

MIL-B-28617C(YD)
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SUPERSEDING
MIL-B-28617B(YD)
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MILITARY SPECIFICATION

BOOMS, FLOATING BARRIER, OIL (FOR HARBOR USE)

This specification is approved for use by the Naval Facilities Engineering 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 commercial type floating booms, standardized Navy hardware (hereinafter called hardware), and boom shipping-storage containers for use in the containment of spilled oil and debris in harbors.

1.2 Classification.

1.2.1 Booms. Booms shall be one of the following classes and sizes as specified (see 6.2.1):

Class I - 12-inch vertical barrier.
Class II - 24-inch vertical barrier.
Class III - 36-inch vertical barrier.

Size 1 - 50-foot length.
Size 2 - 100-foot length.
Size 3 - 200-foot length.

1.2.2 Hardware. Hardware shall be one of the following types and classes as specified (see 6.2.1):

Type - Boom connectors (pair).

Class I - For 12-inch boom.
Class II - For 24-inch boom.
Class III - For 36-inch boom.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Commanding Officer (156), Naval Construction Battalion Center, Port Hueneme, CA 93043 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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Type - Boom connector adapter.

Class I - For 12-inch boom.

Class II - For 24-inch boom.

Class III - For 36-inch boom.

Type - Boom bulkhead assembly.

Type - Boom towing assembly.

1.2.3 Shipping-storage container(s). Shipping-storage containers shall be one of the classes and sizes as specified (see 6.2.1):

Class I - For 12-inch boom.

Size 1 - 300-linear foot capacity.

Size 2 - 400-linear foot capacity.

Size 3 - 500-linear foot capacity.

Class II - For 24-inch boom.

Size 1 - 300-linear foot capacity.

Size 2 - 400-linear foot capacity.

Size 3 - 500-linear foot capacity.

Class III- For 36-inch boom.

Size 1 - 300-linear foot capacity.

Size 2 - 400-linear foot capacity.

Size 3 - 500-linear foot capacity.

1.2.4 Standard boom system. A standard boom system consists of the following:

- | | |
|---|---------|
| (a) Boom, 500 lineal feet (10-50 foot lengths) with end connectors. | |
| (b) Tow assemblies _____ | 2 each. |
| (c) Bulkhead assemblies _____ | 2 each. |
| (d) Adapters _____ | 2 each. |
| (e) Repair kit _____ | 1 each. |
| (f) Container, 500 lineal feet _____ | 1 each. |

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

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SPECIFICATIONS

FEDERAL

- QQ-A-200 - Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube, and Wire Extruded; General Specification for.
- QQ-A-200/8 - Aluminum Alloy Bar, Rod, Shapes, Tube and Wire, Extruded, 6061.
- QQ-S-781 - Strapping, Steel, Flat, and Seals.
- TT-P-320 - Pigment, Aluminum, Powder and Paste, For Paint.
- TT-T-291 - Thinner-Paint, Volatile Spirits (Petroleum-Spirits).
- TT-V-119 - Varnish, Spar, Phenolic-Resin.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Shipping, Fiberboard.

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

STANDARDS

FEDERAL

- FED STD No. 595 - Colors.
- FED TEST METHOD STD No. 101 - Preservation, Packaging, and Packing Materials: Test Procedures.
- FED TEST METHOD STD No. 191 - Textile Test Methods.
- FED TEST METHOD STD No. 601 - Rubber: Sampling and Testing.

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

DRAWINGS

CIVIL ENGINEER SUPPORT OFFICE (CESO)

- 73-11-1F - Boom Connector.
- 73-11-2F - Boom Connector Adapter.

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73-11-3F - Boom Bulkhead Assembly.
73-11-4F - Boom Tow Assembly.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

DEPARTMENT OF COMMERCE (DOC)

PS51-71 - Hardwood and Decorative Plywood.

NATIONAL BUREAU OF STANDARDS (NBS)

H28 - Screw-Thread Standards for Federal Services.

(Application for copies of DOC and NBS should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC. 20402.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
D975 - Specification for Diesel Fuel Oils.

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

ENVIRONMENTAL PROTECTION AGENCY (EPA)

(Submission of requests for using biodegradeable materials in operational tests of this specification should be made by the contractor to the particular Regional Environmental Protection Agency Office in charge of the area.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Department, 1616 P Street, N. W., Washington, DC 20036.)

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UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification.

(Application of copies should be addressed to the Uniform Classification Committee, Tariff Publishing Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

3. REQUIREMENTS

3.1 Description. Definitions for use in this document are listed in 6.5.

3.1.1 Boom. The boom shall consist of a fence or sail (above the waterline), skirt (below the waterline), float or series of floats, reinforcement as required, ballast, and anchoring provisions as specified.

3.1.2 Hardware. Hardware shall be as specified on the applicable drawings forming a part of this specification. It shall be noted that the drawings are for Navy designed hardware and do not preclude the use of manufacturer's boom accessories, such as reinforcing and ballast, that might be termed hardware, providing such hardware is integral with the boom and compatible with Navy designed equipment without modification to the Navy equipment. Compatibility may not be accomplished by use of shackles, pins, dowels, or other loose hardware.

3.1.3 Container(s). The container(s) shall be a weatherproof box for shipping specific classes and sizes of boom, attached and detached hardware, and a repair kit to various destinations, domestic and foreign. After arrival at its destination the container shall be used to store its contents. In addition to its shipping and storing capabilities, the container shall have an ease of access allowing its contents to be easily removed and repacked within a specified time (see 3.7.2.3), with a minimum of required manual effort. To insure proper integrity and weather tightness throughout the useful life of the container, removable panels shall be properly reinforced, gasketed, and provided with line-up marks to facilitate reinstallation.

3.1.4 Drawings. The drawings forming a part of this specification are engineering design drawings. The contractor is responsible for preparing his own shop drawings. Where tolerances prescribed could cumulatively result in incorrect fits, the contractor shall provide tolerances within

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those prescribed on the figures to insure correct fit, assembly, and operation of the item. No deviation from the prescribed dimensions or tolerance is permissible without prior approval of the contracting officer.

3.2 First article.

3.2.1 Boom. When specified (see 6.2.1), the contractor shall furnish one 1,000-foot length of boom complete with hardware of each class ordered for first article inspection and approval (see 4.2.1 and 6.4).

3.2.2 Hardware. When specified (see 6.2.1), the contractor shall furnish one boom connector and one boom connector adapter of each type and class, one boom bulkhead assembly, and one boom tow assembly for first article inspection and approval (see 4.2.1 and 6.4).

3.2.3 Container(s). When specified (see 6.2.1), the contractor shall furnish one shipping-storage container of each required size for first article inspection and approval (see 4.2.1 and 6.4).

3.2.4 Repair kit. When specified (see 6.2.1), the contractor shall furnish one repair kit of each class ordered, for first article inspection and approval (see 4.2.1 and 6.4).

3.2.5 Test plan. When specified (see 6.2.1), a written first article test plan shall be submitted prior to scheduling the first article tests (see 4.2.1 and 6.4).

3.3 Standard product. Except where modified herein, it is intended that the equipment and its component parts shall be a regular commercial product of the manufacturer or his suppliers. All parts, components, and assemblies shall be new, unused, and free from defects and imperfections which might affect the serviceability and appearance of the finished products.

3.4 Interchangeability. All units of the same type, class, and size shall be functionally and dimensionally interchangeable. This requirement includes parts, assemblies, and accessories.

3.5 Material. All material shall be as specified herein or on the applicable drawings. Material not specified shall be of the same quality used for the intended purpose in commercial practice. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual component or the overall assembly.

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3.5.1 Boom. All materials used for boom construction shall be inherently resistant to, treated to become resistant to, or be hermetically sealed from the effects of continuous exposure to the following working environment: sea water; fresh water; weathering, both ultraviolet and ozone; and petroleum products (crude oil through refined and treated oil products). Boom material, after use for oil containment, shall be easily cleaned with commercially available industrial detergents and water without damage to the materials.

3.5.2 Hardware.

3.5.2.1 Aluminum. All aluminum shall be 6061-T6. 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 1.

3.5.2.2 Stainless steel. All stainless steel shall be of standard quality suited for its intended use.

3.5.2.3 Galvanized products. All galvanized products shall conform to ASTM Standard A153.

3.5.2.4 Rope. The polypropylene rope shall be as specified in MIL-R-24049, type I.

3.5.2.5 Shell. The flotation shell of the boom tow assembly shall be medium density polyethylene.

3.5.2.5.1 Foam. The filling required in the flotation shell shall be polyurethane foam.

3.5.3 Container.

3.5.3.1 Container material option. Container material shall be that utilized by the manufacturer in his shipping-storage container provided that it meets the performance criteria specified herein.

3.5.3.2 Plywood. When plywood is the material utilized in container design it shall be type I (exterior), with a sound grade veneer in accordance with DOC PS51-71. Construction, size, and thickness shall be determined by design and test requirements specified herein.

3.5.3.2.1 Varnish. Varnish shall be as specified in TT-V-119.

3.5.3.2.2 Thinner. Thinner shall be as specified in TT-T-291.

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3.5.3.2.3 Aluminum pigment paste. Aluminum pigment paste shall be as specified in TT-P-320, type II, class 2.

