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**Ships and marine technology —  
Ship's mooring and towing fittings —  
Cruciform bollards**

*Navires et technologie maritime — Corps-morts et ferrures de  
remorquage de navires — Croisillons*

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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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

This second edition cancels and replaces the first edition (ISO 13797:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the definition of SWL (3.1) has been reworded;
- a construction requirement has been added in 7.2.

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](http://www.iso.org/members.html).

# Ships and marine technology — Ship's mooring and towing fittings — Cruciform bollards

## 1 Scope

This document specifies the types, nominal sizes, dimensions and materials, as well as construction, manufacturing and marking requirements, for cruciform bollards suitable for installation on sea-going vessels to meet normal mooring and towing requirements.

## 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.

IMO Circular MSC/Circ.1175, *Guidance on shipboard towing and mooring equipment*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

### 3.1

**safe working load**

**SWL**

safe load limit (maximum permissible load) of the fittings used for mooring and towing

## 4 Classification

### 4.1 Type

Depending on the manufacturing method, cruciform bollards shall be classified as belonging to one of the following two types:

- a) Type A: manufactured by steel pipes;
- b) Type B: manufactured by steel plates.

### 4.2 Nominal sizes

The nominal sizes,  $D_n$ , of cruciform bollards are denoted by reference to the outside diameter of the main post, in millimetres, in terms of the nearest number drawn from a basic series of preferred numbers.

The nominal sizes are: 150, 200, 250, 300, 350 and 400.

## 5 Dimensions

Cruciform bollards shall have dimensions and particulars in accordance with [Table 1](#) and [Figure 1](#).

## 6 Materials

The following materials shall be used for manufacturing the cruciform bollards:

- a) Type B: weldable steel plates having a yield point of not less than 235 N/mm<sup>2</sup>;
- b) Type A: weldable steel pipes having a yield point of not less than 215 N/mm<sup>2</sup> or equivalent.

## 7 Construction

**7.1** The posts of the cruciform bollards shall be constructed from steel pipes or formed from plate.

**7.2** The deck on which the cruciform bollards are installed shall be reinforced by carling or stiffeners, as shown [Figure 1](#).

## 8 Manufacturing and inspection

**8.1** All surfaces of the cruciform bollards, including welded surfaces, shall be free from any visible flaws or imperfections.

**8.2** All surfaces in contact with the ropes shall be free from surface roughness or irregularities likely to cause damage to the ropes by abrasion.

**8.3** The cruciform bollards shall be coated externally with an anti-corrosion protective finish.

## 9 Marking

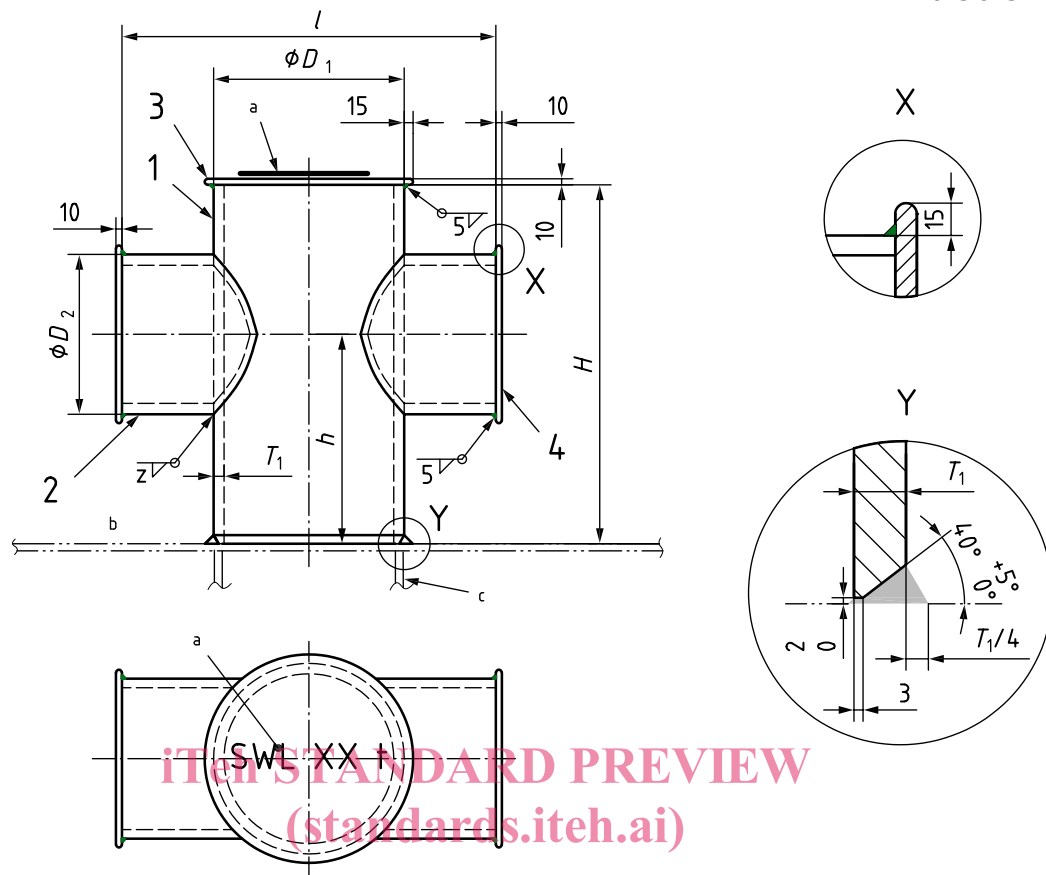
**9.1** The safe working load (SWL) for the intended use of the cruciform bollards shall be noted in the towing and mooring plan available on board for the guidance of the shipmaster, as specified in IMO circular MSC/Circ.1175.

