

INCH-POUND

MIL-F-23788A(SH)

2 January 1991

SUPERSEDING

MIL-F-23788(SHIPS)

27 November 1963

MILITARY SPECIFICATION

FENDERS, MARINE, VINYL, AIR FILLED

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 cylindrical shaped air filled plastic fenders for protection of boats and harbor craft from damage when alongside other boats or pier.

1.2 Classification. Fenders shall be of the following sizes (see 6.2):

- 4 by 18 inches
- 5 by 24 inches
- 8 by 30 inches.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified,

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 20362-5101 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 2040

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MIL-F-23788A(SH)

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).

SPECIFICATIONS**FEDERAL**

PPP-F-320 Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes

MILITARY

MIL-P-116 Preservation, Methods of
MIL-L-19140 Lumber and Plywood, Fire Retardant Treated

STANDARDS**FEDERAL**

FED-STD-406 Plastic: Methods of Testing
FED-STD-601 Rubber, Sampling and Testing

MILITARY

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-2073-1 DOD Materiel Procedures for Development and Application of Packaging Requirements

(Application for copies should be addressed to the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) 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).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 3951 Standard Practice for Commercial Packaging

MIL-F-23788A(SH)

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may 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, 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 Fender composition. The fender shall consist of a one-piece cylindrical plastic shell having two mounting flaps; one flap projecting at each end and both flaps in the same plane.

3.1.1 Outside surface. The outside surface of the plastic shell shall have a semi-gloss finish and shall be smooth except for the mold line and manufacturer's indicia. Projection shall be not more than 0.040 inch above the surface.

3.1.2 Manufacturer's indicia. The manufacturer's indicia shall cover a maximum area of 6 by 3 inches.

3.1.3 Fender content. The fender shall be filled with air under pressure specified in table I and permanently sealed.

TABLE I. Fender pressure.

Fender size diameter by length (inches)	Gauge	
	Minimum (lb/in ²)	Maximum (lb/in ²)
4 by 18	3	4
5 by 24	3	4
8 by 30	1-1/2	1-1/2

3.1.4 Fenders shall be cured throughout the material.

3.2 Materials. Materials used in the fabrication of the fender shall be new. The entire body of the fender shall be made of a white plastisol. The plastisol shall consist of dispersion of polyvinyl chloride in suitable plasticizers or mixers of plasticizers including stabilizers, pigment or other ingredients necessary to enable the plastisol to meet the requirements of this specification.

MIL-F-23788A(SH)

3.3 Physical properties.

3.3.1 Physical form and dimensions. The physical form and dimensions shall be in accordance with figures 1 and 2 and table II.

