

# S3 Strength of End Bulkheads of Superstructures and Deckhouses

(1973)  
(Rev.1  
May 2010)  
(Rev.2  
June 2023)

## S3.1 Scope

The following proposal applies to bulkheads forming the only protection for openings as per Regulation 18 of LLC 1966 and for accommodations. These requirements define minimum scantlings based upon local lateral loads and it may be required that they be increased in individual cases. Scantlings of tiers not specifically mentioned in this proposal are left to the discretion of individual Classification Societies.

This UR does not apply to CSR Bulk Carriers.

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### Note:

1. Changes introduced in Rev.2 are to be uniformly implemented by IACS Members for ships contracted for construction on or after 1 July 2024.
2. The “contracted for construction” date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of “contract for construction”, refer to IACS Procedural Requirement (PR) No. 29.

# S3

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## S3.2 Design pressure head

$$p = \frac{a}{100}(bf - y)c$$

where

$p$  = design pressure in N/mm<sup>2</sup> (MPa)

$$a = 2.0 + \frac{L_1}{120} \text{ for lowest tier of unprotected fronts}$$

The lowest tier is normally that tier which is directly situated above the uppermost continuous deck to which the rule depth  $D$  is to be measured. However, where the freeboard is excessive, it may be left to each individual Classification Society to define this tier as an upper tier. It is recommended that 'excessive freeboard' is that which exceeds the minimum tabular freeboard by more than one standard superstructure height.

$$a = 1.0 + \frac{L_1}{120} \quad \text{for 2<sup>nd</sup> tier of unprotected fronts}$$

$$a = 0.5 + \frac{L_1}{150} \quad \text{for 3<sup>rd</sup> tier of unprotected fronts and} \\ \text{for sides and protected fronts}$$

$$a = 0.7 + \frac{L_1}{1000} - 0.8 \frac{x}{L} \quad \text{for aft ends aft of amidships}$$

$$a = 0.5 + \frac{L_1}{1000} - 0.4 \frac{x}{L} \quad \text{for aft ends forward of amidships}$$

$L, L_1$  = length of ships in metres,  $L_1$  need not be taken greater than 300 m

$$b = 1.0 + \left( \frac{x/L - 0.45}{C_b + 0.2} \right)^2 \quad \text{for } x/L \leq 0.45$$

$$b = 1.0 + 1.5 \left( \frac{x/L - 0.45}{C_b + 0.2} \right)^2 \quad \text{for } x/L > 0.45$$

$C_b$  = block coefficient,  $0.60 < C_b < 0.80$   
when determining aft ends forward of amidships,  $C_b$  need not be taken less than 0.80

$x$  = distance in metres between bulkhead considered and AP  
When determining sides of a deckhouse, the deckhouse is to be subdivided into parts of approximately equal length, not exceeding  $0.15L$  each and  $x$  is to be taken as the distance between AP and the centre of each part considered.

### S3 (cont)

$$f = \frac{L}{10} e^{-L/300} - \left[ 1 - \left( \frac{L}{150} \right)^2 \right] \quad \text{for } L < 150 \text{ m}$$

$$f = \frac{L}{10} e^{-L/300} \quad \text{for } 150 \text{ m} < L < 300 \text{ m}$$

$$f = 11.03 \quad \text{for } L > 300 \text{ m}$$

$y$  = vertical distance in metres from summer waterline to midpoint of stiffener span

$$c = \left( 0.3 + 0.7 \frac{b'}{B'} \right)$$

$b'$  = breadth of deckhouse at the position considered

$B'$  = actual maximum breadth of ship on the exposed weather deck at the position considered

For exposed parts of machinery casings  $c$  is not to be taken less than 1.0

The design pressure  $p$  is not to be taken less than the minimum values given in Table 1.

**Table 1**

L(m)	$p$ (N/mm <sup>2</sup> or MPa)	
	Lowest tier of unprotected fronts	Elsewhere
$L \leq 50$	0.03	0.015
$50 < L < 250$	$0.025 + 10^{-4}L$	$0.0125 + 0.5 \times 10^{-4}L$
$L \geq 250$	0.05	0.025

### S3.3 Stiffener modulus

$$W = 350sl^2p$$

where

$W$  = stiffener modulus (cm<sup>3</sup>)

$s$  = spacing of stiffeners (m), measured along the plating

$l$  = unsupported span (m), which is to be taken as the 'tween deck height  $l_{min} = 2.0$  m

$p$  = pressure in N/mm<sup>2</sup> (MPa) as defined above.

**S3**  
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The section modulus of house side stiffeners need not be greater than that of side frames on the deck situated directly below, taking account of spacing and span.

These requirements assume the webs of lower tier stiffeners to be efficiently welded to the decks.

Scantlings for other types of end connections may be specially considered.

**S3.4 Thickness of plating**

$$t = 30s\sqrt{p}$$

where

$t$  = thickness of plating (mm), not less than the minimum thickness as follows:

$$\begin{aligned} t_{\min} &= 5.0 + L_1/100 \text{ for lowest tier} \\ &4.0 + L_1/100 \text{ for upper tiers, but not less than 5.0 mm} \end{aligned}$$

For ships with  $L_1 < 65\text{m}$ , the minimum thickness of plating should be as follows:

$$\begin{aligned} t_{\min} &= 5\text{mm for the lowest unprotected front} \\ &4\text{mm for all other cases} \end{aligned}$$

$s$  and  $p$  are as defined above.

When determining  $p$ ,  $y$  is to be measured to middle of the plate field.

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