



Standard Specification for Oil Spill Response Boom Connection: Z-Connector¹

This standard is issued under the fixed designation F962; 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 specification covers design criteria requirements, design geometry, material characteristics, and desirable features for oil spill response boom connections. These criteria are intended to define minimum mating characteristics and are not intended to be restrictive to a specific configuration.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

[F818 Terminology Relating to Spill Response Barriers](#)

[F1523 Guide for Selection of Booms in Accordance With Water Body Classifications](#)

3. Material Characteristics

3.1 End connector and cross pin materials shall be corrosion resistant in sea water and such other environments as the intended service may require. If dissimilar metals are used, care shall be used in design to avoid galvanic corrosion.

3.2 Any material is acceptable for construction of the boom connector provided consideration is given to such factors as weight, mechanical strength, chemical resistance, flexibility, and conditions of the environment in which it is to be used.

4. Design Requirements

4.1 The minimum tensile strength of a boom-to-boom connection shall equal or exceed the minimum fabric tensile strength specified in Table 1 of Guide [F1523](#).

4.2 When the connector is designed as an integral part of the boom, it shall ensure distribution or transfer of the tension

member loads from one boom section to the next through or around the end connector in such a manner that the integrity of the joint is not broken.

4.3 The connector or adapter shall not take more than 0.04 in. permanent set when a 250-lb load, distributed over 3 in., is applied. The load shall be applied at the location that results in maximum deflection and shall be resisted by supports placed $\frac{1}{2}$ in. from each end as shown in [Fig. 1](#).

4.4 In addition to the dimensional requirements shown in [Fig. 2](#), the self-locking cross-pin/lanyard assembly shall have the following characteristics:

4.4.1 Its assembled strength shall resist a tensile load of 180 lbs placed upon the closed toggle by the test fixture to which the cross pin's lanyard is attached without deformation as shown in [Fig. 3](#).

4.4.2 It shall have a ring or lanyard loop of a minimum diameter of 1- $\frac{1}{2}$ in. for the convenience of pulling the pin from the boom connectors.

4.4.3 The toggle shall turn freely and shall latch in either direction.

4.4.4 The cross-pin's spring shall be captured or locked to the assembly and shall exert a force on the toggle of between 16 and 22 lbs when connectors are assembled.

4.4.5 When the cross-pin's spring is compressed fully, there shall be a clearance of $\frac{1}{8}$ in. between the short end of the toggle and the mated connector as shown in [Fig. 2](#).

4.4.6 The cross-pin's overall length shall be minimized and its ends rounded or chamfered so as to minimize wear and tear on adjacent stored booms or injury to boom handlers.

4.5 Pinholes, designed to accommodate the $\frac{3}{8}$ in. diameter self-locking pin, shall be incorporated at the design water line (DWL) and, if required, a location as determined in [4.5.1](#) or [4.5.2](#) and shown in [Fig. 4](#).

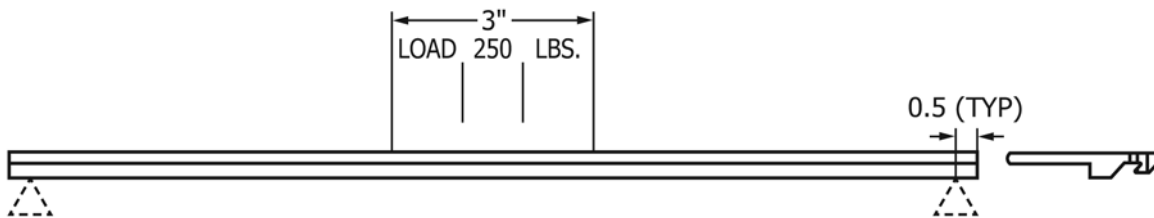
4.5.1 For any connector with 7.0 to 12.9 in. of connector material below the DWL pinhole, a second pinhole shall be located 6.000 ± 0.0015 in. below the DWL pinhole as shown in [Fig. 4\(a\)](#).

4.5.2 For any connector with 13.0 in. or more of connector material below the DWL pinhole, a second cross-pin hole shall be located 12.000 ± 0.0015 in. below the DWL pinhole as shown in [Fig. 4\(b\)](#).

