

# TÜRK LOYDU



## Guidelines for Power Plant Ships January 2022

This latest edition incorporates all rule changes. The latest revisions are shown with a vertical line. The section title is framed if the section is revised completely. Changes after the publication of the rule are written in red colour.

Unless otherwise specified, these Rules apply to ships for which the date of contract for construction as defined in IACS PR No.29 is on or after 1<sup>st</sup> of January 2022. New rules or amendments entering into force after the date of contract for construction are to be applied if required by those rules. See Rule Change Notices on TL website for details.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

If there is a difference between the rules in English and in Turkish, the rule in English is to be considered as valid. This publication is available in print and electronic pdf version. Once downloaded, this document will become UNCONTROLLED. Please check the website below for the valid version.

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### Classification and Surveys

For classification and survey requirements **TL** Rules, Classification and Surveys is to be applied in general. In addition, following are also applicable.

#### A. Classification

##### 1. Classification

These rules are intended to apply for Powerships converted from an existing ship. For classification of new buildings, this guide can also be used as reference, but additional requirements may apply and subject to agreement with **TL**, the owner and flag administration.

##### 2. Retention of Class

Retention of the class is to be maintained according to **TL** Classification and Surveys, Section 2, C. For laid-up condition, **TL** Guidelines for Laid-Up Vessels is to be used in accordance with Section 2, C.7.

##### 3. Class Designations

The ship type notation **POWER PLANT SHIP** is affixed to the characters of classification. For Powerships without self-propulsion **no-propulsion** is also to be added to machinery notation. If requested, different notations subject to case-by-case evaluation by **TL** may be assigned for power plant ships during international voyage or during anchored or moored on electricity production site.

##### 4. Documents to be Submitted

Documents and drawings to be submitted to **TL** for granting **POWER PLANT SHIP** class notation are as follows :

Documents	A/I (*) (**)
General arrangement of power plant	I
General arrangement of the support unit including power plant layout	I
Power plant steel structure drawings and details	A
Process flow diagrams	I
Piping and instrument diagrams	A
Power generation operational proces and safety	I
Single line diagram including power export system	A
Operational and maintenance manual	I
List of local authority applicable regulations (if any)	I
Hazardous area plans	A
Risks assessment and analysis study reports	I
Fire and gas detection and alarm systems	A
Safety cause and effect diagram and chart	A
Passive and active fire protection systems	A
Escape route and evacuation plan	A
Detailed diagrams of the electrical installations of unit	A
Electrical power balance (main and emergency supply)	I
Architecture diagram of the automation systems	A
(*) I: for information, A: for approval	
(**) <b>TL</b> may require additional documents and plans	

## 5. Certification

New material and equipment during new construction and conversion are to be certified by **TL** as defined in Classification and Survey Rules, Section 2, E and applicable chapters of the Rules.

## B- Surveys

Survey Requirements are to be applied as defined in **TL** Classification and Surveys, Section 3, according to requirements applicable to general dry-cargo ships.

*Note: if base ship type used for the conversion was subject to ESP Code and the ship has the ESP Notation, the notation should be revised accordingly. In this regard, the ship will not be able to carry any cargo with regards to the base ship type (e.g. bulk dry cargo).*

For ships with **LAID-UP SHIP** Notation, The requirements of hot lay-up should be applied unless instructed different from Flag Administration.

## C. Special Survey Requirements for Power Plant ships

### 1. Surveys Before Commissioning

In initial commissioning or re-commissioning from lay-up condition (**TL** Guidelines for Laid-Up Vessels, Section 4.2) following items are to be surveyed additionally:

- It must be assured that the power plants are not used for the main/auxiliary/emergency power requirement of the ship.
- All fixations arrangements in regards with power plant equipments (Generators, alternators, electrical equipments) are to be made, and to be surveyed before commissioning according to approved fixation arrangement plan.
- It will be ensured that there will be no tests be conducted of the power plant equipment while the ship in sailing condition.
- Special attention is to be given to bulkhead penetrations, air-vent heads, bilge wells, piping and cabling arrangements, emergency lighting and earthing.
- Isolation, piping, cabling arrangements are to be in accordance with ambient conditions in holds when the power plant equipment in use.
- In spaces (e.g. bulk carrier wing spaces), where the fire risk can be highly evident, sensors and indicators are to be installed in control room, and correct functioning of the sensors are to be assured.

**2. Lay-up Surveys**

The requirements given in **TL** Guidelines for Laid-Up Vessels, Section 4.1 are to be applied.

**3. Periodical surveys**

All periodical surveys are to be in accordance with the condition of the ship, in accordance with item 2.



**SECTION 2****HULL STRUCTURES AND SHIP EQUIPMENT**

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**A. General, Definitions**

1. For general conditions and definitions, **TL** Hull Rules, Chapter 1, Section 1 apply.
2. Ships deviating from the Construction Rules in their types, equipment or in some of their parts may be classed, provided that their structures or equipment are found to be equivalent to **TL**'s requirements for the respective class.
3. The layout of the power plant is to be designed giving due consideration to the safety of personnel, prevention potential pollution, environmental impact and protection of floating unit.
4. The arrangement and layout of the power plant are to be considered in view of fire and explosion hazards, depending on the size and complexity of the plant, as well as its location, in relation to the accommodations, escape routes, shelters and evacuation facilities.

The escape routes and the emergency procedures of the power plant are to be coordinated and concur with the requirements concerning the power station itself, and the floating unit emergency escape procedures.

5. Adequate provisions and arrangement should be made to facilitate safe access for control, cleaning and inspection on various places on a regular basis during normal operation of power generation.

**B. Materials**

1. All materials to be used for the structural members are to conform to **TL** Material Rules, Chapter 2.
2. Materials the properties of which deviate from **TL** Material Rule requirements may only be used upon special approval.

**C. Design Principles, Direct Strength Calculations and Design Loads**

1. For design principles, direct strength calculations and design loads, **TL** Hull Rules, Chapter 1, Sections 3,4 and 5 apply, accordingly.

**D. Longitudinal Strength**

1. For longitudinal strength, **TL** Hull Rules, Chapter 1, Section 6 apply.

**E. Ship Arrangement and Hull Structure**

1. Power generation plants are not to be located other than cargo area, e.g. engine room .
2. Scantlings of hull structure of power plant ships are to be determined according to **TL** Hull Rules, Chapter 1, Sections 7 ÷ 15, 18 ÷ 20 and 24 apply, accordingly.

3. In order to increase the flexibility in the structural design, **TL** also accepts direct calculations with computer programs. The aim of such analysis should be the proof of equivalence of a design with the rule requirements.
4. The steel structure of the power plant is to be designed and strengthened so as to support component weight and relevant forces including weather and sea dynamic motions. The local strength of the structure is to be assessed according to recognized methods, codes or standards to the satisfaction of **TL**. Strength of plating under pressure loads is to be separately evaluated, using recognised codes or standards to the satisfaction of **TL**.
5. Dimensioning of foundations for power generation plants including electrical equipment (e.g. transformers, pylon) and related reinforcement taking into account of vibration characteristics of the power plant or equipments are to be based on actual loads. Plans, related calculations and related reinforcement are to be submitted to **TL** for approval.
6. Fixation arrangement of the power generation plants are to be sent for approval.
7. Bilge wells shall have adequate capacity and to be separated from the shell.
8. Oil storage tanks for the transformers should have adequate capacity.
9. The power plant is to be protected from external forces and impact such as green seas and dropped objects as relevant.

