

INCH-POUND

MIL-P-22581C(SH)

23 October 1991

SUPERSEDING

MIL-P-22581B(SH)

16 April 1964

MILITARY SPECIFICATION

PLASTIC TILES, VIBRATION DAMPING, TYPE III

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 establishes the requirements for flexible fire-resistant plastic tile for damping the flexural vibration of metal structures on ships.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

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 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 9330

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

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SPECIFICATIONS

FEDERAL

O-T-620	1,1,1 – Trichloroethane, Technical Inhibited (Methyl Chloroform)
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes

MILITARY

MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-L-19140	Lumber and Plywood, Fire-Retardant Treated
MIL-A-24456	Adhesive for Plastic Vibration-Damping Tiles

STANDARDS

FEDERAL

FED-STD-313	Material Safety Data, Transportation Data and Hazardous Materials Furnished to Government Activities
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MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-407	Visual Inspection Guide for Rubber Molded Items
MIL-STD-2073-1	DOD Materiel Procedures for Development and Application of Packaging Requirements

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

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| D 635 | Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position; (DOD adopted) |
| D 3951 | Standard Practice for Commercial Packaging; (DOD adopted) |

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may also be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets or MS standards), 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 in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3 and 6.3).

3.2 Material. The damping material formulation shall consist of ingredients necessary to obtain the damping characteristics and physical properties described herein, except that mercury and asbestos are prohibited. The formulation of a suggested damping material is listed in table I of the appendix (see 6.2.2).

3.2.1 Toxicity. Vibration damping tiles furnished under this specification shall not emit nauseous, irritating, or toxic volatile matter when the tile is heated to any temperature up to 212 degrees Fahrenheit (°F). The material shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.6 and 6.5). Questions pertinent to this effect shall be referred by the contracting activity to the Naval Medical Command (NAVMEDCOM) who will act as an advisor to the contracting agency.

3.2.2 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 Form OSHA-20, found in and part of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification (see 6.4).

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3.2.3 Recovered materials. Unless otherwise specified herein, all material incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used products is allowed under this specification.

3.3 Weight. The weight of the tiles shall be 4.5 ± 0.2 pounds per square foot (see 4.5.1).

3.4 Dimensions. Unless otherwise specified (see 6.2.1), the tiles shall be $12 \pm 1/16$ inches in width and length, and shall be square in shape. The contractor shall establish a nominal thickness for the damping material based on the other requirements of this specification. This nominal thickness shall be not less than $9/16$ inch, nor greater than $11/16$ inch. Unless otherwise specified (see 6.2.1), tiles shall not differ from the established nominal thickness by more than $1/16$ inch (see 4.5.2).

3.5 Flame resistance. As a minimum, the material shall be rated self-extinguishing (see 4.5.3 and 6.2.2).

3.6 Fuel and water resistance. The tiles shall not experience a gain in weight of more than 2.5 percent as a result of immersion in JP-5 fuel conforming to MIL-T-5624, or more than 7.0 percent as a result of immersion in distilled water (see 4.5.4). Loss in weight shall constitute nonconformance.

3.7 Flexibility and adhesion. The material shall exhibit no cracking on the surface nor lifting from the mandrel. In addition, the bond strength between the tile and the adhesive shall be equal to or greater than the cohesive strength of the tile. The average cohesive strength of the tile shall be not less than 80 pounds per square inch (see 4.5.5).

3.8 Vibration damping characteristics. The material shall demonstrate vibration damping characteristics as shown in table I (see 4.5.6 and 6.2.2).

TABLE I. *Vibration damping characteristics.*

Lengthwise flexural mode number	Nominal frequency (Hz)	Percent critical damping (min)		
		35 °F	55 °F	75 °F
1	250	1.6	1.1	0.5
3	1,350	1.8	1.7	1.0
5	3,300	1.6	1.7	1.8
7	5,800	2.0	1.5	1.8
9	9,000	2.0	3.1	2.8
11	10,500	2.0	5.7	5.8
13	12,600	1.9	6.3	8.0

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3.9 Uniformity. The material shall have a uniform homogeneous appearance throughout (see 4.5.7).

3.10 Workmanship. The tiles shall be free of major defects (see 4.5.8). The tiles shall be square with perpendicular edges. The surfaces of the tiles shall be free of mold release agents or other substances which may interfere with their adhesion (see 4.5.5.2).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

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

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

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

4.2.1 Inspection conditions. Unless otherwise specified (see 6.2.1), all inspections shall be performed in accordance with the test conditions specified herein.

4.3 First article inspection. First article inspection shall consist of the examinations, measurements, and tests outlined in table II. The sample used shall consist of six tiles of the material the contractor proposes to furnish. The same six tiles can be used for all first article tests (see 6.2.2).

