MARITIME AND PORT AUTHORITY OF SINGAPORE
SHIPPING CIRCULAR TO SHIP OWNERS
NO. 8 OF 2011

MPA Shipping Division
460 Alexandra Road
21st Storey PSA Building
Singapore 119963
Fax: 6375-6231
http://www.mpa.gov.sg

22 MARCH, 2011

Applicable to: This circular is for the attention of ship owners, managers, operators, agents, masters, crew members and surveyors

GUIDANCE ON SHIPBOARD OPERATIONAL MATTERS: CIRCULARS APPROVED BY THE 88th SESSION OF THE MARITIME SAFETY COMMITTEE (MSC 88) OF IMO

Related circular: Shipping circular no. 7 of 2011 – *Resolutions adopted by the 88th Session of the Maritime Safety Committee (MSC 88) of IMO*

1. The Maritime Safety Committee of IMO, at its 88th session (24 Nov–3 Dec 2010), approved a number of circulars which provide guidance to improve the safety and efficiency of shipboard operations. This shipping circular informs the Shipping Community of the MSC circulars, as listed below. Queries should be directed to the contact officer/s concerned.

a. Health

- MSC.1/Circ.1374 – Information on prohibiting the use of asbestos on board ships

  From 1 January 2011, installation of materials that contain asbestos is prohibited, under SOLAS regulation II-1/3-5, for all ships without exceptions. The purpose of the circular is to raise awareness about the dangers of asbestos and to ensure ships remain free of asbestos containing materials (ACMs) throughout their service life.

  Contact officer: Mr Ong Hua Siong (tel: 6375-6210)

b. Fire Safety

- MSC.1/Circ.1384 – Guidelines for testing and approval of fixed high-expansion foam systems

  The MSC approved the guidelines in advance of the expected adoption of the revised chapter 6 of the FSS Code by MSC 90 in May 2012, to enable equipment manufacturers to make early preparations for its entry into force (date to be determined at MSC 90). The guidelines should be applied when approving fixed high-expansion foam systems in accordance with the revised chapter 6 of the FSS Code.

- MSC.1/Circ.1385 – Scientific methods on scaling of test volume for fire test on water-mist fire-extinguishing systems

  The circular concerns the scientific methods on scaling of test volume for fire test on water-mist fire-extinguishing systems in conjunction with MSC/Circ.1165 ("Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms"), whereby the scaling from the maximum tested volume to larger volumes is set out in a table in the circular.

- MSC.1/Circ.1386 – Amendments to the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165)

  The amendments concern redundant means of pumping (main and standby pumps) and ceiling and bilge nozzles.

- MSC.1/Circ.1387 – Revised Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces (MSC/Circ.913)

  The circular supersedes MSC/Circ.913, except that fire and component tests previously conducted in accordance with MSC/Circ.913 remain valid for the approval of new systems. Existing fixed water-based local application fire-fighting systems approved and installed based on MSC/Circ.913 are permitted to remain in service as long as they are serviceable.

  MPA accepts the guidance given in the circulars and ship owners and managers should approach the class of their vessels for further details.

  Contact officer: Mr Ong Hua Siong (tel: 6375-6210)

c. Ship stability

MSC.1/Circ.1380 – Guidance for watertight doors on passenger ships which may be opened during navigation

Owners and operators of Singapore-flagged passenger ships and ferries are reminded that all watertight and weathertight doors are to *remain closed at all times during the voyage. Any owner or operator wishing to apply this guidance should make application to MPA with valid reasons.*

Contact officer: Mr Ong Hua Siong (tel: 6375-6210)

d. Carriage of bulk cargoes

- DSC.1/Circ.63 – Carriage of iron ore fines that may liquefy

  The circular is intended to raise awareness of the probable dangers of liquefaction associated with the carriage of iron ore fines. Iron ore fines is not specifically listed in the International Maritime Solid Bulk Cargoes (IMSBC) Code.

  Shipmasters should also refer to section 7 of the IMSBC Code, which warns about cargoes that may liquefy and should exercise good seamanship when handling and carrying this cargo.

  Contact officer: Mr Philip Yeo (tel: 6325-2449)

e. Safety of Navigation

- MSC.1/Circ.1389 – Guidance on procedures for updating shipborne navigation and communication equipment
- SN.1/Circ.266/Rev.1 – Maintenance of Electronic Chart Display and Information Systems (ECDIS) software

  These circulars emphasise the need for regular updates to application software and firmware of shipboard electronic systems, in particular with the entry into force of the ECDIS mandatory carriage requirements on 1 Jan 2011. Any ECDIS system which is not upgraded to the latest version of the IHO's S-52 Presentation Library may not display new symbols and features correctly or at all. This will affect safety of navigation.

  Shipowners should ensure that their equipment suppliers have the mechanism to provide the necessary support in this regard.

  See also Shipping Circular No. 3 of 2011.

- MSC.1/Circ.1391 – Operating anomalies identified within ECDIS

  MSC 88 was informed of anomalies relating to the display and alarm behaviour in the operation of some ECDIS systems and it may be possible that other anomalies remain to be discovered.

  MPA invites shipmasters to report ECDIS anomalies, in particular those that might affect safety of navigation.

- SN.1/Circ.293 – Routeing measures other than traffic separation schemes

  The circular contains new routeing measures and amendments to existing routeing measures:

  (1) new Area To Be Avoided in the Atlantic Ocean, "Off the coast of Ghana" (0000 hours UTC on 1 June 2011);
  (2) new deep-water route including an associated precautionary area "In the approaches to the new port of King Abdullah port (KAP Port) in the Northern Red Sea" (exact implementation date to be announced by Saudi Arabia in due course);
  (3) amendments to the existing Area To Be Avoided, "Off the south-west coast of Iceland" (0000 hours UTC on 1 June 2011);
  (4) amendments to the existing deep-water route forming part of the "In the Strait of Dover and adjacent waters" traffic separation scheme (0000 hours UTC on 1 June 2011); and
  (5) new interim recommendatory measure in the Singapore Strait (0000 hours UTC on 1 July 2011).

  The aforementioned routeing measures will be implemented at the times as indicated above.

- SN.1/Circ.294 –Mandatory Ship Reporting Systems

  The amendments to existing mandatory ship reporting systems are as follows:

  (1) "In the Sound between Denmark and Sweden" (SOUNDREP) (new system) (0000 hours UTC on 1 September 2011);
  (2) "In the Torres Strait region and the Inner Route of the Great Barrier Reef" (REEFREP) (amended system) (0000 hours UTC on 1 July 2011); and
  (3) "Off the south and south-west coast of Iceland" (TRANSREP) (amended system) (0000 hours UTC on 1 June 2011).

  The amendments to these existing mandatory ship reporting systems will be implemented at the times indicated above.

  Masters of ships are advised that they are required to comply with the requirements of the adopted ship reporting systems, in accordance with regulation V/11.7 of SOLAS.

- COLREG.2/Circ.62 – New and amended traffic separation schemes

  The new and amended existing traffic separation schemes and associated routeing measures are as follows:

  (1) "Off the western coast of Norway" (new scheme);
  (2) "Off the southern coast of Norway" (new scheme);
  (3) "In the Strait of Dover and adjacent waters" (amended scheme); and

(4) “Off the south-west coast of Iceland” (amended scheme).

The aforementioned TSS will be implemented at 0000 hours UTC on 1 June 2011.

In addition the MSC also revoked the existing TSS “Off Feistein” with effect from 0000 hrs UTC on 1 Jun 2011.

- SN.1/Circ.295 – Guidelines for safety zones and safety of navigation around offshore installations and structures

  The recent increase in offshore exploration in has resulted in the construction of offshore artificial islands, installations and structures, which poses a challenge to safe navigation. The circular is intended to increase awareness of the availability and best use of existing routeing measures for safety of navigation.

  Shipmasters are to note in particular the relevant guidance in paragraph 4.2 of the circular – to take all necessary precautions and to observe the coastal State’s conditions for navigation within the safety zones.

  Contact officer: Capt Sangam (tel: 6375-6205)

2. Ship owners are urged to implement the recommendations in the circulars. They may approach the nine approved classification societies to seek further guidance.

CHEONG KENG SOON
DIRECTOR OF MARINE
MARITIME AND PORT AUTHORITY OF SINGAPORE

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T1/2.04

MSC.1/Circ.1374
3 December 2010

INFORMATION ON PROHIBITING THE USE OF ASBESTOS ON BOARD SHIPS

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), approved information on prohibiting the use of asbestos on board ships, as set out in the annex, with the aim of raising awareness about the dangers involved among parties concerned.

2 Member Governments, in their capacity as flag, port or coastal States, as well as international organizations concerned, are invited to note the information provided herein and bring it to the attention of all parties concerned (including maritime Administrations, recognized organizations, port authorities, shipbuilders and ship repairers, and equipment suppliers), requesting them to make use of it as it may be deemed appropriate.

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ANNEX

INFORMATION ON PROHIBITING THE USE OF ASBESTOS ON BOARD SHIPS

Introduction

1 Since 1 July 2002, the installation of materials that contain asbestos has, under SOLAS regulation II-1/3-5, been prohibited for all ships, except for some vanes, joints and insulation. From 1 January 2011, any installation of materials that contain asbestos will, under SOLAS regulation II-1/3-5, be prohibited, for all ships without exceptions.

2 Despite the clear and unambiguous prohibition of asbestos containing materials (ACMs), asbestos is still found on various locations on board ships. During inspections, asbestos has been found in such places as fire blankets, joints and insulation materials, types of sealants, friction material for brakes, wall and ceiling coverings, cords, remnants, electric fuses, etc. Moreover, ships that initially were free of asbestos appear to have asbestos on board as a result of repairs at shipyards and/or of purchasing spare parts at a later stage.

Purpose

3 The purpose of this circular is to:

.1 raise awareness among maritime Administrations, recognized organizations, shipbuilders and ship repairers, equipment suppliers and all other parties concerned of the fact that asbestos is still being used on ships, notwithstanding its prohibition as stated in paragraph 1 above;

.2 highlight that the principal means of addressing the issue of asbestos being found on board ships in contravention of the aforementioned provisions of SOLAS rests with shipyards and ship suppliers purchasing and installing asbestos free material;

.3 underline the importance of proper training of surveyors and inspectors in detecting asbestos and ACMs on board ships;

.4 prevent any further use of asbestos on board ships; and

.5 stress the importance of maritime Administrations taking appropriate action in case ACMs are found on board ships, in contravention of the aforementioned provisions of the SOLAS Convention.

Applicability on seagoing ships

4 Ships built before 1 July 2002 are allowed to have ACMs on board. However, the ACMs are only allowed as long as they do not pose a risk to the crew's health. The crew should be aware of the dangers of asbestos and should know how to deal with asbestos in case disturbance of the ACMs cannot be avoided[1].

[1] Refer to MSC/Circ.1045, Guidelines for maintenance and monitoring of on-board materials containing asbestos.

5 Since 1 July 2002, new installation of ACMs on board all ships has been allowed only in exceptional cases.

6 From 1 January 2011, new installation of ACMs on board all ships will, without exception, no longer be allowed.

Recognizing asbestos containing materials

7 Asbestos is used for its specific characteristics such as fire resistance, thermal insulation, electrical insulation, strength, flexibility, etc. Therefore, asbestos is used in various locations throughout a ship. Inspectors should be aware of the large number of probable asbestos applications on board.

8 Asbestos is a fibrous material and can often be identified visually on that basis. However, most asbestos is used on board in materials where it cannot easily be identified visually.

9 It is recommended that, whenever an item or material is to be installed, it is ensured that the item or material has a statement of compliance, or similar, with the relevant SOLAS regulation. This may take the form of an "asbestos free declaration". Due diligence should be paid to such statements or declarations and it is recommended that random confirmations are carried out.

10 Although asbestos in most ACMs can only be ascertained by experts in specialized laboratories, it is possible to provide training to crew members, surveyors and inspectors in identifying materials that might be ACMs. As a result of such training, the crew and ship surveyors and inspectors can avoid health risks by having the suspected material sampled and analysed first. In case sampling and analysing by experts is not possible, the crew and ship surveyors and inspectors should treat the material as if it contains asbestos in order to avoid possible health risks.

Training of surveyors and inspectors

11 Surveyors and inspectors that are charged with asbestos investigations on board ships should be trained in recognizing asbestos and ACMs. They should also be trained in taking samples and should be instructed when to call in experts to conduct the investigation.

12 Surveyors and inspectors should be aware of the dangers of exposure to asbestos and should, while performing their corresponding duties, take all necessary precautions.

Action to be taken in case of contraventions of the SOLAS Convention regulation II-1/3-5

13 When asbestos is detected on board, in contravention of SOLAS regulation II-1/3-5, action should be taken to have it removed. The removal – assigned to professional asbestos removal companies – should take place within a time frame of 3 years from the date when the contravention is found and should be conducted in close consultation with and, where applicable, under the supervision of the flag State concerned. In such cases, a suitable exemption certificate should be issued by the flag State.

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INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

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Ref. T4/4.01

MSC.1/Circ.1384
10 December 2010

GUIDELINES FOR THE TESTING AND APPROVAL OF FIXED HIGH-EXPANSION FOAM SYSTEMS

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), having considered the proposal by the Sub-Committee on Fire Protection, at its fifty-fourth session, approved the Guidelines for testing and approval of fixed high-expansion foam systems, set out in the annex.

2 Member Governments are invited to apply the annexed Guidelines when approving fixed high-expansion foam systems in accordance with the revised chapter 6 of the FSS Code*, which is expected to be adopted at MSC 90 (May 2012), and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

3 This circular supersedes MSC.1/Circ.1271, except that fire and component tests previously conducted in accordance with MSC.1/Circ.1271 remain valid for the approval of new systems.

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* The draft revised chapter 6 of the FSS Code was approved by MSC 88, and is contained in the report of the Committee (MSC 88/26/Add.2, annex 8). Equipment manufacturers should prepare in advance for the adoption of the new chapter 6.

ANNEX

GUIDELINES FOR THE TESTING AND APPROVAL OF FIXED HIGH-EXPANSION FOAM SYSTEMS

1 GENERAL

1.1 Scope

1.1.1 These Guidelines specify the test procedures for the type approval of fixed high-expansion foam systems. The procedures consist of the following parts:

.1 appendix 1: fire test procedures for evaluating the fire-extinguishing effectiveness of the foam system;

.2 appendix 2: component manufacturing test procedures intended to ensure the operability of the system components in the marine environment; and

.3 appendix 3: procedures for determining the discharge capacity of the high-expansion foam generators.

1.1.2 These Guidelines are not intended for testing the performance of high-expansion foam concentrates.

1.1.3 Appendix 4 to the Guidelines is an optional small scale test intended to verify the fire-extinguishing effectiveness of high-expansion foam when made with hot, smoke-laden inside air. This test is recommended for quality control of foam concentrates, and may also be used to compare the extinguishing performance of foam concentrates made with freshwater to those made with seawater.

1.2 Product consistency

The manufacturer should be responsible for implementing a quality control programme to ensure that production continuously meets the requirements in the same manner as the originally tested samples.

1.3 Application

1.3.1 These Guidelines should be applied to both inside air foam systems and to systems using outside air.

1.3.2 All foam generators should be subjected to the fire tests and foam generator capacity tests described in appendices 1 and 3.

1.3.3 Only inside air foam generators should be subjected to the component manufacturing tests in appendix 2.

APPENDIX 1

FIRE TEST METHOD FOR FIXED HIGH-EXPANSION FOAM SYSTEMS

1 SCOPE

The test method is intended for evaluating the extinguishing performance of high-expansion foam fire-extinguishing systems. System approval should be based on the nominal filling rate, water pressure and other conditions used during the specified tests.

2 SAMPLING

The components to be tested should be supplied by the manufacturer together with design and installation criteria, operational instructions, drawings and technical data sufficient for the identification of the components.

3 FIRE TESTS

3.1 Test principles

This test procedure enables the determination of design criteria and the effectiveness of high-expansion foam fire-extinguishing systems against spray and pool fires, which are obstructed by a simulated engine. The test procedures are intended for the approval of foam systems for the protection of machinery spaces, cargo pump-rooms, vehicle and ro-ro spaces, special category spaces and cargo spaces.

3.2 Test description

3.2.1 *Test enclosure*

3.2.1.1 The tests should be performed in a room having an ambient temperature of 10ºC to 25ºC at the start of each test. Details of the test hall geometry, the ventilation conditions and environmental conditions should be given in the fire test report.

3.2.1.2 The fire-extinguishing tests of the system should be carried out using the following test compartments:

.1 Test compartment 1

The test should be performed in a 100 m^2 room with 5 m ceiling height and ventilation through a 2 m x 2 m door opening according to figure 2. The engine mock-up should be designed according to figures 1 and 3. The door opening to the test compartment may be covered during the test at the same rate as the foam layer is building up in the compartment to avoid foam leakage through the door opening.

.2 Test compartment 2

The test should be performed in a test compartment having a volume greater than 1,200 m^3, but not greater than 3,500 m^3, and a ceiling height exceeding 7.5 m. The ventilation of the test compartment should be achieved by a 2 m x 2 m door opening at floor level (as in test compartment 1) combined with a maximum 20 m^2 total ventilation area, distributed in the ceiling and/or along the walls, just below the ceiling. The door opening to the test compartment may be covered during the test at the same rate as the foam layer is building up in the compartment to avoid foam leakage through the door opening.

3.2.2 ***Simulated engine***

The fire test should be performed in a test apparatus consisting of:

.1 a simulated engine* of size (width x length x height) 1 m x 3 m x 3 m constructed of sheet steel with a nominal thickness of 5 mm. The simulated engine is fitted with two steel tubes of 0.3 m in diameter and 3 m in length, which simulate exhaust manifolds and a grating. At the top of the simulated engine a 3 m^2 tray is arranged (see figures 1 and 3); and

.2 a floor plate system of 4 m x 6 m and 0.5 m in height surrounding the simulated engine with a tray (4 m^2 in area), underneath (see figure 1).

3.2.3 ***Test programme***

The fire test should be carried out using the following fire scenarios:

.1 combination of the following fire programmes (Test fuel: commercial fuel oil or light diesel oil):

    .1 low-pressure spray on top of the simulated engine centred with nozzle angled upward at a 45° angle to strike a 12 mm to 15 mm diameter rod 1 m away; and

    .2 fire in trays under (4 m^2) and on top (3 m^2) of the simulated engine;

.2 high-pressure horizontal spray fire on top of the simulated engine. (Test fuel: commercial fuel oil or light diesel oil);

.3 low pressure concealed horizontal spray fire on the side of the simulated engine with oil spray nozzle positioned 0.1 m in from the end of the simulated engine and 0.1 m^2 tray positioned 1.4 m in from the engine end at the inside of floor plate. (Test fuel: commercial fuel oil or light diesel oil); and

.4 flowing fire 0.25 kg/s from top of mock-up (see figure 3) (Test fuel: heptane).

* Safety precaution – appropriate drains or overpressure relief capability should be provided to reduce the risk of explosion from fuel leakage inside the engine mock-up.

Table 1 – *Oil spray fire test parameters*

Fire type	Low pressure	High pressure
Spray nozzle	Wide spray angle (120° to 125°) full cone type	Standard angle (at 6 bar) full cone type
Nominal oil pressure	8 bar	150 bar
Oil flow	0.16 ± 0.01 kg/s	0.050 ± 0.002 kg/s
Oil temperature	20 ± 5°C	20 ± 5°C
Nominal heat release rate	5.8 ± 0.6 MW	1.8 ± 0.2 MW

3.2.4 ***Foam generator installation requirements for tests***

3.2.4.1 *General*

3.2.4.1.1 Foam generators and foam delivery duct outlets should not be installed above the simulated engine in such a way that the foam flow directly hits the test fires. The generators and foam delivery duct outlets should also not be located near the door or ventilation openings.

3.2.4.1.2 The inlet foam solution supply pressure to the foam generators should be maintained within the acceptable range determined in appendix 3, throughout the tests.

3.2.4.1.3 The number and spacing of foam generators and foam delivery duct outlets should be based on the manufacturer's system design and installation manual.

3.2.4.1.4 The mounting arrangement and orientation of the foam generators should be in accordance with the manufacturers' instruction.

3.2.4.2 *Inside air foam systems*

3.2.4.2.1 Foam generators should be installed inside the test room at the uppermost level of the space. The vertical distance between the generators and test room ceiling and floor should be recorded and reflected in the manufacturer's design manual.

3.2.4.3 *Systems using outside air*

3.2.4.3.1 For systems where the foam generators will be located outside the protected space, the test generators should be located outside the test room and arranged to supply foam through ducts of equivalent size or diameter as the foam generator. The length and configuration of the foam delivery ducts should be the maximum length to be used on board as specified by the manufacturer, but in no case less than 5 m vertically and 5 m horizontally. Foam delivery duct outlets should be located near the ceiling, or if located on a side wall, within 1 m of the ceiling. The locations of the foam delivery duct outlets should be recorded and reflected in the manufacturer's design manual.

3.2.4.3.2 For systems where the foam generators will be located inside the protected space and supplied by fresh air ducts, the test generators should be located on the manufacturer's instructions.

4 TEST PROCEDURE

4.1 Preparation

4.1.1 Combination fire (paragraph 3.2.3.1 above): the 4 m^2 fire tray below the engine mock-up should be filled with at least 50 mm fuel on a water base with a freeboard of 150 ± 10 mm. The 3 m^2 fire tray on top of the engine should be filled with at least 50 mm fuel on a water base with a freeboard of 40 ± 10 mm (this requires that the notch on the side of the 3 m^2 fire tray is blocked off by an appropriate means, e.g., steel plate).

4.1.2 Low pressure concealed fire and 0.1 m^2 tray fire (paragraph 3.2.3.3 above): the 0.1 m^2 tray should be filled with at least 50 mm fuel on a water base with a freeboard of 150 ± 10 mm.

4.1.3 Flowing fire (paragraph 3.2.3.4 above): the 4 m^2 fire tray below the engine mock-up should be filled with a 50 mm water base and the 3 m^2 fire tray on top of the engine mock-up should be filled with a 40 mm water base. The fuel should be ignited when flowing down the side of the mock-up, approximately 1 m below the notch. The pre-burn time should be measured from the ignition of the fuel.

4.1.4 Freshwater may be used for practical reasons if it is shown that seawater provides the same level of performance. This should be done either by repeating the freshwater test with the longest time to extinguishment with seawater to ensure that the minimum performance requirements are still fulfilled, or to use the small scale test method in appendix 4 to these Guidelines. If the system is tested in more than one test compartment, the seawater test should be performed in test compartment 2.

4.2 Measurements

The following should be measured during the test:

.1 oil flow and pressure in the oil system;

.2 foam concentrate flow and pressure, and water flow and pressure in the extinguishing system;

.3 oxygen concentration in the test compartment. The sampling point should be located 4.5 m from the centre of the engine mock-up on the exhaust pipe side and 2.5 m from floor level (the measurement may be terminated when the foam fills up to the oxygen sampling point);

.4 temperatures at the fire locations. Thermocouples should be located 1 m in front of the spray nozzles and 0.5 m above the tray fuel surface, to provide additional information about time to extinguishment;

.5 temperatures at the inside air foam generators. Thermocouples should be located to measure the air temperature at the foam generator air inlet, 0.1 m to 0.2 m behind the water/premix nozzles;

.6 foam solution pressure at the inlet to one of the foam generators; and

.7 air supply pressure at the inlet to one of the foam generators for outside air systems.

4.3 Pre-burn

After ignition of all fuel sources, a 2 min pre-burn time is required for the tray fires, and 15 s for the spray fires and flowing heptane fires before the extinguishing agent is discharged.

4.4 Duration of test

The overall time to extinction should not exceed 15 min. The oil spray and heptane, if used should be shut off 15 s after the fire has been judged extinguished. The foam system should be operated for a minimum of 1 min after fire extinguishment.

4.5 Observations before the fire test

Temperature of the test room, fuel and the simulated engine should be measured and recorded.

4.6 Observations during the fire test

The following observations should be recorded:

.1 start of ignition procedure;

.2 start of the test (ignition);

.3 time when the system is activated;

.4 time when inside air foam generators begin producing foam;

.5 foam transit time from outside air generators to the delivery duct outlets;

.6 time when the fire is extinguished;

.7 time when the fire is re-ignited, if any;

.8 time when the oil flow for the spray fire is shut off;

.9 time when the fire-extinguishing system is shut off; and

.10 time when the test is finished.

4.7 Observations after fire test

The following should be recorded:

.1 damage to any system components; and

.2 level of fuel in the tray(s) to ensure that no limitation of fuel occurred during the test.

5 CLASSIFICATION CRITERIA

The overall time to extinction should not exceed 15 min, and at the end of discharge of foam and fuel, there should be no re-ignition or fire spread.

6 TEST REPORT

The test report should include the following items:

.1 name and address of the test laboratory;

.2 date and identification number of the test report;

.3 name and address of client, manufacturer and/or supplier of the system;

.4 purpose of the test;

.5 name or other identification marks of the product;

.6 description and specifications of the tested system and foam concentrate;

.7 date of the test;

.8 test methods;

.9 drawing of each test configuration and test compartment;

.10 identification of the test equipment and instruments used (including type and manufacturer of the foam concentration);

.11 nominal flow rate, nominal application rate and nominal filling rate;

.12 foam mixing rate;

.13 foam expansion;

.14 water supply pressure;

.15 foam supply pressure and air supply pressure, if applicable, at inlet to foam generator;

.16 temperatures at the inside air foam generators;

.17 ventilation conditions;

.18 conclusions;

.19 deviations from the test method, if any;

.20 test results including observation and measurement before, during and after the test; and

.21 date and signature.

7 APPLICATION OF TEST RESULTS

7.1 Systems that have been successfully tested to the provisions of section 3 may be installed in different size spaces according to the following:

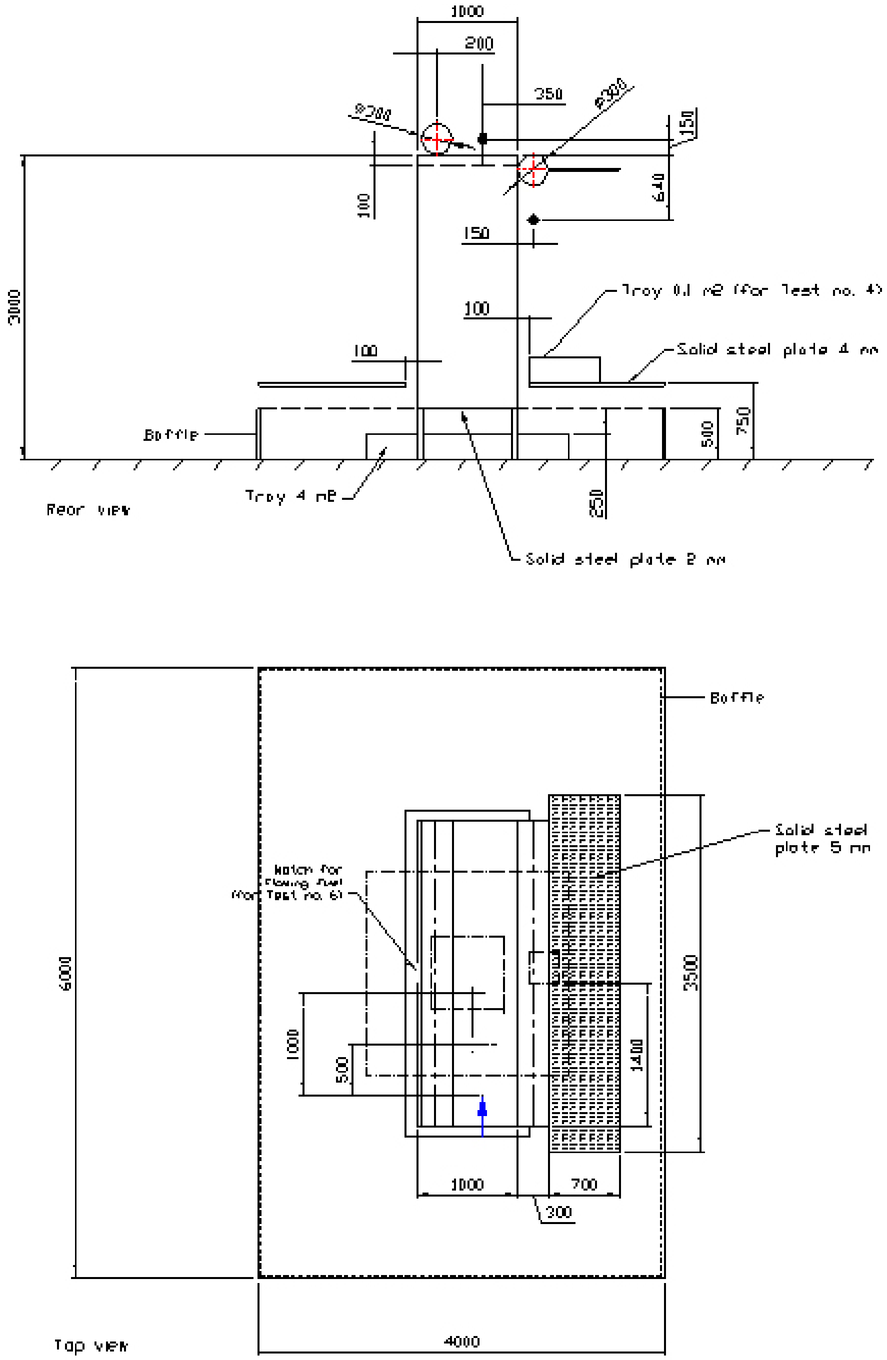
.1 the extinguishing system configuration and filling rate used for the test compartment 1 tests may be applied to systems for the protection of shipboard spaces of equal or less volume than 500 m^3;

.2 the extinguishing system configuration and filling rate used for the test compartment 2 tests may be applied to systems for the protection of shipboard spaces of equal or greater volumes than that of test compartment 2; and

.3 for the protection of shipboard spaces with volumes between test compartments 1 and 2, linear interpolation of the filling rates obtained for test compartments 1 and 2, respectively, should be applied. Despite the above, the filling rate used for the test compartment 2 tests may be applied to systems for the protection of small spaces within protected machinery spaces having volumes less than test compartment 2, such as workshops and similar spaces not containing combustion engines, boilers, purifiers and similar equipment.

7.2 If freshwater is used in the fire tests, any differences in expansion ratios between freshwater and simulated seawater (nominal expansion ratio measured according to standard EN13565-1, annex G, and expansion ratio measured according to "small scale test method") should be reflected in the manufacturer's installation guide. If the foam expansion ratios differ between freshwater and simulated seawater, the nominal application rate used in the fire tests should be adjusted to the level that corresponds to the nominal filling rate based on the lower expansion ratio.

Example: The fire tests were performed using freshwater with nominal filling rate of 2 m/min, corresponding to a nominal application rate of 4 *l*/min/m^2 and nominal expansion ratio with freshwater of 500. Tests according to "small scale test method" and standard EN 13565-1, annex G, showed that the lowest expansion ratio is 425 with seawater. The design application rate should in this case be at least: 4.0*(500/425) = 4.7 *l*/min/m^2.


1000
200
350
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640
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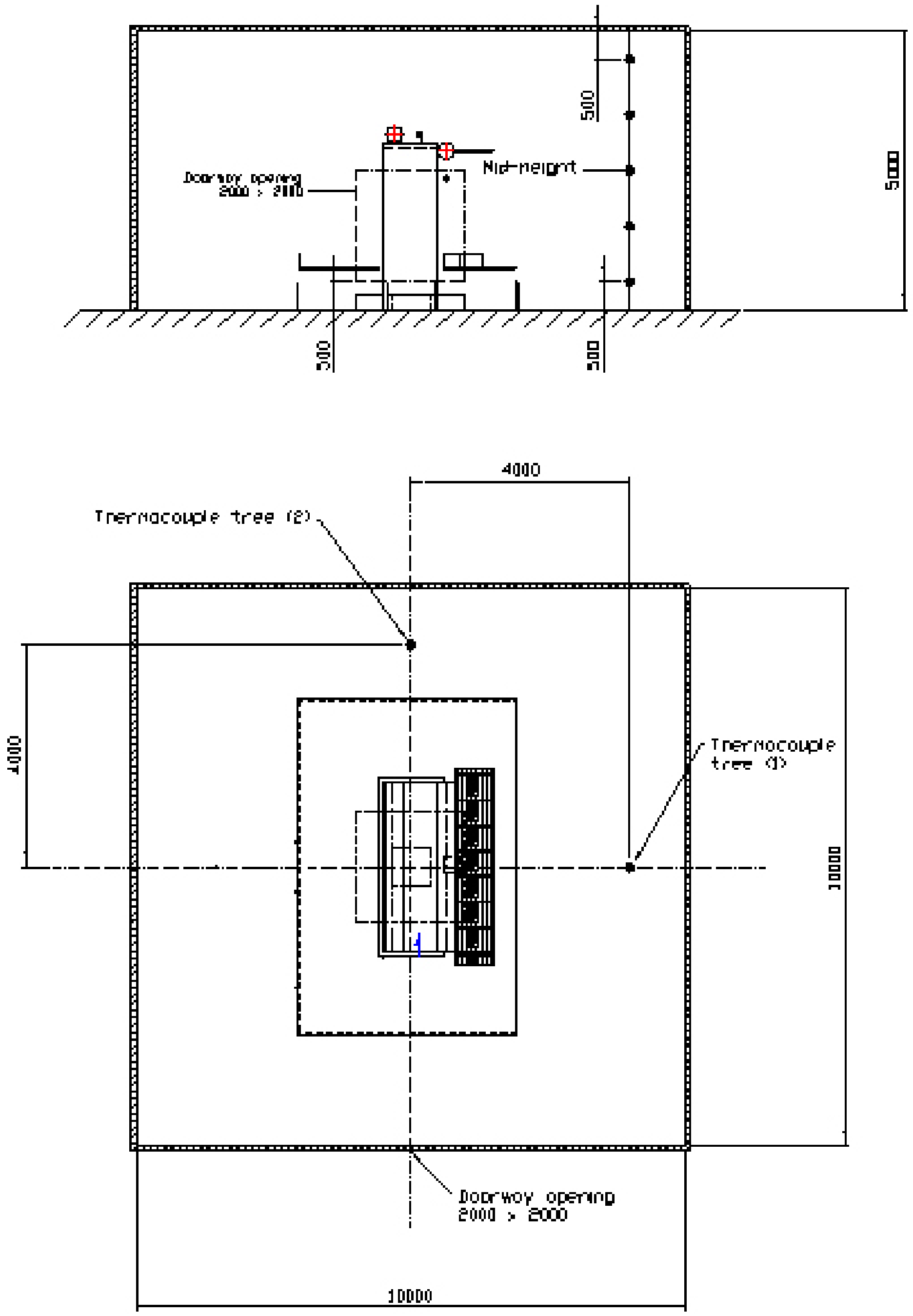
3000
Tray 0.1 m2 (for Test no. 4)
Solid steel plate 4 mm
750
500
Baffle
Tray 4 m2
Rear view
250
Solid steel plate 2 mm
Baffle
Solid steel plate 5 mm
Watch for flowing fuel (for Test no. 6)
6000
3500
1000
500
1400
1000
700
300
4000
Top view

Figure 1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Doorway opening
2000 x 2000
Mid-height
5000
500
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4000
Thermocouple tree (2)
4000
Thermocouple
tree (1)
10000
Doorway opening
2000 x 2000
10000

Figure 2

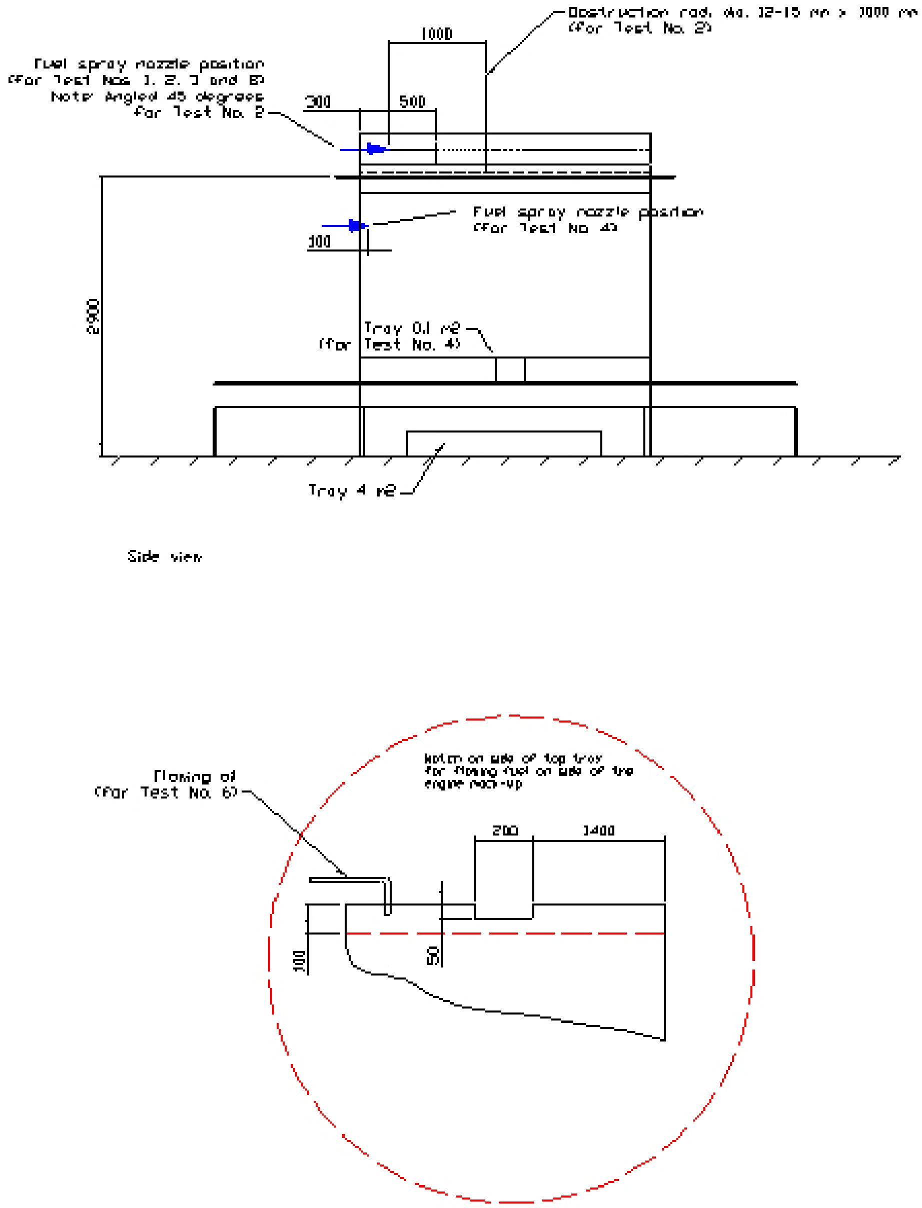

Obstruction rod, dia. 12-15 mm x 1000 mm
(for Test No. 2)
1000
Fuel spray nozzle position
(for Test Nos 1, 2, 3 and 8)
Note: Angled 45 degrees
for Test No. 2
300
500
Fuel spray nozzle position
(for Test No. 4)
100
2900
Tray 0.1 m2
(for Test No. 4)
Tray 4 m2
Side view
Flowing of
(for Test No. 6)
200
1400
100
50

Figure 3

APPENDIX 2

COMPONENT MANUFACTURING STANDARDS FOR HIGH-EXPANSION FOAM SYSTEM GENERATORS

1 All foam generator nozzles should be tested in accordance with the following items stipulated in the indicated paragraphs of the Guidelines developed by the Organization*:

.1 paragraph 3.1 – Dimensions;

.2 paragraph 3.11.1 – Stress corrosion;

.3 paragraph 3.11.2 – Sulphur dioxide corrosion: Visual inspection only may be carried out;

.4 paragraph 3.11.3 – Salt spray corrosion: The test may be carried out at NaCl concentration of 5%. Paragraph 3.14.2 in appendix A to MSC/Circ.1165, as amended by MSC.1/Circ.1269, need not apply;

.5 paragraph 3.15 – Resistance to heat: Where the components are made of steel, this test need not be applied;

.6 paragraph 3.17 – Impact test; and

.7 paragraph 3.22 – Clogging test: where the diameter of the opening of the nozzle exceeds 2.5 mm, this test need not be applied.