#### **F. Fatigue Strength**

1. Structural elements for which fatigue is a probable mode of failure are to be adequately designed to resist the effects of cumulative damage caused by repeated application of fluctuating stresses.

The predominant cause of fluctuating stresses leading to crack propagation and fatigue failure is normally wave loading. However, other sources of cyclic loads such as wind, rotating machinery or cranes may also induce significant fatigue loadings and are to be given due consideration where relevant.

2. For fatigue assessment, see **TL** Hull Rules, Chapter 1, Section 3,D.

#### **G. Hull Outfitting**

1. Hull outfitting are to be in accordance with **TL** Hull Rules, Chapter 1, Section 16.

#### **H. Structural Fire Protection**

1. Structural fire protection are to be in accordance with **TL** Hull Rules, Chapter 1, Section 21, C.
2. When flag State Administration of the ship has issued specific rules concerning with structural fire protection, **TL** may accept such rules in addition to and/or in lieu of those stated in item 1 above.

#### **I. Subdivision and Stability**

1. Subdivision and stability are to be in accordance with **TL** Hull Rules, Chapter 1, Section 26 for cargo ships.

2. Power plant ship converted from an existing ship is to be inclined, and the intact and damage stability of the ship in accordance with 1. are to be submitted for approval.

3. Power plant ships will be assigned class only after it has been demonstrated that their intact and damaged stability is adequate for the service intended.

**J. Habitability**

1. For habitability, see **TL** Hull Rules, Chapter 1, Section 2.

**K. Corrosion Protection**

1. For corrosion protection, see **TL** Hull Rules, Chapter 1, Section 22.

**L. Anchoring and Mooring**

1. Requirements for anchoring and mooring during voyage are to be in accordance with **TL** Hull Rules, Chapter 1, Section 17.

2. Power plant ships will be safely anchored or moored to a pier or a floating unit or jetty at its designated locations for power generation. The aim of this mooring is to avoid moving of the ship due to unfavourable sea and weather conditions. Moving of the ship means movements greater than a meter. The ship will be permanently fixed which means by using number of offshore anchors and chains connected to the eyebolts welded all around the ship's hull.

3. On-site anchoring and mooring arrangement are to be specially considered. The arrangement and related calculations are to be submitted to **TL** for approval.

**M. Welded Joints**

1. Welded joints are to be suitable to **TL** Welding Rules, Chapter 3, in general.

## SECTION 3

### PROPULSION PLANTS

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**A. General, Definitions**

1. For general conditions and definitions, **TL Machinery Rules**, Chapter 4, Section 1 apply.
2. Designs which deviate from these Rules may be approved provided that such designs have been examined by **TL** for suitability and have been recognized as equivalent.
3. Machinery installations which have been developed on novel principles and/or which have not yet been sufficiently tested in shipboard service require the **TL's** special approval.
4. In addition to the Rules, **TL** reserves the right to impose further requirements in respect of all types of machinery where this is necessitated by new findings or operational experience, or **TL** may permit deviations from the Rules where these are specially warranted.
5. National Rules or Regulations outside the **TL's** Rules remain unaffected.

**B. Design Principles, Vibration**

1. For design principles and vibration, see **TL Machinery Rules**, Chapter 4, Section 1,D.

**2. Essential equipment**

Essential equipment are the following auxiliary machinery and plants, which;

- are necessary for propulsion and manoeuvrability of the ship,
- are required for maintaining ship safety,
- serve the safety of human life, and
- equipment according to special class notation.

For details of essential equipment, see **TL Machinery Rules**, Chapter 4, Section 1, H.

Power requirement of essential equipments defined above is not to be supplied by the power generation plant equipment.

**C. Internal Combustion Engines and Air Compressors****1. General**

For the purpose of these requirements, internal combustion engines are:

- Diesel engines, fuelled with liquid fuel oil,
- Dual-fuel engines, fuelled with liquid fuel oil and/or gaseous fuel,

- Gas engines, fuelled with gaseous fuel.

Requirements for dual-fuel engines and gas engines are specified in **TL Machinery Rules**, Chapter 4, Section 2,N.

## **2. Definitions**

For definitions concerning with internal combustion engines, see **TL Machinery Rules**, Chapter 4, Section 2, A.2.

## **3. Materials**

The mechanical characteristics of materials used for the components of diesel engines shall conform to the **TL Material Rules**, Chapter 2.

Materials with properties deviating from the Rules specified may be used only with **TL's** special approval. **TL** requires proof of the suitability of such materials.

## **4. Crankshaft Design**

Rules for crankshaft design applicable to diesel engines for main propulsion, auxiliary purposes and power generating are contained in **TL Machinery Rules**, Chapter 4, Section 2, D.

## **5. Tests and Trials**

**5.1** For Engine Manufacturer's Workshop and Manufacturing Inspections, see **TL Machinery Rules**, Chapter 4, Section 2, E, 1.

**5.2** For certification of engine components, see **TL Machinery Rules**, Chapter 4, Section 2, E, 2.

**5.3** For type tests of diesel engines, see **TL Machinery Rules**, Chapter 4, Section 2, E, 3.

**5.4** For factory acceptance test and shipboard trials of diesel engines, see **TL Machinery Rules**, Chapter 4, Section 2, E, 4.

## **6. Crankcase safety devices**

**TL Machinery Rules**, Chapter 4, Section 2, F.4 is to be applied.

## **7. Auxiliary Systems**

**TL Machinery Rules**, Chapter 4, Section 2, G and H are to be applied.

## **8. Control equipment and alarms**

**TL Machinery Rules**, Chapter 4, Section 2, I. and J. are to be applied.

## **9. Engine Alignment and Seating**

**TL Machinery Rules**, Chapter 4, Section 2, K is to be applied.



**10. Air Compressors**

TL Machinery Rules, Chapter 4, Section 2, L is to be applied.

**D. Thermal Turbomachinery / Steam Turbines****1. General**

These requirements apply to propulsion and auxiliary steam turbines.

**2. Definitions**

For definitions concerning with steam turbines, see TL Machinery Rules, Chapter 4, Section 3, A.2

**3. Materials**

The materials used for the components of steam turbines are to conform to TL Machinery Rules, Chapter 4. Section 3, B.

**4. Design and Construction Principles**

Design and construction of steam turbines are to be in accordance with TL Machinery Rules, Chapter 4. Section 3, C.

**5. Tests and Trials**

For tests and trials of steam turbines, see TL Machinery Rules, Chapter 4. Section 3, D. and E.

**E. Turbomachinery / Gas Turbines and Exhaust Gas Turbochargers****1. Exhaust Gas Turbochargers****1.1 General**

These requirements apply to exhaust gas turbochargers.

**1.2 Definitions**

For definitions concerning with exhaust gas turbochargers, see TL Machinery Rules, Chapter 4, Section 4, A.2.

