INTERNATIONAL STANDARD

ISO 13795

Second edition
2020-08

Ships and marine technology — Ship's mooring and towing fittings — Welded steel bollards for sea-going vessels

Navires et technologie maritime — Corps-morts et ferrures de remorquage de navires — Bittes d'amarrage en acier soudées pour navires de haute mer

Reference number
ISO 13795:2020(E)

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Published in Switzerland

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Foreword

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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).

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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 13795:2012), which has been technically revised.

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

— technical guidelines have been added in 7.4 and 7.5;

— the definition of SWL (3.1) has been reworded;

— the mark numbers and extension numbers in Figures 1 and 2 have been amended;

— the values in Table 1 and Table 2 have been amended;

— the text in Clause A.5 has been amended.

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

A bollard is a type of ship's mooring and towing fitting installed on board to belay the mooring and towing rope.

Ships and marine technology — Ship's mooring and towing fittings — Welded steel bollards for sea-going vessels

1 Scope

This document specifies the types, nominal sizes, dimensions and materials, as well as construction, manufacturing and marking requirements, for welded steel 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

3.2
TOW
safe load limit (maximum permissible load) of the fittings used for normal and other towing operations

4 Classification

4.1 Type

Depending on the construction, welded steel bollards shall be classified as belonging to one of the following two types:

a) Type A: with compact base plate;

b) Type B: with wide base plate.

4.2 Nominal sizes

The nominal sizes, D_n, of bollards are denoted by reference to the outside diameter of the post, in millimetres, in terms of the nearest number drawn from a basic series of preferred numbers. For the bollards having the same post diameter, the letter of the alphabet, i.e. A or B, is followed by the nominal size for the different safe working loads (SWL).

The nominal sizes are: 150, 200, 250A, 250B, 300A, 300B, 350A, 350B, 400A, 400B, 450A, 450B, 500A, 500B, 550A, 550B and 600.

5 Dimensions

The bollards shall have dimensions and particulars in accordance with Tables 1, 2, 3 and 4, and Figures 1 and 2.

6 Materials

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

— base plates: weldable steel plates having a yield point of not less than 235 N/mm^2;

— posts: weldable steel plates having a yield point of not less than 235 N/mm^2 or equivalent steel tubes.

7 Construction

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

7.2 Fins shall be installed to keep the ropes as low as possible so as to reduce the loads to the bollard posts from the mooring/towing ropes.

7.3 An eye plate for tying the stopping-off rope or chain shall be provided.

7.4 The selection of ship's mooring fittings and mooring lines should take into account the diameter, D, of surfaces of mooring fittings that are in contact with the mooring line diameter, d, (D/d ratio) to reduce or mitigate bend ross of strength.

7.5 The tensile strength of mooring rope may be reduced depending on bend radius (D/d ratio) through the mooring fittings, in accordance with the rope manufacturer's guidelines.

8 Manufacturing and inspection

8.1 All surfaces of the 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 bollards shall be coated externally with an anti-corrosion protective finish.

8.4 A low-friction surface coating is not recommended so as to increase the holding force of the mooring ropes under figure-of-eight belay.

9 Marking

9.1 The safe working load (SWL) for the intended use of the 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 by considering the under deck reinforcement, and it shall be marked on the towing and mooring plan. The actual SWL shall not be over the SWL indicated in this document.

