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METRIC
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 SUPERSEDING
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 (See 6.6)

PERFORMANCE SPECIFICATION

CEMENT, EPOXY, METAL REPAIR AND HULL SMOOTHING (METRIC)

This specification is approved for use within the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a two-component epoxy cement for use in filling rough or pitted metal surfaces.

1.2 Classification. Epoxy cements covered by this specification shall be furnished ready-to-use and shall be of the following types, as specified (see 6.2):

- Type I - Alkali resistant.
- Type II - Non-alkali resistant.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. 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.

SPECIFICATIONS

FEDERAL

- QQ-A-250/9 - Aluminum Alloy 5456, Plate and Sheet.
- QQ-C-390 - Copper Alloy Castings (Including Cast Bar).
- PPP-B-566 - Boxes, Folding, Paperboard.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-665 - Boxes, Paperboard, Metal Edged and Components.
- PPP-B-676 - Boxes, Setup.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

MILITARY

- DOD-P-15328 - Primer (Wash), Pretreatment, (Formula No. 117 For Metals) (METRIC).
- MIL-P-15929 - Primer Coating, Shipboard, Vinyl-Red Lead (Formula No. 119).
- MIL-P-15931 - Paint, Antifouling, Vinyl (Formulas No. 121 and No. 129).

STANDARDS

FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing.
- FED-STD-313 - Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials.
- FED-STD-406 - Plastics: Methods of Testing.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 3112, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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STANDARDS (Continued)

MILITARY

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

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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

AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM)

D 695 - Compressive Properties of Rigid Plastics, Test For.

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

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC. AGENT

National Motor Freight Classification

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., ATA Traffic Dept., 1616 "P" Street, N.W., Washington, DC 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Ratings, Rules, and Regulations

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

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Rules and Regulations
Rule 102

(Application for copies should be addressed to the South Coast Air Quality Management District, Metropolitan Zone, 434 South San Pedro Street, Los Angeles, CA 90013.)

(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.)

3. REQUIREMENTS

3.1 Qualification. The cement furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.4).

3.1.1 Toxicity. The material shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.6.16). Questions pertinent to this effect shall be referred by the contracting activity to the appropriate service medical department which will act as advisor to the contracting activity.

3.2 Formula. The cement shall be a two-component (component A-resin and component B-curing agent), chemically reactive, epoxy cement, with suitable additives to produce a material in conformance with the requirements specified herein. Volatile materials shall conform to requirements of 3.4.1. Test reports submitted shall include the exact formula used.

3.3 Manufacture. Ingredients for each component shall be processed and mixed to produce a product which is uniform, free from dirt and grit, and in full conformance with the requirements of this specification.

3.4 Quantitative requirements. The cement shall conform to the quantitative requirements shown in table I, and as herein specified.

TABLE I. Quantitative requirements.

Characteristic	Requirements	
	Minimum	Maximum
Mixing ratio, parts by volume	---	1:5
Hardness of cured epoxy cement, Shore D units	55	---
Pot life, minutes		
21°C ± 1°C (70°F ± 2°F)	15	180
32°C ± 1°C (90°F ± 2°F)	10	120
Curing time, hours	---	24
Compressive strength, pascal (lb/in ²)	3.9 x 10 ⁷ (5500)	---
Shrinkage, percent	---	0.25

3.4.1 Volatile material. Volatile materials used in these formulations shall conform to requirements herein specified:

- (a) A combination of hydrocarbons, alcohols, aldehydes, ethers, esters, or ketones having an olefinic or cycloolefinic type of unsaturation except perchloroethylene: 5 percent maximum.
- (b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene, methyl benzoate, and phenyl acetate: 8 percent maximum.
- (c) A combination of ethylbenzene, ketones having branched hydrocarbon structures, perchloroethylene, or toluene: 20 percent maximum.

3.5 Qualitative requirements. The cement shall conform to the qualitative requirements specified herein.

3.5.1 Consistency. The two components of the cement shall be of smooth, uniform consistency and sufficiently viscous to allow ready mixing at temperatures between 21°C and 32°C (70°F and 90°F).

3.5.2 Color. The two components of the cement shall be of dissimilar colors and the finished cement shall be a distinctive color different from either compound when tested as specified in 4.6.3.