3.6 Design.

3.6.1 Boom. The design of the boom shall incorporate the latest state-of-the-art developments for this type of equipment. The boom shall be capable of operation in and shall withstand air temperatures from -20° Fahrenheit (F) to 120°F without undue loss of strength (see 4.6.1.1.2) cracking when folding or unfolding, or tackiness during storage. Boom dimensions and design criteria shall be as indicated in Table I.

TABLE I. Boom dimensions and design criteria.

Class	Fence height (free-board) (inch)	Skirt depth (below water-line) (inch)	Barrier overall height (inch)	Current velocity perpendicular to boom (knots)	Wind velocity perpendicular to boom (mph)	Wave height to length ratio (h/l)
I	4	8	12 -0 +1	1.0	15	0.08
II	8	16	24 -0 +1	1.5	20	0.08
III	12	24	36 -0 +1	2.0	25	0.08

3.6.1.1 Structural strength. The boom shall be designed and constructed to withstand the following induced forces:

- (a) Straight line towing, one end of boom attached to towboat with the other end free, accelerated to speeds up to and including 10 knots at the rate of 5 knots per minute.
- (b) Launching from another vessel or pier.
- (c) Forces imposed by conditions stated in Table I while in towing configuration shown in Figure 2 at a speed of 1/2 knot.

The required strength for a class I boom shall be not less than 5,000 pounds (1b) static line pull; class II, 10,000 lb static line pull; and class III, 15,000 lb static line pull when tested in accordance with 4.6.1.1.7.

3.6.1.2 Barrier material and strength. The barrier shall be constructed of a nonporous, flexible material with a breaking strength not less than 400 lb per inch of width.

3.6.1.3 Seam or joint strength. All seams or joints in the barrier material shall have a breaking strength exceeding that of the basic material and shall be designed to transmit all imposed stresses without permanent deformation or failure.

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3.6.1.4 Weight. The weight of the boom shall be as light as practicable for ease of handling without sacrificing the structural strength required for the type of boom specified. Class I boom shall weigh not more than 1.5 lb per foot of length. Class II boom shall weigh not more than 2.25 lb per foot of length. Class III boom shall weigh not more than 3.00 lb per foot of length. All above weights are exclusive of ballast weight, end connectors, towing, or bulkhead attachments.

3.6.1.5 Flotation. Buoyancy provided by the float shall be sufficient to cause the boom to float in water and support the specified height of barrier (freeboard) above the level water surface when exposed to the wind, current, and other performance conditions specified in Table I. In no case shall the buoyancy per segment be less than five times the total dead weight per foot when completely assembled. The boom shall form a continuous barrier for its full height to prevent oil from washing over or escaping underneath the boom. The flotation level shall be maintained throughout the length of the boom and the end connectors shall not cause the boom to sag or dip below this level. Extra flotation at boom section ends may be required to compensate for the extra weight of the end connector assemblies. Approximate weights of the section end connector assemblies (male and female combined) are as follows: class I, 7 lb; class II, 12 lb; and class III, 17 lb. Exposed flotation shall not become excessively deteriorated when subjected to the tests of 4.6.1.1.10. In addition, the flotation material shall be of a resilient nature and capable of being subjected to normal handling during deployment and recovery without chipping, cracking, or crumbling. Conformance to this requirement will be determined by visual inspection of the test article after being subjected to the tests of 4.6.1.1.11 and 4.6.1.1.13.

3.6.1.6 Ballast. The skirt shall be weighted at the bottom, as required, to maintain the barrier in the vertical position, and to provide maximum obstruction to oil passage with wind and current velocities shown in Table I. Ballast materials shall be furnished with the boom and shall be lead weights, stainless steel cable, heavily zinc-coated chain, or chain or cable coated with elastomeric or polymeric material. When the ballast is enclosed in the boom material, the containment of ballast shall be of a design that shall minimize the effect of boom material abrasion during deployment and handling.

3.6.1.7 Anchor points. A 7/16-inch diameter grommet reinforced hole with 3/8-inch stainless steel or bronze eyebolt or shackle, shall be provided at not more than 50-foot intervals for attachment to anchorages furnished by others. Anchor points shall be attached to the primary reinforcing member (when used) or skirt and each end connector member (male

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and female, both sides) in a manner that will distribute the load, reduce point loading, and not affect boom stability when moored in place.

3.6.1.8 Handholds. Handholds shall be provided on top of the boom for handling purposes. The handholds shall be spaced on 10-foot centers. Each handhold and fastener shall be capable of sustaining a breaking strength of 300 lb in all directions when applied as specified in 4.6.1.1.8.

3.6.1.9 Grommets. All holes through multilayer fabric type boom material for fastening or attaching various devices shall be reinforced with grommets to prevent tearing. Prior to grommet installation, multilayered fabric shall be heat or chemically ring sealed around the hole to prevent fluid infiltration between material layers in the event of a grommet pull out.

3.6.1.10 Flexibility. The complete boom shall have a degree of flexibility that will allow the boom to be tightly wound on a 2-foot diameter drum without any adverse effects to any of the boom components when tested as in 4.6.1.1.11. Adverse effects are defined as tearing, cracking, warping, or permanent set of the boom or flotation materials as well as any detachment, loosening, or breaking of flotation attaching devices, ballast attaching devices, and vertical stiffeners when these components are incorporated in the boom design.

3.6.2 Boom components. Components of the boom are described in 3.6.2.1 through 3.6.4. Overall length of the boom and boom section length shall be as specified in 6.2.1.

3.6.2.1 Barrier skirt and fence. The skirt and fence shall form a continuous vertical barrier and shall extend continuously for the full length of each boom section. The barrier material shall be flexible between segment fold points when segment construction is utilized. Seam and pocket construction, when required, shall be either vulcanized welded or sewn with a double coating of the compound for watertightness. Joints at connections shall be suitably reinforced for strength and wear and shall conform to the design requirements of the end connector depicted in Dwg No. 73-11-1F. Vertical stiffeners, when required by the particular boom design, shall be subject to the requirements of 3.5.1 and shall be incorporated into the barrier in a manner that will preclude snagging during deployment and retrieval. Externally mounted stiffeners shall not hinder any of the performance requirements specified herein.

3.6.2.2 Floats. The floats shall consist of flexible or articulated buoyant units of the manufacturer's standard length for the type of boom specified herein. Floats may be either integral or detachable parts of

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the boom system. Floats may be either of solid core or enclosed particle form. When solid core float material is used, it shall be closed cell foamed plastic, natural cork, or similar high flotation material which will remain buoyant in the event of a cut, or puncture. All flotation material shall be watertight, oil, and weather resistant. When flotation material in particle form is sealed within puncture resistant casings, construction of the flotation area shall be such to allow not more than 10 percent particle emission, by weight, in event of tear and quantified when tested as in 4.6.1.1.17. For all cases when flotation material is encased or enclosed by fabric or similar material integral to the boom, each compartment or subcompartment, whichever is the shorter, shall be sealed to prevent fluid leakage from adjacent compartments that may become flooded. Boom flotation shall be designed to allow the boom to be deployed at a 90° angle over a 2-foot radius without showing signs of cracking, chipping, or other evidence of brittleness. When external flotation attaching devices are used, they shall be designed to preclude snagging of the attaching device during deployment and retrieval of the boom and shall not hinder any of the performance requirements specified herein.

3.6.2.3 Boom section(s). The boom shall be composed of a section or series of connected sections. Each section shall be designed to be easily and readily connected or disconnected from its adjacent section or specific attachment. Each section end shall be full depth of the section and shall conform to the design requirements of the end connector. A fiberglass rod conforming to Dwg No. 73-11-1F shall be encased in the section end to preclude slippage of the barrier material through the flanges of the connector. The encasement shall be sealed to prevent water intrusion. Sections shall be constructed in the following lengths as specified (see 6.2.1): Size 1, 50 foot; size 2, 100 foot; and size 3, 200 foot.

3.6.2.3.1 Locking rods. The locking rods shall be constructed of fiberglass in the configuration depicted in Dwg No. 73-11-1F so as to lock the boom fabric tightly into the end connector when tension has been applied to fabric. It shall be the responsibility of the manufacturer to size the rod so as to preclude slippage of the boom fabric or locking rod out of the end connector when subjected to the test of 4.6.1.2.3.

3.6.2.4 Section segments. When section construction is of a design utilizing segments, each section shall be constructed in segments not exceeding 10 feet in length to facilitate ease of storage, handling, and repair. Construction shall be of a design to permit folding of the section by segments (accordion style). The fold area shall be of sufficient length to insure free 180° folds. A minimum of 6 inches in length of the fold area shall be seamless (jointless). When construction is of a design utilizing a continuous flat fence and skirt, storage on reels will be acceptable. Reel drum shall not be greater than 2 feet in diameter.

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3.6.2.5 Stability line. When necessary to satisfy the stability requirements of 3.7.1.4 while in the towing configuration shown in Figure 2 against forces imposed by conditions stated in Table 1, a stability line shall be provided. The line may be synthetic webbing, corrosion-resistant metallic cable, or synthetic line running the full length of each boom section terminating at the section end connector.

