GUIDE FOR BUILDING AND CLASSING

YACHTS
2018

NOTICE NO. 2 – OCTOBER 2018

The following Rule Changes were approved by the ABS Rules Committee on 25 September 2018 and become **EFFECTIVE AS OF 1 OCTOBER 2018.**

(See http://www.eagle.org for the consolidated version of the Guide for Building and Classing Yachts 2018, with all Notices and Corrigenda incorporated.)

Notes - *The date in the parentheses means the date that the Rule becomes effective for new construction based on the contract date for construction, unless otherwise noted. (See 1-1-4/3.3 of the ABS Rules for Conditions of Classification (Part 1).)*

PART 1 CONDITIONS OF CLASSIFICATION

CHAPTER 1 SCOPE AND CONDITIONS OF CLASSIFICATION

SECTION 3 CLASSIFICATION SYMBOLS AND NOTATIONS

1 Hull

(Revise Paragraph 1-1-3/1.1, as follows:)

1.1 Pleasure Yachts *(1 October 2018)*

In accordance with 1-1-3/3 of the ABS *Rules for Conditions of Classification (Part 1)*, the classification ✠ **A1 Yachting Service** will be assigned to vessels designed for pleasure yachting service and built to the applicable requirements in Part 3 and Part 4 and other relevant sections of this Guide. Motor yachts receiving a **Yachting Service** notation are permitted to operate with unlimited range geographically in association with voyages planned based on weather routing and with restrictions on significant wave height of 4.0 m (13.1 ft) for the *Operational Design Condition* and 6 m (19.7 ft) for the *Maximum Design Condition*. See also 1-1-4/1.1.

(Revise Paragraph 1-1-3/1.5, as follows:)

1.5 Commercial Yachts *(1 October 2018)*

In accordance with 1-1-3/3 of the ABS *Rules for Conditions of Classification (Part 1)*, the classification ✠ **A1 Commercial Yachting Service** will be assigned to yachts built as noted in 1-1-3/1.1 which are chartered as motor, sailing, or motor-sailing yachts or carry passengers for revenue, are not considered by the Administration to be a SOLAS passenger vessel or an IMO HSC Code craft , do not carry more than 12 charter guests, do not carry cargo, and are built to the applicable requirements in Part 3, Part 4, Part 5, and other relevant sections of this Guide.

In addition to this Guide, Commercial Yachts are to comply with recognized statutory requirements for commercial yachts such as the UK MCA *The Large Commercial Yacht Code (LY3).* Where a flag State has alternative requirements, statutory items may be considered to be in compliance with these requirements. This latter scope would normally include statutory items not normally within the scope of classification, such as Radio, Navigation Lights arrangement, Navigational Equipment, Accommodation-Medical Stores and Manning, Life Saving Appliances, etc. Commercial Yachts are not eligible for the restricted service notation **Yachting Service R**. Motor yachts receiving a **Commercial Yachting Service** notation are permitted to operate with unlimited range geographically in association with voyages planned based on weather routing and with restrictions on significant wave height of 4.0 m (13.1 ft) for the *Operational Design Condition* and 6 m (19.7 ft) for the *Maximum Design Condition*. See also 1-1-4/1.1.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 1 GENERAL

SECTION 1 DEFINITIONS

(Revise Subsection 3-1-1/3, as follows:)

3 Length *(1 October 2018)*

3.1 Scantling Length (L) *(1 October 2018)*

L is the distance in meters (feet) on the summer load line from the fore side of the stem to the centerline of the rudder stock. For use with this Guide, L is not to be less than 96% and need not be greater than 97% of the extreme length on the summer load line. The forward end of L is to coincide with the fore side of the stem on the waterline on which L is measured. Where a yacht is fitted with waterjet propulsion, or some other means of steering that eliminates the need for a conventional rudder, L is to be taken as 97% of the extreme length on the summer load line.

For sailing and motor sailing yachts, the L value to be used for the determination of local scantlings as detailed in 3-2-2/5 and Section 3-2-5 only, is given by the following equation:

$$L = \frac{L_{OA} + L_{WL}}{2} \quad \text{meters (feet)}$$

where

L_{OA} = overall length of the hull. See 3-1-1/Figure 1.

L_{WL} = length on the maximum estimated displacement waterline. See 3-1-1/Figure 1.

