

**MSC/Circ. 670**

**(5 January 1995)**

**GUIDELINES FOR THE PERFORMANCE AND  
TESTING CRITERIA AND SURVEYS OF  
HIGH-EXPANSION FOAM CONCENTRATES  
FOR FIXED FIRE-EXTINGUISHING SYSTEMS**

- 1 The Maritime Safety Committee, at its sixty-fourth session (5 to 9 December 1994), approved Guidelines for the performance and testing criteria and surveys of high-expansion foam concentrates for fixed fire-extinguishing systems, given in annex.
- 2 Member Governments are recommended to ensure that tests for type approval and periodical control of the high-expansion foam concentrates are performed in accordance with the annexed guidelines.

## ANNEX

# **GUIDELINES FOR THE PERFORMANCE AND TESTING CRITERIA AND SURVEYS OF HIGH-EXPANSION FOAM CONCENTRATES FOR FIXED FIRE-EXTINGUISHING SYSTEMS**

## **1 General**

### 1.1 Application

These guidelines apply to the foam concentrates for fixed high-expansion foam fire-extinguishing systems referred to in SOLAS regulation II -2/9.

### 1.2 Definitions

(As per annex to MSC/Circ. 582).

## **2 Sampling procedure**

(As per annex to MSC/Circ. 582).

## **3 Tests for type approval of foam concentrates**

(Paragraphs 3.1 to 3.5 are the same as per annex to MSC/Circ. 582).

(Reference in paragraph 3 is to be modified from "3.1-3.11" to "3.1-3.10").

(Reference in paragraph 3.2 is to be modified from "3.9" to "3.8").

### 3.6 Expansion ratio

3.6.1 The test should be carried out according to paragraph 3.6.2, with sea water at about 20°C. Simulated sea water with the characteristics stated under 3.6.3 may be used. The expansion ratio obtained with the foam generators used on board should be consistent with the expansion ratio obtained with the foam generators during the fire test.

#### 3.6.2 Determination of the expansion ratio

##### (a) Apparatus :

- plastic collecting vessel of volume  $V$ , approximately 500 L and accurately known to  $\pm 5$  L ;
- high expansion foam-malting equipment which when tested with water has a flow rate of  $6.1 \pm 0.1$  L /min at a nozzle pressure of  $(5.0 \pm 0.1)$  bar.

An example for a suitable apparatus is given in document ISO7203-2.

(b) Procedure :

- (b. 1) Wet the vessel-internally and weigh it ( $W_1$ ). Set up the foam equipment and adjust the nozzle pressure to give a flow rate of 6.1 L/min. With the discharge facility closed, collect foam in the vessel. As soon as the vessel is full, stop collecting foam and strike the foam surface level with the rim. Weigh the vessel ( $W_2$ ). During the filling operation, keep the discharge facility in the bottom of the vessel closed until the total weight of the foam is determined.

- (b. 2) Calculate the expansion E from the equation:

$$E = \frac{V}{W_2 - W_1}$$

in which it is assumed that the density of the foam solution is 1.0 kg/L and where :

$V$  is the vessel volume, in mL;

$W_1$  is the mass of the empty vessel, in grammes;

$W_2$  is the mass of the full vessel, in grammes.

Assume that the density of the foam solution is 1.0 kg/L.

- (b.3) Open the drainage facility and measure the 50% drainage time (see paragraph 3.7.1 hereinafter ). Determine the drainage either by having the vessel on a scale and recording the weight loss, or by collecting the drained foam solution in a measuring cylinder. Care should be taken to ensure that there are no voids in the foam collected in the vessel.

3.6.3 Simulated sea water may be made up by dissolving:

- 25.0 g Sodium chloride ( $\text{NaCl}$ ) ;
- 11.0 g Magnesium chloride ( $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ ) ;
- 1.6 g Calcium chloride ( $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ ) ;
- 4.0 g Sodium sulphate ( $\text{Na}_2\text{SO}_4$ ).

in each litre of potable water.

3.7 Drainage time

3.7.1 The drainage time should be determined, after having determined the expansion ratio, according to paragraph 3.6.2(b.3).

3.7.2 The test should be carried out with sea water at about 20°C. Simulated sea water with the characteristics stated in 3.6.3 may be used.

3.7.3 Drainage time obtained with the foam generators used on board should be consistent with the drainage time obtained with the foam generators during the fire test.

3.8 Fire tests

Fire tests should be carried out according to the following paragraphs 3.8.1 to 3.8.7.

**NOTE:** The fire tests of section 3.8 are more expensive and time consuming than the other these guidelines. It is recommended that fire tests should be carried out at the end of the test programme, so as to avoid expense of unnecessary testing of foam concentrates which do not comply in other respects.

