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MIL-PRF-24613(SH)  
21 March 1983

## PERFORMANCE SPECIFICATION

### DECK COVERING MATERIALS, INTERIOR, COSMETIC POLYMERIC

This specification is approved for use by 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 deck covering materials for use on interior decks.

1.2 Classification. Deck covering materials shall be of the following types and classes, as specified (see 6.2.1):

Type I - Deck covering material with a primary matrix consisting of epoxy resin, requires one or more coats of sealer.

Class 1 - Material consisting of epoxy matrix material and colored quartz aggregate.

Class 2 - Material consisting of epoxy matrix material and color flake topping.

Class 3 - Material consisting of epoxy matrix material and marble as the primary aggregate.

Type II - Deck covering material with a primary matrix consisting of urethane resin, requires one or more coats of sealer.

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 5523, 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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- Class 1 - Material consisting of urethane matrix material and colored quartz aggregate.
- Class 2 - Material consisting of urethane matrix material and color flake topping.
- Type III - Deck covering material, which has a primary matrix consisting of polymeric resin, such as epoxy, polyester, or polyurethane, is applied in a single trowelling step, requiring no seal or top coat.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

## SPECIFICATIONS

## FEDERAL

- UU-S-48 - Sacks, Shipping, Paper.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
- PPP-P-704 - Pails, Metal: (Shipping, Steel, 1 through 12 Gallons).

## MILITARY

- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-D-3135 - Deck Covering Underlay Materials.
- MIL-P-24441 - Paint, Epoxy-Polyamide, General Specification for.
- MIL-P-24441/1 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type I.

## STANDARDS

## FEDERAL

- FED-STD-313 - Material Safety Data Sheets, Preparation and the Submission of.
- FED-STD-601 - Rubber: Sampling and Testing.

## MILITARY

- 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-1623 - Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings (Naval Shipboard Use).

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(Copies of specifications and standards 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. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

**AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

D 1141 - Substitute Ocean Water, Specification for (DoD adopted).

D 1391 - Measurement of Odor in Atmospheres, (Dilution Method),  
Test Method 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, NW, Washington, DC 20036.)

**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, 9150 E. Flair Drive, El Monte, CA 91731.)

**UNIFORM CLASSIFICATION COMMITTEE AGENT  
Uniform Freight Classification Ratings, Rules, and Regulations**

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

(Industry 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.

**3. REQUIREMENTS**

**3.1 Qualification.** Deck covering materials 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 6.5).

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3.2 Material. Deck covering materials shall be suitable for application by trowel or broadcast methods to a finished thickness of 1/4 inch in a systems approach which shall include underlayment in accordance with MIL-D-3135, type I, class 2 or other underlayment as designated in the system where required to obtain the 1/4 inch thickness. The material shall be pitched to a drain and form a vertical cove base where the deck meets a bulkhead.

3.2.1 Type I. The deck covering materials shall have a primary matrix of epoxy resin and aggregate or topping material of suitable size such that it need not be ground before the application of the seal coat(s).

3.2.1.1 Class 1. The class 1 deck covering material shall be an epoxy resin with colored quartz aggregate.

3.2.1.2 Class 2. The class 2 deck covering material shall be an epoxy resin with color flake topping.

3.2.1.3 Class 3. The class 3 deck covering material shall be an epoxy resin containing primarily marble chip aggregate.

3.2.2 Type II. The deck covering material shall have a primary matrix of urethane resin and aggregate or topping material such that it shall not need to be ground before the application of the seal coating.

3.2.2.1 Class 1. The class 1 deck covering material shall be a urethane resin with colored quartz aggregate or topping.

3.2.2.2 Class 2. The class 2 deck covering material shall be a urethane resin with color flake topping.

3.2.3 Type III. The deck covering material shall have a primary matrix consisting of polymeric resin and aggregate suitable for application in a single trowel step, requiring no sealer or top coating.

3.2.4 Sealer. A sealer or top coating material shall be furnished for type I and type II deck coverings as required by the application specifications of the deck covering manufacturer.

3.2.5 Bond coating or primer. If the deck covering is provided as a complete system, the system shall include a suitable bond coat or primer.

3.3 Identification characteristics. Values for identification characteristics shall be provided by individual contractors for characteristics as indicated by "X" in table I. The values shall be established for each decking system prior to qualification testing. The purpose of these values is to serve as a basis for determining that the material being offered is essentially the same as that which was approved under qualification testing. Subject to acceptance by the Naval Sea Systems Command (NAVSEA), alternative means of identification (for example, chemical analysis) may be substituted for the characteristics in table I, provided appropriate data are submitted by the contractor.

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TABLE I. Identification characteristics values.