3.3 Freeboard Length (L_f) *(2018)*

L_f is the distance in meters (feet) on a waterline at 85% of the least molded depth measured from the top of the keel from the fore side of the stem to the centerline of the rudder stock or 96% of the length on that waterline, whichever is greater. Where the stem is a fair concave curve above the waterline at 85% of the least molded depth and where the aftmost point of the stem is above the waterline, the forward end of the length, L_f, is to be taken at the aftmost point of the stem above that waterline. See 3-1-1/Figure 2.

In yachts designed with a raked keel, the waterline on which this length is measured is to be parallel to the designed waterline.

FIGURE 1
Profile at Centerline

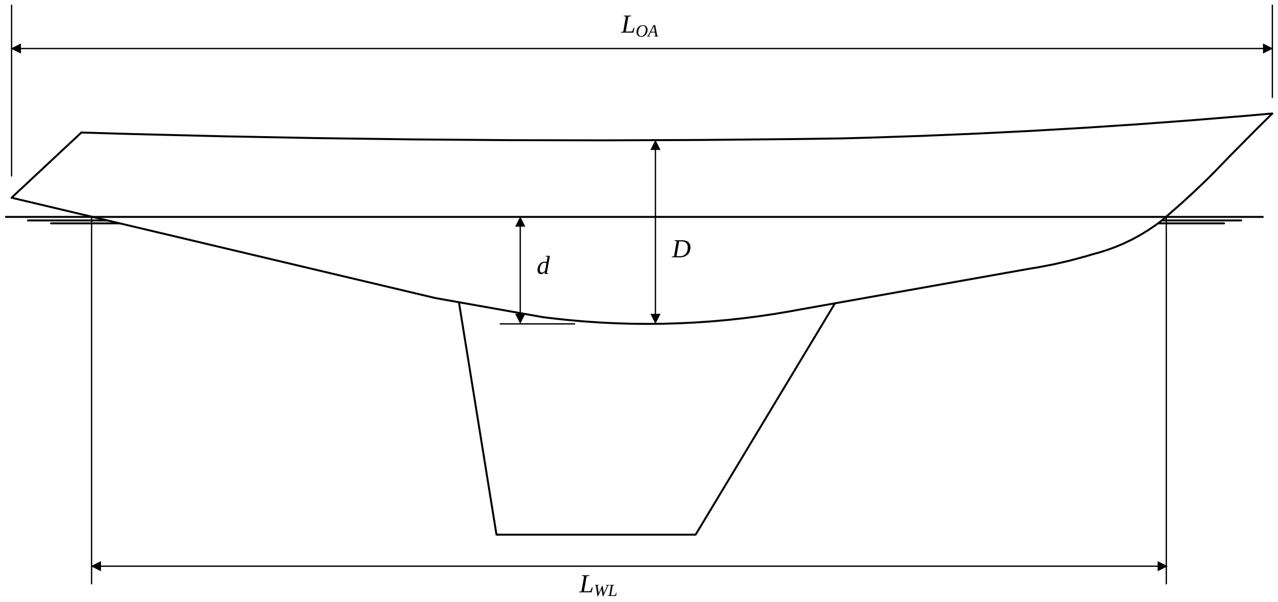
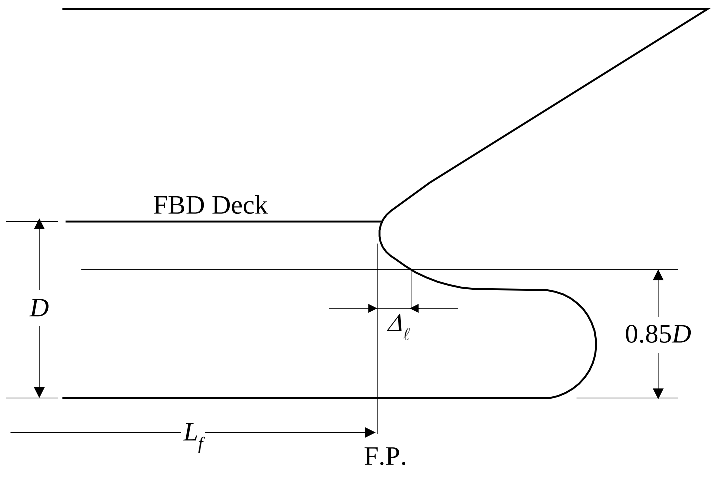


FIGURE 2



(Delete Paragraph 3-1-1/3.5, as follows:)

~~3.5 Scantling Length for Sailing and Motor-Sailing Yachts (*L*)~~

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 1 PRIMARY HULL STRENGTH

1 Longitudinal Hull Girder Strength – Monohulls

1.1 Section Modulus

1.1.2 Yachts 61 Meters (200 Feet) in Length and Greater

1.1.2(d) Slamming Induced Bending Moment (1 October 2018).