**1.3 Type approval and certification**

For type approval and certification, see TL Machinery Rules, Chapter 4, Section 4, A.3 and 4.

**1.4 Design and Installation**

Design and installation of exhaust gas turbochargers are to conform to TL Machinery Rules, Chapter 4, Section 4,B.

## 1.5 Tests

Tests of exhaust gas turbochargers are to conform to **TL Machinery Rules**, Chapter 4, Section 4,C.

## 2. Gas Turbines

For gas turbines, see **TL Machinery Rules**, Chapter 4, Section 4,E.

## F. Main Shafting

### 1. General

These requirements apply to the standard and established types of shafting for main and auxiliary propulsion system and their associated components such as couplings, clutches, shafts and other power transmitting components for propulsion purposes as well as for lateral thrusters.

### 2. Definitions

For definitions concerning with main shafting, see **TL Machinery Rules**, Chapter 4, Section 5, A.1.4.

### 3. Materials

Propulsion shafts (tail, tube, intermediate and thrust shafts) together with flange, couplings, coupling bolts, clutches and keys are to be made of forged steel or rolled bars, as convenient, in accordance with **TL Material Rules**, Chapter 2, Section 5, or other specifications as may be specially approved with a specific design. Where appropriate, the couplings and their components may be made of cast steel. Rolled round steel may be used for plain, flangeless shafts. Where the materials other than those mentioned here are proposed, full details of chemical composition, heat treatment and mechanical properties, as convenient, are to be submitted for approval.

For details see, **TL Machinery Rules**, Chapter 4, Section 5, B.

### 4. Design

Design of shafting is to be in accordance with **TL Machinery Rules**, Chapter 4, Section 5, C.

### 5. Alignment and Vibration

For alignment and vibration of shafting system, see **TL Machinery Rules**, Chapter 4, Section 5, D.

### 6. Inspection, Testing and Certification

Inspection, testing and certification of shafting system are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 5, E.

## **G. Torsional Vibration**

For calculation and permissible stresses of torsional vibration together with measurements, see **TL Machinery Rules**, Chapter 4, Section 6.

## **H. Gears, Couplings**

### **1. General**

These requirements apply to all types of couplings used for either main propulsion or essential auxiliary services and enclosed gears, internal and external involute spur and planetary i.e. helical cylindrical gears having parallel axis as well as bevel gears which accumulate a large number of load cycles, whose gear set is intended to transmit a maximum continuous power equal to, or greater than:

- 220 kW for gears intended for main propulsion
- 110 kW for gears intended for essential auxiliary services.

### **2. Materials**

Shafts, pinions, wheels and wheel rims of gears in the main propulsion plant should preferably be made of forged steel. Rolled steel bar may also be used for plain, flangeless shafts. Gear wheel bodies may be made of grey cast iron or nodular cast iron or may be fabricated from welded steel plate with steel or cast steel hubs. For details see, **TL Machinery Rules**, Chapter 4, Section 7, B.

### **3. Gear Calculations**

For details of gear calculations, see, **TL Machinery Rules**, Chapter 4, Section 7, C. and D.

### **4. Equipment**

For oil level indicator, pressure and temperature control, lubricating oil pumps, gear casing and seating of gears, see **TL Machinery Rules**, Chapter 4, Section 7, E.

### **5. Balancing and Testing**

Balancing and testing of gears are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 7, F.

### **6. Design and Construction of Couplings**

For design and construction of couplings see, **TL Machinery Rules**, Chapter 4, Section 7, G.

## I. Propellers

### 1. General

These requirements apply to propellers intended for propulsion. It covers fixed pitch and controllable pitch propeller.

### 2. Definitions

For definitions concerning with propellers, see **TL Machinery Rules**, Chapter 4, Section 8, A.2

### 3. Materials

Table 3.1 shows the properties of materials normally used for propellers. If an alternative material specification is proposed, the detailed chemical composition and mechanical properties shall be submitted to **TL** for approval.

**Table 3.1 Tensile strength of propeller materials,  $C_w$**

Material	Description (1)	$C_w$ [N/mm <sup>2</sup> ]
Cu 1	Cast manganese bronze	440
Cu 2	Cast nickel manganese bronze	440
Cu 3	Cast nickel aluminium bronze	590
Cu 4	Cast manganese aluminium bronze	630
Fe 1	Unalloyed cast steel	440
Fe 2	Low-alloy cast steel	440
Fe 3	Martensitic cast chrome steel 13/1-6	600
Fe 4	Martensitic-austenitic cast steel 17/4	600
Fe 5	Ferritic-austenitic cast steel 24/8	600
Fe 6	Austenitic cast steel 18/8-11	500
<b>(1)</b> For the chemical composition of the alloys, see the <b>TL Material Rules</b> , Chapter 2.		

For details see, **TL Machinery Rules**, Chapter 4, Section 8, B.

### 4. Propeller design

Design and dimensioning of propellers are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 8, C.

### 5. Controllable Pitch Propellers

For details of controllable pitch propellers, see **TL Machinery Rules**, Chapter 4, Section 8, D.

### 6. Propeller Mounting

For details of propeller mountings, see **TL Machinery Rules**, Chapter 4, Section 8, E.

### 7. Balancing and Testing

Balancing and testing of propellers are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 8, F.

## **J. Steering Gears and Thrusters**

### **1. Steering Gears**

#### **1.1 General**

All vessels are to be provided with power-operated means of steering. Such means, as a minimum, are to be supported by duplication of power units, and by redundancy in piping, electrical power supply, and control circuitry. Steering is to be capable of being readily regained in the event of the failure of a power unit, a piping component, a power supply circuit or a control circuit.

#### **1.2 Definitions**

TL Machinery Rules, Chapter 4, Section 9, A,1.3 apply.

#### **1.3 Materials**

Ram cylinders; pressure housings of rotary vane type actuators; hydraulic power piping valves, flanges and fittings; and all steering gear components transmitting mechanical forces to the rudder stock (such as tillers, quadrants, or similar components) should be of steel or other approved ductile material, duly tested in accordance with the requirements of TL. In general, such material should not have an elongation of less than 12% nor a tensile strength in excess of 650 N/mm<sup>2</sup>.

Pressure vessels should be generally made of steel, cast steel or nodular cast iron (with a predominantly ferritic matrix).

For details see, TL Machinery Rules, Chapter 4, Section 9, A,2.

#### **1.4 Design Principles**

For details see, TL Machinery Rules, Chapter 4, Section 9, A,3.

#### **1.5 Power and Dimensioning**

The power and dimensioning of steering gear are to be in accordance with TL Machinery Rules, Chapter 4, Section 9, A,4.

#### **1.6 Testing and Certification**

Inspection, testing and certification of steering gear components are to comply with TL Machinery Rules, Chapter 4, Section 9, A,5. and A.6.

### **2. Azimuth Thrusters**

The requirements for azimuth thrusters are contained in TL Machinery Rules, Chapter 4, Section 9, B.

### **3. Lateral Thrust Units**

The requirements for lateral thrust units are contained in TL Machinery Rules, Chapter 4, Section 9, C

**K. Spare Parts****1. General**

Depending on the design and arrangement of the engine plant, the intended service and operation of the ship, and also the manufacturer's recommendations, a different volume of spare parts may be agreed between the ship owner and **TL**. A list of the relevant spare parts is to be carried on board.