¹ This specification is under the jurisdiction of ASTM Committee F20 on Hazardous Substances and Oil Spill Response and is the direct responsibility of Subcommittee F20.11 on Control.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



NOTE 1—All items shown are generic and not intended to depict any manufacturer's specific product.

FIG. 1 Connector/Adapter

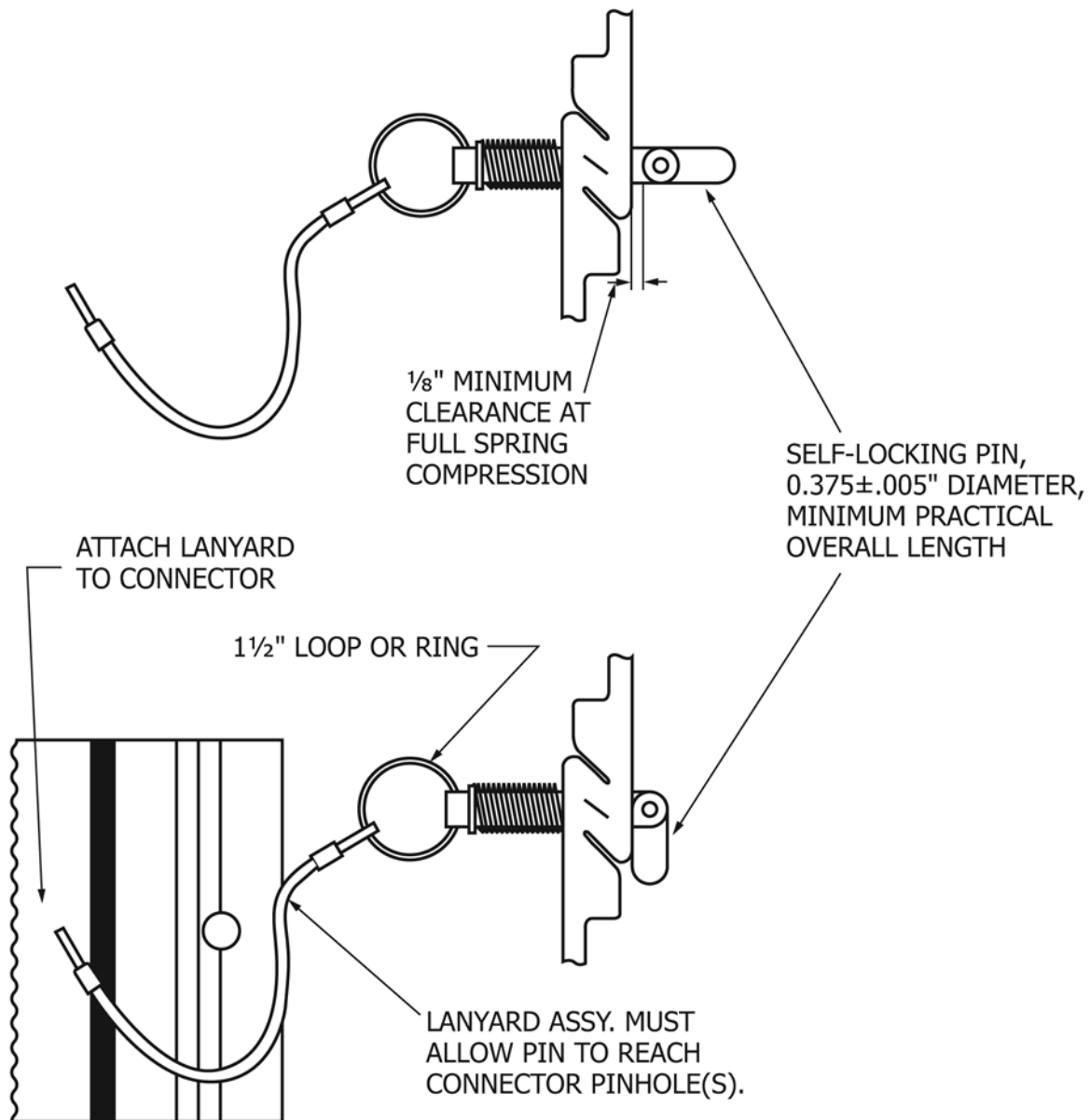


FIG. 2 Self Locking Cross Pin / Lanyard Assembly

4.6 Where one half of a connector set mates with one having the geometry defined herein but is of other dimensions, it shall meet the following design requirements:

- 4.6.1 Possess adequate mechanical strength.
- 4.6.2 Minimize oil leakage.