(Revise definition of n_{cg} in Item 3-2-1/1.1.2(d), as follows:)

n_{cg} = maximum vertical acceleration as defined in 3-2-2/3.3

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 2 DESIGN PRESSURES

1 Displacement Motor Yachts

(Revise Paragraph 3-2-2/1.1, as follows:)

1.1 General *(1 October 2018)*

Where the maximum speed in knots is less than or equal to $2.36\sqrt{L}$, L in meters, ($1.30\sqrt{L}$, L in feet) or where the yacht is a high speed displacement yacht (maximum speed in knots is greater than $2.36\sqrt{L}$, L in meters, ($1.30\sqrt{L}$, L in feet) and less than or equal to than $3.63\sqrt{L}$, L in meters ($2.0\sqrt{L}$, L in feet)) which at maximum speed has negligible dynamic lift and very low running trim, the design heads for the hull, decks and bulkheads are to be as given in 3-2-2/Table 1. Design heads for superstructures and deckhouses are given in 3-2-2/1.5.

(Revise 3-2-2/Table 1, as follows:)

TABLE 1
Displacement Yachts – Design Heads, *h (1 October 2018)*

Location		*Design Head, h, measured in m (ft)*	
Bottom Structure		Distance to main weather deck at side, from lower edge of plate panel for plating and from center of area supported for internals, but not less than $L/10$ or 2.15 m (7.05 ft) whichever is greater.	
Bottom Structure, Fore Slamming		H_{fs}, see 3-2-2/1.3	
Side Structure		Distance to main weather deck at side, from lower edge of plate panel for plating, and from center of area supported for internals, but not less than $0.66D$ or $L/15$, whichever is greater.	
Side Structure, Fore Slamming		H_{fs}, see 3-2-2/1.3, to apply at the waterline and reducing to 0.40 H_{fs} at the weather deck	
Deep Tanks		Distance from lower edge of plate panel for plating or from the center of area supported for internals to the greater of the following, 1. A point at two-thirds the distance to the main weather or bulkhead deck. 2. A point at two-thirds of the distance from the top of the tank to the top of the overflow. 3. A point above the top of the tank, not less than $0.01L$ + 0.15 m ($0.01L$ + 0.5 ft) or 0.46 m (1.5 ft).	
Watertight Bulkheads		Distance from the lower edge of the plate for plating or from the center of area supported for internal to the main weather or bulkhead deck at centerline.	
Decks (see 3-2-2/ Figure 6)	Main Weather Deck (exposed) Superstructure and Deckhouse Decks Forward of $0.25L$ (exposed)	($0.02L$ + 0.46) m	($0.02L$ + 1.5) ft
	Superstructure and Deckhouse Decks elsewhere (exposed) Deckhouse top, First tier	($0.01L$ + 0.46) m	($0.01L$ + 1.5) ft
	Deckhouse tops above 2nd tier (used as weather coverings only)	($0.01L$ + 0.15) m	($0.01L$ + 0.5) ft
	Internal accommodation decks (included in hull-girder section modulus)	($0.01L$ + 0.30) m	($0.01L$ + 1.0) ft
	Internal accommodation decks (not included in hull-girder section modulus)	0.35 m	1.15 ft

(Revise title of Paragraph 3-2-2/1.5, as follows:)

1.5 Design Heads for Superstructures and Deckhouses Bulkheads *(1 October 2016)*

(Revise 3-2-2/Table 2, as follows:)

TABLE 2
Values of *a* *(1 October 2018)*

Bulkhead Location	*Metric Units*	*US Units*
Unprotected front Lowest tier	2.0 + *L*/120	2.0 + *L*/393.6
Unprotected front Second tier	1.0 + *L*/120	1.0 + *L*/393.6
Unprotected front Third tiers	0.5 + *L*/150	0.5 + *L*/492
Protected front All tiers	0.5 + *L*/150	0.5 + *L*/492
Sides of Superstructures, inset from side not more than 0.04B	As indicated above for front bulkheads	
Sides of Deckhouses, All tiers, inset from side greater than 0.04B	0.5 + *L*/150	0.5 + *L*/492
Aft ends, aft of amidships, All tiers	0.7 + (*L*/1000) – 0.8*x*/*L*	0.7 + (*L*/3280) – 0.8*x*/*L*
Aft ends, forward of amidships, All tiers	0.5 + (*L*/1000) – 0.4*x*/*L*	0.5 + (*L*/3280) – 0.4*x*/*L*

