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**Ships and marine technology —  
Ship's mooring and towing fittings —  
Panama chocks**

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

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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 13728:2012), which has been technically revised.

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

- the Scope has been reworded; a NOTE concerning the Panama chock for the Panamax Plus and Neopanamax vessels has been added;
- the definition of SWL (3.1) has been reworded;
- technical information on FEM has been added in A.3.2.

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).

## Introduction

The Panama chock is a type of ship's mooring and towing fitting installed on the shipside to lead the mooring or towing rope from the ship's inboard to outboard.

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# Ships and marine technology — Ship's mooring and towing fittings — Panama chocks

## 1 Scope

This document specifies the types, nominal sizes, dimensions and materials, as well as construction, manufacturing and marking requirements, for Panama chocks installed to lead the mooring and towing rope of a ship. It is intended for ships passing through the Panama Canal, which are normally assisted through the locks by locomotives using steel towing wires and/or by tug boats. These chocks meet normal mooring requirements and Panama Canal requirements; they are suitable for mooring vessels inside the Panama Canal locks.

NOTE The Panama chocks (SWL of 90 tons) for the Panamax Plus and Neopanamax vessels can be replaced by closed chocks (see ISO 13729).

## 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*

*Panama Canal Requirements — OP Notice to shipping No. N-1-2019 — Vessel requirements*

## 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

The Panama chock shall be classified by its installation site as belonging to one of the following types:

- a) Type A: deck-mounted Panama chock;
- b) Type B: bulwark-mounted Panama chock.

## 4.2 Nominal sizes

The nominal sizes of the Panama chocks are denoted by reference to the width of the opening, in millimetres.

The nominal sizes are 310 and 360.

## 5 Dimensions

5.1 The Panama chocks shall have dimensions and particulars in accordance with [Tables 1, 2, 3 and 4](#), and [Figures 1 and 2](#).

5.2 The minimum opening size of the Panama chocks shall be as specified in the *Panama Canal Requirements — OP Notice to shipping No. N-1-2019 — Vessel requirements*.

## 6 Materials

The following material shall be used for manufacturing the Panama chocks:

— steel casting material, having a yield point of not less than 235 N/mm<sup>2</sup> or equivalent.

The carbon contents of the steel casting shall not be more than 0,23 % considering weldability.

## 7 Construction

The foundation of the Panama chocks shall be determined by considering the actual load direction. The foundation and welding connections to the hull shall guarantee a reliable transmission of the maximum loading of the Panama chocks to the hull construction without any plastic deformation or cracks.

## 8 Manufacturing and inspection

8.1 All surfaces of the Panama chocks, 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 Panama chocks 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 Panama chocks 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 by considering the foundation and 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.