3.5.3 Application characteristics. The cement shall be trowelable and shall produce a smooth surface when tested as specified in 4.6.5.

3.5.4 Resistance to vertical sagging. The cement shall not sag when tested as specified in 4.6.6.

3.5.5 Adhesion and resistance to impact. The cement shall remain firmly adhered to the steel, aluminum, and copper alloy plates when tested after 7 days and 3 months curing periods as specified in 4.6.8.

3.5.6 Compatibility of cement with primers and paint. There shall be no signs of lifting, peeling, softening, blistering, poor intercoat adhesion, or other undesirable properties when tested as specified in 4.6.9.

3.5.7 Alkali resistance (type I only). The cement shall show no evidence of evolution of gas, loss of adhesion, swelling, softening, marked color change, or other indications of deterioration when tested as specified in 4.6.10.

3.5.8 Shelf storage life. When stored for 1 year as specified in 4.6.15, the cement shall meet the requirements of 3.3, except that hardness, curing time, and pot life shall vary not more than plus or minus 10 percent of the values specified in table I.

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3.6 Identification characteristics. Values for identification characteristics shall be provided by individual contractors for characteristics as indicated by "X" in table II. The values shall be established for each smoothing cement prior to qualification approval. The purpose of these values is to serve as a basis for determining that the material being offered is the same as that which was approved under qualification testing. Subject to approval by the Naval Sea Systems Command, Coatings and Corrosion Control Branch, or alternative means of identification (for example, infra-red spectrographic examination or chemical analysis justification) may be substituted for the characteristics in table II provided appropriate data is submitted by the contractor.

TABLE II. Identification characteristic.

Characteristic	Cement components		Cement
	Component A (Resin base)	Component B (Curing agent)	
Percent of principal constituents (10 percent or more of total)		X	
Percent volatile matter			X
Mass per unit volume	X	X	
Consistency	X	X	
Mixing ratio	X	X	
Color	X	X	
Pot life			X
Application characteristics			X
Resistance to vertical sagging			X
Alkali resistance			X
Curing time			X
Compressive strength			X
Hardness			X
Shrinkage			X

3.7 Material safety data sheet. The contracting activity shall be provided a material safety data sheet (MSDS) at the time of contract award. The MSDS is DD Form 1813 and found in and part of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 Qualification tests. Qualification tests shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command. Qualification tests shall consist of the tests specified in 4.6.

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4.4 Quality conformance inspection.

4.4.1 Sampling.

4.4.1.1 Lot. For purposes of sampling, a lot shall consist of all cement from one production batch offered for delivery at one time.

4.4.1.2 Sampling for tests. From each lot offered for inspection, a total of 8 liters (two gallons) of the appropriate volume ratio of each component of the cement shall be selected at random and forwarded to an acceptable laboratory for testing as specified in 4.5.

4.4.1.3 Sampling for examination of containers. A random sample of filled containers shall be selected by the inspector in accordance with MIL-STD-105 at inspection level I and Acceptable Quality Level = 2.5 percent defective to verify compliance with all requirements of this specification regarding fill, closure, marking, and other requirements not involving tests.

4.4.1.3.1 Examination of containers. Each filled container selected as a sample shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory markings. Any container in the sample having one or more defects or under required fill, shall be rejected, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.4.1.4 Lot acceptance. The inspection test samples selected in accordance with 4.4.1.2 shall be subjected to the applicable tests specified in 4.6 except for the adhesion test after the 3-month curing period and for the storage stability test (see 3.5.5 and 3.5.8). The contractor shall not release a lot until a favorable report is received from the laboratory. Nonconformance of a sample shall be basis for rejection of the lot represented by the sample.

4.5 Quality conformance tests. Quality conformance tests for each lot shall consist of all the tests specified in 4.6, except for the adhesion test after the 3-month curing period and for the storage life test (see 3.5.5 and 3.5.8).

4.5.1 Rejection. If any sample is found not to be in conformance to the requirements of this specification, this shall be cause for the rejection of the lot represented by the sample.

4.6 Test methods.

4.6.1 Test conditions. Unless otherwise specified, test conditions shall be in accordance with FED-STD-406, using a pretest conditioning period of 48 hours. The conditioned components of the cement shall be mixed in the proportions recommended by the manufacturer and in a manner to produce a uniform color (see 3.5.2).

