



SUB-COMMITTEE ON FIRE PROTECTION
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REPORT TO THE MARITIME SAFETY COMMITTEE

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1 GENERAL

Introduction

1.1 The Sub-Committee held its fifty-second session from 14 to 18 January 2008 under the chairmanship of Mr. J.C. Cubisino (Argentina). The Vice-Chairman, Mr. C. Abbate (Italy), was also present.

1.2 The session was attended by delegations from the following Member Governments:

ANGOLA	LIBERIA
ARGENTINA	MALAYSIA
BAHAMAS	MARSHALL ISLANDS
BELGIUM	MEXICO
BOLIVIA	MOROCCO
BRAZIL	NETHERLANDS
CANADA	NIGERIA
CHILE	NORWAY
CHINA	PANAMA
CROATIA	PAPUA NEW GUINEA
CUBA	PERU
CYPRUS	PHILIPPINES
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	POLAND
DENMARK	PORTUGAL
DOMINICAN REPUBLIC	REPUBLIC OF KOREA
ECUADOR	RUSSIAN FEDERATION
EGYPT	SAUDI ARABIA
FINLAND	SINGAPORE
FRANCE	SLOVENIA
GERMANY	SPAIN
GREECE	SWEDEN
ICELAND	SYRIAN ARAB REPUBLIC
INDONESIA	THAILAND
IRAN (ISLAMIC REPUBLIC OF)	TURKEY
IRELAND	TUVALU
ITALY	UKRAINE
JAPAN	UNITED KINGDOM
KENYA	UNITED STATES
LATVIA	URUGUAY
	VENEZUELA

by the following Associate Member of IMO:

HONG KONG, CHINA

and the following State not Member of IMO:

COOK ISLANDS

1.3 The session was also attended by observers from the following intergovernmental organizations:

EUROPEAN COMMISSION (EC)
MARITIME ORGANISATION FOR WEST AND CENTRAL AFRICA (MOWCA)

and by observers from the following non-governmental organizations:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
INTERNATIONAL TRANSPORT WORKERS' FEDERATION (ITF)
INTERNATIONAL RADIO MARITIME COMMITTEE (CIRM)
INTERNATIONAL ASSOCIATION OF PORTS AND HARBORS (IAPH)
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS (IADC)
INTERNATIONAL FEDERATION OF SHIPMASTERS' ASSOCIATION (IFSMA)
INTERNATIONAL ASSOCIATION OF INDEPENDENT TANKER OWNERS
(INTERTANKO)
SOCIETY OF INTERNATIONAL GAS TANKER AND TERMINAL OPERATORS
LIMITED (SIGTTO)
CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)
INSTITUTE OF MARINE ENGINEERING, SCIENCE AND TECHNOLOGY (IMAREST)
INTERNATIONAL PARCEL TANKERS ASSOCIATION (IPTA)
THE INTERNATIONAL MARINE CONTRACTORS ASSOCIATION (IMCA)
THE ROYAL INSTITUTION OF NAVAL ARCHITECTS (RINA)

Secretary-General's opening address

1.4 In welcoming the participants, the Secretary-General wished all present and the maritime community at large, a happy, healthy, successful and accident-free New Year and urged all associated with the work of IMO to keep working, throughout the year, individually and collectively, to create a safer, more secure, efficient and environmentally-friendly maritime world.

Referring to this session of the Sub-Committee being held again away from the Headquarters building, the Secretary-General emphasized that this was one of the final challenges to be faced during the extended refurbishment period and that he sincerely hoped that the meeting at the Methodist Central Hall, which had hosted the inaugural session of the General Assembly of the United Nations in 1946, would be successful and enjoyable.

The Secretary-General drew the Sub-Committee's attention to the theme for this year's World Maritime Day: **IMO: 60 years in the service of shipping** and pointed out that this theme would give the opportunity to pay due tribute to the sterling work delivered by the Organization since its inception in 1948 as a specialized agency of the United Nations; as an institution serving the common public good; and as the regulator and partner of an industry. He emphasized that the choice of this year's theme would also provide an appropriate way to celebrate the Organization's return to the refurbished Headquarters building, where history affecting international shipping has been made since 1982 and that this would also give the opportunity to remember all those indefatigable servants of IMO's objectives and ideals, whose hard work,

commitment and dedication have helped create the solid edifice of the Organization's regulatory regime.

Referring to the approval, by MSC 83, of the amendments to SOLAS chapter II-2 on carbon dioxide systems and a number of technical circulars dealing with fire-fighting systems and means of escape, he emphasized that these were important achievements in endeavours to update fire safety standards for both passenger and cargo ships and expressed his confidence that they would provide useful advice to ship owners, operators and designers.

With regard to items of significance on the agenda, the Secretary-General, having noted the progress made on the review of fire safety of external areas on passenger ships, which was undertaken in light of the fire on the **Star Princess**, acknowledged that the Sub-Committee had always played an important role in the development of passenger ship safety regulations and urged it to work diligently on the supporting guidelines referred to in the recently approved SOLAS amendments related to the drainage of fire-fighting water from the vehicle decks of ro-ro ships, which were approved by MSC 83 in response to the tragic loss of life caused by the sinking of the passenger ferry **Al-Salam Boccaccio 98**.