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TABLE II. *First article inspection.*

Examinations, measurements, or tests	Number of tiles required	Requirement paragraph	Test paragraph
Group I			
Weight	6	3.3	4.5.1
Dimensions	6	3.4	4.5.2
Workmanship	6	3.10	4.5.8
Group II			
Fuel and water resistance	1	3.6	4.5.4
Flexibility and adhesion	1	3.7	4.5.5
Vibration damping	3	3.8	4.5.6
Uniformity	4	3.9	4.5.7
Group III			
Flame resistance	1	3.5	4.5.3

4.4 Quality conformance inspection. Quality conformance inspection shall be as specified in table III (see 6.2.2).

TABLE III. *Quality conformance inspection.*

Examinations	Requirement paragraph	Test paragraph
Group A		
Weight	3.3	4.5.1
Dimensions	3.4	4.5.2
Workmanship	3.10	4.5.8
Group B		
Fuel and water resistance	3.6	4.5.4
Flexibility and adhesion	3.7	4.5.5
Uniformity	3.9	4.5.7

4.4.1 Lot. An inspection lot shall consist of tiles (not to exceed 1,000) of the same thickness, width, and length produced in one plant under the same conditions.

4.4.2 Preparation for examination. The surface of the sample tiles selected as specified in 4.4.3.1 and 4.4.4.1 shall be examined to determine conformance to table III.

4.4.3 Group A inspection. Group A inspection shall consist of the examinations and measurements listed in table III.

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4.4.3.1 Group A sampling. The sample plan for group A inspection shall be in accordance with MIL-STD-105 single sampling plan for normal inspection, inspection level II. The sample tiles shall be obtained in equal number from each shipping container.

4.4.3.2 Reworking of items. If items are rejected during group A inspection, the manufacturers may rework the items to correct the rejects or submit new items. Rejected items that cannot be reworked shall be destroyed. Reworked items may be resubmitted for another group A inspection.

4.4.4 Group B inspection. Group B inspection shall consist of the examinations and tests in table III.

4.4.4.1 Group B sampling. The sampling plan for group B inspection shall be in accordance with MIL-STD-105 single sampling plan for normal inspection, special inspection level S-1. Samples selected for group A inspection may be utilized for group B inspection. The same tiles shall be obtained in equal number from each shipping container.

4.5 Test procedures.

4.5.1 Weight. The weight of each tile in the sample shall be measured to the nearest 0.01 pound and the six results averaged to determine conformance to 3.3.

4.5.2 Dimensions. Each of the tiles shall be conditioned at 75 ± 9 °F for at least 16 hours. The dimensions of each tile shall be measured at 75 ± 9 °F by the following procedure to determine conformance to 3.4. The tiles shall be laid on a flat surface and measured for length and width with a steel ruler graduated in 1/64-inch units. The thickness of the tile shall be measured with a deep-throat micrometer at not less than six points evenly distributed over the area. The average of the six or more thickness readings shall be computed and considered to be the thickness of the tile (see 3.4).

4.5.3 Flame resistance. Flame resistance shall be determined in accordance with ASTM D 635, except that no wire gauze shall be mounted beneath the specimen, and only three specimens shall be tested. Each of the three specimens shall be at least self-extinguishing (see 3.5). If any of the specimens is not self-extinguishing, the procedure for test specimens which specifies tests in groups of ten shall be followed.

4.5.4 Fuel and water resistance. To determine conformance to 3.6, six specimens, each measuring 1 inch by 3 inches, shall be cut from one tile. Three samples shall be immersed in JP-5 jet fuel in accordance with MIL-T-5624, and three samples shall be immersed in distilled water. At least 1 liter of test fluid shall be used and each specimen shall be isolated so that all surfaces are exposed to the test fluid and immersion is complete. The samples shall be weighed to the nearest 0.01 gram prior to immersion. Immersion shall continue at 75 ± 9 °F for $96 \pm 1/2$ hour.

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Upon completion of this period, the specimens shall be removed from the immersion media, excess fluid wiped off, and the sample weighed again immediately. Percent weight change shall be computed from the following equation:

$$\text{Percent weight change} = \frac{(\text{Final weight} - \text{initial weight}) \times 100}{\text{Initial weight}}$$

The results of the test specimens for each immersion medium shall be averaged.

4.5.5 Flexibility and adhesion. Tests for flexibility and adhesion shall be conducted as follows:

4.5.5.1 Flexibility. Three specimens, each measuring 2 inches by 6 inches, shall be cut from the tile. A 4-inch diameter steel mandrel at least 8 inches long, with a smooth surface, shall be used. The surface of the mandrel shall be wiped with 1,1,1 trichloroethane in accordance with O-T-620 to remove grease or oil. A 1/32-inch thick epoxy adhesive in accordance with MIL-A-24456 shall then be applied. The specimens shall then be applied to the mandrel by wrapping with the length of the specimen perpendicular to the axis of the mandrel, and held in place with hose clamps or other suitable fasteners for 48 hours while the adhesive cures. The edges of the specimens shall not touch one another when applied to the mandrel. The specimens on the mandrel shall be examined for cracks on the surface and for lifting of the edges after being conditioned for $24 \pm 1/4$ hours at 75 ± 2 °F and 50 ± 2 percent relative humidity (see 3.7). The hose clamps or other fasteners shall be removed prior to the start of the conditioning period.

