

## CHAPTER 9

### FIRE-FIGHTER'S OUTFITS AND EMERGENCY ESCAPE BREATHING DEVICES (EEBD)

#### Key Changes

**Minor** revision which incorporates the latest IMO SOLAS amendments and Circulars, and EN / ISO / **IEC** standards for these items/equipment.

**All amendments are highlighted in yellow.**

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## 9.1 Breathing Apparatus

### 9.1.1 General

9.1.1.1 The general requirements for breathing apparatus are contained in MSN 1665(M) Schedule 5 and FSS Code Chapter 3, **as amended**.

9.1.1.2 When breathing apparatus is used in an emergency or during crew training the relevant recommendations of the Code of Safe Working Practices for Merchant Seamen should be observed.

### 9.1.2 Self-contained breathing apparatus (SCBA)

9.1.2.1 The self-contained breathing apparatus required by the regulations should be type approved to meet the testing standards quoted in the **EU Marine Equipment Directive (MED)**. SCBA may be either of the negative demand or positive pressure type or may have a changeover facility to allow operation in either mode. For use in incidents involving dangerous goods a positive pressure type mask is required. Apparatus such as an anti-gas respirator, through which the surrounding atmosphere is inhaled through a canister of chemical absorbents, is unsuitable for enclosed spaces where there is a lack of oxygen, and such apparatus should not be used.

The volume of air contained in the SCBA cylinders should be at least 1,200 litres, **which shall be capable of providing air for at least 30 minutes**. Two spare charges suitable for use with the apparatus should be provided for each apparatus required. If passenger ships carrying not more than 36 passengers and cargo ships are equipped with suitably located means of fully recharging the air cylinders free from contamination, only one spare charge is required for each apparatus required. On passenger ships carrying more than 36 passengers equipped with suitably located means of fully recharging the air cylinders, the required spare capacity may be reduced by one third.

Additional requirement for ships carrying dangerous goods:

*(Reg. II-2/19.3.6.2)*

*For each of the breathing apparatuses, two complete sets of air bottles are required. These spare bottles are to be in addition to the spare bottles required for fireman's outfit.*

*(IACS Unified Interpretation SC92)*

9.1.2.2 Means should be provided for overriding the automatic air supply valve. Where both a pressure reducing valve and a demand valve are fitted, in general, means for overriding the latter need only be provided.

9.1.2.3 **All SCBA of fire-fighter's outfits shall, by 1 July 2019, be fitted with an audible alarm and a visual or other device that operates when the pressure drops to a predetermined level to warn the wearer, (Resolution MSC.338(91))**.

As a requirement of the MED testing standard EN 137, all MED approved SCBA sets must be fitted with a low pressure warning device and pressure indicator.

The most common type of warning device is an audible whistle, however, pneumatically or electrically operated devices can also be accepted provided they meet the criteria below.

The warning device shall either be activated automatically when the pressure vessel valve(s) is (are) opened or if manually activated it shall not be possible to use the apparatus before the device is activated.

The warning device shall activate at a predetermined pressure (usually 55+/-5 bar) which will alert the user before the volume of the air in the cylinder has been reduced to no less than 200 litres.

### **9.1.3 Smoke helmet type breathing apparatus**

*With the entry into force of the revised SOLAS chapter II-2 on 1 July 2002, new ships may no longer be fitted with smoke-helmet type breathing apparatus and it is recommended that existing ships built prior to 1 July 2002 be fitted with additional SCBAs to replace, or make redundant, existing smoke helmet type breathing apparatus where these form part of the minimum equipment required.*

*(Unified Interpretation - MSC/Circ.1085)*

The above recommendation can be applied to replace existing smoke helmet type breathing apparatus required in SI 1998 No, 1011 (Fire Protection: Small Ships) Regulation 17(7) with SCBAs.

### **9.1.4 Lifeline and Safety belt harness**

Each breathing apparatus should be provided with a flexible fireproof lifeline, type approved to meet the testing standards quoted in the Marine Equipment Directive, of at least 30 m in length, capable of being attached by means of a snap hook to the harness of the apparatus, or to a separate safety belt, in order to prevent the breathing apparatus becoming detached when the lifeline is operated. The lifeline should be subjected to a test by static load of 3.5 kN for 5 minutes.

