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* INCH-POUND *

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SUPERSEDING
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FEDERAL SPECIFICATION

BOOMS: FLOATING OIL AND DEBRIS CONTAINMENT, DEPLOYABLE (FOR HARBOR USE)

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers commercially available, deployable booms used to contain spilled oil and debris in harbors of varying environmental conditions.

1.2 Classification. Booms shall be of the following classes as specified (see 6.2).

Class 1 - Overall height of not less than 14 inches and not greater than 18 inches
Class 2 - Overall height of not less than 19 inches and not greater than 28 inches
Class 3 - Overall height of not less than 29 inches and not greater than 36 inches

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: *
*Commanding Officer (Code 156), Naval Construction Battalion Center, Port *
*Hueneme, CA 93043-5000, by using the self-addressed Standardization *
*Document Improvement Proposal (DD Form 1426) appearing at the end of this *
*document or by letter. *

FSC 1945

Federal Specifications

QQ-A-200 - Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube and Wire, Extruded; General Specification For
QQ-A-200/8 - Aluminum Alloy 6061, Bar, Rod, Shapes, Tube and Wire, Extruded
PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-636 - Boxes, Shipping, Fiberboard

Military Specifications

MIL-P-116 - Preservation, Methods of
MIL-F-859 - Fuel Oil, Burner
MIL-A-8625 - Anodic Coatings For Aluminum and Aluminum Alloys
MIL-R-24049 - Rope, Polypropylene

Federal Standards

FED-STD-595 - Colors Used in Government Procurement
FED-STD-101 - Test Procedures for Packaging Materials
FED-STD-191 - Textile Test Methods

Military Standards

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 - Marking for Shipment and Storage

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from 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 which are current on the date of the solicitation (see 6.2).

ASTM:

ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Standard Specification for.
ASTM D 975 - Standard Specification for Diesel Fuel Oils.
ASTM F 818 - Terms Relating to Spill Response Barriers, Standard Definitions of.
ASTM F 962 - Oil Spill Response Boom Connection, Standard Specification for.

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

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 Terminology. Deployable boom designs use one or more flotation elements which provide the boom with buoyancy, a membrane which acts as a barrier to floating oil and debris, and one or more tension members which transfer tensile loads along the boom. Boom is manufactured in sections for handling, and the sections are joined using end connectors.

3.1.1 Boom types. Boom designs are classified as curtain-type or fence-type. Most deployable booms are curtain-type, however fence-type are also used. Curtain-type booms are provided with flexible material for the underwater portion of the membrane called the draft, and have one or more tension members located at the bottom of the membrane. Curtain-type booms sometimes use ballast to help stabilize the draft in the water. Fence-type booms provide a stiffened barrier which floats vertically in the water and generally acts as the tension member.

3.1.2 Towing adapters. Towing adapters, for towing or attachment to fixed objects, shall be provided by the boom manufacturer (see 3.6.12). Towing adapters shall be used with boom that uses the barrier material as a tension member, usually fence-type, or with boom that has both a top and bottom tension member.

3.2 Standard commercial product. The boom shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer’s standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer’s standard commercial product, shall be included in the boom being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer’s catalogs or brochures, and represents the latest production model.

3.3 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.2.1 and 6.2). If the contractor can show that their boom has been supplied to the government previously with favorable response from users, then the contracting officer may wave the first article test.

3.3.1 First article test plan. When a first article is required, the contractor shall submit a first article test plan for approval prior to conducting the first article tests (see 4.5.1 and 6.2).

3.4 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to ensure interchangeability of component parts, assemblies, accessories, and spare parts.

3.5 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible 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. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification.

3.5.1 Boom material. The boom material shall have a base material and a base material coating.

3.5.1.1 Base material. The base material of the boom membrane shall be fabric made from a polyester, nylon or aramid yarn or fabric.

3.5.1.2 Resistance to hydrocarbons. The boom material shall be resistant to hydrocarbons when tested in accordance with 4.5.2.2.1.

3.5.1.3 Base material coating. The base material shall be coated with 100 percent polytetramethylene ether glycol (PTMEG), polyvinylchloride (PVC), or an alloy fabric made up of PVC or urethane and other polyolefins. When specified (see 6.2), the contractor shall provide the specified base material coating which shall be either PTMEG, PVC, or an alloy fabric. See 6.1 for an explanation of the differences between material coatings.