4.5.5.2 Adhesion.

4.5.5.2.1 Specimen preparation. Three discs, each 4 inches in diameter, shall be cut from one of the tiles. One face of each disc shall be bonded with adhesive conforming to MIL-A-24456 to a steel disc 0.5 inch thick by 4 inches in diameter which has been cleaned by sandblasting, followed by wiping with 1,1,1 trichloroethane conforming to O-T-620. The opposite face of the steel disc shall have a centrally located threaded stud 0.5 inch in diameter by 1 inch long. A steel disc, 1.597 ± 0.005 inches in diameter by 0.5 inch thick, with a threaded stud on one face, shall be cleaned by sandblasting the disc face, followed by wiping with 1,1,1 trichloroethane and then bonding to the opposite face of the tile disc with the adhesive in a central position. (The threaded stud shall be protected by tape or tubing during the sandblasting.) The adhesive shall be evenly applied to the steel discs. The tile disc shall be pressed firmly down onto the prepared surfaces. The assembled specimens shall be allowed to set at 75 ± 9 °F for not less than 96 hours prior to testing for adhesion. A drawing of an assembled test specimen is shown on figure 1.

4.5.5.2.2 Adhesion testing. The test specimen shall be placed in a calibrated tension testing machine and the force required to separate the small disc from the specimen determined. The tension testing machine rate of separation shall not exceed 1 inch per minute. The test shall be repeated on each of the three specimens at 75 ± 9 °F. Each specimen shall conform to 3.7.

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4.5.6 Vibration damping characteristics. Conformance to 3.8 shall be determined by the procedures specified in 4.5.6.1.1 through 4.5.6.3.

4.5.6.1 Test specimens.

4.5.6.1.1 Test specimens for vibration damping. The test specimens for determining vibration damping characteristics shall be as follows:

- a. Three flat steel bars, each 1/2-inch by 3-inches by 19-inches
- b. Three flat steel bars, each 0.5-inch by 3-inches by 19-inches, with strips of tiles completely covering one 3-inch by 19-inch face on each bar (bars from a. may be used after measurement of bare-bar damping characteristics).

The tile strips shall be bonded to the sandblasted faces of the steel bars using the bonding procedure detailed in 4.5.6.1.2. The assembled test specimens shall be kept at 75 ± 2 °F for not less than 96 hours prior to temperature conditioning for the vibration tests.

4.5.6.1.2 Bonding procedure. The tile strips shall be bonded with adhesive conforming to MIL-A-24456 to a steel bar which has been cleaned by sandblasting, followed by wiping with 1,1,1 trichloroethane conforming to O-T-620. The adhesive shall be evenly applied to the steel bar and the tile pressed firmly down onto the prepared bar surface.

4.5.6.2 Testing. The equipment and procedure for determining the vibration damping characteristics of the test specimens specified in 4.5.6.1.1 shall be as specified in 4.5.6.2.2 and 4.5.6.2.3. The bare bars shall be conditioned at 75 ± 2 °F for at least 24 hours and tested at this temperature. The covered bars shall be conditioned and tested at each of the temperatures specified in table I. Each of the temperatures shall be maintained during conditioning and testing within a tolerance of ± 2 °F. The conditioning interval shall be not less than 16 hours prior to testing.

4.5.6.2.1 Accelerated aging. After completion of the initial damping measurements of the covered bars, the test bars shall be placed in a forced-draft oven for 168 ± 1 hours at 212 °F. Vibration damping measurements shall then be repeated at each of the temperatures specified in table I.

4.5.6.2.2 Equipment. Arrangements of instruments that have been used and found satisfactory for this test are shown on figures 2 and 3. Other arrangements of similar instruments which meet the requirements specified in 4.5.6.2.3 may also be satisfactory.

4.5.6.2.3 Procedure.

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4.5.6.2.3.1 Methods. Vibration damping tests shall be conducted by the method of the decay rate of free vibrations. This method requires that the test specimen be excited at several of its free free-flexible resonant frequencies in turn. A force at a single resonant frequency shall be applied, and the vibration of the specimen allowed to stabilize; the force shall then be removed and the vibration measured while decaying freely. The rate of decay of the test bar vibration is related to the percent of critical damping by the relation:

$$\text{Percent D} = \frac{100}{2Q} = \frac{100}{2\left(\frac{27.3f}{R}\right)} = 1.83 \frac{R}{f}$$

where:

Percent D	=	Percent of critical damping
f	=	Frequency of the vibrational mode excited (hertz)
R	=	Decay rate of vibration (decibels per second)
Q	=	"Quality factor" at the resonant mode.

4.5.6.2.3.2 Excitation. The bar shall be excited using an electrodynamic vibration exciter. The exciter shall be securely attached to the flat face of the bar at the intersection of the longitudinal centerline and the vertical centerline on the side not covered by damping material. A sinusoidal signal source shall be used to drive the vibration exciter. The excitation shall be adequate to provide an accelerometer signal not less than 40 decibels greater than the combined ambient vibration and instrument noise at each frequency. The frequency of the signal source shall be monitored using an electronic frequency counter.

4.5.6.2.3.3 Accelerometer. An accelerometer weighing not more than 1 ounce and having a resonant frequency of 20 kilohertz or greater shall be used to sense the vibration decay. The accelerometer shall be attached opposite the attachment of the vibration exciter. It is permissible to remove sufficient damping tile as required to permit necessary attachment.