Turning to the Sub-Committee's work on the comprehensive review of the performance testing and approval standards for fire safety systems, the Secretary-General considered it essential that these standards are kept up-to-date with all new developments, and for consistent implementation of relevant SOLAS chapter II-2 requirements; and urged the Sub-Committee, in the context of this work, to also reconsider, as a matter of urgency and as instructed by MSC 83, the draft Guidelines for the approval of fixed fire-detection and fire alarm systems for cabin balconies, for approval by MSC 84, taking into account that the associated SOLAS amendments are due to enter into force on 1 July of this year.

In highlighting the work on the comprehensive review of the Fire Test Procedures Code, aiming at enhancing its user-friendliness and providing a more uniform application of the Code through the inclusion of appropriate interpretations approved by the Committee, he noted the progress made to date and emphasized that this work is essential for accommodating developments in fire protection technologies into the various fire test standards.

With regard to measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes, the Secretary-General recalled that the work to be undertaken was based on the recommendations of the Sub-Committee and the Inter-Industry Working Group established to study incidents of fires and explosions on chemical and product tankers. Recognizing the complexity of the subject and noting the relevant instructions of MSC 83, the Secretary-General pointed out that this task would not be easy to accomplish, but expressed his sincere hope and strong desire that the Sub-Committee would overcome any challenges which might be encountered on the way and, with the usual spirit of co-operation, reach consensus decisions.

On general issues, the Secretary-General stressed that there should be no complacency about security at the various venues where IMO meetings may be held during the remaining part of refurbishment period. In this context, he recalled the atrocious terrorist attack last month in Algiers, which cost the life of many UN workers and stressed that their sacrifice in the pursuit of the noblest of all causes, that of peace and reconciliation, is the latest addition to the long list of UN staff paying the ultimate price in the line of duty, including those lost at the 2003 bombing at the UN Headquarters in Baghdad. The Secretary-General, therefore, appealed to all delegates to abide by the general security measures in place.

With regard to the implementation of the Voluntary IMO Member State Audit Scheme, he encouraged Member States to continue the commendable efforts already made, so that the benefits could be expanded to the Organization's entire membership, thereby promoting the global, consistent and effective implementation and enforcement of IMO instruments, and encouraged Member States to volunteer for audit and to nominate qualified auditors.

Chairman's remarks

1.5 In responding, the Chairman thanked the Secretary-General for his words of encouragement and stated that his advice and requests would be given every consideration in the deliberations of the Sub-Committee.

Statement by the delegation of the Republic of Korea

1.6 The delegation of the Republic of Korea made a brief statement on an oil pollution accident involving the oil tanker **Hebei Spirit**, which took place on 7 December 2007 off the west coast of the Republic of Korea. The accident presented a serious risk of explosion at the scene, besides the actual spillage of approximately 10,000 tonnes of oil. The delegation of the Republic of Korea took the opportunity to express its deep appreciation to all those international organizations who contributed their enormous assistance and support for clean-up and emergency operations, in particular, to the Secretary-General of IMO, UNEP, the United States, Japan, China, Canada, Singapore, ITOPF and the IOPC Funds. They informed the Sub-Committee that a detailed casualty report will be submitted to IMO for the further necessary consideration.

Statement by the delegation of Greece

1.7 The delegation of Greece made a brief statement on the accident involving the Greek flag vessel **Ice Prince** sailing in the English Channel. They informed the Sub-Committee that the vessel was abandoned by its crew and that search and rescue operations by the United Kingdom were immediate and successful. All the crew were reported to be in good health and were transferred ashore by helicopter and rescue vessels. The delegation of Greece expressed its sincere gratitude to the United Kingdom for its successful rescue operations.

Adoption of the agenda and related matters

1.8 The Sub-Committee adopted the agenda (FP 52/1/Rev.1) and agreed to be guided in its work, in general, by the annotations contained in documents FP 52/1/1 and Add.1. The agenda, as adopted, with the list of documents considered under each agenda item, is set out in document FP 52/INF.10

2 DECISIONS OF OTHER IMO BODIES

General

2.1 The Sub-Committee noted the decisions and comments pertaining to its work made by COMSAR 11, DE 50, BLG 11, SLF 50, FSI 15, MEPC 56, NAV 53, DSC 12 and MSC 83, as reported in documents FP 52/2 and FP 52/2/1, and took them into account in its deliberations when dealing with relevant agenda items.

2.2 The Sub-Committee further noted the verbal information by the Secretariat with regard to the outcomes of C/ES.24 and A 25, in particular the approval the Strategic Plan for the Organization for the six-year period 2008 to 2013, as adopted by resolution A.989(25), and the approval of the High-level Action Plan and priorities for the 2008-2009 biennium, as adopted by resolution A.990(25).

Guidelines on the organization and method of work

2.3 The Sub-Committee noted that MSC 83, when considering the Guidelines on the organization and method of work of the MSC and the MEPC and their subsidiary bodies, had agreed that the Guidelines should be strictly adhered to, but having recognized that at the same time flexibility was needed in certain circumstances, agreed that:

- .1 intersessional working groups and technical groups should not be held at the same time as Committee or sub-committee meetings; and
- .2 splinter groups of a working group, if established, should meet outside normal working hours.

2.4 MSC 83 also agreed to extend the deadline for submission of bulky information documents from 13 weeks to 9 weeks if they are submitted in electronic format and to amend the Committees' Guidelines accordingly.

