BS EN ISO 9094:2015

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Small craft — Fire protection

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National foreword

This British Standard is the UK implementation of EN ISO 9094:2015. It supersedes BS EN ISO 9094-2:2002 and BS EN ISO 9094-1:2003 which are withdrawn

The UK participation in its preparation was entrusted to Technical Committee GME/33, Small craft.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2015

ISBN 978 0 580 80776 3

ICS 47.080

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2015.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 9094

December 2015

ICS 47.080

Supersedes EN ISO 9094-1:2003, EN ISO 9094-2:2002

English Version

Small craft - Fire protection (ISO 9094:2015)

Petits navires - Protection contre l'incendie (ISO 9094:2015)

Kleine Wasserfahrzeuge - Brandschutz (ISO 9094:2015)

This European Standard was approved by CEN on 31 October 2015.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN ISO 9094:2015 E

European foreword

This document (EN ISO 9094:2015) has been prepared by Technical Committee ISO/TC 188 "Small craft".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by June 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 9094-1:2003, EN ISO 9094-2:2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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Endorsement notice

The text of ISO 9094:2015 has been approved by CEN as EN ISO 9094:2015 without any modification.

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 88, *Small craft*.

This first edition of ISO 9094 cancels and replaces ISO 9094-1:2003 and ISO 9094-2:2002.

The major technical changes concern:

— change in definition of "readily accessible" being for "emergency conditions";

— added definitions and requirements for cooking appliances, solid fuel appliances and heating appliance installations;

— requirements for cooking and heating appliances using liquid fuel;

— specific requirements addressing compartments containing petrol tanks and containers and portable petrol driven engines;

— added requirements for fire protection for "domed " decklights;

— fire detection requirements for craft over 12 m;

— clarification of escape routes for quarter cabin arrangements;

— detailed requirements for access to deck hatches designated as fire exits;

— changes to engine and engine compartment fire extinguishing requirements;

— fixed fire extinguishing systems to be "approved systems";

— requirement for diesel engine shut down and "shut off dampers";

— audible alarm requirements required only for protected spaces able to be occupied.

Introduction

This International Standard covers the prevention of fire and the protection of life in case of fire on small craft.

It is intended to ensure that the design and layout of the craft and the type of equipment installed minimize the risk and spread of fire and that every habitable craft is provided with viable means of escape in the event of fire.

The requirements in this document might not be effective against some battery chemistries (for example Lithium based products). Battery manufacturers should be consulted for appropriate methods of fire suppression.

Small craft — Fire protection

1 Scope

This International Standard defines a practical degree of fire prevention and protection intended to provide enough time for occupants to escape a fire on board small craft.

It applies to all small craft of up to 24 m length of hull (L_H) except for personal watercraft.

This International Standard excludes:

— the design and installation of those permanently installed galley stoves and heating appliances (including components used to distribute the heat) using fuels that are liquid at atmospheric pressure on small craft, which are covered by ISO 14895;

— carbon monoxide detecting systems, which are covered by ISO 12133[3].

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 3-7, *Portable fire extinguishers – Part 7: Characteristics, performance requirements and test methods*

EN 1869, *Fire blankets*

IEC 60092-507, *Electrical installations in ships — Part 507: Small vessels*

ISO 4589-3, *Plastics — Determination of burning behaviour by oxygen index — Part 3: Elevated-temperature test*

ISO 5923, *Equipment for fire protection and fire fighting — Fire extinguishing media — Carbon dioxide*

ISO 7010:2011, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 7165, *Fire fighting-Portable fire extinguishers – Performance and construction*

ISO 8846, *Small craft — Electrical devices — Protection against ignition of surrounding flammable gases*

ISO 10088, *Small craft — Permanently installed fuel systems*

ISO 10133, *Small craft — Electrical systems — Extra-low-voltage d.c. installations*

ISO 10239, *Small craft — Liquefied petroleum gas (LPG) systems*

ISO 10240, *Small craft — Owner's manual*

ISO 11105:1997, *Small craft — Ventilation of petrol engine and/or petrol tank compartments*

ISO 12216, *Small craft — Windows, portlights, hatches, deadlights and doors — Strength and watertightness requirements*

ISO 13297, *Small craft — Electrical systems — Alternating current installations*

ISO 14895, *Small craft — Liquid-fuelled galley stoves and heating appliances*

ISO 16315, *Small craft — Electric propulsion system*

ISO 21487, *Small craft — Permanently installed petrol and diesel fuel tanks*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
accessible
capable of being reached for inspection, removal or maintenance without removal of permanent craft structure

Note 1 to entry: Hatches are not regarded as permanent craft structures in this sense even if tools are needed to open them.

3.2
readily accessible
capable of being reached quickly and safely for effective use under emergency conditions without the use of tools

3.3
engine compartment
compartment of the craft, containing main or auxiliary engine(s)

3.4
fixed fire extinguishing system
fire fighting system having all components fixed in position and having automatic activation and/or manual release from outside of the space protected

Note 1 to entry: In the following text this system is called "a fixed system".

3.5
fire exit
any door, hatch, or aperture designated as an exit in case of fire and leading either directly or via other areas of the craft, to the open air

3.6
open flame device
any appliance where direct bodily contact with an exposed open flame is possible during normal operation

3.7
petrol
hydrocarbon fuel or blends thereof which is liquid at atmospheric pressure and is used in spark ignition engines

Note 1 to entry: In this context, kerosene is not regarded as petrol.

3.8
diesel
hydrocarbon fuel or blends thereof which is liquid at atmospheric pressure and is used in compression ignition engines

3.9
asphyxiant
any fire extinguishing medium that can dilute or displace oxygen in air, leading to asphyxiation if inhaled

3.10
toxic
any fire extinguishing medium that can be poisonous or harmful if inhaled

3.11
escape route
way through which a person has to pass to access the nearest exit or fire exit

3.12
habitable space
space surrounded by permanent structure in which there is provision for any of the following activities: sleeping, cooking, eating, washing/toilet, navigation, steering

Note 1 to entry: Spaces intended exclusively for storage, open cockpits with or without canvas enclosures and engine rooms are not included.