4.6.2 Hardness. The hardness test shall be performed in accordance with method 1083 of FED-STD-406. Hardness readings shall be determined upon the cemented channel test specimen utilized in 4.6.7. Five random readings shall be made following a 72-hour curing period of the cemented channel. The average of the five readings shall be reported.

4.6.3 Color. Visual examination of the components shall show sufficient contrast in colors so as to produce a new uniform color after combining the two components in the specified proportion and mixing.

4.6.4 Pot life. The pot life of the cement shall be determined at temperatures of $21^{\circ}\text{C} + 1^{\circ}\text{C}$ to $32^{\circ}\text{C} + 1^{\circ}\text{C}$ ($70^{\circ}\text{F} + 2^{\circ}\text{F}$ to $90^{\circ}\text{F} + 2^{\circ}\text{F}$). The components of the cement prior to mixing shall be conditioned for a period of 4 hours at each specified temperature. A sufficient amount of cement shall be prepared and immediately introduced into a flat bottom cylindrical metal container approximately 55 millimeters (mm) (2-3/16 inches) in diameter and 35 mm (1-3/8 inches) in depth (e.g., tin ointment box). The time at which the container is completely filled with cement shall be noted as the starting time. A clean wooden tongue depressor shall be used periodically to probe the surface of the cement to a depth of approximately 3 mm (1/8 inch). The tongue depressor shall be held in a vertical position when probing. The duration of time from the starting time until the cement no longer adheres to the clean end of a probe shall be recorded as the pot life.

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4.6.5 Application characteristics. A steel channel approximately 125 mm (5 inches) long by 75 mm (3 inches) wide by 6 mm (1/4 inch) deep shall be constructed. The channel, while in a horizontal position, shall be completely filled with freshly-prepared cement and the excess cement removed by drawing a straight edge across the top edges of the channel. Dragging or clinging of the cement to the straight edge resulting in incomplete fill of the channel or production of a rough cement surface shall be cause for rejection.

4.6.6 Resistance to vertical sagging. Upon completion of the test specified in 4.6.5, the cemented test specimen shall be used to determine the resistance of the cement to vertical sagging. Any excess cement which may extend beyond the open ends of the channel shall be removed with the straight edge and the channel positioned so that its long dimension is in a vertical position. Any sagging of the cement below the lower end of the channel during a 24-hour period shall be noted and recorded. Sagging below lower end of the channel shall constitute non-compliance with 3.5.4.

4.6.7 Curing time. The cemented channel test specimen utilized in 4.6.6 shall be used to determine the curing time of the cement. Upon completion of the 24-hour vertical sag test, the cemented area of the channel shall be sanded immediately with No. 60 aluminum oxide cloth and any gumming or roll-up of the cement on the abrasive cloth shall be indicative of incomplete curing or hardening and shall be cause for rejection.

4.6.8 Adhesion and resistance to impact of cement bonded to metal.

4.6.8.1 Preparation of specimens. Metal plates of the following compositions and dimensions shall be prepared:

Number of plates	Dimensions Millimeters (inches)	Composition
4	150 by 150 by 6 (6 by 6 by 1/8)	Carbon steel
4	150 by 150 by 6 (6 by 6 by 1/8)	Aluminum alloy 5456 Temper H321 (QQ-A-250/9)
6	3 by 75 diameter (1/8 by 3 diameter)	Copper Alloy 903, Type III (QQ-C-390)

All metal plate surfaces to be utilized for test purposes shall be cleaned and finished with a No. 60 aluminum oxide cloth. Specimens shall be prepared by applying a 1.5 mm (1/16 inch) layer of freshly-prepared cement to the finished surface of the test plates.

4.6.8.2 Procedure. One half the number of specimens prepared with each type alloy shall be cured for 7 days with the remaining specimens cured for 3 months. At the end of the 7-day and 3-month curing periods, the cemented surfaces of the specimens shall be subjected to an impact of a 0.9-kilogram (kg) (2-pound) steel ball dropped from a height of 0.6 meter (m) (2 feet). Four impacts, each approximately 64 mm (2-1/2 inches) from each corner along the diagonal, shall be made upon each aluminum and steel alloy specimen. The copper alloy specimens shall be subjected to two impacts, 25 mm (1 inch) apart along the diameter. Detachment of the cement from the plate or poor adhesion beyond a radius of 6 mm (1/4 inch) from the center of impact shall constitute failure. Gouging at the impact area with 6-mm (1/4-inch) chisel shall be conducted as an aid in determining adhesion.