Status of implementation of codes, recommendations, guidelines and other safety and security-related non-mandatory instruments

2.5 The Sub-Committee noted that MSC 83, when considering the list of codes, recommendations, guidelines and other safety- and security-related non-mandatory instruments relating to the work of the Committee, had referred the detailed consideration of the aforementioned list to the relevant sub-committees for the identification of those instruments which might be relevant in the context of the collection of information on the implementation of such instruments, also requesting them to provide an input on potential users and requirements of the data scheme to be established. In this context, the Sub-Committee noted that a document on the above matter would be issued by the Secretariat, in due course, for consideration at FP 53.

3 PERFORMANCE TESTING AND APPROVAL STANDARDS FOR FIRE SAFETY SYSTEMS

General

3.1 The Sub-Committee recalled that, at FP 51, it had approved the revised action plan identifying the priorities, timeframes and objectives for each priority category prepared by the working group established on the matter (FP 51/WP.1, annex 9).

3.2 The Sub-Committee also recalled that, at FP 51, it had re-established the Correspondence Group on Performance Testing and Approval Standards for Fire Safety Systems and approved terms of reference, as set out in paragraphs 3.26 and 3.27 of document FP 51/19, and had instructed the group to submit a report to FP 52.

3.3 With regard to the outcome of MSC 83, the Sub-Committee noted that the Committee had instructed it to:

- .1 prepare a composite set of draft amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)) on the basis of the draft amendments prepared by FP 50 and FP 51; and
- .2 revise draft Guidelines for the approval of fixed pressure water spraying and water based fire-extinguishing systems for cabin balconies prepared at FP 51, taking into account results of testing conducted by Finland on the matter (MSC 83/28, paragraph 8.17),

both for submission to MSC 84 for approval.

3.4 The Sub-Committee had for its consideration under this agenda item documents submitted by China (FP 52/3/7), Finland (FP 52/3/6 and FP 52/INF.6), Japan (FP 52/3/5), Norway (FP 52/3/3), the Republic of Korea (FP 52/INF.4) and the United States (FP 52/3, FP 52/3/1, FP 52/3/2, FP 52/3/4 and FP 52/INF.3). In the context of this item, the Sub-Committee also considered documents submitted by Japan (FP 52/12/7) and IACS (FP 52/12/2, FP 52/12/3 and FP 52/12/4).

Report of the working group (part 2) established at FP 51

3.5 The Sub-Committee considered part 2 of the report of the Working Group on Performance Testing and Approval Standards for Fire Safety Systems established at FP 51 (FP 52/3) and, having approved it in general, discussed the group's recommendation to amend the structural fire protection tables 9.5 and 9.6 in SOLAS regulation II-2/9 to require A-60 fire integrity for decks separating adjacent ro-ro spaces. Taking into account that the above draft amendments to the structural fire protection regulations in SOLAS chapter II-2 are outside the scope of this work programme item, the Sub-Committee invited interested Member Governments to submit, to the Committee, a proposal for a new work programme item on this matter, in accordance with the Guidelines on the organization and method of work (see also paragraph 12.8).

Report of the correspondence group

3.6 The Sub-Committee considered the report of the Correspondence Group on Performance Testing and Approval Standards for Fire Safety Systems (FP 52/3/1 and FP 52/3/2) together with the documents referred to in paragraph 3.4 and, having approved it in general:

- .1 noted that the correspondence group had taken no further actions on the Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848) (see also paragraphs 3.7 to 3.9);
- .2 agreed, with minor modifications, to the draft unified interpretation for the protection of pipe trunks within the cargo tanks deck area, set out in annex 16 (see paragraph 12.9), for submission to MSC 84 for approval;

- .3 endorsed the group's decision that reference standards for laboratory test fuels should not be developed;
- .4 noted the group's views on matters related to agenda item 14 (Clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre); and
- .5 referred the draft editorial corrections to MSC/Circ.1165 (annex 7 to FP 52/3/2) to the working group for further consideration (see paragraphs 3.17 to 3.19).

Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems

3.7 In considering document FP 52/3/4 (United States), proposing that the draft amendments to the Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848) prepared by the working group established at FP 51 (FP 51/WP.1, annex 6) be agreed without further consideration by a working group, the Sub-Committee noted that the working group at FP 51 had extensively discussed the significant differences in hazards between carbon dioxide (an asphyxiant) and halon/halocarbon agents (potential cardiac and/or neurological toxic effects) and, taking these differences into account, a substantial plurality of the aforementioned group had agreed with the draft amendments, which applied more stringent controls to halon/halocarbon agents than to carbon dioxide. The Sub-Committee also noted that FP 51 had agreed, in principle, to the above draft amendments for finalization at FP 52.

3.8 After an extensive discussion, the Sub-Committee agreed that the controls for carbon dioxide and halon/halocarbon fire-extinguishing systems should not be treated as equivalent from a toxicity point of view and, taking into account that no formal proposals for amendments to the aforementioned guidelines were submitted to this session, agreed to the draft amendments to the Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848) and the associated draft MSC circular, set out in annex 1, for submission to MSC 84 for approval.