#### 3.8.1 Environmental conditions

- Air temperature :  $(15 \pm 5)$ ;
- Maximum wind speed : 3 m/s in proximity of the fire tray.

#### 3.8.2 Records

During the fire test, record the following:

- indoor or outdoor test;
- air temperature;
- fuel temperature;
- water temperature ;
- foam solution temperature;
- wind speed;
- extinction time.

#### 3.8.3 Foam solution

- (a) Prepare a foam solution, following the recommendations from the supplier for concentration, maximum prefix time, compatibility with the test equipment, avoiding contamination by other types of foam, etc.
- (b) The test should be carried out with sea water at about 20°C . Simulated sea water with the characteristics stated in 3.6.3 may be used.

#### 3.8.4 Apparatus

- (a) Fire tray:

Circular fire tray of steel with dimensions as follows:

diameter at rim:  $(1,480 \pm 15)$  mm;

depth:  $(150 \pm 10)$  mm;

nominal thickness of steel wall : 2.5 mm.

NOTE: The tray has an area of approximately 1.73 m<sup>2</sup>.

- (b) Foam-making equipment:

In accordance with subparagraph 3.6.2 (a).

- (c) Fire screens :

Fire screens of nominal 5 mm square metal mesh to form the nominal arrangement mentioned in subparagraph 3.8.6.

#### 3.8.5 Fuel

Use an aliphatic hydrocarbon mixture with physical properties according to the following specification

- distillation range: 84°C-105°C ;
- maximum difference between initial and final boiling points: 10°C;
- maximum aromatic content: 1% ;
- density at 15°C :  $(707.5 \pm 2.5)$  kg/m<sup>3</sup>
- temperature: about 20°C.

**NOTE:** Typical fuels meeting this specification are n-heptane and certain solvent fractions sometimes referred to as commercial heptane.

The Administration may require additional fire tests using an additional test fuel.

#### 3.8.6 Test procedure

- (a) Place the tray directly on the ground and ensure that it is level. Add approximately 30 litres of sea water, or simulated sea water with the characteristics stated in 3.6.3, and  $(55 \pm 5)$  litres of fuel, to give a nominal freeboard of 100 mm.
- (b) Place the net screens around the fire tray as shown in figure 2.. Within 5 min ignite the fuel and allow it to burn for a period of not less than 45 s. Commence foam generation with the foam generator some distance from the fire.  
( $60 \pm 5$ ) s after full involvement move the foam generator to the opening between the net screen and apply foam to the fire. Apply foam for a period of  $(120 \pm 2)$  s. Record the extinction time as the period from start of foam application to extinction.

#### 3.8.7 Permissible limits

extinction time: not more than 120 s.

#### 3.9 Corrosiveness

(As per paragraph 3.10 of annex to MSC/Circ. 582).

#### 3.10 Volumic mass

(As per paragraph 3.11 of annex to MSC/Circ. 582).

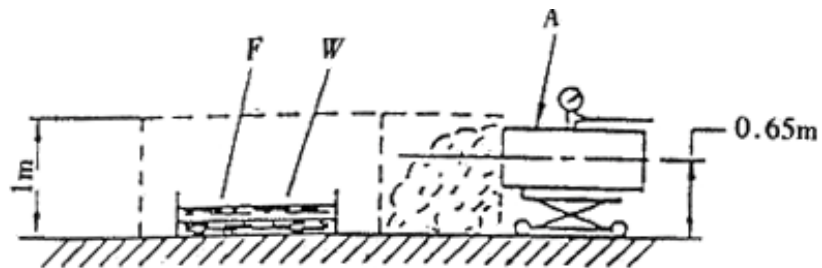
### **4 Periodical controls of foam concentrates stored on board**

(As per annex to MSC/Circ. 582).

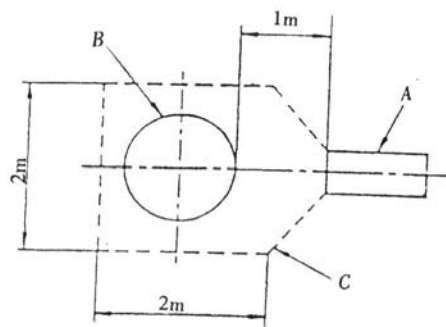
### **5 Interval of periodical controls**

(As per annex to MSC/Circ. 582).

**Figure 1**  
(as per figure 1 of annex MSC/Circ.582)



- A——High expansion foam generator on wheeled trolley
- B——Tray;
- C——Metal mesh screens;
- F——Fuel
- W——Water



All dimensions are nominal in m

**Figure2:Fire test arrangement**