4.6.9 Compatibility of cement with primers and paint. Metal plates shall be prepared as specified in 4.6.8.1, except that primer pretreatment (formula 117) conforming to DOD-P-15328, shall be applied to the finished surfaces to produce a dry film thickness of 8 to 12 micrometers (μm) (0.3 to 0.5 mils). The pretreatment primer shall be allowed to dry for 24 hours and then shall be covered with a 1.6-mm (1/16-inch) layer of freshly-prepared cement. Upon curing for a period of 48 hours, and without prior sanding, one half the number of specimens shall be over-coated with paint system "A" and the remaining specimens with paint system "B", defined as follows:

- (a) Paint system "A". One coat 8 to 12 μm (0.3 to 0.5 mils) dry film thickness of primer pretreatment (formula 117) conforming to DOD-P-15328. Allow to dry for 1 hour. Apply two coats 64 to 90 μm (2.5 to 3.5 mils) total dry film thickness of vinyl primer (formula 119) conforming to MIL-P-15929. Allow a drying time of at least 2 hours between coats.

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- (b) Paint system "B". Two coats 89 to 114 μm (3.5 to 4.5 mils) total dry film thickness of vinyl anti-fouling paint (formulas 121 and 129) conforming to MIL-P-15931. Allow a drying time of at least 2 hours between coats.

After drying, the coated specimens shall be examined for any signs of incompatibility between the paint systems and cement. After conditioning for a period of 4 days, the specimens shall be completely immersed in a 4 percent sodium chloride solution and maintained at the test temperature specified in 4.6.1 for 1 month. The specimens shall then be subjected to the tests specified in 4.6.8.2. Causes for rejection shall be as specified therein. Poor adherence of the paint system to the cement, as evidenced by lifting shall also constitute a cause for rejection.

4.6.10 Alkali resistance (type I only). A 1.6-mm (1/16-inch) layer of the cement shall be applied to the outside surface of a clean glass test tube, approximately 152 mm (6 inches) long by 19 mm (3/4 inch) in diameter. The specimen shall be cured for 48 hours and then immersed to a depth of 102 mm (4 inches) in a 4 percent solution of sodium hydroxide and maintained at the test temperature specified in 4.6.1 for a period of 3 weeks. The alkali solution shall be maintained at 4 percent by addition of water as necessary. The specimen shall be examined periodically and upon completion of the 3-week exposure, for evidence of deterioration.

4.6.11 Compressive strength.

4.6.11.1 Preparation of specimens. A split mold capable of forming a rectangular specimen slightly larger than 13 mm by 13 mm by 76 mm (1/2 by 1/2 by 3 inches) shall be constructed of steel. A hole 1.6 mm (1/16 inch) in diameter shall be placed at the lower end of the mold to allow for the escape of entrapped air. The upper end of the mold shall be fitted with a steel plunger whose cross-sectional dimensions shall be slightly less than 13 mm by 13 mm (1/2 inch by 1/2 inch). A light coating of a mold release agent shall be applied to the mold cavity. Freshly prepared cement shall be introduced into the mold cavity prior to assembly. After assembling and clamping the mold in place, the plunger shall be depressed slightly to permit cement to exude from the 1.6 mm (1/16 inch) orifice and expel any entrapped air. The mold shall then be firmly secured to a flat surface so as to prevent further exudation of the cement through the orifice. A weight of 2.27 kg (5 pounds) shall be applied to the plunger and the cement specimen allowed to cure for 24 hours while under pressure. The cement specimen shall be removed from the mold and aged for 1 week at $23^{\circ}\text{C} + 1^{\circ}\text{C}$ ($73^{\circ}\text{F} + 2^{\circ}\text{F}$) followed by a cure for 24 hours at $66^{\circ}\text{C} + 1^{\circ}\text{C}$ ($150^{\circ}\text{F} + 2^{\circ}\text{F}$). Two test specimens shall be prepared and machined to 13 mm by 13 mm by 25 mm (1/2 by 1/2 by 1-inch) with a tolerance of plus or minus 127 μm (0.005 inch) in each dimension.