Characteristic (if applicable)	Bond coating <sup>1/</sup>		Primary resin <sup>2/</sup>		Seal coating <sup>3/</sup>		Aggregate <sup>4/</sup>	Color topping <sup>5/</sup>
	Component A	Component B	Component A	Component B	Component A	Component B		
1. Chemical nature Percent of each principal consti- tuent (5 percent or more of total) by weight	X	X	X	X	X	X	X	X
2. Percent aggregate by weight	X	X	X	X	X	X	X	X
3. Percent volatile by weight	X	X	X	X	X	X		
4. Percent nonvolatile vehicle by weight	X	X	X	X	X	X	X	X
5. Weight per gallon	X	X	X	X	X	X		X
6. Consistency	X	X	X	X	X	X		X
7. Flash point	X	X	X	X	X	X		X
8. Pot life at 90°F at 50°F								X X
9. Coverage, (ft <sup>2</sup> /gal)								X
10. Drying or curing time, hours (at 72°F)								X

See footnotes at end of table.

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TABLE I. Identification characteristics values. - Continued

Characteristic (if applicable)	Bond coating <sup>1/</sup>		Primary resin <sup>2/</sup>		Seal coating <sup>3/</sup>		Aggregate <sup>4/</sup>	Color topping <sup>5/</sup>
	Component A	Component B	Combined mixture	Component A	Component B	Combined mixture		
11. Mixing instructions			X			X		X
12. Application instructions			X			X		X
13. Aggregate sizes (sieve test)							X	X
14. Compliance with air pollution requirements <sup>6/</sup>	X	X	X	X	X	X	X	X
15. Asbestos <sup>7/</sup>	X	X		X	X		X	X
16. Shelf life: at 90°F at 50°F	X X	X X		X X	X X			X X
17. Infrared spectro- graph 2-5 micro- meters	X	X		X		X		X

1/ Bond coating - any material used to increase adhesion between the primary resin and substrate.

2/ Primary resin - major resinous component of the entire decking system.

3/ Seal coating - finish coating intended to fill in void areas, eliminate surface porosity and enhance wear resistance.

4/ Aggregate - filler material such as quartz or marble.

5/ Color topping - any material used to impart color or enhance the appearance of the decking other than the aggregate.

6/ Formulation shall comply with the requirements of Rule 102 of the South Coast Air Quality Management District.

7/ Product shall be certified to be free of asbestos.

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3.4 Application. The deck covering shall adhere to the deck or structure on which applied without the use of clips or other devices welded to the deck, or other reinforcement not a part of the compound as mixed for application. Material shall be pitched to a drain.

3.5 Odor. When tested as specified in 4.8.16, the deck covering shall be free from objectionable odors.

3.6 Color. The deck covering shall be of a color as specified (see 6.2.1).

3.7 Weight. When tested as specified in 4.8.2, the deck covering shall be a minimum practicable weight, but shall not exceed the following:

Type I - 3.0 pounds per square foot ( $\text{lb/ft}^2$ ) in a thickness of 1/4 inch.  
 Type II - 2.5  $\text{lb/ft}^2$  in a thickness of 1/4 inch.  
 Type III - 3.0  $\text{lb/ft}^2$  in a thickness of 1/4 inch.

3.8 Resistance to impact. When tested as specified in 4.8.3, the deck covering shall not show visible signs of chipping, cracking, or detachment from the steel plate. There shall be not more than 1/16 inch of permanent indentation.

3.9 Indentation. When tested as specified in 4.8.4, the deck covering shall not show signs of cracking or becoming detached from the steel plate. The initial indentation of the deck covering shall be not more than 1 percent for type I and type III systems, and not more than 10 percent for type II materials measured 30 minutes after removing the load.

3.10 Resistance to elevated temperature. When tested as specified in 4.8.5, the deck covering shall not flow or slip in any part more than 1/16 inch, nor soften.

3.11 Nonslip properties. When tested as specified in 4.8.6, the deck covering shall show factors of friction not less than shown in table II.

TABLE II. Factors of friction.

Contacting surface	Factor of static friction condition (minimum)			Factor of sliding friction condition (minimum)		
	Dry	Wet	Oily	Dry	Wet	Oily
Leather	0.60	0.50	—	0.30	0.40	—
Rubber	0.60	0.70	0.30	0.40	0.70	0.10

3.12 Resistance to moisture and temperature changes. When tested as specified in 4.8.7, the deck covering shall not show signs of cracking, separation from the steel plate, or corrosion.

3.13 Moisture absorption. When tested as specified in 4.8.8, the deck covering shall not have absorbed more than 2 percent moisture based on its weight at normal atmospheric conditions.

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3.14 Resistance to corrosion. When tested as specified in 4.8.9, the deck covering shall not soften or become detached and the surface of the steel beneath the deck covering shall not show signs of corrosion.

3.15 Resistance to wear. When tested as specified in 4.8.10, the deck covering shall show wear not to exceed 0.050 inch.

3.16 Fire performance. The fire performance of the finished decking system, including any primer and sealer coats, shall conform to MIL-STD-1623 (see 4.8.11).