- 4.6.3 Be sexless (neither male/female).
- 4.6.4 Be full height of boom of which it is a part.
- 4.6.5 Not impair stability of the boom.
- 4.6.6 Require no special tools for assembly.
- 4.6.7 Not reduce freeboard.

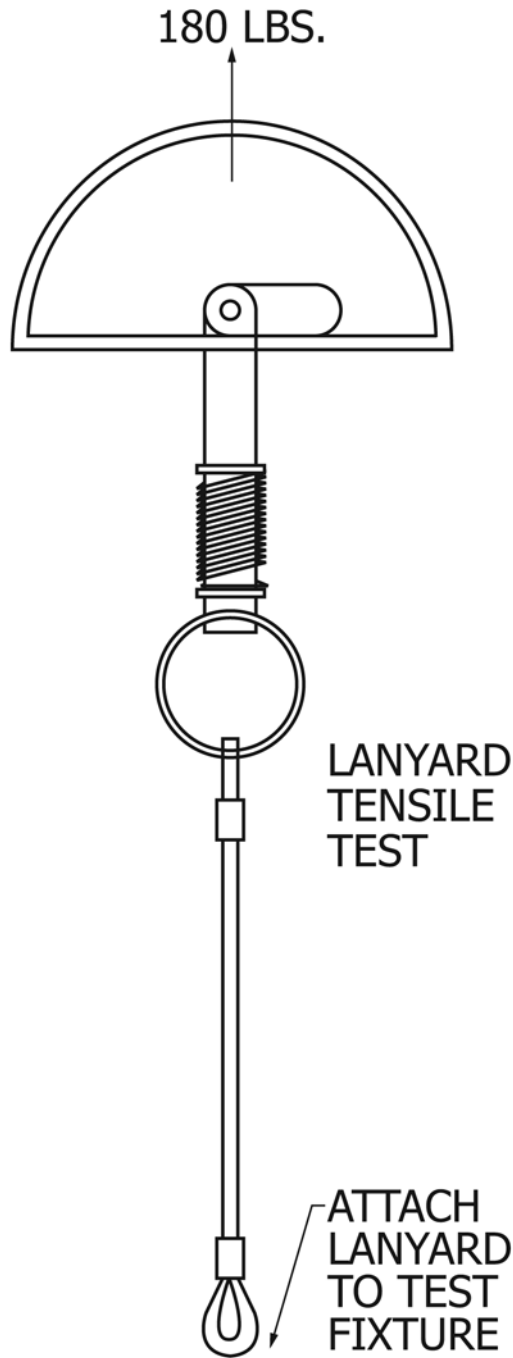


FIG. 3 Toggle / Test Fixture

5. Significance and Use

5.1 The general design geometry herein defined applies to both a separate adaptor accessory mating two booms of different geometry as well as boom end connectors (see Terminology F818).

5.2 Interconnectability is intended to facilitate mating of oil spill response booms of various sizes, strengths, design, and manufacture.