**2. Recommended Spare Parts**

For lists of minimum recommended spare parts, see **TL Machinery Rules**, Chapter 4, Section 17,B.

**L. Machinery for Ice Class Notation**

For ice class notation see **TL Machinery Rules**, Chapter 4, Section 19.

**SECTION 4****ELECTRICAL INSTALLATIONS**

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## **A. General Requirements**

### **1. General**

These Rules apply to design and construction of electrical and electronic installations and material and equipment used in these installations on ships classed by **TL**. For details see, **TL Electric Rules**, Chapter 5, Section 1.

Sufficient earthing is to be provided for the power plant,

*Note : a net of copper plates placed over hull shell can be considered for sufficient earthing.*

### **2. Definitions**

For definitions, **TL Electric Rules**, Chapter 5, Section 1, B apply.

### **3. Materials**

The materials used for electrical machines, switchgear and other equipment shall be resistant to sea air containing moisture and salt, seawater and oil vapours. They shall not be hygroscopic and shall be flame-retardant and self-extinguishing.

For details see, **TL Electric Rules**, Chapter 5, Section 1, J.

### **4. Safety**

Precautions are to be taken to ensure that people onboard are not exposed to hazards caused by the electrical system (arc discharge) or to electromagnetic fields (EMF) exceeding the limits given by applicable national regulations. Where necessary the areas containing high voltage equipment are to be segregated and their access restricted.

## **B. Installation of Electrical Equipment**

### **1. Main Power Supply**

#### **1.1 Main Generators**

The main generators shall be installed in the main engine room or in a particular auxiliary machinery room, e.g. within the space bounded by the watertight main-bulkheads.

#### **1.2 Main Switchboards**

Main switchboard is a switchboard which is directly supplied by the main source of electrical power and is intended to distribute electrical energy to the ship's services.

#### **1.3 Distribution Switchboards**

Distribution switchboards supplying essential equipment and associated transformers, converters and similar equipment may be installed, if:

- The conditions as required for main generators/main switchboards are fulfilled,
- They are installed in the same fire section respectively in the same watertight compartment like the essential equipment itself.

## **2. Generators**

For main and emergency generators, see **TL Electric Rules**, Chapter 5, Section 2,B.

## **3. Storage Batteries**

Storage batteries shall be installed in such a way that persons cannot be endangered and equipment cannot be damaged by exhausted gases or leaked-out electrolytes.

For other details see **TL Electric Rules**, Chapter 5, Section 2,C.

## **4. Power Transformers**

Transformers shall be installed at readily accessible and adequately ventilated places.

## **C. Power Supply Installations**

### **1. Power Balance**

A power balance of the electrical equipment has to be submitted to proof the sufficient ratings of units for the generating, storage and transformation of electrical energy. For details see **TL Electric Rules**, Chapter 5, Section 3,A.

### **2. Main Electric Power Supply**

Every ship is to be provided with a main source of electrical power with sufficient capacity. This main source of electrical power shall consist of at least two mutually independent generating sets.

The capacity of the generating sets mentioned above shall be such that, if any one generating set should fail or be shut down, the remaining generating capacity is sufficient to supply all those items of equipment which are needed, when navigating at sea.

The main power system is to be capable to supply all electrical services necessary for operating safely the unit within the design operational conditions and for maintaining the habitable conditions, whatever the status of the main power system and without recourse to the emergency power system.

For other details see **TL Electric Rules**, Chapter 5, Section 3,B.

### **3. Emergency Electrical Power Supply**

The emergency source of electrical power shall take over the supply of the emergency consumers in case of failure of the main source of electrical power. It shall be independent of the main source of electrical power.

For other details see **TL Electric Rules**, Chapter 5, Section 3,C.

#### **4. Operation of the Emergency Generator in Port**

The emergency generator may be used during lay time in the harbour for the main power supply.

#### **D. Installation Protection and Power Distribution**

##### **1. Three-phase Main Generators**

The main generators supply the relevant main switchboard, either individually or in parallel. For details see, **TL Electric Rules**, Chapter 5, Section 4,A.

##### **2. Emergency Three-Phase Generators**

Emergency generators supply the emergency switchboards and the connected emergency consumers. For details see, **TL Electric Rules**, Chapter 5, Section 4,B.

##### **3. Direct Current Generators**

For details see, **TL Electric Rules**, Chapter 5, Section 4,C.

##### **4. Power Transformers**

For details see, **TL Electric Rules**, Chapter 5, Section 4,D.

##### **5. Storage Batteries**

For details see, **TL Electric Rules**, Chapter 5, Section 4,E.

##### **6. Power Electronics**

For details see, **TL Electric Rules**, Chapter 5, Section 4,F.

##### **7. Shore Connection**

Terminal boxes for shore supply shall be linked to the ship's system by permanently laid cables. For details see, **TL Electric Rules**, Chapter 5, Section 4,G.

##### **8. Consumer Protection Equipment**

For details see, **TL Electric Rules**, Chapter 5, Section 4,H.

#### **E. Low-Voltage Switchgear Assemblies**

##### **1. General**

These Rules apply to low-voltage switchgear with operating voltages of up to 1000 V AC or 1500 V DC.

## 2. Calculations

Short-circuit current calculations are to be carried out in accordance with a standard accepted by TL, e.g. IEC publication 61363-1. For other details see TL Electric Rules, Chapter 5, Section 5,B.

## 3. Construction

Construction of main switchboard, emergency switchboards, distribution panels and motor starters are to be in accordance with TL Electric Rules, Chapter 5, Section 5,C.

## 4. Switchgear

Switchgear shall conform to IEC publications, or to another standard approved by TL. Switchgear shall be selected with regard to its rated current, its rated voltage, its thermal and dynamic stability and its switching capacity. For details see TL Electric Rules, Chapter 5, Section 5,D.

## 5. Electrical Protection Equipment

Protective devices shall be coordinated with each other in such a way that, in the event of a fault, the defective circuit is disconnected and the power supply to essential equipment is maintained.

For details of protection equipment see TL Electric Rules, Chapter 5, Section 5,E.

## 6. Conductors and Busbar Carriers

TL Electric Rules, Chapter 5, Section 5,F. is to be observed.

## 7. Measuring Instruments and Instrument Transformers

For details see TL Electric Rules, Chapter 5, Section 5,G.

## 8. Testing of Switchboards and Switchgear

The following devices and components are subject to mandatory type-approval:

- Circuit breakers, load-switches, disconnect-switches and fuses for direct connection to the main busbars and to non-fused, multi-terminal busbars of main-, emergency- and control switchboards;
- Generator protection devices:
- Standardized switchgear in series manufacture with reduced clearance and creepage distances.

For details of tests are contained in TL Electric Rules, Chapter 5, Section 5,H.

## F. Power Electronics

### 1. Design and Construction

Design and construction of power electronic equipment are to comply with TL Electric Rules, Chapter 5, Section 6,B and

C, accordingly.

## 2. Protection Equipment

Power electronic equipment shall be protected against exceeding of their current and voltage limits.