**9.2** The actual SWL on board shall be determined considering the under deck reinforcement, and marked on the towing and mooring plan. The actual SWL shall not be over the SWL indicated in this document.

**9.3** The cruciform bollard shall be clearly marked with its SWL by weld bead or equivalent. The SWL shall be expressed in tonnes (symbol 't') and be placed so that it is not obscured during operation of the fitting.

EXAMPLE      SWL XX t

Dimensions in millimetres



**Key**

- 1 main post
- 2 cross pipe
- 3 closing plate of main post
- 4 closing plates of cross pipe
- a SWL marking.
- b Deck.
- c Reinforcement.

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**Figure 1 — Cruciform bollards**

**Table 1 — Dimensions and SWL of cruciform bollards**

Dimensions in millimetres

Nominal size $D_n$	Type	$l$	$D_1$	$D_2$	$T_1$	$T_2$	$H$	$h$	Welding leg length <sup>a</sup> $z$	SWL <sup>b</sup>		Calculated weight <sup>c</sup> kg
										kN	t	
150	Type A	350	165,2	114,3	11,0	8,6	450	225	6	78	8	37
	Type B	350	170,0	120,0	8,0	8,0	450	225	5	78	8	31
200	Type A	450	216,3	165,2	12,7	11,0	500	250	7	147	15	58
	Type B	450	220,0	170,0	10,0	8,0	500	250	7	147	15	48
250	Type A	575	267,4	216,3	15,1	12,7	600	300	8	245	25	92
	Type B	575	270,0	220,0	13,0	10,0	600	300	8	245	25	81
300	Type A	625	318,5	267,4	17,4	15,1	600	300	10	392	40	132
	Type B	625	320,0	270,0	15,0	12,0	600	300	9	392	40	115
350	Type A	670	355,6	267,4	19,0	15,1	600	350	10	491	50	150
	Type B	670	360,0	270,0	16,0	12,0	600	350	9	491	50	130
400	Type A	720	406,4	267,4	21,4	15,1	600	350	10	736	75	178
	Type B	720	410,0	270,0	19,0	14,0	600	350	9	736	75	165

<sup>a</sup> Welding with chamfering is available based on the same welding volume/strength.<sup>b</sup> The SWL which is marked on the fitting is the maximum applicable rope tension.The SWLs shown in this table are for reference only. These are based on the loadings as mentioned in [Annex A](#).<sup>c</sup> The calculated weight (mass) is for reference only.

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## Annex A (normative)

### Basis for strength assessment of cruciform bollards

#### A.1 General

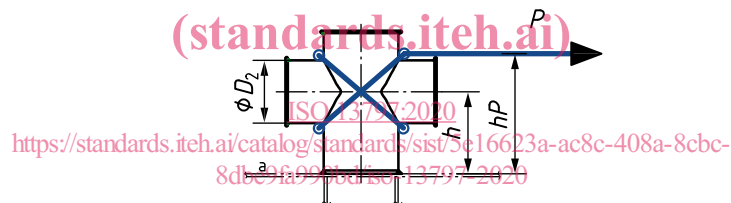
The strength of the cruciform bollards was evaluated by simple beam theory calculation and determined based on the following design criteria.

#### A.2 Loading

**A.2.1** The cruciform bollards shall be designed to withstand the loads imposed by the mooring and/or towing ropes.

**A.2.2** The cruciform bollards shall be designed to withstand the following load case.

It shall be designed to withstand the combined load of bending force and shear force produced by  $P$  imposed at the position above the cross pipe. See Figure A.1.



#### Key

$P$  mooring force or towing force

$d$  diameter of rope

$hP$   $h + (D_2/2) + (d/2)$

<sup>a</sup> Deck.

**Figure A.1 — Combined load by towing rope**

#### A.3 Load and stress criteria

Under the SWL, the following stress criteria were adopted:

- the bending stress is limited to 85 % of the yield stress of the material;
- the shear stress is limited to 60 % of the yield stress of the material;
- the combined stress is limited to 100 % of the yield stress of the material.