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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Shipbuilding — Ordinary rectangular windows — Positioning

Construction navale — Fenêtres rectangulaires de type courant — Positionnement

Reference number
ISO 5779 : 1987 (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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5779 was prepared by Technical Committee ISO/TC 8, *Shipbuilding and marine structures,* in collaboration with representatives of the International Association of Classification Societies (IACS).

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Shipbuilding — Ordinary rectangular windows — Positioning

1 Scope and field of application

This International Standard specifies the allowable positioning of ordinary rectangular windows to ISO 3903, applicable for passenger and cargo ships intended for international voyages.

Annexes A and B form integral parts of this International Standard. Annex A gives a formula for calculation of design pressure; annex B is based on the calculation method for design pressure, but presents simplified graphs for positioning of rectangular windows.

2 References

ISO 3903, *Shipbuilding — Ships' ordinary rectangular windows.*

International convention on load lines, 1966 (LL 1966), International Maritime Organization (IMO).

Requirement S3, *Strength of end bulkheads of superstructures and deckhouses*, International Association of Classification Societies (IACS).

3 Conditions for positioning

3.1 General

The positioning of rectangular windows shall be determined according to the rules and regulations of international conventions and codes, national authorities and classification societies.

3.2 Positioning

The position of a rectangular window on a ship depends on

a) the position of the rectangular window relative to the length, L, of the ship and the the height, y, of its sill[1] above the summer load line, S (see graphs Nos. 1 to 4 in annex B). Where timber load lines are assigned, the height shall be measured from the summer timber load line to the sill of the window;

b) the nature and the orientation of the wall of the superstructures and deckhouses in which it is fitted, namely:

- fronts,
- sides,
- aft ends.

3.3 Window position limitations

For positions where rectangular windows shall not be installed, see 3.3.1 and 3.3.2.

3.3.1 No rectangular window shall be installed below the freeboard deck or in the first tier of superstructures or in the first tier of deckhouses the sides of which are within 1,2 m of the ship's side.

3.3.2 No windows shall be fitted between the position as defined in 3.3.1 and the lower part of the curve derived from graph No. 1 (see annex B).

3.4 Shutters

3.4.1 In first-tier deckhouses which give access to spaces below the freeboard deck, every rectangular window shall be provided with a permanently attached shutter.

3.4.2 Every rectangular window in spaces in the second tier which give direct access to closed first-tier superstructures or to spaces below the freeboard deck shall be protected by a permanently attached shutter.

1) Sill is defined as the lower end of the glass opening.

3.4.3 Portable shutters may be used as an alternative to permanently attached shutters as given in 3.4.1 and 3.4.2 when approved by a national administration.

NOTE — Shutters are not components of the standardized rectangular windows according to ISO 3903 — they are additional components which are fitted on the outside or inside.

4 Strength limitations

In addition to the limitations on the use of windows stipulated in 3.3, the lowest permissible position of rectangular windows is dependent on their strength relative to external forces acting upon the ship.

4.1 Calculation of external forces

The expected maximum external forces (design pressure) are found by the calculation method given in annex A.

4.2 Ultimate position

No rectangular windows shall be installed in any part of the ship where the design pressure exceeds the maximum allowable pressure which individual types and sizes of rectangular windows can withstand, as given in table 1.

Table 1 — Maximum allowable pressure for rectangular windows to ISO 3903

ISO 3903 window				Maximum allowable pressure P
Type	No.	Nominal size	Glass thickness[1]	
		mm	mm	kPa
E, heavy	1	300 × 425	10	99
	2	355 × 500	10	71
	3	400 × 560	12	80
	4	450 × 630	12	63
	5	500 × 710	15	80
	6	560 × 800	15	64
	7	900 × 630	19	81
	8	1 000 × 710	19	64
F, light	1	300 × 425	8	63
	2	355 × 500	8	45
	3	400 × 560	8	36
	4	450 × 630	8	28
	5	500 × 710	10	36
	6	560 × 800	10	28
	7	900 × 630	12	32
	8	1 000 × 710	12	25
	9	1 100 × 800	15	31

1) In special cases a greater glass thickness shall be used for obscured glass panes. See ISO 3903.

Annex A

Calculation of design pressure

(This annex forms an integral part of the Standard.)

