

INCH-POUND

MIL-PRF-32170
12 August 2004

PERFORMANCE SPECIFICATION DECK TILES, WEAR-RESISTANT

This specification is approved for use for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements for no wax and chlorine free wear-resistant deck tiles used in Naval shipboard interior applications.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-141 - Paint, Varnish, Lacquer and Related materials; Methods of Inspection, Sampling and Testing.

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navsea.navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil

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DEPARTMENT OF DEFENSE STANDARDS

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

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch> or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

BUREAU OF MEDICINE AND SURGERY (BUMED)

BUMED INST 6270.8 - Procedures for Obtaining Health Hazard Assessments Pertaining to Operational Use of a Hazardous Material.

(Copies of this document are available online at <https://bumed.med.navy.mil> or from Bureau of Medicine and Surgery, Department of the Navy, 2300 E Street, NW, Washington, DC 20372-5300.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

S9510-AB-ATM-010/(U) - Nuclear Powered Submarine Atmosphere Control Manual, Chapter 7

(Copies of this document are available from Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5133, Washington Navy Yard, DC 20376-5133.)

CODE OF FEDERAL REGULATIONS

40 CFR 60, Ch.1, Appendix A, Method 24 - Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings.

40 CFR 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories.

40 CFR 261 - Protection of Environment: Identification and Listing of Hazardous Waste

(Copies of these documents are available online at www.access.gpo.gov/nara/cfr or from the Superintendent of Documents, U.S. Government Printing Office, North Capitol & "H" Streets, N.W., Washington, DC 20402-0002.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM C 1028 - Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by Horizontal Dynamometer Pull Meter Method

ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser (DoD adopted)

ASTM D 4587 - Florescent UV-Condensation Exposures of Paint and Related Coatings, Standard Practice for

ASTM E 260 - Standard Practice for Packed Column Gas Chromatography

ASTM E 1252 - Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis.

- ASTM F 142 - Indentation of Resilient Floor Tiles, Standard Test Method for (McBurney Test)
(DoD adopted)
- ASTM F 1700 - Standard Specification for Solid Vinyl Floor Tiles (DoD adopted)

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Dimensions and tolerances.

3.3.1 Size. The deck tiles size shall be as specified (see 6.2). A tolerance of 1/64-inch (0.396 mm) per foot shall be permitted.

3.3.2 Thickness. The deck tiles size shall be as specified (see 6.2). The thickness of deck tiles shall not vary by $\pm 5\%$.

3.3.3 Weight. The deck tiles size shall be as specified (see 6.2). The weight of deck tiles shall not vary by $\pm 2\%$.

3.4 Fire performance. The fire performance of the deck tile system, including any primer and adhesive, shall conform to the requirements in MIL-STD-1623

3.5 Indentation. The average residual indentation at the end of 60 minutes recovery shall not exceed 8 percent, and the maximum residual indentation of any single specimen shall not exceed 10 percent.

3.6 Flexibility before and after heating. The deck tiles shall not crack, break, or show any indication of weakness when tested before heating and after heating.

3.7 Wear resistance. The deck tiles shall not show wear characteristics exceeding 30 mg loss.

3.8 Resistance to accelerated light and weather aging. The exposed surface of the deck tiles shall show no appreciable change in color, signs of checking, cracking or any other deterioration.

3.9 Slip resistance. The deck tiles shall have slip resistance equal to or greater than 0.50 static coefficient of friction.

3.10 Impact resistance. The deck tiles shall show no visible signs of chipping, cracking, or detachment from the steel plate. There shall be not more than 1/16-inch of permanent indentation.

3.11 Resistance to cleaning agents. When tested as specified herein, a film of coating shall show no blistering or wrinkling and no more than a slight whitening or softening upon removal of the fluid wetted sponge. After 2 hours of air drying, the portion of the panel that was covered by fluid wetted sponge shall be almost

indistinguishable with regard to hardness, color, and gloss from a panel prepared at the same time, but not immersed.

3.12 Serviceability. The deck tiles shall show no deficiencies that would limit its serviceability when examined during and after the minimum service period specified.

3.13 Off-gassing. The deck tiles shall meet the requirements in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U), for a usage category of Limited (see 6.5).

3.14 Toxicity. The deck tiles shall have no adverse effect on the health of personnel when used for its intended purpose. The deck tiles shall be assessed by the Navy Environmental Health Center (NAVENVIRHLHCEN) using the administrative Health Hazard Assessment (HHA). A flowchart for this process can be found as enclosure (1) of BUMEDINST 6270.8. The HHA is a review of the deck tile based on information submitted by the manufacturer, to assess health hazards associated with the handling, application, use and removal of the product. The deck tiles shall not cause any environmental problems during waste disposal (see 6.6).