4.5.6.2.3.4 Instrumentation. The instrumentation system shall be used to determine the frequencies of the resonant modes and to determine the decay rate at each required modal frequency. The instrumentation used shall measure a decay rate corresponding to not less than 15 percent of critical damping. This value shall be verified by electrical impulse applied to the input of the measuring system. On figure 2, the output of the accelerometer is passed successively through a preamplifier, an amplifier, and a logarithmic amplifier, to an oscilloscope adapted by design or supplemental attachment to measure the decay rate. (Insertion of an octave band filter between the amplifier and logarithmic amplifier is desirable provided it does not affect the limiting decay rate.) Figure 3 shows alternative instrumentation using a spectrum analyzer. In this case, the analyzer shall be configured to capture a time record and display the log magnitude of that record. Filtering is desirable in this case as well, and may be accomplished by translation ("zoom") analysis if the limiting decay criteria is met.

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4.5.6.2.3.5 Testing. Each test bar shall be suspended edgewise from two lightweight nylon or cotton cords at least 24 inches long. These cords are to be attached to the bar at the appropriate nodal points of the first flexural mode of vibration (approximately 4.26 inches from each end of the bar). The free bar shall be excited at each of the numbered lengthwise flexural modes of the bar as required in table I. Care shall be exercised to identify the modes excited and to avoid torsional, longitudinal, and combined modes. Care shall also be taken to prevent overloading of any part of the exciting and sensing circuits to eliminate spurious results. It is very important that the alignment of the vibration exciter be such that the direction of excitation is normal to the face of the test bar to which the vibration exciter is attached. After connecting the instrumentation as shown on figure 2 or 3, but prior to measuring the damping properties, the resonant frequency response of the test specimen shall be measured. In addition to determining the modal frequencies, this process is useful in determining misalignment and overload problems in the exciter and measurement systems.

4.5.6.3 Calculation. The percents of critical damping at each mode found for the three bare bars at 75 °F shall be averaged. Likewise, the percents of critical damping at each mode found for the three coated bars at each of the test temperatures shall be averaged. The corrected percents of critical damping for comparison with the requirements in table I shall be calculated using the following equation:

$$\text{Percent of critical damping (corrected)} = D_c - D$$

where:

D_c is the averaged damping of the coated bars at the specified mode and temperature.

D is the averaged damping of the bare bars at the specified mode at 75 °F.

4.5.7 Uniformity. The freshly cut edges of test specimens cut from tile for the tests specified in 4.5.5 and 4.5.6 shall be examined visually for uniformity. The material shall be examined for segregated filler particles and for incomplete mixing of the ingredients, particularly the hardener and filler (sand) (see 3.9).

4.5.8 Workmanship. Each of the samples selected as specified in 4.3 and 4.4.3.1 shall be examined for visible defects in accordance with MIL-STD-407. Tiles which are not square in shape or which do not have perpendicular edges shall be rejected. Tiles which have mold release or other substances which could interfere with their adhesion shall be rejected.

4.6 Toxicological formulations. The contractor shall have the toxicological formulations and associated information available for review by the contracting activity to evaluate the safety of the material for the proposed use.

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

5. PACKAGING

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

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

5.1.1 Level A. Fifteen tiles shall be unit packed flat in a snug-fitting fiberboard box conforming to PPP-B-636, class-weather-resistant, with the type, the variety, the grade, and the box style at the contractor's option. A reinforcing liner and top and bottom pads of the same material as the fiberboard box shall be used. Tiles shall be separated from one another and the pads by a minimum of 4-mil thick polyethylene film. Separate pieces of polyethylene film shall be used between each tile and each separator shall be 13 inches long by 13 inches wide. Box closure shall be in accordance with 5.2.2.1.2.

5.1.2 Level C. Preservation shall be as specified for level A, except that the fiberboard box shall be class-domestic and in accordance with 5.2.1.1.1.2 and 5.2.2.1.

5.1.3 Commercial. Preservation shall be in accordance with ASTM D 3951.

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

5.2.1 General requirements for levels A, B, and C.

5.2.1.1 Containers. Containers selected (see 5.2.2) shall be of minimum weight and cube to be consistent with the protection required, of uniform size, and shall contain identical quantities of identical tiles.

5.2.1.1.1 Navy fire-retardant requirements.

5.2.1.1.1.1 Lumber and plywood. Unless otherwise specified (see 6.2.1), all lumber and plywood, including laminated veneer material used in shipping container and pallet construction, members, blocking, bracing, and reinforcing, shall be fire-retardant treated material conforming to MIL-I-19140 as follows:

Levels A and B

Type II – Weather resistant
Category 1 – General use

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Level C

Type I – Non-weather resistant
Category 1 – General use.

5.2.1.1.2 Fiberboard. Fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes shall meet the flammability and smoke requirements specified in PPP-F-320.

5.2.2 Levels A, B, and C containers. Tiles preserved as specified (see 5.1) shall be packed in shipping containers. The level of packing (see 5.2) shall be as stated in MIL-STD-2073-1, appendix C, and herein. Unless otherwise specified (see 6.2.1), container selection shall be at the contractor's option.

5.2.2.1 Caseliners, closure, and gross weight.

5.2.2.1.1 Caseliners. Unless otherwise specified (see 6.2.1), level A shipping containers shall be provided with waterproof caseliners in accordance with MIL-STD-2073-1.