3.6.2.5.1 Stability line fasteners. When a stability line is required, the method of fastening the line to the boom shall be determined by contractor design, but the mechanical and structural integrity of the system shall be capable of withstanding the forces imposed on the stability line, not impair boom deployment, and withstand the abrasion test of 4.6.1.1.17.

3.6.3 Repair kit. When specified (see 6.2.1), the contractor shall supply a contractor recommended repair kit for boom repairs. The kit shall contain the necessary tools and materials required for the repair of injured or deteriorated boom components. The kit will vary in accordance with boom design, but in general will include, but not be limited to, the following items:

Item	Description
1	All components in quantities to fabricate one 50-foot boom section with end connectors, plus one additional pair of end connectors, and two end connector adapters.
2	One pair scissors (size recommended by contractor).
3	One quart glue (type recommended by contractor).
4	One roll polo mastic tape (size recommended by contractor).
5	One large peg awl (size recommended by contractor).
6	One rivet gun (type recommended by contractor).
7	One box long aluminum rivets (type and size recommended by contractor).
8	One box short aluminum rivets (type and size recommended by contractor).
9	One box aluminum rivet washers (three washers for each rivet supplied).
10	One sail makers kit (needle, thread, hand thimble, and related items.)
11	One quart colloid cleaning agent.
12	One container (for storage of contents of kit).
13	Twelve spare end connector locking rods per Dwg No. 73-11-1F.
14	One repair instruction pamphlet which contains, as a minimum, an inventory list of components and adequate diagrams and instruction for:

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- (a) Remaking end connections on completely severed boom sections.
- (b) Repairing ballast chain break.
- (c) Repairing a large tear in:
 - (1) Flotation section.
 - (2) Skirt.
 - (3) Ballast chain pocket.
 - (4) Boom section immediately adjacent to end assembly.
- (d) Replacing/repairing missing or partially missing flotation pillow.
- (e) Replacing/repairing handles.
- (f) Strengthening undamaged handles.
- (g) Repair small tears or punctures in boom fabric material.
- (h) A blown up diagram of a complete boom section showing, and identifying, all parts including a complete male/female end assembly and towing assembly.
- (i) Instructions on cleaning and preparing surfaces prior to repair.

3.6.4 Hardware. Hardware shall be as specified on Dwg No. 73-11-1F through 73-11-4F.

3.6.4.1 Screw threads. All screw threads shall be in accordance with NBS H28.

3.6.5 Container(s). The container(s) shall incorporate design features of weatherproofing to allow a 10-year life of the container. Weatherproofing features shall allow for continuous exposure to weather conditions specified herein. Container classes, sizes, and capacities will be as shown in Table I. Strength and handling requirements will be as specified. Basically, design features shall allow for extending the usable life of the containers contents by protecting the contents against adverse weather conditions that would accelerate boom materials deterioration.

3.6.5.1 Classes, sizes, and capacities. There shall be three distinct classes of containers corresponding to the three classes of boom with three sizes in each class. Capacities for the various classes and sizes are shown in Table II.

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TABLE II. Container capacities.

Class	Size (in linear feet)		
	1	2	3
I	300	400	500
II	300	400	500
III	300	400	500

In addition to the lineal footage shown, each container shall have the capacity to contain all detachable floats, a repair kit, and the following boom hardware: (1) Two boom connectors (attached) per 50 foot of boom. (2) Two boom towing assemblies.

3.6.5.2 Handling. For handling purposes, the container base shall be of a skid type design incorporating a four-way forklift handling capability and openings for sling handling. The sling handling method shall include the use of spreader bars to prevent injury to the container and negate its weatherproofing features.

3.6.5.3 Static strength. The container(s) shall be designed to withstand a topline equivalent to the weight of two like containers fully loaded with their required contents.

3.6.5.4 Torsional strength. The container(s) shall be designed to withstand torsional forces imposed when the fully loaded container is tested as specified in 4.6.1.3.1.

3.6.5.5 Impact strength. The container shall be designed to withstand impact forces when fully loaded and tested as specified in 4.6.1.3.4.

3.6.5.6 Weather conditions. The container shall be designed to withstand extended exposure to sunlight, heat, and cold in an environment adjacent to salt water in temperatures ranging from -40°F to +120°F. In addition, container design shall incorporate features to prevent the entrance of water when exposed to heavy rain driven by a 50 mile per hour wind. The container shall incorporate drainage features that will serve as vents in addition to their primary purpose of drainage.

3.6.5.7 Light infiltration. The container(s) shall not permit the infiltration of direct sunlight when closed.

3.6.5.8 Ease of access. The container(s) shall be designed to permit easy manual access to allow manual loading and unloading as specified in 3.7.2.3.

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3.6.5.9 Securing of contents. The container(s) shall incorporate a method of securing the contents. This method shall restrain contents motion during shipment.

3.6.5.10 Boom support(s). When applicable, due to boom design, the contractor shall incorporate a method of supporting the boom for ease in handling during repacking of the boom in the container. When the method incorporates dunnage, this dunnage shall not increase the container volume by more than 5 percent.

3.7 Performance.

3.7.1 Boom.

3.7.1.1 Operational. The boom shall be capable of containing, enclosing, and aiding in cleanup operations of limited oil spills in harbors, lakes, and estuaries. The boom shall be easily and quickly deployed with a minimum of labor and equipment. With the boom stowed in its container on a dock, approximately 10 feet above water level, four crew members ashore and a towboat shall be capable of deploying 1,000 feet of boom in less than 15 minutes, including time required to attach the boom to the towboat.

3.7.1.2 Towing. The boom shall be capable of being towed as specified in 3.6.1.1 under the conditions listed in Table I, without corkscrewing or layover of more than 90° from vertical.

3.7.1.3 Flexibility. The boom system shall have sufficient flexibility and articulation to conform to the surface of the water and not bridge from crest to crest of waves having height to length ratio as shown in Table I.

3.7.1.4 Stability. With the boom fixed on each end, weighted with normal ballast, and deployed in current and wind velocity conditions approximating those shown in Table I, the boom skirt or fence shall not tilt more than 30° from the vertical.

3.7.2 Container(s). The container(s) shall maintain structural integrity and fulfill its purpose of protecting its contents during a 10-year life span with minimum maintenance when subjected to conditions specified in 3.6.5.6.

3.7.2.1 Handling. The container, when fully loaded, shall be capable of being subjected to repeated lifting by either slings or fork lift from all four sides of the container base, without deterioration of structural strength or visible deformation.

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3.7.2.2 Capacity. Each container shall have capacity to hold boom as specified in 3.6.5.1. Packing configuration of the boom, within the container, shall be developed by the contractor to allow unrestricted launching of boom directly off a pier and later retrieval back into the container.

3.7.2.3 Ease of access. The ease of access required for repacking of boom, into the container shall be judged by placing the following requirements in Table III on repacking the boom during a simulated boom restowage exercise performed by four men. Tests shall be run with largest type and class boom supplied under contract considering capacity requirements specified in section 3.6.5.1.

TABLE III. Repacking criteria (Note: Timing to begin with boom fully in water).

Container Class and size		Boom content (lineal feet)	Repacking time (not more than) minutes
I	1	300	15
I	2	400	20
I	3	500	25
II	1	300	15
II	2	400	20
II	3	500	25
III	1	300	20
III	2	400	25
III	3	500	30

3.7.2.4 Securing of contents. The contractor method of securing the contents of the container(s) shall prevent excessive motion of the contents when the fully loaded container is subjected to the tests of 4.6.1.3.1 through 4.6.1.3.6.

3.7.2.5 Hinges and latches. When hinges and latches are utilized in the container(s) they shall remain operable after extended exposure to a salt air environment.

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

3.8.1 Hardware. Construction or manufacturing processes shall be as specified herein or on the applicable drawings.

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3.8.1.1 Flotation shell. The flotation shell shall be rotary molded, medium density polyethylene having an approximately 3/16-inch wall thickness. The flat end of the shell shall be fitted with a 1-1/4 inch National Pipe Taper plug (see 3.6.4.1), thread formed in place, to permit foam filling. The shell shall be filled with 2.5 pounds per cubic foot polyurethane foam utilizing equipment providing accurate quantity measurement and temperature control so as to minimize distortion during the forming process. It shall be noted that preparation, application, and curing of polyurethane substances containing isocyanates present a health hazard to personnel involved in these processes, and that adequate protection shall be afforded.

3.8.2 Container(s). Container(s) shall be constructed in a manner that will enhance its weatherproof features.

3.9 Dissimilar metals. Intimate contact 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 Cleaning, treatment, and painting.

3.10.1 Cleaning. Wood surfaces to be painted or treated shall be smooth, dry, thoroughly cleaned, and free from any substances that would detract from the ability of the coating system to adhere to the surface.