## 3. Tests

Power electronics assemblies shall be individually tested at the maker's works. A Works Test Report shall be rendered on the tests carried out. Essential equipment from 50 kW / kVA upwards shall be tested in the presence of a TL Surveyor. Voltage test, insulation resistance test, operational test and testing of protection and monitoring devices are to be in accordance with TL Electric Rules, Chapter 5, Section 6,G.

## G. Power Equipment

### 1. Steering Gear

Every ship shall be provided with two as far as possible independent steering gear systems, as follows:

- 1 main and 1 auxiliary steering gear
- In every ship of 70.000 GRT and upwards with 1 main steering gear with two or more identical power units

The design of main and auxiliary steering gears shall conform to **SOLAS**, Chapt. II-1, Part C, Reg. 29 and 30, and to the TL Rules set out in Chapter 4 - Machinery, Section 9, A.

For details see TL Electric Rules, Chapter 5, Section 7,A.

### 2. Lateral Thrust Propellers and Manoeuvring Aids

For details see TL Electric Rules, Chapter 5, Section 7, B.

### 3. Auxiliary Machinery and Systems

For fire-extinguishing systems, fans, fuel pumps and separators, turning gears, electric starting equipment for main and auxiliary engines and stand-by circuits for consumers are to comply with TL Electric Rules, Chapter 5, Section 7,D

### 4. Deck Machinery

For details see TL Electric Rules, Chapter 5, Section 7, E.

### 5. Electrical Heating Equipment and Heaters

For details see TL Electric Rules, Chapter 5, Section 7, F.

## **H. High-Voltage Installations**

### **1. Scope**

These rules also apply to a.c. three-phase system with nominal voltages of > 1 kV up to 15 kV. Where necessary for special application, higher voltages may be accepted by **TL**.

### **2. General Provisions**

Equipment with voltage above about 1 kV is not to be installed in the same enclosure as low voltage equipment, unless segregation or other suitable measures are taken to ensure that access to low voltage equipment is obtained without danger.

For details see **TL Electric Rules**, Chapter 5, Section 8, B.

### **3. Network Design and Protection Equipment**

Details are contained in **TL Electric Rules**, Chapter 5, Section 8, C.

### **4. Electrical Equipment**

Details are contained in **TL Electric Rules**, Chapter 5, Section 8, D.

### **5. Installation and Tests**

See **TL Electric Rules**, Chapter 5, Section 8, E.

## **I. Control, Monitoring and Ship's Safety Systems**

### **1. General**

These rules sets out requirements for the equipment and design of control, monitoring and ship's safety systems necessary for the operation of the ship and the machinery installation and for the safety of the vessel.

### **2. Design, Construction and Maintenance**

Design, construction and maintenance are to be in accordance with **TL Electric Rules**, Chapter 5, Section 9,A.

### **3. Machinery Control and Monitoring Installations**

For details see **TL Electric Rules**, Chapter 5, Section 9, B.

### **4. Ship Control Systems**

For details see **TL Electric Rules**, Chapter 5, Section 9, C.

## **5. Ship Safety Systems**

For details see **TL Electric Rules**, Chapter 5, Section 9, D.

## **J. Computer Systems**

### **1. Introduction**

These requirements apply to design, construction, commissioning and maintenance of computer based systems where they depend on software for the proper achievement of their functions.

For references see **TL Electric Rules**, Chapter 5, Section 10,A.3.

### **2. Definitions**

Definitions for computer systems are contained in **TL Electric Rules**, Chapter 5, Section 10,B.

### **3. Requirements for Software and Supporting Hardware**

Requirements contained in **TL Electric Rules**, Chapter 5, Section 10,C. , D. and E. are applicable.

## **K. Lighting and Socket-Outlets**

### **1. Lighting Installations**

Design, construction and mounting of lighting fixtures are to conform to **TL Electric Rules**, Chapter 5, Section 11, B.

### **2. Socket-Outlets**

For details see, **TL Electric Rules**, Chapter 5, Section 11,C.

## **L. Cable Network**

### **1. General**

Cables and conductors shall conform to the requirements stated in item O,6. For details see **TL Electric Rules**, Chapter 5, Section 12, A.

Cabling in the scope of power generation is not subject to applicable requirements set out in this Section, L. The requirements are to be in compliance with a Recognised Standard and to be agreed by **TL**.

### **2. Determination of Conductor Cross-Sections**

For details see, **TL Electric Rules**, Chapter 5, Section 12,B.



### **3. Rating, Protection and Installation of Circuits**

For details see, TL Electric Rules, Chapter 5, Section 12,C.

### **4. Installation**

Installation of cables are to be in accordance with TL Electric Rules, Chapter 5, Section 12,D.

### **M. Additional Rules for Electrical Propulsion Plants**

See TL Electric Rules, Chapter 5, Section 13.

### **N. Additional Rules for Ships with Ice Class**

See TL Electric Rules, Chapter 5, Section 19.

### **O. Electrical Equipment**

#### **1. Electrical Machinery**

Electrical machines shall conform to IEC publication 60034 or an equivalent standard. For details see TL Electric Rules, Chapter 5, Section 20, A.

#### **2. Power Transformers**

The design of transformers shall in general comply with the requirements of IEC 60092-303 and relevant parts of IEC 60076 – “Power Transformers”. For details see TL Electric Rules, Chapter 5, Section 20,B.

#### **3. Capacitors**

For details see TL Electric Rules, Chapter 5, Section 20,C.

#### **4. Storage Batteries, Chargers and Uninterruptible Power Supplies (UPS)**

For details see TL Electric Rules, Chapter 5, Section 20,D.

#### **5. Switchgear and Protection Devices**

For details see TL Electric Rules, Chapter 5, Section 20,E.

#### **6. Cables and Insulated Wires**

**6.1** Cables and wires shall be flame-retardant and self-extinguishing.

**6.2** If cable- and wire types have passed a bundle fire test to IEC publication 60332-3-21 or IEEE 45.-18.13.5, the installation of fire stops is dispensed with when laying in bundles (see also Section 12, D. 14 and **SOLAS**, Chapter II-1, Part D, Rule 45.5.2).

**6.3** Where fireproof cables shall be used, it is permitted to use cables with retention of insulating capability in accordance with IEC publication 60331.

**6.4** Cables manufactured in accordance with the relevant recommendations of IEC publication 60092-350, 60092-352, 60092-353, 60092-354, 60092-360 (\*), 60092-370, 60092-376 will be accepted by **TL** provided that they are tested to its satisfaction.

**6.5** For other requirements, see **TL** Electric Rules, Chapter 5, Section 20, F.

## **7. Cable Penetrations and Fire Stops**

See **TL** Electric Rules, Chapter 5, Section 20, G.

## **8. Installation Material**

See **TL** Electric Rules, Chapter 5, Section 20,H.

## **9. Lighting Fixtures**

See **TL** Electric Rules, Chapter 5, Section 20,I.

## **10. Electrical Heating Equipment**

See **TL** Electric Rules, Chapter 5, Section 20,J.

## **P. Tests**

### **1. Tests in the Manufacturer's Works**

**1.1** The tests shall be carried out on the basis of these Rules and the approved documents. They shall be performed in accordance with a recognized standard.