Snap hooks should be of materials, so far as possible, resistant to incensive sparking on impact. Care should be taken to ensure that the lifeline is free from knots, as their presence may seriously reduce the strength of the line under load.

The adjustable safety belt or harness together with the snap hook should be in accordance with BS EN 354, 355, 358, 361 and 365 requirements.

### **9.1.5 Lifeline signals**

Instructions should include details of the signals to be used between the fire fighting party and the wearer of the breathing apparatus. All members of fire fighting parties should be thoroughly familiar with the signals. The following signals, which could be made by short, sharp pulls on the lifeline, would be suitable:

<b><u>Signal</u></b>	<b><u>Meaning</u></b>
<b><i>By wearer of breathing apparatus</i></b>	
1 pull	I am all right
2 pulls	I am going ahead
3 pulls	Take up my slack
4 pulls	Help me out immediately

#### ***To wearer of breathing apparatus***

1 pull	Are you all right?
2 pulls	Advance
3 pulls	Back out
4 pulls	Come out immediately

In every instance when line signals are employed, they should be acknowledged by the recipient of the order by repeating the signal to show that it has been received.

### **9.1.6 Storage Location**

9.1.6.1 Each breathing apparatus, together with any life line or safety belt forming part of the outfit, should be stowed in a suitable box or locker with a list of the contents on prominent display. The fire-fighter's outfits required by the regulations can be stowed in the same locker or in readily accessible locations which are permanently and clearly marked, close to the SCBA sets, and which are not likely to be easily cut off by fire. All stowage positions for firemen's outfit are required to be lit from the emergency source of power in accordance with SOLAS II-1 Regs. 42.2.1.6 and 43.2.2.4.

9.1.6.2 For passenger ships carrying more than 36 passengers, at least two fireman's outfits should be stored in each main vertical zone.

### **9.1.7 Breathing air compressors**

9.1.7.1 SOLAS II-2 Reg. 10.2.6 requires that passenger ships carrying more than 36 passengers constructed on or after 1 July 2010 shall be fitted with a suitably located means for fully recharging breathing air cylinders, free from contamination. The means for recharging shall be either:

1. breathing air compressors supplied from the main and emergency switchboard, or independently driven, with a minimum capacity of 60 litres/min per required breathing apparatus, not to exceed 420 litres/min; or

2. self-contained high-pressure storage systems of suitable pressure to recharge the breathing apparatus used on board, with a capacity of at least 1,200 litres per required breathing apparatus, not to exceed 50,000 litres of free air.

9.1.7.2 The quality of the air produced by any high-pressure storage system or breathing air compressor should be tested annually by a national accredited laboratory, in accordance with BS EN 12021 – *Respiratory protective devices - compressed air for breathing apparatus*, or an equivalent national standard.

9.1.7.3 Any breathing air compressor should be installed in an enclosed compartment (dedicated solely to this purpose, wherever possible) which in any case should have little or no fire risk, with sufficient space on all sides to ensure good ventilation. The area should be as cool as possible but places where freezing is possible should be avoided, and the air intake should be located in open air and away from potential contaminant release points.

9.1.7.4 The systems must be inspected following installation and maintained and tested at periodic intervals to ensure they remain in a suitable condition for their intended purpose according to the manufacturer's instructions. At least one member of the crew should be competent in the use and maintenance of the equipment.

### **9.1.8 Compressed air line breathing apparatus**

9.1.8.1 Breathing apparatus provided additional to regulation requirements, which draws its air through a compressed air line from the ship's air supply, independent compressor or independent compressed air cylinders may be accepted provided that the supply is capable of functioning for at least 30 minutes.

9.1.8.2 If such apparatus is fitted onboard a high-speed craft it should be type approved to meet the testing standards quoted in the Marine Equipment Directive.

9.1.8.3 As far as practicable, the siting of the main air compressors should be in accordance with the requirements given in 9.1.7.3.

9.1.8.4 The quality of the air produced should be tested annually in accordance with the requirements given in 9.1.7.2. The inspection and maintenance of the system should be in accordance with the requirements given in 9.1.7.4.

### **9.1.9 Breathing apparatus cylinders**

#### 9.1.9.1 Steel cylinders:

Air cylinders most commonly used for marine applications are manufactured from steel and have a working pressure of 200 or 300 bar.