A.0 Introduction

The design pressure to be observed when positioning ordinary rectangular windows to ISO 3903 is determined according to the formula in clause A.1.

This formula, applying generally to the calculated load to which superstructures and deckhouses may be exposed when protecting openings according to Regulation 18 of LL 1966/IMO is taken as a basis for the positioning of ships' rectangular windows.

A.1 Formula

NOTE — This formula is adopted from Requirement S3 of IACS.

The design pressure p is given, in kilopascals, by the formula

$$p = 10\, a\, (b\, f - y)\, c$$

where

a is the height factor (see A.1.1);

b is the factor for distribution over the ship's length (see A.1.2);

f is the probability factor (see A.1.3);

y is the vertical distance, in metres, from the summer load line, S, to the sill of the window; or, where timber load lines are assigned, from the summer timber load line to the sill of the window;

c is the breadth factor (see A.1.4).

A.1.1 Calculation of height factor a

Symbols used in table 2 formulae:

L and L_1 are the length of the ship, in metres, as defined in Regulation 3 (1) of LL 1966/IMO (L_1 need not to be taken > 300 m);

x stands for the distance, in metres, between the bulkhead considered and the aft perpendicular (AP) (see annex B).

NOTE — Regarding the sides of a superstructure or deckhouse, these sides shall be subdivided into parts of approximately equal length, not exceeding 0,15 L each and x shall be taken as the distance between AP and the centre of each part considered.

Table 2 — Formulae for factor a

Position of window in superstructures and deckhouses		a
Fronts, unprotected	lowest tier[1)]	$2{,}0 + \frac{L_1}{120}$
	2nd tier	$1{,}0 + \frac{L_1}{120}$
	3rd tier	$0{,}5 + \frac{L_1}{150}$
Fronts, protected all tiers		
Sides all tiers		
Aft ends all tiers	aft of amidships	$0{,}7 + \frac{L_1}{1\,000} - 0{,}8\,\frac{x}{L}$
	forward of amidships	$0{,}5 + \frac{L_1}{1\,000} - 0{,}4\,\frac{x}{L}$

1) The lowest tier is normally that tier which is situated directly above the uppermost continuous deck to which the rule depth D is to be measured. However, where a greater than minimum freeboard is assigned, it may be left to the administration to define this tier as an upper tier. It is recommended that "excessive freeboard" be that which exceeds the minimum tabular freeboard by more than one standard tier height of the superstructure.

A.1.2 Calculation of factor b for distribution over the ship's length

Table 3 — Formulae for factor b

x/L	b
$\leqslant 0{,}45$	$1{,}0 + \left(\frac{x/L - 0{,}45}{C_b + 0{,}2}\right)^2$
$> 0{,}45$	$1{,}0 + 1{,}5\left(\frac{x/L - 0{,}45}{C_b + 0{,}2}\right)^2$

Block coefficient C_b, used in table 3 formulae

The block coefficient C_b is the block coefficient at moulded draught d corresponding to the summer load line for cargo ships and the deepest subdivision moulded draught for passenger ships, based on length L and maximum moulded breadth B

$$C_b = \frac{\text{moulded displacement at draught } d}{L \times B \times d}$$

where moulded displacement is expressed in cubic metres and L, B and d in metres.

The values to be taken for C_b range from 0,60 to 0,80. When considering aft ends forward of amidships, C_b need not be taken less than 0,80.

A.1.3 Calculation of probability factor f

Table 4 — Formulae for factor f

L m	f
$L \leqslant 150$	$\frac{L}{10} e^{-\frac{L}{300}} - \left[1 - \left(\frac{L}{150}\right)^2\right]$
$150 < L \leqslant 300$	$\frac{L}{10} e^{-\frac{L}{300}}$
$L > 300$	11,03

NOTE — In table 4 formulae, e is the base of Napierian logarithms.

