Amendments to Part B of the “Rules for the Classification of Yachts Designed for Commercial Use”

RFS/008/AMN/05
Effective from 1/2/2023

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SECTION 5 PLATING

1 Definitions and symbols

1.1

1.1.1

s : spacing of longitudinal or transverse ordinary stiffener, in m

p : scantling pressure, in kN/m^2, given in Ch 1, Sec 5

K : factor defined in Sec 2 of this Chapter.

2 Keel

2.1 Sheet steel keel

2.1.1 The keel plating is to have a width b_{CH}, in mm, throughout the length of the yacht, not less than the value obtained by the following equation:

$$b_{CH} = 4,5 \cdot L + 600$$

and a thickness not less than that of the adjacent bottom plating increased by 2 mm.

2.2 Solid keel

2.2.1

The height and thickness of the keel, throughout the length of the yacht, are to be not less than the values h_{CH} and t_{CH}, in mm, calculated with the following equations:

$$h_{CH} = 1,5 \cdot L + 100$$

$$t_{CH} = (0,35 \cdot L + 6) \cdot K^{0,5}$$

Lesser heights and thicknesses may be accepted provided that the effective area of the section is not less than that of the Rule section.

Lesser heights and thicknesses may also be acceptable if a centre girder is placed in connection with the solid keel.

3 Bottom and bilge

3.1

3.1.1 *(1/2/2023)*

Bottom plating is the plating up to the chine or to the upper turn of the bilge.

The thickness of the bottom plating and the bilge is to be not less than the greater of the values t_1 and t_2, in mm, calculated with the following formulae:

$$t_1 = k_1 \cdot k_2 \cdot k_a \cdot s \cdot (p \cdot K)^{0,5}$$

$$t_2 = 8 \cdot s \cdot (T \cdot K)^{0,5}$$

where:

k_1 : 0,~~11~~09, assuming $p=p_1$

: 0,07, assuming $p=p_2$.

k_a : coefficient as a function of the ratio S/s given in Table 1 below, where S is the greater dimension of the plating, in m.

k_2 : curvature correction factor given by 1-(h/s) to be taken not less than 0,7 where h is the distance, in mm, measured perpendicularly from the chord s to the highest point of the arc of plating between the two supports (see Fig 1).

The thickness of the plating of the bilge is, in any event, to be taken as not less than the greater of the thicknesses of the bottom and side.

Sheet steel of plating in way of the propeller shaft struts, tunnel thruster attachment and in the vicinity of the water-jet drive duct entrance is to have a thickness, in mm, not less than the value t_e given by:

$$t_e = (0,05 \cdot L + 6) \cdot K^{0,5}$$

and, in any event, equal to the thickness of the bottom increased by 50%.

Table 1

S/s	K_a
1	17,5
1,2	19,6
1,4	20,9
1,6	21,6
1,8	22,1
2,0	22,3
>2	22,4

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SECTION 7 DOUBLE BOTTOM

1 General

1.1

1.1.1 This Section stipulates the criteria for the structural scantlings of a double bottom, which may be of either longitudinal or transverse type.

The longitudinal type structure is made up of ordinary reinforcements placed longitudinally, supported by floors.

The fitting of a double bottom with longitudinal framing is recommended for planing and semi-planing yachts.

1.1.2 *(1/7/2021)*

The fitting of a double bottom extending from the collision bulkhead to the forward bulkhead in the machinery space, or as near thereto as practicable, is requested for yachts of L > or = 50 m.

On yachts of L > 61 m a double bottom is to be fitted outside the machinery space extending, as far as practicable, forward to the collision bulkhead and aft to the after peak bulkhead.

On yachts of L > 76 m the double bottom is to extend, as far as this is practicable, throughout the length of the yacht.

The double bottom is to extend transversely to the side so as to protect the bottom in the bilge area, as far as possible.

The double bottom may be avoided if the vessel satisfies what required in Ch.II-1 part B-2 Regulation 9 SOLAS'74 as amended. For yachts of less than 80 m in load line length, the alternative arrangements to provide a level of safety may be limited to compartments not having a double bottom or having a double bottom arrangement not in line with what required below. In these cases compliance with the bottom damage standard may be carried out assuming that the damage will only occur between the transverse watertight bulkheads in compartments not having a double bottom or having a double bottom not in line with what below.

1.1.3 The dimensions of the double bottom, and in particular the height, are to be such as to allow access for inspection and maintenance.

In floors and in side girders, manholes are to be provided in order to guarantee that all parts of the double bottom can be inspected at least visually.