#### 9.1.9.2 Carbon composite cylinders:

Carbon composite air cylinders, consisting of an aluminium liner over-wrapped with continuous filaments of carbon and glass fibres, and having a working pressure of 200 or 300 bar, may be accepted for use as part of the statutory breathing apparatus subject to the following conditions:

- (a) a maximum charging rate of 27 bar/minute will help reduce heat build-up and minimise the need to top-up the cylinder after it has cooled down;
- (b) cylinders with abrasion or cut damage to the carbon composite layer must be rendered unserviceable;
- (c) the refilling of cylinders should be the responsibility of a person competent and trained in such matters;
- (d) the label on the cylinder displays vital safety information and should be clearly legible; and
- (e) the cylinders should be provided with a suitable protective cover to give enhanced protection against contact damage, which should be removed prior to each charging to enable a thorough external inspection to be carried out.

9.1.9.3 All air cylinders for breathing apparatus must be interchangeable.

### **9.1.10 Cylinder marking**

Where in any ship breathing apparatus cylinders are carried having different working pressures, in addition to the normal marking on the cylinder the working pressure should be prominently marked on the cylinder.

### **9.1.11 Cylinder inspection**

9.1.11.1 Each cylinder must be checked to ensure that it is within its recertification period and not due for periodic testing.

9.1.11.2 Steel cylinders should be inspected internally, externally and hydrostatically tested at intervals not exceeding 5 years.

9.1.11.3 Carbon composite cylinders, referred to in paragraph 9.1.9.2, should be similarly inspected and hydrostatically tested at intervals specified by the manufacturer or after a period not exceeding 5 years. The normal design lifetime of a carbon composite cylinder is 15 to 20 years.

### **9.1.12 Training cylinders**

SOLAS II-2 Reg. 15 - applicable from 1 July 2014:-

*2.2.6 An onboard means of recharging breathing apparatus cylinders used during drills shall be provided or a suitable number of spare cylinders shall be carried on board to replace those used.*

In addition to the fully charged spare cylinders required by the regulations for each breathing apparatus, where no means for recharging such cylinders is provided onboard, sufficient spare cylinders must be provided for training purposes. Factors to be considered by the ship-owner when deciding upon the number of training cylinders to be provided include the requirements in the Safety Management System for the number of drills on board where SCBA cylinders may be used, and the nature of the vessels trading pattern with respect to shore based charging facilities. Cylinders intended for training purposes should be prominently marked to indicate their intended use.

## **9.2 Personal Equipment**

### **9.2.1 Protective clothing**

The fire-fighter's protective clothing required by the regulations should be type approved to meet the testing standards quoted in the Marine Equipment Directive, and manufactured from material which is water resistant, readily cleanable and which is flameproof to the requirements of BS EN 1486, 469 or ISO 15538. Whilst a two piece garment is preferred, a one piece garment may be accepted. Provision should be taken to ensure the sizes are suitable for all personnel on board whilst wearing normal clothing. The protective clothing should be easy to put on and take off, be reasonably comfortable to wear and permit maximum movement of the wearer.

### **9.2.2 Gloves**

The fire-fighter's gloves required by the regulations should be type approved to meet the testing standards quoted in the Marine Equipment Directive.

Gloves and mitts for protection against accidental contact of energized electrical equipment should meet the BS EN 60903 standard. These types of gloves / mitts must not be used for fire-fighting purposes.

### **9.2.3 Boots**

The fire-fighter's boots required by the regulations should be type approved to meet the testing standards quoted in the Marine Equipment Directive, and should be of rubber or other electrically non-conductive material.

#### 9.2.4 *Helmet*

The fire-fighter's helmet required by the regulations should be type approved to meet the testing standards quoted in the Marine Equipment Directive, and provide effective protection against impact.

### 9.3 **Fire-fighter's Communication**

*For ships constructed on or after 1 July 2014, a minimum of two two-way portable radiotelephone apparatus for each fire party for fire-fighter's communication shall be carried on board. Those two-way portable radiotelephone apparatus shall be of an explosion-proof type or intrinsically safe. Ships constructed before 1 July 2014 shall comply with the requirements of this paragraph not later than the first survey after 1 July 2018.*

*(Resolution MSC.338(91))*

The purpose of these specific radios is to provide a dedicated means of communication between a team of fire fighters entering the space, and the crew member located outside the space who is assigned to control this team, i.e. one Fire Party.