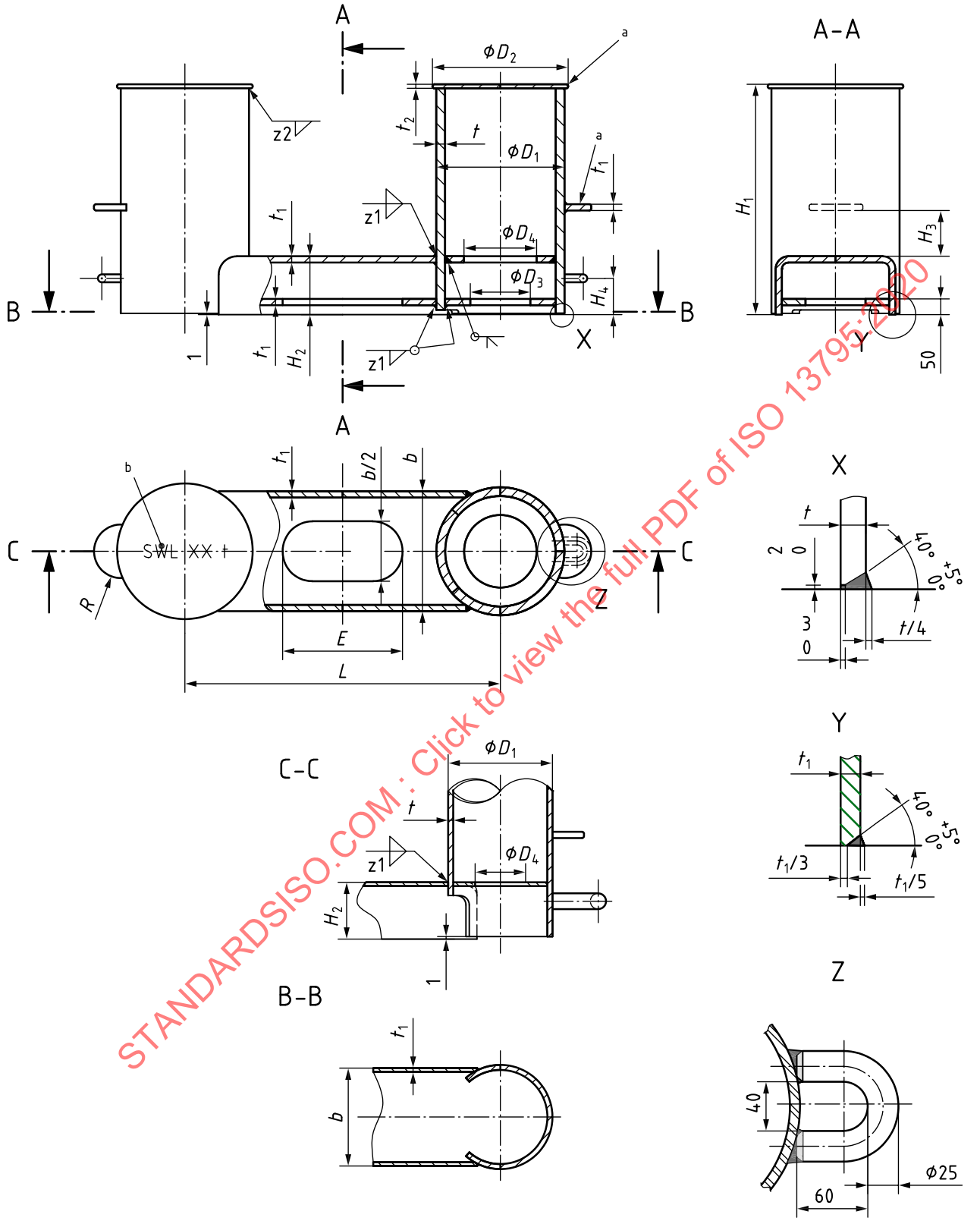
9.3 The bollards shall be clearly marked with their SWL by weld bead or equivalent. The SWL shall be expressed in tonnes (symbol 't') and be placed so that it is not obscured during operation of the fitting.

9.4 In case the bollard is used both for mooring and towing, both the SWL and the TOW for mooring and/or towing purposes shall be marked.

EXAMPLE 1 SWL XXX t.

EXAMPLE 2 TOW XXX t.

Dimensions in millimetres



a Edges smooth grinding.

b SWL marking.