Table 5 — Calculated values for factor f

L	f	L	f	L	f	L	f	L	f
20	0,89	65	4,42	110	7,16	155	9,25	220	10,57
25	1,33	70	4,76	115	7,43	160	9,39	230	10,68
30	1,75	75	5,09	120	7,68	165	9,52	240	10,78
35	2,17	80	5,41	125	7,93	170	9,65	250	10,86
40	2,57	85	5,72	130	8,18	175	9,77	260	10,93
45	2,96	90	6,03	135	8,42	180	9,88	270	10,98
50	3,34	95	6,32	140	8,65	190	10,09	280	11,01
55	3,71	100	6,61	145	8,88	200	10,27	290	11,02
60	4,07	105	6,89	150	9,11	210	10,43	300	11,03

NOTE — Factor f = 11,03 for $L \geqslant 300$ m; intermediate values are determined by linear interpolation.

A.1.4 Calculation of breadth factor c

Breadth factor c is calculated from the formula

$$c = 0{,}3 + 0{,}7 \frac{b'}{B'}$$

where

b' is the breadth, in metres, of the deckhouse at the position considered;

B' is the actual maximum breadth, in metres, of the ship on the exposed weather deck at the position considered;

b'/B' is not to be taken less than 0,25.

Annex B

Graphs for positioning of rectangular windows

(This annex forms an integral part of the Standard.)

B.0 Introduction

This annex is based on the calculation method for design pressure, but it is presented in a simplified graphical form (see also notes 2 to 4 following B.1.6).

Graphs 1 to 4 may be used to determine the admissible type of rectangular windows, according to ISO 3903, depending on their position in the ship.

From the graphs, the minimum height from the summer load line, S, to the sill of the rectangular window can be derived.

The curves given in the graphs are based on the lowest pressure which a particular type of rectangular window can withstand. These values are given in table 6.

Graphs 1 and 2 apply to rectangular windows type E, ISO 3903. Graphs 3 and 4 apply to rectangular windows type F, ISO 3903.

Table 6 — Maximum allowable pressure, p

ISO 3903 type window	Maximum allowable pressure p kPa
E	60
F	25

B.1 Directions for using the graphs

B.1.1 A scale drawing (general arrangement plan, profile drawing or capacity plan or similar showing the summer load line, S) shall be used (see the figure).

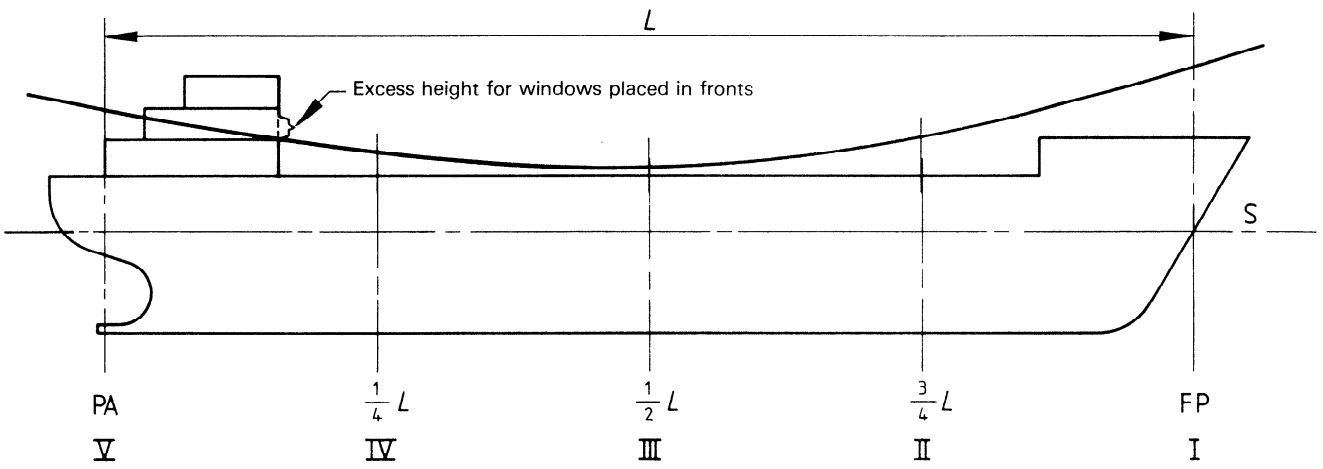
B.1.2 The longitudinal position of the ordinates I to V shall be indicated on the plan.

B.1.3 The ordinate value, i.e. the height above the summer load line, S, or summer timber load lines shall then be plotted for the type of window being considered (these values are obtained from either graph 1 or graph 3).