3.9 In noting the above decision, the delegation of Italy expressed its views that the systems required by MSC/Circ.848 and MSC/Circ.1007 should be considered equivalent to carbon dioxide systems (FSS Code, chapter 5, paragraph 2.5). In referring to annex 1 of document FP 52/3/1 (part 1 of the report of the correspondence group), the delegation of Italy pointed out that if the revised circular MSC/Circ.1007 harmonized with circular MSC/Circ.848, concerning toxicity criteria (i.e., if the amendments to MSC/Circ.848 are approved as they stand), the following situation will happen:

- .1 carbon dioxide systems will still be permitted despite the well known possible lethal consequences; but
- .2 halocarbon and inert gases systems, when at unsafe concentration for human exposure, will not be allowed.

For the above reasons, in order to avoid discrepancies within the regulations on this issue, the same provisions on controls for carbon dioxide systems should be applied for all the aforementioned systems because of their equivalency (FSS Code, chapter 5, paragraph 2.5). On this basis, the delegation of Italy was concerned that the objections put forward by some delegations to the Italian comments were not technically sound, but expressions of opposition towards a principle of equivalence which should harmonize different circulars on the very same

topic. In light of the above, the delegation of Italy reserved its position on the decision taken by the Sub-Committee (paragraph 3.8 above) and informed the Sub-Committee that it would raise the matter at MSC 84 in an appropriate document to be submitted to the Committee.

Establishment of the working group

3.10 Recalling its relevant decision at FP 51 regarding a working group, the Sub-Committee established the Working Group on Performance Testing and Approval Standards and, taking into account the comments and decisions made in plenary, instructed it to:

- .1 finalize, as a high priority, the draft MSC circular on Guidelines for the approval of fixed pressure water spraying and water based fire-extinguishing systems for cabin balconies, taking into account document FP 52/3/6;
- .2 finalize, as a high priority, the draft amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19), taking into account documents FP 50/4 (annex 3), FP 50/WP.2 (annex 1) and FP 51/19 (annex 4);
- .3 continue work on the short-term priorities identified in annex 9 to document FP 51/WP.1, taking into account the report of the working group established at FP 51(FP 52/3), the report of the correspondence group (FP 52/3/1) and documents FP 52/12/2, FP 52/12/3 and FP 52/12/4 (IACS), FP 52/12/7 (Japan), FP 52/3/4 and FP 52/INF.3 (United States) and, in particular, finalize the draft amendments to the Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces (MSC/Circ.1007) (FP 52/3/1, annex 1);
- .4 continue work on the medium- and long-term priorities identified in annex 9 to document FP 51/WP.1, taking into account the report of the working group established at FP 51(FP 52/3), the report of the correspondence group (FP 52/3/2) and documents FP 52/3/3 (Norway), FP 52/3/5 (Japan), FP 52/3/7 (China) and FP 52/INF.6 (Finland);
- .5 update the Revised plan for the harmonization, or new development of, performance testing and approval standards for fire safety systems contained in annex 9 to document FP 51/WP.1, taking into account the progress made to date, and prepare a revised plan identifying the priorities, timeframes and objectives for each category; and
- .6 consider whether there is a need to re-establish the correspondence group and, if so, prepare the terms of reference for consideration by the Sub-Committee.

Report of the working group

3.11 Having received the report of the working group (FP 52/WP.2), the Sub-Committee approved it in general and took action as outlined hereunder.

Guidelines for the approval of fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies

3.12 The Sub-Committee noted that the group, having considered documents FP 51/3/1 (annex 1) and FP 52/3/6 (Finland), changed the table top material in the test arrangement from plywood to steel, based on modifications to the required pre-burn time and acceptance criteria.

3.13 Having noted the above modification, the Sub-Committee agreed to the draft Guidelines for the approval of fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies and the associated draft MSC circular, set out in annex 2, for submission to MSC 84 for approval.

Amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19))

3.14 The Sub-Committee noted that the group had considered and agreed to the editorial modifications to the draft amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)), set out in annex 2 to FP 52/WP.2, taking into account documents FP 50/4 (annex 3), FP 50/WP.2 (annex 1) and FP 51/19 (annex 4).

3.15 In considering the modifications prepared by the group, the Sub-Committee decided that the amendments should apply only to new approvals for equivalent sprinkler systems and that existing type approvals already issued to confirm compliance with the present Revised Guidelines (resolution A.800(19)) should remain valid for six years after the aforementioned amendments are adopted.

3.16 Having made further minor modifications, the Sub-Committee agreed to the draft amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)) and the associated draft MSC resolution, as set out in annex 3, for submission to MSC 84 for adoption.

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

3.17 The Sub-Committee noted that the group had considered the proposed editorial corrections to MSC/Circ.1165 (FP 52/3/2, annex 7) and that, with regard to documents FP 52/12/4 (IACS Unified Interpretations SC 218 and SC 219) relating to the total flooding water mist system fire test procedure, the group had agreed with the above proposed unified interpretations and decided to incorporate the contents into MSC/Circ.1165.

3.18 The Sub-Committee also noted that, while the group did not concur with the proposal in document FP 52/INF.6 with regard to scaling from the maximum tested volume at this time, it had agreed to consider the matter as a long-term topic.

3.19 Subsequently, the Sub-Committee agreed to the draft 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) and the associated draft MSC circular set out in annex 4, for submission to MSC 84 for approval.

