
**Ships and marine technology —
Marine environment protection —
Oil booms —**

**Part 4:
Auxiliary equipment**

*Navires et technologie maritime — Protection de l'environnement
marin — Barrages de rétention de pétrole —*

Partie 4: Équipement auxiliaire



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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 2, *Marine environment protection*.

A list of all parts in the ISO 17325 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In addition to consideration of physical limitations and individual circumstances, the successful application (deployment) of booms very much depends on the use of matching accessories, referred to as auxiliary equipment for the purpose of this document.

This document gives general guidelines for manufacturers as well as users with regard to producing, purchasing and using the most common auxiliary equipment for oil booms. This document does not define any specific type and size for a particular application, as so many variables have to be taken into consideration.

This document has been developed after considering the referred relevant standards.

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Ships and marine technology — Marine environment protection — Oil booms —

Part 4: Auxiliary equipment

1 Scope

This document specifies basic requirements for the design, layout and application of boom accessories, referred to as auxiliary equipment for the purpose of this document. This document does not purport to address all safety concerns, if any, associated with its use. However, it is the responsibility of the user of this document to establish the appropriate safety and health procedures, and to determine the applicability of regulatory limitations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 668, *Series 1 freight containers — Classification, dimensions and ratings*

ISO 1161, *Series 1 freight containers — Corner and intermediate fittings — Specifications*

ISO 1496-1, *Series 1 freight containers — Specification and testing — Part 1: General cargo containers for general purposes*

ISO 16165, *Ships and marine technology — Marine environment protection — Terminology relating to oil spill response*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16165 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 General requirements

Oil boom auxiliary equipment shall be used exclusively with the equipment for which it is specifically designated. Any use other than the designated application requires a careful examination of the acting forces and safety aspects as well as the manufacturers'/suppliers' approval.

On request, the manufacturer shall provide calculations of material strength and dimensions indicating the forces anticipated with intended application. Nevertheless, it is exclusively the users' responsibility to keep the applied forces within the limits given by the manufacturer.

Nameplates of all auxiliary equipment shall mention its maximum gross and net weight including all components installed on it.

5 Boom reels

5.1 General

Boom reels (see [Figure 1](#)) are also referred to as boom winders or boom drums. They usually combine the function of a storage device and a deployment/recovery aid. The most common design consists of a horizontal axle with two lateral flanges. But certain types of booms require a vertical axle with only a bottom flange.

The materials that constitute the reel shall be oil resistant and sea water resistant and shall not be susceptible to deterioration under intended application.

Suitable soil protection canvasses shall be supplied with oil boom reels to prevent abrasion wear on the oil boom and secondary ground pollution resulting from recovery of a contaminated oil boom.

A protective canvas shall be constructed of a material that prevents deterioration due to oil and UV exposure.



Figure 1 — Example of a boom reel

5.2 Basic design requirements

Oil boom reels shall have sufficient structural strength to withstand forces according to the intended application and the additional forces resulting from wind, current, waves, towing and potential extended recovery height for boom retrieval as well as from impacts associated with transportation. See ISO 17325-1 for applicable formulas.

For safety reasons, the lateral flanges shall have no openings of such size that would cause the boom or components to injure operating personnel or block the drum.

In order to prevent capsizing of a boom reel during boom recovery or deployment in currents or in cooperation with a towing vessel, the design of the base frame and axle brackets shall achieve a centre of gravity, which even in a completely filled condition is well below the drum's horizontal axis.

5.3 Operational considerations

Directly hand operated reels are not permissible. Manual operation may be provided only by means of double acting, self-locking gears, requiring a maximum driving force of 250 N. For safe use, hydraulic operation utilizing double acting, self-locking motors are recommended.

The boom reel shall have a brake which withstands 1,25 times the maximum torque acting on it during intended boom deployment and retrieval. As a safety feature, the brake shall allow, at higher forces, the boom to unwind from the reel. The strength of the connection between boom and reel drum shall be less than the force needed to capsize the winder. This shall prevent the reel from being pulled into the water in case of unintended unwinding of the boom.

