities

Navy - MC, MS, SH

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS  
EPA  
VA-OSS

PREPARING ACTIVITY:

Army -GL  
(Project 7930-0404)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

### INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>1. RECOMMEND A CHANGE:</b>		1. DOCUMENT NUMBER P-D-245F	2. DOCUMENT DATE (YYMMDD) 1990 July 11
3. DOCUMENT TITLE DETERGENT, GENERAL PURPOSE, LAUNDRY AND HAND DISHWASHING (GRANULAR)			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME U.S. Army Natick RD&E Center		b. TELEPHONE (Include Area Code) (1) Commercial 508-651-5221 (2) AUTOVON 256-5221	
c. ADDRESS (Include Zip Code) Commander, U.S. Army Natick RD&E Center ATTN: STRNC-ES Natick, MA 01760-5014		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	