3.10.2 Treatment.

3.10.2.1 Aluminum. All aluminum required in this specification shall be treated as specified in 3.5.2.1.

3.10.2.2 Wood. All wood required in the shipping-storage containers shall be treated as follows: (1) Apply two coats of varnish specified in TT-V-119, cut one-to-one with thinner specified in TT-T-291, type II, grade A. (2) This shall be followed by an application of one coat of uncut varnish specified in TT-V-119. (3) This shall be followed by an application of one coat of varnish specified in TT-V-119 mixed with aluminum pigment specified in TT-P-320, type II, class 2 at the ratio of 2 lb of paste to 1 gallon of varnish.

3.10.3 Painting. Treating of all wood required in this specification as specified in 3.10.2.2 shall preclude painting of the wood.

3.11 Color.

3.11.1 Boom. The color of the boom and its major components shall conform to FED STD No. 595, approximating color No. 12197 international orange, or color No. 13538 high visibility yellow.

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3.11.2 Shipping-storage container(s). The finish color of the container(s) shall be that produced by the treatment processes specified in 3.10.2.2.

3.12 Marking.

3.12.1 Container. Each container shall be marked with painted 2-inch high letters centrally located on the container top and two larger sides to give the following information:

OIL SPILL CONTAINMENT BOOM
 CLASS _____ SIZE _____
 QUANTITY _____
 CONNECTOR PAIRS QTY _____
 TOWING ATTACHMENT QTY _____
 REPAIR KIT _____

All blanks on container label shall be filled in by manufacturer before shipping.

3.12.1.1 Slinging instructions. Each container shall be marked with painted 2-inch high letters centered 6 inches from the top on all four sides:

WHEN SLINGING - USE SPREADER BARS

3.12.2 Repair kit. Each repair kit container shall be marked with painted 2-inch high letters centrally located on the top to indicate the class of boom for which the kit is intended (see 6.2.1).

3.13 Workmanship. All components, parts, and accessories required in this specification 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, sewing, soldering, welding, brazing, and riveting; alignment of parts, and tightness of assembly screws and bolts; or any other defects which could impair serviceability.

3.13.1 Extrusions. All extrusions shall be uniform in quality and condition; clean, sound, smooth, and free from hard spots, pipes, laps, cracks, kinks, seams, damaged ends, and other injurious defects within the limits consistent with best commercial practice.

3.13.2 Welding. Surfaces to be welded shall be free from foreign matter which would be injurious to the weld. Welding procedures shall be in accordance with a nationally recognized code. Welds shall be of sufficient size and shape to develop the full design strength of the parts connected by the welds. Welds shall transmit imposed stresses without permanent deformation or failure when subjected to proof or service loadings.

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3.13.3 Bolted connections. Bolt holes shall be accurately formed and shall have the burrs removed. Lockwashers or self-locking nuts shall be furnished on all nuts subject to loss of tightness by vibration. All bolts and other fasteners shall be free from burrs, seams, laps, loose scale, irregular surfaces, and other such defects. All bolts shall be coated with an anti-seize compound during assembly.

3.14 Technical publications. Technical publications shall be as specified in the contract and shall include instructions for connecting and deploying the boom, and guidelines for utilizing the boom system, plus such other instructions that are required to inspect, maintain, clean, repair, and store the boom after use (see 3.6.3 and 6.3). The number of copies to be furnished shall be as specified (see 6.2.1).

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 insuring that materials and components used were manufactured, examined, and tested to the extent specified, in accordance with the requirements of referenced subsidiary specifications and standards.

4.2 Classification of inspections. 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).

4.2.1 First article inspection.

4.2.1.1 Preliminary test program. When specified (see 3.2.5), a written preliminary test program shall be prepared for submittal and approval by the contractor to the Government contracting officer at least 2 weeks prior to the scheduled first article tests in accordance with the contract. The test program shall include, but not be limited to, the following:

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- (a) Schedule for practice sessions.
- (b) Schedule for test session.
 - (1) Deployment procedure.
 - (2) High speed tow procedure.
 - (3) Procedure for sweeping in a catenary configuration.
- (c) Water current, wave height, air speed, and direction monitoring equipment.
- (d) Number of boats and people involved and how utilized.
- (e) EPA approval for test and use of biodegradable oil.
- (f) EPA approval for contingency plan dealing with spill cleanup procedures.
- (g) Number and type of communication equipment to be made available during test.
- (h) Test data sheets in accordance with the sample format provided in Appendix I.

4.2.1.2 Boom. First article inspection shall be performed on one 1,000-foot length of each class of boom specified in the contract when a first article sample is required (see 3.2.1 and 6.4). This inspection shall include the examination of 4.5 and the tests of 4.6.1. 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.

4.2.1.3 Hardware. First article inspection shall be performed on one boom connector pair (male and female) and one boom connector adapter of each class, one boom bulkhead assembly, and one boom tow assembly when a first article sample is required (see 3.2.2 and 6.4). This inspection shall include the examination of 4.5 and the tests of 4.6.1. Failure of the first article to pass the examination or any of the tests shall be cause for rejection.

4.2.1.4 Container(s). First article inspection shall be performed on one container of each class and size when a first article sample is required (see 3.2.3). This inspection shall include the examination of 4.5 and the tests of 4.6.1. Failure of the first article to pass the examination or any of the tests shall be cause for rejection.

4.2.1.5 Repair kit. First article inspection shall be performed on one repair kit when a first article sample is required (see 3.2.4). This

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inspection shall include the examination of 4.5 and the tests of 4.6.1. Failure of the first article to pass the examination or any tests shall be cause for rejection.

4.2.2 Quality conformance inspection.

4.2.2.1 Booms. Quality conformance inspection shall be performed on the sample booms selected in accordance with 4.4.1.1. This inspection shall include the examination of 4.5, and unless otherwise specified (see 6.2.1), inspection of contractor filed Certificate of Compliance shall be accepted in lieu of quality conformance testing.

4.2.2.2 Hardware. Quality conformance inspection shall be performed on the sample hardware selected in accordance with 4.4.1.2. This inspection shall include the examination of 4.5 and unless otherwise specified (see 6.2.1), verification of contractor filed Certificate of Compliance shall be accepted in lieu of quality conformance testing.

4.2.2.3 Container(s). Quality conformance inspection shall be performed on the sample containers selected in accordance with 4.4.1.3. This inspection shall include the examination of 4.5 and unless otherwise specified (see 6.2.1), verification of contractor filed Certificate of Compliance in lieu of quality conformance testing.

4.3 Inspection lot. All units of the same size, type, and class offered to the Government at one time, shall be considered a lot for purposes of inspection. The sample units shall be complete items as specified in 4.2.1.2 through 4.2.1.5 except that boom length shall be a 50-foot section.

4.4 Sampling.

4.4.1 Sampling for examination.

4.4.1.1 Booms. Every tenth boom section shall be examined in accordance with 4.5.

4.4.1.2 Hardware. Random samples of the hardware shall be selected from each lot in accordance with MIL-STD-105. The inspection level shall be S-2 and the Acceptable Quality Level 4.0 percent defective.

4.4.1.3 Container(s). One out of each fifth container of the same class and size shall be examined in accordance with 4.5.

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4.4.2 Sampling for tests.

4.4.2.1 Boom.

4.4.2.1.1 Coated fabric. Two random samples of the fabric shall be selected from each 500 square yards or fraction thereof for the first article test. The sample shall be not less than 1-1/2 feet long and the full width of the coated fabric. The sample shall be fused simultaneously or identically with the booms fabricated from the material represented by the sample.

4.4.2.1.2 Seams in fabric. Not less than two samples of each type of seam in the fabric shall be furnished for the first article test and for each 500 feet of boom fabric during regular production. Seam samples shall be the same seams as used in the boom and shall be fabricated and fused identically and simultaneously with the boom seams. The sample shall have at least 4 inches of fabric on each side of the seam and the seam shall be centered.

4.4.2.1.3 Other material splices. Not less than two samples of each type of splice shall be furnished for the first article test. Splice samples shall be the same splices as used in the boom and shall be fabricated and bonded identically and simultaneously with the boom splices. The sample shall have at least 4 inches of material on each side of the splice and the splice shall be centered.

4.4.2.1.4 Other material. Two random samples of the boom material shall be selected from each 500 feet or fraction thereof for the first article test. The sample shall be not less than 1-1/2 feet long and the full depth of the boom. The sample shall be identical with the booms fabricated from the material represented by the sample.

4.5 Examination.

4.5.1 Boom. Each boom selected in accordance with 4.4.1.1 shall be examined for compliance with the requirements of Section 3 of this specification. Examination shall be conducted as specified in Table IV. Any boom having one major defect or two minor defects shall constitute cause for rejection.

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TABLE IV. List of defects.

Categories	Defects
Major	
101	Material not as specified.
102	Units of same size not interchangeable.
103	Abraded or torn boom material.
104	Defective material seams.
105	Undersized flotation members.
106	Damaged or missing grommets.
107	Design and construction not as specified, dimensions not as shown in Table I.
108	Weight of boom not as specified.
109	Handholds not provided or not spaced as specified.
110	Missing or damaged boom components and hardware affecting serviceability and reliability.
111	Workmanship is inferior and not as specified, extrusion not free from burrs and sharp edges, bolt holes not accurately drilled to coincide with bolts or other fittings, welds are sparse or incomplete.
112	Surfaces not cleaned, treated, and painted as specified.
113	Repair kit not as specified. Components missing or damaged.
114	Construction of storage container not as specified.
115	Method of securing components within storage container inadequate.
116	Color of boom not as specified.
117	Marking omitted or incorrect.
Minor	
201	Underweight ballast.
202	Unfastened flotation.
203	Unfastened ballast.