The maximum lifting torque required is generally defined by the maximum force needed to retrieve the boom when it is being rolled up on the reel. Torque is equal to the force on the boom times the moment arm (distance).

Consider the maximum force acting on the boom and the reel due to:

- height above the water when deployed;
- pull by a towing vessel;
- current, wind and wave drag on the boom while deploying and retrieving.

Specify this maximum calculated torque and a safety factor of at least 1,25^[5].

If a boom reel is equipped with its own hydraulic control, for safety reasons it shall be placed on the opposite side of the boom ballast. The hydraulic control shall automatically return to neutral when released.

5.4 Transport and lifting

Additional devices securing the boom reel for transport shall be designed in a way that their unintended interference during deployment and retrieval is impossible.

Base frames preferably shall be designed according to ISO 668 and shall incorporate corner fittings according to ISO 1161 for stowage on multiple transport vehicles. Forklift pockets shall be provided on all four sides, to prevent capsizing during forklift transport according to ISO 1496-1.

If necessary, special lifting gear shall be provided by the manufacturer. Designated lifting points shall be provided and designed according to the boom reel's maximum total gross weight taking into consideration a safety factor of at least 3,0.

Even higher safety factors are required for specific items, such as shackles, chain, wire, and/or ropes, according to material used.

The lifting points shall provide a stable lifting position. The same lifting points should be useable also for safety lashing during transport, boom deployment and retrieval.

"Working load limit" (WLL)^[10] should replace "safe working load" (SWL).

6 Inflator for inflatable booms

6.1 General

Each inflatable oil boom needs to be filled with the appropriate air pressure in order to ensure full operational functionality. Thus, the air flow, delivery pressure and filling connector of the inflator need to be adapted to the requirements of the individual boom to which it belongs.

Excessive filling pressure does not only damage the boom, but will partially or completely adversely impact its effectiveness.

See [Figures 2](#) and [3](#).



SOURCE W.H. Lehmann, Tedimex GmbH, reproduced with the permission of the authors.

Figure 2 — Example of inflator (air blower), carried on back



Figure 3 — Example of inflator (air blower), hydraulic driven

6.2 Operational considerations

For protection of personnel, during filling of a boom segment or chamber with air, the boom shall be secured to prevent intended slipping.

Sufficient work space and lengths of air hose are indispensable for both safe and quick inflating operation.

Some inflators can also be used as deflators to speed up retrieval of the booms.

Since operation of inflators is associated with excessive noise, hearing protection is recommended.

7 Water pump for beach sealing booms

7.1 General

Each beach sealing boom needs to be filled with water at the appropriate pressure in order to ensure full operational functionality. Thus, the water flow, delivery pressure and filling connector of the water pump need to be adapted to the requirements of the individual boom to which it belongs.

Excessive filling pressure does not only damage the boom, but will partially or completely adversely impact its effectiveness.

7.2 Design considerations

Water pumps (see [Figure 4](#)) shall be self-priming and resistant to sea water. Strainers shall be used to prevent intake of solids or gravel, etc. Water flow and pressure shall be according to the requirements of the specific boom.



SOURCE W.H. Lehmann, Tedimex GmbH, reproduced with the permission of the authors.

Figure 4 — Example of a water pump

7.3 Operational considerations

For protection of personnel during filling of a boom segment or chamber with water, the boom shall be secured to prevent unintended slipping.

Sufficient work space and length of water hose are indispensable for both safe and quick filling operation.

Since operation of pumps is associated with excessive noise, hearing protection is recommended.