3.13
enclosed habitable space
habitable space separated from the nearest fire exit by bulkheads and/or solid doors

3.14
radiated heat device
any appliance intended to transfer heat from its surfaces during normal operation by way of radiation

3.15
cooking appliance
appliance intended to be used for the preparation of food and that makes use of a heat source

3.16
solid fuel appliance
heating appliance intended to be fuelled by solid minerals fuel, natural or manufactured wood logs or pellets, including solidified alcohol

3.17
heating appliance
appliance intended to be used for comfort heating with or without integral heat sources

3.18
decklight
translucent deck fitting providing daytime lighting to inboard spaces by refracting sunlight

Note 1 to entry: These decklights are usually no more than 200 mm diameter.

3.19
shut off damper
air damper or rated fire damper device that closes or reduces air flow at engine space air intakes and/or exhaust ventilators

3.20
portlight
openable window in the hull of the craft below the sheer line and above the waterline

4 Fire prevention

4.1 Cooking and heating appliances

4.1.1 General

Cooking and heating appliances shall be suitable for use in a marine environment.

When selecting appliances consideration should be given to the size and design of the space into which the appliance is to be installed and the appliance's stated heat output.

Cooking and heating appliances shall be installed in accordance with the manufacturer's instructions for small craft installations and secured against accidental or unintended movement. Gimballed appliances shall include a retaining mechanism that meets this requirement.

4.1.2 Appliances with flues

Where flues and associated flue pipes are installed they shall be:

— installed in accordance to manufacturer's instructions;

— routed directly to the open air so that no exhaust gases can enter the interior of the craft;

— insulated or shielded in accordance with 4.2.3.1, where necessary to avoid overheating or damage to adjacent material or to the structure of the craft.

4.1.3 Permanently installed fuel systems

Permanently installed (non-integral) tanks and supply lines using fuel which is liquid at atmospheric pressure shall meet the applicable requirements of ISO 21487, ISO 14895 and ISO 10088 respectively. In addition:

— permanently installed fuel tanks shall be installed outside Zone II according to Figure 1;

— filler openings for tanks shall be prominently identified to indicate the type of fuel to be used with the system;

— unless covered by the design and installation requirements of ISO 14895, a readily accessible shut-off valve shall be installed in the supply line at the tank connection. If this is outside the space containing the appliance a second valve shall be fitted in the fuel line in the space containing the appliance, outside Zone II according to Figure 1, but not behind the appliance. This requirement does not apply where the tank is located lower than the cooking appliance/heater and there is no possibility of back siphoning or where a fire or fusible valve that prevents fuel from continuing to flow to an appliance in the event of a fire is installed in the appliance or near to the final fuel supply joint to it.

4.2 Materials near cooking or heating appliances

4.2.1 General

4.2.2 to 4.2.4 address the potential for the ignition of materials adjacent to cooking and heating appliances.

Materials and finishes used in the vicinity of open flame devices within the ranges as defined in Figure 1 shall comply with 4.2.2, taking into account the movement of the burner up to a heel angle of 20° for monohull sailboats or 10° for multihulls and monohull motorboats, where gimballed stoves are fitted.

These requirements do not apply to the materials of the appliance itself.

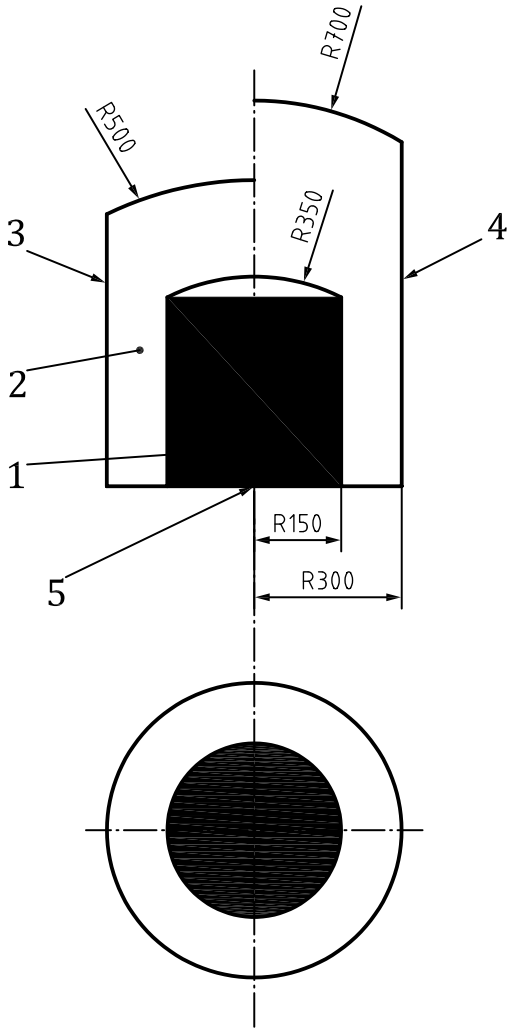
4.2.2 Protection from open flames

4.2.2.1 Free hanging curtains or other fabrics adjacent to open flame devices shall not be fitted in Zone I and Zone II according to Figure 1.

4.2.2.2 Exposed materials adjacent to open flame devices installed in Zone I and Zone II shall not support combustion and accordingly shall have an oxygen index (OI) of at least 21 according to ISO 4589-3 at an ambient temperature of 60°C, or be tested as meeting an equivalent standard. They shall be thermally insulated from the supporting structure to prevent combustion of the supporting structure, if the surface temperature exceeds 80°C during the fire test described in Annex A.

Thermal insulation may be achieved by an air gap or the use of a suitable material.

Dimensions in millimetres



Key

1 Zone I
2 Zone II
3 Limit of zone II for LPG, CNG or electric appliances
4 Limit of zone II for liquid fuel appliances
5 Centre of burner

NOTE Measurements are taken from the centre of the burner

Figure 1 — Areas of special material requirements

4.2.3 Protection from radiated heat devices

4.2.3.1 If their surface temperature can exceed 85°C, combustible materials adjacent to radiated heat devices and other appliances, whether exposed or covered, shall be thermally insulated to ensure that the surface temperature of the combustible materials does not exceed 85°C with the appliance operating at its maximum nominal output.

4.2.3.2 Thermal insulation may be achieved by an air gap, a radiation shielding surface or the use of a suitable material. Materials used to shield the combustible surface shall be ceramics, metals, non-combustible insulation board or other materials with similar fireproof characteristics.

