INTERNATIONAL STANDARD ISO 3913

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Shipbuilding — Welded steel bollards

Construction navale — Bittes soudées

First edition — 1977-05-01

UDC 629.12.011 **Ref. No. ISO 3913-1977 (E)**

Descriptors : shipbuilding, steel products, bollards (towing and mooring), dimensions, materials specifications, loads (forces).

Price based on 5 pages

ISO 3913-1977 (E)

FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3913 was developed by Technical Committee ISO/TC 8, *Shipbuilding*, and was circulated to the member bodies in July 1975.

It has been approved by the member bodies of the following countries :

Australia	Ireland	Spain
Austria	Israel	Turkey
Belgium	Japan	United Kingdom
Brazil	Korea, Dem. P. Rep. of	U.S.S.R.
Czechoslovakia	Netherlands	Yugoslavia
France	Poland	
Germany	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Norway
Sweden

Printed in Switzerland

Shipbuilding – Welded steel bollards

1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard specifies requirements for welded steel bollards suitable for installation on ships to meet normal mooring requirements.

It lays down the material and principal dimensions for a range of nominal sizes 100 to 800 and states the maximum loading for which the bollards are intended.

1.2 The method of construction and details of welding are not specified but each manufacturer shall ensure that the bollards are capable of withstanding the test requirements specified. A guide to the design basis for the bollards is given in an annex.

2 REFERENCES

ISO 64, *Steel tubes – Outside diameters.*

ISO 221, *Steel tubes – Wall thickness.*

3 DIMENSIONS AND LOADINGS

3.1 Welded steel bollards shall have dimensions and loading particulars in accordance with figure 1.

3.2 The values of maximum loading given in the table of figure 1 refer to a single mooring rope wound in "figure-of-eight" fashion around the bitts.

4 NOMINAL SIZES

The nominal size (DN) of a bollard shall be denoted by reference to the outside diameter of the bitts in terms of the nearest number drawn from a basic series of preferred numbers. The nominal sizes are :

100, 125, 160, 200, 250, 315, 400, 500, 630, 710, 800

NOTE – The outside diameters, *D*, of bitts are based on steel tubes selected from ISO 64.

5 MATERIAL

The bollards shall be made from weldable quality steel having a tensile strength of 360 N/mm² minimum or 410 N/mm² minimum. A minimum thickness of bitts made from tube or plate is given in the table of figure 1 depending on which strength grade of steel is selected.

6 CONSTRUCTION

6.1 The details of construction of the bollard, including welding details, shall be the responsibility of the manufacturer.

6.2 The bitts shall be constructed from steel tubes or formed from plate and longitudinally welded.

6.3 While the dimensions of the bollard base, h_2, l_2 and l_3, are provided for guidance only, the thickness of the plates for the base shall be sufficient to withstand the loading imposed by the bitts.

6.4 Fillet welds are not recommended for attaching the bitts to the baseplate.

6.5 Consideration must be given to the length and breadth of the base to ensure that there is an adequate area of fillet weld attachment to the deck to withstand the applied loading.

6.6 An oval eyeplate is commonly required to be fitted to the baseplate of a bollard for the purpose of securing a chain or rope stopper. The strength of the eyeplate should be equal to one-quarter of the strength of the maximum loading appropriate to the nominal size of the bollard.

7 QUALITY OF MANUFACTURE

7.1 All surfaces of the bollard, including welds, shall be free from any visible flaws or imperfections.

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

7.3 After completion, the bollards shall be coated externally with an anti-corrosive protective finish.

8 TEST

8.1 A prototype of each nominal size of bollard shall be tested by the manufacturer to prove the design and construction adopted.