(Revise 3-2-2/Table 3, as follows:)

TABLE 3
Values of *b* *(1 October 2018)*

x/L	*b*
0.10*L*	1.19
0.20*L*	1.10
0.30*L*	1.04
0.40*L*	1.00
0.45*L*	1.00

x/L	*b*
0.50*L*	1.00
0.60*L*	1.05
0.70*L*	1.15
0.80*L*	1.29
0.90*L*	1.47

3 Semi-Planing and Planing Motor Yachts

3.9 Side and Transom Design Pressure – Multi-hulls

(Revise Subparagraph 3-2-2/3.9.1, as follows:)

3.9.1 Side Slamming Pressure *(1 October 2018)*

$$P_{sxx} = \frac{N_1 \Delta}{L_w N_h B_w}[1 + n_{xx}]\left[\frac{70 - \beta_{sx}}{70 - \beta_{cg}}\right]F_D \quad \text{kN/m}^2 \text{ (tf/m}^2\text{, psi)}$$

(Revise 3-2-2/Table 6, as follows:)

TABLE 6
Deck Design Pressures, P_d *(1 October 2018)*

Location	*kN/m²*	*tf/m²*	*psi*
Main Weather Deck (exposed)	$0.20L + 4.5$	$0.02L + 0.46$	$0.0088L + 0.66$
Superstructure and deckhouse decks forward of 0.25*L* (exposed)			
Superstructure and deckhouse decks elsewhere (exposed)	$0.10L + 4.5$	$0.01L + 0.46$	$0.0044L + 0.66$
Internal decks (included in hull-girder section modulus)			
Internal accommodation only decks, platform decks and house tops above 2nd tier. (not included in hull-girder section modulus.)	3.4	0.35	0.5

5 Sailing Yachts *(1 October 2018)*

(Delete Paragraph 3-2-2/5.3, as follows:)

~~5.3 Design Heads for Sailing Yachts Greater than 30.5 m (100 ft)~~

(Revise 3-2-2/Table 7, as follows:)

TABLE 7
Sailing Yachts – Design Heads, h *(1 October 2018)*

Plating Location			*Design Head in m (ft)*
a)	Shell below d + 0.15m, (*d* + 0.5 ft), where *d* is measured vertically from the underside of canoe hull at its lowest point, and shell below the point where angle between the waterline and the tangent line to the transverse section is 65°.	At forward end of L_{OA}	$0.80h_b$
		At $0.05L_{WL}$ aft of fore end of L_{WL}	$1.20h_b$
		At 0.4 L_{WL} aft of fore end of L_{WL}	$1.20h_b$
		At 0.60 L_{WL} aft of fore end of L_{WL} to aft end of L_{OA}	$0.70h_b$
b)	Shell elsewhere	At forward end of L_{OA}	$0.70\ (h_b – d)$
		At $0.05L_{WL}$ aft of fore end of L_{WL}	$1.08\ (h_b – d)$
		At $0.4L_{WL}$ aft of fore end of L_{WL}	$1.08\ (h_b – d)$
		At $0.60L_{WL}$ aft of fore end of L_{WL} to aft end of L_{OA}	$0.63\ (h_b – d)$
c)	Deck	Main weather deck, cockpit and cabin house front	$(0.04L + 1.83)$ m $(0.04L + 6.0)$ ft
		Cabin house top, sides and end	$(0.04L + 0.83)$ m $(0.04L + 2.72)$ ft
d)	Bulkheads	Watertight or structural	Distance from lower edge of bulkhead to main weather deck at centerline, not less than 1.52 m (5.0 ft)
		Tank boundary	Distance to top of tank overflow, not less than 1.52 m (5.0 ft)

Notes

1. Shell design heads between locations given above are to be obtained by interpolation.
2. d = draft as defined in 3-1-1/9 except that in calculation of basic head, d is not to be taken less than $0.048L + 0.091$ m ($0.048L + 0.30$ ft)
3. Design head for bottom structure to be not less than $1.33D$ and for side shell not less than $0.66D$.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 3 DISPLACEMENT YACHTS

(Revise Subsection 3-2-3/1, as follows:)

1 Application *(1 October 2018)*

This Section applies to displacement yachts as defined in 3-2-2/1.1.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 4 SEMI-PLANING AND PLANING YACHTS

(Revise Subsection 3-2-4/1, as follows:)

1 Application *(1 October 2018)*

This Section applies to semi-planing and planing yachts as defined in 3-2-2/3.1.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 5 SAILING YACHTS

(Revise Subsection 3-2-5/1, as follows:)

1 Application *(1 October 2018)*

This Section applies to yachts having maximum speed in knots less than $2.36\sqrt{L}$ $(1.30\sqrt{L})$ where L is the length, in m (ft), as defined in 3-1-1/3.1.