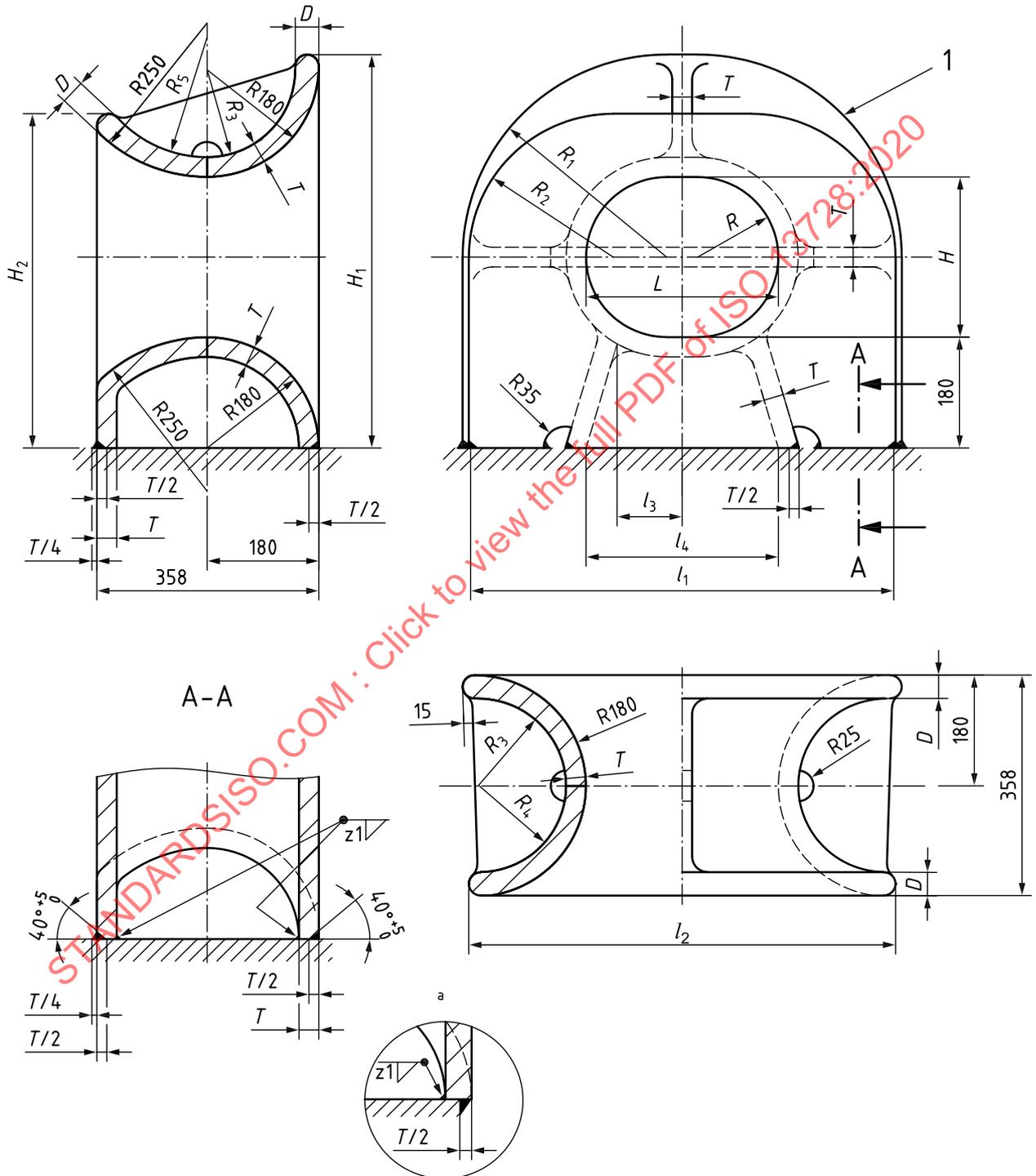
9.3 The Panama chock shall be clearly marked with its SWL by weld bead or equivalent. The SWL shall be expressed in tonnes (symbol 't') and be located so that it is not obscured during operation of the fitting.

EXAMPLE SWL XXX t

9.4 The SWL mark shall be placed on the foundation of the chock or on the deck.

9.5 The radii of edges and corners not shown in [Figure 1](#) shall be of minimum 25 mm.

Dimensions in millimetres



**Key**

- 1 Panama chock
- a Alternative welding method.

**Figure 1 — Type A — Deck-mounted Panama chock**

**Table 1 — Dimensions of Type A — Deck-mounted Panama chocks**

Dimensions in millimetres

Nominal size	$L$	$l_1$	$l_2$	$l_3$	$l_4$	$H$	$H_1$	$H_2$	$R$	$R_1$	$R_2$
310	310	708	688	105	310	260	639	541	130	329	231
360	360	760	740	130	360	260	640	543	130	330	233

**Table 2 — Dimensions (continued) and SWL of Type A — Deck-mounted Panama chocks**

Dimensions in millimetres

Nominal size	$R_3$	$R_4$	$R_5$	$T$	$D$	Welding leg length <sup>a</sup> $z_1$	SWL <sup>b</sup>		Calculated weight <sup>c</sup> kg
							kN	t	
310	142	140	198	32	38	8	471	48	257
360	140	138	196	34	40	8,5	687	70	286