Appliance manufacturer's instructions may be followed to meet this clause provided the appliance has been temperature tested in accordance with EN 12815[5], EN 13240[6] or UL 1100[8].

4.2.4 Protection from solid fuel appliances

4.2.4.1 Solid fuel appliances shall stand on and be secured to a hearth, designed and constructed of suitable robust and non-combustible materials, substantial enough to support the weight of the appliance and be of appropriate dimensions such that, in normal use, will prevent ignition of floor coverings through radiated heat or in the event a hot solid fuel falls from the appliance.

Appliance manufacturer's instructions may be followed to meet this clause provided the appliance has been temperature tested in accordance with EN 12815[5], EN 13240[6] or UL 1100[8].

4.2.4.2 Combustible fixtures, fittings or furniture other than flooring and its covering shall not be positioned within the distance from solid fuel appliance specified by the manufacturer or, if no distance is specified, within 600 mm of the closest point to the appliance.

4.2.4.3 Free-hanging combustible material, such as curtains or blinds adjacent to solid fuel appliance shall be fitted not less than the minimum distance specified by the manufacturer or, if no distance is specified, not within 600 mm of the closest point to the appliance and any uninsulated flue pipe.

NOTE Careful consideration needs to be given in the selection of materials in all other parts of habitable spaces to ensure, as far as practical, that the materials are not readily ignitable and/or have low flame spread characteristics and do not readily give rise to toxic or explosive hazards at elevated temperatures.

4.2.5 Protection from electrical appliances

4.2.5.1 Free hanging curtains or other fabrics adjacent to electrical cooking hobs shall not be fitted in Zone I according to Figure 1.

4.2.5.2 Electrical heating appliances shall not be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.

4.3 Engine and fuel compartments and exhausts

4.3.1 General requirements not dependent on fuel type

4.3.1.1 Insulation material

Material used for the insulation of engine compartments shall:

— present a non-fuel absorbent surface towards the engine; and

— not support combustion and accordingly shall have an oxygen index (OI) of at least 21 according to ISO 4589-3 at an ambient temperature of 60°C, or be tested as meeting an equivalent standard

4.3.1.2 Permanently installed fuel tanks

Permanently installed fuel tanks shall be designed and constructed in accordance with the requirements of ISO 21487 and installed in accordance with ISO 10088.

4.3.1.3 Bilge cleaning

Bilges and other spaces that can contain spillage of petrol and diesel shall be accessible for cleaning and shall have a non-fuel absorbent floor surface.

4.3.1.4 Checking of exhaust water injection

Where a non-metallic component or flexible hose is part of a water-cooled exhaust system a means to indicate a loss of cooling water shall be provided to prevent failure of the component or flexible hose. The means shall be obvious from the steering position.

NOTE A temperature or flow alarm may suffice.

Where the engine manufacturer makes specific system recommendations or with installations of engine systems that include all the exhaust components through the terminus where the exhaust gases are discharged, the manufacturer's recommendations shall be followed.

4.3.2 Specific requirements for compartments containing fixed petrol engines and permanently installed petrol tanks

4.3.2.1 General

Compartments or spaces containing fixed petrol engines and/or fixed petrol tanks shall be separated from habitable spaces. This is met where the structure fulfils the following requirements:

a) the boundaries are continuously sealed (e.g. welded, brazed, glued, laminated or otherwise sealed);

b) penetrations for cables, piping etc. are closed by fittings, seals and/or sealants;

c) access openings such as doors, hatches, etc. are equipped with fittings so they can be secured to minimize the flow of gas or vapours in the closed position.

The effectiveness of the boundary joints or sealing may be demonstrated either by documentation or visual inspection.

4.3.2.2 Ignition protection

All electrical equipment shall be ignition protected as specified in 4.6.

4.3.2.3 Ventilation

Compartments or spaces containing fixed petrol engines and fixed petrol tanks shall meet the ventilation requirements of ISO 11105.

4.3.2.4 Insulation of permanently installed petrol tanks from heat sources

Petrol tanks shall be insulated from the engine or other source of heat by either:

a) a physical barrier between tank and engine, engine-mounted components including fuel and water supply lines, and any source of heat (e.g. bulkhead, wall, insulating material etc.), or

b) an air gap to prevent any contact between the tank and engine, engine-mounted components, and any source of heat, the gap being wide enough to allow for servicing the engine and related components.

Any air gap shall be at least:

— 100 mm between a petrol engine and a fuel tank;

— 250 mm between a dry exhaust and a fuel tank.

4.3.3 Specific requirements for compartments containing portable petrol-engined equipment and portable petrol tanks or containers

Compartments or spaces designed to contain portable petrol-engine equipment, tanks and containers shall meet the requirements of 4.3.1.3, 4.3.2.1 and 4.3.2.2; and meet Clause 5 of ISO 11105:1997.

Spaces used for the storage of outboard motors and portable generators with integral petrol tanks and 'garage' spaces containing personal watercraft are included in this requirement.

4.4 Electrical installations

The requirements for electrical systems to minimize the risk of fire and to prevent the accumulation of explosive gases which might be emitted from batteries are set out in the following ISO standards:

— direct current electrical installations operating at not more than DC 50V shall be in accordance with ISO 10133;

— single phase electrical operating at not more than AC 250V shall be in accordance with ISO 13297;

— three phase electrical systems operating at not more than AC 500V shall be in accordance with EN IEC 60092-507;

— electric propulsion systems shall be in accordance with ISO 16315.

NOTE Battery types common in electric propulsion might require specialized extinguishing medium.

4.5 Liquefied petroleum gas (LPG) systems

4.5.1 General

LPG appliances shall not be installed in engine compartments unless this location is in accordance with the manufacturer's recommendations for installation in small craft.

Clearance between dry exhaust components or equivalent heat sources and LPG cylinders, pressure regulators and safety devices shall be at least 250 mm, unless an equivalent thermal barrier is provided.

4.5.2 LPG systems not used for propulsion

LPG systems shall be in accordance with ISO 10239.

4.5.3 LPG systems used for propulsion

LPG propulsion systems shall be installed to conform to a suitable standard, for example EN 15609[7].

4.5.4 Self-contained portable appliances

Self-contained portable appliances having LPG cylinders or containers attached shall be stored in accordance with the LPG cylinder storage requirements of ISO 10239.