3.5.2 Foam. The flotation foam shall be closed cell polyethylene or polypropylene. Foam construction shall be either a solid, single, continuous mass or a rolled foam. Foam "pellets" shall not be used. The foam shall be of a resilient nature capable of being subjected to normal handling during deployment and recovery without chipping, cracking, or crumbling.

3.5.3 Hardware.

3.5.3.1 Aluminum. All aluminum shall be 6061-T6. When specified (see 6.2), the contractor shall provide a certificate of compliance to insure that all extruded aluminum meets the requirements of QQ-A-200 and QQ-A-200/8. All aluminum required in this specification shall be anodized as specified in MIL-A-8625, type II, class I.

3.5.3.2 Steel. All fasteners, wire rope and cables used on the boom shall be made from stainless steel. Galvanized products shall conform to ASTM Standard A 153.

3.5.3.3 Rope. Polypropylene rope shall be as specified in MIL-R-24049, type I.

3.6 Boom design.

3.6.1 Boom material.

3.6.1.1 Material weight. Class I boom material shall weigh not less than 22 ounces (oz)/square yard (sq yd). Class II boom material shall weigh not less than 22 oz/sq yd. Class III boom material shall weigh not less than 30 oz/sq yd.

3.6.1.2 Material grab tensile strength. Grab tensile strength for Class I and Class II booms shall be not less than 300 pounds (lb)/in of width of material when tested in accordance with 4.5.2.2.2. Grab tensile strength for Class III booms shall be not less than 400 lb/in of width of material when tested in accordance with 4.5.2.2.2. When specified (see 6.2), the contractor can omit this test if a certificate of compliance from the fabric manufacturer can be supplied by the contractor to confirm that the material meets these requirements.

3.6.2 Freeboard. The freeboard of the assembled boom, the height above the free floating water line, shall be no more than 50 percent and no less than 30 percent of the boom overall height. In the event of puncture or tear of the flotation coating, freeboard loss shall not exceed 20 percent of the undamaged freeboard (see 4.5.2.3.1).

3.6.3 Draft. The draft of the boom shall be ballasted or stiffened to ensure the curtain or fence is perpendicular to the waterline.

3.6.4 Flotation. The flotation shall be either integral or detachable from the boom assembly. If the flotation is not integral to the boom assembly, field removal and replacement of damaged floats shall be possible. In the event of a puncture or tear in the flotation coating, there shall be no loss of freeboard below that of 3.6.2, or loss of flotation material to the environment. The flotation shall be completely enclosed by a coating meeting the requirements of 3.6.4.1.

3.6.4.1 Flotation coating. The flotation coating, at its thinnest point, shall have a puncture strength of no less than 100 lb when tested in accordance with 4.5.2.2.3. The coating shall hermetically seal the flotation to prevent water absorption when the boom is immersed in salt, brackish, or fresh water. Also, the flotation coating shall comply with paragraph 3.7.2 when tested in accordance with 4.5.2.2.5.

3.6.5 Section length. A boom section shall be 50 feet (ft) in length unless otherwise specified (see 6.2). A boom section shall include anchor attachment points as specified in 3.6.6, handholds as specified in 3.6.8, and ASTM end connectors as specified in 3.6.11.

3.6.6 Anchor points. Anchor points shall be located at the boom's center line at no more than 5 ft from each end of the boom section or at each end connector depending on the boom design. An anchor point shall have a 7/16-inch diameter grommet reinforced hole with 3/8-inch galvanized eyebolt or shackle.

3.6.7 Boom attachment method. All mechanical attachment fittings between flotation and boom material shall minimize stress concentrations which may result in excessive abrasion or tearing.

3.6.8 Handholds. The boom shall have handholds at the fold points in the boom. These handholds shall be capable of sustaining a 150 lb load applied as specified in 4.5.2.2.4 without permanent set, peeling, tearing, or elongation.

3.6.9 Material seams/splices. Seams shall be thermally welded, electronically welded with radio-frequency (RF) welding equipment, or ultrasonically welded. Sewn seams shall not be permitted. Seams shall have the full strength of the fabric.