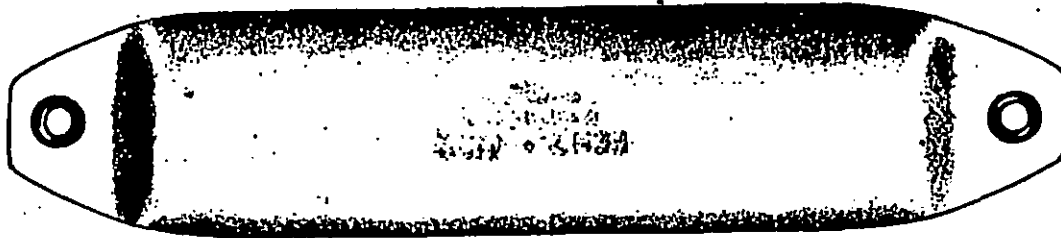


FIGURE 1. *Plastic air-filled fender.*

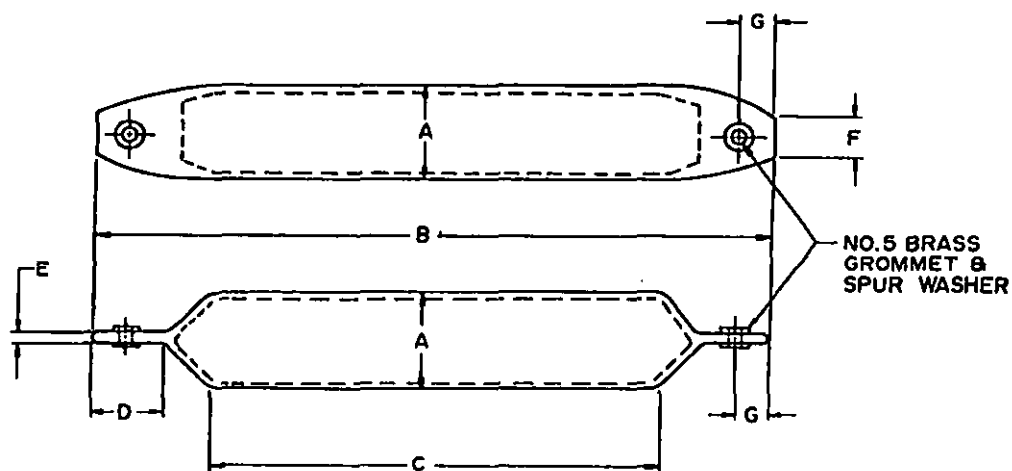


FIGURE 2. *Fender dimensions.*

MIL-F-23788A(SH)

Table II. *Dimensions and tolerances.*

Fender size	4 by 18	Dimensions in inches 5 by 24	8 by 30	Tolerances (inch)
Outside diameter (A)	4	5	8	+3/8, -0
Overall length (B)	18	24	30	+1/8, -0
Cylinder length (C)	11-3/8	16	19-3/8	±1/4
Flap length (D)	2-1/16	2-3/8	3-1/8	±1/8
Flap thickness (E)	3/8	3/8	3/8	±1/16
Flap width at end (F)	1-1/2	1-3/4	3	+3/8, -0
Center of grommet hole from end (G)	1-1/8	1-5/16	1-5/8	±1/8

3.3.2 Weight. Weight shall be as shown in table III.

TABLE III. *Fender weight.*

Fender size (inches)	Maximum (lbs)	Minimum (lbs)
4 by 18	2.5	1.75
5 by 24	4.0	3.50
8 by 30	10.0	9.00

3.3.3 Physical characteristics. The physical characteristics shall be as follows:

- | | | |
|-----------------------|---|-------------------------------|
| a. Specific gravity | — | 1.25 ± 0.10 |
| b. Hardness (Shore A) | — | 78 ± 5 durometer |
| c. Tensile strength | — | 1900 ± 100 lb/in ² |
| d. Elongation | — | 350 ± 10 percent |
| e. Tear strength | — | 350 ± 10 percent |
| f. Modulus | — | 100 percent, 1000 ± 50 lb |

3.3.4 Resistance to accelerated aging.

3.3.4.1 There shall be no exudation, tackiness, or stiffness of the fender.

3.3.4.2 The color change of the whole or part of the fender shall not be appreciable.

3.3.5 Grommets. The grommets in the flaps at both ends of the fender shall be a commercial size No. 5 with a spur washer. Brass grommets and washers shall be nickel or cadmium plated.

MIL-F-23788A(SH)

3.3.6 Air core pressure. The air core internal pressures shall be as specified in table I.

3.4 Identification. Fender identification shall be stenciled in black vinyl ink on one side of one flap as follows:

Manufacturer's part number
Diameter and length of fender
National stock number
U.S. Government property.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for compliance. All items shall 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 the 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 Sampling for quality conformance inspection.

4.2.1 Lot. Fenders produced from the same batch material mixture shall be considered a lot.

4.2.2 Sampling for examination. Sample fenders shall be selected at random from each lot in accordance with MIL-STD-105. The inspection level shall be level II for the examination specified in 4.3.

4.2.3 Sampling for tests. Sample fenders shall be selected at random from each lot in accordance with MIL-STD-105. The inspection level shall be 54 for the tests specified in 4.4.

4.3 Examination. Each fender selected in accordance with 4.2.2 shall be examined for appearance (smoothness, finish, and color) and measured to verify conformance to the dimensions in table II and weights in table III. Any sample fender having one or more defects specified in

MIL-F-23788A(SH)

table IV shall be rejected. If any defects are noted in the original sample fenders, additional fenders shall be randomly selected up to same number of samples found defective or as specified in the original sampling plan and if any defects specified in table IV are noted the entire lot shall be rejected.

TABLE IV. *Classification of defects.*

Categories		Defects
Critical:		
1		Material not as specified
2		External cracks or signs of failure
Major:		
101		Tolerance not in accordance with table II
102		Fender does not retain specified air pressure (see table I)
103		Grommets not as specified or incorrectly installed (see table II, figure 2 and 3.3.5)
Minor:		
201		Outside surface not clean, smooth (except for mold line and manufacturer's indicia) and not with semi-gloss finish (see 3.1.1)
202		Weight of fender not within limits specified in table III.