4.6 Ignition protection

Only ignition-protected items in accordance with ISO 8846 shall be installed in compartments, lockers or housings that contain:

— petrol engines;

— petrol fuel tanks;

— petrol fuel line fittings;

— LPG cylinders;

— LPG line fittings with the exception of connections in the accommodation space near the appliance.

4.7 Decklights

Exposed materials within 300 mm below decklights shall be ceramics, aluminium, ferrous metals or other materials with similar fireproof characteristics, unless the decklight by design, does not provide a focal point.

5 Fire detection

A means to alert craft occupants to the outbreak of fire is required for craft with more than one habitable space. Shower and toilet compartments are not to be included as an additional habitable space. The device shall be installed according to the device manufacturer's instructions.

Fire detection devices (e.g. smoke detectors or heat detectors) shall:

— be constructed according to an international standard; and

— suitable for the space it is monitoring; and

— provide an audible alarm; and

— be connected to the on-board electrical supply or be independently powered.

6 Fire escape

6.1 Fire escape routes

6.1.1 General

Habitable spaces shall be fitted with at least one fire escape route leading to the open air or the next habitable space, or the bottom step of a staircase leading to the next habitable space or open air.

A fire escape route shall:

1) have a passage through doorways or hatches complying with the minimum requirements for fire exits (see 6.2.);

2) have a passage way minimum width of 500 mm and a minimum height of 500 mm;

3) not be obstructed by fixtures, fittings or furniture.

The distance to the nearest fire exit shall not exceed the greater of 6 m or $L_H/2.5$, (L_H = Length of Hull). The distance shall be measured in the horizontal plane, following along the escape route, between the nearest part of the fire exit and the farthest:

— point where a person can stand (minimum height 1,60 m), or

— midpoint of a bunk, whichever is greater.

Additionally, the fire escape route for enclosed habitable spaces for sleeping shall have:

— its middle line passing not less than 500 mm from the centre of the closest burner, or an open flame appliance, or the distance measured along the middle line, from the cabin threshold to the bottom of the stairs leading to the open air is less than 2 m;

— a fire detection device(s) provided in accordance with Clause 5, installed between any open flame appliance and the cabin exit along the distance of the escape route;

— a portable extinguisher suitably sized as per Table 1 located in the escape route prior to reaching the appliance.

Alternatively or where these conditions cannot be met, a second fire escape route shall be provided.

Description of escape routes and the location of fire exits shall comply with Clause B.4.

6.1.2 Escape routes passing over or beside an engine compartment

Where there are two escape routes required only one can pass through, over or beside an engine compartment.

6.1.3 Escape routes passing over an open flame or radiated heat device

No escape route shall pass directly over an open flame appliance or a radiated heat device.

6.2 Fire exits

6.2.1 General

An exit not specifically designated as a fire exit may be considered as a fire exit if it fulfils the requirements in 6.2.2 to 6.2.6.

6.2.2 Minimum clear dimensions

Any fire exit from a habitable space shall have the following minimum clear openings:

— circular shape: 450 mm diameter;

— any other shape: minimum dimension of 380 mm and 0,18 m^2 area. The dimensions shall be large enough to allow for a 380 mm diameter circle to be inscribed after taking account of any restriction introduced by any hinges, stays, etc., see Figure 2.

Dimensions in millimetres

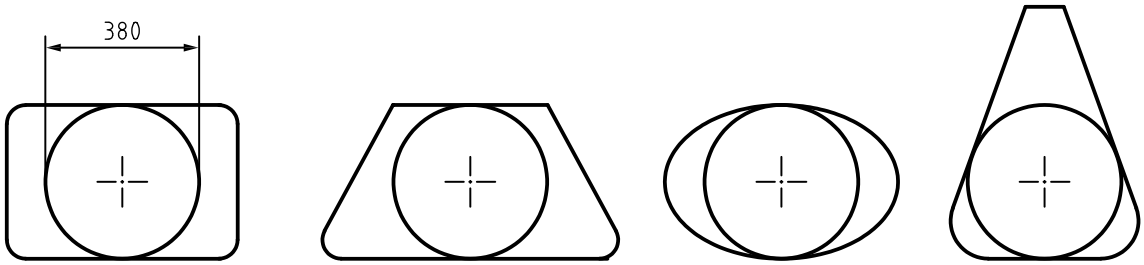


Figure 2 — Measurement of minimum clear opening, in millimetres

6.2.3 Positioning fire exits

Fire exits shall be positioned in an unobstructed and readily accessible location.

6.2.4 Capability to open fire exits

Fire exits leading to the weather deck or to the open air shall be capable of being opened without the use of tools, and from the inside and the outside when closed and unlocked. The requirement does not apply to port lights of sufficient size to be designated as fire exits.

Winch handles and similar equipment are considered tools.

6.2.5 Deck hatches designated as fire exits

Where deck hatches are designated as fire exits, the following shall apply:

— means shall be provided to reach the upper foothold whose vertical distance to the fire exit shall not exceed 1,2 m. In the case of cushions or mattresses this distance is taken from the compressed material;

— footholds, ladders, steps or other means provided to meet this requirement intended to be permanently installed, shall only be removable with tools;

— folding or deployable devices are acceptable but their stowage location shall be clearly indicated by the fixing of a label. (see 8.6);

— information on the operation and location of folding or deployable devices shall comply with Clause B.4.

6.2.6 Water tightness of fire exits

Fire exit openings that are critical for the craft's watertightness, i.e. those that could lead to flooding in case of rupture of the cover plate, shall conform to the applicable requirements of ISO 12216.

7 Fire fighting equipment

7.1 Purpose

This section specifies minimum fire fighting requirements according to the type of engine fuel and power rating, the habitable spaces and the provision of heating and cooking appliances.

7.2 Protection of habitable spaces containing sleeping bunks

Craft fitted with habitable spaces containing sleeping bunks shall be equipped with at least a 5A/34B rated portable fire extinguisher in accordance with 7.5.4..

7.3 Protection of habitable spaces containing cooking and heating appliances

Each habitable space containing cooking or heating appliances shall be protected by a portable fire extinguisher in accordance with 7.5.4, and according to Table 1,

Table 1 — Protection of habitable spaces with cooking and heating appliances

Type of cooking/heating appliances	Protection device
without open flame	One portable extinguisher with fire rating 5A/34B or a fixed system in according to 7.6.
with open flame	Portable extinguisher(s) with minimum total capacity 8A/68B or Fire blanket according to 7.7 plus one portable extinguisher 5A/34B or a fixed system according to 7.6.