Amendments to the Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces (MSC/Circ.1007)

3.20 Having considered documents FP 52/3/1 (annex 1) and FP 52/3/7 (China), the Sub-Committee noted that the group had kept the polymeric sheet and the use of three wood crib fuel source in the test method and, having decided to retain the wood crib fuel source, agreed to the modifications on the acceptance criteria.

3.21 Subsequently, the Sub-Committee agreed to the draft Revised Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and the associated draft MSC circular, set out in annex 5, for submission to MSC 84 for approval.

3.22 In this context, the Sub-Committee, having noted that the draft Revised Guidelines had been prepared to clearly indicate that all systems should be designed to allow evacuation of the protected spaces prior to discharge through the use of two separate controls for releasing the extinguishing medium, agreed on the need for applying this requirement to MSC/Circ.848 as well and instructed the Secretariat to prepare the draft amendments to MSC/Circ.848 on this matter, accordingly (see also paragraph 3.8).

Guidelines for high expansion foam using inside air for the protection of machinery spaces and cargo pump-rooms

3.23 The Sub-Committee noted that the group had agreed that all foam concentrates should be tested in accordance with MSC/Circ.670 and that the small scale test in appendix 4 of annex 2 to document FP 52/3/1 should be regarded as an optional test to be used to evaluate the suitability of foam concentrates. In regard to the foam generator capacity tests, the Sub-Committee also noted that the group had revised the requirements to include a range of pressures from 50 to 150% of the nominal operating pressure.

3.24 Having noted the above and decided that the Guidelines should be effective on 1 July 2009, the Sub-Committee agreed to the draft Guidelines for high expansion foam using inside air for the protection of machinery spaces and cargo pump-rooms and the associated draft MSC circular set out in annex 6, for submission to MSC 84 for approval.

Amendments to Recommendation on fixed fire-extinguishing systems for special category spaces (resolution A.123(V)) and Guidelines for the approval of alternative fixed water-based fire-fighting systems for special category spaces (MSC/Circ.914)

3.25 The Sub-Committee noted that the group, in considering document FP 52/3/1 (annex 3), had clarified that the draft guidelines were intended for water-based systems that are considered equivalent to those referred to in resolution A.123(V) and had agreed that automatic systems are not acceptable for installation on open ro-ro spaces.

3.26 Subsequently, the Sub-Committee agreed to the draft Guidelines for the approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V) and the associated draft MSC circular, set out in annex 7, for submission to MSC 84 for approval. In this context, the Sub-Committee also agreed that the Guidelines should be implemented as soon as possible to allow the industry to begin installing such systems.

Installation Guidelines for water-based fire-extinguishing systems for class III machinery spaces of category A (sectioned type systems)

3.27 The Sub-Committee noted that the group had considered document FP 52/3/1 (annex 4), but agreed to refrain from further consideration of the draft Installation Guidelines for water-based fire-extinguishing systems for class III machinery spaces of category A (sectioned type systems) until data from the research programme being performed by Sweden becomes available.

Guidelines for the testing of alcohol resistant foam concentrates

3.28 With regard to the revision of the Guidelines for the performance and testing criteria and surveys of expansion foam concentrates for fire-extinguishing systems for chemical tankers (MSC/Circ.799), the Sub-Committee noted that the group, having considered documents FP 52/3/2 (annex 3) and FP 52/3/3, had deemed that the foam testing procedures currently contained in MSC/Circ.582 and MSC/Circ.799 were superseded by advances in the technology of foam fire-fighting agents and agreed to refer the issue to an intersessional correspondence group to further develop the guidelines incorporating more current information available in accepted relevant standards such as ISO/EN standards.

Amendments to SOLAS regulation II-2/10 regarding the number of spare charges for required breathing apparatus

3.29 The Sub-Committee noted that the group had considered draft amendments to SOLAS regulation II-2/10 regarding recharging requirements and the appropriate number of spare charges for the required breathing apparatus (FP 52/3/2, annex 4) and had agreed not to amend paragraph 10.2.5 of the above regulation, but to prepare a new paragraph 10.2.6 to be applicable to new passenger ships carrying more than 36 passengers.

3.30 Consequently, the Sub-Committee agreed to the draft amendments to SOLAS regulation II-2/10 regarding recharging requirements and the appropriate number of spare charges for the required breathing apparatus set out in annex 8, for submission to MSC 84 for approval with a view to adoption.

Fixed fire detection and fire alarm systems and sample extraction smoke detection systems in the FSS Code

3.31 The Sub-Committee noted that the group, in its deliberations of the revised criteria for fire detection and fire alarm systems in document FP 52/3/2 (annex 1), and sample extraction smoke detection systems in document FP 52/3/2 (annex 2), had agreed that, on passenger ships, fire detection control panels should be located in the onboard safety centre, with an indicating unit on the navigation bridge since onboard safety centres are not required to be continuously manned, and on cargo ships, the control panel should be located in the fire control room or the navigation bridge with an indicating unit on the navigation bridge if the panel is located in the fire control room. In this context, the Sub-Committee noted that this matter would be further considered by the correspondence group referred to in paragraph 3.35.

Consideration of IACS unified interpretations

UI SC 216 on water-based fire-extinguishing systems

3.32 The Sub-Committee noted that the group, having considered document FP 52/12/2, presenting the UI SC 216 on water-based fire-extinguishing systems where spaces having different fire risk are protected by a single pump unit, had not agreed with the interpretation, since the requirements for redundancy could be subject to varying interpretations and endorsed the group's recommendation to instruct the correspondence group to further consider the aforementioned document and invite IACS to submit additional information to the group (see paragraph 3.35.7).