8 Boom anchoring

8.1 General

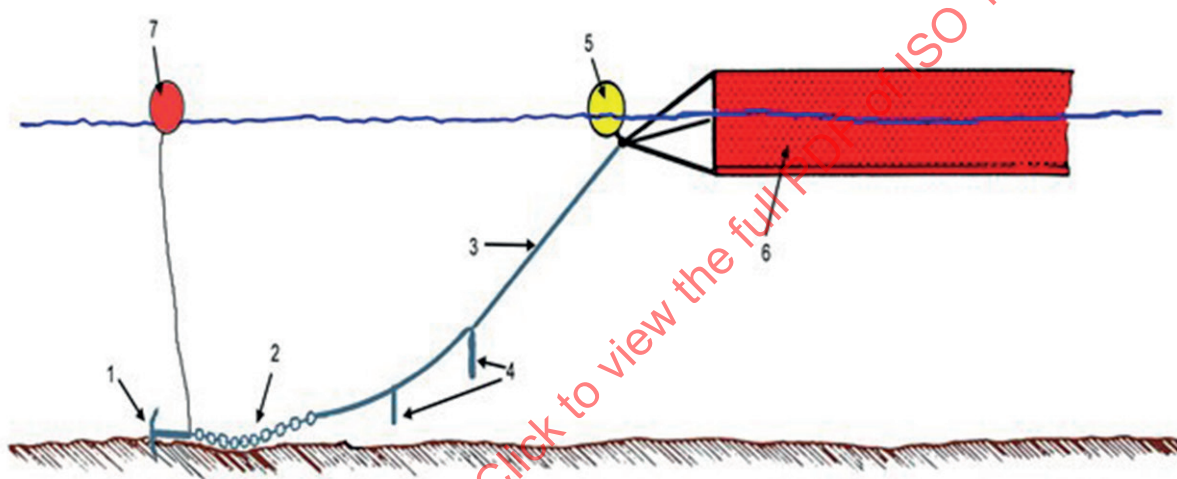
In some applications, booms may be anchored or moored (see [Figure 5](#)) for maintaining a certain configuration.

For the type and size of anchor to be used, the following shall be taken into consideration:

- type and condition of particular sea bed *in situ*;
- currents and tidal flow (intensity and direction);
- wind forces (intensity and direction);
- change of water depth (tide);
- boom type and length.

8.2 Anchoring assembly considerations

It shall be noted that the actual holding power of an anchor is not only defined by its design and weight in relation to the sea bed. It is mainly dependent on the ballast effect of its chain forerunner and a flat angle of the anchor chain or line, keeping the direction of the forces in a flat angle relative to the sea bed. If synthetic anchoring lines are used, they shall not be made from floating material.



Key

- | | |
|----------------------|---------------|
| 1 anchor | 5 buoy |
| 2 anchor chain | 6 boom |
| 3 anchor line | 7 anchor buoy |
| 4 weights (optional) | |

SOURCE W.H. Lehmann, Tedimex GmbH, reproduced with the permission of the authors.

Figure 5 — Typical boom mooring arrangement

Wave movement shall be compensated by an anchor buoy attached to the towing gear. An additional marker buoy may help in recovering the anchor.

The anchor chain/rope length shall be:

- 3 x water depth in calm water;
- 5 x water depth in choppy water;
- 7 x water depth in rough water.

Rope length from anchor to marker buoy shall be approximately two times the water depth.

Holding force depends on the type of anchor, its weight, and the consistency of the sea bed. [Table 1](#) provides examples of different holding strengths for a Danforth anchor in varying sea bed consistencies.

Table 1 — Holding strength (kgf) of Danforth type anchors in loose mud, sand and clay^[14]

Anchor weight (kg)	Mud	Sand	Clay
15	200	250	300
25	350	400	500
35	600	700	700

NOTE In sheltered waters, concrete blocks have proven their suitability as alternative anchoring devices.

9 Towing and mooring gear

9.1 General

Towing and mooring gear are mandatory devices which transfer the forces resulting from towing (respectively, from current or mooring) into the tension members of the boom. Thus, the gear needs to be individually dedicated to any oil boom type and size. They shall also incorporate the same type of end connector as the oil boom.