5.2.2.1.2 Closure. Container closure, reinforcing, or banding shall be in accordance with the applicable container specification or appendix thereto, except that weather-resistant fiberboard boxes shall be closed in accordance with method V and reinforced with non-metallic or tape banding; and domestic fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape.

5.2.2.1.3 Weight. Wood, plywood, and cleated type containers exceeding 200 pounds gross weight shall be modified by the addition of skids in accordance with MIL-STD-2073-1 and the applicable container specification or appendix thereto.

5.2.3 Commercial. Tiles preserved as specified (see 5.1) shall be packed for shipment in accordance with ASTM D 3951 and herein.

5.2.3.1 Container modification. Shipping containers exceeding 200 pounds gross weight shall be provided with a minimum of two, 3- by 4-inch nominal wood skids laid flat, or a skid- or sill-type base which will support the material and facilitate handling by mechanical handling equipment during shipment, storage, and stowage.

5.3 Palletized unit loads. When specified (see 6.2.1), shipping containers shall be palletized in accordance with MIL-STD-2073-1.

5.4 Marking.

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5.4.1 Levels A, B, and C. In addition to any special marking required (see 6.2.1 and herein), unit packs, shipping containers, and palletized unit loads shall be marked in accordance with MIL-STD-2073-1. The marking shall include lot numbers and bar coding (unit packs and shipping containers). In addition, each unit and shipping container shall be marked on two sides with the word "UP". An arrow pointing toward the top of the container shall be placed beneath each word. Arrows should be employed only to indicate or supplement the words, "THIS SIDE UP". The following precautionary markings shall appear on two opposite sides of each package or packing:

FOR STORAGE, DO NOT STACK MORE THAN TWO HIGH.
STORE IN COOL DRY PLACE.

FREE OF ASBESTOS AND CERAMIC
(REFRACTORY) FIBERS.

5.4.2 Commercial. Marking shall conform to 5.4.1, except where ASTM D 3951 applies.

6. NOTES

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

6.1 Intended use. The specified material is intended for general use as a vibration damping material on shipboard structures.

6.2. Ordering data.

6.2.1 Acquisition documents. Acquisition documents specify the following:

- a. Title, number, and date of this specification
- b. When first article inspection is required (see 3.1)
- c. Thickness tolerance, if other than specified (see 3.4)
- d. Inspection conditions, if other than specified (see 4.2.1)
- e. Level of preservation and packing required (see 5.1 and 5.2)
- f. When Navy fire-retardant requirement for lumber and plywood is not required (see 5.2.1.1.1.1).
- g. Container selection, if not at contractor's option (see 5.2.2)
- h. When caseliners are not required (see 5.2.2.1.1)

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- i. When palletization is required (see 5.3)
- j. Special marking required (see 5.4).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27-475-1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraphs.

Paragraph No.	Data requirement title	DID No.	Option
3.2, 3.5, and 3.8	DI-MISC-80678	Certification/Data Report	10.3.1 does not apply
4.3	DI-T-4902	First Article Inspection Report	–
4.4	DI-T-2072	Test Report	–

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical items has been supplied previously (for example, test reports).

6.3 First article. When first article inspection is required, the item(s) should be a first article sample. The first article should consist of six units. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval for 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. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

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6.4 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets (MSDS) prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313. In order to obtain the MSDS, federal acquisition regulation (FAR) clause 52.223-3 must be in the contract.

6.5 Toxicity. The manufacturer of vibration damping tiles should disclose the formulation of his product to the Naval Medical Command (NAVMEDCOM) (see 3.2.1). The disclosure of proprietary information, which will be held in confidence by the NAVMEDCOM, should include the name, formula, and approximate percentage by weight and volume of each ingredient in the product; the results of any toxicological testing of the product; and such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, disposal, or combustion of the material.