For sailing yachts having L lower than 30.5 m (100 ft) and maximum speed in knots equal or greater than $2.36\sqrt{L}$ $(1.30\sqrt{L})$, the shell structure is also to comply with this section using the design pressures calculated in 3-2-2/3 or 3-2-2/5, whichever is greater.

For sailing yachts having L greater than 30.5 m (100 ft), the shell structure is also to comply with 3-2-4 considering the design pressures based on $V = 2.36\sqrt{L}$ $(V = 1.30\sqrt{L})$ or the maximum attainable speed, whichever is greater.

In addition those areas of plating associated with primary hull strength are to meet the buckling criteria as given in Appendix 3-2-A4. Where plate panels are subjected to other bending, biaxial, or a combination of stresses, they will be specially considered.

3 Aluminum and Steel

3.3 Plating – Thickness

3.3.1 All Plating, Lateral Loading *(1 October 2018)*

(Revise definition of F in Subparagraph 3-2-5/3.3.1, as follows:)

F = design head reduction factor for plating, given in 3-2-5/Table 11a or 3-2-5/Table 11b for the location under consideration. The resultant *Fh* is in general not to be taken less than *D* for the bottom shell, nor less than 0.8*D* for the side shell plating

3.5 Internals

3.5.2 Strength *(1 October 2018)*

(Revise definition of F in Subparagraph 3-2-5/3.5.2, as follows:)

F = design head reduction factor given in 3-2-5/Table 11d or 3-2-5/Table 11e for the mid-length location of the internal member under consideration

5 Fiber-Reinforced Plastic

5.1 Plating

5.1.2 Single Skin Laminate

5.1.2(a) With Essentially Same Properties in 0° and 90° Direction (1 October 2018).

(Revise definition of F in Subparagraph 3-2-5/5.1.2(a), as follows:)

F = design head reduction factor given in 3-2-5/Table 11a or 3-2-5/Table 11b for the location under consideration. In equation *i)*, *Fh* is not in general to be taken less than *D* (see 3-1-1/7.3) for the bottom shell nor less than 0.5*D* for the side shell plating. In equation *ii)*, *F* is not in general to be taken less than 0.5 for the bottom and side shell plating.

5.1.3 Sandwich Laminate

5.1.3(c) Shear Strength (1 October 2018).

(Revise definitions of p and F in Item 3-2-5/5.1.3(c), as follows:)

p = $9.8F_s h$ ($1.0F_s h$, $0.44F_s h$) in kN/m^2 (tf/m^2, psi)

F = design head reduction factor for plating shear strength, given in 3-2-5/Table 11b or 3-2-5/Table 11c for the location under consideration

5.3.3 Strength and Stiffness

5.3.3(a) Section Modulus (1 October 2018). T

(Revise definition of F in Item 3-2-5/5.3.3(a), as follows:)

F = design head reduction factor given in 3-2-5/Table 11d or 3-2-5/Table 11e for the mid-length location of the internal member under consideration

5.3.3(c) Shear Area (1 October 2018).

(Revise definition of F in Item 3-2-5/5.3.3(c), as follows:)

F = design head reduction factor, given in 3-2-5/Table 11a or 3-2-5/Table 11b for the location under consideration

(Delete existing 3-2-5/Table 11 and add new 3-2-5 Tables 11a through 11e, as follows:)

TABLE 11a
Coefficient, F, Design Head Reduction for Shell Plating *(1 October 2018)*

SI, MKS Units	*US Units*
$C_F = \dfrac{s - 254}{54.2L + 559}$	$C_F = \dfrac{s - 10}{0.65L + 22}$

Where C_F is	F =
1.0 and greater	0.25
0.9	0.28
0.8	0.32
0.7	0.36
0.6	0.42
0.5	0.49
0.4	0.57
0.3	0.67
0.2	0.77
0.1	0.88
0.05	0.94
0 and negative values	1.00

Notes:

Intermediate values of F can be obtained by linear interpolation.

s = spacing, in mm (in.), as defined in 3-2-5/3.3 but is not to be taken greater than 1270 mm (50 in).