2 Foam generators should also be tested in accordance with the following items stipulated in standard EN 13565-1; where applicable, a representative sample of components from the generator may be used:

.1 clause 4: general construction requirements (4.1 (connections), 4.5 (corrosion resistance of metal parts) and 4.8 (heat and fire resistance));

.2 clause 5: discharge coefficients;

.3 clause 6: quality of foam (6.2 (high-expansion components)); and

.4 clause 9: components for medium and high-expansion foam systems.

Foam generators should also be able to withstand the effects of vibration without deterioration of their performance characteristics when tested in accordance with paragraph 4.15 of appendix A of MSC/Circ.1165, as amended by MSC.1/Circ.1269, except that three foam generators should be subjected to the vibration test and the test duration should be 2 h. The mounting arrangement and orientation of the foam generators should be in accordance with the manufacturers' instruction. After the vibration test, the generators should show no visible deterioration. The generator should be connected to a suitable water supply and operated at the maximum

* Refer to appendix A to the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165, as amended by MSC.1/Circ.1269).

operating pressure for 15 min to demonstrate that the generator did not suffer damages. Equivalent alternative testing standards may be used as determined by the Administration. The mounting arrangement and orientation of the foam generators should be in accordance with the manufacturers' instruction.

APPENDIX 3

FOAM GENERATOR CAPACITY TESTS

1 Representative foam generators should be tested to demonstrate their nominal foam production rate over the manufacturer's specified range of inlet pressures. The results of the testing should be reflected in the manufacturer's design and installation manual.

2 The generator should be connected to a suitable water and foam concentrate supply through a pressure regulating device. The generator should then be operated throughout a pressure range of 50% to 150% of the nominal operating pressure in 1 bar increments.

3 The generator should be used to fill a fixed volume container at each tested pressure. The time to fill the container should be recorded and used to calculate the generator output in m^3/min.

4 The nominal foam production rate of the generator should be recorded at all test pressures.

5 The nominal foam production rate of the generator should be greater than or equal to the manufacturer's specified rating.

APPENDIX 4

OPTIONAL SMALL SCALE TEST METHOD FOR HIGH-EXPANSION FOAM CONCENTRATES TO BE USED WITH INSIDE AIR

1 SCOPE

1.1 This fire test method is intended for evaluating and documenting high-expansion foam properties under elevated temperatures. The data could be used for quality control of foam concentrates, as the results from the tests can be compared to results from earlier tests. Therefore, the test method can also be used during the development of new foam concentrates. The test method can also be used for evaluating the influence of using seawater compared to freshwater.

1.2 The test method is NOT intended to serve as a system verification test. Such tests need to be conducted in large scale, using realistic fire conditions and actual foam generators, as the content of the combustion gases also might influence foam production.

Note 1: A high-expansion foam system for inside air consists of both the foam generators and the foam concentrate. When measuring the foam expansion ratio of the system, the actual foam generators should be used. As the actual foam generators in practice are much larger, with higher flow rates, than the foam generator used in this small-scale test method, the method is not intended for determination of the foam expansion of the system. For determination of nominal foam expansion ratio of the system the foam concentrate, using actual foam generator, should be tested according to standard EN 13565-1, annex G (or equivalent).

Note 2: Presently, there are no requirements related to the results given in the test method. However, such criteria could be established in order to test if the foam concentrate has acceptable resistance to heat. The minimum criteria should specify that the foam expansion ratio should be above a certain limit under some specific test conditions in relation to "cold" foam expansion. In that case the test method could be a part of an approval. However, in order to choose sufficient requirements, additional pre-normative tests need to be undertaken.

2 DEFINITIONS

2.1 *Drainage time* is the time taken for the original premix to drain out of the generated foam.

2.2 *Expansion ratio* is the ratio of the volume of foam to the volume of the premix from which it was made.

2.3 *Foam concentrate* is the liquid which, when mixed with water in the appropriate concentration, gives a premix.

2.4 *Premix* is the solution of foam concentrate and water.

3 SAMPLING

The foam concentrate for the tests should be supplied by the manufacturer along with documentation that includes the brand name of the product, manufacturer, the manufacturing site, date of manufacture and batch number.

4 METHOD OF TEST

4.1 Principle

4.1.1 The foam properties of the foam concentrate should be determined using the following two evaluation parameters:

.1 the expansion ratio as a function of gas temperature; and

.2 the drainage time measured at ambient temperature.

Note: Pre-normative testing has verified that drainage time is usually very difficult to record at elevated temperatures.

4.1.2 Normally the foam properties should be measured both with freshwater and with simulated seawater specified in standards ISO 7203-2, annex F, and EN 1568-2, annex G.

4.2 Test equipment

The following test equipment is necessary for the tests:

.1 fire test compartment, as described within this document;

.2 propane gas burner, as described in standard ISO 9705;

.3 high-expansion foam generator, as described within this document;

.4 foam collector vessel for expansion and drainage measurements, as described in standards ISO 7203-2, annex F, and EN 1568-2, annex G;

.5 premix pressure vessel;

.6 air compressor;

.7 load cell; and

.8 stopwatch.

4.3 Tolerances

Unless otherwise stated, the following tolerances should apply:

.1	length:	± 2% of value;
.2	volume:	± 5% of value;
.3	time:	± 5 s; and
.4	temperature:	± 2% of value.

The tolerances are not applicable to the evaluation parameters.

5 THE FIRE TEST COMPARTMENT

5.1 General

5.1.1 The fire test compartment should be constructed using 45 mm by 90 mm wood studs (or equivalent) and non-combustible wall boards, having a nominal thickness of between 10 and 15 mm. The walls and the ceiling should not be insulated.

5.1.2 The compartment should be fitted with a doorway opening, to allow easy access. This doorway should be sealed closed during the tests.

5.1.3 The compartment should be reasonably airtight and, if considered necessary, all gaps between parts of the compartment should be sealed using high-temperature resistant sealant.

5.2 Dimensions

5.2.1 The inner dimensions of the compartment should be:

.1 length: 2,400 mm;

.2 width: 1,200 mm; and

.3 height: 2,400 mm.

5.2.2 The bottom of the walls should be positioned 150 mm above floor level, in order to provide a gap around the bottom perimeter of the compartment, to allow the inflow of fresh air.

5.3 Flame screen

5.3.1 The top part of the test compartment should be fitted with a flame screen, in order to prevent flames and hot combustion gases from flowing directly in to the high-expansion foam generator.

5.3.2 The screen should be made from a perforated (approximately 50% free area) steel sheet. It should cover the width of the test compartment and should extend 600 mm down from the ceiling.

5.4 Position of the high-expansion foam generator

The high-expansion foam generator should be positioned centrically through one of the short sides of the fire test compartment, with its centreline 200 mm below the ceiling. The cone end of the generator should be located 360 mm outside the short side of the fire test compartment.

5.5 Position of the propane gas burner

5.5.1 The propane gas burner should be positioned at the opposite part of the test compartment, relative to the position of the high-expansion foam generator.

5.5.2 The horizontal distance measured from the back and long side walls, should be 600 mm. The propane gas burner should be elevated, such that its top is 500 mm above floor level.

6 PREMIX PRESSURE VESSEL AND PIPING

6.1 A pressure vessel should be used for propelling the premix. The pressure vessel should be connected to an air compressor, via a pressure regulation valve. The outlet should be connected to the high-expansion foam generator, via a shut-off valve.

6.2 The piping to the generator should be connected to a valve arrangement making it possible to switch from water to premix.

7 THE HIGH-EXPANSION FOAM GENERATOR

High-expansion foam generator should have a flow rate of approximately 3 *l*/min at a pressure of 6 bar.

8 INSTRUMENTATION, MEASUREMENTS AND MEASUREMENT EQUIPMENT

8.1 Gas temperature measurements

The gas temperature inside the test compartment should be continuously measured and recorded during the tests. The individual thermocouples should be positioned as follows:

.1 one thermocouple 150 mm behind the foam generator; and

.2 five thermocouples, respectively, at vertical distances of 100 mm, 200 mm, 300 mm, 600 mm and 1,200 mm from the ceiling. The thermocouple tree should be positioned 500 mm from the front side wall (for informative reasons only).

All thermocouples should be of type K (chromel-alumel) and made from 0.5 mm wire welded together.

8.2 Foam system and water pressure

8.2.1 The system pressure at the inlet to the fire test compartment should be monitored using a pressure gauge.

8.2.2 The pressure gauge should have an accuracy of ± 0.05 bar.

9 FIRE TEST PROCEDURES

9.1 Test conditions

The following test conditions should apply:

.1 the ambient temperature, measured inside the fire test compartment, prior to the start of a test should be 20 ± 5°C;

.2 the water temperature, measured prior to the test, should be 15 ± 5°C; and

.3 the premix temperature, measured prior to the test, should be 17.5 ± 2.5°C.

9.2 Verification of the temperature in the test compartment

9.2.1 Prior to any testing, the propane gas burner should be adjusted to provide the following gas temperatures, respectively, measured using the thermocouple 150 mm behind the foam generator. The approximate Heat Release Rate (HRR) used in pre-normative testing is given as a guide (see note below).

Ambient conditions (propane gas burner not in use)	**Approximate Heat Release Rate (HRR)**
+ 100°C	18 kW
+ 150°C	28 kW
+ 200°C	42 kW
+ 300°C	90 kW

9.2.2 The temperature should be reached within 3 min to 6 min and the temperature increase should be less than 5% per min after the desired temperature is reached. It might be necessary to adjust the HRR slightly during the temperature rise.

9.2.3 During the verification of the temperature, the generator should be connected to the water source. The flowing water pressure should be 6 ± 0.1 bar. The flowing water will cool down the pipes, connectors and the generator during the temperature rise and provides airflow through the generator and the test compartment.

Note: During pre-normative testing it has been concluded that the above temperatures at given HHR are reached within 3 min to 6 min.

9.3 Fire test procedures

9.3.1 The fire test procedure should be applied as follows:

.1 the ambient temperature, the water temperature and the premix temperature should be measured and recorded;

.2 start the water flow through the generator. The flowing water pressure should be within 10% of the nominal/design water pressure;

.3 the temperature measurements should be started;

.4 the propane gas burner should be lit by means of a torch or a match;

.5 when the desired gas temperature is reached, the valve for the water delivery should be shut and the valve for the premix should be opened;

.6 adjust the foam system pressure to within 10% of the nominal/design pressure;

.7 the determination of the foam properties should be undertaken (see section 10); and

.8 the test is terminated.

9.3.2 The procedure is repeated at each temperature level, as described in subsection 9.2.

10 DETERMINATION OF FOAM PROPERTIES

10.1 Principle

For the determination of the foam properties, it is essential that all foam and any possible unexpanded premix is collected.

10.2 Foam expansion ratio and drainage time at ambient conditions

10.2.1 The expansion ratio and drainage time should be measured in accordance with standards ISO 7203-2, annex F, or EN 1568-2, annex G, with the deviation that the foam generator is replaced by the foam generator as described within this document.

10.2.2 The expansion ratio and drainage time should be measured both with fresh and with simulated seawater specified in standards ISO 7203-2, annex F, and EN 1568-2, annex G.

10.3 Foam expansion as a function of temperature

10.3.1 The foam expansion should be measured by collecting the foam in the foam collector vessel during 20 s, or until it is full. Record the volume of the collected foam, or the filling time. Calculate the foam expansion ratio:

$$E = \frac{V}{Qt}$$

where:

V is the volume of the collected foam;
Q is the premix flow rate from the foam generator; and
t is the time for collecting the foam.

Note: If the foam expansion is high (> 508) the vessel will be full before the 20 s has elapsed. In these cases, the time should be recorded when the vessel is full.

10.3.2 The expansion ratio at each temperature should be measured with both freshwater and simulated seawater specified in standards ISO 7203-2, annex F, and EN 1568-2, annex G.

10.3.3 The results should be presented in diagrams with expansion ratio as a function of temperature.

11 TEST REPORT

The test report should include the following information:

.1 name and address of the test laboratory;

.2 date and identification number of the test report;

.3 name and address of client;

.4 purpose of the test;

.5 method of sampling;

.6 name and address of manufacturer or supplier of the product;

.7 name or other identification marks of the product;

.8 description of the tested product;

.9 date of supply of the product;

.10 date of test;

.11 test method;

.12 identification of the test equipment and used instruments;

.13 conclusions;

.14 deviations from the test method, if any;

.15 test results including observations during and after the test; and

.16 date and signature.

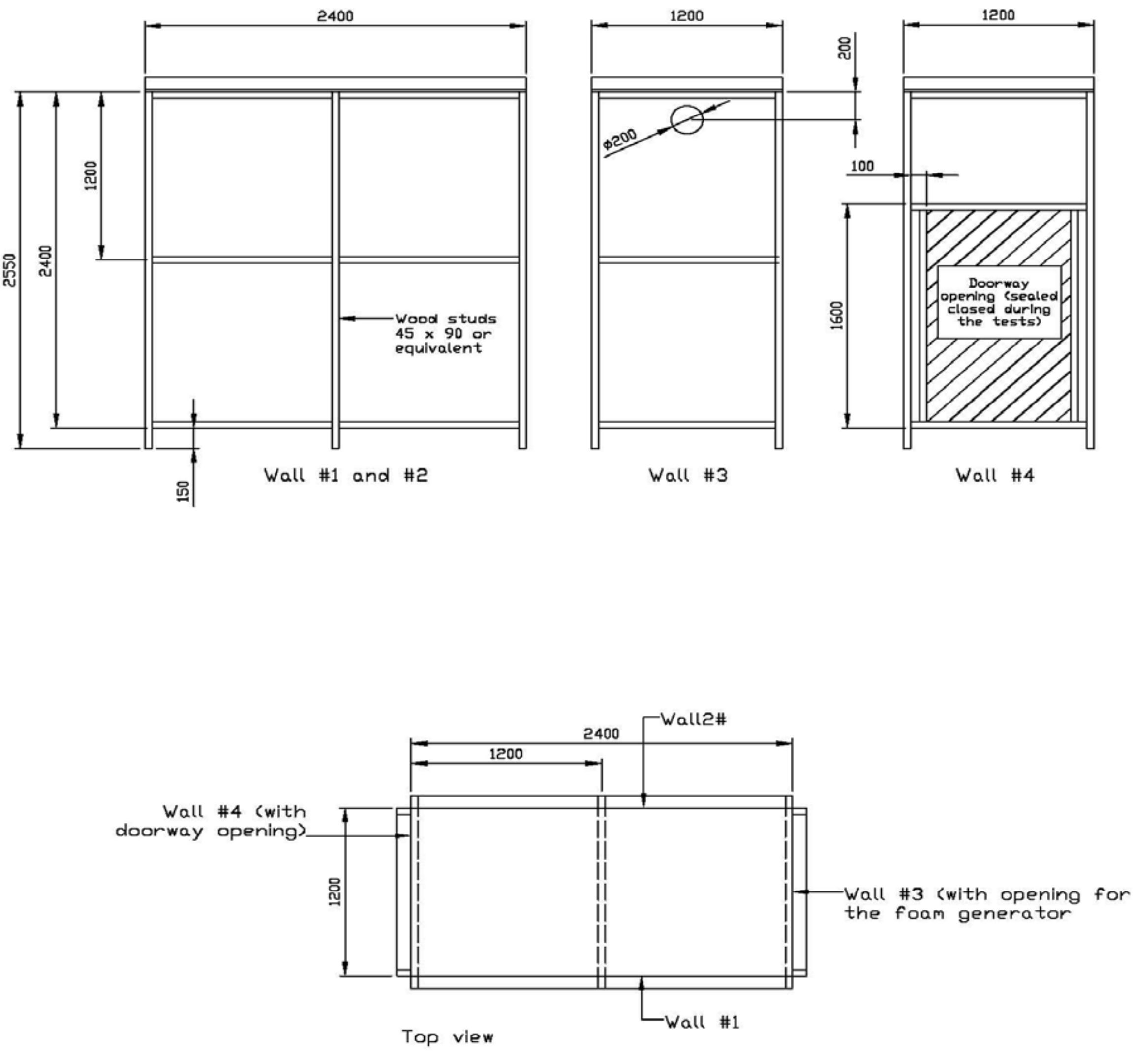
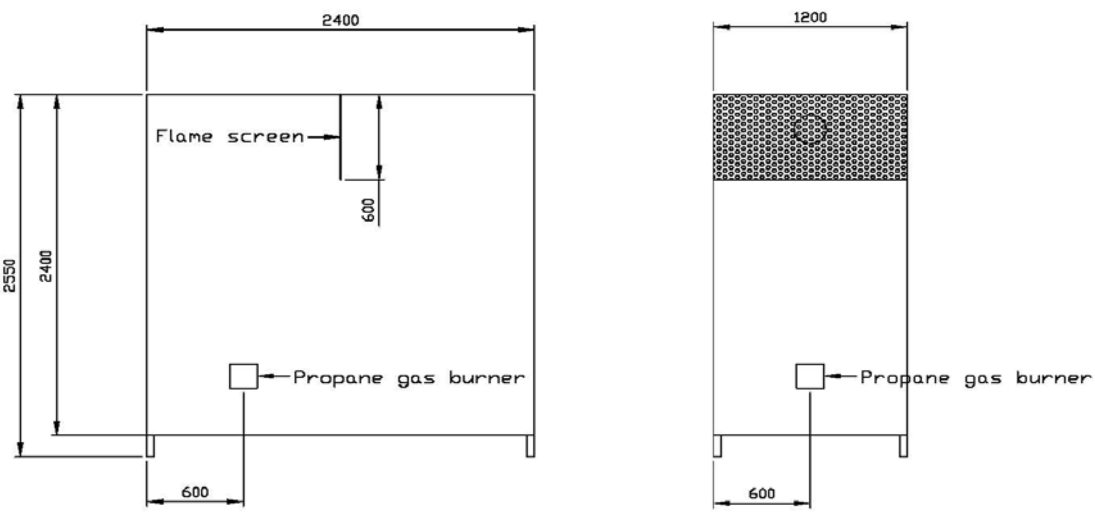
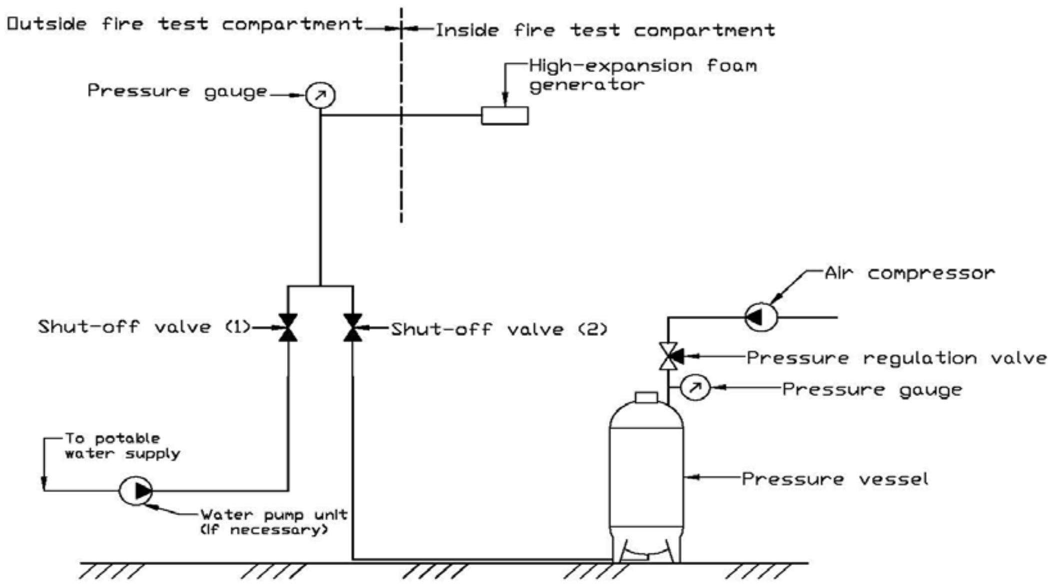


Figure 1 – Fire test compartment



Position of the propane gas burner



Principle lay-out of the foam system (not to scale)

Principal lay-out of the foam system (not to scale)

Figure 2 – Interior of fire test compartment with principal layout of the foam system

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INTERNATIONAL MARITIME ORGANIZATION

E

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T4/4.01

MSC.1/Circ.1385
10 December 2010

SCIENTIFIC METHODS ON SCALING OF TEST VOLUME FOR FIRE TEST ON WATER-MIST FIRE-EXTINGUISHING SYSTEMS

1 With regard to the scientific methods on scaling of test volume for fire test on water-mist fire-extinguishing systems, the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165) state in paragraph 2 of appendix B:

> "However, when based on the scientific methods developed by the Organization*, scaling from the maximum tested volume to a larger volume may be permitted. The scaling should not exceed twice the tested volume.
>
> * To be developed by the Organization."

2 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), after having considered the proposal by the fifty-fourth session of the Sub-Committee on Fire Protection, approved the Scientific methods on scaling of test volume for fire test on water-mist fire-extinguishing systems, related to MSC/Circ.1165, as set out in the annex.

3 Member Governments are invited to apply the annexed Scientific methods when approving scaling from the maximum tested volume to a larger volume in conjunction with MSC/Circ.1165 and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

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ANNEX

SCIENTIFIC METHODS ON SCALING OF TEST VOLUME FOR FIRE TEST ON WATER-MIST FIRE-EXTINGUISHING SYSTEMS

1 Scaling from the maximum tested volume to larger volumes may be accepted based on the approval fire test scenarios in appendix B, paragraph 4.3.1, table 1 of the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165), provided that:

.1 none of the test fires 1 to 4 has an extinguishment time exceeding 10 min; and

.2 provisions of the table below are met.

Average time to extinguishment for the three fires with the longest extinguishing times (tests 1 to 8)	**Scaling factor**
≤ 10 min	2
12.5 min	1.5
15 min	1

2 Linear interpolation may be used for average extinguishing times between the values above. The ceiling height should not be increased over that tested. All the volumes referred to should be the net volume.

E

INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T4/4.01

MSC.1/Circ.1386
10 December 2010

AMENDMENTS TO THE REVISED GUIDELINES FOR THE APPROVAL OF EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR MACHINERY SPACES AND CARGO PUMP-ROOMS (MSC/CIRC.1165)

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), approved amendments to the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165), as set out in the annex, concerning redundant means of pumping, and ceiling and bilge nozzles (paragraph 17 of, and paragraph 1.3 of appendix B to, the annex to MSC/Circ.1165), prepared by the Sub-Committee on Fire Protection, at its fifty-fourth session.

2 Member Governments are invited to use the amendments when applying MSC/Circ.1165 and to bring the unified interpretations to the attention of all parties concerned.

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ANNEX

AMENDMENTS TO THE REVISED GUIDELINES FOR THE APPROVAL OF EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR MACHINERY SPACES AND CARGO PUMP-ROOMS (MSC/CIRC.1165)

1 In paragraph 17 of the annex, the first sentence is replaced by the following:

"The system should be provided with a redundant means of pumping. The capacity of the redundant means should be sufficient to compensate for the loss of any single supply pump. Failure of any one component in the power and control system should not result in a reduction of required pump capacity. Primary pump starting equipment may be manual or automatic. Switch over to redundant means of pumping may be manual or automatic."

2 Paragraph 1.3 of appendix B to the annex is replaced by the following:

"1.3 It was developed for systems using ceiling mounted nozzles or multiple levels of nozzles. Bilge nozzles are required for all spaces with bilges. Ceiling and bilge nozzles may be tested and approved as a system or may be tested and approved separately."

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4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T4/4.01

MSC.1/Circ.1387
10 December 2010

REVISED GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS FOR USE IN CATEGORY A MACHINERY SPACES (MSC/CIRC.913)

1 The Maritime Safety Committee, at its seventy-first session (19 to 28 May 1999), approved Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces (MSC/Circ.913).

2 The Committee, at its eighty-eighth session (24 November to 3 December 2010), having considered the proposal of the Sub-Committee on Fire Protection, at its fifty-fourth session, approved the Revised Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces, set out in the annex.

3 Member Governments are invited to apply the annexed Revised Guidelines when approving fixed water-based local application fire-fighting systems for use in category A machinery spaces, and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

4 This circular supersedes MSC/Circ.913, except that fire and component tests previously conducted in accordance with MSC/Circ.913 remain valid for the approval of new systems. Existing fixed water-based local application fire-fighting systems approved and installed based on MSC/Circ.913 should be permitted to remain in service as long as they are serviceable.

***

ANNEX

REVISED GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS FOR USE IN CATEGORY A MACHINERY SPACES

1 General

Fixed water-based local application fire-fighting systems should provide localized fire suppression in areas, as specified in SOLAS regulation II-2/10.5, for category A machinery spaces, without the necessity of engine shut-down, personnel evacuation, shutting down of forced ventilation fans, or sealing of the space.

2 Definitions

2.1 *Fire suppression* is a reduction in heat output from the fire and control of the fire to restrict its spread from its seat and reduce the flame area.

2.2 *Protected space* is a machinery space where a local application fire-fighting system (hereinafter, referred to as "the system") is installed.

2.3 *Protected area* is an area (an installation or part of an installation) within a protected space which is required to be protected by the system*.

2.4 *Water-based extinguishing medium* is freshwater or seawater with or without additives mixed to enhance fire-extinguishing capability.

3 Principal requirements for the system

3.1 System operation

.1 The system should be capable of manual release.

.2 The activation of the system should not require engine shutdown, closing fuel oil tank outlet valves, evacuation of personnel or sealing of the space, which could lead to loss of electrical power or reduction of manoeuvrability. This is not intended to place requirements on the electrical equipment in the protected area when the system is discharging freshwater.

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* For internal combustion machinery, typical protected areas are hot surfaces such as exhaust pipes without insulation, or with insulation fitted in accordance with SOLAS regulation II-2/4.2.2.6.1 that is likely to be removed frequently for maintenance, and high-pressure fuel oil systems installed near hot surfaces. For typical diesel engines, such areas would include the area on top of the engine, the fuel injection pumps and turbo chargers, unless the fuel injection pumps are installed in a sheltered location beneath the steel platform.

For boiler fronts and oil-fired inert gas generators, typical protected areas are hot surfaces around the burners without insulation, or with insulation fitted in accordance with SOLAS regulation II-2/4.2.2.6.1 that is likely to be removed frequently for maintenance. Boiler fronts should be interpreted as the boiler burner location irrespective of the boiler design.

For incinerators, typical protected areas are hot surfaces around the burners without insulation, or with insulation fitted in accordance with SOLAS regulation II-2/4.2.2.6.1 that is likely to be removed frequently for maintenance.

.3 The operation controls should be located at easily accessible positions inside and outside the protected space. The controls inside the space should not be liable to be cut off by a fire in the protected areas.

.4 Pressure source components of the system should be located outside the protected areas.

.5 Where automatically operated fire-fighting systems are installed:

.1 a warning notice should be displayed outside each entry point stating the type of medium used and the possibility of automatic release;

.2 the detection system should ensure rapid operation while consideration should also be given to preventing accidental release. The area of coverage of the detection system sections should correspond to the area of coverage of the extinguishing system sections. The following arrangements are acceptable:

.1 set-up of two approved flame detectors; or

.2 set-up of one approved flame detector and one approved smoke detector.

Other arrangements can be accepted by the Administration. However, use of heat detectors should in general be avoided for these systems;

.3 the discharge of water should be controlled by the detection system. The detection system should provide an alarm upon activation of any single detector and discharge if two or more detectors activate. The Administration may accept other arrangements; and

.4 visual and audible indication of the activated section should be provided in the engine control room and the navigation bridge or continuously manned central control station. Audible alarms may use a single tone.

.6 Operating instructions for the system should be displayed at each operating position.

.7 Appropriate operational measures or interlocks should be provided if the engine-room is fitted with a fixed high-expansion foam or aerosol fire-fighting system, to prevent the local application system from interfering with the effectiveness of these systems.

3.2 Arrangement of nozzles and water supply

.1 The system should be capable of fire suppression based on testing conducted in accordance with the appendix to these Guidelines. Any installation of nozzles on board should reflect the arrangement successfully tested in accordance with the appendix to these Guidelines. If a specific arrangement of the nozzles is foreseen on board, deviating from the one tested, it can be accepted provided such arrangement additionally passes fire tests based on the scenarios of these Guidelines.

.2 The location, type and characteristics of the nozzles should be within the limits tested in accordance with the appendix to these Guidelines. Nozzle positioning should take into account obstructions to the spray of the fire-fighting system. The use of a single row of nozzles or single nozzles may be accepted for installation where this gives adequate protection according to paragraph 3.4.2.4 of the appendix.

.3 The piping system should be sized in accordance with a hydraulic calculation technique such as the Hazen-Williams hydraulic calculation technique* and the Darcy-Weisbach hydraulic calculation technique, to ensure availability of flows and pressures required for correct performance of the system.

.4 The system may be grouped into separate sections within a protected space. The capacity and design of the system should be based on the section demanding the greatest volume of water. In any case the minimum capacity should be adequate for a single section protecting the largest single engine, diesel generator or piece of machinery. In multi-engine installations, at least two sections should be arranged.

.5 Nozzles and piping should not prevent access to engine or machinery for routine maintenance. In ships fitted with overhead hoists or other moving equipment, nozzles and piping should not be located to prevent operation of such equipment.

3.3 System components

.1 The system should be available for immediate use and capable of continuously supplying water-based medium for at least 20 min in order to suppress or extinguish the fire and to prepare for the discharge of the main fixed fire-extinguishing system within that period of time.

.2 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging and corrosion normally encountered in machinery spaces. Components within the protected spaces should be designed to withstand the elevated temperatures which could occur during a fire. Components should be tested in accordance with the listed sections of appendix A of MSC/Circ.1165, as amended by MSC.1/Circ.1269, as modified below:

* Where the Hazen-Williams Method is used, the following values of the friction factor "C" for different pipe types which may be considered should apply:

Pipe type	C
Black or galvanized mild steel	100
Copper and copper alloys	150
Stainless steel	150

MSC/Circ.1165, as amended by MSC.1/Circ.1269 Appendix A paragraph no.	**Modifications**
3.1 Dimensions	
3.4.1 Flow constant	
3.11.1 Stress corrosion	
3.11.2 Sulphur dioxide corrosion	Open nozzles should be subject to post test visual examination. The requirements of paragraph 3.14.2 are not applicable
3.11.3 Salt spray corrosion	The NaCl concentration used for the test should be 20%. Following exposure, open nozzles should meet the flow constant requirements of paragraph 3.4.1. The requirements of paragraphs 3.14.2 and 4.11.4.2 are not applicable
3.12 Integrity of nozzle coating	Applicable only if the nozzles have wax or bitumen coatings
3.15 Resistance to heat	
3.16 Resistance to vibration	Open nozzles should be subject to post test visual examination. The requirements of paragraphs 3.5 and 3.8 are not applicable
3.17 Impact test	
3.22 Clogging test	

.3 The system and its components should be designed and installed based on international standards acceptable to the Organization*, and manufactured and tested in accordance with the appropriate elements of the appendix to these Guidelines.

.4 The electrical components of the pressure source for the system should have a minimum rating of IPX4** if located in the protected space. Systems requiring an external power source need only be supplied by the main power source.

.5 The water supply for local application systems may be fed from the supply to a water-based main fire-fighting system, providing that adequate water quantity and pressure are available to operate both systems for the required period of time. Local application systems may form a section(s) of a water-based main fire-extinguishing system provided that all requirements of SOLAS regulation II-2/10.5, these Guidelines, and MSC/Circ.1165, as amended by MSC.1/Circ.1237 and MSC.1/Circ.1269, are met, and the systems are capable of being isolated from the other sections of the main system.

.6 A means for testing the operation of the system for assuring the required pressure and flow should be provided.

.7 Spare parts and operating and maintenance instructions for the system should be provided as recommended by the manufacturer.

.8 A fitting should be installed on the discharge piping of open head systems to permit blowing air through the system during testing to check for possible obstructions.

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* Pending the development of international standards acceptable to the Organization national standards as prescribed by the Administration should be applied.

** X means the characteristic numeral used to mark the degree of protection against access to hazardous parts and ingress of solid foreign objects, which could be 0.1 to 6.

APPENDIX

TEST METHOD FOR FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS

1 SCOPE

This test method is for evaluating the effectiveness of fixed water-based local application fire-fighting systems. The test method verifies the design criteria for vertical and horizontal grids of nozzles. The test method is intended to evaluate maximum nozzle spacing, minimum and maximum distance from the nozzle to the hazard, minimum nozzle flow rate and nozzle angle, if any, in addition to minimum operating pressure.