3.15 Disposal. The manufacturer shall certify that the deck tiles shall not contain any hazardous material or exhibit any hazardous characteristic as defined under 40 CFR 261.

3.16 Workmanship. The deck tiles shall be free of cracks, embedded foreign matter, evidence of delamination and broken edges and shall be of uniform color and finish.

3.17 Volatile Organic Content (VOC) solvent. The VOC of all primers and adhesives specified for use with the deck tiles shall not exceed 250 grams per liter (g/L).

3.18 Hazardous air pollutant (HAP) content. The content of the HAPs solvents in the primers and adhesives specified for use with the deck tiles shall not exceed the weight percent (% WT) values listed in Table I. Within these limitations and the requirement that the finished coating meet all requirements of this specification, solvent selection is the responsibility of the manufacturer. HAP materials are defined by 40 CFR 63.

Table I. Hazardous air pollutant solvent content limits.

| Hazardous solvent in each individual total coating | Maximum, % WT |
|---|---------------|
| Benzene | 0.05 |
| Chlorinated solvent (s), total | 0.05 |
| Solvents containing fluorine as defined by 40 CFR Part 82 | 0.01 |
| Ethyl benzene | 0.05 |
| Methyl, Ethyl and Butyl mono-ethers of ethylene glycol or the acetates thereof, total (also known as methyl, ethyl and butyl cello solves and methyl, ethyl and butyl cello solve acetates) | 0.05 |
| Methyl ethyl ketone (MEK) | 0.05 |
| Methyl isobutyl ketone (MIBK) | 0.05 |
| Toluene | 0.05 |
| Xylene (all forms), total | 0.1 |

4. VERIFICATION

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

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.2, 4.3, and 4.4.

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4.1.2 Noncompliance. If a sample fails to pass its appropriate inspections, the Contractor shall notify the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected; which were manufactured with essentially the same materials and processes; and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, suitable to the inspection activity, has been taken. After the corrective action has been taken, appropriate inspections shall be repeated on additional sample units. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity.

4.1.3 Changes to product. Any change in basic ingredients or processes which would affect compliance with this specification must be reported to both the contracting activity and NAVSEA. The Government reserves the right to require that all tests specified in this specification be conducted on all lots before shipment is made.

4.1.4 Certification. The product shall meet the requirements specified in 3.4 through 3.15, of this specification.

The tests specified in 4.4.2 through 4.4.13 may be omitted only if both of the following are true:

- a. If within 3 years prior to shipment, the material has been tested and found in conformance with 3.4 through 3.12 and
- b. If the material offered for delivery is manufactured the same in all respects as that previously tested.

4.2 First article inspection. First article inspection shall consist of the examinations and tests specified in Table II, 4.3 and 4.4.

TABLE II. First article inspection.

| Inspections | Requirements | Tests |
|---|--------------|--------|
| Fire performance | 3.4 | 4.4.2 |
| Indentation | 3.5 | 4.4.3 |
| Flexibility before and after heating | 3.6 | 4.4.4 |
| Wear resistance | 3.7 | 4.4.5 |
| Resistance to accelerated light and weather aging | 3.8 | 4.4.6 |
| Slip resistance | 3.9 | 4.4.7 |
| Impact resistance | 3.10 | 4.4.8 |
| Resistance to cleaning agents | 3.11 | 4.4.9 |
| Serviceability | 3.12 | 4.4.10 |
| Off-gassing | 3.13 | 4.4.11 |
| Toxicity | 3.14 | 4.4.12 |
| Volatile Organic Content (VOC) solvent | 3.17 | 4.4.14 |
| Hazardous air pollutant (HAP) content | 3.18 | 4.4.15 |

4.3 Conformance inspection.

4.3.1 Inspection of end item. Inspections shall be in accordance with Table III, except where otherwise noted.

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TABLE III. Inspection of end item.

| Inspections | Requirements | Tests |
|-------------|--------------|---------|
| Size | 3.3.1 | 4.4.1.1 |
| Thickness | 3.3.2 | 4.4.1.2 |
| Weight | 3.3.3 | 4.4.1.3 |
| Workmanship | 3.17 | 4.4.13 |

4.3.1.1 Examination of end item for defects in appearance. Inspections shall be in accordance with Table IV and 4.3.2.2.1, except where otherwise noted.

