

**Section 9.0**

**M A C H I N E R Y   S Y S T E M S**

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**9.1 Propulsion Engines and Systems****9.1.1 Application**

9.1.1.1 This section applies in respect of non-pleasure craft, except for 9.1.7, “Exhaust Systems,” which applies to all small vessels.

**9.1.2 General**

9.1.2.1 Where persons may come in contact with moving machinery parts, guards shall be fitted where practicable.

**9.1.3 Engine Starting**

9.1.3.1 The machinery shall have either mechanical, hand, or electric starting.

9.1.3.2 Charging facilities for the batteries shall be automatic. Where auxiliary batteries are fitted, it is recommended that they be capable of being connected in parallel to provide additional starting power.

**9.1.4 Operating Station Controls and Gauges**

9.1.4.1 The following shall be provided at the vessel’s operating station, where applicable:

- (a) engine oil pressure and engine coolant temperature indicators for inboard engine;
- (b) fuel capacity gauges, unless other adequate means to determine the amount of fuel is provided;
- (c) battery charging gauges;
- (d) controls for navigation light, steering equipment, etc.;
- (e) control and instructions for the blowers;
- (f) high bilge indicator;
- (g) fire detection panel and alarms; and
- (h) engine shut-off device.

**9.1.5 Gasoline Engines Ventilation and Instructions**

9.1.5.1 In every enclosed machinery space where gasoline is present, there shall be power ventilation that shall be designed for continuous operation to clear the space(s) of vapours in not less than 4 minutes of operation prior to starting. A clear permanent instruction placard covering this operation shall be mounted at the ignition switch on the control console.

## **9.1.6     Shafting and Propellers**

9.1.6.1     The propulsion machinery manufacturer's recommendations or other authorities' criteria, as recognized by the marine community, shall be taken into account when determining the material and dimensions of shafting and propellers.

## **9.1.7     Exhaust Systems – All Small Vessels**

### **9.1.7.1     Application**

9.1.7.1.1     This subsection applies to all exhaust systems on all small vessels equipped with inboard or stern drive engines, or permanently installed auxiliary engines.

### **9.1.7.2     General**

9.1.7.2.1     All exhaust systems shall be gastight to the hull interior.

9.1.7.2.2     Every exhaust system fitting, joint, clamp, and support shall be accessible for inspection and repair. All hose connections shall be double clamped.

9.1.7.2.3     Exhaust system piping, components and connection shall be independently supported to minimize failure from vibration, shock and expansion.

9.1.7.2.4     All supports, hangers, brackets, or other fittings in contact with uncooled exhaust carriers shall be non-combustible and constructed so that the temperatures transmitted to the supporting materials will not cause combustion or component failure.

9.1.7.2.5     Exhaust system piping shall be kept at a safe distance from combustible material, so as to prevent the surface temperature of such materials from exceeding 93°C.

9.1.7.2.6     Protective guards, jacketing or covers shall be provided wherever persons or gear might come into contact with the exhaust system where the temperature exceeds 93°C. The temporary removal of this protection is permitted, if necessary for engine maintenance or repair.

9.1.7.2.7     Each exhaust system shall be designed and installed to prevent cooling water, rain water, or raw water from entering the engine through the exhaust system under all normal operating and non-operating conditions.

9.1.7.2.8     No additional discharges other than cooling water shall share the exhaust gas passage.

### **9.1.7.3     Materials**

9.1.7.3.1     Materials used in a marine engine exhaust system shall be resistant to saltwater corrosion, resistant to exhaust products, and galvanically compatible. Non-metallic exhaust system components shall meet the requirements of Underwriters Laboratories UL 1129 or Society of Automotive Engineers Standard SAE J2006.

- 9.1.7.3.2 Threaded pipe and fittings for the engine exhaust shall be at least schedule 80 pipe or equivalent.
- 9.1.7.3.3 Non-metallic exhaust system components shall retain watertight integrity for two (2) minutes after a total loss of cooling water with the engine operating at full power.