UI SC 217 on nozzles installation for fixed water based local application fire-fighting systems for use in category A machinery spaces (MSC/Circ.913)

3.33 The Sub-Committee noted that the group had considered document FP 52/12/3, presenting UI SC 217 on nozzle spacing of water-based fire-extinguishing systems with nozzles in a single row arrangement, and document FP 52/12/7 (Japan), commenting on IACS Unified Interpretation SC 217, endorsed the group's recommendation that the proposed areas of coverage in the UI SC 217 are correct, and agreed to prepare an appropriate unified interpretation, set out in annex 16, for submission to MSC 84 for approval (see also paragraph 12.9).

Revised plan of action

3.34 The Sub-Committee approved the revised work plan, updated by the group, for the development of performance testing and approval standards for fire-safety systems, set out in annex 8 to document FP 52/WP.2.

Establishment of a correspondence group

3.35 The Sub-Committee re-established the correspondence group, under the co-ordination of the United States*, to progress the work on this issue and instructed the group, taking into account the relevant information contained in documents FP 52/3/1, FP 52/3/2 and FP 52/3/3 and the outcome of the working group outlined in its reports (parts 1 (FP 52/WP.2) and 2), to:

- .1 further consider the draft Installation Guidelines for water-based fire-extinguishing systems for class III machinery spaces of category A (sectioned type systems), based on annex 4 to document FP 52/3/1;
- .2 further consider the draft Guidelines for the performance and testing criteria and surveys of expansion foam concentrates for fire-extinguishing systems for chemical tankers (MSC/Circ.799), based on annex 3 to document FP 52/3/2;

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- .3 further consider the draft amendments to chapter 9 of the FSS Code concerning fixed fire detection and fire alarm systems, based on annex 1 to document FP 52/3/2;
- .4 further consider the draft amendments to chapter 10 of the FSS Code concerning sample extraction smoke detection systems, based on annex 2 to document FP 52/3/2;
- .5 further consider the draft Guidelines for high expansion foam for the protection of machinery spaces, cargo pump-rooms, cargo spaces and vehicle, special category and ro-ro spaces, based on annex 5 to document FP 52/3/2;
- .6 further consider the draft Guidelines for the testing and approval of fixed inert gas fire-extinguishing systems for general cargo as required by SOLAS regulation II-2/10.7.1, based on annex 6 to document FP 52/3/2;
- .7 further consider UI SC 216 on water-based fire-extinguishing systems where spaces having different fire risk are protected by a single pump unit, as contained in document FP 52/12/2;
- .8 commence consideration of medium-term priority systems other than topics referred to in the aforementioned subparagraphs and the long-term priority systems (FP 52/WP.2, annex 8); and
- .9 submit a report to FP 53.

Other matters

3.36 The Sub-Committee recalled that the aforementioned correspondence group had been also instructed, under agenda item 18 (Any other business), to further develop the Guidelines for drainage systems in closed vehicle and ro-ro spaces and special category spaces, with a view to finalization at FP 53 (see also paragraph 18.11).

3.37 In light of the decisions in paragraphs 3.11 to 3.34, the Sub-Committee requested the Secretariat to prepare consolidated texts of the draft Guidelines contained in annexes 1, 4, 5 and 6 to document FP 52/WP.2 for submission to MSC 84 for approval (see also paragraphs 3.13, 3.21, 3.24 and 3.26).

3.38 Having recognized the need to consider how to deal with the long-term work item contained in annex 8 to document FP 52/WP.2, the Sub-Committee invited Member Governments and international organizations to submit their views on the long-term work items to FP 53.

4 COMPREHENSIVE REVIEW OF THE FIRE TEST PROCEDURES CODE

General

4.1 The Sub-Committee recalled that, at FP 51, it had established the Working Group on Comprehensive Review of the Fire Test Procedures Code and, having approved the first part of its report, had agreed to consider part 2 of the group's report at this session.

4.2 It was also recalled that, at FP 51, the Sub-Committee had re-established the Correspondence Group on Comprehensive Review of the Fire Test Procedures Code and approved terms of reference, as set out in paragraphs 4.17 and 4.18 of document FP 51/19, and instructed the group to submit a report to FP 52.

Report of the working group (part 2) established at FP 51

4.3 The Sub-Committee considered part 2 of the report of the Working Group on Comprehensive Review on the Fire Test Procedures Code established at FP 51 (FP 52/4) and, having approved it in general, noted that the correspondence group referred to in paragraph 4.2 had considered the matters identified in the report of the working group during its deliberations.

Report of the correspondence group

4.4 The Sub-Committee considered the report of the Correspondence Group on Comprehensive Review of the Fire Test Procedures Code (FP 52/4/1 to FP 52/4/12), together with documents FP 52/4/13 and FP 52/4/14 (Japan), FP 52/4/15 (Finland) and FP 52/INF.9 (ISO) and, having approved it in general, agreed that the above documents should be forwarded to the working group for detailed consideration, taking into account the comments made in plenary.