Certain boom types require a special support to maintain correct floating position under tow. This function usually is incorporated into the towing gear as well.

9.2 Design considerations

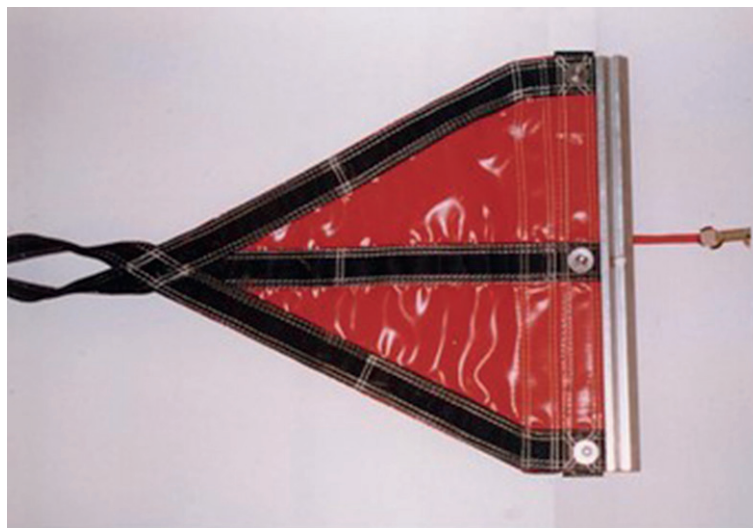
Towing gear can be produced as triangular pieces of boom material or as a bridle from synthetic or steel wires. If not of floating material, additional floatation material or a buoy shall be attached.

Towing lines preferably shall be of the floating type and be sized according to the occurring towing/ mooring forces. Different colours help distinguish them from lines for other purposes.

Any associated lines and hardware, like shackles, shall be of type approved high tensile quality materials.

In order to not break the boom itself during towing, a weak link may be installed in the towing assembly.

See [Figures 6, 7 and 8](#).



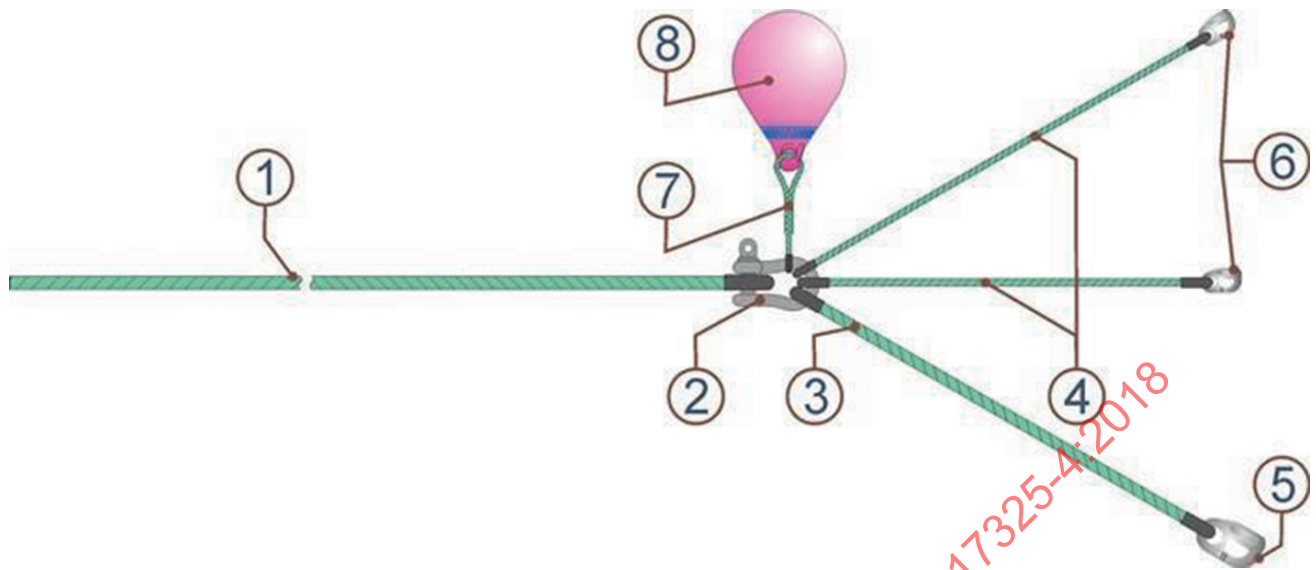
SOURCE R. Byström, FLEXI Boom, AB, reproduced with the permission of the authors.