### **9.1.8 Steering Systems**

- 9.1.8.1 Every non-pleasure craft shall be fitted with a safe and reliable means of steering that is operable from the control position and capable of maneuvering the non-pleasure craft under normal operating conditions. The steering system shall be protected from obstructions, excessive heat, and mechanical wear.
- 9.1.8.2 If the non-pleasure craft's intended service is in remote areas or where help is not readily available, the non-pleasure craft shall be fitted with a means of emergency steering.
- 9.1.8.3 When a steering gear is fitted with remote control, emergency steering shall be fitted on the non-pleasure craft.
- 9.1.8.4 Emergency steering is not required for:
- (a) non-pleasure craft with multiple screw propulsion with independent control of each screw, if it has been demonstrated during sea trials that the non-pleasure craft can be effectively steered at low speed in this fashion;
  - (b) non-pleasure craft with no rudder fitted, where steering action is obtained by a change of directional setting of the propulsion units, when it has been demonstrated during sea trials that the non-pleasure craft can be effectively steered at low speed in this fashion;
  - (c) non-pleasure craft fitted with a rudder and a hand tiller as the main steering arrangement;
  - (d) non-pleasure craft fitted with independently controlled adjustable trim tabs, when it has been demonstrated during sea trials that the non-pleasure craft can be effectively steered at low speed in this fashion; and
  - (e) non-pleasure craft fitted with a bow thruster, when it has been demonstrated during sea trials that the vessel can be effectively steered at low speed using the thruster only.

## **9.2 Auxiliary Machinery**

### **9.2.1 Bilge Pumping Arrangements**

#### **9.2.1.1 Application**

- 9.2.1.1.1 This section applies in respect of non-pleasure craft.

### 9.2.1.2 General

- 9.2.1.2.1 Every non-pleasure craft shall be provided with a means of pumping or bailing each watertight compartment when the vessel is in its operating condition. The means provided shall be effective when the vessel is upright and when it is heeling up to an angle of 10 degrees.
- 9.2.1.2.2 Every non-pleasure craft over 6 m (19 ft 8 in) in length shall have at least one automatic bilge pump of at least 0.91 L/s (0.25 U.S. gal/sec; 900 U.S. gal/hr) minimum capacity.

### 9.2.1.3 Where a Piping System Is Fitted

- 9.2.1.3.1 The piping arrangement shall ensure that no back siphoning can occur and marine type strainers shall be provided on the suction line from each compartment.
- 9.2.1.3.2 The piping shall be of metal, rigid plastic, non-collapsible and non-oil degradable hose with flanged, screwed, or robust double-clamped connections, where practicable.
- 9.2.1.3.3 The piping shall be not less than 25 mm (1 in) in diameter, except that for small compartments piping 18 mm ( $3/4$  in) in diameter may be acceptable if the pump-out time is under five (5) minutes.
- 9.2.1.3.4 On non-pleasure craft over 6 m (19 ft 8 in) in length that have bilges that are not readily observed, audible bilge alarms or visual indicators shall be provided at the operating station to indicate:
- (a) a high bilge level in a normally unattended machinery space or other space having an underwater through-hull connection; and
  - (b) when an automatic bilge pump is operating.
- 9.2.1.3.5 Where overnight sleeping accommodation is provided, high bilge level alarms shall be audible (84 dBA) to persons sleeping.
- 9.2.1.3.6 Where there are automatic bilge pumping arrangements, they shall be fitted with an overriding manual switch that is readily accessible.

### 9.2.2 Pressure Vessels

- 9.2.2.1 Every pressure vessel shall be fitted with a drain valve, pressure gauge, and safety valve, and shall conform to ASME *Boiler and Pressure Vessel Code*, except for the following:
- (a) a pressure vessel having a working pressure that does not exceed 103 kPa (15 lbs/in<sup>2</sup>);
  - (b) a pressure vessel having an internal diameter that does not exceed 152 mm (6 in);
  - (c) a pressure vessel where the volume above the normal working level of a liquid does not exceed 45 L (12 U.S. gal); or
  - (d) a pressure vessel where the volume does not exceed 150 L (40 U.S. gal) and the maximum working pressure does not exceed 700 kPa (100 lbs/in<sup>2</sup>).