5.3 The use of this general design geometry in no way guarantees the effective performance of the linked boom

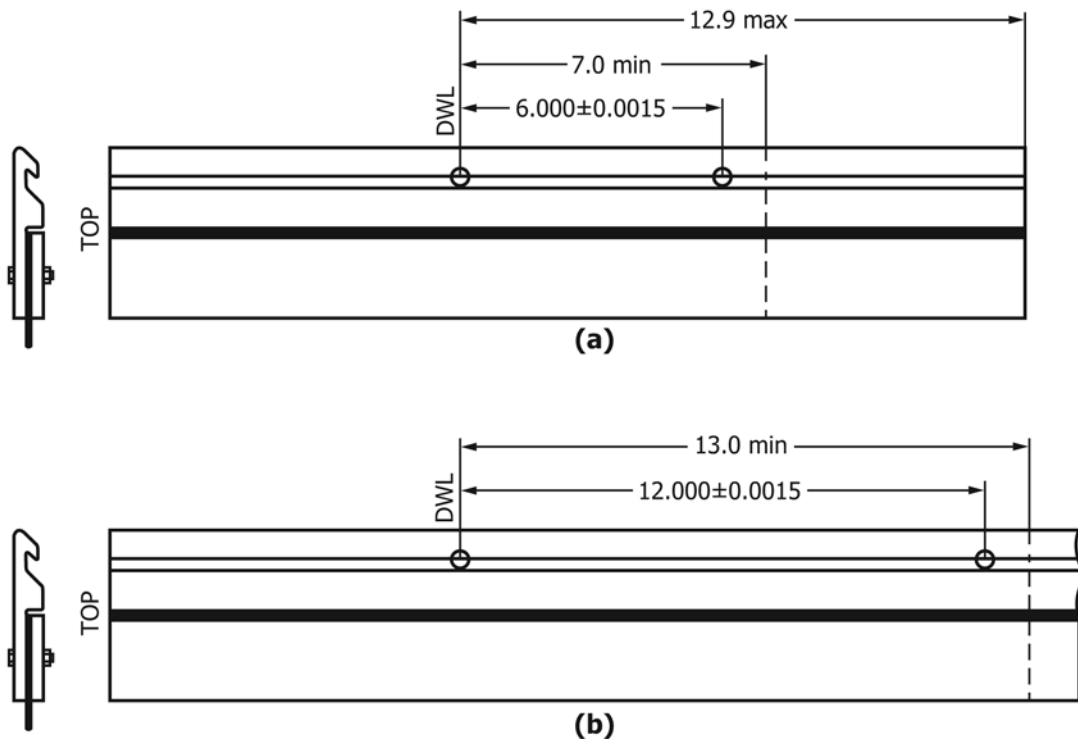


FIG. 4 Connector hole locations

sections, since each boom's design and the environmental conditions at each incident govern overall performance.

6. Design Criteria

6.1 The connector shall be of the hook engagement design. The geometry of single hook engagement end connectors shall be compatible with the requirements shown in Fig. 5.

NOTE 1—The connector opening shall be to the right when looking at the top of the connector as shown in Fig. 6.

6.2 An end connector shall be long enough to be compatible with the particular boom of which it is a part and not be a limiting member as to the functional freeboard or draft of the membrane.

6.3 A hole or holes designed to accommodate a 3/8-in. diameter self-locking cross-pin shall be incorporated as shown in Fig. 2. A self-locking cross-pin/lanyard assembly long enough to reach the cross-pin hole(s) meeting the requirements of Fig. 2 shall be furnished with, and connected to, each end connector or adapter.

6.4 Each connector or adapter will have sufficient bending strength so it will not take a permanent set, along its weakest axis, if inadvertently stepped on in the field.

6.5 Connectors used on permanent booms, such as those intended for long-time storage in the water, should have a 3/8-in. (9-mm) hex head cap screws with self-locking nuts for connections not requiring periodic separation.