2 SAMPLING

2.1 The nozzles and other system components should be supplied by the manufacturer with design and installation criteria, operating instructions, drawings, and technical data sufficient for the identification of the components.

2.2 The flow rate for each type and size of nozzle should be determined at the minimum nozzle operating pressure.

3 FIRE TESTS

3.1 Test principles

3.1.1 These tests are intended to evaluate the fire-extinguishing capabilities of individual nozzles and grids of nozzles used as local application fire-fighting systems on light diesel oil fuel spray fires.

3.1.2 The tests also define the following design and installation criteria:

.1 maximum spacing between nozzles;

.2 minimum and maximum distance between the nozzles and the protected area;

.3 the need for nozzles to be positioned outside of the protected area; and

.4 minimum operating pressure.

3.2 Test description

3.2.1 *Test enclosure*

3.2.1.1 The test enclosure, if any, should be sufficiently large and provided with adequate natural or forced ventilation during the fire test to ensure that the oxygen concentration throughout the fire test remains above 20% (by volume) for 5 min after ignition at the locations specified in paragraph 4.2.2.

3.2.1.2 The test enclosure, if any, should be at least 100 m^2 in area. The height of the test enclosure should be at least 5 m.

3.2.2 *Fire scenarios*

3.2.2.1 The fire scenarios should consist of nominal 1 and 6 MW spray fires. These fires should be produced using light diesel oil as the fuel as described in table 3.2.2.1 below.

Table 3.2.2.1 – Spray fire parameters

Spray nozzle	**Wide spray angle (120° to 125°) full cone type**	**Wide spray angle (80°) full cone type**
Nominal oil pressure	8 bar	8.5 bar
Oil flow	0.16 ± 0.01 kg/s	0.03 ± 0.005 kg/s
Oil temperature	20 ± 5°C	20 ± 5°C
Nominal heat release rate	6 MW	1 MW

3.2.2.2 The fuel spray nozzles should be installed horizontally and directed toward the centre of the nozzle grid as shown in figure 3.3.2.

3.2.2.3 The fuel spray nozzle should be located 1 m above the floor and at least 4 m away from the walls of the enclosure, if any.

3.2.3 *Installation requirements for tests*

3.2.3.1 The local application system should consist of uniformly spaced nozzles directed vertically downward or to the side, or installed at an inclined angle, if any, and tested in accordance with paragraphs 3.3 and 3.4.

3.2.3.2 The system should consist of either a 2 x 2 or 3 x 3-nozzle grid in general.

3.2.3.3 The nozzles should be installed at least 1 m below the ceiling of the enclosure.

3.2.3.4 The maximum spacing of the nozzles should be in accordance with the manufacturer's system design and installation manual.

3.2.3.5 Additional nozzles may be installed at the test in accordance with manufacturer's instruction. In this case, details for additional nozzles should be included in the test report and reflected in the individual ship's design.

3.3 Test programme

3.3.1 The fire-extinguishing capabilities of the system should be evaluated for the minimum and maximum separation distances (the distance between the nozzle grid and the fuel spray nozzle). These distances should be as defined in the manufacturer's system design and installation manual.

3.3.2 Each separation distance should be evaluated against the two fire scenarios (1 and 6 MW spray fires). Tests should be conducted with the fuel spray nozzles horizontally positioned in the following locations:

.1 under one nozzle in the centre of the grid;

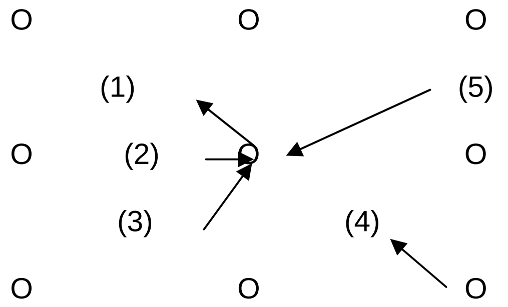
.2 between two nozzles in the centre of the grid;

.3 between four nozzles;

.4 under one nozzle at the edge of the grid (corner); and

.5 between two nozzles at the edge of the grid.

These fire locations are shown in figures 3.3.2, and 3.4.2.1 to 3.4.2.3 below.



O Water nozzle locations
→ Fuel spray nozzle location and direction
( ) Test designation

Figure 3.3.2 – Fuel spray nozzle locations

3.4 Test results and interpretation

3.4.1 The local application fire-fighting system is required to extinguish the test fires within 5 min of the start of water discharge. The fuel oil spray and water spray are required to continue in operation after this, as specified in paragraph 4.3. If the fire re-ignites after this five-minute water discharge period the test is considered to be a failure.

3.4.2 The results of the tests should be interpreted as follows:

.1 Systems (utilizing a 3 x 3 nozzle grid) that extinguish fires referred to in paragraphs 3.3.2.1 to 3.3.2.3 are considered to have successfully completed the protocol with the condition that the outer nozzles should be installed outside of the protected area a distance of at least 1/4 of the maximum nozzle spacing as shown in figure 3.4.2.1.

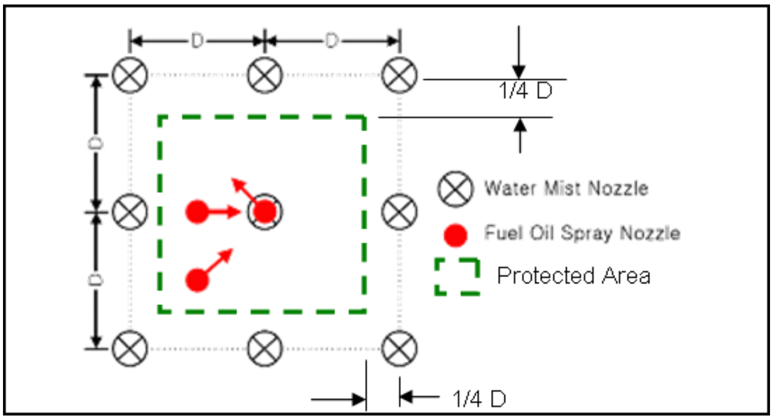


Figure 3.4.2.1

For this system, the outer nozzles should be installed outside of the protected area a distance of at least 1/4 of the maximum nozzle spacing.

.2 Systems (utilizing either a 2 x 2 or 3 x 3 nozzle grid) that extinguish fires referred to in paragraphs 3.3.2.3 to 3.3.2.5 are considered to have successfully completed the protocol and can be designed with the outer nozzles located at the edge of the protected area as shown in figures 3.4.2.2 and 3.4.2.3. This does not prohibit the location of the nozzles outside of the protected area.

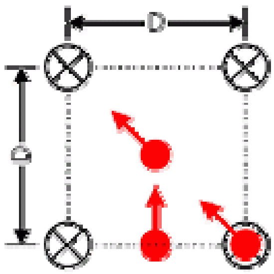


Figure 3.4.2.2 – 2 x 2 nozzle grid

For systems which utilize a 2 x 2 nozzle grid, the outer nozzles can be located either at the edge of the protected area or outside of the protected area.

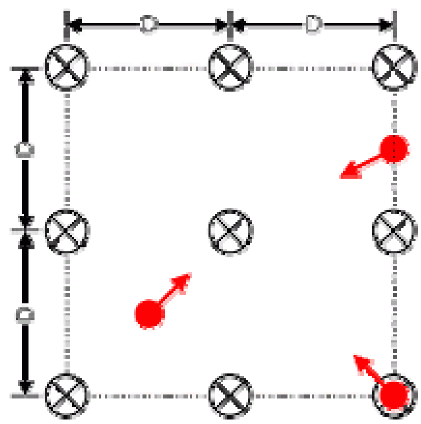


Figure 3.4.2.3 – 3 x 3 nozzle grid

For systems which utilize a 3 x 3 nozzle grid, the outer nozzles can be located either at the edge of the protected area or outside the protected area.

.3 The requirements stated in either paragraph 3.4.2.1 or 3.4.2.2 should be met for both the minimum and maximum separation distances as well as the minimum operating pressure.

.4 For installations which may be adequately protected using individual nozzles or a single row of nozzles, the effective nozzle coverage (width and length) is defined as 1/2 the maximum nozzle spacing as shown in figures 3.4.2.4 to 3.4.2.6. **Note**: the fuel spray nozzle locations shown in figures 3.4.2.4 to 3.4.2.6 are shown for information only.

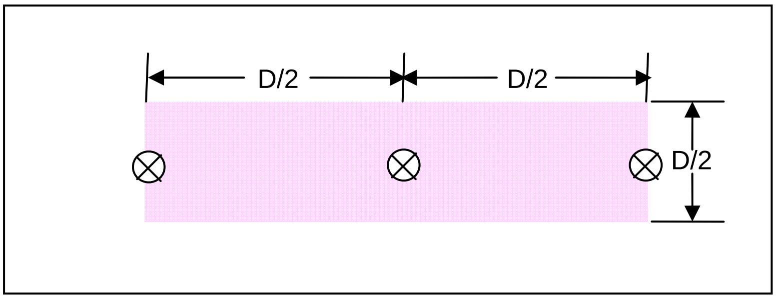


Figure 3.4.2.4

For systems with a single row of nozzles that extinguishes fires referred to in paragraphs 3.3.2.3 to 3.3.2.5, the outer nozzles should be placed at least at the edge of the protected area.

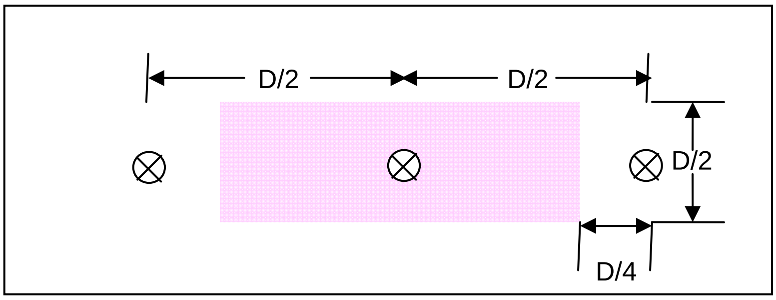


Figure 3.4.2.5

For systems with a single row of nozzles that extinguishes fires referred to in paragraphs 3.3.2.1 to 3.3.2.3, the outer nozzles should be placed outside the protected area a distance of at least 1/4 of the maximum nozzle spacing.

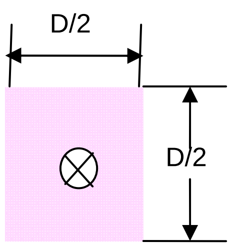


Figure 3.4.2.6

For a single nozzle installation, the spacing should be as shown in figure 3.4.2.6.

.5 For installations where the protected area is next to a bulkhead or similar vertical obstruction, the first row of nozzles should be located at 1/2 the maximum nozzle spacing away from the bulkhead for either of the conditions described in paragraph 3.4.2.1 or 3.4.2.2.

4 TEST PROCEDURE

4.1 Pre-burn time

Each fuel oil spray should be ignited and allowed to burn from 10 s to 15 s prior to system operation.

4.2 Measurements

4.2.1 *Fuel oil spray system*

4.2.1.1 The fuel oil flow rate and pressure in the fuel oil spray system should be verified prior to the test.

4.2.1.2 The fuel oil spray system pressure should be measured during the test.

4.2.2 *Oxygen concentration at the fire location*

Oxygen concentration should be measured at 100 mm below and 500 mm behind the fuel oil spray nozzle.

4.2.3 *Water spray system pressure and flow rate*

The system water pressure and flow rate should be measured using suitable equipment.

4.3 Operation of the fire-fighting system

4.3.1 The water spray system should be activated within the pre-burn time specified in section 4.1.

4.3.2 The fires should be extinguished within 5 min of water application.

4.3.3 The fuel oil spray should be operated for at least 15 s after fire extinguishment.

4.3.4 The water spray system should be operated for a minimum of 1 min after fire extinguishment.

4.4 Observations during the fire test

During the test, the following observations should be recorded:

- .1 start of the ignition procedure;
- .2 start of the test (ignition);
- .3 time when the extinguishing system is activated;
- .4 time when the extinguishing system is shut off;
- .5 time of re-ignition;
- .6 time when the fuel supply to the nozzle is stopped;
- .7 time when the fire is extinguished; and
- .8 time when the test is terminated.

5 TEST REPORT

The test report should, as a minimum, include the following information:

.1 name and address of the test laboratory;

.2 date of issue and identification number of the test report;

.3 name and address of applicant;

.4 name and address of manufacturer or supplier of the product;

.5 test method and purpose;

.6 product identification;

.7 description of the tested product:

  .1 assembly drawings;

  .2 descriptions;

  .3 assembly of included materials and components;

  .4 specification of included materials and components;

  .5 installation specification; and

  .6 detailed drawings of the test set-up;

.8 date of tests;

.9 drawing of each fire test configuration;

.10 measured water spray nozzle flow characteristics;

.11 identification of the test equipment and used instruments;

.12 test results including observations and measurements made during and after the test:

  .1 maximum nozzle spacing;

  .2 minimum and maximum separation distances and angles; and

  .3 minimum operating pressures;

.13 deviations from the test method;

.14 conclusions; and

.15 date of the report and signature.

____

INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T4/3.01

MSC.1/Circ.1380
10 December 2010

GUIDANCE FOR WATERTIGHT DOORS ON PASSENGER SHIPS WHICH MAY BE OPENED DURING NAVIGATION

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), with a view to assisting Administrations in carefully considering the impact of open watertight doors on passenger ships operation and survivability when determining whether a watertight door may remain open during navigation under SOLAS regulation II-1/22 (paragraph 4) (previous SOLAS regulation II-1/15, paragraph 9.3), approved the annexed Guidance for watertight doors on passenger ships which may be opened during navigation, prepared by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-second session, and the Sub-Committee on Ship Design and Equipment, at its fifty-fourth session.

2 The Guidance contains the following appendices:

.1 Procedure for the determination of the impact of open watertight doors on passenger ship survivability (floatability assessment) (appendix 1);

.2 Technical standards for watertight doors on passenger ships (appendix 2);

.3 Flowchart on Guidance for permitting watertight doors on passenger ships to remain open during navigation (appendix 3); and

.4 Illustration of application of the floatability assessment under hazardous conditions in the Guidance (appendix 4).

3 Member Governments are invited to apply the annexed Guidance from 1 January 2011 and bring it to the attention of recognized organizations, ship designers, shipbuilders, manufacturers, companies, shipowners, operators and any other parties concerned.

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ANNEX

GUIDANCE FOR WATERTIGHT DOORS ON PASSENGER SHIPS WHICH MAY BE OPENED DURING NAVIGATION

1 Preamble

1.1 Watertight subdivision is vital to ship stability and survivability to protect life, property and the marine environment in cases of hull damage after collision or grounding. The number of openings in watertight bulkheads on passenger ships is to be kept to a minimum in accordance with SOLAS regulation II-1/13.1 (previous SOLAS regulation II-1/15.1).

1.2 In order to maintain watertight subdivision, while allowing for the safe and effective operation of the ship, all watertight doors are to be kept closed during navigation, except in certain limited circumstances. SOLAS regulation II-1/22.3 (previous SOLAS regulation II-1/15.9.2), allows a watertight door to be temporarily opened to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. In this case, the door must be immediately closed when transit through the door is complete or the work is finished. Additionally, SOLAS regulation II-1/22.4 (previous SOLAS regulation II-1/15.9.3) permits certain watertight doors to remain open during navigation but only if considered absolutely necessary to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. This determination is made by the Administration after careful consideration of the impact on ship operations and survivability.

1.3 SOLAS chapter II-1 regulations, referred to in this Guidance, means SOLAS chapter II-1 regulations amended by resolution MSC.216(82) (entered into force on 1 January 2009); and previous SOLAS chapter II-1 regulations means regulations amended by resolution MSC.13(57) (entered into force on 1 February 1992) and by other amendments afterwards.

2 Introduction

This Guidance is intended to assist Administrations in carefully considering the impact of open watertight doors on passenger ships operations and survivability when determining whether a watertight door may remain open during navigation for the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Guidance is also provided on when watertight doors may be opened or should remain closed.

3 The importance of watertight doors

3.1 Failure to recognize the importance of watertight doors can have great impact on the watertight integrity of the ship and have catastrophic consequences. When structural damage occurs to a ship, especially during collision or grounding, there is potential risk for bulkheads and decks to be deformed, thus rendering watertight doors not able to be closed. The risk of progressive flooding following such deformation of the ship's structure may increase if watertight doors are either left open or unable to be closed.

3.2 Another potential risk to ship survivability is when large amounts of water flood a ship, especially after extensive structural damage. The rate of water ingress, which depends on the size of the damaged opening and the water pressure, can quickly flood a compartment. It is therefore essential that a ship has sufficient survivability in case of damage, keeping in mind that when adjacent watertight doors are open, several compartments may be flooded as watertight doors have up to 60 seconds to close per SOLAS regulation II-1/13.5.1 (previous SOLAS regulation II-1/15.6.1).

4 Operation of watertight doors

Power-operated watertight doors are designed to be remotely closed in a short period of time with a force the magnitude of which is sufficient to overcome not only the weight of the door but also water flowing through its opening, both while a ship is listing 15º in either direction. The operation of watertight doors involves possible dangers to persons passing through a closing door and injury or loss of life is likely to occur to anyone trapped in the door's path. The audible alarm that sounds for a few seconds before the door starts moving, and continues sounding while the door is in motion, is intended to reduce the human element risk.

5 SOLAS regulation and technical standards for watertight doors

5.1 SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15) provides the technical standards for watertight doors in passenger ships constructed on or after 1 February 1992. The basis of this regulation is that all watertight doors shall be kept closed during navigation according to SOLAS regulation II-1/22.1 (previous SOLAS regulation II-1/15.9.1), except as follows:

.1 watertight doors may be opened during navigation to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. The door must be immediately closed when transit through the door is complete or when the task which necessitated it being open is finished; and

.2 certain watertight doors may be permitted to remain open during navigation only if considered absolutely necessary according to SOLAS regulation II-1/22.4 (previous SOLAS regulation II-1/15.9.3); that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability. A watertight door permitted to remain open shall be clearly indicated in the ship's stability information and shall always be ready to be immediately closed.

5.2 For passenger ships constructed before 1 February 1992, watertight doors that do not comply with SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4) shall be closed before the voyage commences and shall be kept closed during navigation. In other words, such doors shall never be permitted to be opened during a voyage. Administrations may use the watertight door checklist in appendix 2 to assess pre-1992 ships for potential compliance with SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations 15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15).

6 Categories of watertight doors

In order to assist Administrations in determining to what extent watertight doors may remain open during navigation, watertight doors may be categorized into one of four different types of doors:

.1 Category A doors:

A watertight door that fulfils the technical requirements in SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15), and has been permitted to remain open during navigation by the Administration according to SOLAS regulation II-1/22.4 (previous SOLAS regulation II-1/15.9.3).

.2 Category B doors:

A watertight door that fulfils the technical requirements in SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15), and may be opened during navigation when work in the immediate vicinity of the door necessitates it being opened, according to SOLAS regulation II-1/22.3 (previous SOLAS regulation II-1/15.9.2). The door must be immediately closed when the task which necessitated it being open is finished.

.3 Category C doors:

A watertight door that fulfils the technical requirements in SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15), and may be opened during navigation to permit the passage of passengers or crew, according to SOLAS regulation II-1/22.3 (previous SOLAS regulation II-1/15.9.2). The door must be immediately closed when transit through the door is complete.

.4 Category D doors:

.1 A watertight door that does not comply with SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15), shall be closed before the voyage commences and shall be kept closed during navigation according to SOLAS regulation II-1/22.1 (previous SOLAS regulation II-1/15.6.5 (refer to paragraph 5.2).

.2 Additionally, watertight doors fitted in watertight bulkheads dividing cargo between deck spaces in accordance with SOLAS regulation II-1/13.9.1 (previous SOLAS regulation II-1/15.10.1), shall be closed before the voyage commences and shall be closed during navigation according to SOLAS regulation II-1/22.6 (previous SOLAS regulation II-1/15.10.2). Such a watertight door is not eligible for upgrade to another category.

7 Permission for category A watertight doors to remain open

7.1 When applying to the Administration for permission for a watertight door to be qualified as a category A watertight door, the Company, as defined in SOLAS regulation IX/1.2, should conduct a risk assessment and consider the ship's survivability as a primary issue. The scope of the risk assessment should be balanced against operational needs.

7.2 The Administration, when permitting watertight doors to remain open, should take into account the outcome of the risk assessment conducted by the Company, which includes the procedure for the determination of the impact of open watertight doors on passenger ship survivability, set out in appendix 1 (hereinafter "floatability assessment").

7.3 The Administration may continue to permit those watertight doors (refer to paragraph 6.1), which have been permitted to remain open during navigation prior to this Guidance becoming effective, to remain open during navigation. However, this does not restrict an Administration from reconsidering whether any category A watertight doors should remain open when operating under the conditions described in paragraph 9.

7.4 The necessity for a watertight door to remain open during navigation should be demonstrated by the Company. The Company should satisfy the Administration with relevant information, such as operational needs, number of passages through the watertight door per time unit, alternative passageways around the watertight door and results from the risk assessment. The Company should also submit a copy of the relevant sections of their safety management procedures relating to the operation of watertight doors during navigation, as well as related information such as restrictions or limitations on when watertight doors may remain open.

7.5 Before permitting a watertight door to remain open during navigation, the Administration should evaluate the information described in 7.1 and 7.4 and verify that:

.1 the watertight door meets the technical requirements of SOLAS regulations II-1/13.5.1 to 13.5.3 and 13.6 (previous SOLAS regulations II-1/15.6.1 to 15.6.4), which also includes the requirements in paragraph 7 of SOLAS regulation II-1/13 (previous SOLAS regulation II-1/15);

.2 the floatability assessment (appendix 1) has been taken into account; and

.3 the proposed category A watertight door meets the criteria specified in SOLAS regulation II-1/22.4 (previous SOLAS regulation II-1/15.9.3).

7.6 The flowchart in appendix 3 and the checklist for the technical standards of the watertight doors in appendix 2 may be used as guidance in the evaluation.

7.7 It is also important for an Administration to envisage the conditions under which adjacent watertight doors of category B or C may be opened during navigation for certain limited periods of time as permitted by SOLAS regulation II-1/22.3 (previous SOLAS regulation II-1/15.9.2), with a view towards preserving watertight subdivision and enhancing survivability. Additional factors, such as the area in which the ship is operating, should also be assessed to consider any additional risks or potentially hazardous situations (see list in paragraph 9 for consideration of such risks).

7.8 All category A doors shall be clearly indicated in the ship's stability information and shall always be ready to be immediately closed. Instructions regarding these watertight doors should be incorporated in the ship's safety management system and included in the ship's operational limitations in accordance with SOLAS chapter V requirements.

7.9 A watertight door should not be permitted to remain open during navigation in potentially hazardous situations, if the ship does not meet the floatability criteria given in section 3 in appendix 1 for each associated extent of flooding.

7.10 A watertight door may be permitted to remain open when operating under normal situations as defined in paragraph 10.3, if the ship does not meet the floatability criteria when the overall risk assessment indicated a level of safety acceptable to the Administration.

8 Considerations to be made on categories B and C watertight doors which may be opened for limited periods, or for passage

A watertight door of category B or C should be clearly indicated in the ship's stability information and should always be ready to be immediately closed. Category D doors should also be clearly indicated in the ship's stability information.

9 Factors restricting the operation of watertight doors

Certain operating conditions, or combinations of several factors, should necessitate categories A, B and C doors being closed during navigation to preserve survivability. In particular, the area in which the ship is operating should be continually evaluated for associated risks with any potentially hazardous conditions. Except for category A doors for which the ship satisfies the floatability assessment criteria, it is recommended that categories A, B and C doors are kept closed during navigation while the ship is operating:

.1 in waters with high traffic density;

.2 near coastal waters;

.3 in heavy weather;

.4 in dangerous ice conditions;

.5 in waters where soundings are unreliable;

.6 during periods of restricted visibility;

.7 within port limits or compulsory pilotage waters;

.8 when loose objects are nearby, which could potentially prevent the watertight door from being closed; or

.9 under any condition when the ship's master considers the situation to necessitate all watertight doors to be closed.

10 Operational instructions, markings and postings

10.1 Operational instructions

Operational instructions for watertight doors should be included in the ship's stability information and address the situations described in paragraphs 10.2 and 10.3. Additionally:

.1 a copy of the operational instruction should be located at the central operating console at the navigation bridge so as to be readily available to the officer in charge of the navigation watch;

.2 the operational instructions should state the means of verifying the correct position of all watertight doors; and

.3 the operational instructions should cover procedures for operating watertight doors to permit safe passage of passengers, in particular, that watertight doors should only be operated by qualified persons and not by passengers.

10.2 Operational instructions in potentially hazardous situations

10.2.1 A potentially hazardous situation is defined as a situation when the ship is on a voyage and operating in conditions as described in paragraph 9.

10.2.2 The operational instructions should specify that, while the ship is navigating in potentially hazardous situations, every watertight door of category A, B or C be closed except for category A doors for which the ship satisfies the floatability assessment criteria, or when a person is passing through it. If such doors are opened for passage then it should be closed immediately after passage.

10.3 Operational instructions in normal situations

10.3.1 A normal situation is defined as a non-hazardous situation when the ship is on a voyage and operating in conditions other than as described in paragraph 9.

10.3.2 The operational instructions should specify that while the ship is navigating in normal situations each watertight door of category A, B or C be operated in accordance with the assigned category (see paragraph 6).

10.4 Markings and postings

10.4.1 The assigned category and meaning of each category should clearly be marked on both sides of either the watertight door or the bulkhead adjacent to the door in order to ensure correct operation.

10.4.2 The assigned category for each door should be indicated on or near the central operating console located on the navigation bridge in order that the correct status of all doors can be ascertained.

Appendix 1

PROCEDURE FOR THE DETERMINATION OF THE IMPACT OF OPEN WATERTIGHT DOORS ON PASSENGER SHIPS SURVIVABILITY (FLOATABILITY ASSESSMENT)

1 Introduction

1.1 This floatability assessment is only for the purpose of determining the impact of open watertight doors on ship survivability under SOLAS regulation II-1/22.4 (previous SOLAS regulation II-1/15.9.3). It is intended that this floatability assessment be applied only after the need for a watertight door(s) to remain open during navigation is established.

1.2 Care should be exercised not to confuse the "floatability assessment" criteria used in this procedure (for determining the impact of open watertight doors on survivability) with the requirements in the SOLAS chapter II-1 damage stability regulations.

2 Damage and flooding extent for the floatability assessment

2.1 In every case in which a determination that keeping one or more watertight doors open during navigation is absolutely necessary, floatability assessment calculations should be performed.

2.2 The extent of damage to be assumed for the floatability assessment should be as defined in SOLAS regulation II-1/8.3. In addition, watertight compartments inboard of the transverse extent of damage should be assumed flooded, irrespective of whether any longitudinal bulkheads are fitted with watertight doors, if:

.1 the inboard compartment is within the longitudinal damage extent; and

.2 the inboard compartment is connected by the watertight door(s) under investigation which are proposed to remain open during navigation.

If any lesser damage extents than indicated above would result in a more severe condition with respect to the floatability criteria, then such damage extents should be assumed in the calculations. In this context, the damage extent should be assumed as both penetrating and not penetrating the double bottom.

2.3 The floatability assessment should account for the worst cases involving the additional flooding of compartments connected with watertight doors requested to remain open during navigation. The extent of flooding assumed for the floatability assessment calculations should be as follows: any watertight door that is requested to remain open during navigation may be considered closed in each case of flooding if it is in a watertight bulkhead that is located away from the damage extent by at least one undamaged transverse watertight bulkhead/door.

3 Criteria for the floatability assessment

3.1 For each assumed flooding case described in section 2, the floatability criteria described below should be met at the deepest subdivision draught at level trim. For this loading condition, the limiting KG or GM should be assumed in the calculations.

.1 The bulkhead deck may be immersed provided that no progressive flooding occurs (i.e. weathertight openings may not be immersed; only watertight openings may be immersed).

.2 The maximum positive righting lever should not be less than 0.05 m.

.3 The range of positive righting levers should not be less than 7°.

.4 The maximum equilibrium heel angle should not exceed 15°.

3.2 The Administration may accept alternative methodologies if it is satisfied that at least the same degree of safety as represented by this procedure is achieved (reference is made to SOLAS regulation II-1/4.2).

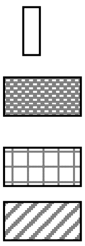
Attachment

Explanatory sketches

Notes:

1 In the sketches below, all the doors are assumed "permitted to remain open during navigation".

2 In case of a ship carrying less than 400 persons, breach should only be considered between transverse bulkheads (if spaced by more than 0.03*L).

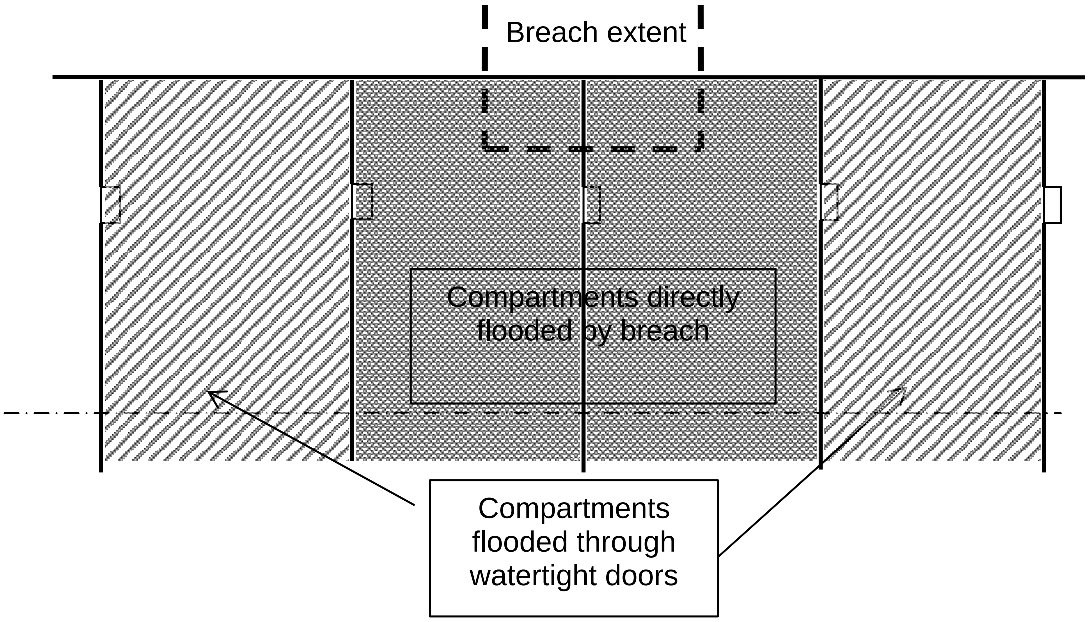


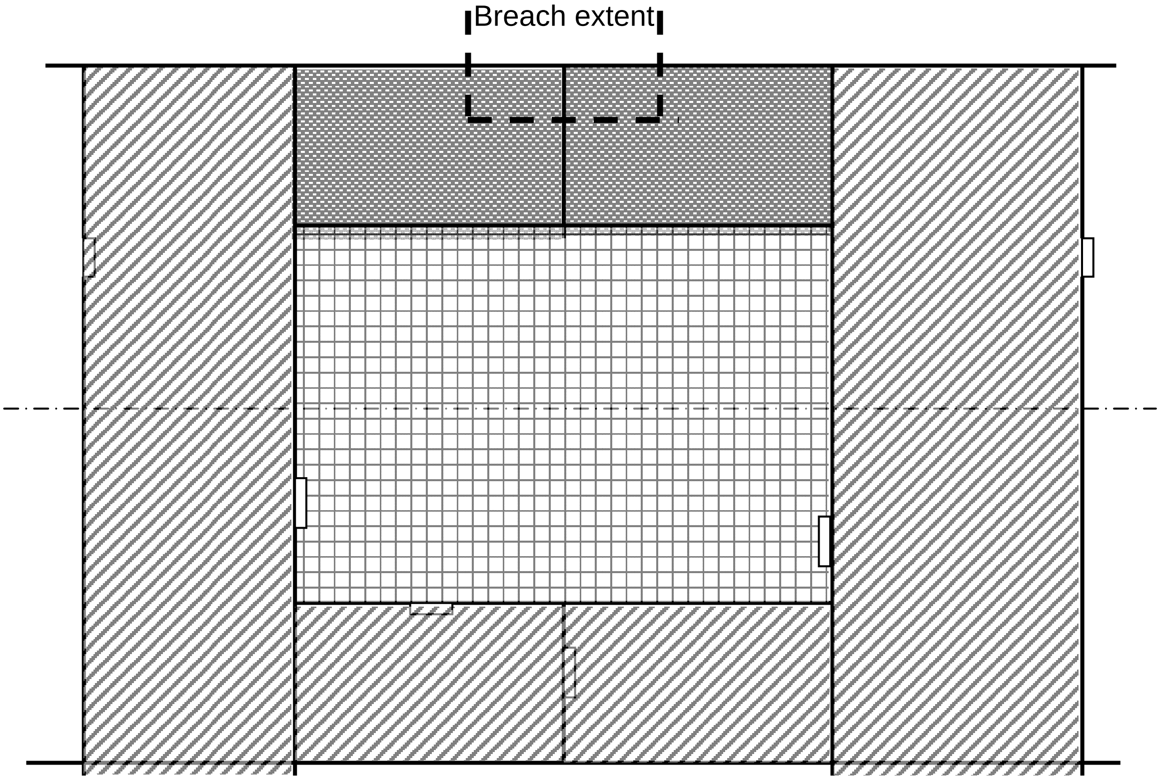
Watertight door permitted to remain open during navigation

Direct flooding (§2.2)

Additional flooding according to §2.2

Additional flooding according to §2.3




Breach extent

Appendix 2

TECHNICAL STANDARDS FOR WATERTIGHT DOORS ON PASSENGER SHIPS

Only after careful consideration of the impact on ship operations and survivability should an Administration permit a watertight door to remain open during navigation. This watertight door checklist has been designed to assist an Administration in making such a determination through validation of each technical standard. Other non-technical considerations are contained in the main guidance document.

Ship	
Date:	
Door(s) No.	

Note: SOLAS regulations referred to in parentheses are previous SOLAS chapter II-1 regulations.

Technical Standards	Yes	No	Comments
Passenger ship constructed on or after 1 February 1992 (Date of new amendments)			
SOLAS regulation II-1/13.5.1 (15.6.1) Can the door be closed simultaneously from navigation bridge in not more than 60 seconds?			
SOLAS regulation II-1/13.5.2 (15.6.2) Can the door be closed with the ship listed to 15º in either direction and with a static head of water 1 m above the sill?			
SOLAS regulation II-1/13.5.3 (15.6.3) Are controls located close to the door, such that if damage is sustained within one fifth of the breadth of the ship the door will continue to operate?			
SOLAS regulation II-1/13.6 (15.6.4) Is there an indicator to show all remote operating positions whether the door is open or closed at the navigation bridge and at the location where hand operation above deck is required?			
SOLAS regulation II-1/13.7.1.1 (15.7.1.1) Does the door have a vertical or horizontal motion?			
SOLAS regulation II-1/13.7.1.2 (15.7.1.2) Does the door have a maximum clear opening width of 1.2 m or less?			
SOLAS regulation II-1/13.7.1.2.1 (15.7.1.2.1) For doors greater than 1.2 m wide, has special consideration been given to the strength of the door and its closing appliance in order to prevent leakage?			
SOLAS regulation II-1/13.7.1.2.2 (15.7.1.2.2) For doors greater than 1.2 m wide, is it located outside the damage zone B/5?			
SOLAS regulation II-1/22.1 (15.7.1.2.3) For doors greater than 1.2 m wide, will it be kept closed when the ship is at sea except for limited periods when absolutely necessary?			