Therefore, the total number of these radios to be carried on board will depend upon the number of fire parties detailed on the Muster List, as each fire party must have at least two of these dedicated radios.

To date, IMO has not set performance standards for the above portable radio telephone apparatus but, in order for such equipment to meet the explosion-proof or intrinsically safe requirements, the UK would expect the radio telephone apparatus to be certified in accordance with relevant standards for equipment and protective systems intended for use in potentially explosive atmospheres, and maintained as such, for example:-

Directive 94/9/EC (ATEX) - with approval rating such as II2G Ex ib IIA T3; or

IEC 60079-0 2009 - Electrical apparatus for explosive gas atmospheres - Classification of areas; or

IEC 60092-502 1999 - Electrical installations in ships - Tankers - Special features.

Intrinsically safe radios should have a power output of 1 watt or less.

It is the ship's responsibility to demonstrate that the radios are fit for purpose, i.e. that they are able to work within the environment to be expected in a fire scenario, that their operating range is sufficient and that they are safe.



## **9.4 Fire-fighter's Axes**

The axe required as part of the fire-fighter's outfit should have a short handle provided with high-voltage insulation and its head should have a spike as well as a cutting edge; a carrying belt should be provided. It is recommended that, in addition, a long handled axe of the felling type should be provided in the fire-fighting equipment locker.

## **9.5 Safety Lamps**

### **9.5.1 General**

Safety lamps forming a part of the fire-fighter's outfit should be of an approved explosion-proof type, complying with a recognised standard, e.g. BS EN 60079 Series or EU ATEX Directive 94/9/EC - *Electrical apparatus for explosive gas atmospheres*, and should be capable of illumination for a minimum period of 3 hours. In order to meet the minimum illumination time requirement, it is strongly recommended that safety lamps use re-chargeable batteries, and that they are permanently connected to the recharging unit when not in use. If any safety lamp onboard uses alkaline cells, regular checks of the batteries voltage should be made to ensure the lamp will meet the minimum illumination time, and sufficient spare cells should be readily available at the fire stations for this purpose.

The safety lamps must be fitted with means for easy attachment of the lamp to the user.

### **9.5.2 Zone areas**

Safety lamps are categorised for use into Zone areas as detailed below. For use with fire-fighter's outfits, safety lamps complying with Zone 0 or 1 requirements can be accepted, (except that Zone 2 lamps may continue to be accepted in existing ships where appropriate).

### **9.5.3 Zone 0 safety lamps**

Zone 0: *"An area in which an explosive gas atmosphere is present continuously or for long periods or frequently."*

Lamps in this category are intended for use in any ship, including those carrying cargoes which are, or may give rise to, flammable gases and vapours continuously or for long periods or frequently.

### **9.5.4 Zone 1 safety lamps**

Zone 1: *"An area in which an explosive gas atmosphere is likely to occur in normal operation occasionally."*

Lamps in this category are intended for use in any ship, including those carrying cargoes which are, or may occasionally give rise to, flammable gases and vapours. All lamps accepted in this category are suitable for use in petroleum tankers but may not be suitable for all flammable cargoes; special attention should be paid to ensure that certification is suitable for use with the cargoes of bulk chemical carriers and liquefied gas carriers.

#### **9.5.5 Zone 2 safety lamps**

*Zone 2: “An area in which an explosive gas atmosphere is not likely to occur in normal operation but, if it does occur, will persist for a short period only.”*

Lamps in this category are only suitable for use in ships where there is limited risk of flammable gas or vapour.

### **9.6 Emergency Escape Breathing Devices (EEBD)**

#### **9.6.1 General**

The general requirements for emergency escape breathing devices are contained in SI 1998 No, 1012 (Fire Protection: Large Ships), as amended, Regulations 12A, 25A and 34A, and FSS Code Chapter 3.

The EEBD’s required by the regulations should be type approved to meet the testing standards quoted in the Marine Equipment Directive.

Guidelines for the performance, location, use and care of EEBD’s are contained in MSC/Circ.849.

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