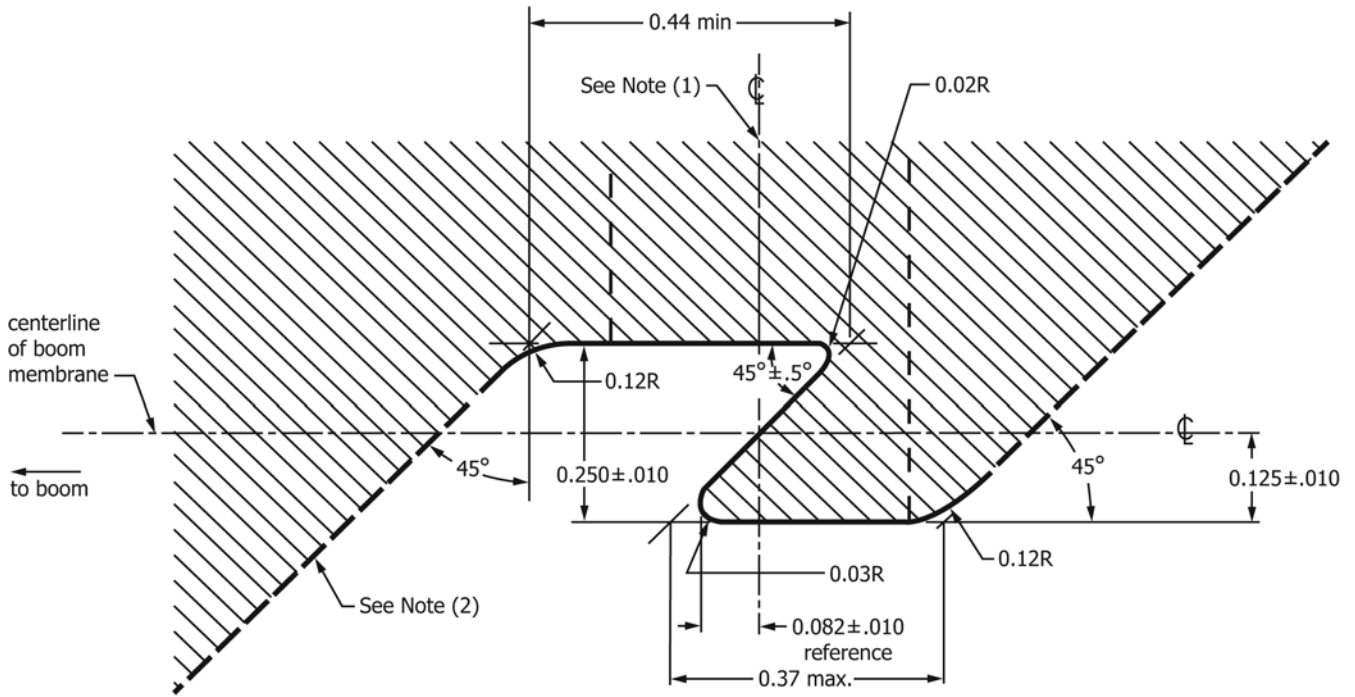
7. Desirable Features

7.1 Desirable features of the connector design include the following:

- 7.1.1 Speed and ease of connection.
- 7.1.2 Light weight.
- 7.1.3 Connectable in the water.
- 7.1.4 Readily cleaned of sand and debris.
- 7.1.5 Inherently safe to personnel.
- 7.1.6 Easy to install or replace.

8. Keywords

- 8.1 boom; boom connection; oil spill response



TOP VIEW

NOTE 1—0.41-in. diameter (+0.00–0.01) drill through for self-locking cross-pin located at the design water line. It is suggested that for all connectors or adapters shorter than 24 in., a second cross-pin hole be located 6.000 ± 0.015 in. below the water line pin hole and that for all connectors and adapters 24 in. and longer, it be mandatory to locate a second cross-pin hole 12.000 ± 0.015 in. below the water line pin hole.

NOTE 2—Surface of connector is to be defined by manufacturer where shown in dashed lines on this drawing, provided that no part of the surface protrude beyond these dashed lines.

NOTE 3—All dimensions are stated in inches.

NOTE 4—All top and bottom corners of each connector shall be radiused to 0.06 in. to reduce the possibility of injury to boom handlers.

NOTE 5—All items shown are generic and not intended to depict any manufacturer's specific product.

FIG. 5 ASTM End Connector Configuration

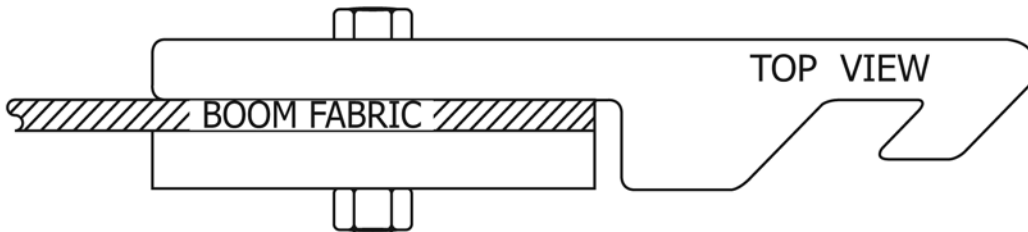


FIG. 6 Connector orientation

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