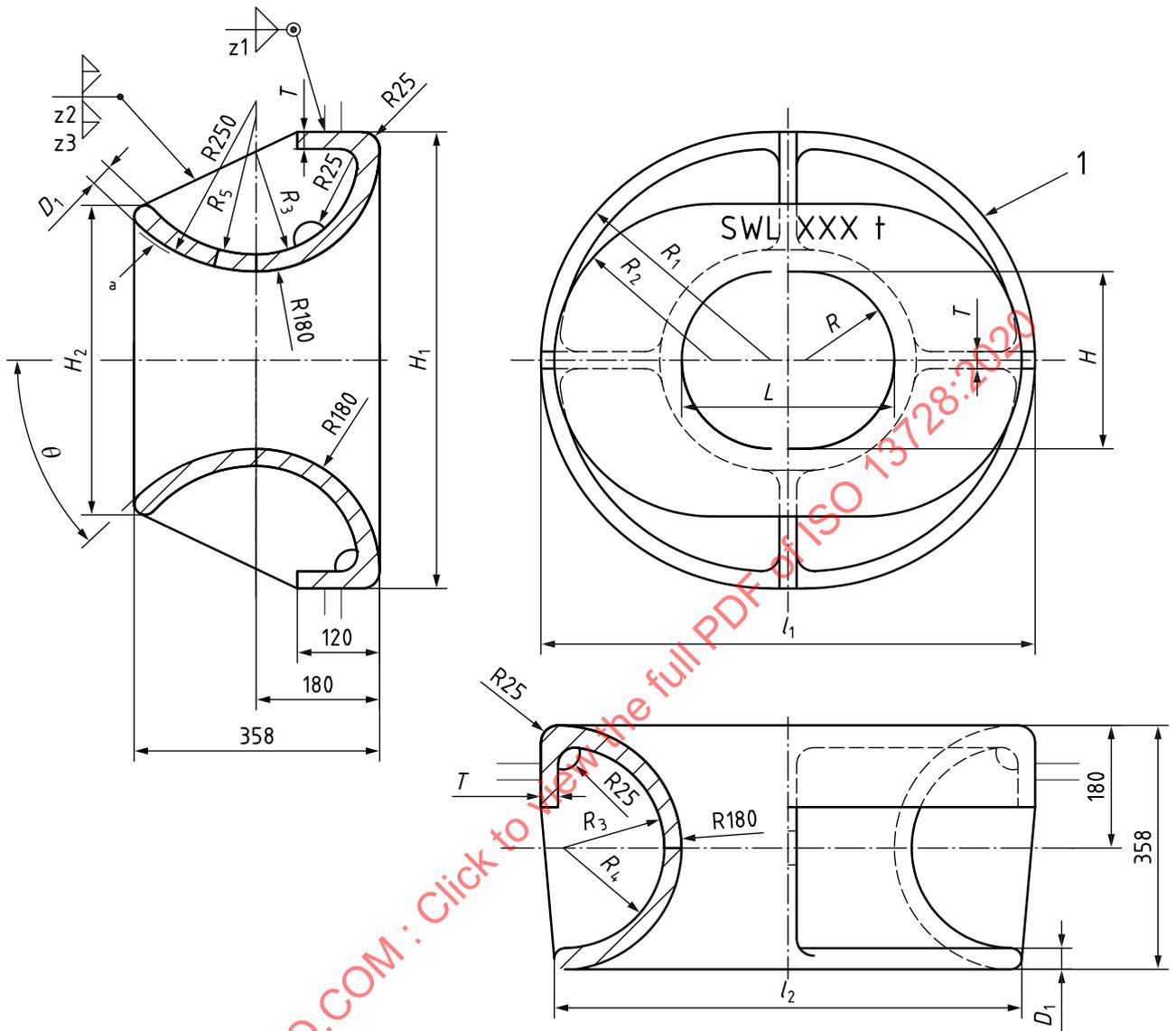
<sup>a</sup> The welding method may be changed based on the same welding volume/strength.