3.6.10 Ballast. If required to maintain a vertical attitude under the conditions of 3.6.2, ballast weight shall be located at the bottom of the boom draft. The ballast material shall be integral with the boom material so that the ballast member does not abrade the boom material. All iron ballasts shall be hot-dipped galvanized.

3.6.11 End connectors. End connectors shall be in accordance with ASTM Standard F 962 with 3/8-inch stainless steel toggle pins.

3.6.12 Towing adapters. Two towing adapters for towing or attachment of the boom to fixed objects shall be provided for each 500 ft of boom. A towing adapter shall have an end connector as described in 3.6.11 for attachment to the boom. The adapter shall have 150 ft of double-braided nylon line connected to the adapter with a swivel and a shackle. The end of the nylon line which connects to the adapter shall have an eye-splice and thimble. One or more floats shall be provided to keep the adapter and connecting hardware on the surface of the water for ease of use when handling from a boat. The towing adapter, connecting hardware, and nylon line shall withstand a tension load of not less than the load for the corresponding boom class described in 3.7.1 without permanent deformation of any component.

3.6.13 Color. The color of the boom and its major components shall conform to FED-STD-595, approximating color No. 12197 international orange.

3.6.14 Repair kit. A field repair kit shall be provided in the quantities specified in the contract (see 6.2). The contents of the repair kit subject to the approval of the Government shall include, as a minimum, the following items:

a. Repair instruction pamphlet containing diagrams and instructions for:

    (1) Remaking end connections on completely severed boom sections.
    (2) Replacing lost or damaged ballast members when the design uses ballast.
    (3) Repairing tears and/or punctures in floats, in boom material, and in seams adjacent to end connectors.
    (4) Replacing floats, handholds, and anchor points.
    (5) Cleaning and preparing surfaces prior to repair.

b. Four sets of replacement anchor points.
c. One set of ASTM end connectors.
d. A hand-held thermal welder and a teflon-coated roller.
e. Tools and materials necessary to make these repairs.

3.7 Boom performance.

3.7.1 Tensile loading strength. Class I boom shall have a failure tensile strength of not less than 5,000 lb when tested in accordance with 4.5.2.1. Class II boom shall have a failure tensile strength of not less than 14,000 lb when tested in accordance with 4.5.2.1. Class III boom shall have a failure tensile strength of not less than 30,000 lb when tested in accordance with 4.5.2.1.

3.7.2 Temperature resistance. The boom material shall remain serviceable over a temperature range of -40 degrees Fahrenheit (oF) to +150oF. There shall be no cracks when tested at -40oF in accordance with 4.5.2.2.5. When tested at 150oF in accordance with 4.5.2.2.5, the outer covering of the material shall not become tacky or sag when vertically positioned like an assembled boom.

3.7.3 Cleaning. Marine growth will occur in boom that is immersed in salt, brackish, or fresh water. Cleaning this growth from the boom while in the water will consist of mechanical scraping means. These mechanical means shall not degrade the tensile loading strength requirements of 3.7.1. When boom is taken out of the water, oil residues shall be completely cleanable, as verified by the test of 4.5.2.2.6, using nontoxic industrial cleaning solutions. Any permanent softening or dissolving of the boom material or flotation coating following this operation shall be cause for rejection.

3.7.4 Operational. The boom shall be capable of containing and enclosing cleanup operations of limited oil spills in dockside areas surrounding vessels, barges, waste oil rings, and other harbor craft. The usual deployment of the boom is from a rafted configuration so the boom can be moved to high risk spill areas around docked vessels. The boom must be capable of sustaining the towing maneuvers of 4.5.2.3.2 without damage to the flotation, boom material, or loss of floats. Also, the boom must be capable of sustaining the towing maneuvers of 4.5.2.3.2 without submerging, twisting or inverting.

3.7.5 Field repairability. The boom shall be field repairable. Each repair shall be performed by not more than two trained personnel in not more than one hour. Failure to do so shall be cause for rejection. Repairs which must be conducted (see 4.5.2.3.3) are: replacement of flotation elements and assemblies; repairs to tears in the boom freeboard or draft and the replacement of an end connector on a trimmed damaged boom end. Permanent repairs shall not require the use of tools or procedures beyond those found in the repair kit specified in 3.6.14.

