

Section

- 1 **General**
- 2 **Rudders**
- 3 **Sternframes and appendages**
- 4 **Fixed and steering nozzles, bow and stern thrust units**
- 5 **Stabiliser arrangements**
- 6 **Particular requirements for multi-hull craft**

■ Section 1 General

1.1 Application

1.1.1 This Chapter applies to all the craft types detailed in the Rules, and requirements are given for rudders, nozzles, steering gear, bow and stern thrust unit structure and stabiliser structure.

1.2 General

1.2.1 The following symbols and definitions are applicable to this Chapter, unless otherwise stated:

σ_o = minimum yield stress or 0,5 per cent proof stress of the material, in N/mm² and is not to be taken greater than 0,7 σ_T

where

σ_T = ultimate tensile strength of the material, in N/mm²

1.2.2 The scantlings in aluminium alloy are to be obtained by multiplying the scantlings in mild steel, determined from this Chapter, by the following factors:

(a) Plating thickness factor = k_{ta}

where

$$k_{ta} = \sqrt{k_{aa}}$$

(b) Section modulus and cross sectional area factor, k_{aa}

where

$k_{aa} = 235/\sigma_{ya}$ or 1,36, whichever is the greater

σ_{ya} = specified minimum yield stress or 0,2 per cent proof stress of aluminium alloy in the welded condition, in N/mm²

1.3 Navigation in ice

1.3.1 Where an ice class notation is to be included in the class of a craft, the scantlings will require special consideration, see Pt 3, Ch 2, 9 *Navigation in ice*.

1.4 Materials

1.4.1 The requirements for materials are contained in the *Rules for the Manufacture, Testing and Certification of Materials* (hereinafter referred to as the Rules for Materials).

Closing Arrangements and Outfit

Part 3, Chapter 4

Section 4

4.7 Design of securing and supporting devices

4.7.1 Securing devices and supporting devices are to be designed to withstand the forces given in *Pt 3, Ch 4, 5.11 Standard designs* using the permissible stresses given in *Table 4.4.1 Permissible stress for bolts, closing and supporting devices*. The terms 'securing device' and 'supporting device' are defined in *Pt 6, Ch 5, 4.3 Symbols and definitions*.

4.7.2 The nominal tensile stress in way of threads of bolts is not to exceed the permissible stress given in *Table 4.4.1 Permissible stress for bolts, closing and supporting devices*. The arrangement of securing and supporting devices is to be such that threaded bolts are not to carry support forces.

4.7.3 For steel to steel bearings in securing and supporting devices, the normal bearing pressure is not to exceed $0,8\sigma_o$. For other bearing materials, the permissible bearing pressure is to be determined according to the manufacturer's specification. The normal bearing pressure is to be calculated by dividing the design force by the projected bearing area.

4.7.4 The distribution of the reaction forces acting on the securing and supporting devices may require to be supported by direct calculations taking into account the flexibility of the hull structure and the actual position and stiffness of the supports. Small and/or flexible devices, such as cleats, intended to provide load compression of the packing material are not generally to be included in these calculations.

4.7.5 Only the active supporting and securing devices having an effective stiffness in the relevant direction are to be considered in the calculation of the reaction forces acting on the devices.

4.7.6 The number of securing and supporting devices is generally to be the minimum practicable whilst complying with *Pt 3, Ch 4, 4.5 Closing, securing and supporting of doors 4.5.3* and taking account of the available space in the hull for adequate support.

Table 4.4.1 Permissible stress for bolts, closing and supporting devices

Material	Closing and supporting devices			Thread of bolts
	Direct stress N/mm ²	Shear stress N/mm ²	Equivalent stress N/mm ²	Direct stress N/mm ²
Steel	$\frac{120}{k_s}$	$\frac{80}{k_s}$	$\frac{150}{k_s}$	$\frac{120}{k_s}$
Aluminium	$\frac{64}{k_a}$	$\frac{43}{k_a}$	$\frac{80}{k_a}$	$\frac{64}{k_a}$
Note $k_s = \frac{235}{\sigma_o}$, σ_o as defined in Ch 3, Pt 3, Ch 3, 1.2 General 1.2.1 $k_a = \frac{120}{\sigma_{ya}}$, σ_{ya} as defined in Ch 3, Pt 3, Ch 3, 1.2 General 1.2.2				

4.7.7 The arrangement of securing devices and supporting devices in way of these securing devices is to be designed with redundancy so that in the event of failure of any single securing or supporting device the remaining devices are capable of withstanding the reaction forces, without exceeding, by more than 20 per cent, the permissible stresses referred to in *Pt 3, Ch 4, 4.7 Design of securing and supporting devices 4.7.1*.

4.8 Operating and Maintenance Manual

4.8.1 An Operating and Maintenance Manual for the doors is to be provided on board and is to contain necessary information on:

- main particulars and design drawings;
- service conditions, (e.g. service area restrictions, acceptable clearances for supports);
- maintenance and function testing;
- register of inspections and repairs.

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4.7.4 The distribution of the reaction forces acting on the securing and supporting devices may require to be supported by direct calculations taking into account the flexibility of the hull structure and the actual position and stiffness of the supports. Small and/or flexible devices, such as cleats, intended to provide load compression of the packing material are not generally to be included in these calculations.

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