L = scantling length, in m (ft), as defined in 3-1-1/3.5

TABLE 11b
Coefficients, F and F_s, Design Head Reduction for Deck Cabin House and Bulkhead Plating *(1 October 2018)*

Deck and Cabin House		*Watertight and Tank Bulkheads*
SI, MKS Units	*US Units*	*All Units*
F and F_s = 1.0 where $s \le 254$ mm F and F_s = (1.102 – 0.0004s) where $s > 254$ mm	F and F_s = 1.0 where $s \le 10$ in. F and F_s = (1.102 – 0.0102s) where $s > 10$ in.	F and F_s = 1.0
F (minimum) = 0.59 F_s (minimum) = 0.59	F (minimum) = 0.59 F_s (minimum) = 0.59	

s = spacing, in mm (in.), as defined in 3-2-5/3.3

TABLE 11c
Coefficient F_s, Design Head Reduction for Shell Plating *(1 October 2018)*

Shell Plating	
SI, MKS Units	*US Units*
F_s = (1.017 – 0.00059s)	F_s = (1.017 – 0.015s)
F_s (minimum) = 0.40 where $L \leq 24.4$ m F_s (minimum) = 0.40 (L/24.4) where $L > 24.4$ m	F_s (minimum) = 0.40 where $L \leq 80$ ft. F_s (minimum) = 0.40 (L/80) where $L > 80$ ft.

s = spacing, in mm (in.), as defined in 3-2-5/3.3

L = Scantling Length, in m. (ft.), as defined in 3-1-1/3.5

TABLE 11d
Coefficient, F Design Head Reduction for Shell Internals *(1 October 2018)*

SI, MKS Units	*US Units*
$C_F = \dfrac{\ell - 0.254}{0.0542L + 0.559}$	$C_F = \dfrac{\ell - 0.833}{0.0542L + 1.833}$

Where C_F is	*F =*
1.0 and greater or where, $\ell \geq 0.054L + 0.813m$ $\ell \geq 0.054L + 2.666\,ft$	0.25
0.9	0.28
0.8	0.32
0.7	0.36
0.6	0.42
0.5	0.49
0.4	0.57
0.3	0.67
0.2	0.77
0.1	0.88
0.05	0.94
0 or negative values or where; $\ell < 0.254m$ $\ell < 0.833\,ft$	1.00

Notes:

Intermediate values of F can be obtained by linear interpolation

ℓ = length of internal member, in m (ft.), as defined in 3-2-5/3.5

L = scantling length, in m (ft), as defined in 3-1-1/3.5

TABLE 11e
Coefficient, *F*, Design Head Reduction for Deck, Cockpit, Cabin House and Bulkhead Internals *(1 October 2018)*

Deck, Cockpit and Cabin House		*Watertight and Tank Bulkheads*
SI, MKS Units	*US Units*	*All Units*
$F = 0.033$ where $\ell \geq$ 1.93 m	$F = 0.033$ where $\ell \geq$ 6.33 ft.	$F = 1.0$
$F = (1.102 - 0.4\ \ell)$ where 0.254 m < ℓ ≤ 1.93 m	$F = (1.102 - 0.122\ \ell)$ where 0.833 ft. < ℓ ≤ 6.33 ft.	
$F = 1.0$ where $\ell \leq$ 0.254 m	$F = 1.0$ where $\ell \leq$ 0.833 ft.	

ℓ = length of internal member, in m (ft.), as defined in 3-2-5/3.5

7 Wood, Cold-Molded Laminate and Carvel

7.1 General

7.1.1 Cold Molded Laminate Thickness *(1 October 2018)*

(Revise definition of F in Subparagraph 3-2-5/7.1.1, as follows:)

F = design head reduction factor for plating shear strength, given in 3-2-5/Table 11a for shell plating and in 3-2-5/Table 11b for deck plating. The resultant *Fh* is in general not to be taken less than *D* for the bottom shell, nor less than 0.8*D* for the side shell plating

7.3 Internals

7.3.1 Scantlings *(1 October 2018)*

(Revise definition of F in Subparagraph 3-2-5/7.3.1, as follows:)

F = design head reduction factor given in 3-2-5/Table 11d or 3-2-5/Table 11e for the mid-length location of the internal member under consideration

9 Stanchions

9.5 Stanchion Load *(1 October 2018)*

(Revise definition of F in Paragraph 3-2-5/9.5, as follows:)

F = design head reduction factor given in 3-2-5/Table 11d or 3-2-5/Table 11e for the mid-length location of the internal member under consideration

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 6 HULL STRUCTURAL ARRANGEMENT

7 Structural Arrangements – Additional Requirements for Sailing Yachts

(Revise Paragraph 3-2-6/7.11, as follows:)

7.11 Chain Plates *(1 October 2018)*

Chain plates are to be of steel, stainless steel, monel or aluminum, or other approved material. Bolts are to be of a compatible, approved, corrosion resistant material. Where aluminum chain plates are used, stainless steel sleeves are to be fitted in the bolt holes.

