Designation: F 1523 – 94

Standard Guide for Selection of Booms in Accordance With Water Body Classifications[1]

This standard is issued under the fixed designation F 1523; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the selection of containment boom that may be used to control spills of oil and other substances that float on a body of water.

1.2 This guide does not address the compatibility of spill control equipment with spill products. It is the user's responsibility to ensure than any equipment selected is compatible with anticipated products.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 751 Test Methods for Coated Fabrics[2]

F 625 Practice for Classifying Water Bodies for Spill Control Systems[3]

F 715 Test Methods for Coated Fabrics Used for Oil Spill Control and Storage[3]

F 1093 Test Methods for Tensile Strength Characteristics for Oil Spill Response Boom[3]

3. Summary of Guide

3.1 Recommendations for the selection of spill containment booms are given for five key boom characteristics that affect performance for each of four water body types (see Table 1). Notes accompanying Table 1 discuss the qualifying factors associated with the minimum values listed, as well as the significance of the values as minimums. Classification criteria for the four water body types are given in Practice F 625.

4. Significance and Use

4.1 This guide is to be used to assist in the selection of containment boom in accordance with water body classifications.

4.2 A small number of key parameters that generally affect boom performance have been used in Table 1, in order to enable the user to readily identify general criteria for boom selection.

4.3 Many factors, other than those listed in Table 1, may be important in selecting containment boom for a particular application. Such factors include: flotation element length, wave length, the effect of stronger than minimum required strength members, shock loads, abrasion resistance, stability in roll, resistance to bridging, interval between anchor points and hand holds, use of reflectors or lighting, compatibility with fresh or salt water, and resistance to sunlight exposure.

4.4 The values given in Table 1 are the recommended minimums for general purpose booms. As identified in 2.3, operational considerations may require trade-offs in boom properties. Special purpose booms, and general purpose booms used in special circumstances, may perform effectively with boom property values above or below those recommended in Table 1.

4.5 Effective operation of oil spill control equipment depends on many factors, of which the prevailing environmental conditions are just a few. Factors such as, but not limited to, deployment techniques, level of training, personnel performance, and mechanical reliability can also affect equipment performance.

5. Keywords

5.1 boom; oil spill; oil spill control equipment

---

[1] This guide is under the jurisdiction of ASTM Committee F-20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.11on Control.

Current edition approved May 15, 1994. Published July 1994.

[2] *Annual Book of ASTM Standards*, Vol 09.02.

[3] *Annual Book of ASTM Standards*, Vol 11.04.

TABLE 1 Recommendations for Selection of Spill Containment Booms

Boom Property[A]	Calm Water	Calm Water-Current	Protected Water	Open Water
height (range)[B], mm (in.)	150 to 600 (6 to 24)	200 to 600 (8 to 24)	450 to 1100 (18 to 42)	900 to 2300+ (36 TO 90+)
minimum gross buoyancy to weight ratio[C]	3:1	4:1	4:1	8:1
minimum total tensile strength[D], N (lbs)	6800 (1500)	23 000 (5000)	23 000 (5000)	45 000 (10 000)
minimum fabric tensile strength[E], N/50 mm (lbs/in.)	(2 TM): 2600 (300) (1 TM): 2600 (300)	2600 (300) 2600 (300)	2600 (300) 3500 (400)	3500 (400) 3500 (400)
minimum fabric tear strength[F], N (lbs)	450 (100)	450 (100)	450 (100)	450 (100)

[A] The values given in parentheses are provided for information purposes only.

[B] The boom dimensions are given as total height, with an assumed freeboard of 33 % (minimum) of boom height for calm, protected, and open water, and a freeboard of up to 50 % of height for calm water-current. Within the range of boom heights cited, values should be selected in accordance with the specific conditions of the application considering such factors as: predominant wave conditions, volume of containment, length of boom required, tension on boom, etc.

[C] Values shown for all water body classifications are the minimums for general purpose booms intended for spill response use. Special purpose booms designed for permanent installations, booms employing balanced upper and lower tension members, and external tension member booms may employ hydrodynamic properties to maintain adequate freeboard and therefore require lower buoyancy to weight ratios, but in no case should the buoyancy to weight ratio be less than 2:1. Buoyancy to weight ratios greater than those listed may result in improved boom performance under certain conditions, however, further research is required before minimum values greater than those shown can be established.

[D] The dominant variables in calculations of forces on deployed boom are current/tow speeds and boom draft. The specified values represent the developed tension on 300 m (1000 ft) lengths of boom, deployed in a typical catenary configuration with a gap ratio of 1:3, with environmental data selected per water body classification, with a current/tow speed of 3 knots (5 kts for calm water-current), and, most significantly, the minimum boom draft per category. Booms with greater drafts should have higher tensile strengths as follows: calm water 57 N/mm of draft (320 lbs/in.), calm water-current 140 N/mm (800 lbs/in.), protected water 64 N/mm (360 lbs/in.), and open water 72 N/mm (400 lbs/in.). The boom tensile strength is tested in accordance with Test Methods F 1093.

[E] The fabric tensile strength requirement is shown for two basic boom designs: two tension members (2 TM) and one tension member (1 TM). Membrane material is tested in accordance with Test Methods F 715 and D 751 (Breaking Strength, Procedure A: Grab Test Method). Boom that employs load carrying fabric, that is, zero tension members, must meet the total tensile strength requirement previously identified.

[F] The membrane material is tested in accordance with Test Methods F 715 and D 751 (Tearing Strength, Procedure B: Tongue Tear Test Method). Certain special-use fabrics have fabric tear strengths less than the values listed, such fabrics may be preferable for certain applications such as, resistance to particular spill products, sunlight, and abrasion, and would be acceptable as long as minimum fabric tensile strength requirements are met.