3.7.6 Operational replacement of sections. When tested as specified in 4.5.2.3.4, a 50 foot section of boom shall be replaced while at least three sections of boom are deployed. This test shall be performed by not more than three trained personnel in not more than two hours. Failure to do so shall be cause for rejection.

3.8 Construction. The equipment shall be designed and constructed to ease field maintenance. All adjustments and replaceable accessories shall be readily accessible. Conditions which can be hazardous to personnel or harmful to equipment shall not be allowed.

3.9 Dissimilar metals. Intimate contact between dissimilar metals which can be expected to cause galvanic corrosion shall be avoided. When such contact cannot be avoided, an interposing insulating material shall be provided to minimize the corrosive effect.

3.10 Marking. Each boom section shall be identified by an identification plate listing the manufacturer, date of manufacture, boom material (i.e. Class 1, urethane coated nylon), and contract number. Identification can also be accomplished by branding the fabric or engraving the end connector with the same information.

3.11 Workmanship. The boom, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs and sharp edges; accuracy of dimensions, and marking of parts and assemblies; completeness of coating, soldering-welding, brazing and riveting; alignment of parts and tightness of assembly screws and bolts; or any other defects which could impair serviceability.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Inspection of materials and components. In accordance with 4.1, the contractor is responsible for ensuring that materials and components used were manufactured, examined, and tested to the extent specified, in accordance with the requirements of referenced specifications and standards. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.2.1).
b. Quality conformance inspection (see 4.2.2).
c. Packaging inspection (see 4.6).

4.2.1 First article inspection. First article inspection shall be performed on one complete barrier assembly when a first article sample is required (see 3.3 and 6.2). This inspection shall include the first article test plan of 4.5.1, the examination of 4.4, and the tests of 4.5.2. Failure of the first article to pass the examination or any of the tests shall be cause for rejection. The first article may be a standard production item from the contractor’s current inventory provided the unit meets the requirements of this specification and is representative of the design, construction, and manufacturing technique applicable to the remaining units to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5, and the packaging inspection of 4.6. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. The unit of product shall be one boom assembly. All boom assemblies offered for delivery at one time shall be considered a lot for the purpose of inspection.

4.3.1 Sampling for examination. Every tenth section of boom with the end connectors attached shall be examined in accordance with 4.4.

4.3.2 Sampling for test. Samples of the boom material to be used for the tests of 4.5.2 shall be selected as in 4.3.2.1. Samples of the flotation coating to be subjected to the tests of 4.5.2 shall be selected as in 4.3.2.2. Each lot of boom assemblies shall be tested as described in 4.5.2.1. The contractor shall use boom sections taken from the delivery lot to perform the test of 4.5.2.1.

4.3.2.1 Boom material. Two samples of the same boom material used to make the boom freeboard and skirt shall be supplied by the contractor. The sample shall be no less than 1-1/2 ft long and the full depth of the boom including freeboard and skirt. The sample shall be identical in all manufacturing respects (like thickness and method of application of coating, and chemical additives) with the material used to produce boom lengths.

4.3.2.2 Flotation coating. Samples of the flotation coating to be subjected to the test of 4.5.2.2.1 shall be obtained cutting a 6- by 6-in flat square sample of the coating from the thinnest section of a flotation element identical to the production items to be supplied under this contract. The foam shall be removed from the underside of the sample before testing.

4.4 Examination. The first article and each sample selected in accordance with 4.3.1 shall be examined for compliance with the requirements of Section 3 of this specification. The examination shall be conducted as specified in Table I. Any sample having one major defect or two minor defects shall constitute cause for rejection.

TABLE I. List of defects.

Categories	Defects
Major:	
101	Boom not a standard commercial product.
102	Component parts, assemblies, accessories, and spare parts not interchangeable.
103	Materials not as specified.
104	Boom materials not as specified.
105	Abraded or torn material.
106	Material coating separated from base material.
107	Foam cracked, damaged or not as specified.
108	Hardware not as specified.