3.17 Resistance to oil. When tested as specified in 4.8.12, deck covering shall show the following change in weight and volume:

	Percent, <u>maximum</u>
Change in weight	3
Change in volume	2

3.18 Shock resistance. When tested as specified in 4.8.13, the deck covering shall not show signs of chipping, cracking, or detachment from the steel backing plate.

3.19 Adhesive strength. When tested as specified in 4.8.14, the adhesive strength of the deck covering shall be not less than shown in table III.

TABLE III. Adhesive strength.

Test	Requirement
Initial, lb/in <sup>2</sup> , minimum	250
After aging, percent of original, minimum	70
After moisture and temperature cycling, percent of original, minimum	70

3.20 Serviceability. The deck covering shall not show breaks, loss of adhesion, corrosion of the deck or other deficiency which would limit its serviceability when examined during and after the minimum service period specified in 4.8.15.

3.21 Directions for application. Each kit which consists of resin, hardener or accelerator, and color chips or aggregate shall be clearly labeled with directions for application, and shall include the following:

- (a) Brand name.
- (b) Preparation of surface, including cleaning agents and primers, if required.
- (c) Method of application.



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- (d) Thickness (within the specified limit) and coverage in square feet per gallon.
- (e) Drying rate.
- (f) Finishing method.
- (g) Procedure for application of sealer (method, coverage, dry time).
- (h) Safety precautions.

**3.22 Workmanship.** The components of the deck covering material shall be the products of a single manufacturer which, when combined, shall produce a finished product or application conforming to the requirements of this specification.

**3.23 Material safety data sheet.** The Naval Sea Systems Command shall be provided a material safety data sheet (Form MSDS) with the application for product qualification and at the time of contract award. The MSDS is form OSHA-20 and found as part of FED-STD-313. The MSDS form 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 or purchase order, the contractor is responsible for the performance of all inspection requirements 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 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).
- (c) Verification tests (see 4.5).

**4.3 Qualification inspection.** Qualification inspection shall be conducted at a laboratory satisfactory to NAVSEA. Qualification tests shall consist of the examination of 4.7 and the tests specified in 4.8.

#### 4.4 Quality conformance inspection.

**4.4.1 Lot.** For purposes of examination and testing, a lot shall consist of a production batch that is offered for delivery under a contract or purchase order.

**4.4.1.1 Special lot case.** A special lot case exists where resin or aggregate is purchased separately or shipped from different locations to the place of installations.

**4.4.1.2 Inspection.** For purposes of inspection, a lot of resin shall consist of not more than 500 gallons offered for delivery at one time.

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4.4.2 Sampling for inspection of filled containers. A random sample of filled containers shall be selected in accordance with MIL-STD-105 at inspection level I and acceptable quality level (AQL) = 2.5 percent defective to conduct examination of 4.7.

4.4.3 Sampling for lot tests. From each lot sufficient unmixed ingredients shall be selected to provide for the one coat of application of 9 square feet in area and 1/4-inch (approximate) thickness.

4.4.3.1 Special sampling case. Any plant furnishing only one of the ingredients shall furnish a sufficient amount of the other to permit the making of the required amount of deck covering for testing.

4.5 Verification tests. Verification tests shall consist of any tests determined to be necessary by NAVSEA for conformance to this specification.

4.6 Lot tests. The samples selected in accordance with 4.4.3 shall be mixed in accordance with the manufacturer's instructions and subjected to the following tests:

<u>Tests</u>	<u>Paragraph</u>
Weight	4.8.2
Resistance to impact	4.8.3
Indentation	4.8.4
Moisture absorption	4.8.8

4.6.1 Fire test. The fire performance test (see 4.8.11) shall be conducted as part of the lot acceptance tests once for every 50,000 pounds of unmixed ingredients offered for delivery under one or more contracts or orders. Manufacturers' records shall be used to determine quantities of material delivered.

4.6.2 Rejection. If any sample representing a lot is found not to be in conformance with this specification, this shall be cause for rejection of the entire lot. If a sample fails the fire performance test (see 4.8.11), this test shall be conducted on every subsequent lot. This additional testing shall be discontinued and lot tests returned to the normal basis of 4.6 when four successive lots have been accepted.

4.6.3 Small lots. The tests of 4.6 shall not be required on any delivery of less than 2,000 pounds of unmixed ingredients. However, deliveries of small quantities which are not represented by tests shall be so identified in the manufacturer's records and when the cumulated total of such deliveries reaches 2,000 pounds, sample material shall be selected and subjected to the tests of 4.6.

4.7 Examination of filled containers. Each sample filled container shall be examined for defects of construction of the container and the closure, for evidence of leakage and for unsatisfactory markings; each filled container shall also be weighed to determine the amount of contents. 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 in accordance with MIL-STD-105, the lot represented by the sample shall be rejected.

