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Shipbuilding — Side scuttles — Positioning

Construction navale — Hublots — Positionnement

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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 5780 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 — Side scuttles — Positioning

1 Scope and field of application

This International Standard specifies the allowable positioning of side scuttles to ISO 1751, 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 side scuttles.

2 References

ISO 1751, *Shipbuilding — Ships' side scuttles*.

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 side scuttles 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 side scuttle on a ship depends on

- a) the position of the side scuttle relative to the length, L , of the ship and to the height, v , of its sill¹⁾ above the sum-

mer 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 side scuttle;

- b) the nature and the orientation of the wall in which it is fitted, namely

- the ship's side below the freeboard deck;
- the fronts, sides and aft ends of superstructures and deckhouses.

3.3 Side scuttle position limitations

For positions where side scuttles shall not be installed, see 3.3.1 and 3.3.3, and where they shall be of non-opening type, see 3.3.2.

3.3.1 No side scuttle shall be installed in a position where its sill would be below a line drawn parallel to the freeboard deck on the side having its lowest point 2,5 % of the breadth, B , of the ship above the summer load line, S , (or summer timber load line if assigned), or 500 mm above the same load line whichever is the greater distance.

3.3.2 If the vessel is required to satisfy damage stability requirements, all side scuttles the sills of which are positioned below the final waterline in damaged condition and are fitted outside the spaces considered flooded shall be of the non-opening type.

NOTE — For detailed information, see the relevant requirements of the international conventions and codes given in the bibliography.

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

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

NOTE — Breadth *B* in relation to a ship means the maximum breadth of the ship measured amidships to the moulded line of the frame in the case of a ship having a metal shell, or to the outer surface of the hull in the case of a ship having a hull of other material.

3.4 Deadlights

3.4.1 In ships' sides or in the first tier of superstructure or in deckhouses which give access to spaces below the freeboard deck, only side scuttles with permanently attached deadlights to ISO 1751, type A or B, shall be fitted.

3.4.2 Spaces in the second tier which give direct access to closed first-tier superstructures or to spaces below the freeboard deck shall be fitted with side scuttles with permanently attached deadlights to ISO 1751, type A or B.

NOTE — For detailed information, see regulation 23 (1) of LL 1966 with relevant interpretations adopted by the Maritime Safety Committee of IMO.

4 Strength limitations

In addition to the limitations on the use of side scuttles stipulated in 3.3, the lowest permissible position of side scuttles 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 side scuttles shall be installed in any part of the ship where the design pressure exceeds the maximum allowable pressure which individual types and sizes of side scuttles can withstand, as given in table 1.

Table 1 — Maximum allowable pressure for side scuttles to ISO 1751

ISO 1751 side scuttle			Maximum allowable pressure <i>P</i> kPa
Type	Nominal size mm	Glass thickness ¹⁾ mm	
A, heavy	200	10	328
	250	12	302
	300	15	328
	350	15	241
	400	19	297
B, medium	200	8	210
	250	8	134
	300	10	146
	350	12	154
	400	12	118
	450	15	146
C, light	200	6	118
	250	6	75
	300	8	93
	350	8	68
	400	10	82
	450	10	65

1) In special cases a greater glass thickness shall be used for obscured glass panes. See ISO 1751.

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 side scuttles to ISO 1751 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 side scuttles.

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 side scuttle; or, where timber load lines are assigned, from the summer timber load line to the sill of the side scuttle;

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

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
$L < 150$	$\frac{L}{10} e^{-\frac{L}{300}} - \left[1 - \left(\frac{L}{150} \right)^2 \right]$
$150 < L < 300$	$\frac{L}{10} e^{-\frac{L}{300}}$
$L > 300$	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 $L > 300$ 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 side scuttles

(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 side scuttles, according to ISO 1751, depending on their position in the ship.

From the graphs, the minimum height from the summer load line, *S*, to the sill of the side scuttle can be derived.

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

Graph 1 applies to side scuttles type A, ISO 1751. Graph 2 applies to side scuttles type B, ISO 1751. Graphs 3 and 4 apply to side scuttles type C, ISO 1751.

Table 6 – Maximum allowable pressure, *p*

ISO 1751 type side scuttle	Maximum allowable pressure <i>p</i> kPa
A	240
B	120
C	60

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).