NOTE The fire ratings of portable fire extinguishers required by Tables 1 and 2 correspond to the definitions in EN 3-7. Annex C gives information from this EN standard on the characteristics of typical fire rating according to the mass or volume of extinguishing medium, and equivalence with other regulations.

7.4 Protection of engine compartment(s)

7.4.1 General

The protection of engine and engine compartments shall be achieved according to the requirements listed in Table 2.

Table 2 — Protection of the engine(s) and engine compartments

Engine position	Criteria	Protection achieved by
Outboard engine(s)	*P* [a] ≤ 25 kW	No extinguisher required
	P > 25 and ≤ 220 kW	1 portable extinguisher 34 B
	P > 220 kW	Portable extinguisher(s) total B capacity = 0,3 *P* [c]
Petrol Inboard engine(s)	Petrol engine located in engine box above deck	- Portable extinguisher(s) to fire port [d] or - Fixed system according to 7.6
	Petrol engine compartments below deck	- Fixed system according to 7.6
Diesel Inboard engine(s)	Diesel engine compartment ≤ 3,5 m^3 net volume [b] or *P* ≤ 120 kW	- Portable extinguisher(s) to fire port [d] or - Fixed system according to 7.6
	Diesel engine compartment > 3,5 m^3 net volume [b] or *P* > 120 kW	- Fixed system according to 7.6

a) *P* is the power rating in kW of the engine or engines in the space combined.

b) Net volume is the gross volume of the engine compartment minus the volume of all fixed engine compartment components such as engines, fuel tanks, batteries.

c) Example: For 1 × 220 kW outboard engine the required minimum rating is 220 × 0,3 = 66B which corresponds to two 34B extinguishers.

d) The fire rating of the portable extinguisher shall not be less than the minimum recommended by its supplier for use with the fire port and for the volume of the engine box or space.

7.4.2 Fire ports

7.4.2.1 General

Where inboard engines are protected by portable fire extinguisher(s) intended for use in a fire port, such fire port shall be positioned so that the extinguishing medium can be properly discharged in the engine compartment without opening the primary access and in accordance with the extinguisher manufacturer's instructions.

Information on the location, use and symbol of fire ports shall comply with B.2.2.

7.4.2.2 Size, location and positioning

Fire ports shall be:

— sized only to accept the discharge nozzle;

— openable to provide ready access for discharge of the medium into the engine compartment;

— located so the required size of extinguisher can be operated in a position that will allow complete discharge of the extinguishing medium in the required location;

— sealed to the habitable space, when closed and not in use, for any port to an engine compartment located inside a habitable space;

— labelled with “Fire port” or an appropriate graphical symbol. If a graphical symbol is used, it must be explained in the owner’s manual.

7.5 Portable fire extinguishers

7.5.1 Purpose

This clause specifies type(s), size(s), number, location and storage of portable fire extinguishers on board. This standard is not intended to regulate the requirements for the extinguishers themselves, which are subject to national regulations.

Information concerning portable fire extinguishers, fire ratings and any specific intended purpose or extinguishing media requirements shall comply with Annex B.

The number, type, capacity, and technical characteristics of portable fire extinguishers and the extinguishing media might also be subject to national regulations, but shall not be less than required in this standard. For guidance on the classification of fires and the desirability of selecting portable fire extinguishers having accredited third party certification, see Annex C.

7.5.2 General requirements

7.5.2.1 Marking

Marking of portable fire extinguishers shall be in accordance with EN 3-7 and ISO 7165 or equivalent.

7.5.2.2 Accessibility

All portable fire extinguishers, or their designated locations, shall be readily accessible.

7.5.2.3 Location

Portable extinguishers located where they might be exposed to splashed or sprayed water shall have extinguisher operating nozzle and triggering devices shielded unless the extinguishers are certified or listed for marine service.

7.5.2.4 Storage

Portable extinguishers may be stored in a locker or other protected or enclosed space. The locker or the enclosed space door shall carry the appropriate symbol (see 8.6).

7.5.2.5 Medium

Extinguishing media shall not be used so that it results in toxic concentrations in the space where it is discharged.

Extinguishing media containing Halon 1211, 1301, and 2402 and per-fluorocarbons shall not be used.

7.5.3 Carbon dioxide (CO_2) extinguishers

7.5.3.1 Location

Portable carbon dioxide (CO_2) extinguishers may only be located in habitable spaces where energised electrical equipment is located (e.g. electric motor space, battery space, switchboard) or flammable liquids are present (e.g. galley). The requirements of ISO 5923 apply for CO_2 as an extinguishing medium.

7.5.3.2 Maximum capacity and number

Any individual CO_2 extinguisher shall have a maximum capacity of 2 kg.

There may be no more than one CO_2 extinguisher in each habitable space.

7.5.3.3 Warning and information

Where a CO_2 extinguisher is provided, except for craft having no habitable spaces, a warning notice shall be affixed near the location of such extinguisher (see 8.5) and a warning included in the Owner's manual according to Clause B.6.

7.5.4 Location and capacity of portable fire extinguishers

7.5.4.1 Location

There shall be a portable fire extinguisher located:

— within 2 m unobstructed distance from the main helm position;

— within 2 m from any permanently installed cooking and heating appliance or open-flame device, but so located that it is accessible in the event of a fire at any such appliance or open-flame device;

— within 5 m unobstructed distance from the centre of a bunk measured in the horizontal plane;

— within 3 m from outboard engines or from fire ports for inboard engines, where required.

There shall be information concerning the responsibility with the owner to select an effective portable fire extinguisher for use with the fire port provided. For details see Annex B.

7.5.4.2 Capacity

At least one extinguisher of 5A/34B capacity shall be located within each 20 m^2 of the habitable space.

Where habitable spaces are protected by a fixed system according to 7.6, only one portable fire extinguisher need be provided for that space.

The extinguisher(s) may meet more than one of these requirements.

7.6 Fixed fire extinguishing systems

7.6.1 Purpose

This set of clauses specifies requirements for fixed fire extinguishing systems, where fitted, with manual and/or automatic operation. For simplicity they will be called "fixed systems" from this point forward. These fixed systems shall meet national requirements where relevant.