B.1.4 A line shall be drawn through the plotted ordinates. This line will be the lowest possible position of the sill of windows of the particular type; however, the position is subject to the limitations given in 3.3.1 and 3.3.2.

B.1.5 For windows in fronts, the chain-dotted lines in graphs 1 and 3 give the additional height which should be added to the applicable curve referred to in B.1.4. The resulting height then becomes the lowest possible position of the sill of windows of the particular type when situated in the fronts of superstructures or deckhouses.

B.1.6 For windows of types E and F, used in aft ends of larger ships, graphs 2 and 4 give the actual ordinates. The procedure to be followed is the same as given in B.1.2 to B.1.4.



Figure

NOTES

1 The particular limitations indicated in 3.2 and 4.2 shall be observed.

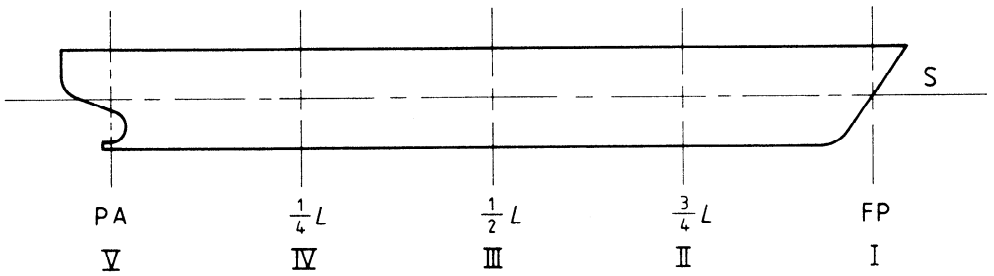
2 The most unfavourable block coefficient (C_b = 0,6) has been chosen for all ships' lengths. Particularly for the extreme ordinate I and to some extent also for ordinate V, the difference between the lowest and highest values of the height above the summer load line is about 3 m and 1 m respectively for a variation of C_b from 0,6 to 0,8.

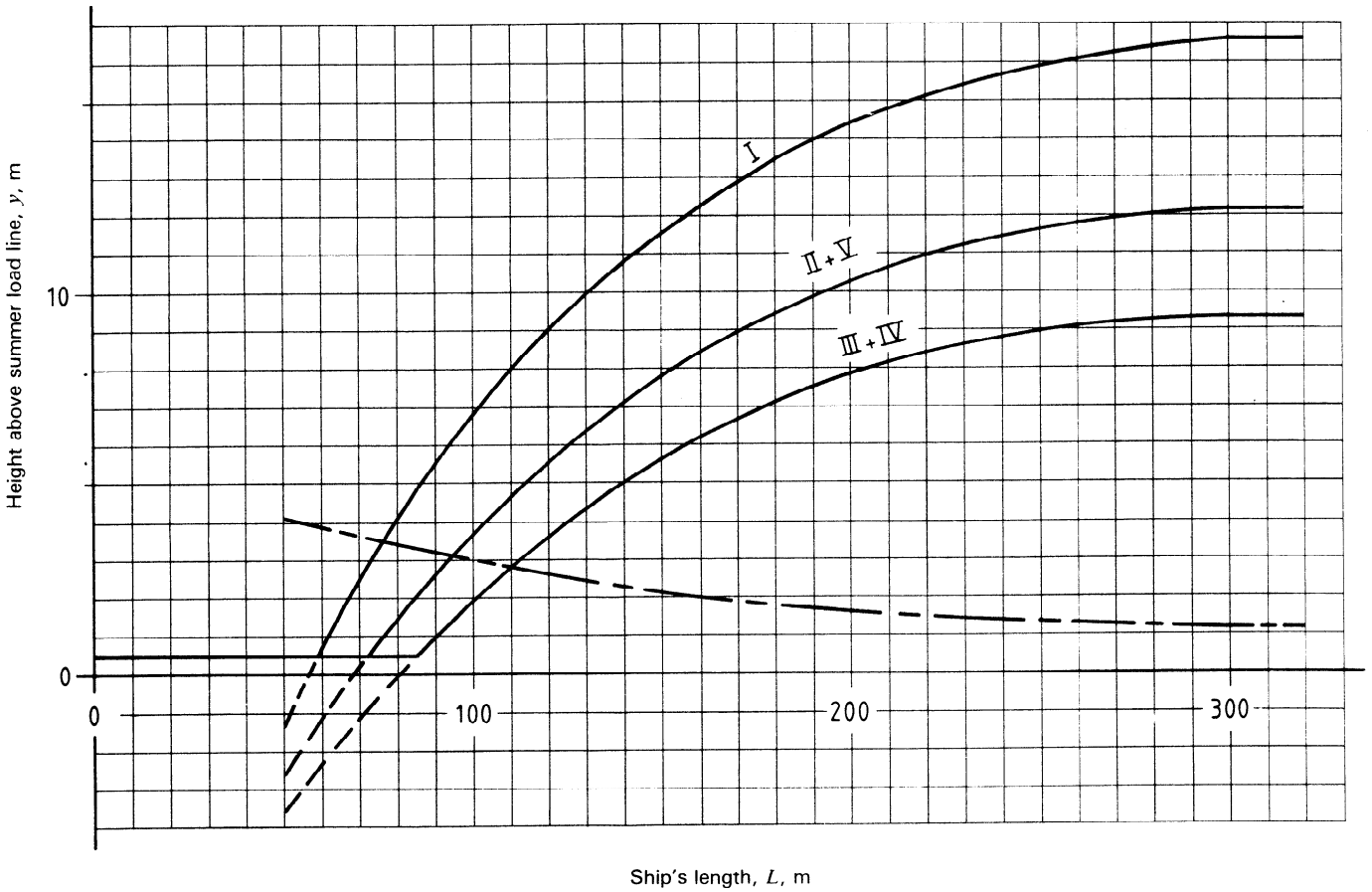
3 Reduction of design pressure due to distance of windows from the ship's side and due to height above deck level, in the case of windows in fronts, is not taken into account.

