

## Mechanical and Electrical Equipment

### 1. General

Basically the following, inter alia, shall be taken into account for new buildings: SOLAS 74/88, the Schiffssicherheitsverordnung (SchSV) vom 18.09.1998 (Artikel 2 der Ersten Schiffssicherheitsanpassungsverordnung - BGBl. I S. 3013) [Ordinance for the Safety of Seagoing Ships from 1998] as amended and as well as the latest edition from 01.01.2011 of the Unfallverhütungsvorschriften für Unternehmen der Seefahrt [Accident Prevention Regulations for Enterprises engaged in Seafaring]. The requirements specified below, which have general application to utility spaces (see UVV See § 43) are part of the rules, or are generally accepted good engineering practice.

We ask that these requirements be taken into account from the planning stage onwards.

### 2. Documents to be Submitted

#### 2.1 Engine room installation plans

An approved engine room installation plan by the recognized classification society shall be submitted to BG Verkehr. In the case of ships in which the height from the floor to the deck immediately above, and between decks, is less than 3.00 m, side elevations and plan views of the specified escape routes and passageways (see item 3.4 below) shall be shown to scale using green hatching (width 600 mm, height 2.00 m). If the decks are more than 3.00 m apart, the escape routes and passageways can be indicated by continuous green lines. These escape routes and passageways shall be kept clear without fail. The workshop drawings shall be prepared in a similar manner, and shipboard fitters shall be informed of the routes that are to be kept free.

#### 2.2 Ventilation plants for engine rooms

**App.1**  
**DE.2** Three copies of the details of the ventilation plant in the engine room shall be submitted to BG Verkehr in accordance with **appendix 1** "Ventilation System in Engine Rooms (Form Lü)".

#### 2.3 Emergency sources of electrical power and emergency consumers

**App. 2**  
**DE.3** Three copies with the details of the emergency sources of electrical power and emergency consumers shall be submitted to BG Verkehr (Form Nt)

#### 2.4 Structural measures for the prevention of marine pollution

**DE.19** Three copies with details of "Structural measures for seagoing vessels for the prevention of marine pollution by oil, sewage and garbage in conformity with MARPOL 73/78 and the HELSINKI Convention" (Form MARP) shall be submitted to BG Verkehr.

#### 2.5 Noise Abatement Measures for the engine room, Accommodation and Bridge Area.

**DE.15** Three copies with the details of "Noise Abatement Measures for the engine room, Accommodation and Bridge Areas shall be submitted to BG Verkehr. (Form LÄRM)

### 3. Mechanical Equipment

- 3.1 **Labels, notices, instructions and prohibition notices** should be illustrated in pictures or symbols which are generally understood and which can be found in the in standards and in IMO documents (see IMO resolution A 603(15) and 760(18)) etc.

**Labels** on units, machines and pipelines shall be **in working language** (see SOLAS 74/88 Ch. II-1, Reg. 26, IMO Resolution MSC 57(67), MSC 67(22) Add. I and ISM Code Res. A.741(18) 6.6).

#### **App. 3** Operating manuals shall be written in accordance with **appendix 3**.

- 3.2 DIN 83206 requires that **stairways** in service rooms shall be made of steel. They shall be arranged in the fore-and-aft direction. Stairways in engine rooms comprising up to four steps and stairways over shaftings may be installed athwart ships.

The inclination of the stairway to the horizontal shall not exceed 60°. The headroom above the stairs, measured at nosing of tread, is to be 2.00 m. If the height between two landings exceeds 3.70 m, half-landings shall be provided to keep flights within this figure. The foothold areas at the ends of stairways and on landings shall not be smaller than 600 mm x 600 mm.

Risers are not to exceed 230 mm and treads 140 mm. All individual stairs shall be the same size. The tread of the uppermost stair is to be 250 mm in accordance with DIN 83206. Protective sheet metal to catch dirt shall be arranged in accordance with DIN 83208 under stairways positioned over open spaces and passageways. To avoid the risk of tripping, no skirting boards or kick boards shall be fitted on the upper stairway access (see DIN 83204, 83205, 83206, 83207, 83208).

On ships with more than 6000 GT, stairways shall be provided in service rooms containing transverse thrusters. Stairways shall be provided, wherever possible, on ships of 6000 GT or less. A ladder may extend up to 3.00 m above the upper edge of the transverse thruster conduit.

