

**S5**

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## Calculation of Midship Section Moduli for Conventional Ship for Ship's Scantlings

This UR does not apply to CSR Bulk Carriers and Oil Tankers.

When calculating the midship section modulus within  $0.4L$  amidships the sectional area of all continuous longitudinal strength members is to be taken into account.

Large openings, i.e. openings exceeding 2.5 m in length or 1.2 m in breadth and scallops, where scallop-welding is applied, are always to be deducted from the sectional areas used in the section modulus calculation.

Smaller openings (manholes, lightening holes, single scallops in way of seams, etc.) need not be deducted provided that the sum of their breadths or shadow area breadths in one transverse section does not reduce the section modulus at deck or bottom by more than 3% and provided that the height of lightening holes, draining holes and single scallops in longitudinals or longitudinal girders does not exceed 25% of the web depth, for scallops maximum 75 mm.

A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of  $0.06 (B - \sum b)$  (where  $B$  = breadth of ship,  $\sum b$  = total breadth of large openings) may be considered equivalent to the above reduction in section modulus.

The shadow area will be obtained by drawing two tangent lines with an opening angle of  $30^\circ$ .

The deck modulus is related to the moulded deck line at side.

The bottom modulus is related to the base line.

Continuous trunks and longitudinal hatch coamings are to be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck line at side:

$$y_t = y \left( 0.9 + 0.2 \frac{x}{B} \right)$$

$y$  = distance from neutral axis to top of continuous strength member

$x$  = distance from top of continuous strength member to centreline of the ship

$x$  and  $y$  to be measured to the point giving the largest value of  $y_t$ .

Longitudinal girders between multi-hatchways will be considered by special calculations.

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