Figure 1 — Type A (for nominal sizes 150, 200, 250A and 250B)

Table 1 — Dimensions for Type A bollards

Dimensions in millimetres

Nominal size D_n	D_1	D_2	D_3	D_4	H_1	H_2	H_3	H_4	b	L	E	t	t_1	t_2	R
150	165,2	185	—	80	330	90	70	60	155	400	—	8,0	6	6	40
200	216,3	240	—	130	395	115	70	60	205	500	—	8,0	6	6	50
250A	267,4	290	—	160	505	135	90	75	250	630	—	12,0	9	8	60
250B	267,4	290	—	160	505	135	90	75	250	630	—	10,0	8	7	60
300A	318,5	340	150	185	600	150	110	85	290	800	300	21,5	16	9	70
300B	318,5	340	150	185	600	150	110	85	290	800	300	12,0	9	9	70
350A	355,6	380	170	200	685	175	130	105	340	890	350	26,0	19	11	80
350B	355,6	380	170	220	685	175	130	105	340	890	350	14,0	10	9	80
400A	406,4	430	190	230	730	185	145	115	380	1 000	380	28,0	20	13	85
400B	406,4	430	190	250	730	185	145	115	380	1 000	380	15,0	11	11	85
450A	457,2	480	210	265	770	195	160	120	425	1 100	410	29,0	21	14	90
450B	457,2	480	210	285	770	195	160	120	425	1 100	410	14,5	11	11	90
500A	508,0	530	235	295	830	230	200	150	480	1 250	460	32,0	23	16	100
500B	508,0	530	235	320	830	230	200	150	480	1 250	460	14,5	11	11	100
550A	558,8	580	255	330	900	270	200	180	520	1 380	540	31,0	22	16	110
550B	558,8	580	255	350	900	270	200	180	520	1 380	540	21,0	16	11	110
600	609,4	630	280	365	950	300	200	200	560	1 550	600	33,0	23	16	120

Table 2 — Dimensions *(continued)* and SWL for Type A bollards

Dimensions in millimetres

Nominal size D_n	Welding leg length[a]		SWL[b]						Calculated weight[c] kg
			For mooring purposes (Figure-of-eight belay)				For towing purposes (Eye splice)		
			One-rope use		Two-rope use				
	z_1	z_2	kN	t	kN	t	kN	t	
150	3,5	3,5	54	5,5	49	5,0	98	10	29
200	3,5	3,5	82	8,4	65	6,7	128	13	46
250A	5,5	4	156	16	134	14	265	27	107
250B	5,5	4	127	13	108	11	216	22	91
300A	10,5	4	332	34	306	31	608	62	281
300B	10,5	4	186	19	161	16	353	36	166
350A	12,5	5	443	45	418	43	834	85	431
350B	7	4	244	25	216	22	491	50	241
400A	12,5	6	594	61	521	53	1 040	106	570
400B	8	5	326	33	269	27	657	67	322
450A	12	7	753	77	612	62	1 216	124	712
450B	8	7	382	39	292	30	765	78	379
500A	12,5	8	992	101	757	77	1 511	154	960
500B	8	5	457	47	326	33	912	93	465
550A	11,5	8	1 131	115	812	83	1 619	165	1 123
550B	11,5	5	781	80	541	55	1 560	159	787
600	11,5	8	1 401	143	948	97	1 893	193	1 391