- 3.3 Enclosed **gratings** shall be provided on high working or erection areas.
- 3.4 The headroom above deck of passageways in utility spaces shall be at least 2.00m, whilst the clear width is not to be less than 600 mm even at fittings. **Passageways** are routes to important operating units and plants, e.g. main propulsion engines, auxiliary diesel engines, boiler plants, heater for heat transfer plants, turbo-generators, separators, pumps and control panels etc., routes around main propulsion engines and alongside auxiliary diesel engines as well as routes to enclosed rooms.

**Passageways between the accommodation** of crew members assigned to engine room duties and the engine rooms shall be fully protected against wind and weather conditions, and fitted with handrails or other facilities providing a secure grip.

The **main access to the steering gear compartment** is to be designed as passageway. The dimensions for passageways cannot be complied with in special ships such as Ro-Ro vessels, drawings showing the main access shall be submitted to BG Verkehr.

- 3.5 A minimum headroom of 2.00 m shall be maintained in **work places** such as workshops, engine control rooms and watch rooms.
- 3.6 The **escape routes** in the engine room area and the doors to emergency exits shall be conspicuously and permanently designated (see SOLAS Ch.II-2, Reg.3.2.5). The designation plates use rescue symbols as specified in DIN 4844 and ISO 7010. Such rescue symbols shall be of the luminescent or long phosphorescence type. Escape routes include the passageways leading from the control station of the main propulsion plant, engine control room, watch room, workshops, from the auxiliary diesel station, separator station and from other places where work is normally carried out to the main descent stairways and/or to all doors of the encased emergency exit. At least two plates shall be provided for each of the floors and for each deck below the main deck. Any escape routes that lead from enclosed rooms through adjoining secondary rooms to encased emergency exits shall likewise be designated.
- 3.7 **Doors** of ancillary spaces adjoining the main engine room such as engine control rooms, watch rooms, workshops, auxiliary diesel spaces and other ancillary spaces as well as the hatches of emergency exit trunks shall open into the engine room. Doors in bulkheads forming the boundary surfaces for CO<sub>2</sub> flooding and doors of workshops shall be approved according to the MED.
- 3.8 The entrance doors to the engine rooms and the doors of the emergency exits within the engine room shall be equipped with **self-closing devices**. The doors of the secondary rooms on the escape route that lead to the main engine room shall be provided with self-closing devices.
- 3.9 An encased **emergency exit** shall be provided, which is accessible directly from the floor of the engine room (see SOLAS Ch. II-2, Reg. 13).  
The trunked emergency exit shall not be incorporated into the engine room ventilating system.  
The entrances to the encased emergency exit shall be as far away as possible from the second group of steel ladders (descent stairway). Engine control rooms, watch rooms, workshops, auxiliary diesel rooms and similar secondary rooms in the engine area should have also emergency exit. These emergency exit is not required when the encased emergency exit is accessible from these enclosed rooms, or when the enclosed rooms are arranged next to or on top of one another, are interconnected by doors and when one of the rooms leads to an area outside the engine room. The emergency exit shafts shall be designed with a clear cross-section of at least 800 mm x 800 mm; the dimensions can be reduced by scaling ladders. (SOLAS Ch.II-2, Reg.4.1/4.21 and MSC/ Circ.847)  
Ladders shall be in accordance with DIN 83202. The rungs shall be made of square steel bars with a sharp edge pointing upwards (UVV See § 87(5)). Ladders shall not be offset to one another, so as to prevent any danger of falling. The clear width of the emergency exit doors is to be at least 800 mm.

Shaft tunnels with a sliding bulkhead door to the main engine room should all have an emergency exit leading to a deck with an escape into the open. Shaft tunnels without a sliding bulkhead door and over 15 m in length and shaft tunnels without a sliding bulkhead door from engine rooms in which the trunked emergency exit is located in the forward area and with a length of more than 7 m should have an emergency exit. Emergency exits from adjacent rooms shall be designed with a clear cross-section of at least 600 mm x 600 mm. The emergency escape from steering gear room shall be in compliance with SOLAS Ch.II-2, Reg. 4.2.2.