**1.2** Machines, appliances and installations subject to testing in accordance with 2 are to be tested in the presence of a **TL** surveyor unless the preconditions for one's own responsibility tests by the manufacturer are fulfilled,

### **2. Machines, Appliances and Installations Subject to Testing**

Machines, appliances and installations subject to testing are stated below:

- Electrical machines (generators and motors for electric propulsion plants, generators and motors for essential equipment, transformers  $P \geq 100$  kVA, autotransformers  $P \geq 100$  kVA),

- Power electronics (for electric propulsion plants, for essential equipment  $P \geq 50$  kW/ kVA, for battery charging  $P \geq 2$  kW),
- Switchboards (main switchboard, emergency switchboards, switchboards for electric propulsion plants, distribution switchboards with connected power  $\geq 500$  kW, starters for motors),
- Steam boiler and thermal oil heater,
- Electrical propulsion plants,
- Computer systems.

### 3. One's Own-Responsibility Tests Made by the Manufacturers

3.1 Generators and motors for essential equipment, transformers  $P \geq 100$  kVA, essential equipment  $P \geq 50$  kW/ kVA, battery charging  $P \geq 2$  kW, distribution switchboards with connected power  $\geq 500$  kW, starters for motors may be tested on the manufacturer's own responsibility if the following preconditions are fulfilled:

- A QM system recognized by TL is available.
- TL has carried out type tests of the products.
- The one's-own responsibility tests have been agreed with TL.

3.2 Reference is made to the "Regulations for the Inspection of Mechanical and Electrotechnical Products".

### 4. Tests on Board

The tests are divided into:

- Tests during construction/installation,
- Tests during dock trials,
- Tests during sea trials

For details of tests are contained in TL Electric Rules, Chapter 5, Section 21, D.

### 5. Type Approval

For details of type approval see TL Electric Rules, Chapter 5, Section 21,E.

### R. Spare Parts

See, TL Electric Rules, Chapter 5, Section 22.

**S. Electric Power Generation Plant**

1. For a Power Plant Ship with **PEC** Notation, Power Generation Plant is to be certified. The certification requirements are to be based on a case by case evaluation of the power plant equipment and to be agreed by TL before the installation of the equipment.

**2. Emergency Shutdown**

For electric power generation machinery/equipment, means are to be provided with an emergency shutdown system. Means of control system is to be situated outside the space in which the machinery/equipment are located so that they may be stopped in the event of fire or emergency.

## SECTION 5

## SHIP OPERATION INSTALLATIONS and AUXILIARY SYSTEMS

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**A. General, Definitions**

1. For general conditions and definitions, **TL Machinery Rules**, Chapter 4, Section 1 apply.
2. Designs which deviate from these Rules may be approved provided that such designs have been examined by **TL** for suitability and have been recognized as equivalent.
3. Machinery installations which have been developed on novel principles and/or which have not yet been sufficiently tested in shipboard service require the **TL's** special approval.
4. In addition to the Rules, **TL** reserves the right to impose further requirements in respect of all types of machinery where this is necessitated by new findings or operational experience, or **TL** may permit deviations from the Rules where these are specially warranted.
5. National Rules or Regulations outside the **TL's** Rules remain unaffected.

**B. Hydraulic Systems**

The requirements in this item are to be applied to hydraulic systems. For details see **TL Machinery Rules**, Chapter 4, Section 10, A.

**C. Windlass and Winches****1. Windlasses****1.1 General**

The requirements in this item apply to bower anchor windlasses, stern anchor windlasses, combined anchor and mooring winches and chain stoppers.

**1.2 Materials**

Ram cylinders; pressure housings of rotary vane type actuators; hydraulic power piping valves, flanges and fittings; and all reduction gears and components transmitting mechanical forces to the main shaft, drums, chain sprockets and the like should be of steel or other approved ductile material, duly tested in accordance with the requirements of **TL Chapter 2 - Material**. In general, such material should not have an elongation of less than 12% nor a tensile strength in excess of 650 N/mm<sup>2</sup>.

Pressure vessels should be generally made of steel, cast steel or nodular cast iron (with a predominantly ferritic matrix).

With the consent of the **TL**, cast iron may be used for certain components. Gray cast iron may be accepted for redundant parts with low stress level, excluding cylinders, upon special consideration. Gray cast iron or other material having an elongation ( $L_0/d = 4$ ) less than 12% in 50 mm. is not to be used for these parts.

**1.3 Design Principles**

Design principles are to comply with **TL Machinery Rules**, Chapter 4, Section 11, A. 3. and A.4.

#### 1.4 Tests in the Manufacturer's Works

Tests in the manufacturer's work are contained in **TL Machinery Rules**, Chapter 4, Section 11, A. 5.

#### 1.5 Shipboard Trials

Shipboard trials are contained in **TL Machinery Rules**, Chapter 4, Section 11, A. 6.

### 2. Winches

The design and testing of these winches are to comply with **TL Rules**, Chapter 50 - Lifting Appliances.

## D. Steam Boilers

### 1. General

1.1 The boiler is a kind of pressure vessel, associated piping systems and fittings.

The boilers are to be of a design and construction adequate for the service for which they are intended.

For the purpose of these requirements, boiler includes all closed vessels and piping systems used for:

- Generating steam at pressure above atmospheric (steam generators), or
- Raising the temperature of water above the boiling point corresponding to atmospheric pressure (hot water generators).

1.2 Steam and hot water generators are subject to the requirements set out in the following. As regards their construction equipment and operation, steam boiler plants are also required to comply with the international and national standards, rules or codes approved by **TL**.

### 2. Materials

The materials used for manufacturing of steam boilers shall satisfy the **TL** technical requirements and comply with the ASME Boiler and Pressure Vessel Code Section I or TRD (Technical Rules for Steam Boilers). For details see, **TL Machinery Rules**, Chapter 4, Section 12, B.

### 3. Design, Manufacturing and Installation

Design, manufacturing and installation of steam boilers are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 12, C, D and E.

### 4. Testing

Non destructive testing, constructional control, hydrostatic pressure tests, acceptance test after installation on board are to comply with **TL Machinery Rules**, Chapter 4, Section 12, F.



## **E. Thermal Oil Systems**

### **1. Scope**

The following requirements apply to thermal oil systems in which organic liquids (thermal oils) are heated by oil burners, exhaust gases or electricity to temperatures below their initial boiling point at atmospheric pressure.

The arrangements for storage, distribution and utilisation of thermal oil under pressure are to comply with the requirements detailed in this item.

### **2. Heaters**

Heaters are to conform to the requirements of **TL Machinery Rules**, Chapter 4, Section 13, B.

### **3. Vessels**

Vessels are to conform to the requirements of **TL Machinery Rules**, Chapter 4, Section 13, C.

### **4. Design of Circulating System and Equipment Items**

Design of circulating system and equipment items are to conform to the requirements of **TL Machinery Rules**, Chapter 4, Section 13, D

### **5. Testing**

#### **5.1 Heaters**

The thermal oil heaters are to be subjected to a constructional check and a hydrostatic pressure test, at 1.5 times the maximum allowable working pressure, at the manufacturer's works, in the presence of the **TL** surveyor.