4 The calculated values for the height above the summer load line, S, for the ordinates II and V and also III and IV differ only by about 0,5 m to 1,0 m. The pairs of ordinates are therefore combined in respective curves in each graph.

Graph No. 1

Type E rectangular window — The curves are valid for positioning in all zones detailed in 3.2, except for aft ends



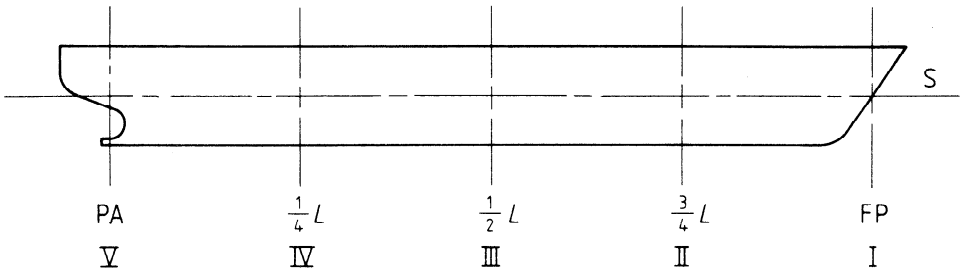


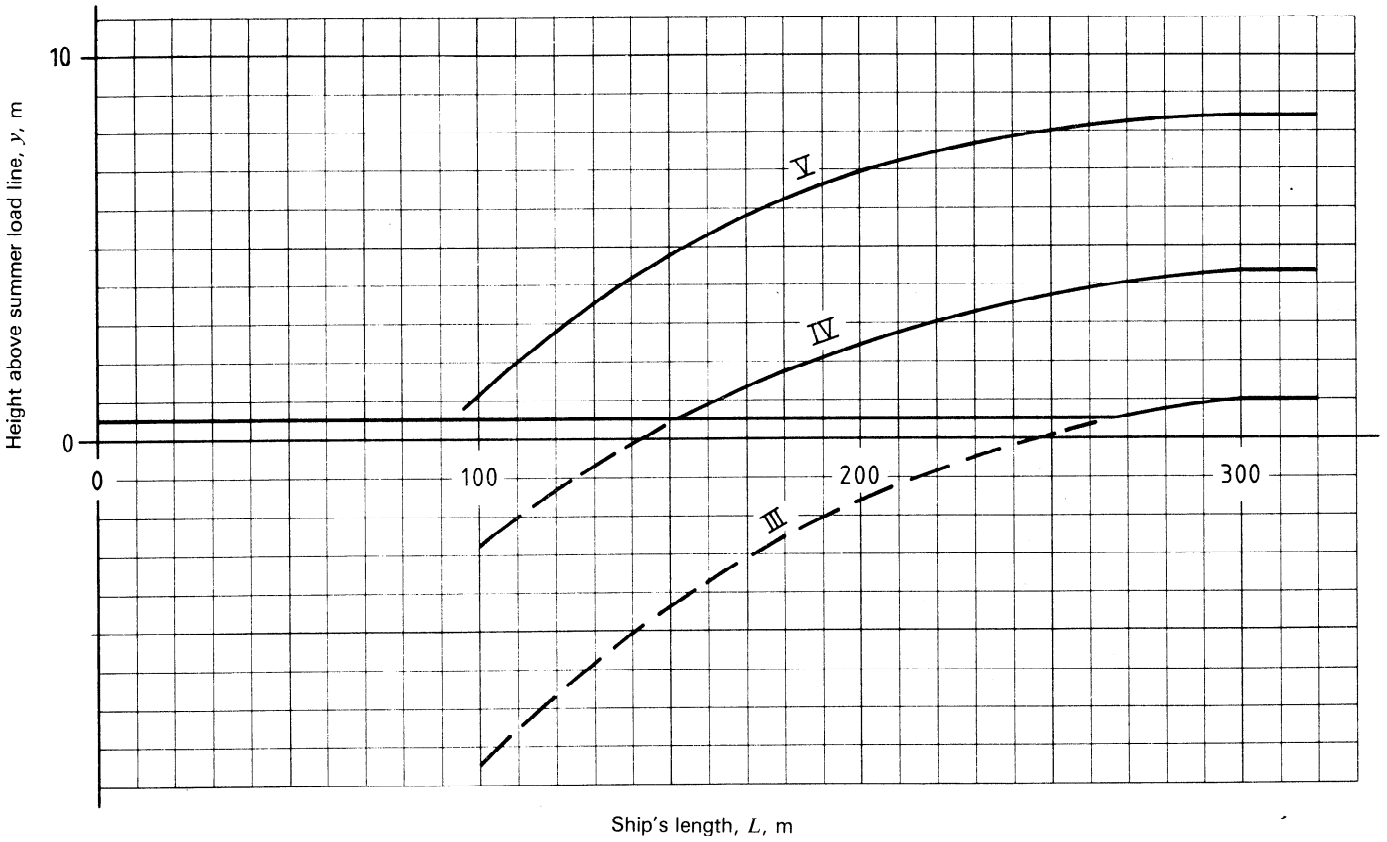
Height for windows placed in side walls of superstructures and deckhouses

