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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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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.

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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.

ISO 13797 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

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

1 Scope

This International Standard specifies the design, size and technical requirements for cruciform bollards suitable for installation on sea-going vessels to meet normal mooring and towing requirements.

2 Normative references

The following referenced documents are indispensable for the application 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.

3.1

safe working load

SWL

maximum load in kN on the rope that should normally be applied in service conditions

4 Classification

4.1 Type

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

- Type A – manufactured by steel pipes;
- 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 have dimensions and particulars in accordance with Table 1 and Figure 1.

6 Materials

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

- Plates: weldable steel plates having a yield point of not less than 235 N/mm².

— Tubes: weldable steel tubes having a yield point of not less than 215 N/mm² or equivalent.

7 Construction

The posts of the cruciform bollards shall be constructed from steel tubes or formed from plate.

8 Manufacturing and inspection

8.1 All surfaces of the cruciform bollards, including welding, 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

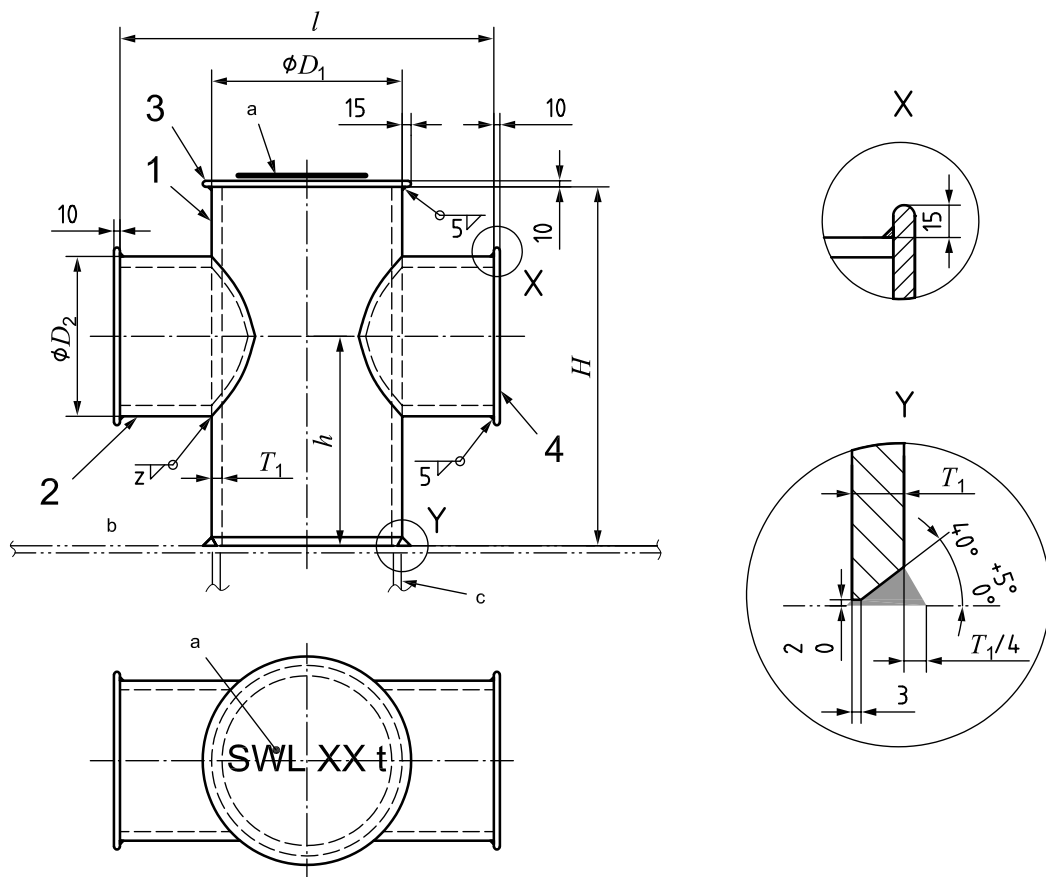
9.1 The safe working load (SWL) intended for the use of the cruciform bollards shall be noted in the towing and mooring plan available on board for the guidance of the shipmaster, as specified in MSC/Circ.1175.

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 International Standard.

9.3 The cruciform bollards shall be clearly marked with its SWL by weld bead or equivalent. The SWL shall be expressed in tonnes (letter '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.

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 ^a	SWL ^b		Calculated weight ^c (kg)
									z	(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

^a Welding with chamfering is available based on the same welding volume/strength.

^b SWL is the maximum applicable rope tension.

SWLs shown in this table are for reference only. These are based on the loadings as mentioned in Annex A.

^c Calculated weight is for reference only.

Annex A (informative)

Basis for strength assessment of cruciform bollards

A.1 General

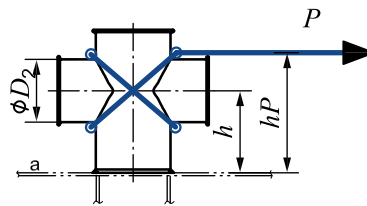
The strength of the cruciform bollards was evaluated by simple beam theory calculation and determined based on the following design criteria.

A.2 Loading

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

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

It is to be designed to withstand the combined load of bending force and shear force produced by P imposed at the position above the cross pipe.



Key

P mooring force or towing force

d diameter of rope

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

a 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.

A.4 Wear-down allowances and corrosion additions

A.4.1 Wear-down allowances

For the strength calculation, the wear-down of 2 mm is to be deducted from the gross thickness, where the rope is rubbing the surface.

A.4.2 Corrosion additions

The corrosion margin was already included in the safety factor and 2 mm wear-down allowance.

Bibliography

- [1] IACS UR A2, *Shipboard fittings and supporting hull structures associated with towing and mooring on conventional vessels*
- [2] OCIMF, *Mooring Equipment Guidelines (MEG3)*
- [3] ISO 2408, *Steel wire ropes for general purposes — Minimum requirements*

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