- 3.10 **Accessible floor areas and floor coverings** in service rooms shall have a non-skid surface. This includes e.g. platform decks within the engine room and floor areas in steering gear compartments. Accessible floor areas and floor coverings shall comply with the requirements applying to "Floor Surfaces and Floor Coverings in Accommodation and Working Areas with Danger of Slipping" regarding assessment groups "R" (see standard letter "Bodenflächen und Bodenbeläge in Unterkunfts- und Arbeitsbereichen mit Rutschgefahr". (see also UVV See § 94b)
- 3.11 Exposed moving parts and rotating shafts shall be protected in compliance with ILO 134/Art.4c).  
Protection shall also be provided in areas other than passageways and working areas. Drive shaft couplings of shaft generators above floor level are examples falling into this category. The components mentioned above shall also be protected in accessible areas below floor level.
- 3.12 The **steering gear** installation area shall be separated by a bulkhead from the main engine room. The steering gear compartment and the main engine room may be linked by a self-closing door (see SOLAS 74, Ch. II-1, Reg. 29, Para 13.1). Exceptions to this Rule may only be allowed in special cases with the consent of BG Verkehr.
- 3.13 **Erection holes** in the engine room area shall be safeguarded to prevent persons or inanimate objects from falling through (UVV See § 103(6)). Installation openings shall not be located in the vicinity of doors or entrances to rooms. The location of installation openings in passageways and working areas is to be avoided. Wherever possible, hatch covers shall be divided so that they fold up in the transverse direction to prevent objects from rolling off. The end faces of the raised hatch cover halves shall be safeguarded in the prescribed manner.  
**Doors** to workshops and installation doors in bulkheads which are the boundary surfaces for CO<sub>2</sub> flooding and which simultaneously serve as doors in passageways shall be of an MED approved type.
- 3.14 Main and auxiliary engine rooms and their adjacent spaces, such as engine control rooms, workshops and watch rooms and steering control rooms, shall not have outside windows and **windows** to living quarters.
- 3.15 **Main propulsion engines** shall be equipped with devices which ensure their automatic shutdown if the lubrication oil supply fails (SOLAS Ch.II-1, Reg.27.5)  
The rungs of climbing irons fitted into walk-in crankcases of main propulsion engines shall be made of square steel sections standing on edge. The surfaces of the base plates of these engines that can be walked upon shall be of anti-skid

design, or appropriate devices shall be available to ensure accident-free access to the crank space.

The operating elements at the engine control positions for **main propulsion machinery and variable-pitch propeller systems** shall be designed so that they can be mechanically secured against unintentional actuation during maintenance work on the units.

- 3.16 The drive of lifeboats, rescue boats and fast rescue boats with inboard and outboard petrol engines shall be approved according to Council Directive 96/98/EC on marine equipment, IMO Resolution MSC.48(66) (LSA-Code) and MSC.81(70) .  
Concise weatherproof operating instructions, tools and spare parts shall be placed on board.
- 3.17 Powered **turning devices for engines and turbines** shall be so designed that only one control device is operating at any one time. Turning devices for engines shall moreover be arranged so that the power drive switches off automatically when the control device is released and when there is a fault in the control cable in the event of a rupture of the cable or short circuit. Main engines and turbine plants shall have equipment which only permits starting when the turning device is disengaged. Only hand wheels with solid discs shall be used for aligning the teeth of the turning devices with the teeth of a flywheel. The power drive of the turning device shall switch off automatically before the hand wheel is brought into contact, e.g. as part of the process of bringing the hand wheel into contact or removing the protective guard. (see also UVV See § 151)
- 3.18 A closed-off **engine control room** or **watch room** and a closed-off **workshop** shall be provided on seagoing ships of 1000 GT and over. These rooms shall be located in the vicinity of the engine rooms, shall be closed off by bulkheads or walls and shall be accessible through doors. The watch room and workshop may be combined in a single room. Unless this is made impossible by compelling structural reasons, the main switchboard is to be placed in the engine control room and also in the watch room, as appropriate.
- 3.19 The main propulsion plant shall have an **engine control stand** in compliance with SOLAS Ch.II-1, Reg.31. The engine control stand may be located directly at the engine or in the engine control room. The control system of the engine control stand shall be independent of the bridge remote control systems.
- 3.20 The equipment and operation of **boiler plants** are subject to the Schiffsdampfkesselrichtlinie (Ordinance on Steam Boiler, edition from April 2008), and those of **lift installations** to the Betriebssicherheitsverordnung (BetrSichV)/Ordinance on the Safe Operation of Equipment.
- 3.21 **Pressure vessels** (fixed) shall be arranged and mounted in the installation space in such a way that internal and external inspection and hydraulic pressure tests can be carried out. Test records covering the tests performed on the pressure vessels shall be available. Closed **hot-water heaters** shall be protected against inadmissible pressure increases by a diaphragm safety valve placed in the cold water feed line and shall be equipped with a safety temperature-limiter and a temperature control. (EN ISO 15748-1/2002).