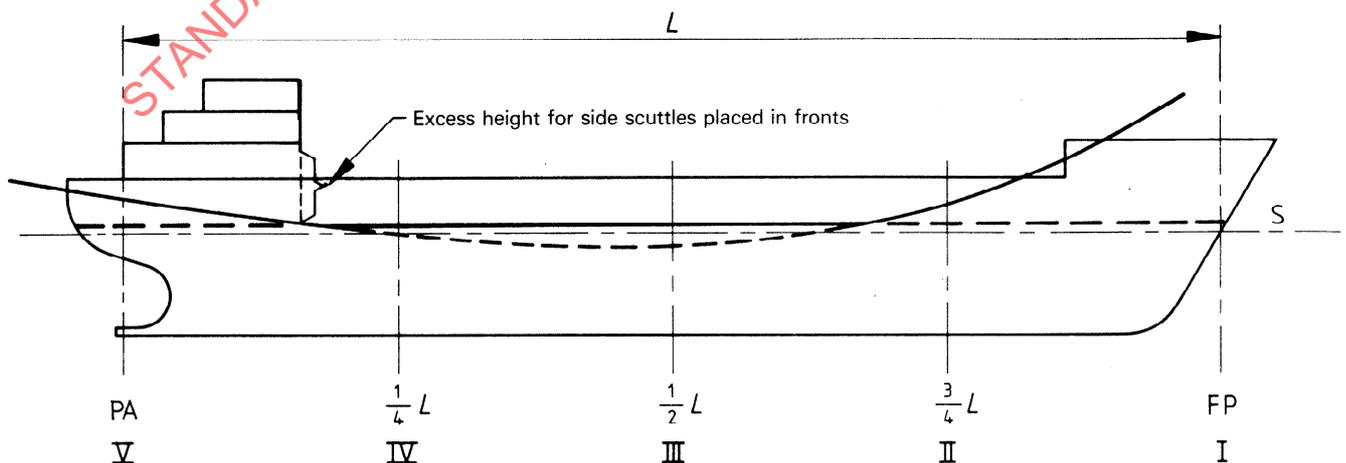
B.1.2 The longitudinal position of the ordinates I to V shall be indicated on the plan.

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 side scuttle being considered (these values are obtained from either graph 1, 2 or 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 side scuttles of the particular type when situated in ships' sides or in sides of superstructures or deckhouses; however, the position is subject to the limitations given in 3.3.1 and 3.3.2.

B.1.5 For side scuttles in fronts, the chain-dotted lines in graphs 1, 2 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 side scuttles of the particular type when situated in the fronts of superstructures or deckhouses.

B.1.6 For side scuttles of type C, used in aft ends of larger ships, graph 4 gives 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.