NOTE 1 This standard does not specify the technical requirements for the cylinders containing the extinguishing medium.

NOTE 2 Information on the requirements for pressurized cylinders in Europe and the USA is provided in Annex D.

7.6.2 General requirements

7.6.2.1 Fixed system approvals

Fixed systems shall be "approved systems". An "approved system" shall have been tested against a recognized test standard and the successful test outcome shall be supported by a test report from a test lab approved to test products to the recognized standard. It is essential the test shows that the number

of nozzles and positions recommended by the manufacturer cover the compartment it is intended for. Further information on "approved systems" is provided in Annex D.

7.6.2.2 Installation

Fixed systems shall be suitably sized and installed in accordance with the system manufacturer's and extinguishing medium provider's instructions for the space protected including for any requirement for dampers.

7.6.2.3 Medium

Fixed systems shall use a total flooding medium.

Extinguishing media shall not be used so that it results in toxic concentrations in the space where it is discharged.

Extinguishing media containing Halon 1211, 1301, and 2402 and per-fluorocarbons shall not be used.

CO_2 shall not be used in fixed systems on recreational craft.

7.6.2.4 Temperature of operation

Fixed systems shall be capable of operating in an ambient temperature higher than 0°C.

7.6.2.5 Multiple systems

If more than one fixed system is installed in a space, each system shall be capable of individually protecting the space, unless their discharge is simultaneous.

7.6.2.6 Location of cylinders

If the cylinders are located inside the space to protect or if the activation of the fixed system is automatic, a visual indication of discharge shall be provided outside the space.

7.6.3 Requirements for use of asphyxiant mediums

7.6.3.1 Installation

Fixed systems shall not be automatically activated.

The installation of a fixed system using an asphyxiate gas extinguishing medium (e.g. CO_2) shall be limited to spaces in a craft that are not intended for habitable purposes and are separated from the habitable space. This requirement is fulfilled if the spaces have no permanent openings other than for the following purposes:

— connection to the surrounding bilges;

— ventilation of engine compartment and supply of combustion air;

— openings for piping and cables;

— openings such as doors, hatches, etc. for access to equipment provided these can be secured in the closed position.

7.6.3.2 Separation from habitable spaces

The separating structure shall be constructed to minimize the flow of the medium into the habitable space.

7.6.3.3 Harmful medium

Where the fixed system uses an asphyxiant gas at or above a concentration harmful to health:

— it shall be fitted with a shut-off valve, that clearly indicates open and closed, as close as possible to the gas bottle, and distinct from the activation system;

— protected spaces large enough to be occupied by one person, even occasionally, shall be equipped with a visual and sound alarm activated prior to discharge.

7.6.4 General installation requirements

7.6.4.1 Fastening

The components for a fixed system shall be securely fastened to the craft's structure to withstand motions, shock and vibrations from normal craft operating conditions.

7.6.4.2 Temperature

Cylinders containing the extinguishing medium, distribution lines and controls shall be located so that they will not be subject to temperatures outside the system's designed operating range, while the craft is in service.

7.6.4.3 Location of the cylinders

Cylinders may be installed either inside or outside the space to be protected. Cylinders containing CO_2 shall be limited to spaces in a craft that are not intended for habitable purposes and are separated from the habitable space (see 7.6.3.1).

To minimize corrosion cylinders shall be mounted clear of the anticipated bilge water level and above surfaces on which water can accumulate.

7.6.4.4 Accessibility of the cylinders

Cylinders shall be accessible for removal. Controls and dials shall be readily accessible and visible.

7.6.4.5 Non-metallic components

Non-metallic components of the distribution line(s) including their fixtures that are not intended to melt as part of the fire fighting system as installed shall be fire resistant or be otherwise protected from fire.

7.6.4.6 Soldering or brazing

Solder or brazing material used for metallic lines or fittings shall have a melting temperature of not less than 600 °C.

7.6.5 Activation of the system

7.6.5.1 General

For automatic systems a remote discharge indicator shall be installed and shall be clearly perceptible from the main helm position.

7.6.5.2 Manual release systems

Where installed, a manual release device shall be readily accessible and operable using a maximum force of 100 N. A label showing how to discharge the system shall be provided immediately adjacent to

the release device, with the protected space(s) identified. A means of preventing accidental discharge shall be provided.

7.6.5.3 Diesel engine shut-down

In fixed systems using gas to protect a space containing a diesel engine there shall be a device, manual or automatic, that shuts down the engine before or during the discharge or activation.

7.6.5.4 Gas concentration

7.6.5.4.1 In fixed systems using gas to protect a space, means shall be provided to ensure that the minimum design concentration of the extinguishing medium will be maintained until the fire is extinguished.

7.6.5.4.2 Prior to or during system discharge, the manual and/or automatic shutdown of engines, generators, forced ventilation, or other permanently installed equipment which could compromise the levels of extinguishing medium in the protected area, shall be provided.

7.6.5.4.3 Where equipment shutdown as described 7.6.5.4.2 cannot guarantee that extinguishing medium design concentration can be maintained, shut-off dampers closing the ventilation ducts shall be installed.

7.6.5.5 Shut off dampers

Shut off dampers, where required in 7.6.5.4 shall be capable of being closed, before or during the discharge or activation of the system and the minimum effective extinguisher media concentration shall be maintained. Where required, closing of shut off dampers on automatic systems shall be automatic. Manual systems may use a manual or automatic damper.

7.6.5.6 Power supply indicator

For automatic systems having a single external power source, a means to indicate to the craft occupants that the power supply is active shall be provided.

7.7 Fire blanket

Where required by Table 1, a fire blanket, in accordance with EN 1869 shall be fixed within reach of any open flame cooking appliance or deep fat fryer, but so located that it can be accessible in the event of a fire.

The fire blanket shall be readily accessible and ready for immediate use.

Information pertaining to fire blanket shall comply with Annex B.

8 Displayed information

8.1 General requirements

The information shall be in the appropriate language. The information may be represented by symbols in accordance with ISO 7010, or other relevant standards.

NOTE For general warning sign see ISO 7010:2011, W001.