- 3.22 The ventilation plant of the engine room and of the service rooms shall be designed in accordance with DIN ISO 8861 and shall meet the requirements for:

**App. 4** 'Engine Room Ventilation Systems (**appendix 4**).

The engine room ventilation system shall at all times supply sufficient air for the consumers. This condition is not satisfied if the air flow passes exclusively through openings which have to be fitted with covers in accordance with the legislation based on the 1966/88 International Freeboard Convention (annex I, regulation 19).

Appendix 4 contains observations regarding the following aspects of engine room ventilation: supply air inlet openings and discharge velocities, discharge air openings and exhaust fans (including discharge air openings with fixed shutters), space ventilation, secondary systems and pressure drops in silencers.

- 3.22a Taking the climate into consideration, the **ventilation of the service rooms** shall be sufficient.

Permanent stations of work (for example: engine control rooms, watch rooms, workshops, separator stations within the engine rooms, test stations for fuel injection valves, engine and boiler control stations and areas in which auxiliary machinery has been installed) that require continuous operation, servicing and cleaning shall have a room temperature and air velocity which are conducive to good health, taking into consideration the work processes and the physical demands on the insured persons.

- 3.23 **Hose lines in hydraulic systems** which consist of hoses and fittings shall be high-pressure hoses and meet the requirements of DIN 20066. Hydraulic hose lines in engine rooms shall be flame-resistant and must be type-approved by a recognised classification society. There shall only be a limited use of hoses.  
(MSC /Circ.647, Annex 6/2)

- 3.24 **Incinerators** shall be designed and approved according to MEPC. 76 (40).

- 3.25 Ammonia **refrigerating plants** shall not be installed. In certain conditions, ammonia may be used exclusively for cargo refrigeration plants.

- 3.26 **Storage tanks and fixed reservoirs for fuels, lubricants and auxiliary materials** shall be connected by pipelines to the areas where the fuels, lubricants or auxiliary materials are generally used. Fuels, lubricants or auxiliary materials in this sense are e.g. lubricating oil for auxiliary diesel engines, and for smaller main propulsion engines, cylinder oil, fuel additives or fluid cleaning materials. The areas mentioned above can be e.g. the auxiliary diesel engine station, cylinder station, fuel additive dosing point or the workshop.

- 3.27 **Pipes** in service rooms shall be clearly and durably marked in accordance with ISO 14726. They shall meet the requirements stated in "Pipe Identification on

**App.5** Seagoing Ships" (**Appendix 5**).

- 3.27a **Pipelines** that carry gases or liquids which are a health hazard shall not be installed in the accommodation area or in rooms where ventilation or air-

conditioning plants are installed. Laying of propane gas lines for domestic use is permitted via the shortest possible route. In addition, collecting mains for the CO<sub>2</sub> fire-extinguishing plant can be installed in passageways using the shortest possible route, when no other possibility exists (see also Verordnung über die Unterbringung der Besatzungsmitglieder an Bord von Kauffahrteischiffen of 8 February 1973).

3.28 **Discharge pipes** shall not be fitted in the lifeboat and liferaft lowering area. When this is unavoidable, it shall be possible to switch off the associated pumps from the boat deck.

3.29 A **bilge level alarm** shall be provided for every machine room on seagoing vessels, including fishing vessels.

The volumes of **bilge wells** in the machinery space bilge shall be designed so that the level alarm does not go off for 16 hours with normal leakage.

Automatic freeing is permitted only with the pump of the oily water separator in conjunction with an alarm system which trips an alarm if the freeing operations are too frequent and/or too long.

3.30 **Hand wheels for actuating the shut-off devices in the main seawater inlet pipes** shall be arranged 1.00 m above the floor plates (see SOLAS Ch.II-1, Reg.35-1 3.7.3). Hand wheel and valve spindles are not to finish up above the accessible floor plates and gratings within the traffic areas. If this arrangement is unavoidable in exceptional circumstances, the hand wheels shall be positioned to end at a height of approximately 1 m above the floor plates.

3.31 The switching-on or engagement devices of **lathes** and other machine tools shall have safety devices which prevent them from being switched on accidentally.

3.32 If **sheets of plate** are stored on board, they shall be safeguarded against falling over or slipping. Sheets of plate standing on their edges shall be positioned in the fore-and-aft direction. A passageway is to be provided over the whole length alongside the plate restraints. If sheets of plate are restrained athwart ships, easily removable stoppers shall be fitted at the ends. Sheets of plate restrained in the fore-and-aft direction shall be secured in such a way that they cannot fall over either in heavy seas or when individual plates are removed.

3.33 **Shelving systems** (e.g. for storing spare parts) and **cupboards** with drawers and slide-in units shall be mounted so that these open fore-and-aft. If this arrangement is impossible, drawers and slide-in units shall be individually secured against opening as a result of the motion from the sea.