Excess height for windows placed in fronts

Graph No. 2

Type E rectangular window — The curves are valid for positioning in aft ends

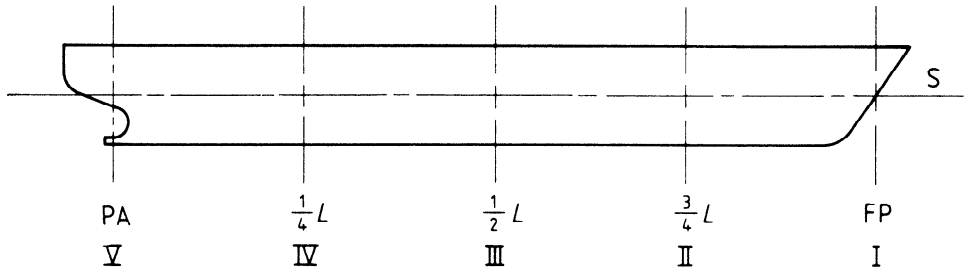


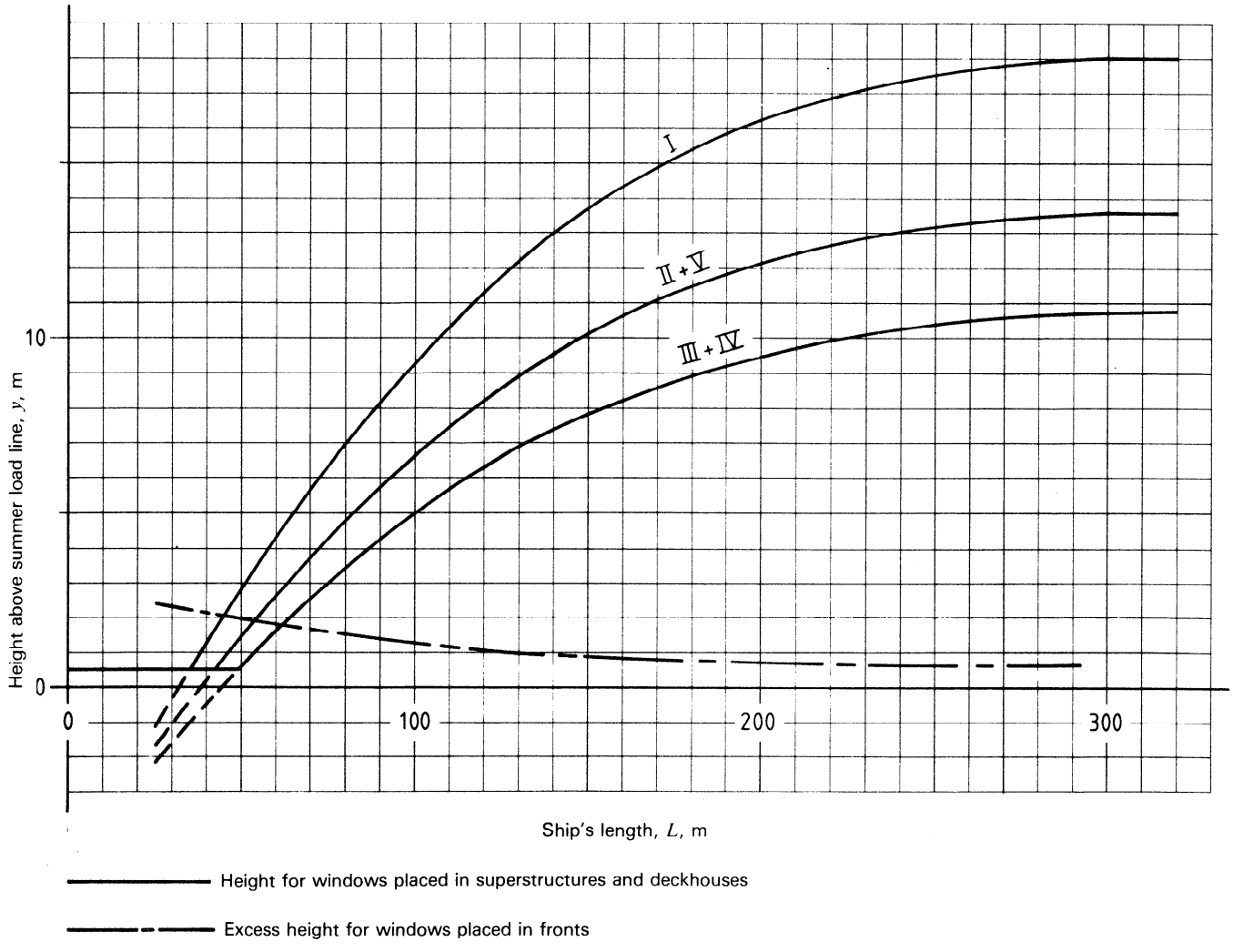


——— Height for windows placed in aft ends

Graph No. 3

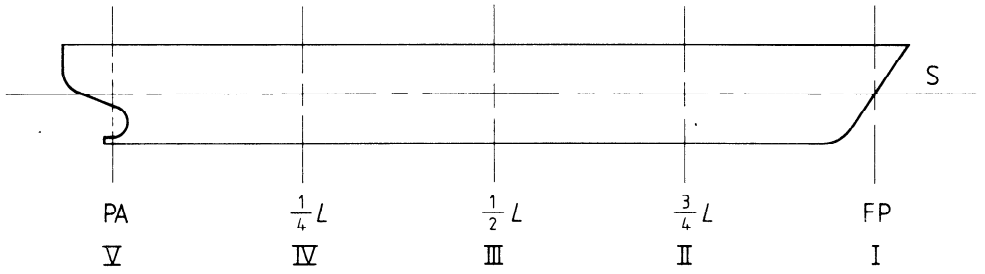
Type F rectangular window — The curves are valid for positioning in all zones detailed in 3.2, except for aft ends