4.5.2 Hardware. Each sample selected in accordance with 4.4.1.2 shall be examined for compliance with Section 3 of this specification. Examination shall be conducted as specified in Table IV.

4.5.3 Container(s). Each sample selected in accordance with 4.4.1.3 shall be examined for compliance with Section 3 of this specification. Examination shall be conducted as specified in Table IV. Presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

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4.5.4 Repair kits. Each repair kit shall be examined in compliance with Section 3 of this specification. Examination shall be conducted as specified in Table IV. One major defect or two minor defects shall constitute cause for rejection.

4.6 Tests.

4.6.1 First article.

4.6.1.1 Boom. The first article, when required, shall be subjected to the tests specified in 4.6.1.1.1 through 4.6.1.1.18, as applicable. Failure to pass any phase of the required test shall be cause for the Government to refuse acceptance of all booms until corrective action has been taken. Tests shall be conducted by the contractor and in the presence of Government representatives.

4.6.1.1.1 Barrier material breaking strength. When coated fabric is used as barrier material, the breaking strength shall be determined for conformance to 3.6.1.2 in accordance with the grab Method 5100.1 specified in FED TEST METHOD STD No. 191. The force required for successful results of the tests shall be not less than 400 lb in both warp and fill directions. When other than coated fabric is used for barrier material, a similar test shall be performed.

4.6.1.1.2 Barrier material tearing strength. When coated fabric is used as barrier material, the tearing strength shall be determined in accordance with the tongue Method 5134 specified in FED TEST METHOD STD No. 191. The force required for successful results of the tests shall be not less than 150 lb in both warp and fill directions. When other than coated fabric is used for barrier material a similar test shall be performed.

4.6.1.1.3 Fabric abrasion test. Fabric strength after abrasion of the coated fabric shall be determined in accordance with the Wyzenbeek Method 5304 specified in FED TEST METHOD STD No. 191. The cloth shall be abraded on the face side for 2,000 cycles with 80 grit garnet paper. Five determinations each from the warp and fill shall be made per sample unit. Specimens shall be not less than 1-inch wide by a minimum of 6 inches long cut from the center of the abraded strips. The specimen shall then be subjected to the breaking strength test specified in 4.6.1.1.1 with success of test being dictated by a breaking strength result of not less than 270 lb per inch of width.

4.6.1.1.4 Accelerated weathering test. Fabric strength after accelerated weathering of the coated fabric shall be determined in accordance with the accelerated weathering Method 5804 specified in FED TEST METHOD STD No. 191. The test will be run with a carbon arc light and procedure

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will extend for 150 hours. Accelerated weathering test specimens shall be tested for breaking strength in accordance with the cut strip Method 5102 specified in FED TEST METHOD STD No. 191. The breaking strength shall be not less than 300 lb per inch.

4.6.1.1.5 Low temperature test. The low temperature resistance test shall be determined in accordance with FED TEST METHOD STD No. 191, Method 5874. The test temperature shall be $-20^{\circ}\text{F} \pm 4^{\circ}\text{F}$ sustained for a 60-minute duration. The loss in hydrostatic resistance shall be not greater than 5 percent.

4.6.1.1.6 Adhesion of coating. Periodic visual inspection of the boom fabric will be made during the tests of Section 4 to verify the integrity of material coating. Cracking, bubbling, or other visible evidence of delamination of the fabric coating shall be cause for rejection of the boom.

4.6.1.1.7 Boom tensile strength test. Boom tensile strength shall be determined for conformance to 3.6.1.1 in the manner specified below. For each type and class, two segments of 20-foot long boom test sectionn identical to those to be delivered, except for length, shall be assembled with end connectors at the two outermost ends. The test section shall be arranged in a testing machine, or similar device, and loaded with a static line pulling force not less than that stipulated in 3.6.1.1, holding this loading for a duration of not less than 15 minutes. Failure to hold, at or above the required proof load, for the required time frame shall constitute failure of this test. Indication of permanent set distortion or elongation of components on the boom or at connection points greater than 10 percent shall be cause for rejection. Cracking or breaking of flotation material or other boom components shall also constitute failure of this test. A stress versus strain diagram shall be developed for each test specimen based on the loading sequence prescribed in Appendix I.

4.6.1.1.8 Boom handhold strength test. One boom test section, identical to those to be delivered shall be subjected to a test to substantiate handhold compliance to 3.6.1.8. All handles on the section shall be subjected to three repeated 300-lb loads of 10-second duration each applied in each of three directions, 90° apart, in planes normal to and parallel to the longitudinal axis of the boom. Indication of excessive permanent set, peeling, tearing, or elongation shall be cause for rejection.

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4.6.1.1.9 Seam or joint breaking strength. Seam samples selected in accordance with 4.4.2 shall be cut to size 6 inches by 2 inches, with the seam parallel to the short dimension and centered. The long dimension of the specimen shall be parallel to the filling threads of the fabric. The edges of the specimen shall not be covered or coated in any additional manner. The breaking strength of the seam specimen shall be determined in accordance with FED TEST METHOD STD No. 601, Method 8311. Results shall be reported in lb per inch of width. Seam breaking strength less than the coated fabric shall constitute failure of this test. For electronically seamed materials, fabric failure near and parallel to the seam may be anticipated at force/inch levels up to 20 percent less than those required to break an equivalent unseamed specimen. When other than coated fabric is used for barrier material, a similar test shall be performed.

4.6.1.1.10 Exposed materials. Flotation material, when exposed, and all other exposed components fabricated of synthetic materials shall be subjected to the tests of 4.6.1.1.4 through 4.6.1.1.6 as modified:

- (a) Accelerated weathering test. Exposed flotation and other exposed components fabricated of synthetic materials shall be subjected to the accelerated weathering test for the prescribed 150 hours of 4.6.1.1.4. Upon completion of the 150 hours weathering test, the flotation and other components will be visually inspected for noticeable deterioration. Failure of this test will be excessive visual deterioration. The flotation material shall not be subjected to the breaking strength test of 4.6.1.1.4.
- (b) Low temperature test. Exposed flotation and other exposed components fabricated of synthetic materials shall be subjected to the test of 4.6.1.1.5 after which these items will be visually inspected. Excessive material degradation, warping, and cracking will be cause for failure.
- (c) High temperature test. Exposed flotation and other exposed components fabricated of synthetic materials shall be subjected to the high temperature test of 4.6.1.1.6. Upon completion of the test the items shall be visually inspected for degradation, warping, and cracking. Excessive visual degradation, warping, and cracking shall be cause for failure.

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4.6.1.1.11 Flexibility test. The test articles listed in this paragraph shall have passed the tests of 4.6.1.1.10 prior to being subjected to the following tests for conformance to the requirements of 3.6.1.5.

- (a) One 50 foot length of completely assembled boom shall be tightly wrapped around a 14 foot long, 2 foot diameter cylinder in a helical manner that will not cause the flotation member to overlap itself. The boom will remain on the cylinder for 5 minutes before removal. Duration of the test will consist of five cycles of emplacing and removal. Tightly wrapped is defined as preclusion of slipping a hand between the flotation member and the cylinder surface at any point along the flotation member. Visible tearing, cracking, warping, or permanent set of any boom material and any breaking or loosening of any attaching devices for boom components shall constitute failure of this test.
- (b) One 6 foot length of flotation material of cross sectional dimensions equal to those used on the production boom shall be tightly wrapped around the circumference of the cylinder described in (a). It shall then be subjected to the test procedure described in (a). Visible tearing, cracking, warping, or permanent set of flotation material shall constitute failure of this test.

4.6.1.1.12 Boom weight. At least three sections of boom shall be selected at random and weighed to determine conformance to 3.6.1.4.

4.6.1.1.13 Operational test. The boom shall be completely assembled and ballast weights installed as recommended by the manufacturer for the test conditions. The boom shall then be placed in a stowage condition, in its container, on the deck of a work boat or dock. Launch the boom by guiding the boom sections into the water over a dock-edge roller or chute and attach to a towboat. Payout the boom to determine conformance to the requirements of 3.6.1.5 and 3.7.1.1. Observe for snagging, binding, or other conditions which affect fast, easy payout of the boom.

4.6.1.1.14 Strength and stability requirements in towing. Tow the boom in a straight line, shown in Figure 2, at average speeds of 10 knots for 10 minutes using a towing assembly to determine conformance to 3.7.1.2. With each end of the boom attached to separate towboats, tow the boom for 20 minutes at an average speed of 0.5 knot under conditions comparable to the current and wind criteria specified in Table I. For tests involving 1,000 feet of boom, the towboats shall remain 300 feet or 30 percent

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of the boom length apart throughout the tow test as shown on Figure 2. This procedure will establish an appropriate stable catenary curve configuration by which boom performance according to 3.7.1.3 and 3.7.1.4 in straight line sweeping can be judged. The boom shall function freely in the water, shall not turn or tilt on its side, and shall remain intact throughout the test. End connection devices should be inspected for excessive boom and bracket wear. Surveillance of boom performance should be made at the apex of the catenary curve from a boat trailing the sweeping boom. Acceleration requirements on boom are to be tested as specified in 3.7.1.2.