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#### 4.8 Test procedures.

4.8.1 Preparation of specimens. Specimens of the sizes as specified in the following tests shall be made by mixing the deck covering in accordance with the manufacturer's instructions. The deck covering shall be prepared using 1/8-inch-thick mild steel plates, except for the 1/16-inch-thick mild steel used for wear as specified in 4.8.10. The plates shall be abrasively blasted to a uniform white appearance with a minimum surface profile of 1-2 mils peak to valley. Panels shall be cleaned after blasting, using clean dry compressed air or vacuum and primed with formula 150 primer in accordance with MIL-P-24441 and MIL-P-24441/1 to a 2-4 mil dry film thickness or other bond coating or primer if provided as part of a system, applied in accordance with manufacturers instructions. The deck covering shall then be applied according to manufacturer's instructions. This application shall be made not later than 24 hours after the plates have been primed. The specimens shall be allowed to cure for 7 days before conducting tests, but all tests must begin before the material has cured 14 days. Cure time shall be considered to start at the time of the last application of top coating or sealer but no longer than 24 hours after the application of the primary resin, as defined in table I. The test specimens shall be finished and sealed in accordance with the manufacturer's instructions. Tests shall be conducted under atmospheric conditions at a temperature of 70 to 75 degrees Fahrenheit ( $^{\circ}\text{F}$ ), and a relative humidity of  $50 \pm 2$  percent. For specimens intended for immersion tests where corrosion of the steel may occur, areas not covered by the deck covering compound, may be protected by a suitable anti-corrosion coating.

4.8.2 Weight. The deck covering shall be applied to three 6-inch-square, 1/8-inch-thick mild steel plates which have been previously measured and weighed. When the material has dried for 96 hours, the three test specimens, including the steel plates, shall each be weighed to the nearest 0.1 gram. The length and width shall be measured to the nearest 0.1 inch and the thickness to the nearest 0.001 inch. From the difference between the weight of the covered steel plate and the uncovered steel plate, the weight of the material shall be computed. The final weight shall be the average of the three specimens. The thickness shall be determined by measuring the steel plates, with and without the covering, at 16 equally distributed points on the specimen, by means of a dial thickness gage and a template. The difference in thickness of the steel plate and the covered steel plate shall be averaged to determine the thickness of the material. The weight of the deck covering for a thickness of 1/4 inch shall then be computed.

4.8.3 Resistance to impact. Two specimens, 6 inches square, prepared as specified in 4.8.1, shall be used. Each specimen shall be tested separately and held on a solid horizontal base. A 2-pound steel ball shall be dropped vertically from a height of 8 feet onto the deck covering such that the impact will be at the center of the specimen. Each specimen shall be subjected to two impacts of the steel ball.

#### 4.8.4 Indentation.

4.8.4.1 Specimen. One specimen, 6 inches square, prepared as specified in 4.8.1, shall be used.

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4.8.4.2 Procedure.

4.8.4.2.1 Indentation. Three indentations shall be made on the deck covering and the results averaged. The center of each indentation shall be not less than 1-1/2 inches from the edge of the specimen and not less than 2-1/2 inches from the center of the adjoining indentation. A load of 2,000 pounds shall be applied on the deck covering for 30 minutes by means of a flat faced circular indenter. The indenter's flat face shall have an area of 1 square inch and its perimeter shall be rounded to a radius of 1/64 inch.

4.8.4.2.2 Thickness. The thickness readings are taken before and immediately after indentation, at the center of each indented area. The percent indentation is calculated on the basis of the measured specimen thickness. The thickness measurements are made using a micrometer dial gage with a 4-ounce weight and a 1/4-inch diameter flat foot.

4.8.4.2.3 Special precautions. Care shall be taken to ensure that the indenter surface is maintained parallel to the plane of the specimen mounting plate and that it travels perpendicular to that plane. In addition, the specimen mounting plate selected for the indentation test shall be checked for flatness before being used.

4.8.4.3 Initial indentation. The initial indentation shall be taken as the difference in percent between the thickness of the deck covering before indentation and immediately after the load has been removed.

4.8.5 Resistance to elevated temperature. The resistance of the material to elevated temperature shall be determined as follows:

4.8.5.1 Flow or slip. A specimen of the material, 6 by 2 inches, prepared as specified in 4.8.1, shall be scribed with a line parallel to and approximately 1 inch from a 2-inch edge used as a reference. The distance between this line and the edge of the steel plate shall be measured to the nearest 0.01 inch. The specimen shall then be suspended vertically from the end opposite the reference end and in an oven maintained at a constant temperature of 158°F for 5 hours. When the specimen has cooled to room temperature, the distance between the reference edge and line shall be measured again. The difference between the two measurements is called the flow or slip.

4.8.5.2 Softening. The deck covering shall be examined by touch, immediately after the specimen has been removed from the oven, to determine whether the material has softened under the action of heat.