IACS unified interpretation on the testing of fire doors

4.5 In considering the test for enlarged fire door (FP 52/4/1 and FP 51/9/2), the Sub-Committee, noting that some members of the above group had proposed the use of engineering analysis to extrapolate the tests results for the full-size door, and that the group could not reach conclusion on this matter, agreed to instruct the working group to further consider this issue in detail, taking into consideration comments by the observer from IACS that the Unified Interpretation FTP 3, contained in document FP 51/9/2, is used by the industry, and, therefore, the analysis would be an extra burden (see also paragraph 4.15).

Calibration of heat fluxmeters

4.6 The Sub-Committee noted that, pursuant to its decision at FP 51, the Secretariat had contacted ISO/TC 8, as the ISO liaison with IMO, concerning the need for more precise procedures for calibration and maintenance of heat fluxmeters (ISO 14934-3:2006). In this regard, the Sub-Committee noted that ISO/TC 8 had communicated the request to ISO/TC 92/SC 1 and was informed that as the original drafters of the above standard, ISO/TC 92/SC 1 had initiated a revision to ISO 14934-3:2006 Fire tests – Calibration and use of heat fluxmeters – Part 3: Secondary calibration method, with a view to completion in 2009.

Other ISO projects of interest to the Sub-Committee

4.7 Further to the above, the Sub-Committee was also informed verbally by the observer from ISO of the status of relevant standards, in particular that:

- .1 ISO 23269-1 Ships and marine technology – Breathing apparatus for ships - Part 1: Emergency Escape Breathing Devices (EEBD) for shipboard use had been submitted to the ISO Central Secretariat (ISO/CS) for publication;
- .2 ISO 24409-1 Design, location and use of shipboard signs for fire protection, life-saving appliances and means of escape – Part 1: Design principles had been submitted to ISO/CS for ballot as a Draft International Standard (DIS); and

- .3 ISO 7240-26 Oil mist detectors had been submitted to ISO/CS for ballot as a Committee Draft (CD).

Establishment of the working group

4.8 Recalling its relevant decision at FP 51 regarding a working group, the Sub-Committee established the Working Group on Comprehensive Review of the FTP Code and instructed it, taking into account the comments and decisions made in plenary, to finalize the draft revised FTP Code based on the text prepared by the correspondence group (FP 52/4/1 to FP 52/4/12), taking into consideration documents FP 52/4, FP 52/4/13, FP 52/4/14, FP 52/4/15, FP 52/INF.9 and FP 50/11/6 (see also paragraph 9.4).

Report of the working group

4.9 Having received the report of the working group (FP 52/WP.1), the Sub-Committee approved it in general and took action as outlined hereunder.

Guidelines for the application of plastic pipes on ships (resolution A.753(18))

4.10 The Sub-Committee noted that, following a discussion of the issues raised in the report of the correspondence group (FP 52/4/1, paragraphs 6 to 10) with regard to the above Guidelines, e.g., inclusion of synthetic rubber pipes in the scope of the Guidelines; application of the Guidelines to all synthetic materials; and negligible leakage, the group had developed draft amendments to the Guidelines, as set out in annex 1 to FP 52/WP.1, and had agreed to keep this draft text for further discussion and subsequent finalization at the next session.

Draft SOLAS requirements for fire doors with three-sided frames

4.11 The Sub-Committee considered draft SOLAS requirements concerning the control of the installation of fire doors with three-sided frames, as proposed by the correspondence group (FP 52/4/1, paragraphs 11 to 15 and appendix 1 to the annex), and agreed to draft amendments to SOLAS regulation II-2/9 (Containment of fire), set out in annex 9, for submission to MSC 84 for approval with a view to adoption, noting that these amendments apply to new ships only.

Review of the FTP Code

Numbering system

4.12 The Sub-Committee noted that the group, having noted that the numbering of the parts in annex 1 of the Code had been changed as compared to the FTP Code in force due to the merging of parts 5 and 6 into one part, and that this renumbering of the parts may lead to confusion, decided to keep part 6 in the Code as a blank section so that the numbers of the parts would stay the same.

Referencing of ISO standards

4.13 The Sub-Committee noted that, in discussing whether to include in the Code references to ISO standards or the relevant text parts of the standards, the group had reiterated its previous agreement, reached at the last session (FP 51/WP.2, paragraph 4), that related ISO standards should be incorporated by reference into the revised FTP Code to make it more user-friendly and agreed that such references should include the date of publication of the standard. In this context,

the delegation of Germany expressed the opinion that the text of the relevant ISO standards should be included in the draft revised FTP Code.

Re-issue of certificate

4.14 The Sub-Committee noted that the group, noting the need for clear specifications for the re-issue of type approval certificates for products which had been type-approved based on the fire tests in the existing FTP Code, had prepared draft provisions for the above, as modified paragraph 8.2 of the main body of the draft revised FTP Code (FP 52/WP.1, annex 3), for further consideration at the next session.

Large fire doors

4.15 The Sub-Committee noted that the group had discussed the first part of the IACS Unified Interpretation (UI) FTP 3 Fire door (FP 51/9/2), which had not been accepted at FP 51 due to the vague term “comfortable margins” not being fully defined (FP 51/19, paragraph 4.12). A new proposal to define the term by use of an overrun test as described in European Standard EN 1634-1 was discussed and the group had agreed, in principle, to the proposal and accepted the first part of the UI FTP 3 (FP 52/WP.1, paragraph 10). Subsequently, the Sub-Committee agreed to the draft unified interpretations of the FTP Code and the associated draft MSC circular, set out in annex 10, for submission to MSC 84 for approval.