#### **5.2 Thermal Oil System**

After completion of installation on board, the system including the associated monitoring equipment is to be subjected to pressure, tightness and operational test in the presence of the **TL** surveyor.

## **F. Pressure Vessels**

### **1. Scope**

The following requirements apply to essential pressure vessels for the operation of the main propulsion plant and its auxiliary machinery. They also apply to vessels and equipment necessary for the operation of the ship if these are subjected to internal or external pressure in service.

### **2. Materials**

The materials of parts subjected to pressure are to be suitable for the intended use. For details see **TL Machinery Rules**, Chapter 4, Section 14,B.

### **3. Design, Manufacturing and Installation**

Design, manufacturing and installation of pressure vessels are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 14, C, D and E.

### **4. Testing**

Pressure tests, tightness tests and acceptance test after installation on board are to comply with **TL Machinery Rules**, Chapter 4, Section 14, F.

### **5. Gas Cylinders**

Design, manufacturing and testing of gas cylinders are to be in accordance with **TL Machinery Rules**, Chapter 4, Section 14, G.

## **G. Oil Burners and Oil Firing Equipment**

### **1. Scope**

The oil burners and oil firing equipment of main steam boilers and auxiliary steam boilers and thermal oil heaters, warm water and hot water generators are subject to the subsequent requirements.

### **2. Oil Firing Equipment for Boilers and Thermal Oil Heaters**

Boilers and thermal oil heaters, heat generators without constant and direct supervision are to be operated with automatic firing system. For details see **TL Machinery Rules**, Chapter 4, Section 15, B.

### **3. Oil Burners for Hot Water Heaters, Oil-Fired Heaters and Small Heating Appliances**

For details of oil burners for hot water heaters, oil-fired heaters and small heating appliances, see **TL Machinery Rules**, Chapter 4, Section 15, C.

## **H. Piping Systems**

### **1. General**

These requirements apply to the design, testing and certification of piping systems, whether they are pressurized or not, including pumps, pipes, tubes, hoses, valves, fittings such as elbows, flanges, glands, filters and collectors etc. which are necessary for the operation of the main propulsion plant together with its auxiliaries and equipment.

### **2. Pipe Classes**

Pipes are to be manufactured according to the international standards approved by **TL**. Piping systems are divided into three classes according to service, design pressure and temperatures as indicated in Table 5.1.

Table 5.1 Classification of piping systems

Type of piping system	PR (Design pressure, bars), t (Design temperature, °C)		
	Pipe class - I	Pipe class - II	Pipe class - III
Toxic media	all	-	-
Corrosive media	all	(1)	-
Inflammable media with service temperature above the flash point	all	(1)	-
Inflammable media with a flash point below 60°C or less	all	(1)	-
Liquefied gases (LG)	all	(1)	-
Steam	PR > 16 or t > 300	7 < PR ≤ 16 170 < t ≤ 300	PR ≤ 7 and t ≤ 170
Thermal oil	PR > 16 or t > 300	7 < PR ≤ 16 150 < t ≤ 300	PR ≤ 7 and t ≤ 150
Liquid fuels, lubricating oil, inflammable hydraulic fluid	PR > 16 or t > 150	7 < PR ≤ 16 60 < t ≤ 150	PR ≤ 7 and t ≤ 60
Air, gas Non-flammable hydraulic fluid Boiler feedwater, condensate Seawater and fresh water for cooling Brine in refrigerating plant	PR > 40 or t > 300	16 < PR ≤ 40 200 < t ≤ 300	PR ≤ 16 and t ≤ 200
Refrigerants	-	all	-
Open-ended pipelines (without shut-off), e.g. drains, venting pipes, overflow lines and boiler blowdown lines	-	-	all
<b>(1)</b> Classification in Pipe Class II is possible if special safety arrangements are available and structural safety precautions are arranged.			

### 3. Materials

Materials must be suitable for the proposed application and comply with the TL's Rules for Materials, Chapter 2.

Pipes, elbows, fittings, valve casings, flanges and semi-finished products intended to be used in pipe class I and II are to be manufactured by TL approved manufacturers. For the use in pipe class III piping systems an approval according to other recognized standards may be accepted. For further requirements see, TL Machinery Rules, Chapter 4, Section 16,B.

**4. Tests for Pipes**

See TL Machinery Rules, Chapter 4, Section 16,B.4. and B.5.

**5. Calculation of Wall Thickness and Elasticity**

See TL Machinery Rules, Chapter 4, Section 16,C.

**6. Principles for the Construction of Pipe Lines, Valves, Fittings and Pumps**

Pipe lines are to be constructed and manufactured on the basis of standards generally used in shipbuilding and recognized by TL. For further requirements see, TL Machinery Rules, Chapter 4, Section 16,D.

**7. Steam Lines**

See TL Machinery Rules, Chapter 4, Section 16,E.

**8. Boiler Feedwater and Circulating Arrangement, Condensate Recirculation**

See TL Machinery Rules, Chapter 4, Section 16,F.

**9. Fuel Oil Systems**

See TL Machinery Rules, Chapter 4, Section 16,G.

**10. Lubricating Oil Systems**

See TL Machinery Rules, Chapter 4, Section 16,H.

**11. Cooling Seawater Equipment**

See TL Machinery Rules, Chapter 4, Section 16,I.

**12. Cooling Freshwater Systems**

See TL Machinery Rules, Chapter 4, Section 16,K.

**13. Compressed Air Lines**

See TL Machinery Rules, Chapter 4, Section 16,L.

**14. Exhaust Gas Lines**

See TL Machinery Rules, Chapter 4, Section 16,M.

**15. Bilge Systems**

See TL Machinery Rules, Chapter 4, Section 16,N.

**16. Equipment for the Treatment and Storage of Bilge Water and Fuel and Residues**

See TL Machinery Rules, Chapter 4, Section 16,O.

**17. Ballast Systems**

See TL Machinery Rules, Chapter 4, Section 16,P.

**18. Thermal Oil Systems**

See TL Machinery Rules, Chapter 4, Section 16,Q.

**19. Air, Overflow and Sounding Pipes**

See TL Machinery Rules, Chapter 4, Section 16,R.

**20. Drinking Water Systems**

See TL Machinery Rules, Chapter 4, Section 16,S.

**21. Sewage and Gravity Drain Systems**

See TL Machinery Rules, Chapter 4, Section 16,T.

**22. Hose Assemblies and Compensators**

See TL Machinery Rules, Chapter 4, Section 16, U.

**23. Storage of Liquid Fuels, Lubricating, Hydraulic and Thermal Oils and Oil Residues**

See TL Machinery Rules, Chapter 4, Section 16, V.

**I. Fire Protection and Fire Extinguishing Equipment****1. General**

These rules apply to fire protection in the machinery and boiler spaces of power plant ships and to fire extinguishing equipment throughout the ship.

The fire safety design and arrangements may differ from the prescriptive requirements of this item, provided that the design and arrangements meet the fire safety objectives and functional requirements

**2. Fire Protection**

For machinery space arrangement, fuel oil purifiers, arrangement of boiler plants, fuel and lube oil tanks, protection against fuel and oil leakages and other details about fire protection, see TL Machinery Rules, Chapter 4, Section 18, B.