4.8.6 Nonslip properties. Two 6- by 6- inches by 1/8-inch specimens shall be prepared as specified in 4.8.1. The specimens shall be evaluated dry, wet, and oily. For non-slip properties in the dry condition, the specimens are evaluated "as prepared". For the wet conditions, the specimens are wet with synthetic seawater prepared from sea salt in accordance with ASTM D 1141. After completion of the "wet" condition test, the specimens shall be rinsed in tap water to remove the synthetic seawater, blotted with paper towels, dried in an oven at 200°F for 1 hour, and then permitted to cool to ambient temperature prior to testing in the oily surface condition. The "oily" condition is obtained by thoroughly wetting the specimen surface with SAE 10W oil at a temperature between 60 and 80°F.

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**4.8.6.1 Procedure.** The nonslip properties shall be determined by means of a properly calibrated Olson slipmeter. The slipmeter is a portable metered instrument weighing 6 pounds, that is supported by a set of three removable, 3/4-inch-diameter feet. Two sets of feet shall be fitted with 1/8-inch-thick vulcanized neoprene rubber having a Shore "A" hardness range of  $85 \pm 5$  durometers. Precondition the rubber surfaces with sandpaper prior to the static friction test by rubbing a piece of 80 grit sandpaper in at least two directions at right angles, to expose fresh rubber. One set of rubber feet shall be used for the dry and wet surface conditions and the other set for the oily surface conditions. An additional set of feet shall be fitted with oak tanned sole leather, which has been sanded smooth with grade "0" garnet paper. The factor of static friction shall be the reading required to start the meter from rest. The factor of sliding friction shall be the reading obtained by pulling the slipmeter over the specimens at a rate of 4.0 inches per minute, by means of a cord wound over a constant speed motor-driven winch in front of the specimens. The set of two 6- by 6-inch specimens shall be butted together with the slipmeter placed such that its two forward feet rest 1-1/2 inches in front of the butt seam on the sample plate nearest the winch. Three readings shall be taken in this position, then the sample plates shall be rotated 90 degrees from their previous position and three additional readings shall be taken. A total of six readings are made for each surface condition, using both leather and rubber feet, except the oily surface condition is not evaluated with leather feet. The factors of friction shall be the average of the six readings.

**4.8.7 Resistance to moisture and temperature changes.** Two specimens, 2 by 6 inches, prepared as specified in 4.8.1, shall be immersed in a solution of 4 percent sodium chloride in water, under a pressure of 8 pounds per square inch ( $\text{lb/in}^2$ ), for 48 hours. Immediately after immersion, the specimens shall be subjected to two complete cycles of alternate exposure to a temperature of  $0 \pm 5^\circ\text{F}$ , for 24 hours, followed by a temperature of  $120 \pm 5^\circ\text{F}$ , for 24 hours. The specimens shall then be examined for evidence of cracking or other failure. A portion of the deck covering shall be carefully removed from the plate to observe any signs of rusting or corrosion under the deck covering.

**4.8.8 Moisture absorption.** Three specimens, 2 inches square by 1/4 inch thick, shall be prepared by applying the deck covering to oiled surfaces of steel plate, so that upon drying the specimens will not adhere to the plates. Each specimen without the steel backing plate shall be weighed dry, dipped into tap water at room temperature, lightly wiped on all surfaces with a paper towel and again weighed to the nearest 0.1 gram. Immediately after weighing, the specimens shall be immersed in the above water for 24 hours, lightly wiped and again weighed. The percent gain in moisture shall be based on the weight of the dry specimen and the difference between the weight after 24 hours immersion and the weight after dipping and wiping.

**4.8.9 Resistance to corrosion.** Two specimens, 6 by 2 inches, prepared as specified in 4.8.1, shall be used. Each specimen shall be immersed in a 10 percent salt ( $\text{NaCl}$ ) solution for 15 days, during which time a continuous stream of air shall be passed through the solution, in order to promote corrosion. The specimen shall then be examined to determine whether the material has softened or detached from the steel backing plates. A portion of the deck covering shall be removed carefully from the steel, to observe any sign of rusting or corrosion of the steel plate beneath the deck covering.

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4.8.10 Resistance to wear. Specimens, 3 inches long by 2 inches wide, shall be prepared so that an area of approximately 6 square inches is presented to the abrasive in the machine specified in 4.8.10.1. The abrasive grit shall be No. 80 aluminum oxide. Before wear-testing, the thickness shall be measured at 12 equally distributed points on the specimen by means of a dial thickness gage and a template. The specimen shall then be subjected to 500 revolutions of the wear testing machine, and the thickness obtained at the same points previously measured. The differences in thickness shall be averaged to determine the thickness of material worn away by the abrasive.