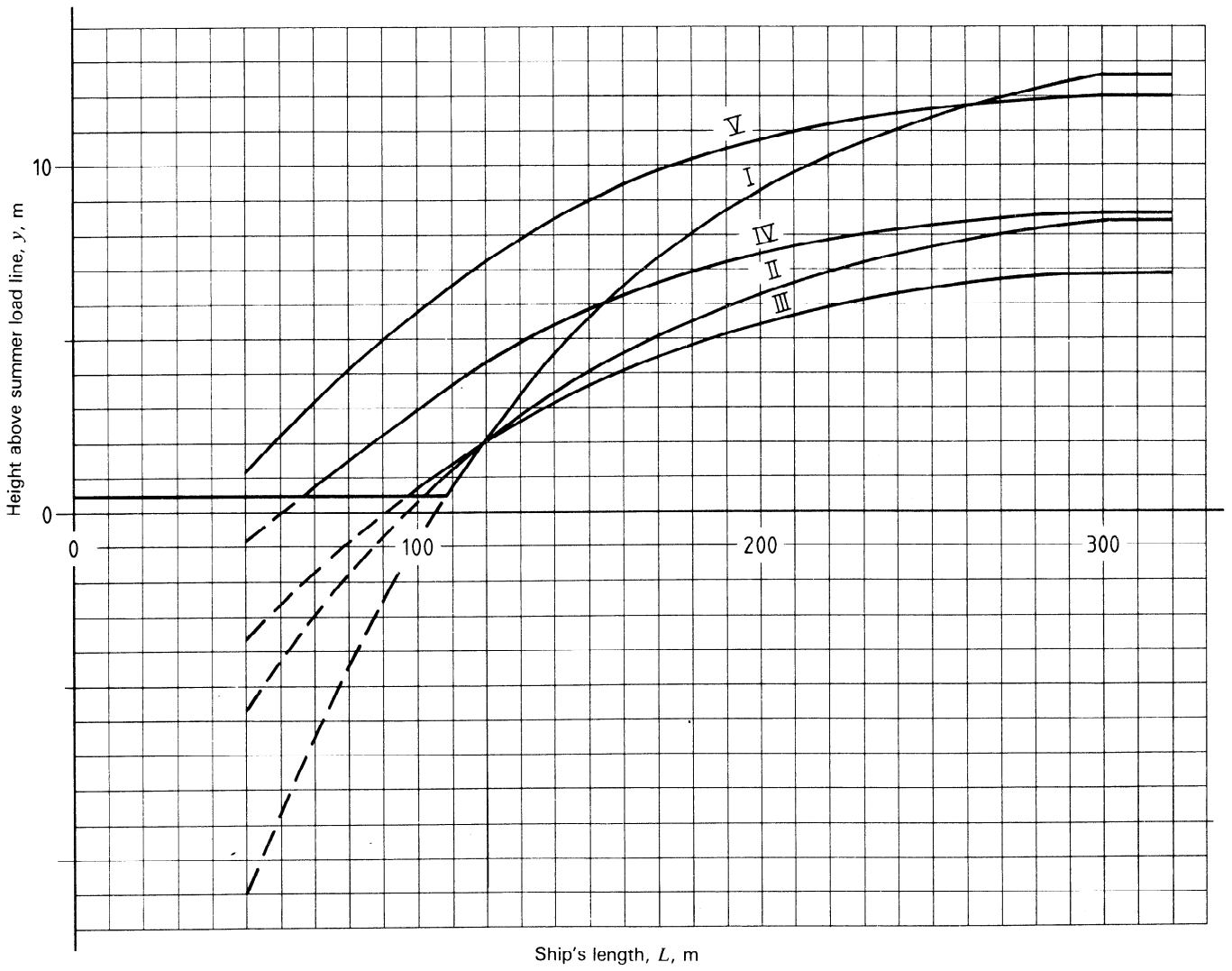




Graph No. 4

Type F rectangular window — The curves are valid for positioning in aft ends





Height for windows placed in aft ends

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