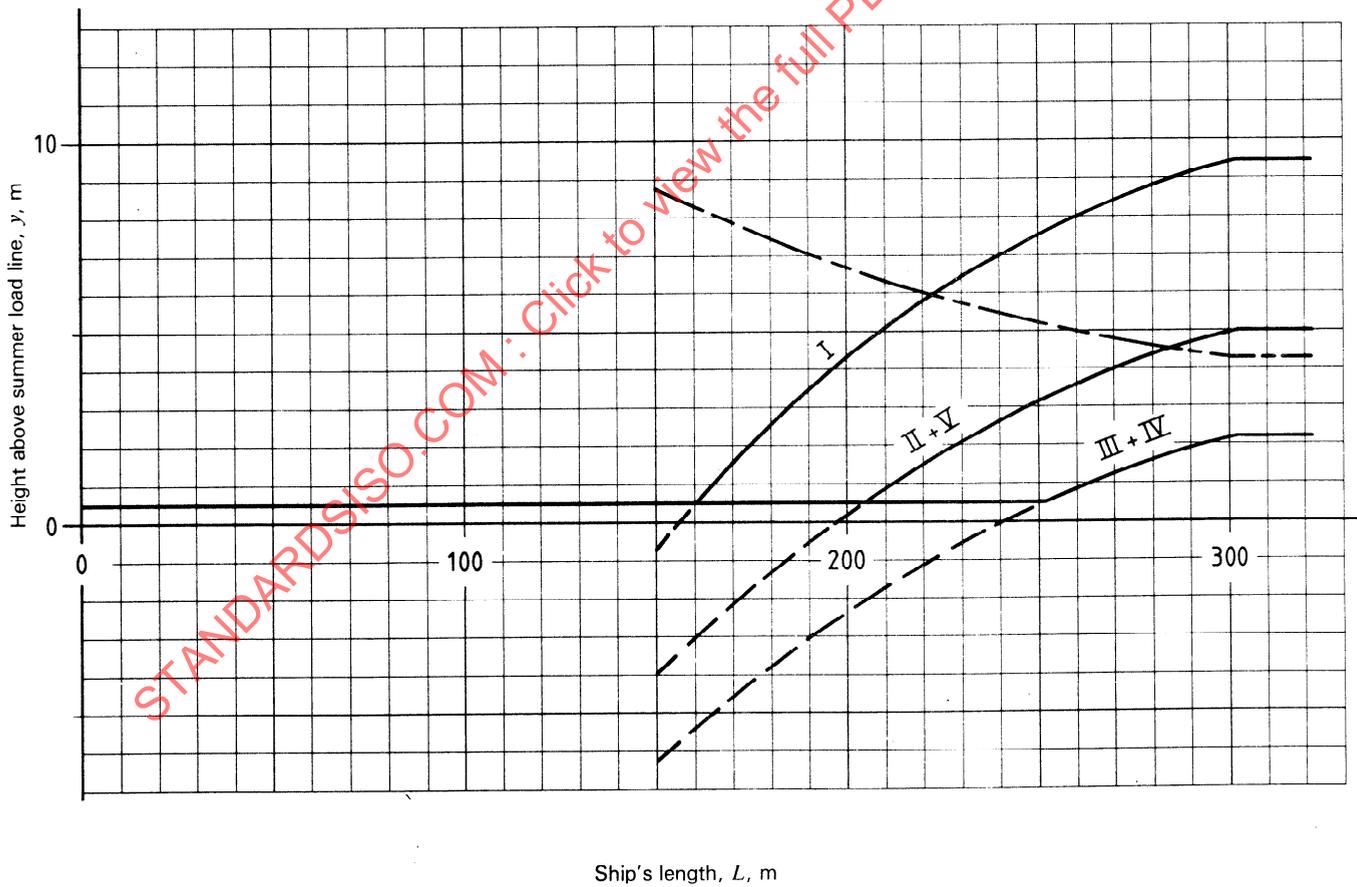
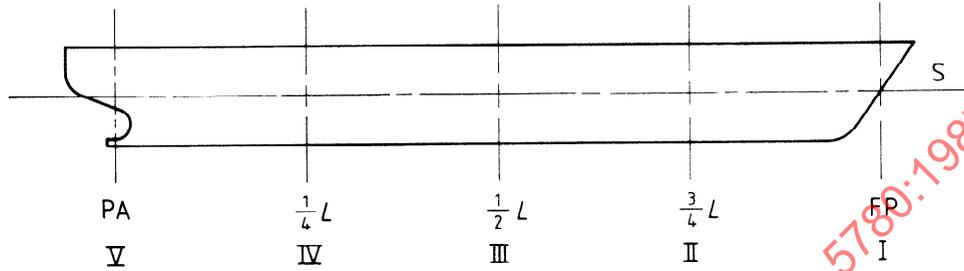
3 Reduction of design pressure due to distance of side scuttles from the ship's side and due to height above deck level, in the case of side scuttles in fronts, is not taken into account.

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.

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Graph No. 1

Type A side scuttle — The curves are valid for positioning in all zones detailed in 3.2