The height of manholes is generally to be not greater than half the local height in the double bottom. When manholes with greater height are fitted, the free edge is to be reinforced by a flat iron bar or other equally effective reinforcements are to be arranged.

Manholes are not to be placed in the continuous centre girder, or in floors and side girders below pillars, except in special cases at the discretion of Tasneef.

1.1.4 Openings are to be provided in floors and girders in order to ensure down-flow of air and liquids in every part of the double bottom.

Holes for the passage of air are to be arranged as close as possible to the top and those for the passage of liquids as close as possible to the bottom.

Bilge wells placed in the inner bottom are to be watertight and limited as far as possible in height and are to have walls and bottom of thickness not less than that prescribed for inner bottom plating.

In zones where the double bottom varies in height or is interrupted, tapering of the structures is to be adopted in order to avoid discontinuities.

2 Minimum height

2.1

2.1.1 The height of the double bottom is to be sufficient to allow access to all areas and, in way of the centre girder, is to be not less than the value h_{DF}, in mm, obtained from the following formula:

$$h_{df} = 28B + 32(T + 10)$$

The height of the double bottom is, in any event, to be not less than 700 mm. For yachts less than 50 m in length, Tasneef may accept reduced height.

3 Inner bottom plating

3.1

3.1.1 *(1/1/2019)*

The thickness of the inner bottom plating is to be not less than the value t_1, in mm,calculated with the following formula:

$$t_1 = (0,04L + 5s + 1)k^{0,5}$$

where:

s : spacing of the ordinary stiffeners, in m.

For yachts of length L ≤ less than 50 m, the thickness is to be maintained throughout the length of the hull.

For yachts of length L > or = 50 m, the thickness may be gradually reduced outside 0,4 L amidships so as to reach a value no less than 0,9 t_1 at the ends.

Where the inner bottom forms the top of a tank intended for liquids, the thickness of the top is also to comply with the provisions of Sec 10.

4 Centre girder

4.1

4.1.1

A centre girder is to be fitted, as far as this is practicable, throughout the length of the hull.

The thickness, in mm, of the centre girder is to be not less than the following value t_{pc}:

$$t_{pc} = (0,008h_{df} + 2)k^{0,5}$$

5 Side girders

5.1

5.1.1 Where the breadth of the floors does not exceed 6 m, side girders need not be fitted.

Where the breadth of the floors exceeds 6 m, side girders are to be arranged with thickness equal to that of the floors.

A sufficient number of side girders are to be fitted so that the distance between them, or between one such girder and the centre girder or the side, does not exceed 3 m.

The side girders are to be extended as far forward and aft as practicable and are, as a rule, to terminate on a transverse bulkhead or on a floor or other transverse structure of adequate strength.

5.2

5.2.1 Where additional girders are foreseen in way of the bedplates of engines, they are to be integrated into the structures of the yacht and extended as far forward and aft as practicable.

Girders of height no less than that of the floors are to be fitted under the bedplates of main engines.

Engine foundation bolts are to be arranged, as far as practicable, in close proximity to girders and floors.

Where this is not possible, transverse brackets are to be fitted.

6 Floors

6.1

6.1.1

The thickness of floors t_m, in mm, is to be not less than the following value:

$$t_m = (0,008h_{df} + 0,5)k^{0,5}$$

Watertight floors are also to have thickness not less than that required in Sec 10 for tank bulkheads.

6.2

6.2.1 When the height of a floor exceeds 900 mm, vertical stiffeners are to be arranged.

In any event, solid floors or equivalent structures are to be arranged in longitudinally framed double bottoms in the following locations:

- under bulkheads and pillars
- outside the machinery space at an interval no greater than 2 m
- in the machinery space under the bedplates of main engines
- in way of variations in height of the double bottom.

Solid floors are to be arranged in transversely framed double bottoms in the following locations:

- under bulkheads and pillars
- in the machinery space at every frame
- in way of variations in height of the double bottom
- outside the machinery space at 2 m intervals.

7 Bracket floors

7.1

7.1.1 *(1/2/2023)*

At each frame between solid floors, bracket floors consisting of a frame connected to the bottom plating and a reverse frame connected to the inner bottom plating are to be arranged and attached to the centre girder and the margin plate by means of flanged brackets with a width of flange not less than 1/10 of the double bottom depth.

The frame section modulus Z_c, in cm^3, is to be not less than:

$$Z_c = k_1 \cdot s \cdot S^2 \cdot p \cdot K$$

where:

k_1 : 0,83 assuming $p=p_1$

: 0,36 assuming $p=p_2$

S : frame span, in m, equal to the distance between the mid-spans of the brackets connecting the frame/reverse frame.