<sup>b</sup> The SWLs shown are for reference only. These are based on the loadings as mentioned in [Annex A](#).

The "SWL" which is marked on the fitting may be adjusted depending on the actual loading conditions of mooring rope under the agreement between the user and the manufacturer.

<sup>c</sup> The calculated weight (mass) is for reference only.

Dimensions in millimetres



**Key**

1 Panama chock

$\theta^\circ$  maximum available line leading angle limited by the end of curve surface (for reference)

The SWL mark shall be provided on the chock or on the shell plate near the chock.

The radii of edges and corners not shown in this figure shall be of minimum 25 mm.

**Figure 2 — Type B — Bulwark-mounted Panama chocks**

**Table 3 — Dimensions of Type B — Bulwark-mounted Panama chocks**

Dimensions in millimetres

Nominal size	$L$	$l_1$	$l_2$	$H$	$H_1$	$H_2$	$R$	$R_1$	$R_2$	$R_3$	$R_4$
310	310	720	681	260	670	453	130	335	226,5	149	147
360	360	770	733	260	670	456	130	335	228	147	145

**Table 4 — Dimensions (continued) and SWL of Type B — Bulwark-mounted Panama chocks**

Dimensions in millimetres

Nominal size	$R_5$	$T$	$D_1$	$\theta$	Welding leg length <sup>a</sup>			SWL <sup>b</sup>		Calculated weight <sup>c</sup> kg
					$z_1$	$z_2$	$z_3$	kN	t	
310	205	25	31	44°	10	6	4	687	70	228
360	203	27	33	43°	10	6	5	775	79	248

<sup>a</sup> The welding method may be changed based on the same welding volume/strength.

<sup>b</sup> The SWLs shown are for reference only. These are based on the loadings as mentioned in [Annex A](#).

The “SWL” which is marked on the fitting may be adjusted depending on the actual loading conditions of mooring rope under the agreement between the user and the manufacturer.

<sup>c</sup> The calculated weight (mass) is for reference only.

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## Annex A (normative)

### Basis for strength assessment of Panama chocks

#### A.1 General

The Panama chocks were designed in accordance with the technical requirements of the Panama Canal as listed below:

- bearing surface radius: not less than 180 mm;
- single chock: opening area: min. 650 cm<sup>2</sup>, 305 × 230 mm, 45,36 t SWL;
- double chock: opening area: min. 900 cm<sup>2</sup>, 355 × 255 mm, 64,00 t SWL.

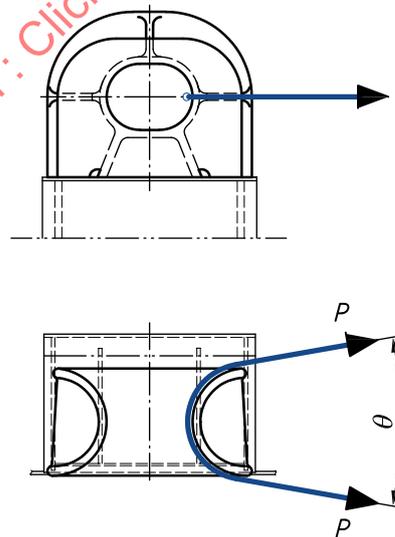
#### A.2 Loading

The Panama chocks shall be designed to withstand the horizontal and vertical load cases.

The horizontal and vertical loadings were considered individually, but both loadings were not considered simultaneously.

##### A.2.1 Case 1 — Horizontal loading

See Figure A.1.