TABLE I. List of defects - Continued

109	Boom design not as specified.
110	Material seams not thermally, electronically, or ultrasonically welded.
111	Design and construction not as specified; dimensions not as specified.
112	Anchor points, handholds, ballast, or end connectors not as specified.
113	Workmanship is inferior and not as specified; extrusions not free from burrs and sharp edges; bolt holes not accurately drilled to coincide with bolts or other fittings.
114	Surfaces not cleaned or treated as specified.
115	Repair kit not as specified. Components missing or damaged.
Minor:	
201	Marking omitted or incorrect.
202	Color of boom not as specified.

4.5 Tests.

4.5.1 First article test plan. A written test plan for the performance of the first article tests of 4.5.2 shall be prepared and submitted to the Government contracting officer by the contractor at least 8 weeks prior to the commencement of tests as specified in the contract (see 6.2). The test plan shall include, but not be limited to the following:

a. Calendar schedule for conduct of:

(1) Boom failure tensile strength test as specified in 4.5.2.1.
(2) Field tests as specified in 4.5.2.3.

b. Location and brief description of facilities used for the laboratory tests of 4.5.2.2.

c. Procedure outline and description of instrumentation used for the test of 4.5.2.1.

d. Procedure outline for conduct of each of the field tests of 4.5.2.3.

e. List of boats and personnel involved and a schematic illustration of their deployment and use for the tests of 4.5.2.3.

4.5.2 First article. The boom first article and its components shall be subjected to the boom failure tensile strength test of 4.5.2.1, the laboratory tests of 4.5.2.2, and the field first article tests of 4.5.2.3.1 through 4.5.2.3.5. Failure to meet the minimum acceptable test results listed in the appropriate paragraphs in Section 3 of this specification shall be cause for the Government to refuse acceptance of all booms until corrective action has been taken and the minimum acceptable test results are met. Tests shall be conducted by the contractor and in the presence of Government representatives.

4.5.2.1 Failure tensile strength test.

4.5.2.1.1 Test method. Two sections of containment boom are tested by subjecting the sections to cyclic tests to 100 percent of the strength as classified in 3.7.1. For example, if a class I boom is desired, the contractor's boom is tested to see if it has a tensile strength of not less than 5,000 lb. Then, by applying tensile loading which progressively deforms the specimen to the point of failure, this value is recorded. For each phase of the test, values for tensile load and deformation are recorded and modes of failure described. Failure of the boom to meet the cyclic loading to 100 percent of strength by classification, paragraph 4.5.2.1.10, shall be cause for rejection.

4.5.2.1.2 Test application device. A suitable load application device such as a hydraulic jack shall be provided. The device must be capable of applying loads in excess of the predicted failure load on the boom.

4.5.2.1.3 Tensiometer. A tensiometer shall be selected which will encompass the range of values from no load up to the maximum boom tensile load which might be expected prior to failure of the boom.

4.5.2.1.4 End supports. The test bed shall be provided with end supports which shall have the strength and rigidity to resist deformation under the loads expected during testing.

4.5.2.1.5 Adaptors and connectors. The manufacturer's standard towing adaptors shall be used at each end of the specimen to be tested. Suitable shackles, cables, chain, etc. shall be provided to connect the towing adaptors to the test equipment, as diagramed in Figure 1.

4.5.2.1.6 Boom specimens to be tested. Equipment shall be arranged to apply tensile loading to at least two complete boom sections of standard length as supplied by the contractor. Shorter than standard boom sections may be used for this test provided the end connectors at each end of each boom section are fabricated identically to the contractor's full size standard boom section, each test section has at least one anchor point, and the length of the two sections is at least 10 ft.

4.5.2.1.7 Gauge points. Gauge points shall be affixed to each end of the test specimen to facilitate measurement of elongation during the test.

4.5.2.1.8 Elongation measurement scale. A measuring device shall be provided so that elongation measurements may be made throughout the test. The device shall have a precision equal or better than 1/1000th the distance between gauge points (i.e., .12 inch precision for 10 ft point separation. Note that .12 inch may be rounded off to 1/8th inch for this test).