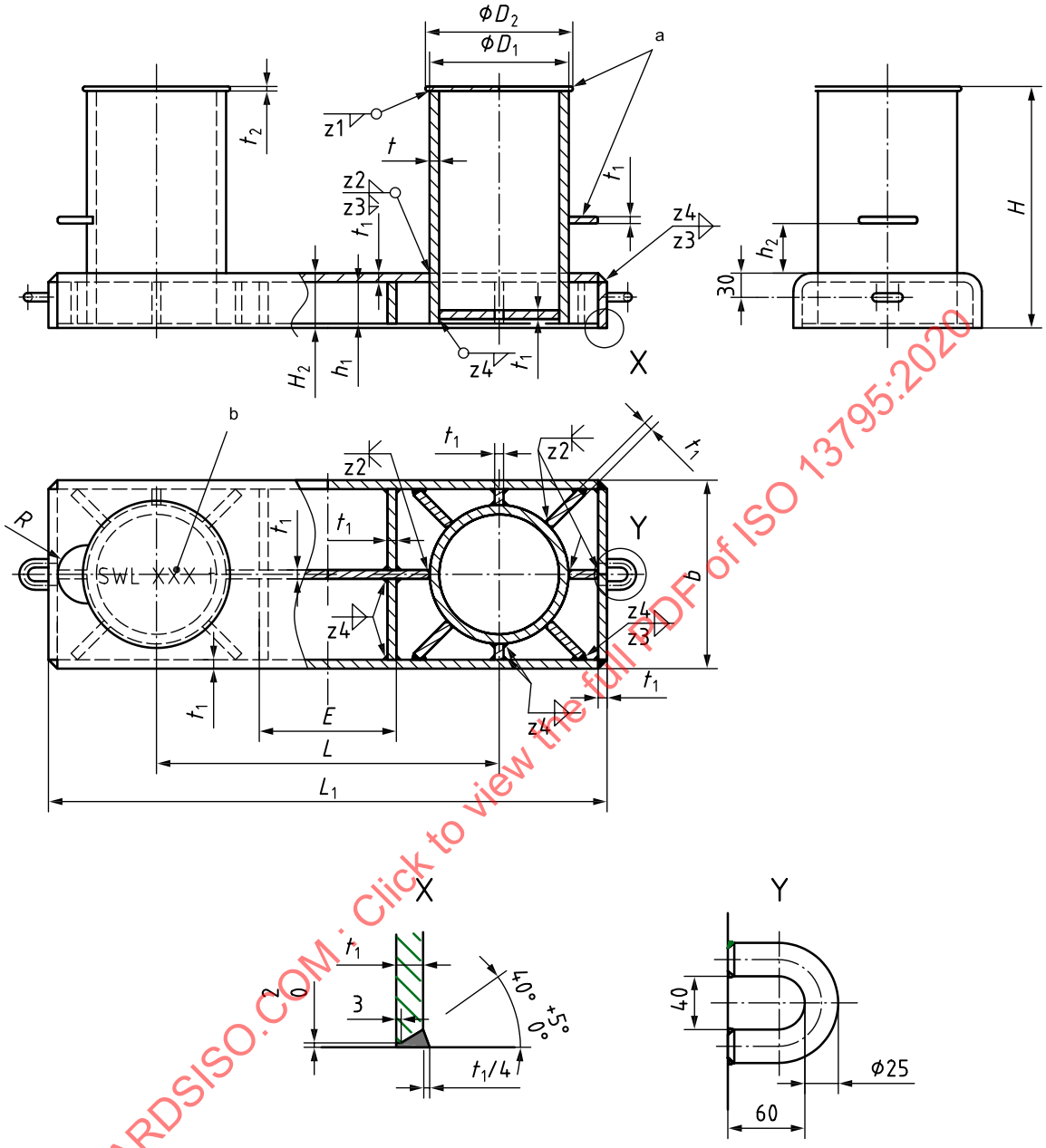
[a] Welding with chamfering is available based on the same welding volume/strength.

[b] 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.

[c] The calculated weight (mass) is for reference only.

Dimensions in millimetres



a Edges smooth grinding.

b SWL marking.

Figure 2 — Type B

Table 3 — Dimensions of Type B bollards

Dimensions in millimetres

Nominal size D_n	D_1	D_2	H_1	H_2	h_1	h_2	b	L	L_1	E	t	t_1	t_2	R
150	165,2	185	320	80	62	70	225	400	670	145	8,0	8	6	40
200	216,3	240	365	85	67	70	290	500	860	160	8,0	8	6	50
250A	267,4	290	470	100	79	90	360	630	1 065	215	12,0	11	8	60
250B	267,4	290	470	100	79	90	360	630	1 065	215	10,0	8	7	60
300A	318,5	340	575	125	95	110	430	800	1 300	325	21,5	20	9	70
300B	318,5	340	575	125	95	110	430	800	1 300	325	12,0	9	9	70
350A	355,6	380	655	145	108	130	480	890	1 475	360	26,0	23,5	11	80
350B	355,6	380	655	145	119	130	480	890	1 475	360	14,0	13	9	80
400A	406,4	430	705	160	121	145	550	1 000	1 630	400	28,0	26	13	85
400B	406,4	430	705	160	133	145	550	1 000	1 630	400	15,0	13,5	11	85
450A	457,2	480	745	170	131	160	620	1 100	1 810	430	29,0	26	14	90
450B	457,2	480	745	170	144	160	620	1 100	1 810	430	14,5	13	11	90
500A	508,0	530	790	190	146	200	690	1 250	2 040	500	32,0	29	16	100
500B	508,0	530	790	190	162	200	690	1 250	2 040	500	14,5	13	11	100
550A	558,8	580	840	210	167	200	750	1 380	2 240	560	31,0	28	16	110
550B	558,8	580	840	210	176	200	750	1 380	2 240	560	21,0	19	11	110
600	609,4	630	875	225	182	200	820	1 550	2 490	660	33,0	28	16	120