TABLE IV. Examination for visual defects.

| Examination | Defect |
|-------------|--------------------------|
| Workmanship | Cracking |
| Workmanship | Embedded foreign matter |
| Workmanship | Evidence of delamination |
| Workmanship | Broken edges |
| Workmanship | Non-uniform color |
| Workmanship | Non-uniform finish |

4.3.2 Testing of the end item.

4.3.2.1 Lot. A lot shall consist of all units of the same type, produced under similar conditions and ready for inspection or shipment at one time. Unless otherwise specified (see 6.2), the lot size shall be expressed in the number boxes of deck tiles.

4.3.2.2 Sampling.

4.3.2.2.1 Sampling for inspection of end item (visual examination and size, thickness and weight). At a minimum, the contractor shall randomly select samples from each lot as specified in Table V, and inspect them as specified in 4.3.1 (see 6.2).

TABLE V. Sampling for inspection of end item^{1, 2, 3}.

| Lot size | Sample size |
|---------------|-------------|
| 1 to 50 | 5 |
| 51 to 90 | 7 |
| 91 to 150 | 11 |
| 151 to 280 | 13 |
| 281 to 500 | 16 |
| 501 and above | 19 |

^{1/} All defective items shall be replaced with acceptable items prior to lot acceptance.

^{2/} Inspect sample size until reject criteria is reached. If reject criteria is reached, the entire lot shall be rejected.

^{3/} Reject lots may be screened, defective items removed and resubmitted for inspection and test.

4.4 Test procedures.4.4.1 Dimensions and tolerances (see 4.3.2.2.1).

4.4.1.1 Size. Each of the tiles selected for conformance shall be laid on a flat surface and measured for length and width with a steel ruler graduated in 1/64-inch units.

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4.4.1.2 Thickness. The thickness of the tile selected for conformance shall be measured with a deep-throat micrometer at six points distributed over the area. The average of the six thickness readings shall be computed and considered to be the thickness of the tile.

4.4.1.3 Weight. The weight of each of the tiles selected for conformance shall be measured to the nearest 0.01 pound and the ten results averaged.

4.4.2 Fire performance. The fire performance of the deck tile system, including any primer and adhesive, shall be tested in accordance with MIL-STD-1623.

4.4.3 Indentation. Indentation testing shall be in accordance with ASTM F 142 using a total of 140 pounds (63.5 kg), and a time of 10 minutes with a recovery of 60 minutes. The flat bottom surface of the indentation tip must rest completely on the flat surface of the deck tiles. The test areas must be large enough so that a circle with at least a 3/8-inch (9.525 mm) diameter can be drawn thereon.

4.4.4 Flexibility.

4.4.4.1 Flexibility before heating. The deck tiles shall not crack, break, or show any indication of weakness when tested in accordance with method 3111 of FED-STD-501. Mandrel size shall be 2 inches diameter \pm 0.01-inch.

4.4.4.2 Flexibility after heating. The deck tiles shall not crack, break, or show any indication of weakness when tested in accordance with method 3111 of FED-STD-501 after being subjected to the heat of $179.6 \pm 3.6^\circ\text{F}$ ($82 \pm 2^\circ\text{C}$) for $6 \pm 1/4$ hours as described in method 6211 of FED-STD-501. Mandrel size shall be 2 inches diameter \pm 0.01-inch.

4.4.5 Wear resistance. Wear testing shall be tested in accordance with ASTM D 4060 using a CS 17 wheel, 1000 cycles and a 1 kg load. Samples shall be adhered to steel discs using epoxy adhesive or adhesive specified by the manufacturer and allowed to cure for at least 7 days at room temperature (approximately 77°F (25°C)).

4.4.6 Resistance to accelerated light and weather aging. The exposed surface of the deck tiles shall show no appreciable change in color, signs of checking, cracking or any other deterioration when tested for 2000 hours using a UV-A lamp in accordance with ASTM D 4587.

4.4.7 Slip resistance. The deck tiles shall be tested in accordance with ASTM C 1028.

4.4.8 Impact resistance. Two 6-inch square specimens shall be applied (using epoxy adhesive or other adhesive specified by the manufacturer) to two 8-inch square by 1/8-thick mild steel plates. 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 tile so that the impact will be at the center of the specimen. Each specimen shall be subjected to two impacts of the steel ball.

4.4.9 Resistance to cleaning agents. The deck tiles shall be applied to the test panel per manufacturers instructions. The test panel shall be laid flat and sponges wet with a shipboard cleaner shall be laid on the panel in a manner to cover the full face of the test panel. A list of suitable shipboard cleaners is available from Naval Sea Systems Command, SEA 05M, 1333 Isaac Hull Avenue, Washington Navy Yard, Washington DC 20376. The sponge shall be kept wet for a period of 24 hours at ambient laboratory conditions. The sponge may be covered to restrict evaporation. Upon removal of the sponge, observe the panel for discoloration, change in gloss, glistening, softening, swelling or loss of adhesion.