The reverse frame section modulus is to be not less than ~~85~~75% of the frame section modulus.

Where tanks intended for liquids are arranged above the double bottom, the frame and reverse frame section moduli are to be no less than those required for tank stiffeners as stated in Sec 10.

8 Bottom and inner bottom longitudinals

8.1

8.1.1 *(1/2/2023)*

The section modulus of bottom stiffeners is to be no less than that required for single bottom longitudinals stipulated in Sec 6.

The section modulus of inner bottom stiffeners is to be no less than ~~85~~75% of the section modulus of bottom longitudinals.

Where tanks intended for liquids are arranged above the double bottom, the section modulus of longitudinals is to

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SECTION 7 DOUBLE BOTTOM

1 General

1.1

1.1.1 This Section stipulates the criteria for the structural scantlings of a double bottom, which may be of either longitudinal or transverse type.

The longitudinal type structure is made up of ordinary reinforcements placed longitudinally, supported by floors.

The fitting of a double bottom with longitudinal framing is recommended for planing and semi-planing yachts.

1.1.2 *(1/7/2021)*

The fitting of a double bottom extending from the collision bulkhead to the forward bulkhead in the machinery space, or as near thereto as practicable, is requested for yachts of L > or = 50 m.

On yachts of L > 61 m a double bottom is to be fitted outside the machinery space extending, as far as possible, forward to the collision bulkhead and aft to the after peak bulkhead.

On yachts of L > 76 m the double bottom is to extend, as far as possible, throughout the length of the yacht.

The double bottom is to extend transversely to the side so as to protect the bottom in the bilge area, as far as possible.

The double bottom may be avoided if the vessel satisfies what required in Ch.II-1 part B-2 Regulation 9 SOLAS'74 as amended. For yachts of less than 80 m in load line length, the alternative arrangements to provide a level of safety may be limited to compartments not having a double bottom or having a double bottom arrangement not in line with what required below. In these cases compliance with the bottom damage standard may be carried out assuming that the damage will only occur between the transverse watertight bulkheads in compartments not having a double bottom or having a double bottom not in line with what below.

1.1.3 The dimensions of the double bottom, and in particular the height, are to be such as to allow access for inspection and maintenance.

In floors and in side girders, manholes are to be provided in order to guarantee that all parts of the double bottom can be inspected at least visually.

The height of manholes is generally to be not greater than half the local height in the double bottom. When manholes with greater height are fitted, the free edge is to be reinforced by a flat iron bar or other equally effective reinforcements are to be arranged.

Manholes are not to be placed in the continuous centre girder, or in floors and side girders below pillars, except in special cases at the discretion of Tasneef.

1.1.4 Openings are to be provided in floors and girders in order to ensure down-flow of air and liquids in every part of the double bottom.

Holes for the passage of air are to be arranged as close as possible to the top and those for the passage of liquids as close as possible to the bottom.

Bilge wells placed in the inner bottom are to be watertight and limited as far as possible in height and are to have walls and bottom of thickness not less than that prescribed for inner bottom plating.

In zones where the double bottom varies in height or is interrupted, tapering of the structures is to be adopted in order to avoid discontinuities.

2 Minimum height

2.1

2.1.1 The height of the double bottom is to be sufficient to allow access to all areas and, in way of the centre girder, is to be not less than the value h_{DF}, in mm, obtained from the following formula:

$$h_{df} = 28B + 32(T + 10)$$

The height of the double bottom is, in any event, to be not less than 700 mm. For yachts less than 50 m in length, Tasneef may accept reduced height.

3 Inner bottom plating

3.1

3.1.1 *(1/1/2019)*

The thickness of the inner bottom plating is to be not less than the value t_1, in mm, calculated with the following formula:

$$t_1 = 1,4(0,04L + 5s + 1)k$$

where:

s : spacing of the ordinary stiffeners, in m.

For yachts of length L less than 50 m, the thickness is to be maintained throughout the length of the hull.

For yachts of length L > or = 50 m, the thickness may be gradually reduced outside 0,4 L amidships so as to reach a value no less than 0,9 t_1 at the ends.

Where the inner bottom forms the top of a tank intended for liquids, the thickness of the top is also to comply with the provisions of Sec 10.

4 Centre girder

4.1

4.1.1

A centre girder is to be fitted, as far as this is practicable, throughout the length of the hull.