Table 4 — Dimensions *(continued)* and SWL of Type B bollards

Dimensions in millimetres

Nominal size D_n	Welding leg length[a]				SWL[b]						Calculated weight[c] kg
					For mooring purposes (Figure-of-eight belay)				For towing purposes (Eye splice)		
					One-rope use		Two- rope use				
	z_1	z_2	z_3	z_4	kN	t	kN	t	kN	t	
150	3	3	6	4	54	5,5	49	5,0	98	10	45
200	3	3	6	4	82	8,4	65	6,7	128	13	68
250A	4	4,5	8	6	156	16	134	14	265	27	150
250B	3	3,5	6	4	127	13	108	11	216	22	119
300A	4	8	12	10	332	34	306	31	608	62	383
300B	4	5	8	6	186	19	161	16	353	36	203
350A	5	10	14	12	443	45	418	43	834	85	582
350B	4	5,5	8	6	244	25	216	22	491	50	333
400A	6	11	16	13	594	61	521	53	1 040	106	793
400B	5	5,5	8	7	326	33	269	27	657	67	441
450A	7	11	16	13	753	77	612	62	1 216	124	979
450B	7	5,5	8	7	382	39	292	30	765	78	517
500A	8	12	17	15	992	101	757	77	1 511	154	1 321
500B	5	5,5	8	7	457	47	326	33	912	93	631
550A	8	11	17	14	1 131	115	812	83	1 619	165	1 530
550B	5	8	12	10	781	80	541	55	1 560	159	1 059
600	8	11	17	14	1 401	143	948	97	1 893	193	1 850

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

[b] 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.

[c] The calculated weight (mass) is for reference only.

Annex A
(normative)

Basis for strength assessment of welded steel bollards

A.1 General

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

A.2 Loading

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

When using two ropes on a bollard, the maximum applicable load on each rope shall be limited as described under the SWL column "Two-rope use" in Tables 1 and 2. The ropes shall be belayed as low as possible to reduce the bending stress on the posts.

NOTE In normal mooring practice, only one mooring rope is fitted per bollard.

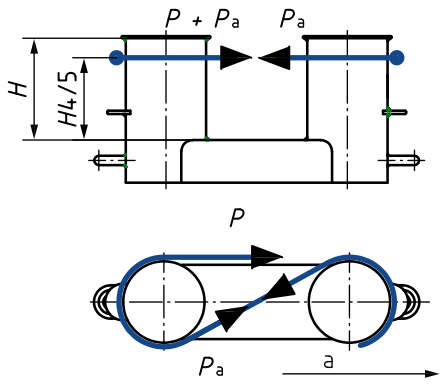
A.2.2 The load P imposed by a rope belayed in figure-of-eight fashion around the bollard produces a resultant load of $2P$.

A.2.3 When two ropes are used, it is possible to impose $4P$ as a shear load at the lowest part of the post.

A.2.4 The bollards shall be designed to withstand the following load cases.

A.2.4.1 Case 1 — Bending loads by mooring rope

It shall be designed to withstand the bending force produced by P imposed at position H 4/5 above the base plate. See Figure A.1.



Key

P mooring force

P_a reaction force produced by $P(P_a = P)$

[a] Ship side.

Figure A.1 — Bending loads by mooring rope