Technical Standards	Yes	No	Comments
SOLAS regulation II-1/13.7.1.3 (15.7.1.3) Are the doors fitted with necessary equipment to close and open the door using electrical power, hydraulic power or any other form of power that is acceptable to the Administration?			
SOLAS regulation II-1/13.7.1.4 (15.7.1.4) Is individual hand-operated mechanism provided for each door that permits it to be open or closed from either side and from above the bulkhead deck within 90 seconds?			
SOLAS regulation II-1/13.7.1.4 (15.7.1.4) Is direction of rotation or other movement clearly indicated and displayed at all operating positions?			
SOLAS regulation II-1/13.7.1.5 (15.7.1.5) Is the door provided with controls for opening and closing the door by power from both sides of the door and also for closing the door by power from the central operating console at the navigating bridge?			
SOLAS regulation II-1/13.7.1.6 (15.7.1.6) Is the door provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever the door is closed remotely by power for at least 5 seconds, but no more than 10 seconds, before the door begins to move and shall continue sounding until the door is completely closed?			
SOLAS regulation II-1/13.7.1.6 (15.7.1.6) During remote hand operation, does the audible alarm sound when the door is moving?			
SOLAS regulation II-1/13.7.1.6 (15.7.1.6) Is the audible alarm supplemented by intermittent visual signal at the door in passenger areas of high ambient noise (if so required by Administration)?			
SOLAS regulation II-1/13.7.1.7 (15.7.1.7) Does the door have a uniform rate of closure under power that allows the door to be closed in no less than 20 seconds and no more than 40 seconds with the ship in the upright position?			
SOLAS regulation II-1/15.7.2 Is the electrical power supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck?			
SOLAS regulation II-1/13.7.2 (15.7.2) Are the associated control, indication and alarm circuits supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck and capable of being automatically supplied by the transitional source of emergency electrical power required by SOLAS regulation 42.3.1.3 in the event of failure of either the main or emergency source of electrical power?			
SOLAS regulation II-1/13.7.3.1 (15.7.3.1), requires 13.7.3.1 or 3.2 or 3.3 (15.7.3.1 or 3.2 or 3.3) Is there a centralized hydraulic system with two independent power sources each consisting of a motor and pump capable of simultaneously closing all doors with hydraulic accumulators of sufficient capacity to operate all the doors at least three times, i.e. closed-open-closed, against an adverse list of 15°?			

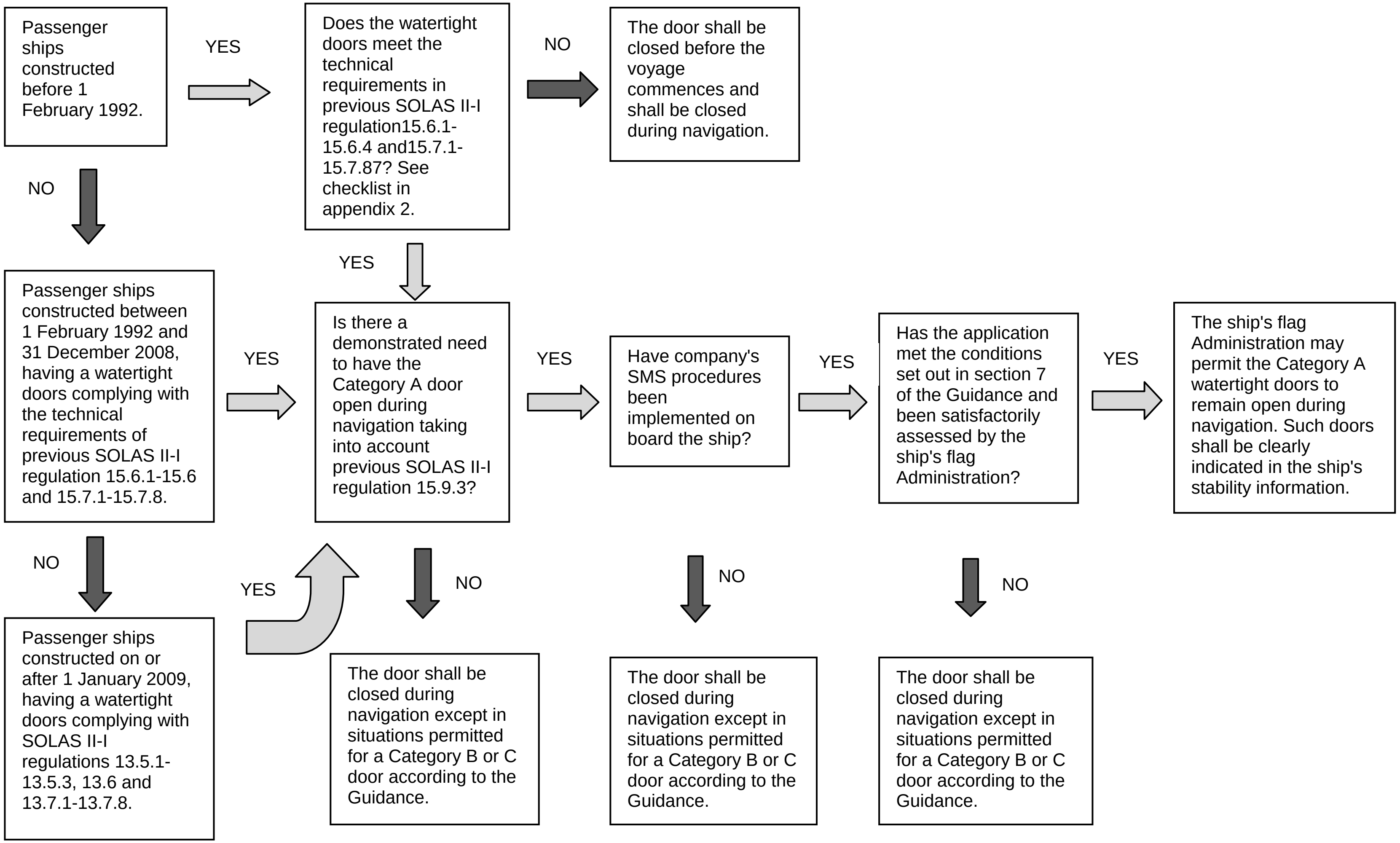
Technical Standards	Yes	No	Comments
SOLAS regulation II-1/13.7.3.2 (15.7.3.2), requires 13.7.3.1 or 3.2 or 3.3 (15.7.3.1 or 3.2 or 3.3) Is there an independent hydraulic system for each door with each power source consisting of a motor and pump capable of opening and closing the door with a hydraulic accumulator of sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15°?			
SOLAS regulation II-1/13.7.3.3 (15.7.3.3), requires 13.7.3.1 or 3.2 or 3.3 (15.7.3.1 or 3.2 or 3.3) Is there an independent electrical system and motor for each door with each power source consisting of a motor capable of opening and closing the door that is automatically supplied by the transitional source of emergency electrical power, as required by SOLAS regulation 42.4.2, in the event of failure of either the main or emergency source of electrical power and with sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15°?			
SOLAS regulation II-1/13.7.3 (15.7.3) Are there alarms for low pressure/level or loss of electrical power?			
SOLAS regulation II-1/13.7.3 (15.7.3) Are the power systems separated from all other power systems such that a single failure in the electric or hydraulic power-operated systems excluding the hydraulic actuator shall not prevent the hand operation of any door?			
SOLAS regulation II-1/13.7.4 (15.7.4) Are controls handles provided at each side of the bulkhead at a minimum height of 1.6 m above the floor and arranged as to enable persons passing through the doorway to hold both handles in the open position without being able to set the power closing mechanism in operation accidentally?			
SOLAS regulation II-1/13.7.4 (15.7.4) Is the direction of movement of the handles in opening and closing the door in the direction of door movement and clearly indicated?			
SOLAS regulation II-1/13.7.5 (15.7.5) Are as far as practicable, electrical equipment and components for watertight doors situated above the bulkhead deck and outside hazardous areas and spaces?			
SOLAS regulation II-1/13.7.6 (15.7.6) Do the enclosures of electrical components necessarily situated below the bulkhead deck provide suitable protection against the ingress of water? (See footnote in SOLAS)			
SOLAS regulation II-1/13.7.7 (15.7.7) Are electric power, control, indication and alarm circuits protected against fault in such way that a failure in one door circuit will not cause a failure in any other door circuit?			
SOLAS regulation II-1/13.7.7 (15.7.7) Are short circuits or other faults in the alarm or indicator circuits of a door protected from causing a loss of power operation of that door?			

Technical Standards	Yes	No	Comments
SOLAS regulation II-1/13.7.7 (15.7.7) Does the arrangement prevent leakage of water into the electrical equipment located below the bulkhead?			
SOLAS regulation II-1/13.7.8 (15.7.8) Will a single electrical failure in the power operating or control system of a power-operated sliding watertight door be protected from causing a closed door to open?			
SOLAS regulation II-1/13.7.8 (15.7.8) Is the availability of the power supply continuously monitored at a point in the electrical circuit as near as practicable to each of the motors required by paragraph 7.3?			
SOLAS regulation II-1/13.7.8 (15.7.8) Does the loss of any such power supply activate an audible and visual alarm at the central operating console at the navigating bridge?			
SOLAS regulation II-1/13.8.1 (15.8.1)* Is the central operating console at the navigating bridge provided with a "master mode" switch with two modes of control that provide for a "local control" mode for any door to be locally opened and locally closed after use without automatic closure, and a "doors closed" mode to automatically close any door that is open?			
SOLAS regulation II-1/13.8.1 (15.8.1)* Does the "doors closed" mode permit doors to be opened locally and automatically re-close the doors upon release of the local control mechanism?			
SOLAS regulation II-1/13.8.1 (15.8.1)* Does the "master mode" switch normally remain in the "local control" mode, allowing the "doors closed" mode to only be used in an emergency or for testing purposes?			
SOLAS regulation II-1/13.8.2 (15.8.2)* Is the central operating console at the navigating bridge provided with a diagram showing the location of each door, with visual indicators to show whether each door is open or closed, such that a red light indicates a door is fully open and a green light indicates a door is fully closed?			
SOLAS regulation II-1/13.8.2 (15.8.2)* When the door is closed remotely, does the red light indicate the intermediate position by flashing?			
SOLAS regulation II-1/13.8.2 (15.8.2)* Is the indicating circuit independent of the control circuit for each door?			
SOLAS regulation II-1/13.8.3 (15.8.3)* Is the possibility to remotely open any door from the central operating console ruled out?			

* These regulations are not required for upgrade in previous SOLAS regulation II-1/15.6.5.

Appendix 3

FLOWCHART
GUIDANCE FOR PERMITTING WATERTIGHT DOORS ON PASSENGER SHIPS TO REMAIN OPEN DURING NAVIGATION



Appendix 4

ILLUSTRATION OF APPLICATION OF THE FLOATABILITY ASSESSMENT UNDER HAZARDOUS CONDITIONS IN THE GUIDANCE

		Assess the floatability as a part of the risk assessment		**Comply with floatability criteria**		**Hazardous conditions**	
		yes	no	yes	no	Within	Outside
Category A	after the Guidance effective	x		x		open	open
Category A-	after the Guidance effective	x			x	passage	open
Category A	before the Guidance effective	x		x		open	open
Category A-	before the Guidance effective		x		x	TBD by Admin	open
Category B			N/A		N/A	passage	passage + vicinity
Category C			N/A		N/A	passage	passage
Category D			N/A		N/A	closed	closed

INTERNATIONAL MARITIME ORGANIZATION

E

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T3/1.01

DSC.1/Circ.63
12 October 2010

CARRIAGE OF IRON ORE FINES THAT MAY LIQUEFY

1 The Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC), at its fifteenth session (13 to 17 September 2010), considered a preliminary report submitted by a Member Government relating to two recent serious casualties in the last monsoon season of 2009 and many near misses reported by the ship masters on ships engaged in the carriage of iron ore fines. The Sub-Committee also considered another submission made by an industry organization relating to the carriage of this cargo.

2 In considering the above submissions, the Sub-Committee concluded that:

.1 there is a need to raise awareness despite the efforts made by the various protection and indemnity clubs and other reporting casualty services, informing of the probable dangers of liquefaction associated with carriage of iron ore fines;

.2 that iron ore fines is not specifically listed in the International Maritime Solid Bulk Cargoes (IMSBC) Code;

.3 iron ore fines may liquefy and should be treated as such, in particular the Master should refer to section 7 of the IMSBC Code, which warns about cargoes that may liquefy;

.4 if this cargo is shipped with moisture content in excess of its transportable moisture limit (TML) there is a risk of cargo shift, which may result in capsizing;

.5 the Master should be aware that some shippers have in the past declared this cargo under the "iron ore" schedule in the IMSBC Code, which is classified as a Group 'C' cargo;

.6 the Master should not accept this cargo for loading unless the moisture content of the cargo indicated in the certificate is less than its transportable moisture limit; and

.7 the Master should exercise good seamanship when handling and carrying this cargo, such as protecting the cargo holds bilge covers to stop the ingress of this fine cargo into the bilge wells, for further guidance refer to sections 7 and 8 of the IMSBC Code.

3 In order to investigate further the hazards and risks associated with the carriage of iron ore fines, including clarification of the existing schedules on DRI and iron ore Group 'C' and the need for a new schedule, Member Governments and international organizations are invited to submit relevant information regarding the safe handling and carriage of this cargo, at their earliest convenience, to the Organization.

4 Member Governments are also invited to bring the above information to the attention of shippers, terminal operators, shipowners, ship operators, charterers, shipmasters and all other entities concerned, requesting that extreme care and appropriate action be taken, taking into account the provisions of relevant IMO instruments when handling and carrying iron ore fines in bulk.

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4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS/2.7.1

MSC.1/Circ.1389
7 December 2010

GUIDANCE ON PROCEDURES FOR UPDATING SHIPBORNE NAVIGATION AND COMMUNICATION EQUIPMENT

1 The Maritime Safety Committee (MSC), at its eighty-eighth session (24 November to 3 December 2010), approved the guidance on procedures for updating shipborne navigation and communication equipment, as prepared by the Sub-Committee on Safety of Navigation (NAV) at its fifty-sixth session (26 to 30 July 2010).

2 Member Governments are invited to bring the information to the attention of all parties concerned.

***

ANNEX

GUIDANCE ON PROCEDURES FOR UPDATING SHIPBORNE NAVIGATION AND COMMUNICATION EQUIPMENT

Background

1 As navigation and radiocommunication equipment becomes increasingly software and firmware dependent, updates to application software and firmware to meet changes in IMO and ITU regulatory requirements are needed. This applies in the case of retrospective changes to regulations which apply to all relevant ships.

2 Means should be provided to replace software and firmware or install updates to software and firmware in systems aboard ships.

3 Manufacturers should provide customers and interested parties with timely access to relevant information.

4 Adequate navigation and radiocommunication equipment software and firmware maintenance arrangements should be implemented by shipowners and be supported by equipment manufacturers. Equipment should provide the means to display, on demand, the current applicable software and firmware versions.

Procedures

5 Member Governments should promulgate information to all affected parties in relation to IMO and ITU regulatory changes that have the potential to affect maritime navigation and radiocommunication equipment.

6 Equipment manufacturers should provide timely access to information pertaining to maritime navigation and radiocommunication equipment application software, for any relevant changes, originating from IMO and ITU regulations. This could, for example, be by website listing relevant regulations currently in effect for the equipment, equipment software and firmware versions, compliance status and regulatory type approvals for the listed configurations/ versions. Update of operating systems and hardware may also be necessary to meet the changed requirements.

7 Shipowners should ensure that the vessel's equipment is up to date with the latest requirements.

8 In addition to the above, in the case of ECDIS refer to SN.1/Circ.266/Rev.1 as may be amended.

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INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS.2.7.1

MSC.1/Circ.1391
7 December 2010

OPERATING ANOMALIES IDENTIFIED WITHIN ECDIS

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), was informed of anomalies in the operation of some ECDIS systems relating to display and alarm behaviour in particular system configurations. The anomalies were discovered by the inspection of ENCs within a small number of ECDIS systems and the Committee considered it possible that other anomalies remain to be discovered.

2 Given the widespread use and the impending implementation of the ECDIS carriage requirement, the Committee considered it important that any anomalies identified by mariners are reported to and investigated by the appropriate authorities to ensure their resolution.

3 In order to better understand the extent of the issue, the Committee agreed to invite Administrations to collect, investigate and disseminate information about ECDIS anomalies. The Administrations or designated bodies are invited to:

.1 encourage vessels under their flag to report such anomalies, with sufficient detail on the ECDIS equipment and ENCs, to allow analysis;

.2 treat the identity of the reporter as confidential;

.3 agree to share information with other IMO Member Governments and international organizations on request; and

.4 issue alerts to mariners where such anomalies might affect safety of navigation.

4 Member Governments are invited to bring this circular to the attention of all parties concerned and report on relevant information received and experience gained to the Maritime Safety Committee.

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4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

E

Ref. T2-OSS/2.7.1

SN.1/Circ.266/Rev.1
7 December 2010

MAINTENANCE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM (ECDIS) SOFTWARE

1 The Sub-Committee on Safety of Navigation (NAV), at its fifty-sixth session (26 to 30 July 2010), reviewed the text of SN.1/Circ.266 and agreed that the text of the original circular should be amended as this was an important issue for ensuring the safety of navigation.

2 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), concurred with the Sub-Committee's views, approved the revised Guidance on the maintenance of Electronic Chart Display and Information System (ECDIS) software, as set out in the annex, and encouraged their use by the relevant authorities.

3 Member Governments are invited to bring the attached revised SN circular to the attention of all concerned for information and in particular to ensure that mariners always have the latest safety-related information available to them.

***

ANNEX

1 Resolution MSC.282(86), adopted on 5 June 2009, introduced a mandatory carriage requirement for Electronic Chart and Display Systems (ECDIS) to be phased in, according to size and class of ship, between 1 July 2012 and 1 July 2018. ECDIS Performance Standards have been adopted by IMO and in turn refer to the International Hydrographic Organization (IHO) Standards that govern the transfer and presentation of the chart information used in ECDIS.

2 ECDIS in operation comprises hardware, software and data. It is important for the safety of navigation that the application software within the ECDIS works fully in accordance with the Performance Standards and is capable of displaying all the relevant digital information contained within the Electronic Navigational Chart (ENC).

3 ECDIS that is not updated for the latest version of IHO Standards may not meet the chart carriage requirements as set out in SOLAS regulation V/19.2.1.4.

4 For example, in January 2007, Supplement No.1 to the IHO ENC Product Specification[1] was introduced in order to include, within the ENC, the then recently introduced IMO requirements for Particularly Sensitive Sea Areas (PSSA), Archipelagic Sea Lanes (ASL) and to cater for any future Safety of Navigation requirements.

5 Any ECDIS which is not upgraded to be compatible with the latest version of the Product Specification or the S-52 Presentation Library[2] may be unable to correctly display the latest charted features. Additionally, the appropriate alarms and indications may not be activated even though the features have been included in the ENC. Similarly any ECDIS which is not updated to be fully compliant with the latest version of the S-63 Data Protection Standard may fail to decrypt or to properly authenticate some ENCs, leading to failure to load or install.

6 In 2010, the status of IHO standards affecting ECDIS Equipment is:

IHO ECDIS Standards	Current Edition
Electronic Navigational Chart (ENC)	S-57 Edition 3.1
Presentation Library for ECDIS	S-52 PresLib Edition 3.4
ENC Data Protection Scheme	S-63 Edition 1.1
Raster Navigational Chart (RNC) *(Only if ECDIS software supports RCDS mode)*	S-61 Edition 1.0

An up-to-date list of all the relevant IHO standards relating to ECDIS equipment is maintained within the "About ENCs" section of the IHO website (www.iho.int).

1 S-57 Appendix B.1, ENC Product Specification, ed. 3.1.
2 S-52 Appendix 2, Annex A, Presentation Library, ed. 3.4.

7 The need for safe navigation requires that manufacturers should provide a mechanism to ensure software maintenance arrangements are adequate. This may be achieved through the provision of software version information using a website. Such information should include the IHO Standards which have been implemented.

8 Administrations should inform shipowners and operators that proper ECDIS software maintenance is an important issue and that adequate measures need to be implemented by masters, shipowners and operators in accordance with the International Safety Management (ISM) Code.

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INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS/2.7.1

SN.1/Circ.293
7 December 2010

ROUTEING MEASURES OTHER THAN TRAFFIC SEPARATION SCHEMES

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010) adopted, in accordance with the provisions of resolution A.858(20), the following new routeing measures other than traffic separation schemes including amendments to existing routeing measures other than traffic separation schemes, annexed hereto:

.1 new Area To Be Avoided in the Atlantic Ocean, "Off the coast of Ghana";

.2 new deep-water route including an associated precautionary area "In the approaches to the new port of King Abdullah port (KAP Port) in the Northern Red Sea";

.3 amendments to the existing Area To Be Avoided, "Off the south-west coast of Iceland";

.4 amendments to the existing deep-water route forming part of the "In the Strait of Dover and adjacent waters" traffic separation scheme; and

.5 new interim recommendatory measure in the Singapore Strait.

2 On 7 December 2010, the Organization received a communication from the Government of Saudi Arabia requesting the deferring of the implementation date of the new deep-water route including an associated precautionary area "In the approaches to the new port of King Abdullah port (KAP Port) in the Northern Red Sea" (paragraph 1.2 above) to the third quarter of 2015. Member Governments will be informed of the exact implementation date as and when the relevant information is received by the Secretariat.

3 Accordingly, the aforementioned routeing measures other than traffic separation schemes will be implemented as follows: routeing measures listed in subparagraphs 1.1, 1.3 and 1.4 will be implemented at 0000 hours UTC on 1 June 2011; routeing measure listed in subparagraph 1.5 at 0000 hours UTC on 1 July 2011.

***

ANNEX

ROUTEING MEASURES OTHER THAN TRAFFIC SEPARATION SCHEMES

ESTABLISHMENT OF AN AREA TO BE AVOIDED "OFF THE COAST OF GHANA IN THE ATLANTIC OCEAN"

(Reference chart: British Admiralty 1383, 2009 edition.
***Note*:** This chart is based on World Geodetic System 1984 Datum (WGS 84).)

Description of the Area To Be Avoided

Excepting ships authorized by the Ghana Maritime Authority, all ships should avoid the area within a radius of 5 nautical miles centred on the following geographical position:

04° 32′.10 N, 002° 54′.60 W (marked J-09).

ESTABLISHMENT OF A NEW DEEP-WATER ROUTE "IN THE APPROACHES TO THE NEW PORT OF KING ABDULLAH PORT (KAP PORT) IN THE NORTHERN RED SEA"

(Reference chart: British Admiralty (BA) 2659, 4 May 1990.
***Note*:** This chart is not based on World Geodetic System 1984 Datum (WGS 84). The geographical positions, (1) to (11), listed in item (a) below are referenced to BA 2659.)

Description of the deep-water route

(a) The deep-water route is bounded by a line drawn connecting the following geographical positions:

(1)	22° 17′.236 N	038° 52′.933 E
(2)	22° 18′.610 N	038° 53′.600 E
(3)	22° 20′.570 N	038° 54′.640 E
(4)	22° 25′.940 N	038° 57′.472 E
(5)	22° 28′.997 N	038° 58′.978 E
(6)	22° 31′.752 N	039° 03′.008 E
(7)	22° 29′.578 N	039° 03′.610 E
(8)	22° 26′.694 N	038° 59′.418 E
(9)	22° 21′.250 N	038° 56′.610 E
(10)	22° 19′.240 N	038° 55′.580 E
(11)	22° 15′.900 N	038° 53′.905 E

Thence back to the point of origin (1)

Notes:

Geographical positions referenced to WGS 84

(1)	22° 17.238′ N	038° 52.942′ E
(2)	22° 18.612′ N	038° 53.609′ E
(3)	22° 20.572′ N	038° 54.649′ E
(4)	22° 25.942′ N	038° 57.481′ E
(5)	22° 28.999′ N	038° 58.987′ E
(6)	22° 31.752′ N	039° 03.017′ E
(7)	22° 29.580′ N	039° 03.619′ E

(8)	22° 26.696′ N	038° 59.427′ E
(9)	22° 21.252′ N	038° 56.619′ E
(10)	22° 19.242′ N	038° 55.589′ E
(11)	22° 15.902′ N	038° 53.914′ E

ESTABLISHMENT OF A NEW PRECAUTIONARY AREA "IN THE APPROACHES TO THE NEW PORT OF KING ABDULLAH PORT (KAP PORT) IN THE NORTHERN RED SEA"

(Reference chart: British Admiralty (BA) 2659, 4 May 1990.
***Note*:** This chart is not based on World Geodetic System 1984 Datum (WGS 84). The geographical positions, (1) to (4), listed in item (a) below are referenced to BA 2659.)

Description of the precautionary area

(a) The precautionary area is established bounded by a line connecting the following geographical positions:

(2)	22° 18.610′ N	038° 53.600′ E
(3)	22° 20.570′ N	038° 54.640′ E
(9)	22° 21.250′ N	038° 56.610′ E
(10)	22° 19.240′ N	038° 55.580′ E

Thence back to the point of origin (2)

Notes:

Geographical positions referenced to WGS 84

(2)	22° 18.612′ N	038° 53.609′ E
(3)	22° 20.572′ N	038° 54.649′ E
(9)	22° 21.252′ N	038° 56.619′ E
(10)	22° 19.242′ N	038° 55.589′ E

AMENDMENTS TO THE EXISTING AREA TO BE AVOIDED "OFF THE SOUTH-WEST COAST OF ICELAND"

1 The first paragraph after the title "OFF THE SOUTH-WEST COAST OF ICELAND", which refers to the reference chart, is replaced by the following text:

"(Reference chart: Icelandic No.31 (INT 1103) Dyrhólaey – Snæfellsnes (May 2008 edition).
Note: The chart is based on World Geodetic System 1984 datum (WGS 84).)"

2 In "Notes" section, the following two new paragraphs are added after the existing paragraph 2:

"3 Ships of up to 20,000 gross tonnage, en route to or from Faxaflói Bay, which neither carry dangerous goods nor noxious materials in bulk or cargo tanks, may transit the Eastern ATBA south of latitude 63° 45′ N. When sailing such ships within this area, navigating officers should take utmost precaution and take special notice of weather and sea state forecasts in onshore wind conditions.

4 Passenger ships of unlimited size may only transit the area during the period 1 May to 1 October. When sailing such ships within this area, navigating officers should take utmost precaution and take special notice of weather and sea state forecasts in onshore wind conditions."

AMENDMENTS TO THE EXISTING DEEP-WATER ROUTE FORMING PART OF THE "IN THE STRAIT OF DOVER AND ADJACENT WATERS" TRAFFIC SEPARATION SCHEME

1 In "WARNINGS" section, the existing paragraph 3 is replaced by the following text:

"3 In the area of the deep-water route east of the separation line, ships are recommended to avoid overtaking where traffic and navigation do not allow sufficient sea room and passing distance. If overtaking is performed then a safe distance must be maintained and COLREG Rule 13 observed."

AMENDMENTS TO THE RULES FOR VESSELS NAVIGATING THROUGH THE STRAITS OF MALACCA AND SINGAPORE – RECOMMENDATIONS FOR VESSELS CROSSING THE TRAFFIC SEPARATION SCHEME (TSS) AND PRECAUTIONARY AREAS IN THE SINGAPORE STRAIT DURING HOURS OF DARKNESS (INTERIM RECOMMENDATORY MEASURE)

1 Vessels are recommended to display the night signals consisting of 3 all-round green lights[1] in a vertical line in the following situations:

a) Vessels departing from ports or anchorages when crossing the westbound or eastbound lane of the TSS or precautionary areas in the Singapore Strait to join the eastbound or westbound lane respectively; and

b) Eastbound or westbound vessels in the TSS or precautionary areas in the Singapore Strait crossing to proceed to ports or anchorages in the Singapore Strait.

2 The night signals should be displayed by:

a) Vessels of 300 gross tonnage and above;

b) Vessels of 50 metres or more in length; and

c) Vessels engaged in towing or pushing with a combined 300 gross tonnage and above, or with a combined length of 50 metres or more.

3 Vessels crossing the TSS and precautionary areas in the Singapore Strait to proceed to or from ports or anchorages are recommended to comply with the following procedures:

a) A vessel in the Singapore Strait which intends to cross the eastbound or westbound traffic lanes in the TSS or precautionary areas respectively, is recommended to comply with the following:

i) report to the VTIS to indicate its intention in advance.

ii) display the signals consisting of 3 all-round green lights in a vertical line. VTIS would alert ships in the vicinity to keep a good look out for the crossing vessel.

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1 The specifications of the lights used in configuring the "3 green lights" signal are to comply closely with positioning and technical details of lights in Annex I of COLREG.

iii) when traffic condition is favourable, alter course boldly if necessary, (to be readily apparent to other vessels in the vicinity observing by sight or radar) and cross the traffic lane on a heading as nearly as practicable at right angles to the general direction of traffic flow.

iv) report to VTIS and switch off the night signals when it has safely left/crossed or joined the appropriate traffic lane.

b) Displaying the night signals shall not exempt the crossing vessel of its obligation to give way to other vessels in a crossing situation or any other rules under the COLREG.

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INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS/2.7.1

SN.1/Circ.294
7 December 2010

MANDATORY SHIP REPORTING SYSTEMS

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), adopted resolutions MSC.314(88), MSC.315(88) and MSC.316(88), as attached to this circular, in accordance with the provisions of Assembly resolution A.858(20), adopting a new mandatory ship reporting system including amendments to existing mandatory ship reporting systems, as follows:

.1 "In the Sound between Denmark and Sweden" (SOUNDREP) (new system);

.2 "In the Torres Strait region and the Inner Route of the Great Barrier Reef" (REEFREP) (amended system); and

.3 "Off the south and south-west coast of Iceland" (TRANSREP) (amended system).

2 The new mandatory ship reporting system for "In the Sound between Denmark and Sweden" will be implemented at 0000 hours UTC on 1 September 2011, whilst the amendments to the existing mandatory ship reporting systems "In the Torres Strait region and the Inner Route of the Great Barrier Reef" and "Off the south and south-west coast of Iceland", will be implemented at 0000 hours UTC on 1 July 2011 and 0000 hours UTC on 1 June 2011, respectively.

3 Member Governments are requested to bring the attached information to the attention of masters of ships under their flags and advise them that they are required to comply with the requirements of the adopted ship reporting systems, in accordance with regulation V/11.7 of the International Convention for the Safety of Life at Sea, 1974, as amended.

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ANNEX 1

RESOLUTION MSC.314(88)
(adopted on 29 November 2010)

ADOPTION OF A NEW MANDATORY SHIP REPORTING SYSTEM "IN THE SOUND BETWEEN DENMARK AND SWEDEN" (SOUNDREP)

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO regulation V/11 of the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS Convention), in relation to the adoption of mandatory ship reporting systems by the Organization, and

RECALLING FURTHER resolution A.858(20) resolving that the function of adopting ship reporting systems shall be performed by the Committee on behalf of the Organization,

TAKING INTO ACCOUNT the guidelines and criteria for ship reporting systems adopted by resolution MSC.43(64), as amended by resolutions MSC.111(73) and MSC.189(79),

HAVING CONSIDERED the recommendations of the Sub-Committee on Safety of Navigation, at its fifty-sixth session,

1. ADOPTS, in accordance with SOLAS regulation V/11, a new mandatory ship reporting system "In the Sound between Denmark and Sweden" (SOUNDREP), as described in the annex to this resolution;

2. DECIDES that the above-mentioned new mandatory ship reporting system will enter into force at 0000 hours UTC on 1 September 2011;

3. REQUESTS the Secretary-General to bring this resolution and its annex to the attention of Contracting Governments to the SOLAS Convention and to members of the Organization.

ANNEX

DESCRIPTION OF THE MANDATORY SHIP REPORTING SYSTEM "IN THE SOUND BETWEEN DENMARK AND SWEDEN" (SOUNDREP)

1 Categories of ships required to participate in the system

1.1 Ships participating in the ship reporting system:

Ships of 300 gross tonnage and upwards proceeding to or from ports or anchorages in the Sound or passing through the reporting area.

Pursuant to SOLAS 1974 Convention, as amended, the SOUNDREP does not apply to warships, naval auxiliaries, other ships owned or operated by a Contracting Government and used, only on Government non-commercial service. However, such ships are encouraged to participate in the reporting system.

2 Geographical coverage of the system and the number and edition of the reference chart used for delineation of the system

2.1 The mandatory ship reporting system SOUNDREP is operated by Sound VTS. The call sign is "Sound Traffic".

2.2 The operational area of SOUNDREP covers the northern, central and southern part of the Sound as shown on the chartlet given in Appendix 1. The area includes the routeing systems, in the north TSS "In the Sound" and in the south TSS "Off Falsterbo", both adopted by the Organization.

2.2.1 Report and border line North

Denmark:

(1)	56° 06´.58 N	012° 11´.00 E	(Rågeleje)
(2)	56° 14´.00 N	012° 11´.00 E	(At sea North of Rågeleje)

Sweden:

(3)	56° 18´.08 N	012° 17´.39 E	(At sea West of Kullen)
(4)	56° 18´.08 N	012° 26´.88 E	(Kullen Light House)

2.2.2 Report and border line South

Denmark:

(5)	55° 17´.44 N	012° 27´.28 E	(Stevns Light House)
(6)	55° 10´.00 N	012° 27´.28 E	(At sea South of Stevns)

Sweden:

(7)	55° 10´.00 N	012° 54´.50 E	(At sea South of Falsterbo)

2.2.3 Report and border line East

Sweden:

(7)	55° 10´.00 N	012° 54´.50 E	(At sea South of Falsterbo)
(8)	55° 22´.89 N	013° 01´.93 E	(Fredshög)

2.2.4 Report and border line West

Denmark:

(9)	55° 19´.81 N	012° 27´.30 E	(Mandehoved)
(10)	55° 33´.28 N	012° 35´.53 E	(Aflandshage)

2.2.5 Sector division

The SOUNDREP area is divided into two sectors at latitude 55° 50´.00 N; sector 1 northerly and sector 2 southerly. Each sector has an assigned VHF channel as shown in Appendix 2.

2.3 The reference charts (Datum: World Geodetic System 1984 (WGS 84)), which include the operational area of SOUNDREP, are:

.1 Danish charts Nos. 102 (7th edition May 2009), 104 (5th edition Aug 2009), 131 (1st edition Nov 2008), 132 (19th edition Aug 2009) and 133 (13th edition Sep 2009); and

.2 Swedish charts Nos. 921 (4th edition 2009) and 922 (22nd edition 2009).

3 Format, content of reports, times and geographical positions for submitting reports, authority of whom reports should be sent and available services

3.1 *Procedures of reporting*

3.1.1 The SOUNDREP report must be initiated (see paragraph 3.1.4) to Sound VTS using VHF voice transmission. However, ships can fulfil most of the reporting requirements of the reporting system by the use of non-verbal means such as AIS (Automatic Information System) class A as approved by the Organization, and by e-mail or other alternative methods, prior to entering the ship reporting area (see also paragraph 3.4.1, Note (c)). Additional details are given in Appendix 3. For contact information see Appendix 2.

3.1.2 The use of correct and updated AIS information can accomplish the reporting requirements for designators A (part of), B, C, E, F, I, O, P and W.

3.1.3 E-mail or other alternative methods prior to entering the ship reporting area, can accomplish the reporting requirements for designators L, T and X. Such non-verbal part report must also state designator A (see also paragraph 3.4.1, Note (c)). Additional details are given in Appendix 3.

3.1.4 A ship which fulfils the reporting requirements of the SOUNDREP mandatory ship reporting system, by the use of non-verbal means, must as a minimum carry out a VHF voice transmission to communicate the name of the ship (part of designator A) and the report line of entry, to the Sound VTS when actually entering the area. The same procedure must be followed before departing a port or leaving an anchorage in the SOUNDREP area. Additional details are given in Appendix 3.

3.1.5 Designators U and Q, if applicable, shall at all times be given using VHF voice transmission to Sound VTS when entering the area. Additional details are given in Appendix 3.

3.1.6 To prevent overloading the VHF channels for reporting by verbal voice transmissions and to avoid interference with essential navigational duties, and by this hampering the safety of navigation in the area, a ship unable to accomplish the reporting requirements for designators L, T and X by e-mail or other alternative methods prior to entering the ship reporting area, can report these designators by the use of radio telephone or mobile phone to Sound VTS. Designator A must additionally be included in this part reporting.

3.2 Verbal reporting is not required when a ship is passing the SOUNDREP sector line at latitude 55° 50´.00 N. However, change of VHF frequency is required according to Appendix 2.

3.3 *Format*

3.3.1 The mandatory ship report shall be drafted in accordance with the format shown in Appendix 3. The information requested from ships is derived from the Standard Reporting Format shown in paragraph 2 of the Appendix to resolution A.851(20).