4.8.10.1 Wear-test machine. The wear-test machine shall have the following essential mechanical characteristics:

- (a) Mild steel, abrasion disk, 14-1/8 inches in diameter and 1/2 inch thick, revolved clockwise at a constant speed of 23.5 revolutions per minute (r/min).
- (b) Specimen holder, 2 by 4 inches, attached to a 5/8-inch-diameter shaft by means of a universal coupling. The distance between centers of the disk and the specimen holder shaft is 5.1 inches. A specimen of decking material is secured in the specimen holder by means of clamps at each end of the holder. The holder revolves clockwise at a constant speed of 32.5 r/min.
- (c) Hardened tool-steel cam attached to the specimen holder shaft by means of set-screws. In each one-half revolution of the shaft, the specimen is lifted a distance of 1/16 inch and then dropped back on disk (A) under a 10-pound weight. Change in the lift, due to wear of the specimen, is compensated by adjustment of the cam at regular intervals, so that the lift is maintained at a practically constant distance.
- (d) Weight, 10 pounds, the maximum found suitable for use with this test machine.
- (e) Distributor for abrasive grit. The grit flows by gravity from the hopper (F) through a 13/64-inch-inside diameter tube and into the center of the distribution chamber. An impeller in the chamber provides an evenly distributed feed of the grit through eight 3/64-inch-diameter holes centered on a 1-5/8-inch-diameter pitch circle. A uniform distribution of grit falls to disk (A) in the path of the test specimen. The distributor is revolved at a constant speed of 9 r/min.
- (f) Hopper for feeding abrasive grit.
- (g) Bevel drive gear.
- (h) Predetermining revolution counter and switch.
- (i) A suitable 1/2 horsepower electric motor.
- (j) Hopper for collecting used abrasive grit.
- (k) Steel frame.

4.8.10.2 Procedure. The steel disk (A) revolves while the weighted specimen of decking material in holder (B) is lifted and dropped by a cam while it is being revolved. When the specimen is dropped through motion of the cam, it falls a distance of 1/16 inch and meets disk (A) with impact, simulating the fall of a foot on the deck surface. Foot action is further simulated in that the revolving specimen contacts the disk with a sliding and twisting motion until lifted clear by the cam. Continuous rotation of the specimen introduces the element of wear in all directions on the decking material. Free abrasive



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grit on No. 80 aluminum oxide is fed at a steady rate from the hopper (F) and distributed uniformly on the steel disk in the path of the specimen. The revolving motions of the steel disk and the test specimen keep the abrasive grit circulating to the outer side of the path of the specimen. The grit falls from the edge of the steel disk and is discarded.

4.8.11 Fire performance test. The material shall be tested in accordance with the test procedure specified in MIL-STD-1623.

4.8.12 Resistance to oil.

4.8.12.1 Specimens. Three specimens, 2 inches square by 1/4 inch thick, shall be prepared as for the moisture absorption test.

4.8.12.2 Immersion medium. The immersion medium shall be medium No. 3 (high swelling) petroleum base oil, in accordance with method 6001 of FED-STD-601.