4.5.2.1.9 Test bed preparation and calibration. The test bed shall be prepared with two end supports separated with clearance for the boom sections, two towing adaptors, and testing equipment as diagramed in Figure 1. The sections shall be mounted with one end having a towing adapter attached to one of the end supports. Use the tensiometer to link the towing adapter at the other end of the boom sections to the second end support. Suitable shackles, chain, cables, etc. can be used for making connections. In some cases it may be necessary to design and fabricate connecting devices to distribute loads evenly.

4.5.2.1.10 Cyclic loading to 100 percent of strength by classification. The boom sections shall be loaded to 100 percent of the strength chosen as in 3.7.1 by the contracting officer. The load shall then be reduced to 10 percent of this strength. Note the positions of the gauge points on the sections while under full tensile load and at 10 percent of the full tensile load. This loading cycle is then repeated until the specimen has been subjected to 10 complete cycles.

4.5.2.1.11 Test to ultimate failure or permanent deformation. If the specimen has not failed during the cyclic loading phase, it is then subjected to increasing loading until failure occurs. Failure is defined here as rupture of the tension member, skirt material, or end connector.

4.5.2.1.12 Test safety. Failure of a loaded containment boom can release substantial amounts of energy. During testing, personnel and equipment shall be positioned and protected so that sudden failure of the test specimen will not cause injury or damage.

4.5.2.1.13 Test report. The report shall provide a description of the boom tested, including the name of the contractor, the model number, and the class and size for which the boom was selected in 1.2. For each phase of the test, values shall be reported for length of the specimen and initial positions of the gauge points. The report shall also provide a tabulation with columns for observed data including boom elongation values, load values, and notes regarding any damage to boom fabric or other components. Consideration should be given to recording all gauge point positions and tensiometer values photographically. During the test to ultimate failure, sufficient data points shall be taken to permit plotting a curve of deformation vs. loading. The ultimate loading on the boom at the time of failure shall be recorded. The report shall include photographs and descriptions of any damage observed. The report shall identify boom components involved in the failure and provide a description of how the failure occurred.

4.5.2.2 Laboratory tests.

4.5.2.2.1 Resistance to hydrocarbons. A 2- by 3-in sample of the boom material and the flotation coating shall be immersed in the test fluid of 4.5.2.2.6 for 70 hours (+/-1 hour) at 73oF (+/-4oF). The tested samples shall be unacceptable if they crack, soften and become sticky, or otherwise show signs of decay which would affect long term use.

4.5.2.2.2 Material grab tensile strength test. As specified in paragraph 3.6.1.2, Class I and Class II booms shall have a grab tensile strength of not less than 300 lb/in of width of material when tested in accordance with FED-STD-191, Method 5100.1. As specified in paragraph 3.6.1.2, Class III booms shall have a grab tensile strength of not less than 400 lb/in of width of material when tested in accordance with FED-STD-191, Method 5100.1.

4.5.2.2.3 Flotation coating puncture strength. As specified in paragraph 3.6.4.1, the flotation coating, at its thinnest point, shall have a puncture strength of not less than 100 lb when tested in accordance with FED-STD-101, Method 2031.

4.5.2.2.4 Handhold strength test. One 50-foot long boom section, identical to those to be delivered, shall be subjected to the following test to ensure compliance with 3.6.8. Three of the handholds on the boom section shall be subjected to a 150 lb load for a duration of 5 minutes in each of the following directions: along the boom length, horizontally at right angles to the boom length, and vertically at right angles to the boom length. The load shall be applied with a 3/4-in rope loop through the handhold. A visual inspection following this test shall be made to determine compliance with 3.6.8.

4.5.2.2.5 Temperature resistance (boom material and flotation coating). A 1-in by 4-in specimen of the boom material with the long dimension warpwise and a 1-in by 4-in specimen of the boom material with the long dimension fillingwise shall be exposed for 4 hours at a temperature of -40oF +/-5oF with the temperature recorded at the lowest point in the chamber. The sample shall then be bent 180oF over a 1-in steel pipe that has been exposed in the test chamber with the test specimen to determine compliance with 3.7.2. The same sample shall then be heated to a temperature of +150oF to determine compliance with 3.7.2. The same test shall be performed for the flotation coating of 3.6.4.1 to determine compliance with 3.7.2.