3.4 *Content*

3.4.1 A report from a ship to the SOUNDREP by non-verbal means or by voice transmission must contain the following information:

A Name of the ship, call sign and if available IMO identification number and MMSI No.
B Date and time
C Position expressed in latitude and longitude
E True course
F Speed
I Destination and ETA
L Route information on the intended route through the Sound
O Maximum present draught
P Cargo; and quantity and IMO class of dangerous goods, if applicable (see Note (c) below)
Q Defects and deficiencies or other limitations
T Contact details for the communication of cargo information (see Note (c) below)
U Air draught when exceeding 35 metres
W Total number of persons on board
X Type and estimated quantity of bunker fuel, for ships of 1,000 gross tonnage and above

Note:

(a) On receipt of a report, operators of the Sound VTS will establish the relation to the ship's position and the information supplied by the facilities available to them.

(b) The master of the ship must forthwith inform the Sound VTS concerned of any change to the information notified, including designator Q.

(c) Information on dangerous cargo and contact details for the communication of cargo information (designators P and T of the reporting format) is only requested when such information has not been notified to the competent authority via SafeSeaNet in an European Union (EU) member State in accordance with the requirements of Article 13 (for ships leaving or entering an EU port) in Directive 2002/59/EC on establishing Community vessel traffic monitoring and information system and amended by Directive 2009/17/EC, prior to entering the operational SOUNDREP area. Additional details are given in Appendix 3.

3.5 *Geographical position for submitting reports*

3.5.1 Ships entering the SOUNDREP operational area shall submit a report when crossing the entrance lines or on departure from a port or anchorage within the operational area.

3.5.2 Further reports should be made whenever there is a change in navigational status or circumstance, particularly in relation to designator Q the reporting format.

3.6 *Crossing traffic*

3.6.1 Recognizing that ferries crossing between Helsingør and Helsingborg operate according to published schedules special reporting arrangements can be made on a ship to ship basis. Ferries leaving the ports Helsingør in Denmark and Helsingborg in Sweden operating according to published schedules are normally not requested to report to the Sound VTS.

3.7 *Authority*

The VTS Authority for the SOUNDREP is Sound VTS with call sign "Sound Traffic". Additional details are given in Appendix 2.

4 Information to be provided to ships and procedures to be followed

4.1 Ships are required to keep a continuous listening watch in the area on the relevant VHF sector channel and VHF channel 16.

4.2 Sound VTS will provide information service to shipping about specific and urgent situations, which could cause conflicting traffic movements as well as other information concerning safety of navigation for instance, information about weather, current, ice, water level, navigational problems or other hazards.

4.2.1 If necessary, Sound VTS can provide individual information to a ship particularly in relation to positioning and navigational information or local conditions by using the IMO Standard Marine Communication Phrases (SMCP), section A1/6 for VTS message markers. The message markers can be of ADVICE, WARNING, INFORMATION, QUESTION, ANSWER, REQUEST and INTENTION.

4.2.2 Information of general interest to shipping in the area will be broadcast by Sound VTS on VHF channel as specified by the VTS operator or will be given on request. A broadcast will be preceded by an announcement on VHF channel 16. All ships navigating in the area should listen to the announced broadcast.

4.3 If a ship needs to anchor due to breakdown, low visibility, adverse weather, changes in the indicated depth of water, etc., Sound VTS can recommend suitable anchorages or other place of refuge within the operational area.

5 Communication required for the SOUNDREP system

5.1 The language used for communication shall be English, using IMO Standard Marine Communication Phrases, where necessary.

5.2 Details of communication and contact information are given in Appendix 2.

6 Rules, regulations and recommendation in force in the area of the system

6.1 *Regulations for preventing collisions at sea*

The International Regulations for Preventing Collisions at Sea (COLREG) are applicable throughout the operational area of SOUNDREP.

6.2 *Traffic separation scheme "In the Sound"*

The Traffic separation scheme "In the Sound", situated to the north in the narrows of the Sound, as adopted by the Organization, and Rule 10 of the International Regulations for Preventing Collisions at Sea therefore applies.

6.3 *Traffic separation scheme "Off Falsterbo"*

The separation scheme "Off Falsterbo" situated in the southern part of the Sound, as adopted by the Organization, and Rule 10 of the International Regulations for Preventing Collisions at Sea therefore applies.

6.4 *IMO Recommendation on Navigation through the entrances to the Baltic Sea – The Sound*

SN.1/Circ.263, section 1.9 and IMO publication on Ships' Routeing, part C, on Amendments to Recommendation on Navigation through the entrances to the Baltic Sea, adopted at MSC 83 in October 2007, recommends for the Sound that loaded oil tankers with a draught of 7 metres or more, loaded chemical tankers and gas carriers, irrespective of size, and ships carrying a shipment of irradiated nuclear fuel, plutonium and high-level radioactive wastes (INF Code materials), when navigating the Sound between a line connecting Svinbådan Lighthouse and Hornbæk Harbour and a line connecting Skanör Harbour and Aflandshage should use the pilotage services established by the Governments of Denmark and Sweden.

6.5 *Mandatory pilotage*

Harbours within the SOUNDREP area are covered by provisions about mandatory pilotage for certain ships bound for or coming from Danish and Swedish ports.

6.6 *Air draught when exceeding 35 metres*

The navigable Drogden channel is located beside a major airport. In order to ensure safety of navigation in the dredged channel of Drogden and to reduce the risk of collision between an aircraft that serves the airport and a ship or other floating equipment, a reporting obligation has been established. Additional details are given in Appendix 3, designator U.

6.6.1 The safety procedure that has been established is that for all ships, including ships with a tow, with an air draught exceeding 35 metres, Sound VTS shall notify the air traffic control stating the maximum air draught of the ship or floating equipment. The notification shall be given at least 30 minutes prior to the expected time (UTC) for passage of:

- Nordre Røse lighthouse at position 55° 38´.17 N, 012° 41´.21 E; and
- light buoy No.9 at position 55° 36´.15 N, 012° 41´.79 E.

Sound VTS will transfer the information to the air traffic control.

7 Shore-based facilities to support the operation of the system

7.1 *System capability*

7.1.1 The Sound VTS centre is situated at Malmö, Sweden.

7.1.2 The Sound VTS system comprises several remote sensor sites. The sites provide surveillance of the SOUNDREP area using a combination of radar and AIS. An integrated network of ten radar sensors integrated with AIS provides surveillance of the area.

7.1.3 All the sensors mentioned below will be controlled or monitored by the VTS operators.

7.1.4 Recording equipment automatically stores information from all tracks, which can be replayed. In case of incidents the VTS authority can use records as evidence. VTS operators have access to different ship registers, pilot information and hazardous cargo data.

7.1.5 An integrated database is available for the operators in handling information.

7.2 *Radar and other sensors*

Information necessary to evaluate the traffic activities within the operational area of SOUNDREP is compiled via remote controlled sensors comprising:

- Sensors for water level and current at Drogden and Flintrännan;
- High-resolution radar systems; and
- VHF communications systems including DSC call (see Appendix 2).

7.3 *Radio communication equipment*

Redundant VHF system with DSC functionality (see Appendix 2).

7.4 *AIS facilities*

Sound VTS is linked to both the Danish and Swedish national shore-based AIS network and can continually receive messages broadcast by ships with transponders to gain information on their identity and position. The information is displayed as part of the VTS system and is covering the ship reporting area.

7.5 *Personnel qualifications and training*

7.5.1 The VTS centre is staffed with personnel all educated and experienced as officers in charge of navigational watch according to national and international requirements.

7.5.2 Training of VTS personnel will meet the standards recommended by IMO in MSC/Circ.1065 on IALA Standards for training and certification of VTS personnel (Ed. 2).

7.5.3 Refresher training is carried out on a regular basis.

8 Information concerning the applicable procedures if the communication facilities of shore-based Authority fail

8.1 The system is designed with sufficient system redundancy to cope with normal equipment failure.

8.2 In the event of radio communication system failure at the VTS centre, communication will be maintained via a redundant standby VHF system. If the radar system or other essential equipment suffers a breakdown, information of reduced operational capability will be given by Sound VTS or as national navigational warnings.

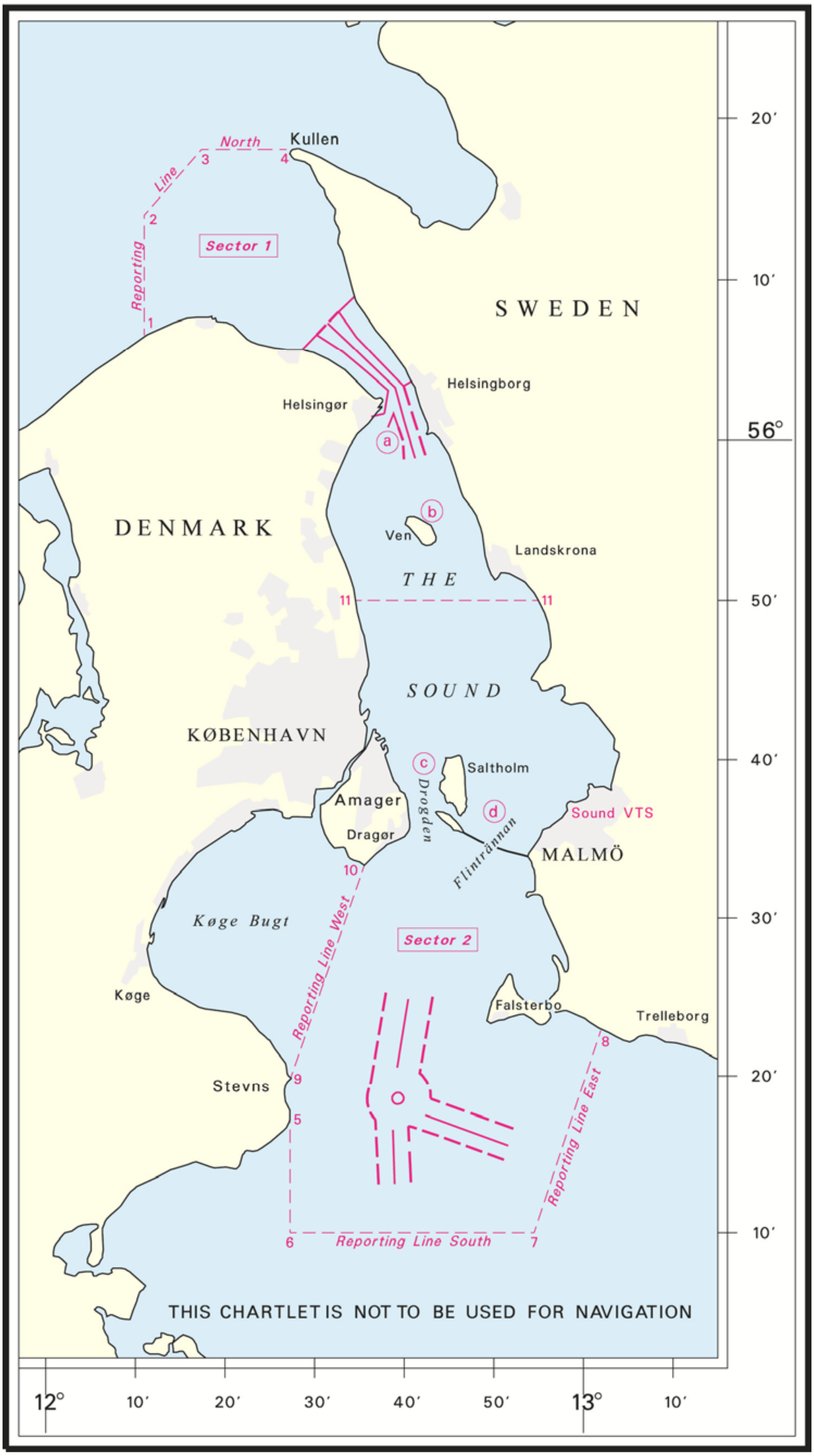
9 Measures to be taken if a ship fails to comply with the requirements of the system

9.1 The objective of the VTS Authority is to facilitate the exchange of information between the shipping and the shore in order to ensure safe passages of the bridges, support safety of navigation and the protection of the marine environment.

9.2 All means will be used to encourage and promote the full participation of ships required to submit reports under SOLAS regulation V/11. If reports are not submitted and the offending ship can be positively identified, then information will be passed to the relevant flag State Authority for investigation and possible prosecution in accordance with national legislation. Information will also be made available to Port State Control inspectors.

Appendix 1

SOUNDREP Operational Area



Appendix 2

Contact information and assigned VHF channels for sectors in the mandatory ship reporting system "In the Sound between Denmark and Sweden" (SOUNDREP)

SOUNDREP, radio call sign:	**"Sound Traffic"**

VHF Channels	**Operational use**
VHF Channel 73	Sound VTS – Sector 1 North
VHF Channel 71	Sound VTS – Sector 2 South
VHF Channel 79	Sound VTS – Broadcast 1, individual assistance
VHF Channel 68	Sound VTS – Broadcast 2, individual assistance and reserve channel

The Sound VTS operating SOUNDREP is located in Malmö, Sweden:

H24 contact information:

1) Sound VTS is monitoring VHF channels 73, 71 and 16 continuously.

2) Duty officer phone: +46 40 20 43 17 or,
+46 40 20 43 34

3) Fax: +46 40 20 43 45

4) E-mail: contact@soundvts.org

Address:

Sound VTS
Hans Michelsensgata 9
Box 855
S-201 80 Malmö
Sweden

Appendix 3

Drafting of reports to the mandatory ship reporting system "In the Sound between Denmark and Sweden" (SOUNDREP)

Designator	AIS	Function	Information required
A	Yes, and VHF	Ship	Name of the ship (VHF); call sign and if available IMO identification number and MMSI number (AIS)
B	Yes	Date and time of event	A 6-digit group event giving day of month and hours and minutes in Universal Co-ordinated Time (UTC).
C	Yes	Position	A 5-digit group giving latitude in degrees and minutes, decimal, suffixed with N and a 6-digit group giving longitude in degrees and minutes, decimal, suffixed with E.
E	Yes	True course	A 3-digit group
F	Yes	Speed in knots and tenths of knots	A 3-digit group
I	Yes	Destination and ETA	The name of next port of call given in UN LOCODE. For details see in IMO SN/Circ.244 and; www.unece.org/cefact/locode/service/main.htm. Date and time group expressed as in (B)
L	No	Route information	A brief description of the intended route as planned by the master. Ships navigating in The Sound have options on deciding route in the following areas (see Appendix 1); a) Disken shoal b) Ven island c) Drogden channel d) Flintrännan channel The route information should be given coded by using the following local designators: • DW – Disken, west of • DE – Disken, east of • VW – Ven, west of • VE – Ven, east of • D – Drogden • F – Flintrännan See examples below.
O	Yes	Maximum present draught in metres	A 2-digit or 3-digit group giving the present maximum draught in metres (e.g.: 6.1 or 10.4).

Designator	AIS	Function	Information required
P	Yes	Cargo on board	Cargo; and quantity and IMO class of dangerous goods, if applicable (see 3.4.1, Note c).
Q	VHF	Defects and deficiencies or other limitations	Details of defects and deficiencies affecting the equipment of the ship or any other circumstances affecting normal navigation and manoeuvrability.
T	No	Ship's representative and/or owner	Address and particulars from which detailed information on the cargo may be obtained.
U	VHF	Ships size	Information of maximum air draught when exceeding 35 metres, required for all ships, including ships towing or other floating equipment. This information shall be given by voice transmissions when entering the SOUNDREP area, irrespectively of, if the information also is given by, e.g., AIS; details in paragraph 6.6.
W	Yes	Total number of persons on board	State number.
X	No	Miscellaneous	Type and estimated quantity of bunker fuel, for ships of 1,000 gross tonnage and above.

Examples of routes as given under designator L

A northbound ship leaving Malmö Port planning to sail, east of Ven, TSS In the Sound (UN LOCODE format for Malmö Port is SE MMA):

L: SE MMA, VE,

A southbound ship in transit planning to sail TSS In the Sound, east of Disken, west of Ven, Drogden channel and TSS Off Falsterbo:

L: DE, VW, D

***

ANNEX 2

RESOLUTION MSC.315(88)
(adopted on 29 November 2010)

ADOPTION OF AMENDMENTS TO THE EXISTING MANDATORY SHIP REPORTING SYSTEM "IN THE TORRES STRAIT REGION AND THE INNER ROUTE OF THE GREAT BARRIER REEF" (REEFREP)

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO regulation V/11 of the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS Convention), in relation to the adoption of mandatory ship reporting systems by the Organization, and

RECALLING FURTHER resolution A.858(20) resolving that the function of adopting ship reporting systems shall be performed by the Committee on behalf of the Organization,

TAKING INTO ACCOUNT the guidelines and criteria for ship reporting systems adopted by resolution MSC.43(64), as amended by resolutions MSC.111(73) and MSC.189(79),

HAVING CONSIDERED the recommendations of the Sub-Committee on Safety of Navigation, at its fifty-sixth session,

1. ADOPTS, in accordance with SOLAS regulation V/11, the amendments to the existing mandatory ship reporting system "In the Torres Strait region and the Inner Route of the Great Barrier Reef" (REEFREP), as described in the annex of this resolution;

2. DECIDES that the amendments to this existing mandatory ship reporting system will enter into force at 0000 hours UTC on 1 July 2011;

3. REQUESTS the Secretary-General to bring this resolution and its annex to the attention of Contracting Governments to the SOLAS Convention and to members of the Organization.

ANNEX

AMENDMENTS TO THE EXISTING MANDATORY SHIP REPORTING SYSTEM "IN THE TORRES STRAIT REGION AND THE INNER ROUTE OF THE GREAT BARRIER REEF" (REEFREP)

AMENDMENTS TO ANNEX 1 OF RESOLUTION MSC.52(66), AS AMENDED BY RESOLUTION MSC.161(78)

1 *In Annex 1, paragraphs 2.1 and 2.2 are replaced by the following paragraphs:*

"2.1 The reporting system will cover the general area, as shown in the chartlet at appendix 1. The area encompasses the Torres Strait between longitudes 141º 45′ E and 144º 00′ E, including the Endeavour Strait, and the waters of the Great Barrier Reef (GBR) between the Australian coast and the outer edge of the GBR, from the latitude of Cape York (10º 40′ S) south-eastwards to 21° 00′ S 152° 55′ E. From this position, the REEFREP boundary extends as follows:

(a) to position 23° 42′ S 153° 45′ E,

(b) thence to position 24° 30′ S 153° 35′ E,

(c) thence westward on latitude 24° 30′ S to its intersection with the Queensland coastline at the low water mark, and

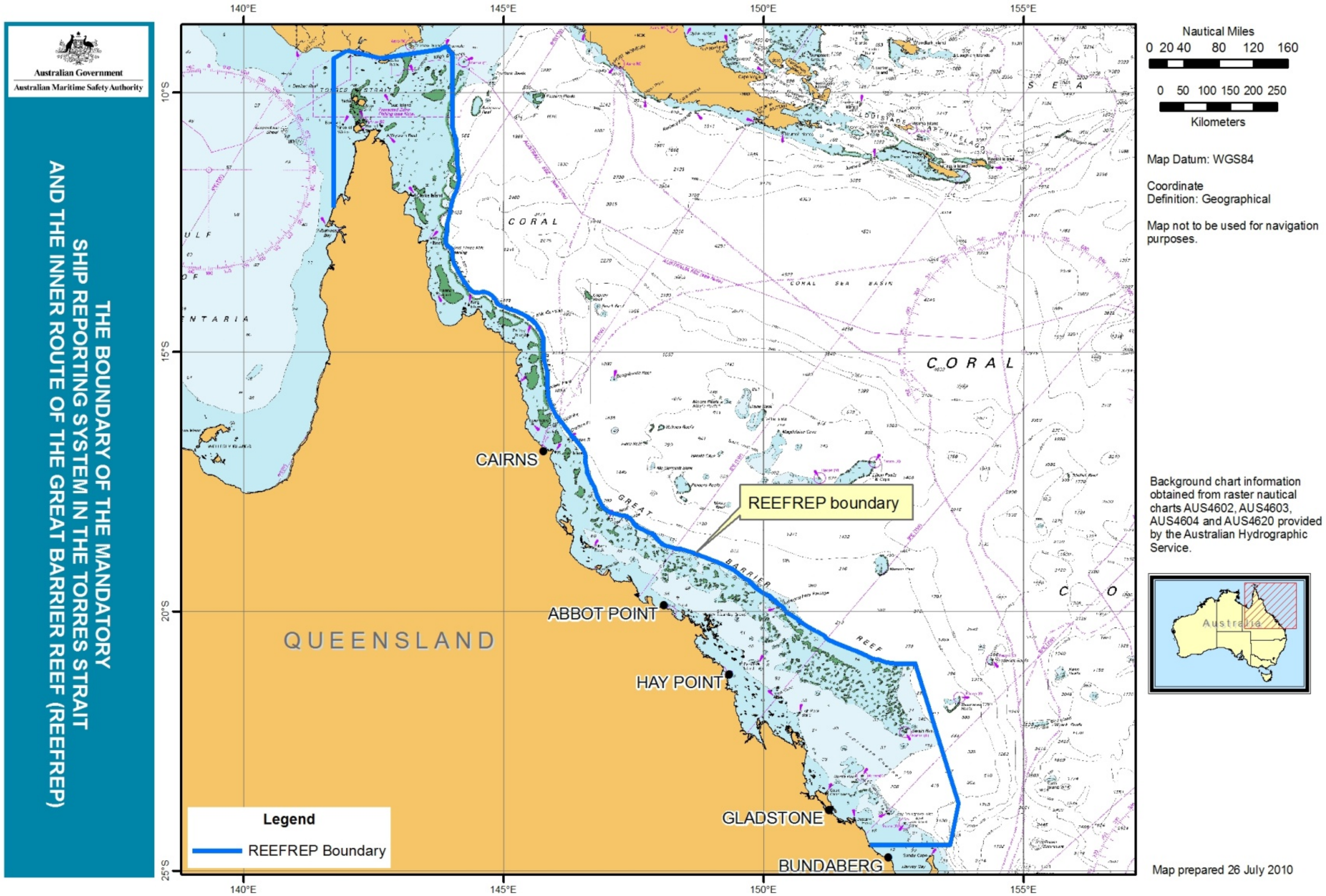
(d) thence generally north-westerly along the coastline to the latitude of Cape York (10º 40′ S).

2.2 The REEFREP area is shown on charts AUS 4620 (1996) and AUS 4635 (2010). A series of large scale charts is provided for coastal navigation throughout the REEFREP area."

2 *Appendix 1 is replaced as follows:*

Appendix 1

GENERAL AREA COVERED BY THE REPORTING SYSTEM



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ANNEX 3

RESOLUTION MSC.316(88)
(adopted on 29 November 2010)

ADOPTION OF AMENDMENTS TO THE EXISTING MANDATORY SHIP REPORTING SYSTEM "OFF THE SOUTH AND SOUTH-WEST COAST OF ICELAND" (TRANSREP)

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO regulation V/11 of the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS Convention), in relation to the adoption of mandatory ship reporting systems by the Organization, and

RECALLING FURTHER resolution A.858(20) resolving that the function of adopting ship reporting systems shall be performed by the Committee on behalf of the Organization,

TAKING INTO ACCOUNT the guidelines and criteria for ship reporting systems adopted by resolution MSC.43(64), as amended by resolutions MSC.111(73) and MSC.189(79),

HAVING CONSIDERED the recommendations of the Sub-Committee on Safety of Navigation, at its fifty-sixth session,

1. ADOPTS, in accordance with SOLAS regulation V/11, the amendments to the existing mandatory ship reporting system "Off the south and south-west coast of Iceland" (TRANSREP), as described in the annex of this resolution;

2. DECIDES that the amendments to this existing mandatory ship reporting system will enter into force at 0000 hours UTC on 1 July 2011;

3. REQUESTS the Secretary-General to bring this resolution and its annex to the attention of Contracting Governments to the SOLAS Convention and to members of the Organization.

ANNEX

AMENDMENTS TO THE EXISTING MANDATORY SHIP REPORTING SYSTEM "OFF THE SOUTH AND SOUTH-WEST COAST OF ICELAND" (TRANSREP)

1 In section 1 "Categories of ships required to participate in the system", the following paragraphs are added after the existing paragraph 1.1.2:

".3 ships of up to 20,000 gross tonnage, en route to or from Faxaflói Bay, which neither carry dangerous goods nor noxious materials in bulk or cargo tanks and which may transit the Eastern ATBA south of latitude 63° 45´ N; and

.4 passenger ships of unlimited size, which may only transit the inner route (Húllid Passage) and the Eastern ATBA during the period 1 May to 1 October."

2 In section 2 "Geographical coverage of the system and the number and edition of the reference charts used for the delineation of the system", the second paragraph, which refers to the reference chart, is replaced by the following paragraph:

"The reference chart, which includes all the area of coverage for the system, is Icelandic chart No.31 (INT 1103) *Dyrhólaey – Snæfellsnes* (May 2008 edition), based on datum WGS 84."

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INTERNATIONAL MARITIME ORGANIZATION

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS/2.7.1

SN.1/Circ.295
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GUIDELINES FOR SAFETY ZONES AND SAFETY OF NAVIGATION AROUND OFFSHORE INSTALLATIONS AND STRUCTURES

1 The Sub-Committee on Safety of Navigation (NAV), at its fifty-sixth session (26 to 30 July 2010), agreed on Guidelines for safety zones and safety of navigation around offshore installations and structures, for increasing awareness of the availability and best use of existing routeing measures for the safety of both navigation and artificial islands, installations or structures.

2 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010), approved the circulation of the attached guidelines for safety zones and safety of navigation around offshore installations and structures.

3 Member Governments are invited to bring the information to the attention of all parties concerned.

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ANNEX

GUIDELINES FOR SAFETY ZONES AND SAFETY OF NAVIGATION AROUND OFFSHORE INSTALLATIONS AND STRUCTURES

1 Some offshore artificial islands, installations or structures are complex systems that present particular challenges for safe navigation. These artificial islands, installations or structures are such that navigation around them creates concern about the safety of personnel and the risk of serious damage to offshore installations or structures, vessels and the environment in the event of a collision.

2 Any features of a sufficiently permanent nature of offshore artificial islands, installations or structures should be shown on all appropriate navigational charts.

3 Related documents:

- Resolution A.671(16) provides guidance on safety zones and safety of navigation around offshore installations and structures.

- Resolution A.572(14), as amended, establishes the General Provisions on Ships' Routeing.

- Resolution A.857(20) establishes guidelines for vessel traffic services.

- Resolution A.893(21) establishes guidelines for voyage planning when approaching artificial islands, installations and structures.

4 In order to enhance both the safety of navigation and of these artificial islands, installations or structures as well as the safety of personnel:

.1 Governments are requested to:

.1 implement the recommendations in resolution A.671(16);

.2 take appropriate measures to ensure navigation charts clearly reflect the location and projected swing or movement, if any, with the wind and seas of Floating Production Storage Offloading units (FPSOs), including their connected associated and necessary structures, installations, vessels, shuttle tankers and/or tugs in its operations, and other similarly situated installations or structures, that rotate around a fixed mooring;

.3 adopt as standard representation on navigation charts the legends, symbols and notes recommended by the International Hydrographic Organization for the designation of safety zones around offshore artificial islands, structures or installations including their connected associated and necessary operational arrangements mentioned in paragraph 4.1.2 above, as guidance for the representation of details of safety zones established in accordance with international law;

.4 consider as standard representation on navigation charts, the use of appropriate area legends, symbols and notes, such as "development areas" and "anchors and cables", recommended by the International Hydrographic Organization, as a warning to mariners navigating in the vicinity of offshore resource and exploitation areas;

.5 include a cautionary or explanatory note on navigation charts depicting the location of safety zones established in accordance with international law;

.6 consider and propose to the Organization those routeing measures that, in combination with duly established safety zones around offshore artificial islands, structures or installations, will enhance the safety both of navigation and of the artificial island, structure or installation, particularly those that are complex systems; and

.7 if circumstances permit, consider holding consultation with all stakeholders with respect to safety of navigation.

.2 Flag States are requested to:

.1 take all necessary steps to ensure that, unless specifically authorized, ships flying their flag observe any coastal State's conditions for entry into and/or navigation within duly established safety zones; and

.2 draw the attention of seafarers to the need to navigate with extreme caution, including taking all necessary measures in regard to voyage planning required by SOLAS regulation V/34 and make timely radio contact with the offshore artificial islands, installations or structures, associated vessel traffic services and other vessels in the area, if an infringement of the safety zone cannot be avoided.

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INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

Ref. T2-OSS/2.7.1

COLREG.2/Circ.62
15 December 2010

NEW AND AMENDED EXISTING TRAFFIC SEPARATION SCHEMES

1 The Maritime Safety Committee, at its eighty-eighth session (24 November to 3 December 2010) adopted, in accordance with the provisions of resolution A.858(20), new and amended existing traffic separation schemes and associated routeing measures listed, in annexes 1 to 4, as follows:

.1 "Off the western coast of Norway" (new scheme);

.2 "Off the southern coast of Norway" (new scheme);

.3 "In the Strait of Dover and adjacent waters" (amended scheme); and

.4 "Off the south-west coast of Iceland" (amended scheme).

2 In addition, the Maritime Safety Committee also **revoked** the existing traffic separation scheme "Off Feistein" (revoked scheme).

3 The new and amended traffic separation schemes listed in subparagraphs 1.1, 1.2, 1.3, and 1.4 above and detailed in annexes 1, 2, 3 and 4 will be implemented at 0000 hours UTC on 1 June 2011. The traffic separation scheme "Off Feistein" will be revoked also at 0000 hours UTC on 1 June 2011.

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ANNEX 1

NEW AND AMENDED TRAFFIC SEPARATION SCHEMES

OFF THE WESTERN COAST OF NORWAY

(Reference charts: Norwegian Charts No.306, 307 and 308 published by the Norwegian Hydrographic Service.
***Note*:** These charts are based on European Datum 1950 (ED 50). The geographical positions, (1) to (43), listed below are based on World Geodetic System 1984 Datum (WGS 84).)

Categories of ships to which the traffic separation schemes apply

(a) tankers as defined in Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78);

(b) chemical tankers carrying noxious liquid substances in bulk assessed or provisionally assessed as Category X or Y in Annex II to MARPOL 73/78;

(c) ships of 5,000 gross tonnage and upwards, in transit or on international voyages to or from Norwegian ports; and

(d) the routeing schemes do not apply to any size or category of ship in domestic traffic with passengers and/or goods between Norwegian ports.

International voyages to or from ports in Norway

Ships of above categories on international voyages, to or from ports in Norway, should follow the ship's routeing system until a course to port can be clearly set. This also applies to ships calling at Norwegian ports for supplies or service.

Description of the traffic separation schemes

I Off Runde

(a) A separation zone is bounded by a line connecting the following geographical positions:

(1)	62° 59′.95 N	004° 08′.40 E
(2)	62° 55′.17 N	004° 04′.07 E
(3)	62° 49′.98 N	004° 04′.07 E
(4)	62° 49′.98 N	004° 08′.43 E
(5)	62° 54′.78 N	004° 08′.43 E
(6)	62° 59′.18 N	004° 12′.45 E

(b) A traffic lane for southbound traffic is established between the separation zone described in paragraph (a) and a line connecting the following geographical positions:

(7)	63° 01′.12 N	004° 02′.32 E
(8)	62° 55′.78 N	003° 57′.50 E
(9)	62° 50′.00 N	003° 57′.52 E

(c) A traffic lane for northbound traffic is established between the separation zone described in paragraph (a) and a line connecting the following geographical positions:

(10)	62° 58′.05 N	004° 18′.52 E
(11)	62° 54′.20 N	004° 15′.00 E
(12)	62° 50′.00 N	004° 14′.97 E

II Off Stad

(d) A separation zone is bounded by a line connecting the following geographical positions:

(13)	61° 59′.00 N	004° 04′.13 E
(14)	61° 54′.00 N	004° 04′.13 E
(15)	61° 54′.00 N	004° 08′.37 E
(16)	61° 59′.00 N	004° 08′.37 E

(e) A traffic lane for southbound traffic is established between the separation zone described in paragraph (d) and a line connecting the following geographical positions:

(17)	61° 59′.00 N	003° 57′.78 E
(18)	61° 54′.00 N	003° 57′.80 E

(f) A traffic lane for northbound traffic is established between the separation zone described in paragraph (d) and a line connecting the following geographical positions:

(19)	61° 59′.00 N	004° 14′.72 E
(20)	61° 54′.00 N	004° 14′.70 E

III Off Sotra

(g) A separation zone is bounded by a line connecting the following geographical positions:

(21)	60° 20′.00 N	004° 04′.23 E
(22)	60° 15′.00 N	004° 04′.25 E
(23)	60° 15′.00 N	004° 08′.25 E
(24)	60° 20′.00 N	004° 08′.27 E

(h) A traffic lane for southbound traffic is established between the separation zone described in paragraph (g) and a line connecting the following geographical positions:

(25)	60° 20′.00 N	003° 58′.20 E
(26)	60° 15′.00 N	003° 58′.23 E

(i) A traffic lane for northbound traffic is established between the separation zone described in paragraph (g) and a line connecting the following geographical positions:

(27)	60° 20′.00 N	004° 14′.30 E
(28)	60° 15′.00 N	004° 14′.27 E

IV Off Utsira

(j) A separation zone is bounded by a line connecting the following geographical positions:

(29)	59° 05′.00 N	004° 04′.32 E
(30)	58° 59′.83 N	004° 04′.32 E
(31)	58° 57′.72 N	004° 08′.20 E
(32)	59° 05′.00 N	004° 08′.20 E

(k) A traffic lane for southbound traffic is established between the separation zone described in paragraph (j) and a line connecting the following geographical positions:

(33)	59° 05′.00 N	003° 58′.47 E
(34)	58° 58′.50 N	003° 58′.47 E

(l) A traffic lane for northbound traffic is established between the separation zone described in paragraph (j) and a line connecting the following geographical positions:

(35)	59° 05′.00 N	004° 14′.03 E
(36)	59° 01′.73 N	004° 14′.03 E
(37)	58° 58′.50 N	004° 19′.95 E

Description of the recommended routes

(m) A recommended route is established between the traffic separation schemes Off Runde and Off Stad with a central line between the following geographical positions:

(38)	62° 50′.00 N	004° 06′.25 E
(39)	61° 59′.00 N	004° 06′.25 E

(n) A recommended route is established between the traffic separation schemes Off Stad and Off Sotra with a central line between the following geographical positions:

(40)	61° 54′.00 N	004° 06′.25 E
(41)	60° 20′.00 N	004° 06′.25 E

(o) A recommended route is established between the traffic separation schemes Off Sotra and Off Utsira with a central line between the following geographical positions:

(42)	60° 15′.00 N	004° 06′.25 E
(43)	59° 05′.00 N	004° 06′.25 E

Note:

Chart No.	Title	Scale	Datum
306	Skagerrak, vestre blad	1:350 000	ED 50
307	Stavanger – Florø	1:350 000	ED 50
308	Florø – Smøla	1:350 000	ED 50

Typical shift of position co-ordinates referred to the WGS 84 Datum to the ED 50 Datum are:

From Datum	To Datum	Approximate latitude in the area	Datum shift
WGS 84	ED 50	62˚ 30′ N	99 m (NE-diagonal)
WGS 84	ED 50	59˚ 00′ N	109 m (NE-diagonal)

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ANNEX 2

OFF THE COAST OF SOUTHERN NORWAY

(Reference charts: Norwegian Charts No.305 (INT 1300) and 306 published by the Norwegian Hydrographic Service.
***Note*:** These charts are based on European Datum 1950 (ED 50). The geographical positions, (1) to (63), listed below are based on World Geodetic System 1984 Datum (WGS 84).)

Categories of ships to which the traffic separation schemes apply

(a) tankers as defined in Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78);

(b) chemical tankers carrying noxious liquid substances in bulk assessed or provisionally assessed as Category X or Y in Annex II to MARPOL 73/78;

(c) ships of 5,000 gross tonnage and upwards, in transit or on international voyages to or from Norwegian ports; and

(d) the routeing schemes do not apply to any size or category of ship in domestic traffic with passengers and/or goods between Norwegian ports.

International voyages to or from ports in Norway

Ships of above categories on international voyages, to or from ports in Norway, should follow the ship's routeing system until a course to port can be clearly set. This also applies to ships calling at Norwegian ports for supplies or service.