8.2 The prototype test shall comprise two parts :

a) mounting two ropes, appropriate to the loading required, in figure-of-eight fashion and inducing loads simultaneously in each rope to the value for the nominal size of bollard given in the table of figure 1; and

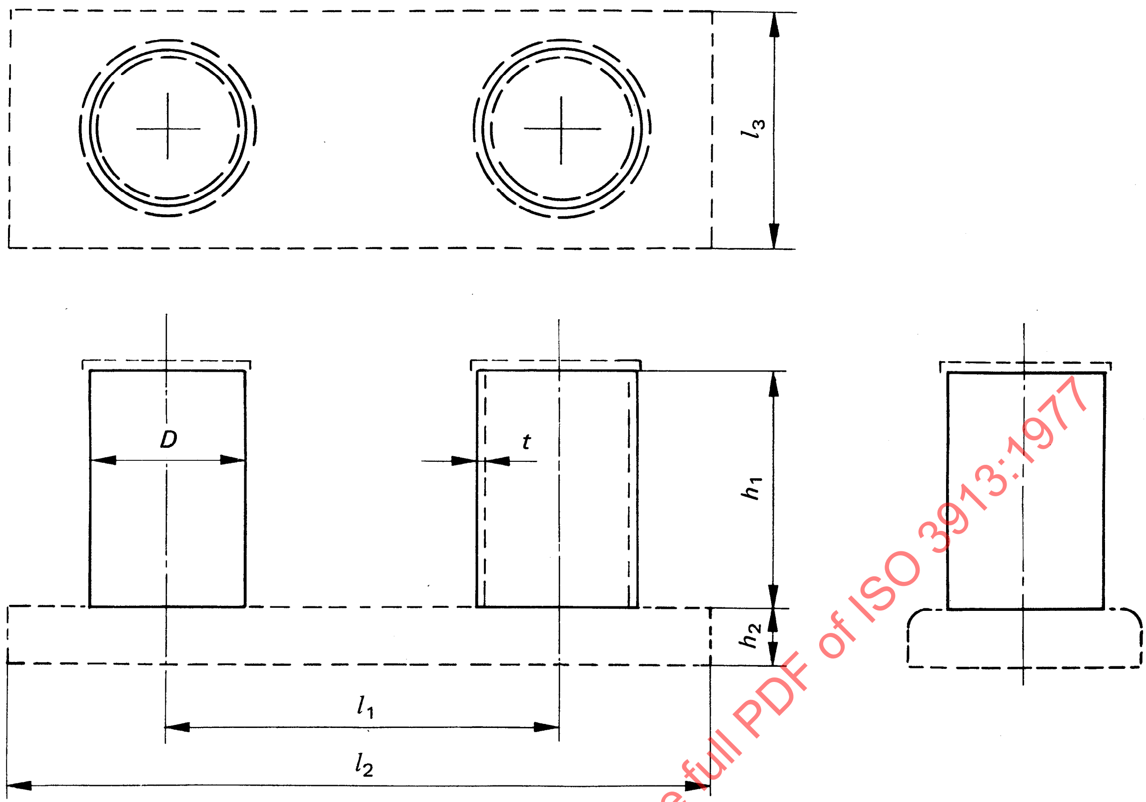
b) mounting a single rope on one bitt at a height of 1,2 DN above the top of the baseplate and applying twice the appropriate loading value given in the table of figure 1. This test shall be repeated on the other bitt.

8.3 After the application of the tests 8.2 a) and b), the bollard shall be examined to ascertain that :

a) no change occurs in the centre-to-centre dimension (l_1) measured across the tops of the bitts;

b) no part of the bollard shows any signs of permanent deformation or failure;

c) all principal welds are intact and free from cracks or flaws.



Nominal size DN	Dimensions, mm										Single rope maximum loading tonnes
	D	t (nominal)				h_1	h_2	l_1	l_2	l_3	
		tube		plate							
		360 N/mm^2 min.	410 N/mm^2 min.	360 N/mm^2 min.	410 N/mm^2 min.						
100	114,3	10	10	10	10	150	75	250	450	150	3
125	139,7	10	10	10	10	190	80	315	560	190	4
160	168,3	10	10	10	10	250	90	400	720	250	5
200	219,1	12,5	11	10	10	300	100	500	900	300	8
250	273,0	14,2	12,5	12	11	380	125	630	1 130	380	12
315	323,9	17,5	16	16	15	480	150	800	1 430	480	20
400	406,4	22,2	20	19	18	600	175	1 000	1 800	600	32
500	508,0	25	22,2	22	20	750	200	1 250	2 250	750	46
630	609,6	30	28	27	24	940	225	1 570	2 830	940	70
710	711,2	30	28	27	25	1 050	250	1 750	3 200	1 050	82
800	813,0	32	30	28	26	1 200	275	2 000	3 600	1 200	100