6.6 Sub-contracted material and parts. The packaging 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.

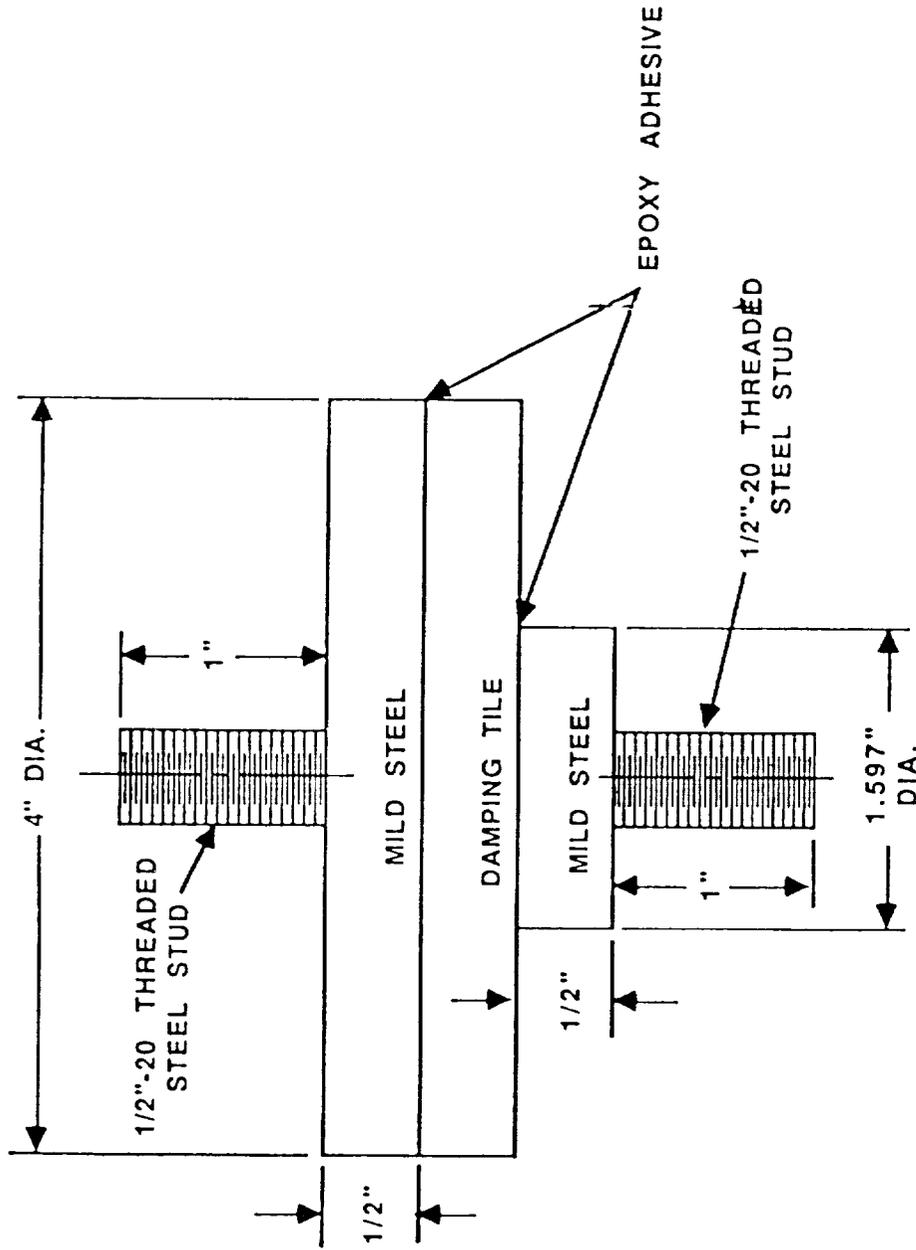
6.7 Subject term (key word) listing.

- Accelerometer
- Flame resistance
- Fuel and water resistance
- Self-extinguishing
- Trichloroethane

6.8 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.

Preparing activity:
Navy – SH
(Project 9330-NB04)

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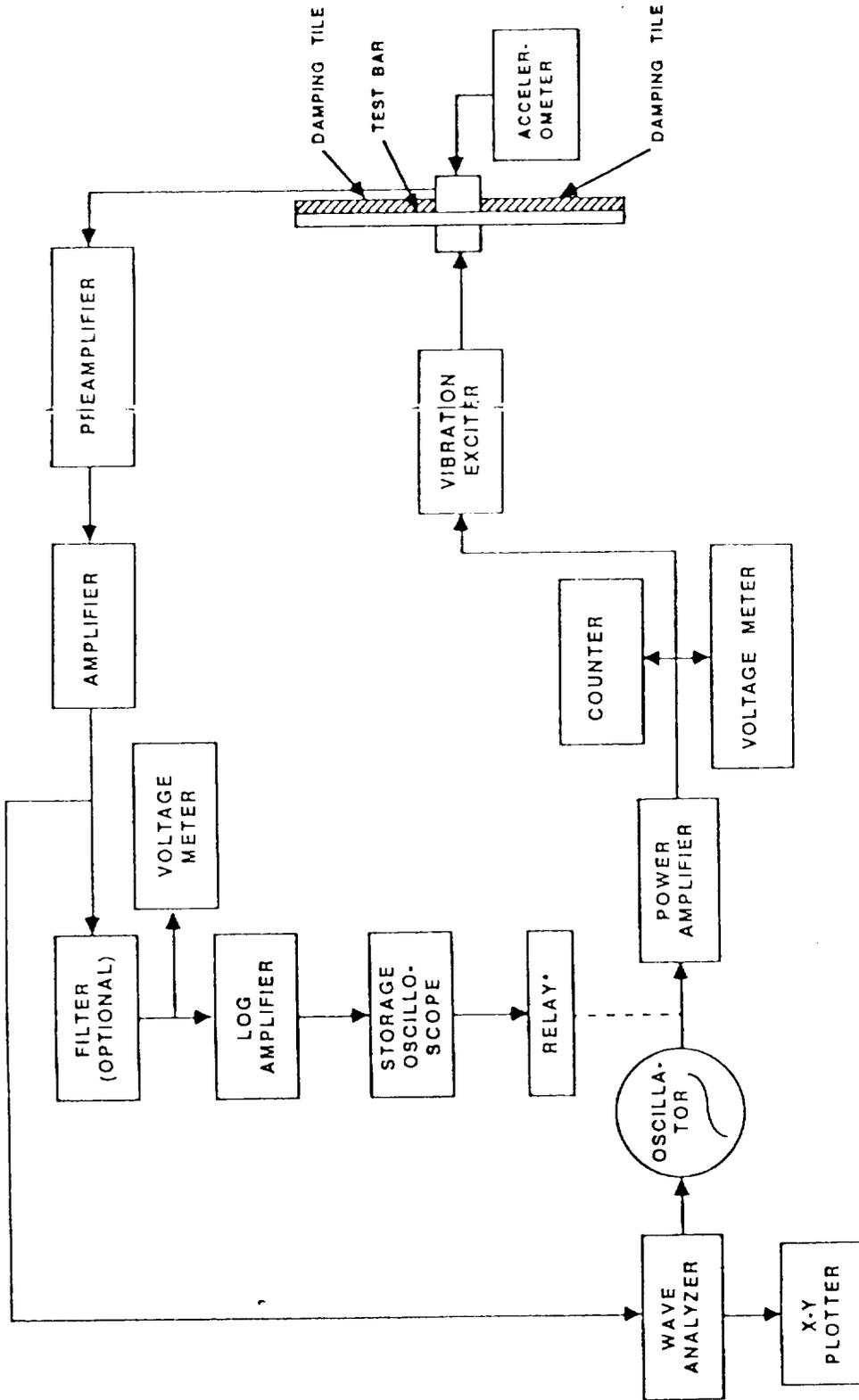