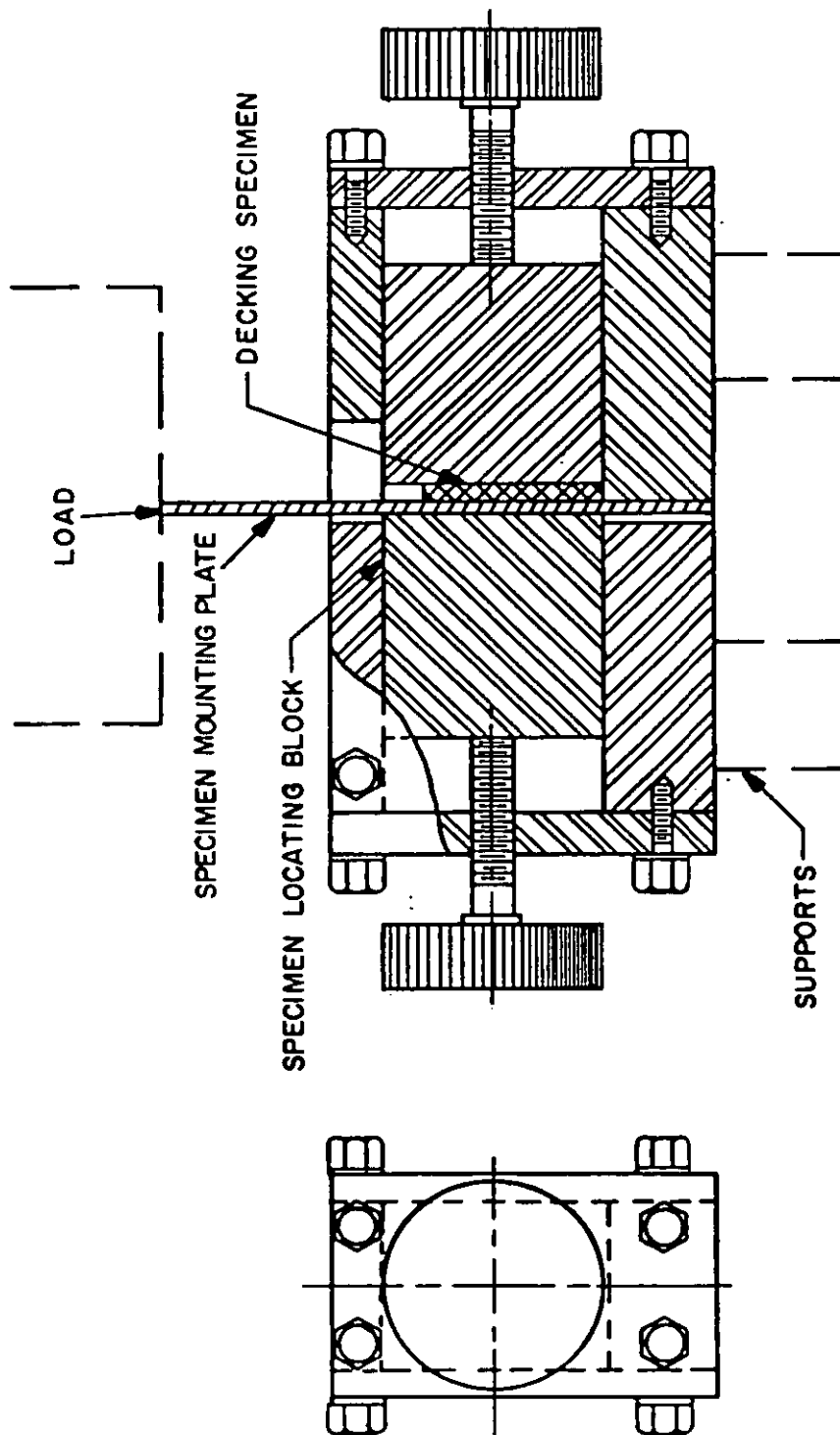
4.8.12.3 Weight change. The change in weight shall be in accordance with method 6251 of FED-STD-601, except that the immersion time shall be 24 hours.

4.8.12.4 Volume change. The change in volume shall be in accordance with method 6211 of FED-STD-601, except that the immersion time shall be 24 hours.

4.8.13 Shock resistance. Three specimens, 6 inches square by 1/4 inch thick, shall be centrally applied to three 8-inch-square by 1/8-inch-thick mild steel plates, so that a 1-inch-wide portion of the steel plate is exposed along the periphery of the specimen. Each specimen shall be subjected to high impact (H.I.) shock in a testing machine conforming to MIL-S-901. Each specimen is centrally secured to the test plate of the testing machine by eight 1/4-inch diameter machine screws equally located along the periphery of the specimen plate 1/2 inch away from the edge of the specimen steel plate. Each specimen shall then be subjected to a series of shocks consisting of consecutive blows of 100, 200, 400, 700, 1,000, 1,400, and 2,000 foot pounds to provide approximately uniform increase of striking velocity. The 2,000 foot pound blow shall then be immediately followed by a second 2,000 foot pound blow. The specimens shall then be examined for chipping, cracking, or detachment from the steel backing plate.

4.8.14 Adhesive strength. Eighteen specimens, in a thickness of 1/4 inch and with an area of 4 square inches, shall be prepared. These shall be applied to mild steel plates, 2 by 6 inches by 1/8 inch thick, in such a manner that 1 inch of the steel plate is exposed at one end and 3 inches exposed at the opposite end. Specimens shall be tested by measuring the load required to shear the 2-inch-square area of deck covering from the steel plate by means of a shear test jig shown on figure 1. After preparation, all specimens shall be allowed to set for 96 hours. Six specimens shall then be tested to determine the initial adhesive strength. Six specimens shall be tested after aging in an oxygen bomb for 96 hours under a pressure of 300 lb/in<sup>2</sup> and temperature of 158°F. The remaining six specimens shall be tested after a moisture and temperature cycle as specified in 4.8.7. All specimens shall be tested by compression loading at a rate of 0.25 inch per minute. The load at failure shall be recorded and the average of six readings taken for computation of the adhesive strength in lb/in<sup>2</sup> for the respective conditions.

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FIGURE 1. Shear test jig for hard-setting deck covering materials.



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4.8.15 Serviceability. The deck covering shall be applied aboard ship for a minimum service period of 6 months.

4.8.16 Odor test. The odor test shall be conducted in accordance with ASTM D 1391.

4.9 Inspection of packaging. Packaging, packing, and marking shall be examined to determine compliance with section 5 of this specification.