3.34 The **surface temperature** of units and pipelines shall not exceed 220 °C, in order to prevent fire hazards.

The **exhaust pipes** from diesel engines shall be completely insulated, from the connection to the cylinder head or cylinder jacket up to the outlet from the engine room. The insulation of the exhaust pipes in the diesel engine area and the **superheated steam pipes** in the turbine area shall be completely clad with sheet steel. Moreover, insulated exhaust and superheated steam pipes shall be jacketed with sheet steel in other high risk areas (SOLAS Ch.II-2, Reg.4 and 4.2.2.6.1/ MSC/Circ.847, Annex 7).

High risk areas are for instance places where fuel or lubricating oil can drip or spray into insulated pipelines. The sheet steel cover shall be designed so that no fuel or lubricating oil can penetrate the insulation (SOLAS Ch.II-2, Reg. 4.3). In all cases, the sheet steel cladding shall also cover the hot surfaces of the turbocharger, the connecting flanges and the expansion joints. In the cylinder connection area, the insulation and sheet steel covering is to be designed for ease of removal and refitting during maintenance work.

- 3.35 Only approved non-combustible **insulation material** shall be used throughout. (MED -approved, MSC/ Circ. 847)
- 3.36 **Fuel tanks** shall not be positioned above engines, turbines, superheated steam pipes or other plant with high surface temperatures. Surface temperatures in excess of 220 °C are classified as high. This ruling is complied with if fixed decks or similar structural elements are located between the fuel tanks and plant with high surface temperatures which at the same time do not form part of the fuel tanks, so that escaping fuel cannot ignite on parts with high surface temperatures. The surface temperatures of the components are applicable for this ruling, irrespective of insulation and jacketing.
- 3.37 **Sounding pipes of fuel tanks** shall be designed in compliance with SOLAS Ch. II-2, Reg. 4 2.2.3.5.1). If they cannot be led up to the open deck because of structural constraints, they are not to terminate in the vicinity of plant with high surface temperatures (exhaust pipes and superheated steam pipes) or of electrical equipment.
- 3.38 **Fuel level indicators** made of glass, Plexiglas or similar materials shall not be used. Fuel level indicators with magnetic or pneumatic indicating devices shall have passed the type test of recognized classification society. Provided this type test is available, the combination with a level alarm suffices. If a prototype of the level indicator has not been tested, the tank in question shall be equipped with a sounding pipe.
- 3.39 **Components in fuel systems**, e.g. housings of fuel filters, pre-pump pistons etc., shall not be made of glass, Plexiglas, aluminium or similar materials. Fuel filters made of aluminium can be used if their flame resistance has been verified.
- 3.40 **Fuel oil filters** shall be arranged so that they can be operated, serviced and examined without danger (see UVV See § 148). They shall not be positioned above the flywheels of main and auxiliary diesel engines. They shall not be positioned in the vicinity of exhaust pipes, for example between rows of cylinders of V-engines. MSC/Circ.647, Annex 6.3

**Filters in fuel and lubricating oil systems** shall be provided with safety devices which prevent the opening of a filter chamber under pressure, enforce ventilation in certain specified conditions or which guarantee an equal degree of safety. MSC/Circ.647, Annex 6.2

These measures apply to filters which are fitted with two or more filter chambers, whose filter chambers can be individually isolated from the circuit for the cleaning of the filter cartridges and which are mounted on the pressure side of the pumps.

- 3.41 The following units and equipment items shall be fitted with **oil pans, oil troughs or boundary coamings**.

The required depths of the oil pans and oil troughs and the height of the coamings are recommended below:

(see inter alia SOLAS Ch. II-2, Reg. 4 2.2.3.3./2.4 - 2.5)

- |    |  |        |
|----|--|--------|
| 1. | Tweendecks on which boilers are installed inside the engine room   | 400 mm |
| 2. | Boilers installed on the floor   | 200 mm |
| 3. | Fuel and lubricating oil tanks in the area of valves and fittings  | 100 mm |
| 4. | Fuel and lubricating oil filters, heaters of heat transfer systems, hot water generators for heating systems, pumps for fuels, lubricating oils, thermal oils and hydraulic oils, main propulsion engines, auxiliary diesel engines and separator stations | 50 mm  |
| 5. | Steering gear system, lubricating oil cooler, cooling oil cooler and other units and vessels containing fuel, lubricating oil, thermal oil and hydraulic oil   | 50 mm  |

Drains shall be provided for the areas of the units and equipment as per numbers 2, 3 and 4 above that are surrounded by oil pans, troughs and coamings. The drains shall be connected to the leakage oil tanks by pipes of sufficient cross-section.