NOTE: STUDS MAY BE TAPPED OR WELDED TO STEEL PLATES

FIGURE 1. Adhesion test specimen.

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* RELAY INTERRUPTS OUTPUT OF OSCILLATOR AND SIMULTANEOUSLY TRIGGERS SCOPE

FIGURE 2. Schematic layout of instrument used to evaluate vibration damping.

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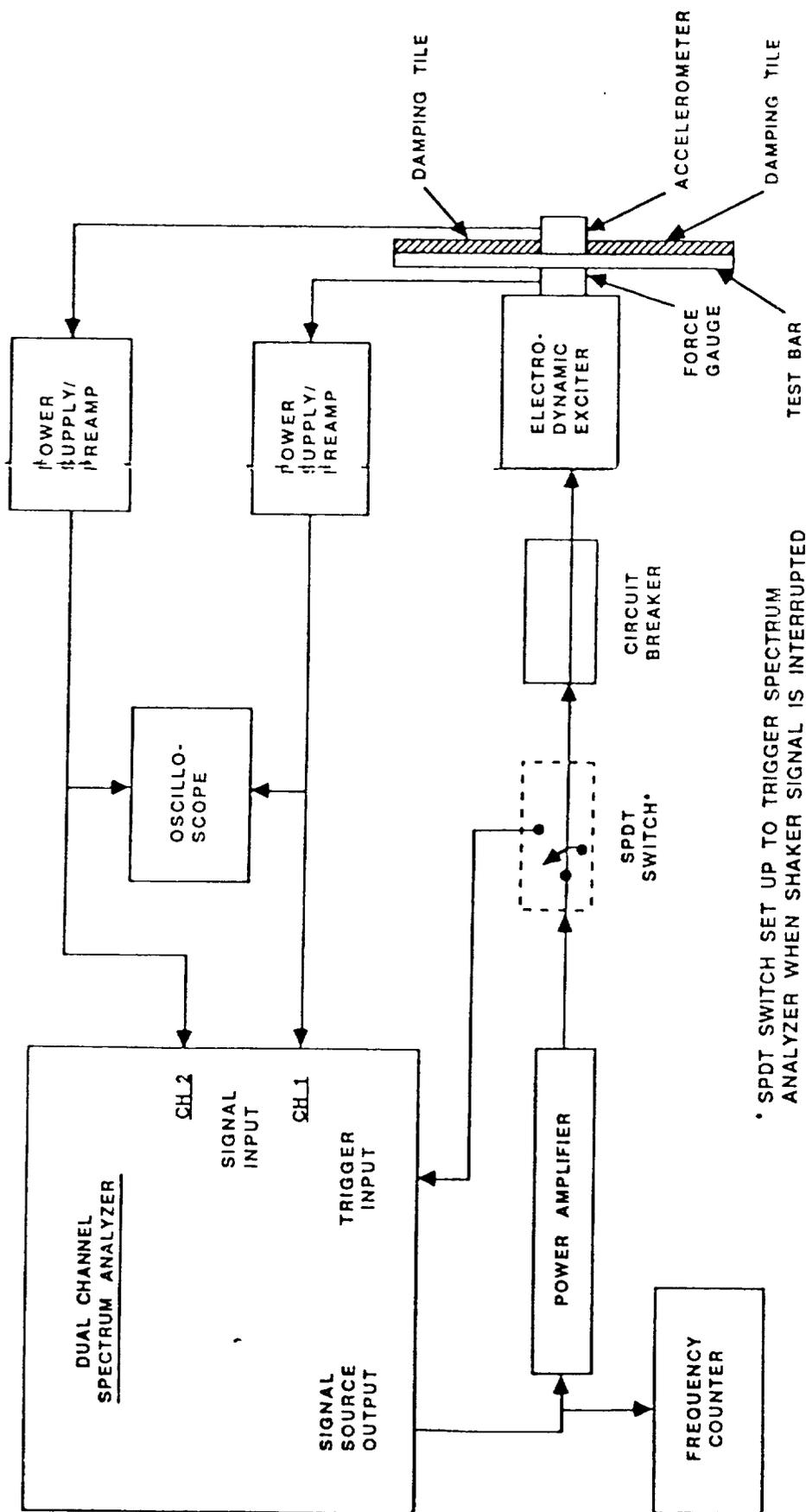


FIGURE 3. Schematic layout of alternate instrumentation used to evaluate vibration damping.