4.6.11.2 Procedure. The 0.2 percent offset yield stress of the cement in compression shall be determined in accordance with ASTM D 695 and the average value obtained from two tests noted and recorded.

4.6.12 Shrinkage. Two steel molds, capable of being disassembled to facilitate removal of the test specimens, shall be constructed with cavities 102 mm (4 inches) long by 25 mm (1 inch) wide by 64 mm (1/4 inch) deep. The molds shall be assembled, firmly secured in place and the cavity length of each mold measured to the nearest 25 μm (0.001 inch). A light coating of mold release agent shall be applied to the mold cavities. The mold cavities shall be completely filled with freshly prepared cement and the excess removed by drawing a steel straight edge across the top edges of the mold. The specimens shall be allowed to cure in the molds under the test conditions specified in 4.6.1 for a period of 2 weeks. Upon completion of the 2-week curing period, the molds shall be disassembled and the specimens removed. The length of each specimen shall be measured to the nearest 25 μm (0.001 inch). The percent shrinkage shall be calculated based upon the decrease in length of each specimen from the length of its respective mold. The average percent shrinkage of the two specimens shall be reported.

4.6.13 Mass per unit volume. The mass per unit volume for identification purposes shall be determined in accordance with method 4184 of FED-STD-141.

4.6.14 Volatile matter. Volatile matter for identification purposes (see 3.6) shall be determined by utilizing a tared metal container, approximately 76 mm (3 inches) in diameter and 1.6 mm (1/16 inch) deep and completely filling it with freshly-prepared cement. The container and contents shall be weighed immediately and then placed in an air circulating oven at $100^{\circ}\text{C} - 105^{\circ}\text{C}$ ($212^{\circ}\text{F} - 221^{\circ}\text{F}$) for 24 hours. At the end of this period the container and contents shall be cooled, the mass determined, and the percent mass loss of the cement calculated and recorded.

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4.6.15 Shelf storage life. Separate components shall be stowed in original unopened containers for 1 year after date of manufacture at 24°C + 5°C (75°F + 9°F), and test for conformance with 3.5.8. The manufacturer shall certify that his formulas meet this requirement.

4.6.16 Toxicity. A manufacturer of material shall disclose the formulation of his product to the Navy Bureau of Medicine and Surgery, Department of the Navy, Washington, DC 20372. The disclosure of proprietary information, which will be held in confidence by the Bureau of Medicine and Surgery, shall include the name, formula, and approximate percentage by mass and volume of each ingredient in the product; the results of any toxicological testing of the product; identification of its pyrolysis products; and any such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, or disposal of the material.

4.7 Inspection of preparation for delivery. Sample packages and packs and the inspection of packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of 4.4.1.3, section 5, and the documents specified therein.

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions.)

5.1 General. The two-part cement (resin and curing agent) shall be furnished in equal quantities, in separate containers, and packaged as a kit.

5.1.1 Packaging. Packaging shall be level A or C, as specified (see 6.2).

5.1.1.1 Level A. The two-part cement shall be furnished in pint, quart, or gallon (or metric equivalents) quantity, as specified (see 6.2), in multiple friction-top cans conforming to type V class 2 round of PPP-C-96 with plan B coating and side seam striping required. Soldered seams shall be coated with a suitable coating which is nonreactive to the base resin and the activator or hardener. One-gallon (or metric equivalent) cans shall be provided with wire handles.

5.1.1.1.1 Unit protection. One-pint (or metric equivalent) size kits shall be unit protected in a paperboard folding, set-up, or metal stayed box or a fiberboard box, conforming to PPP-B-566, PPP-B-676, PPP-B-665, or PPP-B-636, respectively, with type, class, or style at the contractors option. One-quart and 1-gallon (or metric equivalent) size kits shall be unit protected in a fiberboard box conforming to PPP-B-636 type CF, with class, variety, and grade at the contractors option. Box closure shall conform to the applicable container specification or appendix thereto, with method I and V closure applicable to domestic and weather-resistant class containers, respectively, for PPP-B-636 boxes.

5.1.1.2 Level C. The cement, kit packaged in the quantity specified (see 6.2), shall be packaged in containers to afford protection against deterioration, damage, or loss of material during shipment from the supply source to the first receiving activity for immediate use. The contractors normal retail or wholesale packaging methods may be utilized when such meets the requirements of this level.