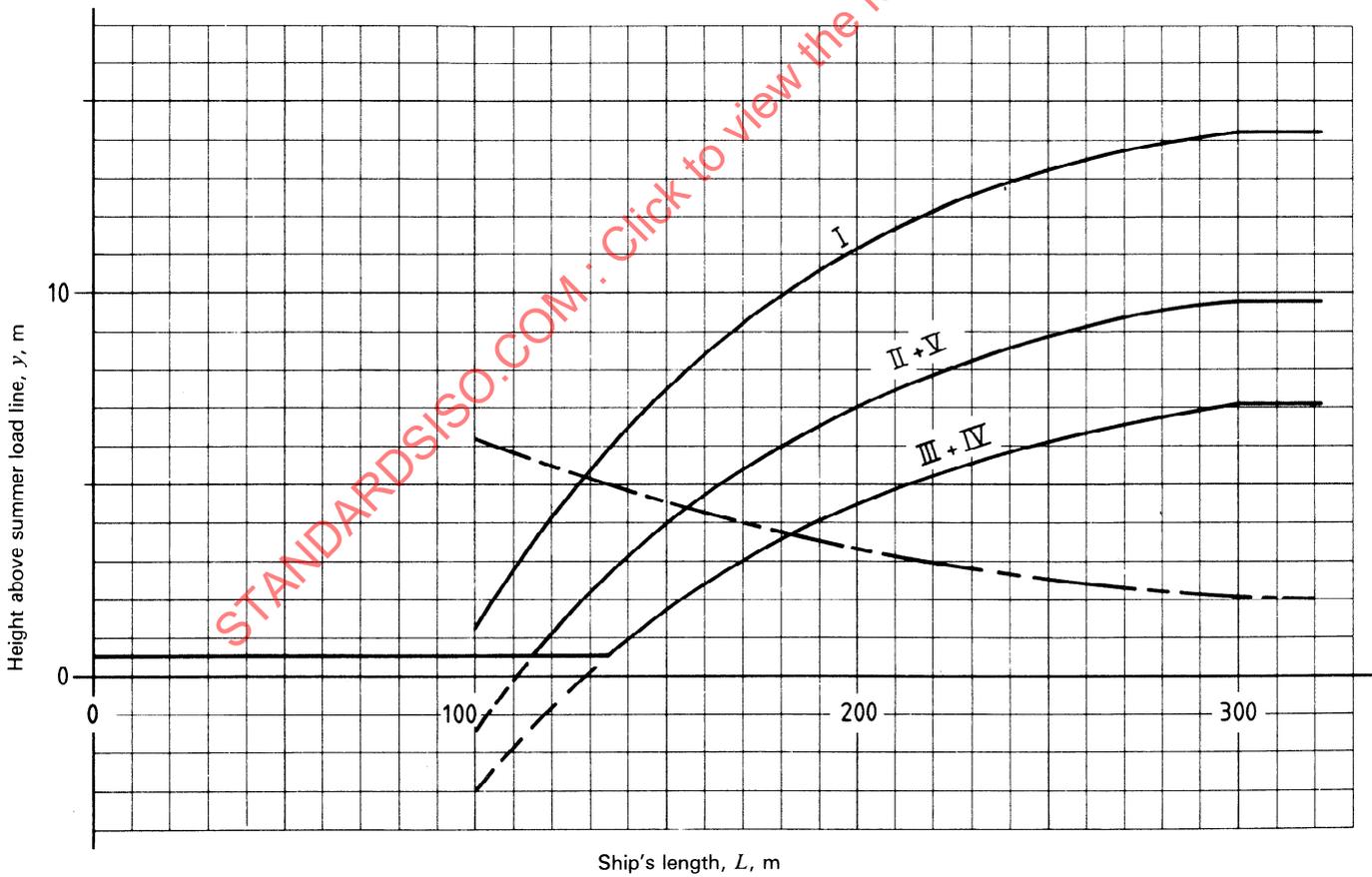
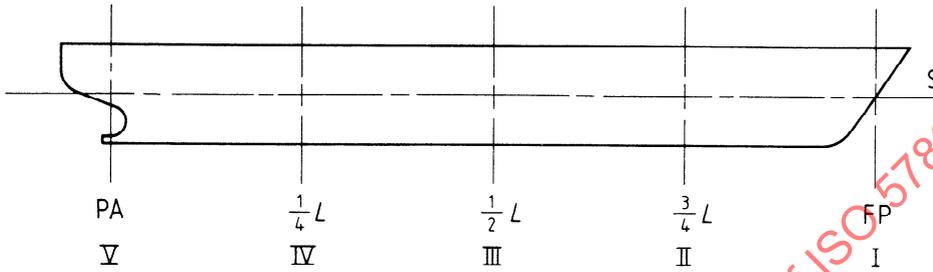


- Height for side scuttles placed in hull and sides
- - - - Excess height for side scuttles placed in fronts

NOTE — There are no restrictions on aft ends.

Graph No. 2

Type B side scuttle — The curves are valid for positioning in all zones detailed in 3.2



————— Height for side scuttles placed in hull and sides
 - - - - - Excess height for side scuttles placed in fronts

NOTE — There are no restrictions on aft ends.