4.4 Tests. Completed sample fenders selected in accordance with 4.2.3 shall be subjected to the tests specified in 4.5.1 and 4.5.2. The fenders shall not burst, split, or show other signs of failure and shall return to its original shape and size. If any fender fails one or more of the tests specified in 4.5.1 or 4.5.2 the entire lot shall be rejected.

4.5 Test procedures.

4.5.1 Material specimen tests.

4.5.1.1 Hardness. Specimens shall be tested in accordance with methods 3021 and 3025 of FED-STD-601.

4.5.1.2 Tensile strength and modulus. Specimen shall be tested in accordance with method 4111 of FED-STD-601, utilizing dumbbell specimens prepared in accordance with figure 4111, die IV. Test specimens shall be between 0.065 and 0.075 inch thick.

4.5.1.3 Elongation. Ultimate elongation shall be determined in accordance with method 4121 of FED-STD-601.

4.5.1.4 Tear strength. Specimen shall be tested in accordance with method 4211, using die C of FED-STD-601.

MIL-F-23788A(SH)

4.5.1.5 Resistance to accelerated aging. Fused test specimens 2 by 6 by 0.125 inch \pm 10 percent shall be exposed for a period of 120 hours as specified in FED-STD-406, method 6022.

The specimens shall be conditioned for 24 hours at 77 ± 2 degrees Fahrenheit ($^{\circ}$ F) and checked for color change, exudation, tackiness, or stiffness.

4.5.2 Fender test.

4.5.2.1 Internal pressure test. Test internal pressure within limits listed in table I by use of hypodermic needle (or other similar Government approved means) assuring complete sealing after test. Allow adequate time for resealing before proceeding with the following tests.

4.5.2.1.1 Flex test. Perform a flex test to determine the development of any cracks in the internal cylinder wall of the fender due to inadequate curing.

4.5.2.1.1.1 A ram shall be made from a 2 inch channel, with 7 inches minimum length. Form web of channel into an arc with a 5 inch radius and with flanges of channel facing toward radius center. Position ram at right angles to longitudinal axis of fender and perpendicular to base on which sample is placed.

4.5.2.1.1.2 Perform test at center and approximately 2 inches from each end of the full cylinder of fender.

4.5.2.1.1.3 At each of the three locations specified in 4.5.2.1.1.2 apply 10 strokes with ram in rapid succession so that cylinder is compressed to within 1 inch of base plate making a total of 30 strokes.

4.5.2.1.1.4 After testing, examine fender by flexing with hand. Cup open fenders suspected to have developed internal cracks.

4.5.2.2 Compression test. At room temperature between two parallel surfaces, place fender with flaps parallel to these surfaces. The lower parallel surface shall overlap the compressed fender periphery. The upper parallel surface shall overlap the compressed fender diameter and extend in length such that the flap plus 3 inches shall be exposed at each end. The upper parallel surface edge that does not overlap fender shall have a minimum 3/16 inch radius. Compress fender with load of 200,000 pounds for a period of 30 seconds.

4.5.3.2 Impact tests. At room temperature, subject fender to impact load as follows:

- a. Place fender on solid concrete or steel floor with flaps parallel to floor
- b. The load shall be 200 pounds. The contact portion of the load shall be 3 inches nominal pipe size (nps) standard steel pipe. The length of the pipe shall be equal to fender diameter plus 2 feet.

MIL-F-23788A(SH)

- c. Position load 10 feet above fender with pipe longitudinal axis perpendicular to fender length and in plane parallel to floor
- d. The load shall strike at approximately mid-point of the fender and pipe lengths.

4.5.2.4 Cold soak. Cold soak fender at 0 °F for 6 hours and repeat impact test of 4.5.2.3, except position load 5 feet above fender.

4.5.3 Test failures. Test failures are defined as follows:

- a. Hardness greater than 83 or less than 73
- b. Tensile strength less than 1800 pounds per square inch (lb/in²)
- c. Modulus less than 950 or more than 1050
- d. Elongation less than 340 percent or more than 360 percent
- e. Tear strengths less than 340 or more than 360 lb/in²
- f. Accelerated aging causing appreciable color change, exudation, tackiness, or stiffness
- g. Internal air pressure for respective size fender not in accordance with table I
- h. Breaks, signs of failure, or is permanently deformed. Does not return to original size or shape when subjected to the tests specified in 4.5.2.