Figure 6 — Example of a towing connector



SOURCE R. Byström, FLEXI Boom, AB, reproduced with the permission of the authors.

Figure 7 — Connector with support to maintain floating position

**Key**

- | | | | |
|---|--------------------------------------|---|-----------------|
| 1 | towing rope | 5 | quick connector |
| 2 | towing shackle | 6 | quick connector |
| 3 | rope to connect to the ballast chain | 7 | buoy rope |
| 4 | rope | 8 | buoy |

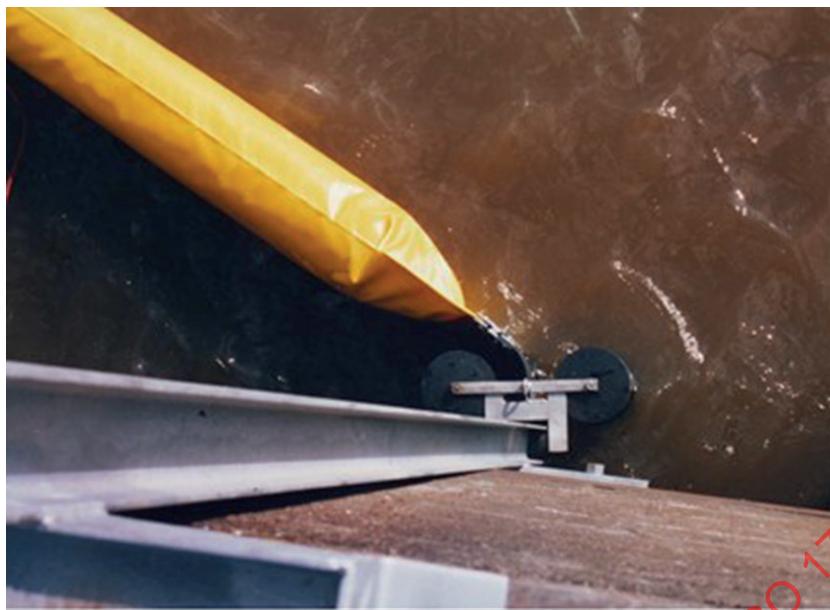
SOURCE W.H. Lehmann, Tedimex GmbH, reproduced with the permission of the authors.

Figure 8 — Towing system for containment booms

10 Tidal compensator

10.1 General

The purpose is to provide an oil tight connection between the oil boom and a non-floating vertical body under tidal conditions. See [Figures 9](#) and [10](#).



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Figure 9 — Example of tidal compensator — View looking down from pier



SOURCE R. Bystrom, FLEXI Boom, AB, reproduced with the permission of the authors.

Figure 10 — Example of tidal compensator — View from the water

10.2 Design considerations

Materials used shall be non-corrosive and non-abrasive. The design shall enable the boom to follow the water level all the way. It shall have the necessary strength to resist the forces applied by the connected boom.

The tidal compensator shall be equipped with the same type and size connector as the boom and shall prevent any leakage of oil between the boom and the non-floating body to which it is connected.

There are permanent types which are fixed to the non-floating body. Temporary types of tidal compensators, formed by magnets or cables, may be deployed in certain cases.