The thickness of the centre girder is to be not less than the following value t_{pc}, in mm:

$$t_{pc} = 1,4(0,008\,h_{df} + 2)k$$

5 Side girders

5.1

5.1.1 Where the breadth of the floors does not exceed 6 m, side girders need not be fitted.

Where the breadth of the floors exceeds 6 m, side girders are to be arranged with thickness equal to that of the floors.

A sufficient number of side girders are to be fitted so that the distance between them, or between one such girder and the centre girder or the side, does not exceed 3 m.

The side girders are to be extended as far forward and aft as practicable and are, as a rule, to terminate on a transverse bulkhead or on a floor or other transverse structure of adequate strength.

5.2

5.2.1 Where additional girders are foreseen in way of the bedplates of engines, they are to be integrated into the structures of the yacht and extended as far forward and aft as practicable.

Girders of height no less than that of the floors are to be fitted under the bedplates of main engines.

Engine foundation bolts are to be arranged, as far as practicable, in close proximity to girders and floors.

Where this is not possible, transverse brackets are to be fitted.

6 Floors

6.1

6.1.1 *(1/1/2023)*

The thickness of floors t_m, in mm, is to be not less than the following value:

$$t_m = (0,008\,h_{df} + 0,5) \cdot k^{0,5}$$

Watertight floors are also to have thickness not less than that required in Sec. 10 for tank bulkheads.

6.2

6.2.1 When the height of a floor exceeds 900 mm, vertical stiffeners are to be arranged.

In any event, solid floors or equivalent structures are to be arranged in longitudinally framed double bottoms in the following locations.

- under buklheads and pillars
- outside the machinery space at an interval no greater than 2 m
- in the machinery space under the bedplates of main engines
- in way of variations in height of the double bottom.

Solid floors are to be arranged in transversely framed double bottoms in the following locations:

- under bulkheads and pillars
- in the machinery space at every frame
- in way of variations in height of the double bottom
- outside the machinery space at 2 m intervals.

7 Bracket floors

7.1

7.1.1 *(1/2/2023)*

At each frame between solid floors, bracket floors consisting of a frame connected to the bottom plating and a reverse frame connected to the inner bottom plating are to be arranged and attached to the centre girder and the margin plate by means of flanged brackets with a width of flange not less than 1/10 of the double bottom depth.

The frame section modulus Z_c, in cm^3, is to be not less than:

$$Z_c = k_1 \cdot s \cdot S^2 \cdot p \cdot K$$

where:

k_1 : 1,6 assuming $p=p_1$

: 0,68 assuming $p=p_2$

S : frame span, in m, equal to the distance between the mid-spans of the brackets connecting the frame/reverse frame.

The reverse frame section modulus is to be not less than ~~85~~75% of the frame section modulus.

Where tanks intended for liquids are arranged above the double bottom, the frame and reverse frame section moduli are to be no less than those required for tank stiffeners as stated in Sec 10.

8 Bottom and inner bottom longitudinals

8.1

8.1.1 *(1/2/2023)*

The section modulus of bottom stiffeners is to be no less than that required for single bottom longitudinals stipulated in Sec 6.

The section modulus of inner bottom stiffeners is to be no less than ~~85~~75% of the section modulus of bottom longitudinals.

Where tanks intended for liquids are arranged above the double bottom, the section modulus of longitudinals is to

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The fitting of a double bottom extending from the collision bulkhead to the forward bulkhead of the machinery space, or as near thereto as practicable, is requested for yachts of L > or = 50 m.

The double bottom may be avoided if the vessel satisfies what required in Ch.II-1 part B-2 Regulation 9 SOLAS'74 as amended. For yachts of less than 80 m in load line length, the alternative arrangements to provide a level of safety may be limited to compartments not having a double bottom or having a double bottom arrangement not in line with what required below. In these cases compliance with the bottom damage standard may be carried out assuming that the damage will only occur between the transverse watertight bulkheads in compartments not having a double bottom or having a double bottom not in line with what below.

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The height of manholes is generally to be not greater than half the local height in the double bottom. When manholes with greater height are fitted, the free edge is to be reinforced by a flat iron bar or other equally effective reinforcements are to be arranged.

Manholes are not to be placed in the continuous centre girder, or in floors and side girders below pillars, except in special cases at the discretion of Tasneef.

1.1.4 Openings are to be provided in floors and girders in order to ensure down-flow of air and liquids in every part of the double bottom.

Holes for the passage of air are to be arranged as close as possible to the top and those for the passage of liquids as close as possible to the bottom.