- 3.42 The entire **floor** shall normally be constructed of steel. Where part of the floor is made of aluminium, the following areas shall be made of steel plate: lower access points to main stairways with a foothold area of 1 m<sup>2</sup>, the escape route between the main stairway and the trunked emergency exit and working areas around the main and auxiliary engines.

- 3.43 **Gangways, gratings**, floor plates located above the floor and **stairway landings** shall be of steel construction. Gangways, floors, gratings and landings shall be fitted with **skirting boards or kick boards** rising to a height of 50 mm above the walking surface.

Where stair rails without intermediate rails are used on elevated decks or gangways, the skirting boards or kick boards shall be 200 mm high (see DIN 83205).

No skirting boards or kick boards shall be fitted close to passageways and the upper accesses to stairways, in order to prevent the dangers of stumbling.

- 3.44 Remote actuation of shut-off valves in the discharge lines of fuel tanks (**remote fuel shut-off**) shall be pneumatic or manually hydraulic operated, and in smaller ships can be effected by control cables.

The pipelines of the hydraulic and pneumatic systems shall be steel with connections employing olives. Preferably stainless steel shall be used. Copper pipes are not permitted. The connections shall be positioned so that they are

visible. The air reservoirs of the pneumatic plant shall be filled from the working air system and their pressure monitored by an alarm system.

For cable shut-off gear, the pulleys shall have groove diameters of 14 times the cable diameter, with a minimum diameter of 80 mm. There shall be no more than 6 changes of the cable direction. The release levers for the remote fuel shut-offs on the open deck shall be provided with seawater-resistant bearings.

The remote fuel shut-offs shall be subdivided so that they can easily be checked for proper functioning. So as not to interfere with the ship operations, one service tank each for diesel oil or heavy fuel oil shall be controlled separately, or a subdivision into groups shall be undertaken, e.g. port and starboard side. The valves for remote fuel shut-off should be type-tested.

- 3.45 The **cover frames or doors for release stations** of mechanical and electrical **remote shut-offs** shall be easy to open, so as to facilitate regular inspections. Cover frames or doors arranged on the open deck shall be secured with wing nuts or wing bolts in accordance with DIN 315 and 316, and made of seawater-resistant materials, or by a lock, with the key being kept under glass next to the emergency shut-off. Doors of emergency shut-off stations shall be clearly marked and designated.
- 3.46 **Ventilation flaps** at supply air inlet openings for the machinery space shall be situated on one deck wherever possible. The supply air inlet openings should be sited next to or aft of the deckhouse. The machinery space should normally be provided with no more than three supply air inlet openings and one main discharge air opening. Where more than three openings are provided, all ventilation port covers shall be power-operated. Ventilation flaps shall be designed so that a full seal is achieved and so that the number of bearings is kept as small as possible and their positions are accessible. (MSC/Circ.847 16.2.2.2)

**Louvre type shutters** may be accepted as closing arrangements for engine rooms subject to the following conditions, provided it can be shown that this arrangement is as equally effective and if the shutters have an Class A Fire Damper approval according to the Marine Equipment Directive (MED approval) or the construction is according to the following specification:

- the chosen materials ensure a maintenance free bearing,
- the bearing pins of the concentric lamella axis shall be protected (encapsulated),
- the closing devices and power driven appliances are easy accessible for maintenance work,
- every single lamella is closed against a surrounded frame or is equipped with a suitable profile to avoid air leakage.

Flaps for achieving watertight integrity (**ventilation flaps/fire dampers**) shall be designed in accordance with DIN 83 409; vertical installation (stop at the top or bottom) shall only be used in fully justified exceptional circumstances.

No fixed studs shall be used:

- to secure the open flaps (except for the cases when the fire flaps to be closed can be moved after the cage nuts have been loosened slightly) or
- to seal off using the ventilation flaps and closures.

Only cage nuts shall be used to secure the ventilation flaps.

Material combination and bearing clearance for ventilation flaps and fittings shall comply with DIN 83406. The bearing materials shall be combined in such a way that maintenance by the crew is not required. For instance, the bushes and pins shall be made of stainless steel or sintered metal.

Notice plates detailing the rooms to be closed, e.g. main engine room, auxiliary engine room, separator room, etc., shall be fixed to all operating equipment for ventilation flaps.

Operating levers shall be as long as their installation position will allow. The operating forces required to overcome friction caused by rusting shall be taken into account here.