Description of the traffic separation schemes

I Off Egersund

(a) A separation zone is bounded by a line connecting the following geographical positions:

(1)	58° 21′.00 N	005° 15′.23 E
(2)	58° 18′.78 N	005° 19′.20 E
(3)	58° 16′.82 N	005° 23′.58 E
(4)	58° 18′.33 N	005° 26′.02 E
(5)	58° 20′.22 N	005° 21′.80 E
(6)	58° 22′.37 N	005° 18′.00 E

(b) A traffic lane for eastbound traffic is established between the separation zone described in paragraph (a) and a line connecting the following geographical positions:

(7)	58° 18′.95 N	005° 11′.08 E
(8)	58° 16′.60 N	005° 15′.27 E
(9)	58° 14′.53 N	005° 19′.90 E

(c) A traffic lane for westbound traffic is established between the separation zone described in paragraph (a) and a line connecting the following geographical positions:

(10)	58° 24′.40 N	005° 22′.17 E
(11)	58° 22′.40 N	005° 25′.75 E
(12)	58° 20′.63 N	005° 29′.70 E

II Off Farsund

(d) A separation zone is bounded by a line connecting the following geographical positions:

(13)	57° 46′.62 N	006° 30′.43 E
(14)	57° 44′.43 N	006° 35′.20 E
(15)	57° 44′.30 N	006° 41′.48 E
(16)	57° 46′.30 N	006° 41′.62 E
(17)	57° 46′.40 N	006° 36′.63 E
(18)	57° 48′.12 N	006° 32′.87 E

(e) A traffic lane for eastbound traffic is established between the separation zone described in paragraph (d) and a line connecting the following geographical positions:

(19)	57° 44′.33 N	006° 26′.80 E
(20)	57° 41′.48 N	006° 33′.03 E
(21)	57° 41′.32 N	006° 41′.25 E

(f) A traffic lane for westbound traffic is established between the separation zone described in paragraph (d) and a line connecting the following geographical positions:

(22)	57° 50′.40 N	006° 36′.52 E
(23)	57° 49′.35 N	006° 38′.80 E
(24)	57° 49′.28 N	006° 41′.85 E

III Off Ryvingen

(g) A separation zone is bounded by a line connecting the following geographical positions:

(25)	57° 42′.80 N	007° 41′.87 E
(26)	57° 42′.55 N	007° 51′.72 E
(27)	57° 44′.87 N	007° 59′.92 E
(28)	57° 44′.55 N	007° 50′.77 E
(29)	57° 44′.78 N	007° 42′.10 E

(h) A traffic lane for eastbound traffic is established between the separation zone described in paragraph (g) and a line connecting the following geographical positions:

(30)	57° 39′.85 N	007° 41′.72 E
(31)	57° 39′.58 N	007° 52′.97 E
(32)	57° 39′.92 N	008° 00′.25 E

(i) A traffic lane for westbound traffic is established between the separation zone described in paragraph (g) and a line connecting the following geographical positions:

(33)	57° 47′.75 N	007° 42′.55 E
(34)	57° 47′.58 N	007° 49′.68 E
(35)	57° 49′.40 N	007° 56′.00 E

IV Off Lillesand

(j) A separation zone is bounded by a line connecting the following geographical positions:

(36)	57° 58′.25 N	008° 46′.92 E
(37)	57° 59′.75 N	008° 52′.25 E
(38)	58° 02′.17 N	008° 56′.22 E
(39)	58° 03′.47 N	008° 53′.38 E
(40)	58° 01′.35 N	008° 49′.88 E
(41)	58° 00′.02 N	008° 45′.15 E

(k) A traffic lane for eastbound traffic is established between the separation zone described in paragraph (j) and a line connecting the following geographical positions:

(42)	57° 55′.60 N	008° 49′.55 E
(43)	57° 57′.37 N	008° 55′.82 E
(44)	58° 00′.18 N	009° 00′.47 E

(l) A traffic lane for westbound traffic is established between the separation zone described in paragraph (j) and a line connecting the following geographical positions:

(45)	58° 02′.67 N	008° 42′.50 E
(46)	58° 03′.73 N	008° 46′.32 E
(47)	58° 05′.45 N	008° 49′.13 E

V Off Risør

(m) A separation zone is bounded by a line connecting the following geographical positions:

(48)	58° 26′.27 N	009° 36′.28 E
(49)	58° 30′.03 N	009° 42′.53 E
(50)	58° 31′.33 N	009° 39′.67 E
(51)	58° 27′.57 N	009° 33′.42 E

(n) A traffic lane for eastbound traffic is established between the separation zone described in paragraph (m) and a line connecting the following geographical positions:

(52)	58° 24′.30 N	009° 40′.60 E
(53)	58° 28′.07 N	009° 46′.85 E

(o) A traffic lane for westbound traffic is established between the separation zone described in paragraph (m) and a line connecting the following geographical positions:

(54)	58° 29′.53 N	009° 29′.08 E
(55)	58° 33′.30 N	009° 35′.33 E

Description of the recommended routes

(p) A recommended route is established between the traffic separation schemes Off Egersund and Off Farsund with a central line between the following geographical positions:

(56)	58° 17′.60 N	005° 24′.85 E
(57)	57° 47′.38 N	006° 31′.65 E

(q) A recommended route is established between the traffic separation schemes Off Farsund and Off Ryvingen with a central line between the following geographical positions:

(58)	57° 45′.33 N	006° 41′.57 E
(59)	57° 43′.82 N	007° 41′.97 E

(r) A recommended route is established between the traffic separation schemes Off Ryvingen and Off Lillesand with a central line between the following geographical positions:

(60)	57° 44′.70 N	007° 55′.23 E
(61)	57° 59′.17 N	008° 46′.03 E

(s) A recommended route is established between the traffic separation schemes Off Lillesand and Off Risør with a central line between the following geographical positions:

(62)	58° 02′.78 N	008° 54′.80 E
(63)	58° 26′.95 N	009° 34′.78 E

Note:

Chart No.	Title	Scale	Datum
306	Skagerrak, vestre blad	1:350 000	ED 50
305 (INT 1300)	Skagerrak	1:350 000	WGS 84

Typical shift of position co-ordinates referred to the WGS 84 Datum to the ED 50 Datum are:

From Datum	To Datum	Approximate latitude in the area	Datum shift
WGS 84	ED 50	62˚ 30′ N	99 m (NE-diagonal)
WGS 84	ED 50	59˚ 00′ N	109 m (NE-diagonal)

***

ANNEX 3

AMENDMENTS TO THE EXISTING TRAFFIC SEPARATION SCHEME "IN THE STRAIT OF DOVER AND ADJACENT WATERS"

1 In "WARNINGS" section, the existing paragraph 3 is deleted and the following new paragraphs are added after the existing paragraph 2:

"3 In the area of the deep-water route east of the separation line, ships are recommended to avoid overtaking where traffic and navigation do not allow sufficient sea room and passing distance. If overtaking is performed then a safe distance must be maintained and COLREG Rule 13 observed.

4 Mariners leaving the north east going lane and planning to cross the south west going lane, between the Varne (51° 01′.3 N 001° 23′.9 E) and F1 (51° 11′.2 N 001°45′.0 E) light-buoys should be aware of heavy traffic in the south west going lane, as well as ferry traffic, and alter course and/or speed at an appropriate point."

***

ANNEX 4

AMENDMENTS TO THE EXISTING TRAFFIC SEPARATION SCHEME "OFF THE SOUTH-WEST COAST OF ICELAND"

1 The first paragraph after the title "OFF THE SOUTH-WEST COAST OF ICELAND", which refers to the reference chart, is replaced by the following text:

"(Reference chart: Icelandic No.31 (INT 1103) Dyrhólaey – Snæfellsnes (May 2008 edition).
Note**:** The chart is based on World Geodetic System 1984 datum (WGS 84).)"

2 In "Notes" section, the following paragraph is added after the existing paragraph 1.4:

"1.5 Passenger ships of unlimited size may only navigate the Inner Route (Húllid Passage) during the period from 1 May to 1 October."

3 In "Notes" section, the reference to paragraphs "1.2 and 1.4" in the last part of paragraph 1.1 is replaced by "1.2 to 1.5".

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INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR

Telephone: 0171-735 7611
Fax: 0171-587 3210
Telex: 23588 IMOLDN G

IMO

E

Ref. T4/4.01

MSC/Circ.913
4 June 1999

GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS FOR USE IN CATEGORY A MACHINERY SPACES

1 The Maritime Safety Committee, at its seventy-first session (19 to 28 May 1999), approved Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces, as set out in the annex.

2 Member Governments are requested to apply the annexed Guidelines when approving fixed water-based local application fire-fighting systems for use in category A machinery spaces.

***

ANNEX

GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS

1 General

Fixed water-based local application fire-fighting systems should provide localized fire suppression in areas, as specified in SOLAS regulation II-2/7.7 for category A machinery spaces, without the necessity of engine shut-down, personnel evacuation, shutting down of forced ventilation fans or the sealing of the space.

2 Definitions

2.1 **Fire suppression**: A reduction in heat output from the fire and control of the fire to restrict its spread from its seat and reduce the flame area.

2.2 **Water-based extinguishing medium**: Fresh water or sea water with or without additives mixed to enhance fire-extinguishing capability.

3 Principal requirements for the system

3.1 The system should be capable of manual release.

3.2 The activation of the fire-fighting system should not result in loss of electrical power or reduction of the manoeuvrability of the ship.

3.3 The system should be capable of fire suppression based on testing conducted in accordance with the appendix to these guidelines.

3.4 The system should be capable of fire suppression with forced ventilation fans running and supplying air to the protected area, or a method of automatically shutting air supply fans upon release of the system should be provided to ensure that the fire-fighting medium is not dispersed.

3.5 The system should be available for immediate use and capable of continuously supplying water-based medium for at least 20 minutes in order to suppress or extinguish the fire and to prepare for the discharge of the main fixed fire-extinguishing system within that period of time.

3.6 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging and corrosion normally encountered in machinery spaces. Components within the protected spaces should be designed to withstand the elevated temperatures which could occur during a fire. Components should be tested in accordance with the relevant sections of appendix A of MSC/Circ.668, as amended by MSC/Circ.728.

3.7 The system and its components should be designed and installed based on international standards acceptable to the Organization*, and manufactured and tested in accordance with the appropriate elements of the Appendix to these guidelines.

3.8 The location, type and characteristics of the nozzles should be within the limits tested, as referred to in paragraph 3.3. Nozzle positioning should take into account obstructions to the spray of the fire-fighting system.

3.9 The electrical components of the pressure source for the system should have a minimum rating of IP 54. Systems requiring an external power source need only be supplied by the main power source.

3.10 The piping system should be sized in accordance with a hydraulic calculation technique** to ensure availability of flows and pressures required for correct performance of the system.

3.11 The water supply for local application systems may be fed from the supply to a water-based main fire-fighting system providing that adequate water quantity and pressure are available to operate both systems for the required period of time. Local application systems may form a section(s) of a water-based main fire-extinguishing system provided that all requirements of SOLAS regulation II-2/10 and these guidelines, and MSC/Circ.668, as amended by MSC/Circ.728, are met, and the systems are capable of being isolated from the main system.

3.12 The capacity and design of the system should be based on the protected area demanding the greatest volume of water.

3.13 The operation controls should be located at easily accessible positions inside and outside the protected space. The controls inside the space should not be liable to be cut off by a fire in the protected areas.

3.14 Pressure source components of the system should be located outside of the protected areas.

3.15 A means for testing the operation of the system for assuring the required pressure and flow should be provided.

3.16 Where automatically operated fire-fighting systems are installed, a warning notice should be displayed outside each entry point stating the type of medium used and the possibility of automatic release.

---

*Pending the development of international standards acceptable to the Organization national standards as prescribed by the Administration should be applied.

**Where the Hazen-Williams Method is used, the following values of the friction factor "C" for different pipe types which may be considered should apply:

Pipe type	C
Black or galvanised mild steel	100
Copper and copper alloys	150
Stainless steel	150

3.17 Operating instructions for the system should be displayed at each operating position.

3.18 Spare parts and operating and maintenance instructions for the system should be provided as recommended by the manufacturer.

3.19 Nozzles and piping should not prevent access to engine or machinery for routine maintenance. In ships fitted with overhead hoists or other moving equipment, nozzles and piping should not be located to prevent operation of such equipment.

APPENDIX

TEST METHOD FOR FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS

1 SCOPE

This test method is for evaluating the effectiveness of fixed water-based local application fire-fighting systems. The test method verifies the design criteria for vertical and horizontal grids of nozzles. The test method is intended to evaluate maximum nozzle spacing, minimum and maximum distance from the nozzle to the hazard, minimum nozzle flow rate in addition to minimum and maximum operating pressure.

2 SAMPLING

2.1 The nozzles and other system components should be supplied by the manufacturer with design and installation criteria, operating instructions, drawings, and technical data sufficient for the identification of the components.

2.2 The flow rate for each type and size of nozzle should be determined at the minimum and maximum nozzle operating pressure.

3 FIRE TESTS

3.1 Test principles

3.1.1. These tests are intended to evaluate the fire-extinguishing capabilities of individual nozzles and grids of nozzles used as local application fire-fighting systems on light diesel oil fuel spray fires.

3.1.2 The tests also define the following design and installation criteria:

.1 maximum spacing between nozzles;

.2 minimum and maximum distance between the nozzles and the protected hazard;

.3 the need for nozzles to be positioned outside of the protected hazard; and

.4 minimum and maximum operating pressure.

3.2 Test description

3.2.1 Test enclosure

3.2.1.1 The test enclosure, if any, should be sufficiently large and provided with adequate natural or forced ventilation during the fire test to ensure that the oxygen concentration at the fire location during the fire test remains above 20% (by vol) without activation of the local application fire-fighting system.

3.2.1.2 The test enclosure, if any, should be at least 100 m^2 in area. The height of the test enclosure should be at least 5 m.

3.2.2 Fire scenarios

3.2.2.1 The fire scenarios should consist of nominal 1 and 6 MW spray fires. These fires should be produced using light diesel oil as the fuel as described in Table 3.2.2.1.

Table 3.2.2.1
Spray fire parameters

Spray nozzle	Wide spray angle (120° to 125°) full cone type	Wide spray angle (80°) full cone type
Nominal oil pressure	8 Bar	8.5 Bar
Oil flow	0.16 ± 0.01 kg/s	0.03 ± 0.005 kg/s
Oil temperature	20 ± 5°C	20 ± 5°C
Nominal heat release rate	6 MW	1 MW

3.2.2.2 The fuel spray nozzles should be installed horizontally and directed toward the centre of the nozzle grid.

3.2.2.3 The fuel spray nozzle should be located 1 m above the floor and at least 4 m away from the walls of the enclosure, if any.

3.2.3 Installation requirements for tests

3.2.3.1 The local application system should consist of uniformly spaced nozzles directed vertically downward.

3.2.3.2 The system should consist of either a 2 x 2 or 3 x 3 nozzle grid, as required.

3.2.3.3 The nozzles should be installed at least 1 m below the ceiling of the enclosure, if any.

3.2.3.4 The maximum spacing of the nozzles should be in accordance with the manufacturers system design and installation manual.

3.3 Test programme

3.3.1 The fire-extinguishing capabilities of the system should be evaluated for the minimum and maximum separation distances (the distance between the nozzle grid and the fuel spray nozzle). These distances should be as defined in the manufacturers system design and installation manual.

3.3.2 Each separation distance should be evaluated against the two fire scenarios (1 and 6 MW spray fires). Tests should be conducted with the fuel spray nozzles horizontally positioned in the following locations:

.1 under one nozzle in the centre of the grid;

.2 between two nozzles in the centre of the grid;

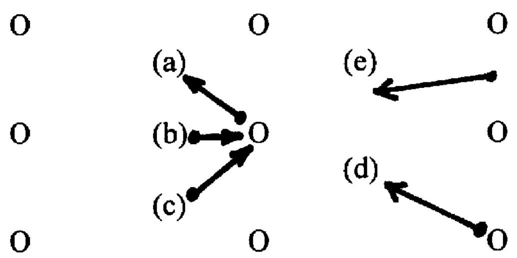
.3 between four nozzles;

.4 under one nozzle at the edge of the grid (corner); and

.5 between two nozzles at the edge of the grid.

These fire locations are shown in figure 3.3.2.

Figure 3.3.2
Fuel spray nozzle locations



O	Water nozzle locations
ö	Fuel spray nozzle location and direction
( )	Test designation

3.4 Test results and interpretation

3.4.1 The local application fire-fighting system is required to extinguish the test fires within 5 minutes from the start of water discharge. If the fire re-ignites after this five minute water discharge period the test is considered to be a failure.

3.4.2 The results of the tests should be interpreted as follows:

.1 Systems (utilizing a 3 x 3 nozzle grid) that extinguish fires referred to in 3.3.2.1 to 3.3.2.3 are considered to have successfully completed the protocol with the condition that the outer nozzles should be installed outside of the protected area a distance of at least 1/4 of the maximum nozzle spacing.

.2 Systems (utilizing either a 2 x 2 or 3 x 3 nozzle grid) that extinguish fires referred to in 3.3.2.3 to 3.3.2.5 are considered to have successfully completed the protocol and can be designed with the outer nozzles located at the edge of the protected area. This does not prohibit the location of the nozzles outside of the protected area.

.3 The requirements stated in either 3.4.2.1 or 3.4.2.2 should be met for both the minimum and maximum separation distances as well as the minimum and maximum operating pressures.

.4 For installations which may be adequately protected using individual nozzles or a single row of nozzles, the effective nozzle coverage (width and length) is defined as 1/2 the maximum nozzle spacing.

4 TEST PROCEDURE

4.1 Pre-burn time

Each fuel oil spray should be ignited and allowed to burn for no more than 15 seconds prior to system operation.

4.2 Measurements

4.2.1 Fuel oil spray system

4.2.1.1 The fuel oil flow rate and pressure in the fuel oil spray system should be verified prior to the test.

4.2.1.2 The fuel oil spray system pressure should be measured during the test.

4.2.2 Oxygen concentration at the fire location

Oxygen concentration should be measured at 100 mm below the fuel oil spray nozzle.

4.2.3 Water spray system pressure and flow rate

The system water pressure and flow rate should be measured using suitable equipment.

4.3 Operation of the fire-fighting system

4.3.1 The water spray system should be activated within the pre-burn time specified in section 4.1.

4.3.2 The water spray system should be operated for a minimum of one minute after fire extinguishment.

4.3.3 The fires should be extinguished within the 5 minutes of water application.

4.3.4 The fuel oil spray should be operated for at least 15 seconds after fire extinguishment.

4.4 Observations during the fire test

During the test, following observations should be recorded:

.1 start of the ignition procedure;

.2 start of the test (ignition);

.3 time when the extinguishing system is activated;

.4 time when the fire is extinguished;

.5 time when the extinguishing system is shut off;

.6 time of re-ignition;

.7 time when the fuel supply to the nozzle is stopped; and

.8 time when the test is terminated.

5 TEST REPORT

The test report should, as a minimum, include the following information:

.1 name and address of the test laboratory;

.2 date of issue and identification number of the test report;

.3 name and address of applicant;

.4 name and address of manufacturer or supplier of the product;

.5 test method and purpose;

.6 product identification;

.7 description of the tested product:

  .1 assembly drawings;

  .2 descriptions;

  .3 assembly of included materials and components;

  .4 specification of included materials and components;

  .5 installation specification; and

  .6 detailed drawings of the test set-up;

.8 date of tests;

.9 drawing of each fire test configuration;

.10 measured water spray nozzle flow characteristics;

.11 identification of the test equipment and used instruments;

.12 test results including observations and measurements made during and after the test:

  .1 maximum nozzle spacing;

  .2 minimum and maximum separation distances; and

  .3 minimum and maximum operating pressures;

.13 deviations from the test method;

.14 conclusions; and

.15 date of the report and signature.

INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR

Telephone: 020 7587 3152
Fax: 020 7587 3210

IMO

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Ref. T4/4.01

MSC/Circ.1165
10 June 2005

REVISED GUIDELINES FOR THE APPROVAL OF EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR MACHINERY SPACES AND CARGO PUMP-ROOMS

1 The Maritime Safety Committee, at its sixty-fourth session (5 to 9 December 1994), recognizing the urgent necessity of providing guidelines for alternative arrangements for halon fire-extinguishing systems, approved Guidelines for the approval of equivalent water-based fire-extinguishing systems as referred to in SOLAS 74 for machinery spaces and cargo pump-rooms (MSC/Circ.668).

2 The Committee, at its sixty-sixth session (28 May to 6 June 1996), having considered a proposal by the fortieth session of the Sub-Committee on Fire Protection to revise the interim test method for equivalent water-based fire-extinguishing systems, contained in MSC/Circ.668, approved a revised test method for equivalent water-based fire-extinguishing systems for category A machinery spaces and cargo pump-rooms contained in MSC/Circ.668 (MSC/Circ.728).

3 The Sub-Committee on Fire Protection, at its forty-ninth session (24 to 28 January 2005), reviewed the Guidelines for the approval of equivalent water-based fire-extinguishing systems as referred to in SOLAS 74 for machinery spaces and cargo pump-rooms (annex to MSC/Circ.668, as amended by MSC/Circ.728) and made amendments to the test method for equivalent water-based fire-extinguishing systems for machinery spaces of category A and cargo pump-rooms, taking into account the latest technological progress made in this area.

4 The Committee, at its eightieth session (11 to 20 May 2005), after having considered the above proposal by the forty-ninth session of the Sub-Committee on Fire Protection, approved Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms, as set out in the annex.

5 Member Governments are invited to apply the annexed Guidelines when approving equivalent water-based fire-extinguishing systems for machinery spaces and pump-rooms and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.

6 Test approvals already conducted in accordance with guidelines contained in MSC/Circ.668, as amended by MSC/Circ.728, should remain valid until 5 years after the date of this circular.

***

ANNEX

REVISED GUIDELINES FOR THE APPROVAL OF EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR MACHINERY SPACES AND CARGO PUMP-ROOMS

General

1 Water-based fire-extinguishing systems for use in machinery spaces of category A and cargo pump-rooms equivalent to fire-extinguishing systems required by SOLAS regulation II-2/10 and chapter 5 of the FSS Code should prove that they have the same reliability which has been identified as significant for the performance of fixed pressure water-spraying systems approved under the requirements of SOLAS regulation II-2/10 and chapter 5 of the FSS Code. In addition, the system should be shown by test to have the capability of extinguishing a variety of fires that can occur in a ship's engine-room.

Definitions

2 *Antifreeze system* is a wet pipe system containing an antifreeze solution and connected to a water supply. The antifreeze solution is discharged, followed by water, immediately upon operation of nozzles.

3 *Bilge area* is the space between the solid engine-room floor plates and the bottom of the engine-room.

4 *Deluge system* is a system employing open nozzles attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the nozzles or opened manually. When this valve opens, water flows into the piping system and discharges from all nozzles attached thereto.

5 *Dry Pipe system* is a system employing nozzles attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a nozzle) permits the water pressure to open a valve known as a dry pipe valve. The water then flows into the piping system and out of the opened nozzle.

6 *Fire extinction* is a reduction of the heat release from the fire and a total elimination of all flames and glowing parts by means of direct and sufficient application of extinguishing media.

7 *Preaction system* is a system employing automatic nozzles attached to a piping system containing air that mayor may not be under pressure, with a supplemental detection system installed in the same area as the nozzles. Actuation of the detection system opens a valve that permits water to flow into the piping system and to be discharged from any nozzles that may be open.

8 *Water-based extinguishing medium* is fresh water or seawater with or without additives mixed to enhance fire-extinguishing capability.

9 *Wet pipe system* is a system employing nozzles attached to a piping system containing water and connected to a water supply so that water discharges immediately from the nozzles upon system activation.

Principal requirements for the system

10 The system should be capable of manual release.

11 The system should be capable of fire extinction, and tested to the satisfaction of the Administration in accordance with appendix B to these Guidelines.

12 The system should be available for immediate use and capable of continuously supplying water for at least 30 min in order to prevent re-ignition or fire spread within that period of time. Systems which operate at a reduced discharge rate after the initial extinguishing period should have a second full fire-extinguishing capability available within a 5-minute period of initial activation.

13 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging and corrosion normally encountered in machinery spaces or cargo pump-rooms in ships. Components within the protected spaces should be designed to withstand the elevated temperatures which could occur during a fire.

14 The system and its components should be designed and installed in accordance with international standards acceptable to the Organization[1] and manufactured and tested to the satisfaction of the Administration in accordance with appropriate elements of appendices A and B to these guidelines.

15 The nozzle location, type of nozzle and nozzle characteristics should be within the limits tested to provide fire extinction as referred to in paragraph 10.

16 The electrical components of the pressure source for the system should have a minimum rating of IP 54. The system should be supplied by both main and emergency sources of power and should be provided with an automatic change-over switch. The emergency power supply should be provided from outside the protected machinery space.

17 The system should be provided with a redundant means of pumping. The capacity of the redundant means should be sufficient to compensate for the loss of any single supply pump. The system should be fitted with a permanent sea inlet and be capable of continuous operation using seawater.

18 The piping system should be sized in accordance with an hydraulic calculation technique.[2]

19 Systems capable of supplying water at the full discharge rate for 30 min may be grouped into separate sections within a protected space. The sectioning of the system within such spaces should be approved by the Administration in each case.

---

1 Pending the development of international standards acceptable to the Organization, national standards as prescribed by the Administration should be applied.

2 Where the Hazen-Williams Method is used, the following values of the friction factor "C" for different pipe types which may be considered should apply:

Pipe type	**C**
Black or galvanized mild steel	100
Copper and copper alloys	150
Stainless steel	150

20 In all cases the capacity and design of the system should be based on the complete protection of the space demanding the greatest volume of water.

21 The system operation controls should be available at easily accessible positions outside the spaces to be protected and should not be liable to be cut off by a fire in the protected spaces.

22 Pressure source components of the system should be located outside the protected spaces.

23 A means for testing the operation of the system for assuring the required pressure and flow should be provided.

24 Activation of any water distribution valve should give a visual and audible alarm in the protected space and at a continuously manned central control station. An alarm in the central control station should indicate the specific valve activated.

25 Operating instructions for the system should be displayed at each operating position. The operating instructions should be in the official language of the flag State. If the language is neither English nor French, a translation into one of these languages should be included.

26 Spare parts and operating and maintenance instructions for the system should be provided, as recommended by the manufacturer.

27 Additives should not be used for the protection of normally occupied spaces unless they have been approved for fire protection service by an independent authority. The approval should consider possible adverse health effects to exposed personnel, including inhalation toxicity.

APPENDIX A

COMPONENT MANUFACTURING STANDARDS OF EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS

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Figures given in square brackets refer to ISO Standard 6182/1.

INTRODUCTION

This document is intended to address minimum fire protection performance, construction, and marking requirements, excluding fire performance, for water-mist nozzles.

Numbers in brackets following a section or sub-section heading refer to the appropriate section or paragraph in the Standard for Automatic sprinkler systems - Part 1: Requirements and methods of test for sprinklers, ISO 6182-1.

The requirements for automatically operating nozzles which involve release mechanism need not be met by nozzles of manually operating systems.

1 DEFINITIONS

1.1 *Conductivity factor* is a measure of the conductance between the nozzle's heat responsive element and the fitting expressed in units of $(m/s)^{0.5}$.

1.2 *Rated working pressure* is the maximum service pressure at which a hydraulic device is intended to operate.

1.3 *Response time index (RTI)* is a measure of nozzle sensitivity expressed as $RTI = tu^{0.5}$, where **t** is the time constant of the heat responsive element in units of seconds, and **u** is the gas velocity expressed in metres per second. RTI can be used in combination with the conductivity factor (C) to predict the response of a nozzle in fire environments, defined in terms of gas temperature and velocity versus time. RTI has units of $(m.s)^{0.5}$.

1.4 *Standard orientation.* In the case of nozzles with symmetrical heat responsive elements supported by frame arms, standard orientation is with the air flow perpendicular to both the axis of the nozzle's inlet and the plane of the frame arms. In the case of non-symmetrical heat responsive elements, standard orientation is with the air flow perpendicular to both the inlet axis and the plane of the frame arms which produces the shortest response time.

1.5 *Worst case orientation* is the orientation which produces the longest response time with the axis of the nozzle inlet perpendicular to the air flow.

2 PRODUCT CONSISTENCY

2.1 It should be the responsibility of the manufacturer to implement a quality control programme to ensure that production continuously meets the requirements in the same manner as the originally tested samples.

2.2 The load on the heat responsive element in automatic nozzles should be set and secured by the manufacturer in such a manner so as to prevent field adjustment or replacement.

3 WATER-MIST NOZZLE REQUIREMENTS

3.1 Dimensions

Nozzles should be provided with a nominal 6 mm (1/4 in.) or larger nominal inlet thread or equivalent. The dimensions of all threaded connections should conform to International Standards where applied. National Standards may be used if International Standards are not applicable.

3.2 Nominal release temperatures (6.2)

3.2.1 The nominal release temperatures of automatic glass bulb nozzles should be as indicated in table 1.

3.2.2 The nominal release temperatures of fusible automatic element nozzles should be specified in advance by the manufacturer and verified in accordance with 3.3. Nominal release temperatures should be within the ranges specified in table 1.

Table 1 – Nominal release temperature

Values in degrees Celsius

GLASS BULB NOZZLES		FUSIBLE ELEMENT NOZZLES	
Nominal release temp.	Liquid colour code	Nominal release temp.	Frame colour code *
57	orange	57 to 77	uncoloured
68	red	80 to 107	white
79	yellow	121 to 149	blue
93-100	green	163 to 191	red
121-141	blue	204 to 246	green
163-182	mauve	260 to 343	orange
204-343	black		

* Not required for decorative nozzles

3.3 Operating temperatures (see 4.6.1) [6.3]

Automatic nozzles should open within a temperature range of

$$X \pm 0.035X + 0.62^{o}C$$

where X is the nominal release temperature.

3.4 Water flow and distribution

3.4.1 Flow constant (see 4.10) [6.4.1]

3.4.1.1 The flow constant K for nozzles is given in the following formula:

$$K = Q/P^{0.5}$$

where:

P is the pressure in bars; and
Q is the flow rate in litres per min.

3.4.1.2 The value of the flow constant K published in the Manufacturer's Design and Installation Instructions should be verified using the test method of 4.10. The average flow constant K should be verified within ± 5% of the manufacturer's value.

3.5 Function (see 4.5) [6.5]

3.5.1 When tested in accordance with 4.5, the nozzle should open and, within 5 s after the release of the heat responsive element, should operate satisfactorily by complying with the requirements of 4.10. Any lodgement of released parts should be cleared within 60 s of release for standard response heat responsive elements and within 10 s of release for fast and special response heat responsive elements or the nozzle should then comply with the requirement of 4.11.

3.5.2 The nozzle discharge components should not sustain significant damage as a result of the functional test specified in 4.5.6 and should have the same flow constant range and water droplet size and velocity within 5 per cent of values as previously determined per 3.4.1 and 3.4.3.

3.6 Strength of body (see 4.3) [6.6]

The nozzle body should not show permanent elongation of more than 0.2% between the load-bearing points, after being subjected to twice the average service load, as determined using the method of 4.3.1.

3.7 Strength of release element [6.7]

3.7.1 Glass bulbs (see 4.9.1)

The lower tolerance limit for bulb strength should be greater than two times the upper tolerance limit for the bulb design load based on calculations with a degree of confidence of 0.99 for 99 per cent of the samples as determined in 4.9.1. Calculations will be based on the Normal or Gaussian Distribution except where another distribution can be shown to be more applicable due to manufacturing or design factors.

3.7.2 Fusible elements (see 4.9.2)

Fusible heat-responsive elements in the ordinary temperature range should be designed to:

.1 sustain a load of 15 times its design load corresponding to the maximum service load measured in 4.3.1 for a period of 100 hours in accordance with 4.9.2.1; or

.2 demonstrate the ability to sustain the design load when tested in accordance with 4.9.2.2.

3.8 Leak resistance and hydrostatic strength (see 4.4) [6.8]

3.8.1 A nozzle should not show any sign of leakage when tested by the method specified in 4.4.1.

3.8.2 A nozzle should not rupture, operate or release any parts when tested by the method specified in 4.4.2.

3.9 Heat exposure [6.9]

3.9.1 Glass bulb nozzles (see 4.7.1)

There should be no damage to the glass bulb element when the nozzle is tested by the method specified in 4.7.1.

3.9.2 All uncoated nozzles (see 4.7.2)

Nozzles should withstand exposure to increased ambient temperature without evidence of weakness or failure, when tested by the method specified in 4.7.2.

3.9.3 Coated nozzles (see 4.7.3)

In addition to meeting the requirement of 4.7.2 in an uncoated version, coated nozzles should withstand exposure to ambient temperatures without evidence of weakness or failure of the coating, when tested by the method specified in 4.7.3.

3.10 Thermal shock (see 4.8) [6.10]

Glass bulb nozzles should not be damaged when tested by the method specified in 4.8. Proper operation is not considered as damage.

3.11 Corrosion [6.11]

3.11.1 Stress corrosion (see 4.12.1 and 4.12.2)

When tested in accordance with 4.12.1, all brass nozzles should show no fractures which could affect their ability to function as intended and satisfy other requirements.

When tested in accordance with 4.12.2, stainless steel parts of water-mist nozzles should show no fractures or breakage which could affect their ability to function as intended and satisfy other requirements.

3.11.2 Sulphur dioxide corrosion (see 4.12.3)

Nozzles should be sufficiently resistant to sulphur dioxide saturated with water vapour when conditioned in accordance with 4.12.2. Following exposure, five nozzles should operate, when functionally tested at their minimum flowing pressure (see 3.5.1 and 3.5.2). The remaining five samples should meet the dynamic heating requirements of 3.14.2.

3.11.3 Salt spray corrosion (see 4.12.4)

Coated and uncoated nozzles should be resistant to salt spray when conditioned in accordance with 4.12.4. Following exposure, the samples should meet the dynamic heating requirements of 3.14.2.

3.11.4 Moist air exposure (see 4.12.5)

Nozzles should be sufficiently resistant to moist air exposure and should satisfy the requirements of 3.14.2 after being tested in accordance with 4.12.5.

3.12 Integrity of nozzle coatings [6.12]

3.12.1 Evaporation of wax and bitumen used for atmospheric protection of nozzles (see 4.13.1)

Waxes and bitumens used for coating nozzles should not contain volatile matter in sufficient quantities to cause shrinkage, hardening, cracking or flaking of the applied coating. The loss in mass should not exceed 5% of that of the original sample when tested by the method in 4.13.1.

3.12.2 Resistance to low temperatures (see 4.13.2)

All coatings used for nozzles should not crack or flake when subjected to low temperatures by the method in 4.13.2.

3.12.3 Resistance to high temperature (see 3.9.3)

Coated nozzles should meet the requirements of 3.9.3.

3.13 Water hammer (see 4.15) [6.13]

Nozzles should not leak when subjected to pressure surges from 4 bar to four times the rated pressure for operating pressures up to 100 bars and two times the rated pressure for pressures greater than 100 bar. They should show no signs of mechanical damage when tested in accordance with 4.15 and should operate within the parameters of 3.5.1 at the minimum design pressure.

3.14 Dynamic heating (see 4.6.2) [6.14]

3.14.1 Automatic nozzles intended for installation in other than accommodation spaces and residential areas should comply with the requirements for RTI and C limits shown in figure 1. Automatic nozzles intended for installation in accommodation spaces or residential areas should comply with fast response requirements for RTI and C limits shown in figure 1. Maximum and minimum RTI values for all data points calculated using C for the fast and standard response nozzles should fall within the appropriate category shown in figure 1. Special response nozzles should have an average RTI value, calculated using C, between 50 and 80 with no value less than 40 or more than 100. When tested at an angular offset to the worst case orientation as described in section 4.6.2, the RTI should not exceed 600 $(m.s)^{0.5}$ or 250% of the value of RTI in the standard orientation, whichever is less. The angular offset should be 15º for standard response, 20º for special response and 25º for fast response.

3.14.2 After exposure to the corrosion test described in sections 3.11.2, 3.11.3 and 3.11.4, nozzles should be tested in the standard orientation as described in section 4.6.2.1 to determine the post exposure RTI. All post exposure RTI values should not exceed the limits shown in figure 1 for the appropriate category. In addition, the average RTI value should not exceed 130% of the pre-exposure average value. All post exposure RTI values should be calculated as in section 4.6.2.3 using the pre-exposure conductivity factor (C).