8.2 Fixed system warning for non-asphyxiant medium

Where a space is protected by a fixed fire extinguishing system with manual activation capability, the following information shall be displayed near the manual release device:

Background: Yellow

CAUTION

BEFORE DISCHARGING
SHUT DOWN
ENGINES AND BLOWERS

8.3 Fixed system warning for asphyxiant medium

The following information shall be displayed at any entrance to the protected space(s), if the extinguishing medium is an asphyxiate:

Background: Yellow or orange

WARNING

ENGINE COMPARTMENT HAS
FIXED EXTINGUISHING SYSTEM

TO AVOID ASPHYXIATION LEAVE
THE AREA BEFORE DISCHARGE

AFTER DISCHARGE VENTILATE
BEFORE ENTERING

8.4 CO_2 portable extinguisher

The following information shall be displayed near any CO_2 portable extinguisher

Background: Yellow or orange

WARNING

THIS EXTINGUISHER USES CO_2

AS AN EXTINGUISHING MEDIUM
IT SHALL BE USED ONLY TO FIGHT
ELECTRIC OR FLAMMABLE LIQUID

TO AVOID ASPHYXIATION AFTER
DISCHARGE LEAVE THE AREA
IMMEDIATELY AND VENTILATE
BEFORE ENTERING

8.5 Storage of ladder to escape hatch

The following information shall be displayed near to the storage area to indicate the location of any stowed folding or deployable devices to aid escape through a fire exit hatch.

White letters/green background

IMPORTANT SAFETY INFORMATION

FIRE EXIT LADDER INSIDE

8.6 Displayed symbol requirements

The symbol in accordance with Table 3 shall be displayed where appropriate.

Table 3 — Symbols

Symbol	Colour		Application	Source
	Symbol/Text	Background		
	Symbol: white	red	Designated place of portable fire extinguisher or locker where it is stowed	ISO 7010:2011; F001
NOTE Other symbols may be used as appropriate, preferably from ISO 7010.				

9 Owner's manual

The information and instructions to be included in the owner's manual are listed in Annex B.

Annex A
(normative)

Fire test referenced in 4.2.2

For conducting the test each of the open flame burners shall be covered by a metal plate of 200 mm diameter and a thickness of 3 mm ± 0,2 mm. The flames shall burn for 10 min, the controls being set to the maximum. At the end of the burning period the surface temperature of any material around the open flame device shall be measured.

Annex B
(normative)

Information to be provided in the Owner's manual

B.1 General

ISO 10240 specifies the information that shall be included in the owner's manual of small craft.

Fire protection information shall be sufficiently detailed and where appropriate shall include sketches, diagrams or photos to impart a full understanding of equipment location, escape routes etc.

The following information shall be included, as applicable.

B.2 Fire-fighting equipment

B.2.1 Portable fire extinguishers

Information shall be included concerning any specific intended purpose or extinguishing media requirements for portable fire extinguishers for example: number, location, type and capacity.

Where a CO_2 extinguisher is provided, except for craft having no habitable space, information shall be included about the asphyxiation hazards and to leave the area immediately after discharge and to ventilate prior to re-entering the area.

B.2.2 Fire port facilities

Information shall be included concerning the location and use of any installed fire port.

Information shall be included concerning the responsibility of the owner to select an effective portable fire extinguisher for use with any installed fire port, if a portable fire extinguisher is not supplied.

B.2.3 Fire blanket

Information shall be included concerning the location of any provided fire blanket.

B.2.4 Fixed systems

Information shall be included concerning the safe operation of any fixed system. Instructions shall indicate the operation to be performed, where needed, before, during, and after discharge. These shall contain, where relevant, instruction on evacuation of the protected space, stopping the engine and fuel feed, stopping of forced ventilation, activating shut off dampers. If the extinguishing medium is an asphyxiant these shall include directions to ventilate the space prior to entering for damage assessment and subsequent engine restart.

B.2.5 Servicing of fire-fighting equipment

Information shall be included concerning the servicing of fire-fighting equipment and shall:

— have fire-fighting equipment checked at intervals indicated on the equipment;

— replace portable fire-fighting equipment, if expired or discharged, by devices of identical or greater fire-fighting capacity;

— have fixed systems refilled or replaced when expired or discharged;

— have for fixed systems, information on maintenance schedule.

NOTE PED/TPED cylinders require hydrostatic testing after 10 years, DOT cylinders require hydrostatic testing at 12 years or every 5 years from the date of any discharge. (See Annex D for information on PED/TPED).

B.3 Fire detection and alarm equipment and smoke alarms

Information shall be included concerning the provision of any fire detection equipment, describing its location and function and maintenance and replacement regimes.

Fire detection and alarm equipment shall be maintained in accordance with the manufacturer's instructions or as indicated on the equipment.

Smoke alarms shall be tested as part of the boarding routine and weekly if aboard for an extended period. In the event testing a smoke alarm indicates the alarm is faulty, replace the smoke alarm with one of an equivalent type.

B.4 Fire escape

Information shall be included identifying escape routes and the location of all fire exits.

Information shall be included concerning the operation and location of any folding or deployable device used to aid escape through a fire exit.

B.5 Information concerning the responsibility of craft owners/operators when the craft is occupied

Information shall be included concerning the responsibility of the craft owner/operator to:

a) ensure that fire-fighting equipment is in serviceable condition and readily accessible;

b) unlock any deck hatches, or any other locked escape openings;

c) unlock any locked storage containing any folding or deployable device used to aid escape through a fire exit;

d) inform craft occupants about:

   1) the location and operation of fire-fighting equipment,

   2) the location of any fire port discharge openings into the engine compartment,

   3) the location of escape routes and fire exits and to plan what to do in the event of fire.

B.6 Cautionary notices to the craft operator

B.6.1 General

Keep the bilges clean and check for fuel and gas vapours or fuel leaks at regular intervals and before starting the engine.

When replacing parts of the fire-fighting installation only matching components shall be used, bearing the same designation or being equivalent in their technical and fire resistant capabilities.

Do not install free hanging curtains or other fabrics in the vicinity of or above open flame appliances, radiant heat devices or electrical heating and cooking elements.

Do not stow combustible material in the engine compartment. If non-combustible materials are stowed in the engine compartment they shall be secured against falling into machinery and shall cause no obstruction to access in or from the space.