## 5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.6.)

5.1 Packaging. Packaging shall be level A or C, as specified (see 6.2.1).

5.1.1 Level A. The deck covering can be supplied as a kit, consisting of primary resin, components A and B, and aggregate. Bond coating and seal coating shall also be supplied as required. The quantity of each component in the kit shall be in the proper proportions such that when applied, it shall meet the performance requirements herein. The components shall be supplied in cans or pails of appropriate size, to contain the required quantities of each material. The pail containing the aggregate shall be of sufficient size to contain, as appropriate, the mixed materials ready for the trowel systems application. Materials may also be supplied separately, with resins in appropriate cans and pails, and aggregate in sacks.

5.1.1.1 Cans. Cans shall conform to type V, class 2 of PPP-C-96. Interior of cans may be unlined; plan B coating and side seam stripping are required.

5.1.1.2 Pails. One and 5-gallon pails shall conform to type II, class 3 of PPP-P-704. Interior coating is not required. Wire handles on pails shall be treated to resist corrosion. Six-gallon pails shall conform to type II, class 5 or 11 of PPP-P-704, at the contractor's option. Interior coating is not required. Wire handles or bails shall be treated to resist corrosion.

5.1.1.3 Aggregate. The aggregate shall be furnished in quantities not exceeding 100 pounds net weight in paper shipping sacks, conforming to UU-S-48 or in the pails described above.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2.1).

5.2.1 Levels A and B.

5.2.1.1 Cans. Cans shall be packed in a fiberboard box conforming to PPP-B-636, class weather resistant for level A and class domestic for level B. Fiberboard pads shall be placed on the bottom and tops of the cans. For level A, boxes shall be closed and waterproofed in accordance with method V; for level B, boxes shall be closed in accordance with method I as specified in the appendix to the box specification. Reinforcing of level A boxes shall be accomplished by the use of nonmetallic banding or pressure sensitive reinforced tape, at the contractor's option.

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5.2.1.2 Pails and sacks. Pails and sacks shall require no additional packing. When specified (see 6.2.1), pails and sacks shall be palletized in accordance with MIL-STD-147.

5.2.2 Level C. Deck covering, packaged as specified in 5.1, 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. Container packing or method of shipment shall comply with Uniform Freight Classification Ratings, Rules, and Regulations or National Motor Freight Classification or other carrier rules, as applicable to the mode of transportation.

5.3 Marking. In addition to any special marking (see 6.2.1), and as required by the contract or order herein, interior packages, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129.

5.3.1 Special marking. Each component container shall have the following additional information:

- (a) Type.
- (b) Manufacturer's name.
- (c) Manufacturer's lot number and date of manufacture.
- (d) Contract number.
- (e) Color designation and number.
- (f) Shelf-life marking.
- (g) For products indicating compliance with the air pollution requirements in table I, the following additional marking is required:

"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."

- (h) Asbestos free.

5.3.1.1 Mixing, rolling, trowelling, and use instructions. Each component container shall be marked with the following:

**"CAUTION**

This is one component of a two component system which WILL NOT HARDEN unless both components are mixed together.

**INSTRUCTIONS FOR USE**

Refer to manufacturer's written mixing and application instructions prior to use."

5.3.1.1.1 Air pollution compliance. For those products which have been approved for use in areas with regulations controlling the emission of solvents into the atmosphere (see 3.3 and 6.4), containers shall include the following statement: "Complies with air pollution regulations."

5.3.1.2 Caution label. Each component container shall be marked with the following:

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"CAUTION: Avoid skin contact during application. Chemicals may cause irritation or skin sensitization. In case of contact, wash skin thoroughly with soap and water."

5.3.1.3 For shipping containers and palletized unit loads, a copy of the Material Safety Data Sheet (Form OSHA-20) shall be attached to the shipping document for each destination (see 3.23). The contractor shall furnish a copy of the OSHA-20 form to NAVSEA with application for product qualification.

## 6. NOTES

6.1 Intended use. These materials are intended for use on interior metal decks in habitability spaces and sanitary and other wet spaces.

6.1.1 Deck covering materials applied by the broadcast method are intended for light traffic areas only.

## 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 and class required (see 1.2).
- (c) Compliance with air pollution regulations required (see table I).
- (d) Color of chips, flakes, or aggregate (see 3.6).
- (e) Quantity and size of containers required (see 5.1).
- (f) Level of packaging and packing required (see 5.2).
- (g) Palletization, when required (see 5.2.1.2).
- (h) Special markings required (see 5.3).

6.3 Material safety data sheet. In order to obtain the MSDS, which is found as part of FED-STD-313, DAR clause 7-104.98 must be involved in the contract.

6.4 Formulations which comply with air pollution regulations may be required for use in areas with regulations controlling the emission of solvents into the atmosphere.

6.5 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-24613 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 purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is Naval Sea Systems Command, SEA 5523, 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 6.5.1).

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

6.6 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

Preparing activity:  
Navy - SH  
(Project 5610-N054)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-D-24613(SH)		2. DOCUMENT TITLE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	