The thickness of rectangular ventilation flaps, taking account of the flap area, shall be selected as for round flaps.

Inspection openings shall be provided at concealed fire flaps.

- 3.47 **Power-driven** controls for **ventilation flaps** shall be provided with devices for a second, independent power operating system or manual control. The remote control of the equipment shall be affected from the bridge. It shall be possible to separate the power-driven control elements from the ventilation port easily and without tools. It shall be possible to operate the second power drive, the manual control and the separating device from outside the engine room. The power-driven fire flap actuators shall be accessible for maintenance work. All mechanical and electrical components of the actuating mechanisms shall meet the requirements under the ambient conditions stated in the Germanischer Lloyd's Construction Rules.

This requirement can be fore gone if, in the case of a failure of the power supply, the ventilation flaps/fire dampers are closed by a fail safe arrangement and a device for function testing of each flap is available.

- 3.48 **Equipment for achieving watertight integrity**, e.g. fire flaps and doors, shall be fixed in such a way that the operator can actuate the closures or locking devices without having to enter or grope in the area to be closed. The locking devices shall be easy to release without tools. The mounting of closure covers on studs is not permitted (**appendix 6**).

## App. 6

- 3.49 Flexible connections (**hoses**) in fuel and lubricating oil lines and in seawater cooling lines shall be flame-resistant (see GL's Regulations for the Performance of Type Tests on Mechanical Components and Appliances). Hoses may only be used to a limited extent.(MSC/Circ.847, Annex 2, SOLAS Ch.II-2, Reg. 4.2.2.5.1, 2.3 )

3.50 **Emergency fire pumps** outside the machine room shall be installed as follows:

- a) The basic requirement is that the emergency fire pumps be installed low enough in the ship for the sea water to flow into them easily.
- b) If this type of installation for the emergency pump is not possible, self-priming pumps may be used up to a geodetic suction head of 4 m, measured from the centreline of the pump intake flange to the water line with the most unfavourable loading condition of the ship (ship without load, ballast and fuel).

**It should be noted**, that the sea suction must be positioned below the water line in case of an inappropriate angle of heel.

- c) If the geodetic suction head of emergency fire pumps in the most unfavourable loading condition exceeds 4 m, additional equipment that ensures reliable operation of the emergency fire pump shall be fitted. Examples of such equipment are:
  - delivery pumps (e.g. hydraulically driven pumps),
  - elevated water tanks with which continuous filling is assured and which in addition are adequately sized so that the empty piping and pump systems can be filled from them several times. The filling pipe from the tank to the pump shall be provided with a surge tank to obviate entry of air into the suction pipe of the pump via the tank.

**Spare parts** for the emergency fire pumps driven by diesel motors have to be provided.

3.51 A permanently installed telephone link between the fuelling station on deck and the engine room (bunkering telephone) shall be provided on seagoing ships with 4000 GT and over. On seagoing ships with less than 4000 GT, a bunkering telephone or two approved VHF mobile radio telephony units (156 - 162 MHz) should be provided on board for bunkering.  
(see Form MARP - DE.19 - )

#### 4. Electrical equipment

4.1 When working in confined spaces, movable double insulated or protectively earthed equipment shall only be used together with protective isolation or earth-leakage circuit breakers (see also UVV See § 161, D zu (2),(3) und (4)). However, increased danger from electricity in the working spaces cannot be ruled out even with these measures. The low-voltage systems, to which the portable equipment (hand lamps, electric hand drills) is connected via sockets, shall be fitted in working spaces with **isolating transformers for protective isolation** or with **earth-leakage circuit breakers** (breaking circuit at a rated earth-leakage current of 30 mA maximum).

The isolating transformers or earth-leakage circuit breakers shall also be provided for use at changing work places outside the working spaces, for connection to sockets as part of the equipment.

- 4.2 The **intensities of the lighting** in accommodation and working areas, on the open deck (stairways, passageways, working areas on fishing vessels, at pilot ladders and in container areas), in service rooms, holds and at the access to the towers of deck cranes are specified in **appendix 7 and describe recommendations**.
- App. 7**

Light fittings shall be so arranged and designed that the lamps can be safely changed. When lights are positioned higher than 2.20 m above accessible floor areas, then hoops, hooks or similar holding devices shall be provided to permit ladders with hooks or hanging fastenings to be attached safely.