4.6.1.1.15 Containment requirements in towing. While towing the boom in a catenary configuration as specified in 4.6.1.1.14, 10 gallons discharged at an even rate controlled at 5 gallons per minute, of biodegradable soybean oil, dyed with fluorescein for visibility in the water, shall be poured in an area midway between the tow boats, which is to be swept by the boom. When EPA or Coast Guard approval for such a spill is required, but not obtainable, straw or other suitable material may be substituted. The equipment required to perform the test is shown on Figure 3. No oil shall pass through or under the boom, based on visual surveillance.

4.6.1.1.16 Ballast pocket abrasion test. For boom with pocket ballast, two connected 50-foot boom sections, class 3, shall be dragged, from one end, across a 100-yard long concrete or asphalt paved surface so that the ballast pocket is in continuous contact with the paved surface. The boom shall be dragged at a minimum speed of 2 feet per second. Visual inspection of the ballast pocket will be made after the test run to determine the extent of abrasion occurring. The abrasion must be limited to the material coating and no abrasion of the reinforcing webb. Existence of frequent locations (more than two per 10 feet of length) along the test sections where the ballast pocket has worn through to the material webb shall constitute failure of this test.

4.6.1.1.17 Particle type flotation test. A vertical tear the length of the boom freeboard shall be created in a flotation segment end of the boom. The segment shall then be shaken over a 3-inch amplitude from one end at a 60 cycle per minute rate for 5 minutes. The emitted flotation shall be accumulated and weighed to determine the percentage loss. Successful performance of the test is determined by the following criteria.

$$\frac{\text{Weight of flotation emitted}}{\text{Weight of flotation segment contents}} \times 100 = \text{not more than 10 percent.}$$

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4.6.1.1.18 Cleaning. Place a boom test section of not less than 50 feet in length in an area that is suitable for performing a cleaning operation. Place and spread completely on one side only a sufficient quantity of oil, Navy Special Fuel Oil, conforming to MIL-F-859 or Diesel Fuel Oil-Grade 2D (ASTM D957), on a boom test section and its components to simulate the condition of the boom after operational usage on an oil spill. The fuel oil shall be applied at a temperature range of 70°F \pm 10°F. Utilizing contractor's recommended cleaning materials, thoroughly clean the oil from the boom to determine conformance to 3.5.1. Specific notation shall be made of those areas of the boom requiring special attention during cleaning to insure thorough oil removal.

4.6.1.2 Hardware. Each unit of hardware specified in 4.5.2 shall be subjected to the applicable test of 4.6.1.2.1. In addition, the flotation shell of the boom tow assembly shall be tested as specified in 4.6.1.2.2.

4.6.1.2.1 Tensile load test.

- (a) Boom connector, class 1. Assemble one boom connector pair (male and female) and subject the assembly to uniform tensile load of 7,500 lb. Deformation of the male or female connectors shall be cause for rejection. Deformation is defined as an increase in linear measurement between two points, punchmarked on the semicircular portion of the male and female connectors, prior to testing, 90° from the direction the tensile load is imposed.
- (b) Boom connector, class 2. Same as for class 1, except the tensile load shall be 15,000 lb.
- (c) Boom connector, class 3. Same as for class 1, except the tensile load shall be 22,500 lb.
- (d) Boom connector adapter, class 1, class 2, and class 3. Same as for the male portion of the boom connector of similar class.
- (e) Boom bulkhead and boom tow assemblies. The boom bulkhead and boom tow assemblies shall be subjected to the tensile load tests specified for the class 3 boom connector. A class 3 male portion of the boom connector will be utilized in these tests. In addition to the deformation rejection criteria specified, any visual distortion or structural weld failure shall be cause for rejection.

4.6.1.2.2 Water-tight integrity test. The flotation shell of the boom tow assembly shall be tested for water-tight integrity by chilling the shell to a temperature of 50 \pm 10°F and immersing the shell in water with a temperature of 130 \pm 10°F. The shell shall be kept submerged for not

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less than 3 minutes. Bubbling from the shell, indicating leakage, shall be cause for rejection. This test shall be conducted after the shell has been filled with polyethylene foam and sealed.

4.6.1.2.3 Locking rod test. With the end connector properly installed on a boom section and no tensile load on the boom, apply a 5 lb axial load to the locking rod for 60 seconds (+5 seconds). The rod may not move a distance greater than 10 percent of its own length when subjected to this test.

4.6.1.3 Container(s). One of each container specified in 4.5.3 shall be tested as specified in 4.6.1.3.1 through 4.6.1.3.9.

4.6.1.3.1 Corner-wise drop test. The container loaded to its capacity, shall be tested in accordance with test Method 5005 of FED TEST METHOD STD No. 101. The prescribed height of drop shall follow the published schedule in the test method based on total weight of the filled container. Relaxation of structural rigidity, excessive variation of joint spacing, or misalignment of movable panels shall constitute failure of this test.

4.6.1.3.2 Mechanical handling test. The container, loaded to its capacity, shall be fork lifted in accordance with paragraph 6.2 of Method 5011, Mechanical Handling Test, of FED TEST METHOD STD No. 101 and then inspected to determine the integrity of all joints and seams. Relaxation of structural rigidity, excessive variation of joint spacing, excessive damage to lifting pallet, loosening of lifting brackets, bending of structural members, or misalignment of movable panels shall constitute failure of this test.

4.6.1.3.3 Static strength test. Two like containers, loaded to capacity, or an equivalent weight providing the same pounds per square foot stress over an equal surface area shall be placed atop of the test container by fork lift. After 60 minutes, the test container shall be inspected to determine the integrity of all joints and seams. Relaxation of structural rigidity, excessive variation of joint spacing, permanent warp of frame, or misalignment of movable panels shall constitute failure of this test.

4.6.1.3.4 Impact strength test. The container shall be tested in accordance with Method 5012, Pendulum Impact Test, of FED TEST METHOD STD No. 101. Upon completion of the test, the test container shall be

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inspected to determine the integrity of all joints and seams. Relaxation of structural rigidity, excessive variation of joint spacing, goring of side panels, or misalignment of movable panels shall constitute failure of this test.

4.6.1.3.5 Dent resistance test. The container shall be tested in accordance with Method 5006, Dent Resistance, of FED TEST METHOD STD No. 101.

4.6.1.3.6 Securing method test. Upon completion of testing specified in sections 4.6.1.3.1 through 4.6.1.3.5, the securing method utilized shall be inspected to determine if an acceptable level of restraint of contents motion to prevent content abrasion has been achieved.

4.6.1.3.7 Sling hoisting test. The container shall be hoisted by sling in accordance with 6.3 of Method 5011, Mechanical Handling Test, of FED TEST METHOD STD No. 101 and then inspected to determine the integrity of all joints and seams. Relaxation of structural rigidity, excessive variation of joint spacing, excessive damage or loosening of hoisting bars or their mounts, bending of structural members, or misalignment of movable panels shall constitute failure of this test.

4.6.1.3.8 Leak test. After being subjected to prior tests specified in section 4.6.1.3, the test containers shall be tested in accordance with 1.3(b) of Method 5009, Leaks in Containers, of FED TEST METHOD STD No. 101. To prevent failure of this test, inspection of the interior of the container shall show entrance of no more than one pint of water.

4.6.1.3.9 Repack test. Conformance to the requirements in 3.7.2.3 shall be determined by repacking the boom during a simulated boom retrieval exercise performed by four men. The time requirements shall be as specified in 3.7.2.3.

4.6.1.4 Repair kit. Unless otherwise specified (see 6.2.1), the contractor shall demonstrate the ability of the repair kit to make the repairs listed in 3.6.3 (a) through (g).

4.6.2 Quality conformance.

4.6.2.1 Boom, hardware, and container(s). The contractor shall keep and maintain a file of Certificates of Compliance. The Certificate of Compliance shall cover all materials, components, parts, and accessories for each 1,000 linear feet of boom manufactured. In addition there shall be a Certificate of Compliance for each lot of containers and repair kits on the delivery schedule.

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4.7 Packaging inspection. The preservation-packaging, packing, and marking of the boom, hardware, repair parts, and shipping-storage containers shall be inspected to verify conformance to the requirements of Section 5.

5. PACKAGING

5.1 Preservation-packaging. The preservation-packaging shall be level A or C as specified (see 6.2.1).

5.1.1 Level A.

5.1.1.1 Disassembly. Disassembly shall be the minimum necessary to safeguard parts known to be subject to damage or loss, to accomplish reduction in cube, and permit ease of deployment of the booms from the shipping-storage container. Bolts, nuts, screws, 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 in a manner to permit ease of removal from the shipping-storage containers.

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 preserved and packaged as specified herein. Preservatives and methods of packaging shall be applied in accordance with MIL-P-116.