B.6.2 Specific warnings

Never:

— obstruct passageways to fire exits and hatches;

— obstruct access to safety controls, e.g. fuel shut-off valves, gas shut-off valves, isolation switches of the electrical system or fire ports;

— deliberately or inadvertently block ventilation for compartments or spaces, particularly those containing fixed petrol engines, fixed petrol tanks and batteries;

— obstruct access to portable fire extinguishers or fire ports;

— leave the craft unattended when cooking and/or heating appliances are in use unless the appliance is designed to operate unattended;

— modify any of the craft's systems unless competent to do so;

— fill any fuel tank or replace gas bottles when engines are running or open flame appliances or radiant heat devices are in use;

— smoke while handling fuel or gas;

— store petrol containers or equipment containing petrol in any area not designated for the specific storage of petrol.

B.7 Displayed information and symbols

The applicable caution and warning notices shall be displayed in the Owner's manual or their wording be repeated, as specified in Clause 8 or in other installation standards and specifications used.

Annex C
(informative)

Classification of fires, fire ratings according to EN 3-7 and the selection of portable fire extinguishers

C.1 ISO Classification of fires

ISO 3941[1] defines classes of fires according to the nature of the material undergoing combustion. In consequence, it does not define a particular class of fire involving an electrical risk.

Not all extinguishing media types are suited to all types of fire. The following designations are to identify and classify fires according to their type and the effectiveness of various extinguishers and extinguishants as denoted by their fire ratings:

— ISO Class A: Fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers.

— ISO Class B: Fire involving liquids or liquefiable solids.

— ISO Class C: Fires involving gases.

— ISO Class D: Fires involving metals.

— ISO Class F: Fires involving cooking media (vegetable or animal oils or fats) in cooking appliances.

C.2 Extinguisher fire ratings according to EN 3-7

C.2.1 A type rating

For Class A fires, the rating figure, which may be 5, 8, 13, 21, 27, 34, 43 and 55, followed by an A, represents fires involving solids such as paper and wood.

C.2.2 B type rating

For Class B fires, the rating figure which may be 21, 34, 55, 70, 89, 113, 144, 183, and 233 followed by a B, represents fires involving liquids such as oil and petrol.

C.2.3 General guidance

The pertinent value is the fire rating of an extinguisher, but the following information on mass or volume of a portable extinguisher might be useful when selecting portable fire extinguishers.

Table C.1 — Typical Type A, B or A/B/C portable extinguisher ratings according to EN 3-7

Mass kg	Time of discharge seconds [a]	Typical fire rating [b]
Typical dry powder		
1	6	5A-34B-C
2	6	8A-55B-C / 8A-70B
Typical CO_2 extinguishers		
2	6	21B
Typical water plus foam		
Volume litre	**Time of discharge seconds [a]**	**Typical fire rating [b]**
2	6	5A-70B
3	9	8A-113B
6	12	13A-233B

a) Minimum time according to EN 3-7.

b) Typical values sometimes greater than minimal value required by EN 3-7.

EN 3 normally applies throughout European Union, other standards apply outside the European Union. For other extinguishers, an equivalent mass or volume of extinguishing media may be applied.

C.3 Guidance on the selection of portable fire extinguishers

Portable fire extinguisher should be manufactured to an accepted standard such as:

— EN 3-7, *Portable fire extinguishers*

— ISO 7165[5], Fire fighting - *Portable fire extinguishers – Performance and construction*

— US Coast Guard approved portable fire extinguishers; see 46 CFR[10] chapter 1, subchapter C, Part 25, subpart 25.30

It is recommended that portable fire extinguishers should have their conformity to the manufacturing standard certified by an accredited certification body. Conformity assessments should include verification of fire ratings and periodic type-testing and control during manufacture.

Annex D
(informative)

Selection of fixed fire extinguishing systems

D.1 Fixed systems – 'Approved systems'

Use of an 'approved system' is intended to:

— demonstrate the capacity of the extinguishing system to extinguish a fire in the protected area, and

— show that the principal components of which a fixed fire system is composed (e.g. cylinders and extinguishing mediums, etc.) are certified according to national requirements.

The following provides assurance of the approved system's stated fire extinguishing capacity by, for example:

— US. Coast Guard Marine Safety Center as having been tested by a Coast Guard Accepted Independent Laboratory to an appropriate ANSI, UL or FM standard and listed and labelled for marine use;

— a body accredited by a National Accreditation Body, or an Accreditation Body that meets ISO/IEC 17011[9], with the testing of fixed marine fire extinguishing systems in the scope of the accreditation;

— a body authorized to undertake the "type approval" of such safety critical marine equipment under the European Council's Marine Equipment Directive 96/98/EC, as amended.

D.2 Examples of type approvals for fixed system components

D.2.1 European Union

Fixed systems using pressurized cylinders in the European Union are required to be certified according to the following European Union Directives, as applicable:

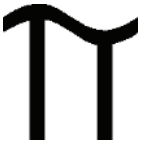
a) **Pressure Equipment Directive 97/23/EC (PED)**

PED compliant products are marked with a label as below:

Notifying Body Identification number is also marked.

b) **Transportable Pressure Equipment Directive 2010/35/EU (TPED)**

TPED complaint products are marked with the label as below:



Notifying Body Identification number is also marked.

c) **The revised Machinery Directive 2006/42/EC**

Products are marked with a label as below:

For the revised Machinery Directive 2006/42/EC the CE mark is applied but there can be two separate notifying body marks underneath it.

A certificate of conformity, on which the serial number of the product is noted, will accompany the system.

D.2.2 United States of America

In the USA, cylinders are certified "DOT" (US Department of Transportation) and principal system components are generally approved by Underwriters Laboratories (UL) or Factory Mutual (FM).

Bibliography

[1] ISO 3941, *Classification of fires*

[2] ISO 7840, *Small craft — Fire-resistant fuel hoses*

[3] ISO 12133, *Small craft — Carbon monoxide (CO) detection systems*

[4] IEC 60092-501, *Electrical installations in ships — Part 501: Special features - Electric propulsion plant*

[5] EN 12815, *Residential cookers fired by solid fuel – Requirements and test methods*

[6] EN 13240, *Roomheaters fired by solid fuel – Requirements and test methods*

[7] EN 15609, *LPG equipment and accessories. LPG propulsion systems for boats, yachts and other craft*

[8] UL 1100, *Alcohol and kerosene cooking appliances for marine use*

[9] ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*

[10] *US Code of Federal Regulations* (CFR), Title 46 *Shipping*

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