3.15 Resistance to heat (see 4.14) [6.15]

Open nozzles should be sufficiently resistant to high temperatures when tested in accordance with 4.14. After exposure, the nozzle should not show:

.1 visual breakage or deformation;

.2 a change in flow constant K of more than 5 per cent; and

.3 no changes in the discharge characteristics of the Water Distribution Test (see 3.4.2) exceeding 5 per cent.

3.16 Resistance to vibration (see 4.16) [6.16]

Nozzles should be able to withstand the effects of vibration without deterioration of their performance characteristics, when tested in accordance with 4.16. After the vibration test of 4.16, nozzles should show no visible deterioration and should meet the requirements of 3.5 and 3.8.

3.17 Impact test (see 4.17) [6.17]

Nozzles should have adequate strength to withstand impacts associated with handling, transport and installation without deterioration of their performance or reliability. Resistance to impact should be determined in accordance with 4.1.

3.18 Lateral discharge (see 4.18) [6.19]

Nozzles should not prevent the operation of adjacent automatic nozzles when tested in accordance with 4.21.

3.19 30 day leakage resistance (see 4.19) [6.20]

Nozzles should not leak, sustain distortion or other mechanical damage when subjected to twice the rated pressure for 30 days. Following exposure, the nozzles should satisfy the test requirements of 4.22.

3.20 Vacuum resistance (see 4.23) [6.21]

Nozzles should not exhibit distortion, mechanical damage or leakage after being subjected to the test in 4.23.

3.21 Water shield [6.22 and 6.23]

3.21.1 General

An automatic nozzle intended for use at intermediate levels or beneath open grating should be provided with a water shield which complies with 3.21.2 and 3.21.3.

3.21.2 Angle of protection (see 4.21.1)

Water shields should provide an "angle of protection" of 45º or less for the heat responsive element against direct impingement of run-off water from the shield caused by discharge from nozzles at higher elevations. Compliance with this requirement should be determined in accordance with 4.21.1.

3.21.3 Rotation (see 4.21.2)

Rotation of the water shield should not alter the nozzle service load when evaluated in accordance with 4.21.2.

3.22 Clogging (see 4.21) [6.28.3]

A water-mist nozzle should show no evidence of clogging during 30 minutes of continuous flow at rated working pressure using water, which has been contaminated in accordance with 4.21.3. Following the 30 minutes of flow, the water flow at rated pressure of the nozzle and strainer or filter should be within ± 10 per cent of the value obtained prior to conducting the clogging test.

4 METHODS OF TEST [7]

4.1 General

The following tests should be conducted for each type of nozzle. Before testing, precise drawings of parts and the assembly should be submitted together with the appropriate specifications (using SI units). Tests should be carried out at an ambient temperature of (20,±5)ºC, unless other temperatures are indicated.

4.2 Visual examination [7.2]

Before testing, nozzles should be examined visually with respect to the following points:

.1 marking;
.2 conformity of the nozzles with the manufacturer's drawings and specification; and
.3 obvious defects.

4.3 Body strength test [7.3]

4.3.1 The design load should be measured on ten automatic nozzles by securely installing each nozzle, at room temperature, in a tensile/compression test machine and applying a force equivalent to the application of the rated working pressure.

4.3.2 An indicator capable of reading deflection to an accuracy of 0.01 mm should be used to measure any change in length of the nozzle between its load bearing points. Movement of the nozzle shank thread in the threaded bushing of the test machine should be avoided or taken into account.

4.3.3 The hydraulic pressure and load is then released and the heat responsive element is then removed by a suitable method. When the nozzle is at room temperature, a second measurement is to be made using the indicator.

4.3.4 An increasing mechanical load to the nozzle is then applied at a rate not exceeding 500 N/minute, until the indicator reading at the load bearing point initially measured returns to the initial value achieved under hydrostatic load. The mechanical load necessary to achieve this should be recorded as the service load. Calculate the average service load.

4.3.5 The applied load is then progressively increased at a rate not exceeding 500 N/minute on each of the five specimens until twice the average service load has been applied. Maintain this load for 15 ± 5 s.

4.3.6 The load is then removed and any permanent elongation as defined in 3.6 is recorded.

4.4 Leak resistance and hydrostatic strength tests (see 3.8) [7.4]

4.4.1 Twenty nozzles should be subjected to a water pressure of twice their rated working pressure, but not less than 34.5 bar. The pressure is increased from 0 bar to the test pressure, maintained at twice rated working pressure for a period of 3 min and then decreased to 0 bar. After the pressure has returned to 0 bar, it is increased to the minimum operating pressure specified by the manufacturer in not more than 5 s. This pressure is to be maintained for 15 s and then increased to rated working pressure and maintained for 15 s.

4.4.2 Following the test of 4.4.1, the twenty nozzles should be subjected to an internal hydrostatic pressure of four times the rated working pressure. The pressure is increased from 0 bar to four times the rated working pressure and held there for a period of 1 minute. The nozzle under test should not rupture, operate or release any of its operating parts during the pressure increase nor while being maintained at four times the rated working pressure for 1 minute.

4.5 Functional test (see 3.5) [7.5]

4.5.1 Nozzles having nominal release temperatures less than 78°C, should be heated to activation in an oven. While being heated, they should be subjected to each of the water pressures specified in 4.5.3 applied to their inlet. The temperature of the oven should be increased to 400 ± 20°C in 3 min measured in close proximity to the nozzle. Nozzles having nominal release temperatures exceeding 78°C should be heated using a suitable heat source. Heating should continue until the nozzle has activated.

4.5.2 Eight nozzles should be tested in each normal mounting position and at pressures equivalent to the minimum operating pressure, the rated working pressure and at the average operating pressure. The flowing pressure should be at least 75% of the initial operating pressure.

4.5.3 If lodgement occurs in the release mechanism at any operating pressure and mounting position, 24 more nozzles should be tested in that mounting position and at that pressure. The total number of nozzles for which lodgement occurs should not exceed 1 in the 32 tested at that pressure and mounting position.

4.5.4 Lodgement is considered to have occurred when one or more of the released parts lodge in the discharge assembly in such a way as to cause the water distribution to be altered after the period of time specified in 3.5.1.

4.5.5 In order to check the strength of the deflector/orifice assembly, three nozzles should be submitted to the functional test in each normal mounting position at 125 per cent of the rated working pressure. The water should be allowed to flow at 125 per cent of the rated working pressure for a period of 15 min.

4.6 Heat responsive element operating characteristics

4.6.1 Operating temperature test (see 3.3) [7.6]

4.6.1.1 Ten nozzles should be heated from room temperature to 20 to 22°C below their nominal release temperature. The rate of increase of temperature should not exceed 20°C/min and the temperature should be maintained for 10 min. The temperature should then be increased at a rate between 0.4°C/min to 0.7°C/min until the nozzle operates.

4.6.1.2 The nominal operating temperature should be ascertained with equipment having an accuracy of ±0.35% of the nominal temperature rating or ±0.25°C, whichever is greater.

4.6.1.3 The test should be conducted in a water bath for nozzles or separate glass bulbs having nominal release temperatures less than or equal to 80°C. A suitable oil should be used for higher-rated release elements. The liquid bath should be constructed in such a way that the temperature deviation within the test zone does not exceed 0.5%, or 0.5°C, whichever is greater.

4.6.2 Dynamic heating test (see 3.4)

4.6.2.1 Plunge test

4.6.2.1.1 Tests should be conducted to determine the standard and worst case orientations as defined in 1.4 and 1.5. Ten additional plunge tests should be performed at both of the identified orientations. The worst case orientation should be as defined in 3.14.1. The RTI is calculated as described in 4.6.2.3 and 4.6.2.4 for each orientation, respectively. The plunge tests are to be conducted using a brass nozzle mount designed such that the mount or water temperature rise does not exceed 2°C for the duration of an individual plunge test up to a response time of 55 s. (The temperature should be measured by a thermocouple heatsinked and embedded in the mount not more than 8 mm radially outward from the root diameter of the internal thread or by a thermocouple located in the water at the centre of the nozzle inlet.) If the response time is greater than 55 s, then the mount or water temperature in degrees Celsius should not increase more than 0.036 times the response time in seconds for the duration of an individual plunge test.

4.6.2.1.2 The nozzle under test should have 1 to 1.5 wraps of PTFE sealant tape applied to the nozzle threads. It should be screwed into a mount to a torque of 15 ±3 Nm. Each nozzle is to be mounted on a tunnel test section cover and maintained in a conditioning chamber to allow the nozzle and cover to reach ambient temperature for a period of not less than 30 min.

4.6.2.1.3 At least 25 ml of water, conditioned to ambient temperature, should be introduced into the nozzle inlet prior to testing. A timer accurate to ±0.01 s with suitable measuring devices to sense the time between when the nozzle is plunged into the tunnel and the time it operates should be utilized to obtain the response time.

4.6.2.1.4 A tunnel should be utilized with air flow and temperature conditions[1] at the test section (nozzle location) selected from the appropriate range of conditions shown in table 2. To minimize radiation exchange between the sensing element and the boundaries confining the flow, the test section of the apparatus should be designed to limit radiation effects to within ± 3% of calculated RTI values[2].

4.6.2.1.5 The range of permissible tunnel operating conditions is shown in table 2. The selected operating condition should be maintained for the duration of the test with the tolerances as specified by footnotes 4 and 5 in table 2.

4.6.2.2 Determination of conductivity factor (C) [7.6.2.2]

The conductivity factor (C) should be determined using the prolonged plunge test (see 4.6.2.2.1) or the prolonged exposure ramp test (see 4.6.2.2.2).

4.6.2.2.1 Prolonged plunge test [7.6.2.2.1]

.1 the prolonged plunge test is an iterative process to determine C and may require up to twenty nozzle samples. A new nozzle sample must be used for each test in this section even if the sample does not operate during the prolonged plunge test;

.2 the nozzle under test should have 1 to 1.5 wraps of PTFE sealant tape applied to the nozzle threads. It should be screwed into a mount to a torque of 15 + 3 Nm. Each nozzle is to be mounted on a tunnel test section cover and maintained in a conditioning chamber to allow the nozzle and cover to reach ambient temperature for a period of not less than 30 min. At least 25 ml of water, conditioned to ambient temperature, should be introduced into the nozzle inlet prior to testing;

.3 a timer accurate to ± 0.01 s with suitable measuring devices to sense the time between when the nozzle is plunged into the tunnel and the time it operates should be utilized to obtain the response time;

.4 the mount temperature should be maintained at 20 ± 0.5°C for the duration of each test. The air velocity in the tunnel test section at the nozzle location should be maintained with ± 2% of the selected velocity. Air temperature should be selected and maintained during the test as specified in table 3;

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[1] Tunnel conditions should be selected to limit maximum anticipated equipment error to 3%.

[2] A suggested method for determining radiation effects is by conducting comparative plunge tests on a blackened (high emissivity) metallic test specimen and a polished (low emissivity) metallic test specimen.

.5 the range of permissible tunnel operating conditions is shown in table 3. The selected operating condition should be maintained for the duration of the test with the tolerances as specified in table 3; and

.6 to determine C, the nozzle is immersed in the test stream at various air velocities for a maximum of 15 min.[1] Velocities are chosen such that actuation is bracketed between two successive test velocities. That is, two velocities must be established such that at the lower velocity (u_j) actuation does not occur in the 15 min test interval. At the next higher velocity (u_h), actuation must occur within the 15 min time limit. If the nozzle does not operate at the highest velocity, select an air temperature from table 3 for the next higher temperature rating.

Table 2 – Plunge oven test conditions

	Air temperature ranges*			**Velocity ranges****		
Normal Temperature, ºC	**Standard Response, ºC**	**Special Response, ºC**	**Fast Response, m/s**	**Standard Response, m/s**	**Special Response, m/s**	**Fast Response Nozzle, m/s**
57 to 77	191 to 203	129 to 141	129 to 141	2.4 to 2.6	2.4 to 2.6	1.65 to 1.85
79 to 107	282 to 300	191 to 203	191 to 203	2.4 to 2.6	2.4 to 2.6	1.65 to 1.85
121 to 149	382 to 432	282 to 300	282 to 300	2.4 to 2.6	2.4 to 2.6	1.65 to 1.85
163 to 191	382 to 432	382 to 432	382 to 432	3.4 to 3.6	2.4 to 2.6	1.65 to 1.85

* The selected air temperature should be known and maintained constant within the test section throughout the test to an accuracy of ±1ºC for the air temperature range of 129 to 141ºC within the test section and within ±2ºC for all other air temperatures.

** The selected air velocity should be known and maintained constant throughout the test to an accuracy of ±0.03 m/s for velocities of 1.65 to 1.85 and 2.4 to 2.6 m/s and ±0.04 m/s for velocities of 3.4 to 3.6 m/s.

Table 3 – Plunge oven test conditions for conductivity determination

Nominal nozzle temperature, ºC	**Oven temperature, ºC**	**Maximum variation of air temperature during test, ºC**
57	85 to 91	± 1.0
58 to 77	124 to 130	± 1.5
78 to 107	193 to 201	± 3.0
121 to 149	287 to 295	± 4.5
163 to 191	402 to 412	± 6.0

[1] If the value of C is determined to be less than 0.5 $(m.s)^{0.5}$ a C of 0.25 $(m.s)^{0.5}$ should be assumed for calculating RTI value.

Test velocity selection should ensure that:

$(U_H/U_L)^{0.5} \leq 1.1$

The test value of C is the average of the values calculated at the two velocities using the following equation:

$C = (\Delta T_g / \Delta T_{ea} - 1)u^{0.5}$

where:

- ΔT_g Actual gas (air) temperature minus the mount temperature (Tm) in ºC.
- ΔT_{ea} Mean liquid bath operating temperature minus the mount temperature (Tm) in ºC.
- u Actual air velocity in the test section in m/s.

The nozzle C value is determined by repeating the bracketing procedure three times and calculating the numerical average of the three C values. This nozzle C value is used to calculate all standard orientation RTI values for determining compliance with 3.14.1.

4.6.2.2.2 Prolonged exposure ramp test [7.6.2.2.2]

.1 the prolonged exposure ramp test for the determination of the parameter C should be carried out in the test section of a wind tunnel and with the requirements for the temperature in the nozzle mount as described for the dynamic heating test. A preconditioning of the nozzle is not necessary;

.2 ten samples should be tested of each nozzle type, all nozzles positioned in standard orientation. The nozzle should be plunged into an air stream of a constant velocity of 1 m/s ± 10% and an air temperature at the nominal temperature of the nozzle at the beginning of the test; and

.3 the air temperature should then be increased at a rate of 1 ± 0.25ºC/min until the nozzle operates. The air temperature, velocity and mount temperature should be controlled from the initiation of the rate of rise and should be measured and recorded at nozzle operation. The C value is determined using the same equation as in 4.6.2.2.1 as the average of the ten test values.

4.6.2.3 RTI value calculation [7.6.2.3]

The equation used to determine the RTI value is as follows:

$$RTI = \frac{-t_r\,(u)^{0.5}(1+C/u^{0.5})}{In[1 - \Delta T_{ea} \quad (1+C/(u)^{0.5})/\Delta T_g]}$$

where:

- t_r Response time of nozzles in seconds
- u Actual air velocity in the test section of the tunnel in m/s from table 2

ΔT_{ea} Mean liquid bath operating temperature of the nozzle minus the ambient temperature in ºC

ΔT_g Actual air temperature in the test section minus the ambient temperature in ºC

C Conductivity factor as determined in 4.6.2.2

4.6.2.4 Determination of worst case orientation RTI

The equation used to determine the RTI for the worst case orientation is as follows:

$$RTI_{wc} = \frac{-t_{r-wc}\,(u)^{0.5}[(1+C(RTI_{wc}/RTI)/(u)^{0.5})]}{In\{1 - \Delta T_{ea} \quad [1+C(RTI_{wc}/RTI)/(u)^{\ 0.5})]/\Delta T_g\}}$$

where:

$T_{t\text{-}wc}$ Response time of the nozzles in seconds for the worst case orientation

All variables are known at this time per the equation in paragraph 4.6.2.3 except RTI_{wc} (Response Time Index for the worst case orientation) which can be solved iteratively per the above equation.

In the case of fast response nozzles, if a solution for the worse case orientation RTI is unattainable, plunge testing in the worst case orientation should be repeated using the plunge test conditions under Special Response shown in table 2.

4.7 Heat exposure test [7.7]

4.7.1 Glass bulb nozzles (see 3.9.1):

.1 glass bulb nozzles having nominal release temperatures less than or equal to 80°C should be heated in a water bath from a temperature of (20 ± 5)ºC to (20 ± 2) ºC below their nominal release temperature. The rate of increase of temperature should not exceed 20°C/min. High temperature oil, such as silicone oil should be used for higher temperature rated release elements; and

.2 this temperature should then be increased at a rate of 1°C/min to the temperature at which the gas bubble dissolves, or to a temperature 5°C lower than the nominal operating temperature, whichever is lower. Remove the nozzle from the liquid bath and allow it to cool in air until the gas bubble has formed again. During the cooling period, the pointed end of the glass bulb (seal end) should be pointing downwards. This test should be performed four times on each of four nozzles.

4.7.2 All uncoated nozzles (see 3.9.2) [7.7.2]

Twelve uncoated nozzles should be exposed for a period of 90 days to a high ambient temperature that is 11°C below the nominal rating or at the temperature shown in table 4, whichever is lower, but not less than 49°C. If the service load is dependent on the service pressure, nozzles should be tested under the rated working pressure. After exposure, four of the nozzles should be subjected to the tests specified in 4.4.1, four nozzles to the test of 4.5.1, two at the minimum operating pressure and two at the rated working pressure, and four nozzles to the requirements of 3.3. If a nozzle fails the applicable requirements of a test, eight additional nozzles should be tested as described above and subjected to the test in which the failure was recorded. All eight nozzles should comply with the test requirements.

4.7.3 Coated nozzles (see 3.9.3) [7.7.3]:

.1 in addition to the exposure test of 4.7.2 in an uncoated version, twelve coated nozzles should be exposed to the test of 4.7.2 using the temperatures shown in table 4 for coated nozzles; and

.2 the test should be conducted for 90 days. During this period, the sample should be removed from the oven at intervals of approximately 7 days and allowed to cool for 2 h to 4 h. During this cooling period, the sample should be examined. After exposure, four of the nozzles should be subjected to the tests specified in 4.4.1, four nozzles to the test of 4.5.1; two at the minimum operating pressure and two at the rated working pressure, and four nozzles to the requirements of 3.3.

Table 4 – Test temperatures for coated and uncoated nozzles

Values in degrees Celsius		
Nominal release Temperature	**Uncoated nozzle test temperature**	**Coated nozzle test temperature**
57-60	49	49
61-77	52	49
78-107	79	66
108-149	121	107
150-191	149	149
192-246	191	191
247-302	246	246
303-343	302	302

4.8 Thermal shock test for glass bulb nozzles (see 3.10) [7.8]

4.8.1 Before starting the test, condition at least 24 nozzles at room temperature of 20 to 25ºC for at least 30 min.

4.8.2 The nozzle should be immersed in a bath of liquid, the temperature of which should be 10 ± 2ºC below the nominal release temperature of the nozzles. After 5 min., the nozzles are to be removed from the bath and immersed immediately in another bath of liquid, with the bulb seal downwards, at a temperature of 10 ± 2ºC. Then test the nozzles in accordance with 4.5.1.

4.9 Strength test for release elements [7.9]

4.9.1 Glass bulbs (see 3.7.1) [7.9.1]

4.9.1.1 At least 15 sample bulbs in the lowest temperature rating of each bulb type should be positioned individually in a text fixture using the sprinkler seating parts. Each bulb should then be subjected to a uniformly increasing force at a rate not exceeding 250 N/s in the test machine until the bulb fails.

4.9.1.2 Each test should be conducted with the bulb mounted in new seating parts. The mounting device may be reinforced externally to prevent its collapse, but in a manner which does not interfere with bulb failure.

4.9.1.3 Record the failure load for each bulb. Calculate the lower tolerance limit (TLI) for bulb strength. Using the values of service load recorded in 4.3.1, calculate the upper tolerance limit (TL2) for the bulb design load. Verify compliance with 3.7.1.

4.9.2 Fusible elements (see 3.7.2)

4.10 Water flow test (see 3.4.1) [7.10]

The nozzle and a pressure gauge should be mounted on a supply pipe. The water flow should be measured at pressures ranging from the minimum operating pressure to the rated working pressure at intervals of approximately 10% of the service pressure range on two sample nozzles. In one series of tests, the pressure should be increased from zero to each value and, in the next series, the pressure shall be decreased from the rated pressure to each value. The flow constant, K, should be averaged from each series of readings, i.e., increasing pressure and decreasing pressure. During the test, pressures should be corrected for differences in height between the gauge and the outlet orifice of the nozzle.

4.11 Corrosion tests [7.12]

4.11.1 Stress corrosion test for brass nozzle parts (see 3.11.1)

4.11.1.1 Five nozzles should be subjected to the following aqueous ammonia test. The inlet of each nozzle should be sealed with a nonreactive cap, e.g., plastic.

4.11.1.2 The samples are degreased and exposed for 10 days to a moist ammonia-air mixture in a glass container of volume 0.02 ± 0.01 m^3.

4.11.1.3 An aqueous ammonia solution, having a density of 0.94 g/cm^3, should be maintained in the bottom of the container, approximately 40 mm below the bottom of the samples. A volume of aqueous ammonia solution corresponding to 0.01 ml per cubic centimetre of the volume of the container will give approximately the following atmospheric concentrations: 35% ammonia, 5% water vapour, and 60% air. The inlet of each sample should be sealed with a nonreactive cap, e.g., plastic.

4.11.1.4 The moist ammonia-air mixture should be maintained as closely as possible at atmospheric pressure, with the temperature maintained at 34 ± 2°C. Provision should be made for venting the chamber via a capillary tube to avoid the build-up of pressure. Specimens should be shielded from condensate drippage.

4.11.1.5 After exposure, rinse and dry the nozzles, and conduct a detailed examination. If a crack, delamination or failure of any operating part is observed, the nozzle(s) should be subjected to a leak resistance test at the rated pressure for 1 min and to the functional test at the minimum flowing pressure (see 3.1.5).

4.11.1.6 Nozzles showing cracking, delamination or failure of any non-operating part should not show evidence of separation of permanently attached parts when subjected to flowing water at the rated working pressure for 30 min.

4.11.2 Stress-Corrosion Cracking of Stainless Steel Nozzle Parts (see 3.11.1)

4.11.2.1 Five samples are to be degreased prior to being exposed to the magnesium chloride solution.

4.11.2.2 Parts used in nozzles are to be placed in a 500-millilitre flask that is fitted with a thermometer and a wet condenser approximately 760 mm long. The flask is to be filled approximately one-half full with a 42% by weight magnesium chloride solution, placed on a thermostatically-controlled electrically heated mantel, and maintained at a boiling temperature of 150 ± 1°C. The parts are to be unassembled, that is, not contained in a nozzle assembly. The exposure is to last for 500 hours.

4.11.2.3 After the exposure period, the test samples are to be removed from the boiling magnesium chloride solution and rinsed in deionised water.

4.11.2.4 The test samples are then to be examined using a microscope having a magnification of 25X for any cracking, delamination, or other degradation as a result of the test exposure. Test samples exhibiting degradation are to be tested as described in 4.12.5.5 or 4.12.5.6, as applicable. Test samples not exhibiting degradation are considered acceptable without further test.

4.11.2.5 Operating parts exhibiting degradation are to be further tested as follows. Five new sets of parts are to be assembled in nozzle frames made of materials that do not alter the corrosive effects of the magnesium chloride solution on the stainless steel parts. These test samples are to be degreased and subjected to the magnesium chloride solution exposure specified in paragraph 4.12.5.2. Following the exposure, the test samples should withstand, without leakage, a hydrostatic test pressure equal to the rated working pressure for 1 minute and then be subjected to the functional test at the minimum operating pressure in accordance with 4.5.1.

4.11.2.6 Non-operating parts exhibiting degradation are to be further tested as follows. Five new sets of parts are to be assembled in nozzle frames made of materials that do not alter the corrosive effects of the magnesium chloride solution on the stainless steel parts. These test samples are to be degreased and subjected to the magnesium chloride solution exposure specified in paragraph 4.12.5.1. Following the exposure, the test samples should withstand a flowing pressure equal to the rated working pressure for 30 minutes without separation of permanently attached parts.

4.11.3 Sulphur dioxide corrosion test (see 3.11.2 and 3.14.2)

4.11.3.1 Ten nozzles should be subjected to the following sulphur dioxide corrosion test. The inlet of each sample should be sealed with a nonreactive cap, e.g., plastic.

4.11.3.2 The test equipment should consist of a 5 litre vessel (instead of a 5 litre vessel, other volumes up to 15 litre may be used in which case the quantities of chemicals given below shall be increased in proportion) made of heat-resistant glass, with a corrosion-resistant lid of such a shape as to prevent condensate dripping on the nozzles. The vessel should be electrically heated through the base, and provided with a cooling coil around the side walls. A temperature sensor placed centrally 160 mm ± 20 mm above the bottom of the vessel should regulate the heating so that the temperature inside the glass vessel is 45°C ± 3ºC. During the test, water should flow through the cooling coil at a sufficient rate to keep the temperature of the discharge water below 30°C. This combination of heating and cooling should encourage condensation on the surfaces of the nozzles. The sample nozzles should be shielded from condensate drippage.

4.11.3.3 The nozzles to be tested should be suspended in their normal mounting position under the lid inside the vessel and subjected to a corrosive sulphur dioxide atmosphere for 8 days. The corrosive atmosphere should be obtained by introducing a solution made up by dissolving 20 g of sodium thiosulphate ($Na_2S_20_3H_2O$) crystals in 500 ml of water.

4.11.3.4 For at least six days of the 8-day exposure period, 20 ml of dilute sulphuric acid consisting of 156 ml of normal H_2SO_4 (0.5 mol/litre) diluted with 844 ml of water should be added at a constant rate. After 8 days, the nozzles should be removed from the container and allowed to dry for 4 to 7 days at a temperature not exceeding 35°C with a relative humidity not greater than 70%.

4.11.3.5 After the drying period, five nozzles should be subjected to a functional test at the minimum operating pressure in accordance with 4.5.1 and five nozzles should be subjected to the dynamic heating test in accordance with 3.14.2.

4.11.4 Salt spray corrosion test (see 3.11.3 and 3.14.2) [7.12.3]

4.11.4.1 Nozzles intended for normal atmospheres

4.11.4.1.1 Ten nozzles should be exposed to a salt spray within a fog chamber. The inlet of each sample should be sealed with a nonreactive cap, e.g., plastic.

4.11.4.1.2 During the corrosive exposure, the inlet thread orifice is to be sealed by a plastic cap after the nozzles have been filled with deionised water. The salt solution should be a 20% by mass sodium chloride solution in distilled water. The pH should be between 6.5 and 7.2 and the density between 1.126 g/ml and 1.157 g/ml when atomized at 35ºC. Suitable means of controlling the atmosphere in the chamber should be provided. The specimens should be supported in their normal operating position and exposed to the salt spray (fog) in a chamber having a volume of at least 0.43 m^3 in which the exposure zone shall be maintained at a temperature of 35 ± 2ºC. The temperature should be recorded at least once per day, at least 7 hours apart (except weekends and holidays when the chamber normally would not be opened). Salt solution should be supplied from a recirculating reservoir through air-aspirating nozzles, at a pressure between 0.7 bar (0.07 MPa) and 1.7 bar (0.17 MPa). Salt solution runoff from exposed samples should be collected and should not return to the reservoir for recirculation. The sample nozzles should be shielded from condensate drippage.

4.11.4.1.3 Fog should be collected from at least two points in the exposure zone to determine the rate of application and salt concentration. The fog should be such that for each 80 cm^2 of collection area, 1 m1 to 2 ml of solution should be collected per hour over a 16 hour period and the salt concentration shall be 20 ± 1% by mass.

4.11.4.1.4 The nozzles should withstand exposure to the salt spray for a period of 10 days. After this period, the nozzles should be removed from the fog chamber and allowed to dry for 4 to 7 days at a temperature of 20°C to 25°C in an atmosphere having a relative humidity not greater than 70%. Following the drying period, five nozzles should be submitted to the functional test at the minimum operating pressure in accordance with 4.5.1 and five nozzles should be subjected to the dynamic heating test in accordance with 3.14.2.

4.11.4.2 Nozzles intended for corrosive atmospheres [7.12.3.2]

Five nozzles should be subjected to the tests specified in 4.12.3.1 except that the duration of the salt spray exposure shall be extended from 10 days to 30 days.

4.11.5 Moist air exposure test (see 3.11.4 and 3.14.2) [7.12.4]

Ten nozzles should be exposed to a high temperature-humidity atmosphere consisting of a relative humidity of 98% ± 2% and a temperature of 95°C ± 4ºC. The nozzles are to be installed on a pipe manifold containing de-ionized water. The entire manifold is to be placed in the high temperature humidity enclosure for 90 days. After this period, the nozzles should be removed from the temperature-humidity enclosure and allowed to dry for 4 to 7 days at a temperature of 25 ± 5°C in an atmosphere having a relative humidity of not greater than 70%. Following the drying period, five nozzles should be functionally tested at the minimum operating pressure in accordance with 4.5.1 and five nozzles should be subjected to the dynamic heating test in accordance with 3.14.2[1].

4.12 Nozzle coating tests [7.13]

4.12.1 Evaporation test (see 3.12.1) [7.13.1]

A 50 cm^3 sample of wax or bitumen should be placed in a metal or glass cylindrical container, having a flat bottom, an internal diameter of 55 mm and an internal height of 35 mm. The container, without lid, should be placed in an automatically controlled electric, constant ambient temperature oven with air circulation. The temperature in the oven should be controlled at 16°C below the nominal release temperature of the nozzle, but at not less than 50°C. The sample should be weighed before and after 90 days exposure to determine any loss of volatile matter; the sample should meet the requirements of 3.12.1.

4.12.2 Low-temperature test (see 3.12.2) [7.13.2]

Five nozzles, coated by normal production methods, whether with wax, bitumen or a metallic coating, should be subjected to a temperature of -10°C for a period of 24 hours. On removal from the low-temperature cabinet, the nozzles should be exposed to normal ambient temperature for at least 30 min before examination of the coating to the requirements of 3.1.12.2.

4.13 Heat-resistance test (see 3.15) [7.14]

One nozzle body should be heated in an oven at 800°C for a period of 15 min, with the nozzle in its normal installed position. The nozzle body should then be removed, holding it by the threaded inlet, and should be promptly immersed in a water bath at a temperature of approximately 15°C. It should meet the requirements of 3.14.

4.14 Water-hammer test (see 3.13) [7.15]

4.14.1 Five nozzles should be connected, in their normal operating position, to the test equipment. After purging the air from the nozzles and the test equipment, 3,000 cycles of pressure varying from 4 ± 2 bar ((0.4 ± 0.2)MPa) to twice the rated working pressure should be generated. The

[1] At the manufacturer's option, additional samples may be furnished for this test to provide early evidence of failure. The additional samples may be removed from the test chamber at 30-day intervals for testing.

pressure should be raised from 4 bar to twice the rated pressure at a rate of 60 ± 10 bar/s. At least 30 cycles of pressure per minute should be generated. The pressure should be measured with an electrical pressure transducer.

4.14.2 Visually examine each nozzle for leakage during the test. After the test, each nozzle should meet the leakage resistance requirement of 3.8.1 and the functional requirement of 3.5.1 at the minimum operating pressure.

4.15 Vibration test (see 3.16) [7.16]

4.15.1 Five nozzles should be fixed vertically to a vibration table. They should be subjected at room temperature to sinusoidal vibrations. The direction of vibration should be along the axis of the connecting thread.

4.15.2 The nozzles should be vibrated continuously from 5 Hz to 40 Hz at a maximum rate of 5 min/octave and an amplitude of 1 mm (1/2 peak-to-peak value). If one or more resonant points are detected, the nozzles after coming to 40 Hz, should be vibrated at each of these resonant frequencies for 120 hours/number of resonances. If no resonances are detected, the vibration from 5 Hz to 40 Hz should be continued for 120 hours.

4.15.3 The nozzle should then be subjected to the leakage test in accordance with 3.8.1 and the functional test in accordance with 3.5.1 at the minimum operating pressure.

4.16 Impact test (see 3.17) [7.17]

4.16.1 Five nozzles should be tested by dropping a mass onto the nozzle along the axial centreline of waterway. The kinetic energy of the dropped mass at the point of impact should be equivalent to a mass equal to that of the test nozzle dropped from a height 1 m (see figure 2). The mass is to be prevented from impacting more than once upon each sample.

4.16.2 Following the test a visual examination of each nozzle shall show no signs of fracture, deformation, or other deficiency. If none is detected, the nozzles should be subjected to the leak resistance test, described in 4.4.1. Following the leakage test, each sample should meet the functional test requirement of 4.5.1 at a pressure equal to the minimum flowing pressure.

4.17 Lateral discharge test (see 3.18) [7.19]

4.17.1 Water is to be discharged from a spray nozzle at the minimum operating and rated working pressure. A second automatic nozzle located at the minimum distance specified by the manufacturer is mounted on a pipe parallel to the pipe discharging water.

4.17.2 The nozzle orifices or distribution plates (if used), are to be placed 550 mm, 356 mm and 152 mm below a flat smooth ceiling for three separate tests, respectively at each test pressure. The top of a square pan measuring 305 mm square and 102 mm deep is to be positioned 152 mm below the heat responsive element for each test. The pan is filled with 0.47 litres of heptane. After ignition, the automatic nozzle is to operate before the heptane is consumed.

4.18 30-day leakage test (see 3.19) [7.20]

4.18.1 Five nozzles are to be installed on a water filled test line maintained under a constant pressure of twice the rated working pressure for 30 days at an ambient temperature of (20 ± 5°C).

4.18.2 The nozzles should be inspected visually at least weekly for leakage. Following completion of this 30-day test, all samples should meet the leak resistance requirements specified in 3.2.4 and should exhibit no evidence of distortion or other mechanical damage.

4.19 Vacuum test (see 3.20) [7.21]

Three nozzles should be subjected to a vacuum of 460 mm of mercury applied to a nozzle inlet for 1 min at an ambient temperature of 20 ± 5°C. Following this test, each sample should be examined to verify that no distortion or mechanical damage has occurred and then should meet the leak resistance requirements specified in 4.4.1.

4.20 Clogging Test (see 3.22) [7.28]

4.20.1 The water flow rate of an open water-mist nozzle with its strainer or filter should be measured at its rated working pressure. The nozzle and strainer or filter should then be installed in test apparatus described in Figure 3 and subjected to 30 minutes of continuous flow at rated working pressure using contaminated water which has been prepared in accordance with 4.20.3.

4.20.2 Immediately following the 30 minutes of continuous flow with the contaminated water, the flow rate of the nozzle and strainer or filter should be measured at rated working pressure. No removal, cleaning or flushing of the nozzle, filter or strainer is permitted during the test.

4.20.3 The water used during the 30 minutes of continuous flow at rated working pressure specified in 4.20.1 should consist of 60 litres of tap water into which has been mixed 1.58 kilograms of contaminants which sieve as described in table 6. The solution should be continuously agitated during the test.

4.20.4 Alternative supply arrangements to the apparatus shown in figure 3 may be used where damage to the pump is possible. Restrictions to piping defined by note 2 of table 5 should apply to such systems.

Table 5 – Contaminant for the contaminated water cycling test

SIEVE DESIGNATION*	NOMINAL SIEVE OPENING, MM	GRAMS OF CONTAMINANT (± 5%)**		
		PIPE SCALE	TOP SOIL	SAND
No. 25	0.706	-	456	200
No. 50	0.297	82	82	327
No. 100	0.150	84	6	89
No. 200	0.074	81	-	21
No. 325	0.043	153	-	3
	TOTAL	400	544	640

* Sieve designations correspond with those specified in the standard for wire-cloth sieves for testing purposes, ASTM E11-87, CENCO-MEINZEN sieve sizes 25 mesh, 50 mesh, 100 mesh, 200 mesh and 325 mesh, corresponding with the number designation in the table, have been found to comply with ASTM E11-87.

** The amount of contaminant may be reduced by 50 per cent for nozzles limited to use with copper or stainless steel piping and by 90 per cent for nozzles having a rated pressure of 50 bar or higher and limited to use with stainless steel piping.