4.5.2.2.6 Cleaning. Place a completely assembled boom section 50 ft in length in an area suitable for performing a cleaning operation. Spread completely Navy Special Fuel Oil conforming to MIL-F-859 or diesel fuel oil, grade 2-D, (ASTM-D 975) on approximately 10 ft of one side of the test section to simulate the condition of the boom after use during an oil spill. Utilizing the contractor's recommended nontoxic cleaning materials, clean the oil from the test section to demonstrate conformance to 3.7.3. Notation shall be made of areas of the boom that required special attention during the cleaning process.

4.5.2.3 Field first article tests. The boom first article shall be subjected to the field tests specified in 4.5.2.3.1 through 4.5.2.3.5. Failure to meet the minimum acceptable test results listed in referenced paragraphs in Section 3 of this specification shall be cause for the Government to refuse acceptance of all booms until corrective action has been taken and the minimum acceptable test results are met. Tests shall be conducted by the contractor in the presence of Government representatives. All of the following tests shall be conducted at a harbor test site in accordance with a test plan approved by the Government as specified in 4.5.1.

4.5.2.3.1 Freeboard and draft measurement. Place a 50-foot boom test section in the water secured with no tensile forces acting on it so that it is free floating. Make direct measurement of the boom freeboard at no fewer than five equally spaced locations along the boom. Determine the boom draft at these points by subtracting the freeboard measurements from the overall height of the boom. Average these values and use them to determine compliance with 3.6.2. Then, starting 2 inches above and ending 2 inches below the waterline, make a vertical cut in every other flotation chamber. Measure the resulting freeboard to determine compliance with 3.6.2.

4.5.2.3.2 Towing maneuvers. Perform the following towing maneuvers on the boom in sequence checking for compliance with 3.7.4 after each test:

a. Place ten sections of the assembled boom, or no less than 500 ft, in a rafted position as shown in Figure 2(a). Tie the boom to a pier structure. Using a towing assembly attached to anchor points on the end connector of the opposite end, a harbor craft secured to the towing assembly shall tow the rafted boom into a straight line. The craft speed shall be limited to bare steerageway until the boom is taut.

b. Tow the same 500-foot test length in a straight line after a 180-degree turn as shown in Figure 2(b) at no less than 3 knots for 15 minutes.

c. Attach the free end of the boom to another harbor craft and tow the boom in a "U" configuration at no less than 3 knots for 15 minutes. The vessels should be on the same course and parallel with a distance between them of no less than 250 ft.

4.5.2.3.3 Field repairability. To determine compliance with 3.7.5, perform the following operations with the repair kit of 3.6.14 on a 10-foot length of assembled boom. If the flotation is not integral with the boom material, remove and replace the float assembly on both sides of the boom. Regardless of flotation, cut the boom freeboard and draft with a knife or tool. Then, patch the tear completely. Also, completely sever the end connectors and then replace them by trimming and preparing the severed boom material as necessary and reseaming with one of the welding methods specified in 3.6.9. Each repair shall be performed by not more than two trained personnel in not more than 1 hour.

4.5.2.3.4 Operational replacement of section test. To determine compliance with 3.7.6, place three sections of the assembled boom, no less than 150 ft, in the water so that they are free floating with no tensile forces acting on them. From a small boat remove the middle section and replace it. This test shall be performed by not more than three trained personnel in not more than 2 hours.

4.5.2.4 Quality conformance tests. The contractor shall submit for Government approval, a quality assurance plan for production of booms procured under the contract. The plan shall ensure that all booms procured under the contract meet the performance requirements specified herein. The plan shall, as a minimum, outline the sampling method and the tests of the boom and boom materials, the flotation elements, and the attachment hardware to ensure quality control during production. The tests shall include, as a minimum, 4.5.2.1, and the laboratory tests of 4.5.2.2.

4.6 Packaging inspection. The preservation, packing, and marking of the item shall be inspected to verify conformance to the requirements of section 5.

5. PACKAGING

5.1 Preservation. The preservation shall be level A or Commercial, as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Disassembly. Disassembly shall be the minimum necessary to safeguard components known to be subject to damage or loss and to accomplish reduction in cube. Bolts, nuts, pins, and washers removed shall be reinstalled in one of the mating parts and secured to prevent their loss.