#### Key

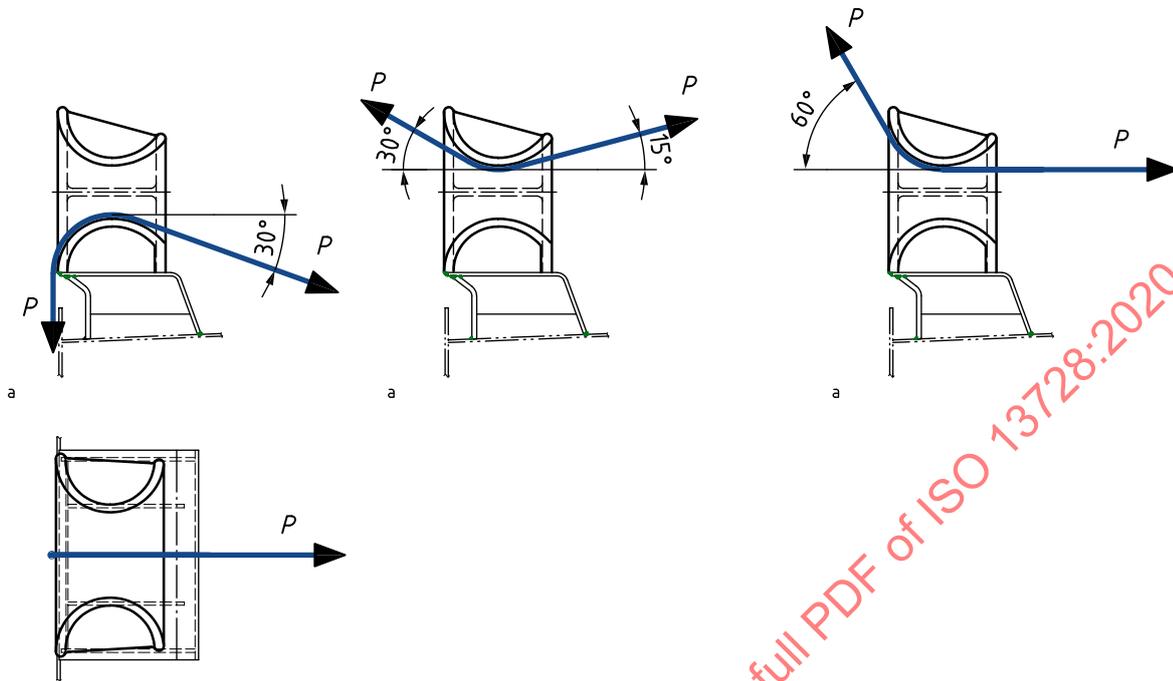
*P* mooring force or towing force

NOTE The loads were considered for a rope deflected 180° ( $\theta = 0^\circ$ ) through the Panama chock.

Figure A.1 — Horizontal loading

A.2.2 Case 2 — Vertical loading

See Figures A.2 and A.3.



**Key**

$P$  mooring force or towing force

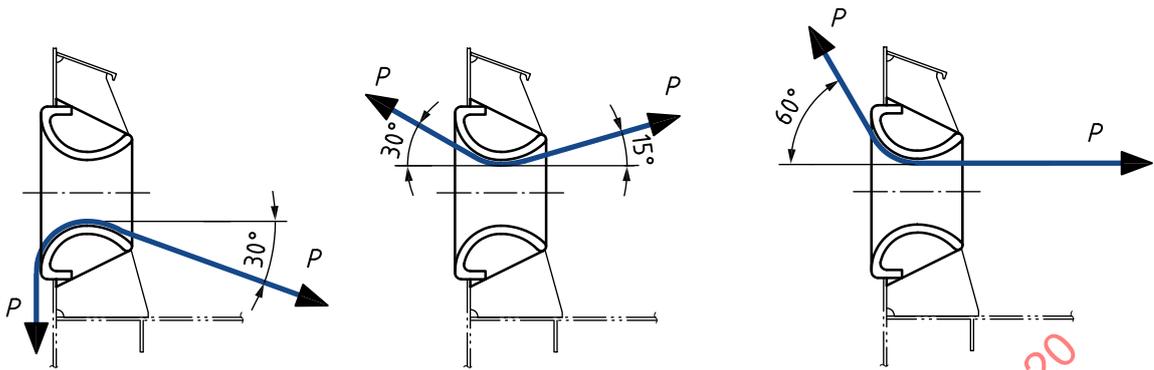
a Ship side.