The chain plates are in general to be slotted through the deck, and effectively attached to bulkheads, webs or brackets.

Substantial reinforcement of the deck structure is to be provided in way of the chain plates in the form of bulkheads or web frames.

The breaking loads of all masts, running and standing rigging together with the actual imposed working loads are to be submitted.

The design load is not to be less than the breaking load of the rigging to which it is attached or 2.0 times the maximum working load of the rigging, whichever is greater.

For steel or aluminum structures, the allowable stress is the yielding strength (in welded conditions) of any part of the hull structure to which the chain plates are attached.

For FRP structures, the allowable stress is 0.6 times the breaking strength of the structural lamination to which the chain plates are attached.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 8 KEELS, STEMS, AND SHAFT STRUTS

3 Keels

3.5 Sailing Yachts

3.5.2 Keel Bolts

(Revise Item 3-2-8/3.5.2(a), as follows:)

3.5.2(a) Grounding Loads (1 October 2018):

i) Load as indicated below acting in the aft direction along the centerline of the yacht at the bottom leading edge of the keel.

$$3F_{\Delta}$$

ii) Load of $1.5F_{\Delta}$ acting upward on the bottom of the keel.

3.5.3 Structure

(Revise Item 3-2-8/3.5.3(b), as follows:)

3.5.3(b) Grounding Conditions (1 October 2018). The shear and primary stresses at any location of the keel structure under the following assumed loads acting separately are not to exceed the respective allowable stresses given below.

Assumed Load:

Acting aft	Load as indicated below on the centerline of the yacht at the bottom leading edge of the keel

$$3F_{\Delta}$$

Assumed Load:

Acting upward	$1.5F_{\Delta}$ on the bottom of the keel

$$3F_{\Delta}$$

Allowable Stress:	*Shear Stress*	*Primary Stress*
Steel and aluminum[(1)]	$0.75\tau_y$	$0.75\sigma_y$
Fiber reinforced plastic (FRP)	$0.35\tau_u$	$0.35\sigma_u$

where

F_{Δ} = force corresponding to the maximum displacement of the yacht

τ_u = minimum ultimate shear strength of the laminate

σ_u = minimum ultimate tensile or compressive strength of the laminate as appropriate

σ_y and τ_y are as defined in 3-2-8/3.5.3(a).

It is recommended that radii or other effective means be provided at the intersection with the canoe hull to avoid hard spots. Buckling strength is also to be considered.

Note:

1 Where FE analysis is used, Von Mises Stress should not be greater than $0.9\sigma_y$.

9 Shaft Struts

(Revise Paragraph 3-2-8/9.1, as follows:)

9.1 General *(1 October 2018)*

Tail-shaft (propeller-shaft) struts where provided may be of the V or I type. The following equations are for solid struts having streamlined cross-sectional shapes. For struts other than ordinary strength steel, see 3-2-8/1.3. For hollow section and non-streamlined struts, the equivalent cross sectional area, inertia, and section modulus (major axis) are to be maintained. For a streamlined cross-section strut, the offered inertia about the longitudinal axis is $wt^3/25$ and the offered section modulus about the same axis is $wt^2/12.5$. Generally, each leg of a “V” strut is to have similar cross section. Alternative methods for the determination of “V” strut requirements can be found in Appendix 3-2-A3. In general the width/ thickness should not be less than 4.5 or more than 7.0. Struts are to be effectively supported by backing structure in the hull.

(Revise Paragraph 3-2-8/9.5, as follows:)

9.5 I Strut *(1 October 2018)*

9.5.1 Width

The width of the strut arm is not to be less than obtained from the following equation:

$$w_1 = 3.22D$$

where

w_1 = width of strut (major axis) in mm (in.)

D = required diameter of ABS Grade 2 tail shaft in mm (in.), see Section 4-3-1

9.5.2 Thickness

The thickness of the strut is not to be less than obtained from the following equation:

$$t_1 = 0.515D$$

where

t_1 = thickness of strut (minor axis), in mm (in.)