5.1.1.2 Booms. The booms shall be folded, rolled, or coiled, as applicable, to a minimum safe diameter, and secured if required, with cotton cord or by other suitable means.

5.1.1.3 Hardware. Hardware, which is not attached to the boom, shall be packaged in accordance with MIL-P-116, Method III.

5.1.1.4 Repair kit. Components of the repair kit shall be packaged in accordance with MIL-P-116, Method III.

5.1.1.5 Instruction pamphlets. The instruction pamphlet shall be packaged Method IC-3 in accordance with MIL-P-116.

5.1.1.6 Consolidation packaging. Small components of the repair kit and hardware shall be consolidated and packaged in close-fitting boxes conforming to PPP-B-636, class weather-resistant. The contents shall be blocked, braced, and cushioned to prevent movement inside the container or damage to the contents. The boxes shall be closed in accordance with the appendix to the box specification, Method IV.

5.1.2 Commercial. The complete barrier system shall be preserved to ensure protection against deterioration and damage during shipment.

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

5.2.1 Level A. The barrier system shall be packed in boxes conforming to PPP-B-601, overseas type. The contents shall be blocked and braced to prevent movement.

5.2.2 Commercial. The barrier system shall be packed in a manner which will ensure arrival at destination in satisfactory condition. Preparation for delivery shall comply with applicable carrier rules and regulations.

5.3 Marking. In addition to any special marking required in the contract, interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

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 booms covered in this specification are deployable booms used to control oil spills in harbors and inland waterways and around dockside vessels, barges, waste oil rings, and other harbor craft.

6.1.1 Base material coating applications. The choice between PTMEG, PVC, or an alloy fabric made of a combination of PVC, urethane or other polyolefin depends on user needs. To get their needs met, users should be aware of the differences between material coatings. The following is a brief explanation: PTMEG is used in environments exposed to high level aromatic hydrocarbons like gasoline. Also, PTMEG provides the highest abrasion resistance of all boom material coatings which would be effective where a boom will be used many times

in harsh conditions. PVC is used when economy is important. The cheapest of boom material coatings, PVC is used in temporary applications such as emergency only situations. Alloy fabrics have varying characteristics and are often the best buy for the price. They have characteristics in the spectrum between PTMEG and PVC, and the cost reflects this trend.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in acquisition documents:

a. Title, number, and date of this specification.
b. Class required (see 1.2).
c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
d. When a first article is required for inspection and approval (see 3.3).
e. When a first article test plan is required (see 3.3.1).
f. When a specific base material coating is desired (see 3.5.1.3).
g. When a certificate of compliance for the aluminum of 3.5.3.1 is required.
h. When a certificate of compliance can be accepted in place of the grab tensile strength test (see 3.6.1.2).
i. When the boom section length shall be other than 50 ft (see 3.6.5).
j. The quantity of repair kits to be supplied (see 3.6.14).
k. When a first article sample is required (see 4.2.1).
l. The exact delivery time of the first article test plan when required (see 4.5.1).
m. The level of preservation and packing required (see 5.1 and 5.2).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first article sample, or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of as many units as it takes to complete the tests specified herein. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

PREPARING ACTIVITY:

Navy - YD

(Project 1945-0066)

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.

Figure 1. Tensile strength test bed.
[FIGURE NOT INCLUDED]

Figure 2. Towing maneuvers.
[FIGURE NOT INCLUDED]

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* INCH-POUND *

A-B-2787
AMENDMENT 1
May 28, 1993

FEDERAL SPECIFICATION

BOOMS: FLOATING OIL AND DEBRIS CONTAINMENT, DEPLOYABLE (FOR HARBOR USE)

This amendment, which forms a part of Federal Specification A-B-2787, dated 26 February 1992, is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

The attached insertable replacement pages listed below are replacements for stipulated pages. When the new pages have been entered in the document, insert the amendment as the cover sheet to the specification.

Replacement page	Page replaced
17	Added
18	Added

MILITARY INTERESTS:

Custodians

Army - ME

Navy - YD

PREPARING ACTIVITY:

Navy - YD

(Project 1945-0069)

FSC 1945