5 WATER-MIST NOZZLE MARKING

5.1 General

Each nozzle complying with the requirements of this Standard should be permanently marked as follows:

(a) trademark or manufacturer's name;

(b) model identification;

(c) manufacturer's factory identification. This is only required if the manufacturer has more than one nozzle manufacturing facility;

(d) nominal year of manufacture[1] (automatic nozzles only);

(e) nominal release temperature[2]; and

(f) K-factor. This is only required if a given model nozzle is available with more than 1 orifice size.

In countries where colour-coding of yoke arms of glass bulb nozzles is required, the colour code for fusible element nozzles should be used.

5.2 Nozzle housings

Recessed housings, if provided, should be marked for use with the corresponding nozzles unless the housing is a non-removable part of the nozzle.

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[1] The year of manufacture may include the last three months of the preceding year and the first six months of the following year. Only the last two digits need be indicated.

[2] Except for coated and plated nozzles, the nominal release temperature range should be colour-coded on the nozzle to identify the nominal rating. The colour code should be visible on the yoke arms holding the distribution plate for fusible element nozzles, and should be indicated by the colour of the liquid in glass bulbs. The nominal temperature rating should be stamped or cast on the fusible element of fusible element nozzles. All nozzles should be stamped, cast, engraved or colour-coded in such a way that the nominal rating is recognizable even if the nozzle has operated. This should be in accordance with table 1.

FIGURE 1

RTI AND C LIMITS FOR STANDARD ORIENTATION

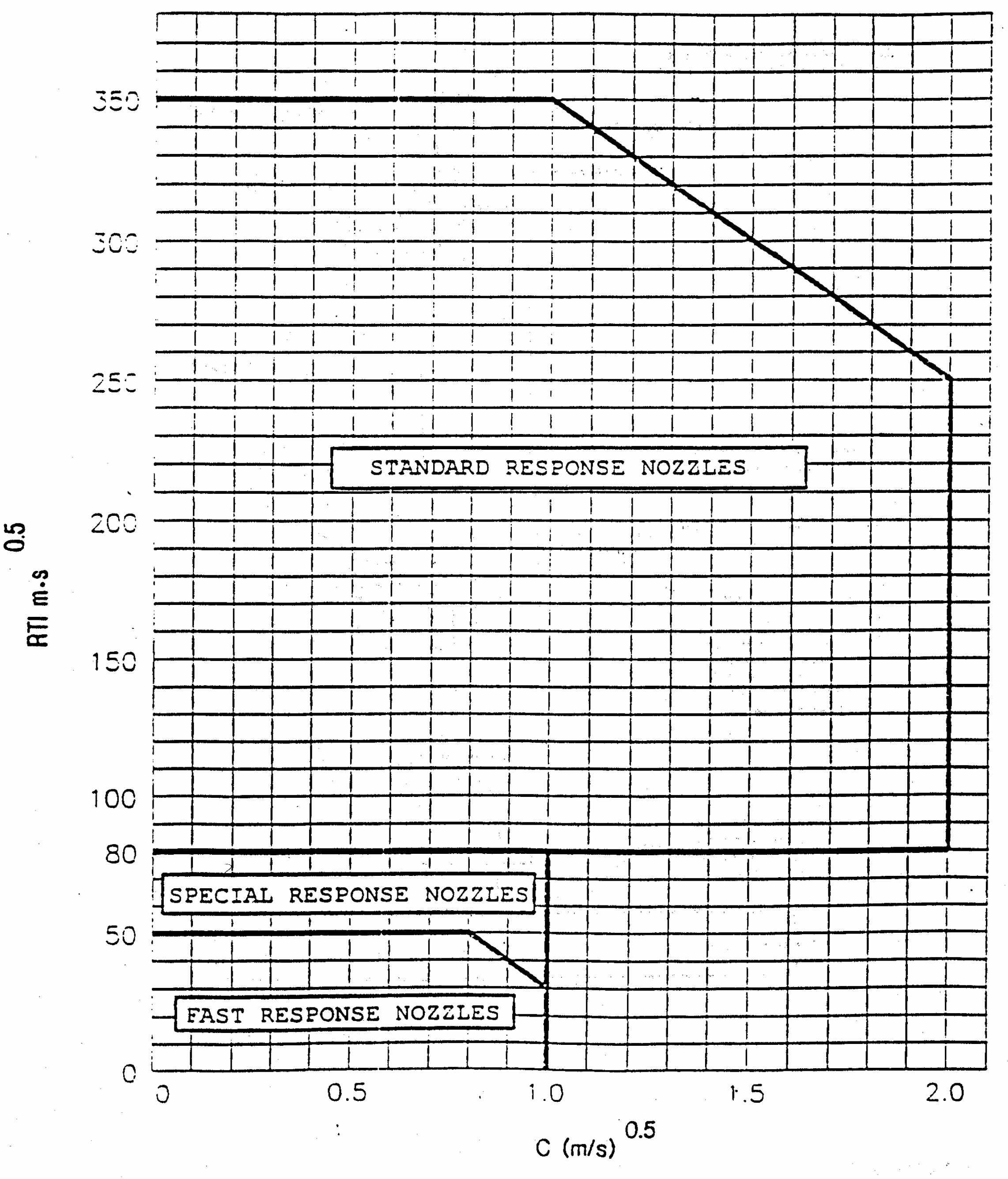


FIGURE 2

IMPACT TEST APPARATUS

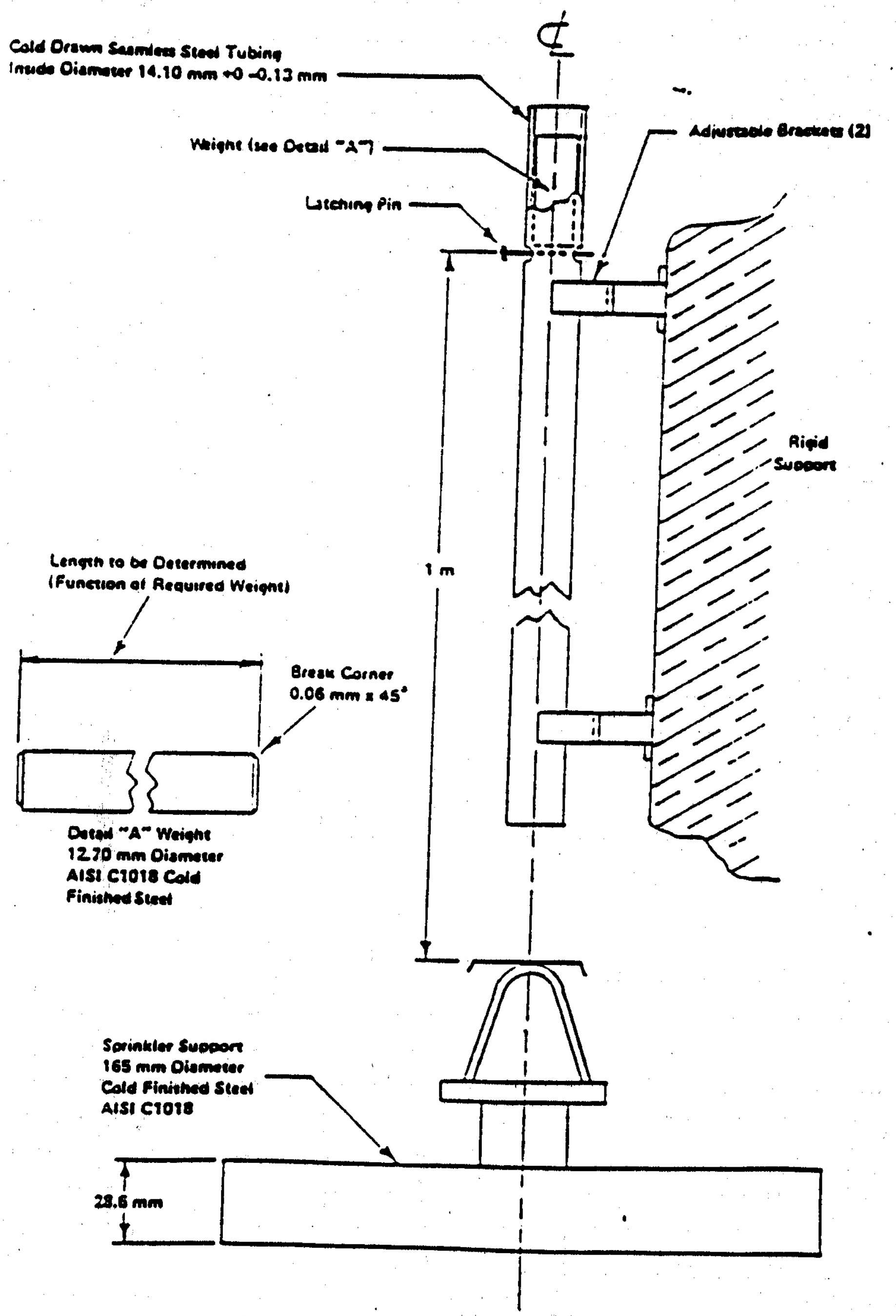
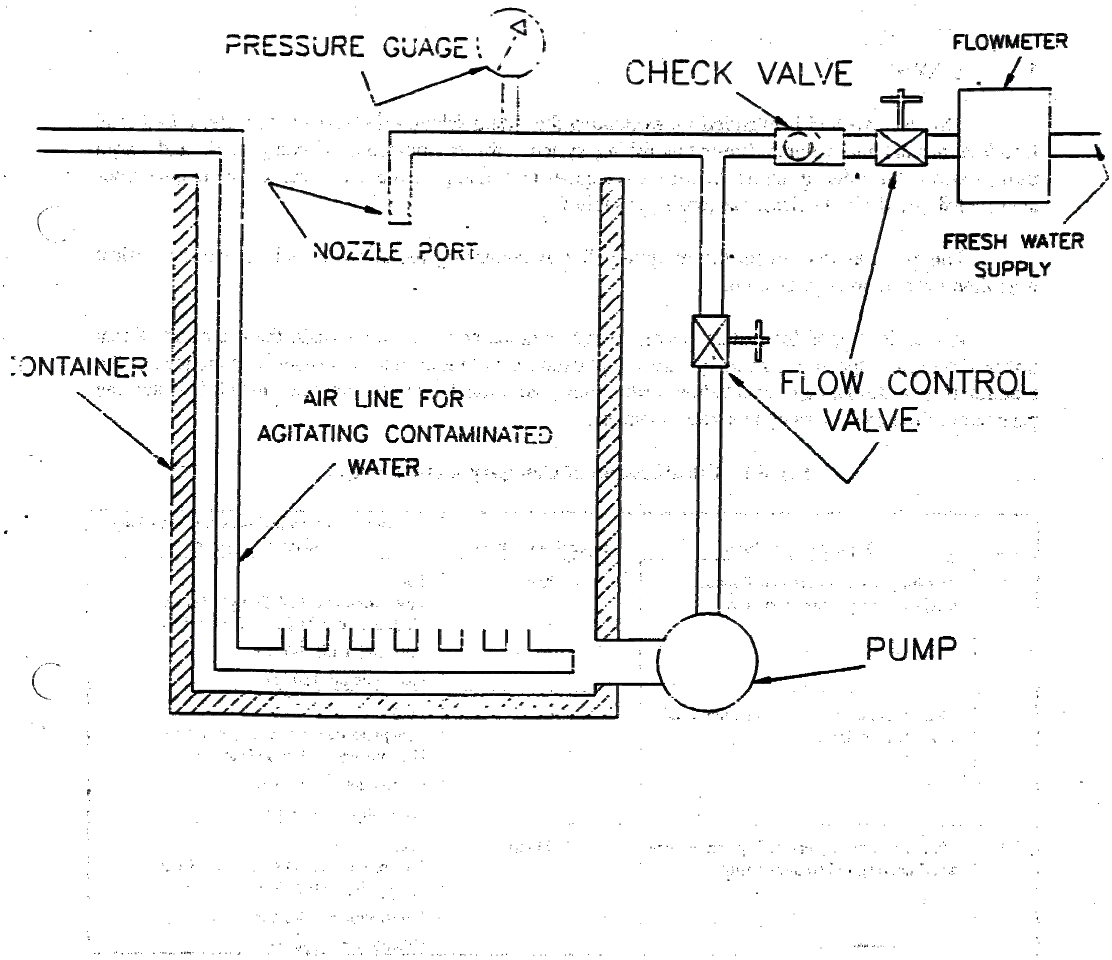


FIGURE 3

CLOGGING TEST APPARATUS



APPENDIX B

TEST METHOD FOR FIRE TESTING EQUIVALENT WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR MACHINERY SPACES OF CATEGORY A AND CARGO PUMP-ROOMS

1 SCOPE

1.1 This test method is intended for evaluating the extinguishing effectiveness of water-based total flooding fire-extinguishing systems for the protection of engine-rooms of category A and cargo pump-rooms.

1.2 The test method covers the minimum fire-extinguishing requirement and prevention against reignition for fires in engine-rooms.

1.3 It was developed for systems using ceiling mounted nozzles or multiple levels of nozzles. Bilge nozzles are required for all systems. The bilge nozzles may be part of the main system, or they may be a separate bilge area protection system.

1.4 In the tests, the use of additional nozzles to protect specific hazards by direct application is not permitted. However for ship board applications additional nozzles may be added as recommended by the manufacturer.

2 FIELD OF APPLICATION

The test method is applicable for water-based fire-extinguishing systems which will be used as alternative fire-extinguishing systems as required by SOLAS regulation II-2/10.4.1 and II-2/10.9.1. For the installation of the system, nozzles shall be installed to protect the entire hazard volume (total flooding). The installation specification provided by the manufacturer should include maximum horizontal and vertical nozzle spacing, maximum enclosure height, and distance of nozzles below the ceiling and maximum enclosure volume which, as a principle, should not exceed the values used in approval fire test. However, when based on the scientific methods developed by the Organization*, scaling from the maximum tested volume to a larger volume may be permitted. The scaling should not exceed twice the tested volume.

3 SAMPLING

The components to be tested should be supplied by the manufacturer together with design and installation criteria, operational instructions, drawings and technical data sufficient for the identification of the components.

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* To be developed by the Organization.

4 METHOD OF TEST

4.1 Principle

This test procedure enables the determination of the effectiveness of different water-based extinguishing systems against spray fires, cascade fires, pool fires, and Class A fires which are obstructed by an engine mock-up.

4.2 Apparatus

4.2.1 *Engine mock-up*

The fire test should be performed in a test apparatus consisting of:

.1 an engine mock-up of the size (width × length × height) of 1 m × 3 m × 3 m constructed of sheet steel with a nominal thickness of 5 mm. The mock-up is fitted with two steel tubes of 0.3 m in diameter and 3 m in length that simulate exhaust manifolds and a grating. At the top of the mock-up, a 3 m^2 tray is arranged (see figure 1); and

.2 a floor plate system of the size (width × length × height) of 4 m × 6 m × 0.5 m, surrounding the mock-up. Provision shall be made for placement of the fuel trays, described in table 1, and located as described in figure 1.

4.2.2 *Fire test compartment*

The tests should be performed in a room having a specified area greater than 100 m^2, a specified height of at least 5 m and ventilation through a door opening of 2 m × 2 m in size. Fires and engine mock-up should be according to tables 1, 2, 3 and figure 2. The test hall should have an ambient temperature of between 10°C and 30°C at the start of each test.

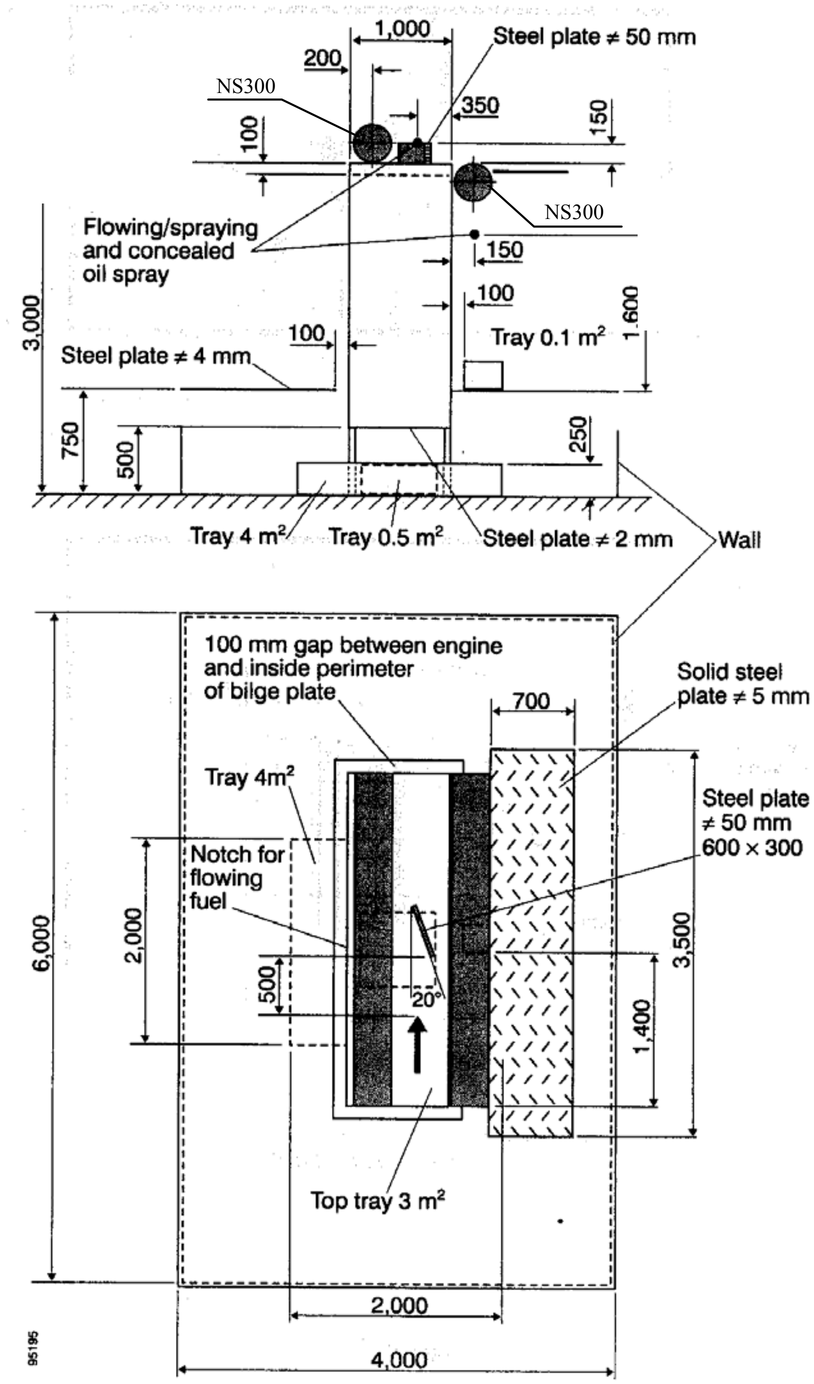
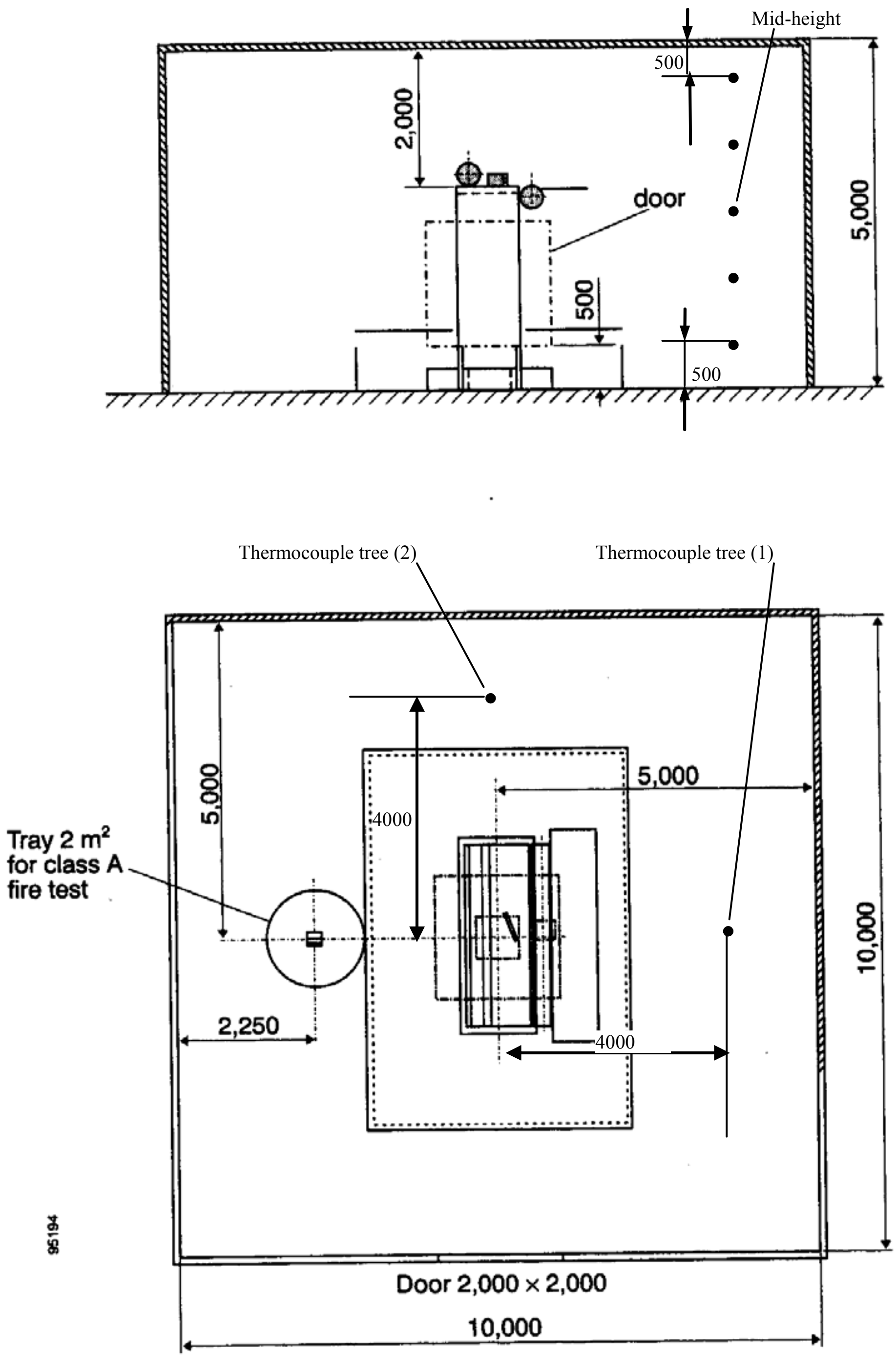

1,000
Steel plate ≠ 50 mm
200
NS300
350
150
100
NS300
Flowing/spraying
and concealed
oil spray
150
100
3,000
1.600
Tray 0.1 m²
100
Steel plate ≠ 4 mm
750
500
250
Tray 4 m²
Tray 0.5 m²
Steel plate ≠ 2 mm
Wall
100 mm gap between engine
and inside perimeter
of bilge plate
Solid steel
plate ≠ 5 mm
700
Tray 4m²
Steel plate
≠ 50 mm
600 × 300
Notch for
flowing
fuel
6,000
2,000
500
20°
3,500
1,400
Top tray 3 m²
2,000
4,000
95195

Figure 1



4000

Figure 2

4.3 Test scenario

4.3.1 *Fire-extinguishing tests*

Table 1

Test No.	Fire Scenario	Test Fuel
1	Low pressure horizontal spray on top of simulated engine between agent nozzles.	Commercial fuel oil or light diesel oil
2	Low pressure spray in top of simulated engine centred with nozzle angled upward at a 45° angle to strike a 12-15 mm diameter rod 1 m away.	Commercial fuel oil or light diesel oil
3	High pressure horizontal spray on top of the simulated engine.	Commercial fuel oil or light diesel oil
4	Low pressure concealed horizontal spray fire on the side of simulated engine with oil spray nozzle positioned 0.1 m in from the end of the engine and 0.1 m^2 tray positioned on tope of the bilge plate 1.4 m in from the engine end at the edge of the bilge plate closest to the engine.	Commercial fuel oil or light diesel oil
5	Concealed 0.7 m × 3.0 m fire tray on top of bilge plate centred under exhaust plate.	Heptane
6	Flowing fire 0.25 kg/s from top of mock-up (see figure 3).	Heptane
7	Class A fires wood crib (see Note) in 2 m^2 pool fire with 30 s preburn. The test tray should be positioned 0.75 m above the floor as shown in figure 1.	Heptane
8	A steel plate (30 cm × 60 cm × 5 cm) offset 20° to the spray is heated to 350°C by the top low pressure spray nozzle positioned horizontally 0.5 m from the front edge of the plate. When the plate reaches 350°C, the system is activated. Following system shutoff, no reignition of spray is permitted.	Heptane

Note: 1 The wood crib is to weigh 5.4 to 5.9 kg and is to be dimensioned approximately 305 mm × 305 mm × 305 mm. The crib is to consist of eight alternate layers of four trade size 38.1 mm × 38.1 mm kiln-dried spruce or fir lumber 305 mm long. The alternate layers of the lumber are to be placed at right angles to the adjacent layers. The individual wood members in each layer are to be evenly spaced along the length of the previous layer of wood members and stapled. After the wood crib is assembled, it is to be conditioned at a temperature of 49 ± 5°C for not less than 16 h. Following the conditioning, the moisture content of the crib is to be measured with a probe type moisture meter. The moisture content of the crib should not exceed 5% prior to the fire test.

Table 2 - ***Test Programme for Bilge Nozzles***

Test No.	Fire Scenario	Test Fuel
1	0.5 m^2 central under mock-up	Heptane
2	0.5 m^2 central under mock-up	SAE 10W30 mineral based lubrication oil
3	4 m^2 tray under mock-up	Commercial fuel oil or light diesel oil

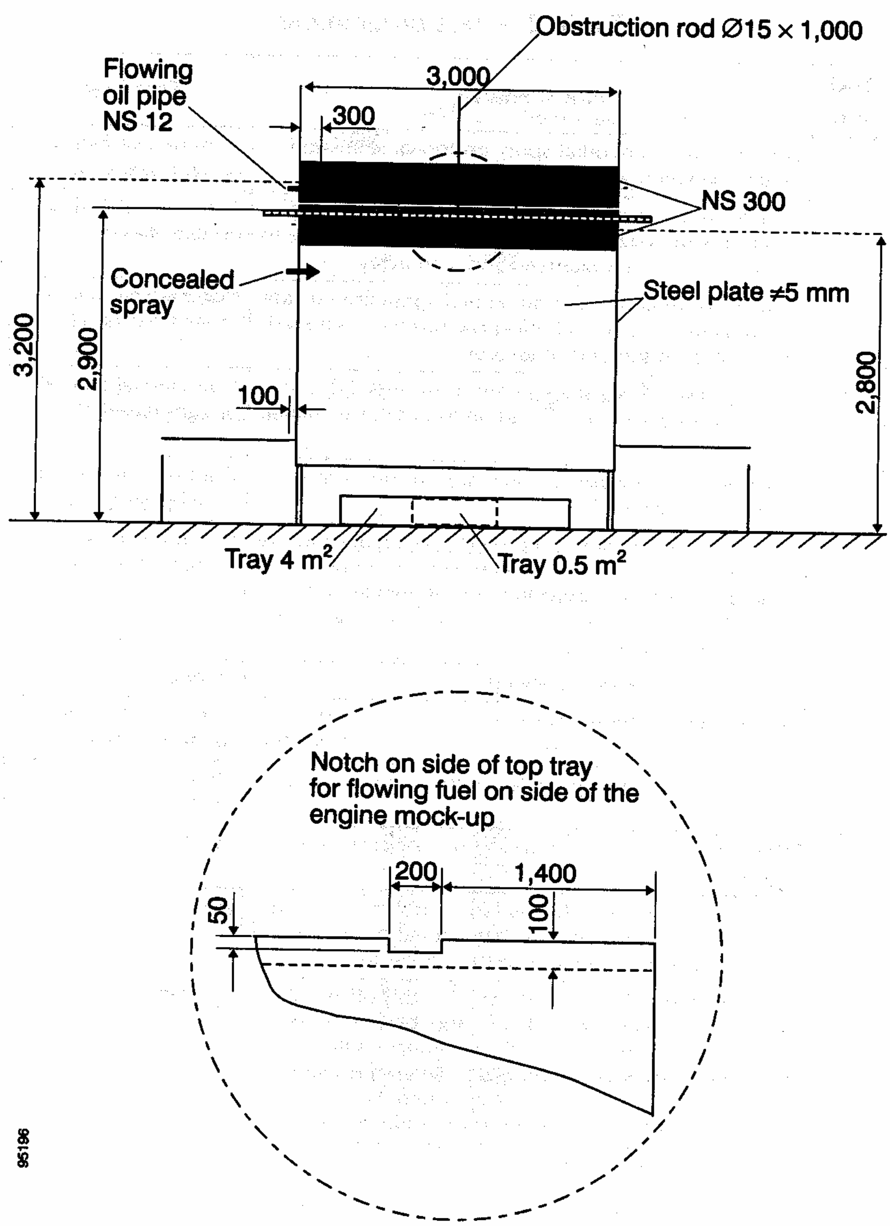


Figure 3

Table 3 - S*pray fire test parameters*

Fire type	**Low pressure**	**High pressure**
Spray nozzle	Wide spray angle (120° to 125°) full cone type	Standard angle (at 6 bar) full cone type
Nominal fuel pressure	8 bar	150 bar
Fuel flow	0.16 ± 0.01 kg/s	0.050 ± 0.002 kg/s
Fuel temperature	20 ± 5°C	20 ± 5°C
Nominal heat release rate	5.8 ± 0.6 MW	1.8 ± 0.2 MW

4.3.2 *Thermal management tests*

4.3.2.1 Instrumentation

4.3.2.1.1 Thermocouples should be installed in two trees. One tree should be located 4 m from the centre of the mock-up, on the opposite side of the 2 m^2 tray for class A fire test as shown in figure 2. The other tree should be located 4 m from the centre of the mock-up, on the opposite side of the door opening.

4.3.2.1.2 Each tree should consist of five thermocouples of diameter not exceeding 0.5 mm, positioned at the following heights: (1) 500 mm below the ceiling; (2) 500 mm above floor level; (3) at mid-height of the test compartment; (4) between the uppermost thermocouple and the thermocouple at mid-height and (5) between the lowest thermocouple and the thermocouple at mid-height.

4.3.2.1.3 Measures should be provided to avoid direct water spray impingement of the thermocouples.

4.3.2.1.4 The temperatures should be measured continuously, at least once every two seconds, throughout the test.

4.3.2.2 Fire size and position

4.3.2.2.1 For the determination of the thermal management, an obstructed n-Heptane pool fire scenario should be used. The nominal fire sizes should be correlated to the test compartment volume according to table 4. The test tray should be positioned in accordance with test No.7 as shown in table 1 and figure 2.

Table 4 - Correlation between nominal pool fire sizes and test compartment volume

Test compartment volume	Pool fire scenario
500 m^3	1 MW
1000 m^3	2 MW
1500 m^3	3 MW
2000 m^3	4 MW
2500 m^3	5 MW
3000 m^3	6 MW

Note: Interpolation of the data in the table is allowed.

4.3.2.2.2 The rim height of the trays should be 150 mm and the tray should be filled with 50 mm of fuel. Additional water should be added to provide a freeboard of 50 mm. Table 5 provides examples of pool tray diameters and the corresponding area, for a selection of nominal heat release rates.

Table 5 - Pool tray diameters and the corresponding area, for a selection of nominal heat release rates

Nominal HRR	Diameter (cm)	Area (m^2)	Size of obstruction steel plate (m x m)
0.5 MW	62	0.30	2.0 x 2.0
1 MW	83	0.54	2.0 x 2.0
2 MW	112	0.99	2.0 x 2.0
3 MW	136	1.45	2.25 x 2.25
4 MW	156	1.90	2.25 x 2.25
5 MW	173	2.36	2.5 x 2.5
6 MW	189	2.81	2.5 x 2.5

Note: Interpolation or extrapolation of the data is allowed according to the following equation:

$$Q = 2.195A - 0.18$$

where:

Q = the desired nominal heat release rate (MW)
A = the area of the fire tray (m^2)

4.3.2.2.3 A square horizontal obstruction steel plate should shield the pool fire tray from direct water spray impingement. The size of the obstruction steel plate is dictated by the size of the fire tray, as indicated in table 5. The vertical distance measured from the floor to the underside of the obstruction steel plate should be 1.0 m.

4.3.2.2.4 The thickness of the steel plate should be a nominal 4 mm. The vertical distance measured from the rim of the trays to the underneath of the horizontal obstruction steel plate should be 0.85 m.

4.4 Extinguishing system

4.4.1 During fire test conditions the extinguishing system should be installed according to the manufacturer's design and installation instructions in a uniformly spaced overhead nozzle grid. The lowest level of nozzles should be located at least 5 m above the floor. For actual installations, if the water-mist system includes bilge area protection, water-mist nozzles must be installed throughout the bilges in accordance with the manufacturer's recommended dimensioning, as developed from bilge system testing using the tests in table 2, conducted with the bilge plate located at the maximum height for which approval is sought. Tests should be performed with nozzles located in the highest and lowest recommended position above the bilge fires. Bilge systems using the nozzle spacing tested may be approved for fire protection of bilge areas of any size.

4.4.2 The system fire tests should be conducted at the minimum system operating pressure, or at the conditions providing the minimum water application rate.

4.4.3 During the laboratory fire tests the bilge system nozzles may not be located beneath the engine mock-up, but should be located beneath the simulated bilge plates at least one-half the nozzle spacing away from the engine mock-up.

4.5 Procedure

4.5.1 *Ignition*

The trays used in the test should be filled with at least 50 mm fuel on a water base. Freeboard is to be 150±10 mm.

4.5.2 *Flow and pressure measurements (Fuel system)*

The fuel flow and pressure in the fuel system should be measured before each test. The fuel pressure should be measured during the test.

4.5.3 *Flow and pressure measurements (Extinguishing system)*

Agent flow and pressure in the extinguishing system should be measured continuously on the high pressure side of a pump or equivalent equipment at intervals not exceeding 5 s during the test, alternatively, the flow can be determined by the pressure and the *K* factor of the nozzles.

4.5.4 *Duration of test*

4.5.4.1 After ignition of all fuel sources, a 2-min preburn time is required before the extinguishing agent is discharged for the fuel tray fires and 5-15 s for the fuel spray and heptane fires and 30 s for the Class A fire test (Test No.7).

4.5.4.2 The fire should be allowed to burn until the fire is extinguished or for a period of 15 minutes, whichever is less, measured from the ignition. The fuel spray, if used, should be shut off 15 s after the end of agent discharge.

4.5.5 *Observations before and during the test*

4.5.5.1 Before the test, the test room, fuel and mock-up temperature is to be measured.

4.5.5.2 During the test the following items should be recorded:

.1 the start of the ignition procedure;

.2 the start of the test (ignition);

.3 the time when the extinguishing system is activated;

.4 the time when the fire is extinguished, if it is;

.5 the time when the extinguishing system is shut off;

.6 the time of re-ignition, if any;

.7 the time when the oil flow for the spray fire is shut off;

.8 the time when the test is finished; and

.9 data from all test instrumentation.

4.5.6 *Observations after the test*

.1 damage to any system components;

.2 the level of fuel in the tray(s) to make sure that the fuel was not totally consumed; and

.3 test room, fuel and mock-up temperature.

5 CLASSIFICATION CRITERIA

5.1 Fire-extinguishing tests

All fires in the fire-extinguishing tests should be extinguished within 15 minutes of system activation and there should be no re-ignition or fire spread.

5.2 Thermal management tests

The 60 s time-weighted average temperature should be kept below 100°C, no later than 300 s after activation of the system for the thermal management test in 4.3.2.

6 TEST REPORT

The test report should include the following information:

.1 name and address of the test laboratory;

.2 date and identification number of the test report;

.3 name and address of client;

.4 purpose of the test;

.5 method of sampling;

.6 name and address of manufacturer or supplier of the product;

.7 name or other identification marks of the product;

.8 description of the tested product:

- drawings,
- descriptions,
- assembly instructions,
- specification of included materials, and
- detailed drawing of test set-up;

.9 date of supply of the product;

.10 date of test;

.11 test method;

.12 drawing of each test configuration;

.13 measured nozzle characteristics;

.14 identification of the test equipment and used instruments;

.15 conclusions;

.16 deviations from the test method, if any;

.17 test results including observations during and after the test; and

.18 date and signature.