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APPENDIX

MATERIAL FORMULATION

10. SCOPE

10.1 Scope. This appendix details the composition and formulation of the material outlined in this specification. This is intended as a suggested formulation.

20.1 Formulation. The material formulation shown in table I has been found to meet the requirements of this specification.

TABLE I. *Suggested formulation (type III damping).*

	Function	Approximate percent by weight
Epoxy ^{1,2,3}	Co-reactant	3.0
Polyamide ^{4,5}	Co-reactant	17.0
Polyamine ⁶	Hardener	1.0
Antimony trioxide ⁷	Flame retardant	2.0
Chlorinated wax ^{8,9}	Flame retardant	7.0
Aluminum oxide or sand ^{10, 11}	Filler	70.0

¹6010 Epoxy Resin Ciba-Geigy, P.O. Box 12141, Church St. Station, New York, N.Y. 10249.

²Epotuf Reichhold Chemical, P.O. Box 10237, Newark, New Jersey 07101.

³Epon 828 Shell Chemical, P.O. Box 777W-4880, Philadelphia, PA 19175.

⁴Versamid 115 Henkel, 5325 S. Ninth Avenue, La Grange, IL 60525.

⁵37-613/TC 9113 Tri-Mont Chemicals, P.O. Box 513, Peabody, MA 01960.

⁶DMP-30 Rohm & Haas, P.O. Box 8500 S-1150, Philadelphia, PA 19178.

⁷75RA Oncor Anzon Inc., P.O. Box 8068-207, Philadelphia, PA 19177.

⁸Chlorowax IV40 Occidental Chemical, P.O. Box 15727-7521, 8800 Central Expressway, Dallas, TX 75239.

⁹CPI00001 Pearsall Chemical, P.O. Box 100538, Houston, Texas 77212.

¹⁰Aluminum Oxide Carborundum Company, Box 156, Carborundum Center, Niagara Falls, NY 14302.

Aluminum oxide 70PT – size 70, tough blocky, polishing type of grain.

Aluminum oxide 80 – approximate size 80 grain (Blastite).

Aluminum oxide 80W – size 80, medium sharp grain.

Aluminum oxide 80TP – size 80, rough, blocky, polishing type of grain.

Aluminum oxide 80FPI – size 80, friable, sharp polishing type of grain.

¹¹Sand (George F. Pettinos Inc., Coulter Avenue, Ardmore, PA 19003).

Sand – 80 mesh (55 percent – 80 mesh; 25 percent – 100 mesh; 15 percent – 50 mesh). Tolerance of plus or minus 5 for any percentage. These values refer to the percent of sand and that is retained on the mesh screen sizes indicated.

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APPENDIX

20.2 Suggested nomenclature.

20.2.1 Formulation. The component raw materials should be mixed together in the order given in table I. Each ingredient should be added to the mixture successively and thoroughly blended in prior to the addition of the next ingredient. The filler (aluminum oxide or sand) should be added to the mixture in small increments in order to ensure complete and thorough wetting of the filler. Following the addition of the last ingredient, mixing should continue for 15 to 20 minutes to ensure thorough blending. Mixing conditions and speed should be adjusted to prevent excessive incorporation of entrained air into mixture. Mixing guides include:

- a. A slow speed, heavy duty, double planetary type mixer has been found satisfactory.
- b. It has been found that the polyamine component may collect at the side of the container. If this occurs, the material should be scraped off the sides and blended into the mixture.
- c. The final mixture should have a density of approximately 180 pounds per cubic feet.

20.2.2 Casting. The mix should be charged into appropriate molds constructed to produce an end product which is smooth and flat and of the proper dimensional requirements and weight per square foot. Casting guides include:

- a. Flat glass and aluminum molds have been used successfully. Wooden molds covered with thick (1/16 inch or thicker) polyethylene may also be used.
- b. One-foot square silicon-treated cardboard boxes have been used successfully as combined casting and shipping containers.

20.2.3 Curing. The material charged into the mold should be allowed to cure either at room temperature (70 to 80 °F) for 96 hours, or at 160 °F for 10 to 12 hours, prior to removal from the mold.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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

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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-P-22581C(SH)	2. DOCUMENT DATE (YYMMDD) 23 October 1991
3. DOCUMENT TITLE Plastic Tiles, Vibration Damping Type III		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME Technical Point of Contact (TPOC): Mr. Robert Corbitt (SEA 51431) PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON	
c. ADDRESS (Include Zip Code) Commander, Naval Sea Systems Command Department of the Navy (SEA 5523) Washington, DC 20362-5101	(703) 602-0146 8-332-0146 IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardizat on Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	