**Bilges**, and bilge wells in particular, shall be adequately lit

- 4.3 **Emergency sources of power and emergency consumers** shall be designed in accordance with **appendix 8**.
- App. 8**

- 4.4 **Cranes** the control platforms of which are located 10 m or more above the main deck (measured up to the bottom of the control platform) shall be provided with emergency lighting. Emergency lighting can be ensured either by connecting the emergency lighting lamps to the shipboard emergency source of power or by permanently installed lights (backed up by an accumulator battery) which will automatically switch on in the event of failure of the ship's mains (permanently installed accumulator lamps with power supply to keep the charge).

- 4.5 The installation of **electrical alarm devices** shall meet the requirements of IMO Alarm Code A. 1021(26), dated 02.12.2009

- 4.6 **Power sockets** shall not be installed below windows or in areas where there is a danger of water, e.g. not close to washbasins. No power sockets or **switches** shall be installed in shower cubicles or close to bathtubs (VDE 0100). **Razor sockets** shall be provided with protection by protective isolation.

- 4.7 **Accumulator batteries** or the like shall not be installed in engine control rooms, watch rooms, workshops and holds, other than in completely closed cabinets or boxes, with air supply and extraction to and from the machine room.  
(SOLAS Ch.II-1, Reg. 45 1.3, 91-9.3)

- 4.8 Switchboards should be free-standing. If switchboards have an input power of 500 kVA and above, they shall be free-standing and installed in a self-contained room. Switchboards which are not free-standing shall be designed so that maintenance work can be safely performed from the front. Switchboards in this context are main switchboards and main distribution switchboards.

Operating and maintenance alleyways shall have a minimum unobstructed cross-section of 900 mm width and 2.0 m height in front of **switchboards** and 600 mm width and 2.0 m height behind free-standing switchboards. Operating and maintenance alleyways behind switchboards shall be provided with two means of access; the second access is not required for switchboards less than 4.00 m in length.

If the panels on the back of free-standing switchboards are closed off by individual doors, such doors shall be positioned and designed so that they can be fixed against the stop in the open position, allowing unimpeded working. The hinges are therefore generally to be designed so that the doors can be pushed open

180° and secured in this position. Operating and maintenance alleyways shall not be restricted by open doors. When the doors are fully opened, there shall remain at the front of the switchboards a minimum clearance of 600 mm between the door on the one side and the bulkhead, control console or other internal structures on the other side for use as a passageway.

Special provisions have to be observed for medium-voltage installations, which case need can be ordered from BG Verkehr.

- 4.9 **Test stations for electrical appliances** should be arranged. Installations within reach of the test stations shall be insulated from the hull so that the risk of electrical shock is eliminated. The test stations should be equipped with an earth-leakage circuit breaker of no higher than 30 mA as well as with two red emergency shut-down switches (see DIN EN 61008/61009). The emergency shut-down switches should be installed on the test station switchboard and in the entrance area.

- 4.10 **The rooms** in which **emergency sets**, e.g. emergency generating units and emergency fire pumps, are located and in which the atmospheric temperature can fall below 0 C shall be provided with an adequately rated **heating appliance**.  
(SOLAS Ch.II-1, Reg.44-1)

- 4.11 Accumulator batteries in lifeboats with electrically started propulsion engines shall be automatically charged from the ship's power supply at a voltage of not more than 55 volts.

The **charge level of accumulator batteries** can also be maintained by permanently installed solar generators of approved type. In this case, a permanently installed link to the ship's power supply is not necessary.

- 4.12 **Rubber mats for the insulation of standing areas** shall be placed in front of and behind main switchboards and major distribution boards as well as in front of the workbench in the electrical workshop. These rubber mats shall comply with DIN VDE 0680, Part 1, shall be oil-resistant and shall be permanently marked with the letters VDE. Insulating mats matching other standards, can be accepted.  
(SOLAS Ch.II-1, Reg.45-2)

- 4.13 **Sauna cabins** and their fittings shall be positioned and designed in such a way so that they can be operated safely, thus avoiding the risk of accidents  
(SOLAS Ch.II-2, Reg. 9 -2.2.3.4.6 / UVV See § 65 a)

- 4.14 **Operating elements** shall be positioned and designed in such a way that they can be operated and read safely and unambiguously, and are protected from accidental operation.

The operating elements shall have permanent signs indicating the effect of the resulting action. If moving the controls is potentially dangerous, the operating elements shall automatically return to a neutral position once they have been released.

Controls should be designed logically; for example, the pulling of a lever towards the operator should correspond to lifting, whilst the pushing of the lever should correspond to lowering.

- 4.15 Medium-voltage installations on seagoing vessels must be in compliance with “Anforderungen an Mittelspannungsanlagen” (I 10 Guideline for medium-voltage installations by BG Verkehr/dated 27.06.2003).