The edges of the holes are to be suitably sealed in order to prevent the absorption of liquid into the laminate.

Bilge wells placed in the inner bottom are to be watertight and limited as far as possible in height and are to have walls and bottom of thickness not less than that prescribed for inner bottom plating.

In zones where the double bottom varies in height or is interrupted, tapering of the structures is to be adopted in order to avoid discontinuities.

2 Minimum height

2.1

2.1.1 The height of the double bottom is to be sufficient to allow access to all areas and, in way of the centre girder, is to be not less than the value h_{dF}, in mm, obtained from the following formula:

$$h_{df} = 28B + 32(T + 10)$$

The height of the double bottom is, in any event, to be not less than 700 mm. For yachts less than 50 m in length, Tasneef may accept reduced height.

3 Inner bottom plating

3.1

3.1.1 *(1/1/2019)*

The thickness of the inner bottom plating is to be not less than the value t_1, in mm, calculated with the following formula:

$$t_1 = 1,3(0,04L + 5s + 1)k_{of} \text{ for single-skin laminate}$$

$$t_1 = (0,04L + 5s + 1)k_{of} \text{ for sandwich laminate}$$

where:

s : spacing of the ordinary stiffeners, in m

k_{of} : coefficients for the properties of the material defined in Sec 2.

For yachts of length L less than 50 m, the thickness is to be maintained throughout the length of the hull.

For yachts of length L > or = 50 m, the thickness may be gradually reduced outside 0,4 L amidships so as to reach a value no less than 0,9 t_1 at the ends.

Where the inner bottom forms the top of a tank intended for liquids, the thickness of the top is also to comply with the provisions of Sec 10.

4 Centre girder

4.1

4.1.1 A centre girder is to be fitted, as far as this is practicable, throughout the length of the hull.

The thickness, in mm, of the core of a sandwich type centre girder is to be not less than the following value t_{pc}:

$t_{pc} = (0,125L + 3,5)k_{of}$

where k_{of} is defined in Sec 2.

Where a single-skin laminate is used for the centre girder, the thickness is to be not less than twice that defined above.

5 Side girders

5.1

5.1.1 Where the breadth of the floors does not exceed 6 m, side girders need not be fitted.

Where the breadth of the floors exceeds 6 m, side girders are to be arranged with thickness equal to that of the floors.

A sufficient number of side girders are to be fitted so that the distance between them, or between one such girder and the centre girder or the side, does not exceed 3 m.

The side girders are to be extended as far forward and aft as practicable and are, as a rule, to terminate on a transverse bulkhead or on a floor or other transverse structure of adequate strength.

Watertight girders are to have thickness not less than that required in Sec 10 for tank bulkheads

5.2

5.2.1 Where additional girders are foreseen in way of the bedplates of engines, they are to be integrated into the structures of the yacht and extended as far forward and aft as practicable.

Girders of height no less than that of the floors are to be fitted under the bedplates of main engines.

Engine foundation bolts are to be arranged, as far as practicable, in close proximity to girders and floors.

Where this is not possible, transverse brackets are to be fitted.

6 Floors

6.1

6.1.1 Te thickness t_m, in mm, of the core of sandwich type floors is to be not less than the following value:

$t_m = (0,125L + 1,5)k_{of}$

where k_{of} is defined in Sec. 2.

Where a single-skin laminate is used for floors, the thickness is to be not less than twice that calculated above.

Watertight floors are also to have thickness not less than that required in Sec 10 for tank bulkheads.

6.2

6.2.1 When the height of a floor exceeds 900 mm, vertical stiffeners are to be arranged.

In any event, solid floors or equivalent structures are to be arranged in longitudinally framed double bottoms in the following locations.

- under buklheads and pillars
- outside the machinery space at an interval no greater than 2 m
- in the machinery space under the bedplates of main engines
- in way of variations in height of the double bottom.

Solid floors are to be arranged in transversely framed double bottoms in the following locations:

- under bulkheads and pillars
- in the machinery space at every frame
- in way of variations in height of the double bottom
- outside the machinery space at 2 m intervals.

7 Bottom and inner bottom longitudinals

7.1

7.1.1 *(1/2/2023)*

The section modulus of bottom stiffeners is to be no less than that required for single bottom longitudinals stipulated in Sec 6.

The section modulus of inner bottom stiffeners is to be no less than ~~85~~75% of the section modulus of bottom longitudinals.

Where tanks intended for liquids are arranged above the double bottom, the section modulus of longitudinals is to be no less than that required for tank stiffeners as stated in Sec 10.