D = required diameter of ABS Grade 2 tail shaft in mm (in.), see Section 4-3-1

(Revise Paragraph 3-2-8/9.7, as follows:)

9.7 Strut Length *(1 October 2018)*

The length of the longer leg of a V strut or the leg of an I strut, measured from the outside perimeter of the strut barrel or boss to the outside of the shell plating, is not to exceed 10.6 times the required diameter of the tail shaft. Where this length is exceeded, the width and thickness of the strut are to be increased, and the strut design will be given special consideration. Where strut length is less than 10.6 times required tailshaft diameter, the section modulus of the strut may be reduced in proportion to the reduced length, provided the section modulus is not less than 0.85 times Guide required section modulus.

(Revise Paragraph 3-2-8/9.9, as follows:)

9.9 Strut Barrel *(1 October 2018)*

The thickness of the strut barrel or boss is to be at least one-fifth the required diameter of the tail shaft. The length of the strut barrel or boss is to be adequate to accommodate the required length of propeller-end bearings. Strut barrels constructed of aluminum are not subject to the corrections required by 3-2-7/1.3.

PART 3 HULL CONSTRUCTION AND EQUIPMENT

CHAPTER 2 HULL STRUCTURES AND ARRANGEMENTS

SECTION 9 RUDDERS

7 Rudder Stocks

(Revise Paragraph 3-2-9/7.1, as follows:)

7.1 Upper Rudder Stocks *(1 October 2018)*

The upper rudder stock is that part of the rudder stock above the neck bearing or above the top pintle, as applicable.

$$S = N_u C \sqrt[3]{Q_R K_S} \quad \text{mm (in.)}$$

where

N_u = 42.0 (89.9, 2.39)

Q_R = rudder torque, as defined in 3-2-9/5, in kN-m (tf-m, Ltf-ft)

K_s = material factor for upper rudder stock, as defined in 3-2-9/1.3

C = 0.85, where V is 20 knots or less

= $1.35 - 0.039V/\Delta^{1/6}$, where V is greater than 20 knots, but need not exceed 0.85 and is not to be taken as less than 0.65

(Revise Paragraph 3-2-9/7.3, as follows:)

7.3 Lower Rudder Stocks *(1 October 2018)*

In determining lower rudder stock scantlings, values of rudder design force and torque calculated in 3-2-9/3 and 3-2-9/5 are to be used. Bending moments, shear forces, as well as the reaction forces are to be determined from 3-2-9/7.7 and 3-2-9/13.5, and are to be submitted for review. For rudders supported by shoe pieces or rudder horns, these structures are to be included in the calculation model to account for support of the rudder body. Guidance for calculation of these values is given in Appendix 3-2-A1.

Lower stocks are to be of the required diameter at the top arm of single-plate rudders or at the top diaphragm of built-up rudders. The diameter may be gradually reduced below this point until it is 0.75S at the bottom. Lower stocks within built-up rudders may be omitted provided the strength of the rudder in torsion and bending is equivalent to that required for the lower stock. When determining the equivalent section the amount of attached plate on each side of the rudder is not to be taken more than twice the rudder thickness at the given section.

The lower rudder stock diameter is not to be less than obtained from the following equation:

$$S_\ell = S\sqrt[6]{1 + (4/3)(M/Q_R)^2} \quad \text{mm (in.)}$$

where

S = upper stock required diameter from 3-2-9/7.1, in mm (in.)

S_ℓ = lower stock required diameter.

M = bending moment at the section of the rudder stock considered, in kN-m (tf-m, Ltf-ft)

Q_R = rudder torque from 3-2-9/5, in kN-m (tf-m, Ltf-ft)

Above the neck bearing a gradual transition is to be provided where there is a change in the diameter of the rudder stock.

The equivalent stress of bending and torsion, σ_c to be assessed from the aforementioned direct calculation in the transition is not to exceed 118/K N/mm^2 (12.0/K kgf/mm^2, 17100/K psi).

$$\sigma_c = \sqrt{\sigma_b{}^2 + 3\tau^2}$$

where

K = material factor as defined in 3-2-9/1.3.

σ_b = 10.2M/ S_ℓ^3 10^6 N/mm^2 (10.2M/ S_ℓ^3 10^6 kgf/mm^2, 10.2M/ S_ℓ^3 26880 psi)

τ_t = 5.1Q_R/ S_ℓ^3 10^6 N/mm^2 (5.1Q_R/ S_ℓ^3 10^6 kgf/mm^2, 5.1Q_R/ S_ℓ^3 26880 psi)