5.1.1.4.1 Scissors, awl, and rivet gun. These items shall be preserved with type P-7 preservative and packaged method IC-1 or IC-2.

5.1.1.4.2 Glue and cleaning agent. The glue and cleaning agent furnished in commercial containers shall be packaged method III, in a fiber-board box conforming to PPP-B-636, class weather resistant.

5.1.1.4.3 Tape, rivets, washers, and sailmakers kit. These items shall be packaged method IC-1 or IC-2.

5.1.1.4.4 Instruction pamphlet. The instruction pamphlet shall be packaged method IC-3.

5.1.1.4.5 Other components. Other components, such as boom sections, connectors, and adapters shall be packaged method III.

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5.1.1.5 Consolidated packaging. Small components of the repair kit and hardware, which is not attached to the boom, shall be consolidated packaged in boxes conforming to PPP-B-636, class weather resistant. The contents shall be cushioned, blocked, and braced to prevent movement inside the container or damaging of the contents.

5.1.2 Level C. The booms, repair kit, and hardware shall be preserved and packaged in a manner that will insure adequate protection against deterioration and damage during shipment. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

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

5.2.1 Level A.

5.2.1.1 Booms. The boom shall be packed inside the shipping and storage container. The contents shall be cushioned, blocked, or braced or otherwise secured to prevent movement inside the container.

5.2.1.2 Repair kits. The repair kits shall be packed in the container provided for each kit. The components shall be cushioned, blocked, and braced to prevent movement. The container shall be packed inside the shipping-storage container with the boom.

5.2.1.3 Hardware. The hardware which is not attached to the boom shall be packed in boxes conforming to PPP-B-601, overseas type, or PPP-B-621, class 2. The contents shall be cushioned, blocked, and braced to prevent movement. The packed hardware shall be placed inside the shipping-storage container, if space permits. If space is not available the packed hardware shall be shipped separate from, but at the same time as, the shipping-storage container.

5.2.1.4 Shipping-storage containers. The shipping-storage containers, containing the boom, repair kit, and hardware as applicable, shall be shipped uncrated. The openings into the containers shall be closed and secured with the fastening devices provided. To prevent accidental opening or pilferage, two flat steel straps conforming to QQ-S-781, class 1, type I, finish B, size 0.023 by 3/4 inch shall be placed around the container. The straps shall be placed not more than 18 inches from each end of the container. To prevent damage to the container, steel edge protectors shall be used under the strapping.

5.2.2 Level C. The boom, repair kit, hardware, and shipping-storage container shall be packed as specified for level A with the following exceptions: The steel strapping used on the shipping-storage container shall not be zinc coated. The wooden container for the hardware shall conform to Uniform Freight Classification rules or National Motor Freight Classification rules.

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5.3 Marking. In addition to the marking specified in 3.12, interior packages and shipping-storage containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The boom covered by this specification is to be used to control oil and debris pollution in inner and outer harbors and inland waterways at various Naval installations.

6.2 Ordering data. Procurement documents should specify:

6.2.1 Procurement requirements:

- (a) Title, number, and date of this specification.
- (b) Class and size of boom required (see 1.2.1).
- (c) Type and class of hardware required (see 1.2.2).
- (d) Class and size of container required (see 1.2.3).
- (e) When a first article sample is required for inspection and approval (see 3.2, 4.2.1, and 6.4).
- (f) When a preliminary test program is required (see 3.2 and 4.2.1).
- (g) When a repair kit is required (see 3.6.3).
- (h) Class of repair kit required (see 3.6.3 and 3.12.2).
- (i) Number of technical publications required (see 3.14 and 6.3).
- (j) When Certificate of Compliance shall not be used in lieu of Quality Conformance Tests (see 4.2.2).
- (k) When first article testing of repair kit is not required (see 4.6.1.4).
- (l) Level of preservation-packaging and level of packing required (see 5.1 and 5.2).

6.3 Contract data requirements. When this specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of paragraph 7-104.9(n) of the Armed Services Procurement Regulation (ASPR), the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of ASPR 7-104.9(n) are not invoked, the data specified below shall be delivered in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

<u>Paragraph</u>	<u>Data requirements</u>	<u>Applicable DD 1664</u>
3.2.5	Test Plan	DI-T-5204
3.6.3 and 3.14	Publications, Commercial	DI-M-24010A

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(Copies of Data Item Descriptions required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

6.4 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of paragraph 7-104.55 of the ASPR. The first article should be a first production item consisting of one complete boom with hardware, container, and repair kit. The contracting officer should include specific instructions in all procurement instruments, regarding arrangements for examinations, tests, and approval of the first article.

6.5 Definitions. Definitions listed below are illustrated in Figure 1.

- | | |
|-----------------------|--|
| Boom | - Synonym for floating barrier; a section or series of connected sections. |
| Barrier fence | - Portion of boom positioned above its free-floating water line designed to prevent release of contained oil due to splashover. |
| Barrier skirt | - Portion of boom positioned below its free floating water line designed to prevent release of contained oil due to oil particle entrainment and oil drainage. |
| Section | - Specified length of detachable portion of the boom with ends designed for mounting the section connectors. |
| Boom segment | - Portion of a boom section of 10-foot maximum length which allows each boom section to be folded accordian style. |
| Section end connector | - Navy Standard Design metal connector, male or female, used for: <ul style="list-style-type: none"> (a) Quick coupling of boom sections. (b) Quick coupling of boom section to bulkhead assembly. (c) Quick coupling of boom section to towing assembly. |
| Weatherproof | - Able to withstand exposure to weather without damage or loss of function. |

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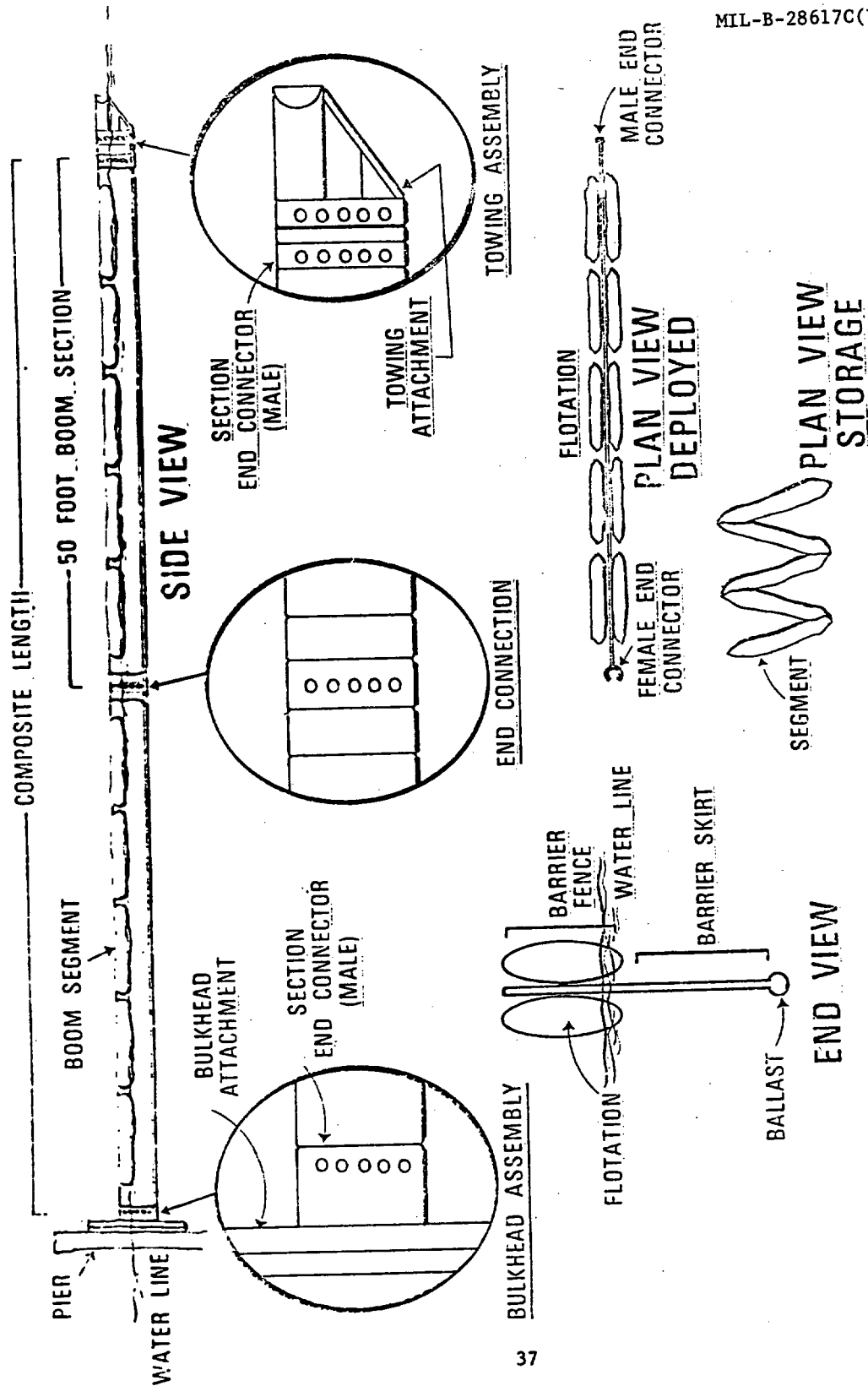
6.6 Revision changes. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensive changes involved.