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

5.2.1 Level A. Twenty-four 1-pint, twelve 1-quart or three 1-gallon (or metric equivalents) size kits, packaged as specified in 5.1.1, shall be packed in accordance with the level A packing requirements for fluid cans as specified in the appendix to PPP-C-96, except that the exterior packing arrangement does not apply and method V closure is applicable to PPP-B-636 boxes. In addition, reinforcing for fiberboard boxes shall be accomplished by use of nonmetallic banding or pressure sensitive reinforced tape at the contractor's option. One-quart and 1-gallon (or metric equivalents) kits, packaged in weather-resistant boxes as specified in 5.1.1.1.1, closed and reinforced as specified herein, will require no over packing.

5.2.2 Level B. Twenty-four 1-pint, twelve 1-quart, or three 1-gallon (or metric equivalents) size kits, packaged as specified in 5.1.1, shall be packed in accordance with the level B packing requirements for filled cans as specified in the appendix to PPP-C-96, except that the exterior packing arrangement does not apply and method I closure is applicable to PPP-B-636 boxes. One-quart and 1-gallon (or metric equivalents) kits, packaged as specified in 5.1.1.1.1 will require no over packing.

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5.2.3 Level C. Kits of cement, packaged as specified in 5.1.1, shall be packed in containers acceptable to the common carrier which will insure safe delivery at destination in a satisfactory condition at the lowest applicable rate. Containers, packing, or method of shipment shall comply with Uniform Freight or National Motor Freight Classification Rules or Regulations or other carrier rules as applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required herein or by the contractor order (see 6.2), unit containers, kit packages, and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.3.1 Special marking. In addition to other markings required on the containers, there shall be the following statement: "The volatile content of the material in this container is not photochemically reactive as defined by Rule 102 of the South Coast Air Quality Management District (see 6.3)."

5.3.2 Labeling. Each container shall be clearly labeled with directions for use, which shall include the following:

- (a) Brand name.
- (b) Designation or code number for the proper hardener to be used with the resin material.
- (c) Mixing ratio of hardener to resin by volume.
- (d) Pot life of cement after mixing.
- (e) Precautionary markings shall be applied as follows:
 - (1) "Caution: Do not mix hardener and resin together until ready for use."
 - (2) "Warning: May cause skin irritation. Avoid contact with the skin. Use protective gloves when handling."
 - (3) Include any other necessary handling precautions, such as flammability or toxic vapors.
 - (4) "Store below 27°C (80°F)."
- (f) Date of first reinspection (insert date 1-year after date of manufacture in month and year).

6. NOTES

6.1 Intended use. The products covered by this specification shall be suitable for use for hull repair and hull smoothness and where air pollution regulations apply (see 6.3).

6.1.1 Type I. Type I cement is resistant to alkali and approved for general use to fair, smooth or fill metallic surfaces that have become worn, pitted, corroded, or misaligned and for application in way of cathodic protection (sacrificial anodes, and impressed current systems).

6.1.2 Type II. Type II cement is not alkali resistant, is applicable in the same manner as type I material and shall be used only in areas not affected by cathodic protection (sacrificial anodes, and impressed current systems).

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type cement required (see 1.2).
- (c) Level of packaging and level of packing required (see 5.1.1 and 5.2).
- (d) Quantitative size required - pint, quart, or gallon (or metric equivalents) (see 5.1.1.1).
- (e) Size of container required (see 5.2).
- (f) Marking required (see 5.3).

6.3 Volatile content. Although the container marking specifically refers to the Air Pollution District of Los Angeles County, the cement may be used anywhere else a product complying with 3.4.1 is allowed. This includes other air pollution control districts or similar areas controlling the emission of solvents into the atmosphere. Information regarding Los Angeles County Air Pollution Rules 102, 442, and 443 may be obtained from: South Coast Air Quality Management District, Metropolitan Zone, 434 South San Pedro Street, Los Angeles, CA 90013.

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6.4 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List QPL 24176 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is Naval Sea Systems Command, Department of the Navy, Washington, DC 20362, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.5).

6.5 Copies of "Provisions Governing Qualifications SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.6 Changes from previous issue. Asterisks (*) are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

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