4.4.10 Serviceability. The deck tiles shall be applied in high traffic areas aboard ship for a minimum service period of 6 months.

4.4.11 Off-gassing. The deck tiles shall be tested in accordance with the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U), by a Government approved

testing facility. The results shall be submitted to the Government for evaluation and approval for use (see 3.14 and 6.5).

4.4.12 Toxicity. To determine conformance with the requirements of 3.15, deck tiles shall be evaluated using the HHA process. Sufficient data to permit a HHA of the product shall be provided by the manufacturer/distributor to the NAVENVIRHLTHCEN. To obtain current technical information requirements specified by the NAVENVIRHLTHCEN, see 6.6.

4.4.13 Workmanship. The deck tiles shall be uniform in quality and condition. They shall be clean, smooth and free from all foreign materials and defects that will impair material use and serviceability.

4.4.14 Volatile Organic Content (VOC) solvent. VOC of the primers and adhesives specified for use with the deck tiles shall be determined in accordance with 40 Code of Federal Regulations (CFR) ch.1, part 60, appendix A, method 24.

4.4.15 Hazardous air pollutant (HAP) content. Hazardous solvent content of each primer and adhesive specified for use with the deck tiles shall be determined in accordance with ASTM E 260 or Methods 7356 and 7360 of FED-STD-141, as applicable. Solvent fractions shall be identified in accordance with ASTM E 1252 with the results recorded as the percent weight of the total paint. Alternate methods of analysis must be reviewed and approved by NAVSEA. Formulation data may be used by manufacturers in lieu of testing to demonstrate compliance with hazardous air pollutant requirements of this specification. The manufacturer's formulation data must have a consistent and quantitatively known relationship to the testing required. Calculation of individual HAP contents can be based on either manufacturer evaluation of batches or supplier data for raw materials used in the product.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. Material covered by this document is intended for use as floor covering on US Navy ships where improved wear-resistance is required.

The deck tiles are to be applied to the deck or structure using adhesive. During application, the use of clips or other devices welded to the deck or other reinforcement is prohibited. Material should be pitched to a drain.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. When a first article sample is required (see 3.1).
- c. Tile size, thickness and weight (see 3.3.1, 3.3.2 and 3.3.3).
- d. Inspection conditions (see 4.1.1).
- e. Lot size, if other than specified (see 4.3.2.1).
- f. Sampling for visual examination (see 4.3.2.2.1).
- g. Sampling for tests (see 4.3.2.2).
- h. Packaging requirements (see 5.1).

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- i. Is Material Safety Data Sheet (MSDS) required? (see 6.4).
- j. Is off-gassing testing required? (see 3.14 and 6.6).
- k. Toxicity conformance (see 3.15 and 6.5).

6.3 First article. When a first article inspection is required, the item should be a first article sample. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Material safety data sheets. Contracting officers will identify those activities requiring companies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.5 Off-gassing. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the atmosphere and results in health hazards to personnel or deleterious effects on machinery. These controls are accomplished through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U). Under the Submarine Material Control Program, all materials considered for use on submarines require certification and assignment of a usage category. Under the certification process, candidate materials are selected by Navy activities or contractors, and a request for certification is submitted to Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard DC 20376-5122. The certification request is accompanied by detailed information, including descriptions of the material. A chemical analysis is conducted, which is normally accomplished through off-gas testing. The off-gas test is required to be conducted in a Government approved laboratory designated by the preparing activity. Information pertaining to this test requirement may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160. Based on the chemical analysis results, a usage category is assigned to the material defining whether, and to what extent, the material may be used on submarines.

6.6 Toxicity evaluation. The NAVENVIRHLTHCEN requires sufficient information to permit a HHA of the product. Any questions concerning toxicity and requests for HHA should be addressed to the Commanding Officer, Navy Environmental Health Center, ATTN: Hazardous Materials Department, Industrial Hygiene Directorate, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 20378-2103. Upon receipt of the HHA, a copy should be provided to Commander, Naval Sea Systems Command, ATTN: SEA 05M1, 1333 Isaac Hull Ave., SE, Stop 5133, Washington Navy Yard, DC 20376.

6.7 Subject term (key word) listing.

Floor covering
Deck tile

Custodian:
Army - GL
Navy - (SH)
Air Force - 03
DLA - IS

Preparing activity:
Navy (SH)
(Project 7220-0004)

Review activities:
Navy - CG
Air Force - 84

Civil agency:
3FNE-CO

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.