### **3. Fire Detection**

Fire detection and alarm systems and sample extraction smoke detection systems are subject to approval.

#### **3.1 Fire Detection in the Accommodation Spaces**

For detailed requirements see TL Machinery Rules, Chapter 4, Section 18, C.3.

#### **3.2 Fire Detection and Alarm Systems for Machinery Spaces**

For detailed requirements see TL Machinery Rules, Chapter 4, Section 18, C.4.

#### **3.3 Design of Fire Detection and Fire Alarm Systems**

For detailed requirements see TL Machinery Rules, Chapter 4, Section 18, C.6.

### **4. Fire Extinguishing Equipment**

The purpose of this subsection is to suppress and swiftly extinguish a fire in the space of origin. For this purpose, the following functional requirements shall be met:

- Fixed fire-extinguishing systems shall be installed having due regard to the fire growth potential of the protected spaces; and
- Fire-extinguishing appliances shall be readily available.

Further requirements are contained in TL Machinery Rules, Chapter 4, Section 18, D.

#### **4.1 General Water Fire Extinguishing Equipment (Fire and Deckwash System)**

For details, see TL Machinery Rules, Chapter 4, Section 18, E.

#### **4.2 Portable and Mobile Fire Extinguishers, Portable Foam Applicators and Water Fog Applicators**

For details, see TL Machinery Rules, Chapter 4, Section 18, F.

#### **4.3 High-Pressure CO<sub>2</sub> Fire Extinguishing Systems**

For details, see TL Machinery Rules, Chapter 4, Section 18, G.

#### **4.4 Low-Pressure CO<sub>2</sub> Fire Extinguishing Systems**

For details, see TL Machinery Rules, Chapter 4, Section 18, H.

#### **4.5 Gas Fire-Extinguishing Systems Using Gases Other than CO<sub>2</sub> for Machinery Spaces**

For details, see TL Machinery Rules, Chapter 4, Section 18, I.

#### 4.6 Other Fire Extinguishing Systems

For details, see TL Machinery Rules, Chapter 4, Section 18, J.

#### 4.7 Foam Fire Extinguishing Systems

For details, see TL Machinery Rules, Chapter 4, Section 18, K.

#### 4.8 Pressure Water Spraying Systems

For details, see TL Machinery Rules, Chapter 4, Section 18, L.

#### 4.9 Fire Extinguishing Systems for Paint Lockers, Flammable Liquid Lockers, Galley Range Exhaust Ducts and Deep-Fat Cooking Equipment

For details, see TL Machinery Rules, Chapter 4, Section 18, M.

### J. Environmental Protection

#### 1. General

1.1 For the Class Notation **EP** to be assigned, an Environmental Passport will be issued if the technical requirements set out in Part D, Chapter 76, Environmental Service System are met. This Passport comprises the “Environmental Passport” Certificate, together with Certificates issued by state Organisations and Certificates, statements of compliance and test Certificates issued by **TL** or other recognized Classification Societies.

1.2 For new buildings an “Interim Environmental Passport” with a validity period of 5 months will be issued by **TL**.

1.3 The Environmental Passport and the corresponding Class Notation are valid within the ongoing class period starting from the date of issue of normally 5 years. In case of **EP** renewal for a further period, the duration of **EP** validity and class period are identical.

1.4 In the event that certain parts of the Environmental Passport lose their validity, the latter will become invalid as a whole and Class Notation **EP** will be retracted. If the necessary surveys and certifications are obtained subsequently, the validity of the Environmental Passport and the Class Notation will be reinstated within the scope of their original validity period.

1.5 The full and binding technical requirements are defined in the latest issue of the Part D, Chapter 76, Environmental Service System and additional rule on Installation of Ballast Water Management Systems.

1.6 Noise limits for working and living spaces of the crew should be contractually agreed upon shipyard and owner, and to be in accordance with “The Code on noise levels on board ships” (adopted by resolution MSC.337(91)) as applicable (see also Chapter 1, Hull, Section 2, Habitability).

**K. Ventilation**

Ventilation requirements in general are to be in compliance with relevant sections of Chapter 4, Machinery and Chapter 28, Ventilation. For the cargo area, where the power plant equipment is installed, heat load calculation is to be submitted for approval.

In spaces (e.g. bulk carrier wing spaces), where the fire risk can be highly evident, temperature sensors also to be installed with indicators placed in the control room.

**L. Hazardous Areas**

Power plant ships may have hazardous areas due to permanent or temporary equipment onboard using gas or other low flash point fuels. These areas are to be considered as hazardous areas and electrical equipment, ventilation, and access to adjacent spaces are to comply with the applicable requirements defined in Chapter 4, Machinery, Chapter 5, Electrical Installation, Chapter 28, Ventilation Rules, and IEC Standard Series 60079 and 60092.

**TL** can also accept alternative standards, codes, or other arrangements based on using acceptable risk assessment methods (e.g. HAZIP, HAZOP) which are suitable to satisfy the intent of the respective **TL** requirements and to achieve the equivalent safety level. Alternative arrangements are to be agreed by **TL** and to be submitted for approval.



**SECTION 6****AUTOMATION**

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**A. Scope and Application**

1. These rules apply additionally to automated machinery systems on seagoing ships, classed by **TL** which have one of the class notations in the class certificate relating to the machinery system as listed below under B.
2. Approval may be given for designs which differ from these Rules if they have been checked for suitability by **TL** and accepted as being of equivalent design.
3. **TL** reserve the right to specify additional requirements to these Rules where these are related to new systems or installations or where they are necessary due to new findings or practical experience.

Deviations from these Rules may be permitted in particularly justified instances.

4. For other details see, TL Automation Rules, Chapter 4-1, Section 1. B, C and D.

**B. Class Notations**

Machinery installations which comply with **TL's** Rules for Construction for automated and/or remotely controlled systems are given the following additions to the class notation:

**1. AUT**

The machinery installation has been designed to operate in an unmanned machinery space so that no control and maintenance operations are required for at least 24 hours.

**2. AUT-nh**

This denotes the period during which no control and maintenance operations are necessary, whereby nh means that the machinery installation may be left unmanned for n hours (h).

**3. AUT-C**

Applies to machinery systems on ships with a permanently manned machinery control room for centralized control, remote control of the propulsion plant from the bridge or facilities for manoeuvring the ship from the machinery control room.

**C. Range of Control and Monitoring Equipment**

See, TL Automation Rules, Chapter 4-1, Section 2.

**D. Basic Requirements**

See, TL Automation Rules, Chapter 4-1, Section 3.

**E. Automation Systems**

See, TL Automation Rules, Chapter 4-1, Section 4.

**F. Main Propulsion Plant**

See, TL Automation Rules, Chapter 4-1, Section 5.

**G. Auxiliary Machinery Systems**

See, TL Automation Rules, Chapter 4-1, Section 6.

**H. Tests**

See, TL Automation Rules, Chapter 4-1, Section 7.

**I. Sensors, Stand-by Circuits and Remote Control Facilities**

See, TL Automation Rules, Chapter 4-1, Section 8.