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

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 General.

5.1.1 Navy fire-retardant requirements.

- a. *Treated lumber and plywood.* Unless otherwise specified (see 6.2), 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-L-19140 as follows:

MIL-F-23788A(SH)

Level A and B Type II – weather resistant
 Category I – general use

Level C Type I – non-weather resistant
 Category I – general use.

- b. *Fiberboard.* Fiberboard used in the construction of interior (unit and intermediate) and exterior boxes including interior packaging forms shall conform to the class-domestic/fire retardant or class-weather resistant/fire retardant materials requirements as specified (see 6.2), of PPP-F-320.

5.2 Preservation. Preservation shall be level A, C, or commercial as specified (see 6.2).

5.2.1 Level A. Each air filled fender (see 3.1.3) shall be placed in a transparent or opaque bag. Bag closure shall be accomplished by heat or cold sealing, pressure sensitive tape, or provided with an interlocking or press fit type closure. Unit protection shall meet the requirement for method III of MIL-P-116. Each sealed bag shall then be placed into a water resistant, folding, set-up, or metal edged paperboard or fire retardant fiberboard unit container meeting the unit and intermediate container requirements of MIL-STD-2073-1. Fiberboard box closure shall be in accordance with method V of the appendix to the box specification. Container selection shall be at the option of the contractor.

5.2.2 Level C. Fenders shall be unit protected as specified under level A except that the unit container shall be as follows:

- a. The paperboard containers shall be of the domestic or non-weather resistant type, class, or variety as applicable
- b. The fiberboard containers shall be of the class-domestic/fire-retardant material (see 5.1.1 b.). The box closure shall be in accordance with method I using pressure sensitive, adhesive tape.

5.2.3 Commercial. Commercial packaging (cleaning, preservation, cushioning, unit and intermediate package) shall be in accordance with ASTM D 3951.

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

5.3.1 General requirements for levels A, B, and C. Containers selected (see 5.3.2), shall be of minimum weight and cube consistent with the protection required, of uniform size, and contain identical quantities of identical fenders.

5.3.2 Levels A, B, and C containers. Fenders preserved as specified (see 5.2), shall be packed in exterior shipping containers for the level of packing specified (see 5.3), in accordance with the

MIL-F-23788A(SH)

exterior shipping container requirements of MIL-STD-2073-1 and herein. Unless otherwise specified (see 6.2), container selection shall be at the contractor's option.

5.3.2.1 Caseliners, closure, and gross weight.

5.3.2.1.1 Caseliners. Unless otherwise specified (see 6.2), level A shipping containers containing fenders preserved level C or commercial shall be provided with waterproof caseliners in accordance with MIL-STD-2073-1.

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

5.3.2.1.3 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.

5.3.3 Commercial. Fenders preserved as specified (see 5.2) shall be packed for shipment in accordance with ASTM D 3951 and herein.

5.3.3.1 Container modification. Shipping containers exceeding 200 pounds gross weight shall have 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, stowage, and storage.

5.4 Marking, levels A, B, C, and commercial. In addition to any special marking required (see 6.2), interior packs and shipping containers shall be marked including bar coding for shipment, stowage, and storage in accordance with MIL-STD-2073-1.

6. NOTES

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

6.1 Intended use. This specification covers three different size marine vinyl fenders that are intended to be used on naval ships.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1)

MIL-F-23788A(SH)

- c. Size (diameter and length) of fender (see 1.2)
- d. Number of fenders required
- e. When fire retardant lumber and plywood is not required (see 5.1.1 a.)
- f. Class of fire retardant fiberboard required (see 5.1.1 b.)
- g. Level of preservation and level of packing required (see 5.2 and 5.3)
- h. Container selection if other than contractor's option (see 5.2.1 and 5.3.2)
- i. When caseliners are not required (see 5.3.2.1.1)
- j. Special marking required (see 5.4).

6.3 Subject term (key word) listing.

Grommet
Plastisol
Polyvinyl chloride
Tear strength

6.4 Changes from previous issue. Marginal notations 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 2040–N179)