NOTE The loads were considered for a rope deflected through the Panama chock as shown in this figure.

Vertical down side: outboard down  $90^\circ$ , inboard down  $30^\circ$ .

Vertical up side: outboard up  $30^\circ$ , inboard up  $15^\circ$ , or outboard up  $60^\circ$ , inboard up  $0^\circ$ .

**Figure A.2 — Vertical loading for Type A — Deck-mounted Panama chocks**

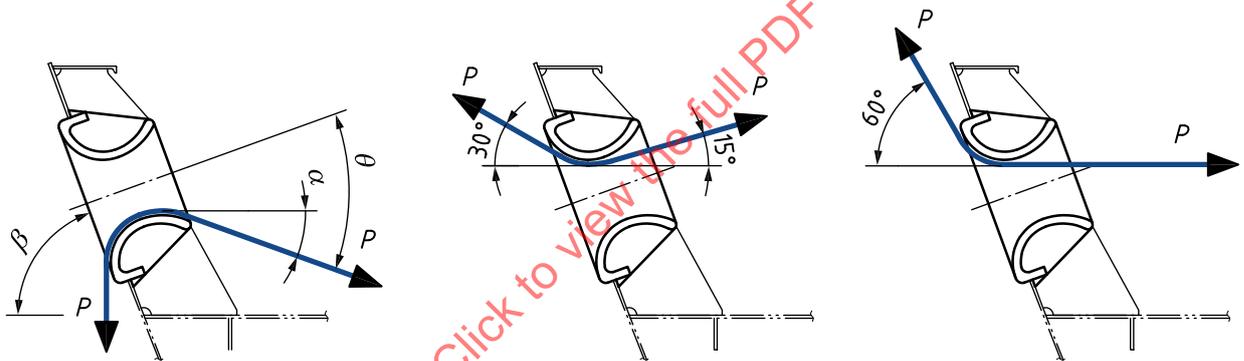


NOTE The loads were considered for a rope deflected as through the Panama chock as shown in [Figure A.3 a\)](#).

Vertical down side: outboard down 90°, inboard down 30°.

Vertical up side: outboard up 30°, inboard up 15°, or outboard up 60°, inboard up 0°.

**a) Bulwark-mounted Panama chocks without bulwark inclination**



NOTE The loads were considered for a rope deflected as through the Panama chock as shown in [Figure A.3 b\)](#).

Vertical down side: outboard down 90°, inboard down  $\theta^\circ$  is not over the figures in [Table 2](#).

Vertical up side: outboard up 30°, inboard up 15° or outboard up 60°, inboard up 0°.

**b) Bulwark-mounted Panama chocks with bulwark inclination**

**Key**

$P$  mooring force or towing force

$\alpha$  refer to below table for instance at the design bulwark angle of  $\beta = 60^\circ$ .

Nominal size	(Maximum available angle) $\alpha^\circ$
310	14°
360	13°

Figure A.3 — Vertical loading for Type C — Bulwark-mounted Panama chock

### A.3 Load and stress criterion

#### A.3.1 Stress criterion

Under the SWL, the combined stress is limited to 85 % of the yield stress of the material.

#### A.3.2 Analysis conditions for FEM

##### A.3.2.1 Boundary conditions

Boundary conditions are shown in [Table A.1](#) and [Figure A.4](#).

Table A.1 — Displacement and rotational degrees of freedom

Location	Dx	Dy	Dz	Rx	Ry	Rz
Model Bottom	Fix	Fix	Fix	Fix	Fix	Fix



Figure A.4 — Displacement boundary condition

##### A.3.2.2 Mesh size

The Panama chock was modelled based on 2 times the Panama chock thickness.

##### A.3.2.3 Element

Panama chock – shell (2D).