Preparing activity:

Navy - YD

Project No. 1945-N033

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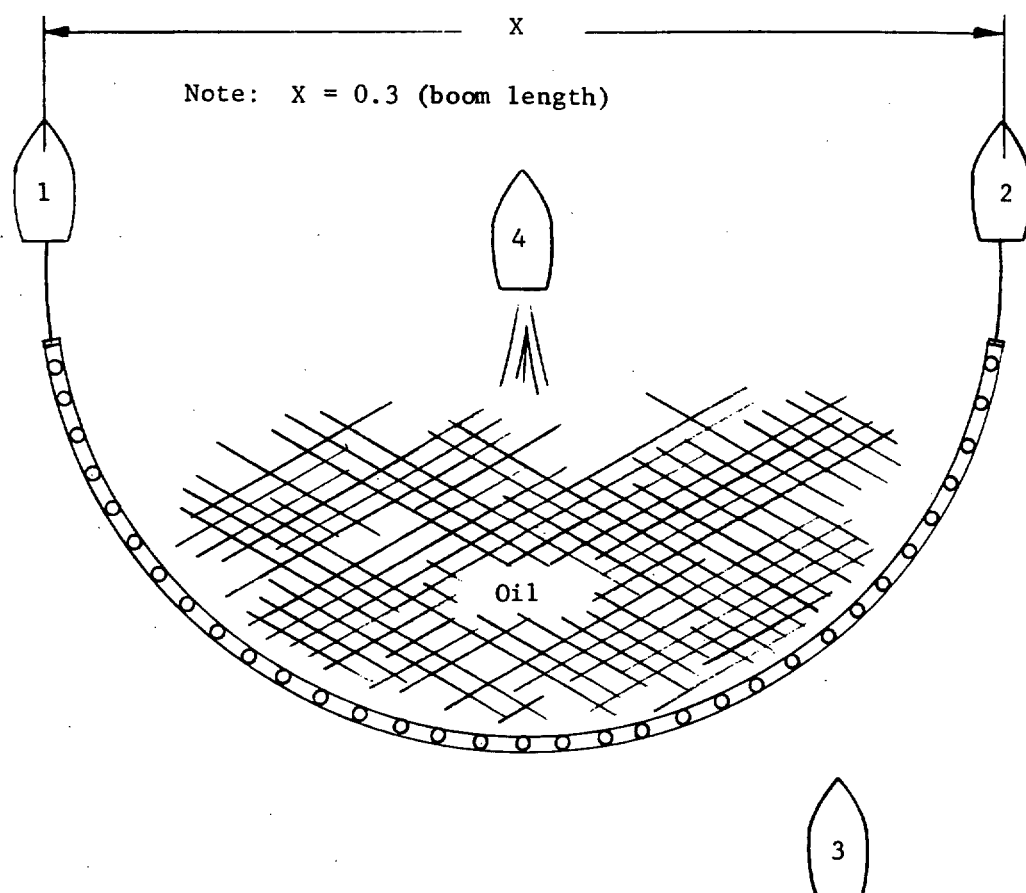


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SCHEMATIC OF GENERAL BOOM TERMINOLOGY

FIGURE 1

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**Boats required:**

Number 1 and 2 (towboats).

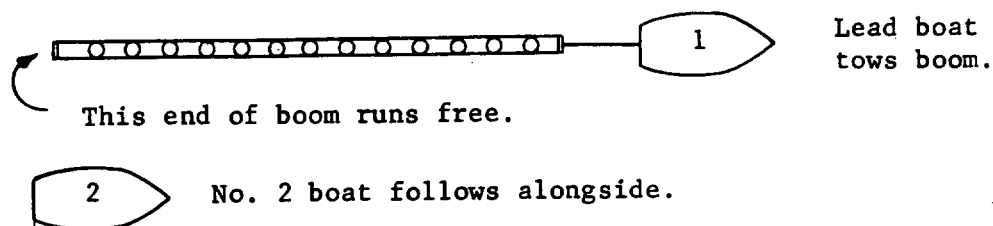
Number 3 (surveillance boat).

Number 4 (oil release boat, number 3 may be used in lieu of number 4, if feasible).

Figure 3 Oil containment configuration

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A. High speed tow test.



B. At an area where oil can be collected.

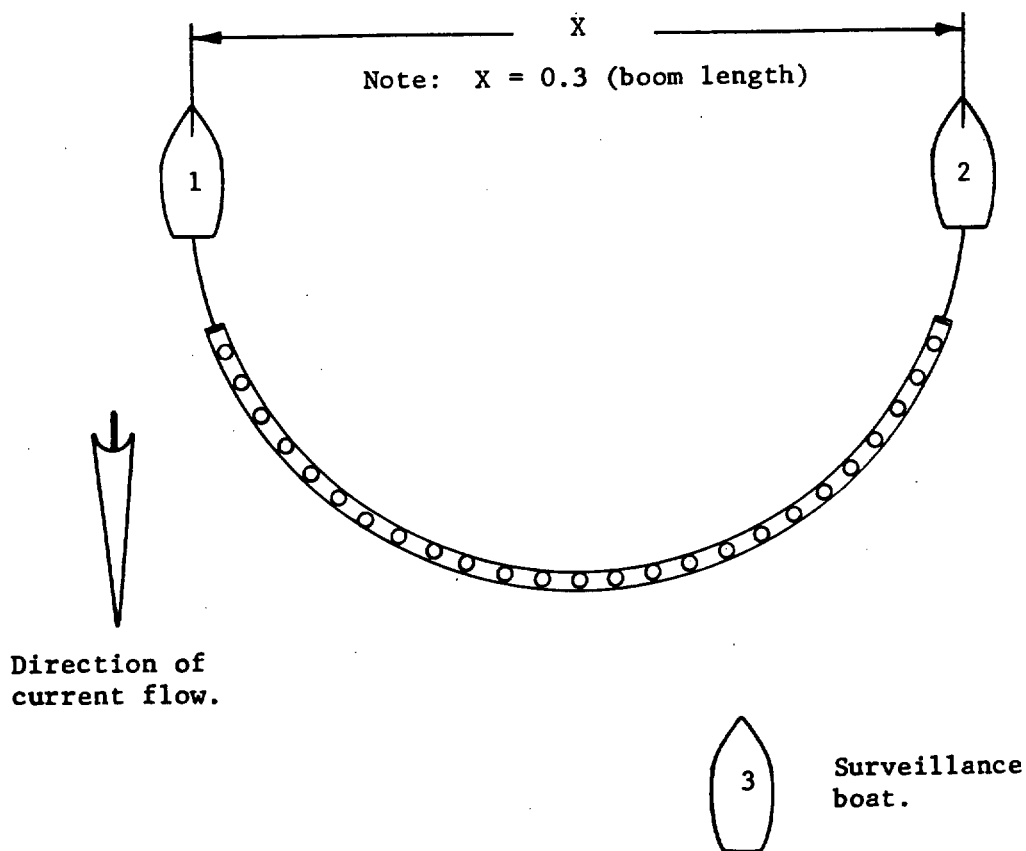


Figure 2. Strength and stability configuration

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Appendix

Appendix I

TEST LOCATION/LABORATORY:

ADDRESS/PHONE NUMBER:

CERTIFIED PERFORMING TECHNICIANS:

DCASD REPRESENTATIVES:

TEST REPORT

Ref: Para. 4.6.1.1.7 MIL-B-28617B, Boom Tensile Strength Test (Full Scale)

	<u>Actual</u>	<u>Required</u>
Class 1		
Class 2		
Class 3		

Strain at above loads

<u>Required</u>	<u>Actual</u>
10 percent	
10 percent	
10 percent	

Original length of samples

Tensile load schedule
Strain (inches/inch)

<u>Load (lb)</u>	<u>Class I</u>	<u>Class II</u>	<u>Class III</u>
1,000			
2,000			
3,000			
4,000			
4,500			
4,700			
4,800			
4,900			

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Appendix

5,000
6,000
7,000
8,000
9,000
9,500
9,700
9,800
9,900
10,000
11,000
12,000
13,000
13,500
14,000
14,500
14,700
14,800
14,900
15,000

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Appendix

Ultimate Strength

Stress Vs. Strain Diagram For Each Sample
Comments and Discussion:

Signature: _____

Date: _____

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Appendix

TEST LOCATION/LABORATORY:

ADDRESS/PHONE NUMBER:

CERTIFIED PERFORMING TECHNICIANS:

DCASD REPRESENTATIVES:

TEST REPORT

Ref: Para. 4.6.1.1.4 MIL-B-28617 Accelerated Weathering Test

Required 360 lb/in, Warp and Fill

Actual _____ lb/in, Warp

_____ lb/in, Fill

Test Procedure: Test Method Std. No. 191, Method 5804 and 5102
Comments and Discussion:

Signature: _____

Date: _____

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

OTHER (Specify):

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (VYMMDD)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)