NOTES

1 Dimensions h_2, l_2 and l_3 are given for guidance only.

2 Tolerance on outside diameter of bitts, whether plate or tube, shall be ± 1 %. (See A.3.)

3 Tolerance on thickness shall be ± 15 % for tube and ± 3 % for bitts from plate. (See A.3.)

FIGURE 1 — **Dimensions and maximum loadings of welded bollards**

ANNEX

BASIS FOR DESIGN OF WELDED STEEL BOLLARDS

A.1 LOADING

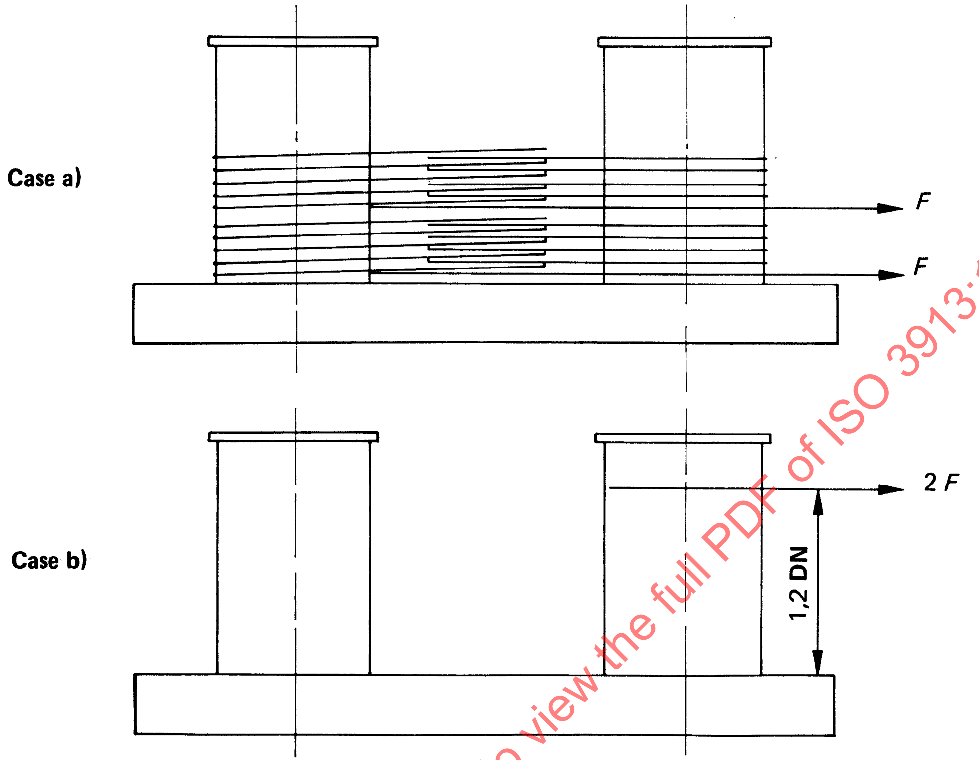


FIGURE 2

Case a) : The bollard is designed to withstand the loading imposed by two mooring ropes each of breaking load *F*, wound in figure-of-eight fashion (about five turns per bitt).

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

Case b) : The bollard is designed to withstand the loading imposed by a single rope (using a soft loop) having a breaking load of 2 *F* mounted at a maximum distance of 1,2 DN above the base plate.

The loading *F* imposed by a single rope wound in figure-of-eight fashion around a bitt produces a resultant loading of approximately 2 *F*. For case a) twice this value is used in the design calculations (i.e. 4 *F*).

A.2 DESIGN STRESS VALUES

For bending, the stress is limited to 85 % of the yield stress of the material used.

For shear, the stress is limited to 60 % of the yield stress of the material used.

A.3 DIMENSIONAL ALLOWANCES

The minimum limit of tolerance is used for the bitts for design purposes, as follows :

Steel tubes : *D* minus 1 %
t (nominal) minus 15 %

Steel plate : *D* minus 1 %
t (nominal) minus 3 %

Wear allowance

An allowance of 4 mm is deducted from (*D* minus 1 %) in calculating the second moment of inertia of the bitt and for the area subject to shear.