4.16 The Sub-Committee noted that the group had discussed, as a matter of principle, how to deal with large doors which could not be accommodated in the fire test specimen specified in part 3 of annex 1 of the draft revised FTP Code and, recognizing that there would be a great variety of large doors, such as two- or four-leaf fire doors, very high (two or more deck height) and wide (equal to the width of a large atrium) fire doors and wide shutter-type fire doors used in car carriers, had agreed that it would be necessary to establish a fundamental requirement for testing and evaluation of such doors.

4.17 Noting the lack of sufficient information on engineering analysis and method of testing for fire safety of such doors, the Sub-Committee instructed the correspondence group (paragraph 4.30) to consider fundamental requirements for testing and evaluation of large doors (larger than those discussed in paragraph 4.15 above), taking into account the second part of the IACS UI contained in document FP 51/9/2.

Toxicity

4.18 The Sub-Committee noted that the group had agreed to keep using ISO 5659-2 for the smoke test method and Fourier transform infrared spectroscopy (FTIR) for gas measurement. Noting the ongoing activities of ISO/TC92/SC1 on the development of an ISO standard for gas measurement during smoke test (ISO/DIS 21489), the Sub-Committee also noted that the group had further agreed to await the results of the ISO activities (finalization of the standard) by the next session of the Sub-Committee, in view of the incorporation of the standard into part 2 of the draft revised FTP Code.

4.19 The Sub-Committee noted that the group had reviewed the outcome of the correspondence group, in particular the proposed model and criteria for analysis of toxicity and evaluation in the annex of document FP 52/4/1, and had recognized that toxicity analysis and criteria in part 2 of the draft revised FTP Code should have a scientific and technological background, as proposed in the above document. However, the contents of the proposal would need thorough technical review. Some delegations had expressed concern that the proposed method and criteria might bring a major change of the toxicity test results and preferred to keep

the existing criteria. In this connection, the Sub-Committee also noted that it was suggested that some trial analysis could be done using existing toxicity test results to compare the analysis results of the existing method with those of the proposed new one.

4.20 The Sub-Committee agreed that the correspondence group should monitor the ISO activities with regard to the development of standard ISO/DIS 21489 and consider the proposed analysis and criteria and invited Members to provide relevant data on toxicity test results in order to consolidate the existing database for further analysis in the correspondence group (see also paragraph 4.19), bearing in mind that this data are kept anonymous for confidentiality reasons. It was noted that both materials that have passed and materials that have failed under current IMO criteria are required, so that an unbiased analysis can be carried out. The generic type of material (e.g., floor covering, etc.) should also be provided.

Lightweight constructions

4.21 The Sub-Committee noted that the group had considered a proposal by Finland (FP 52/4/15) for lightweight constructions (bulkheads, doors and ceilings/decks) and had agreed, in principle, with the proposal. Therefore, the Sub-Committee agreed that the correspondence group should be instructed to provide draft text for part 3 of the draft revised FTP Code to accommodate the proposal.

Non-combustibility and low-flame spread characteristics

4.22 The Sub-Committee noted that, due to the lack of time, the group had agreed to refer the consideration of the requirement of non-combustibility and low-flame spread characteristics in part 3 of the draft revised FTP Code to the correspondence group.

Water and organic content in the insulation materials for fire division specimen

4.23 The Sub-Committee noted that the group had considered proposals for the test and evaluation method for water and organic contents in the insulation materials used in fire division test specimen, as contained in document FP 52/4/5, and had agreed in principle that the evaluation was necessary to make sure that materials used in the test specimen represent the actual product and that this did not constitute a quality control of the insulation materials. It was pointed out that, if organic content is introduced as part of the evaluation, this should be specified in the certificate for non-combustible materials (possibly part 1 of the draft revised FTP Code should specify such scheme), and parts 1 and 3 should be harmonized. Consequently, the Sub-Committee agreed to instruct the correspondence group to consider the requirements for a test method and the relevant paragraphs in parts 1 and 3 of the draft revised FTP Code for water and organic content in the insulation materials for fire division specimen.

Use of plate thermometers

4.24 The Sub-Committee noted that the group had considered the outcome of the correspondence group on this issue (FP 52/4/1 and FP 52/4/5) and that there was support for the use of plate thermometers for controlling the fire test furnace, because this would increase the reproducibility of fire resistance tests among the testing laboratories and improve harmonization of the tests, noting that the measurement of the plate thermometer would well represent the heat input to the specimen. However, some delegations had expressed concern that furnace control by plate thermometer would require an increased heat input to the test furnace and so would result in increased heat input to the specimen at the beginning of the test, and that this would result in more severe test conditions for, in particular, B-15 class divisions. These delegations proposed

to keep the existing furnace control scheme as an option in part 3 of annex 1 of the draft revised FTP Code.

4.25 The Sub-Committee further noted that, in this connection, the group had considered document FP 52/4/13 (Japan) which showed, in comparing the furnace condition under the control of existing thermo-couple systems, that a greater heat input would be required at the beginning of the test (up to 5 minutes), but that the heat input may decrease in the remainder of the testing period and that there were minor differences between the test results of temperature measurements on the unexposed surface of the well insulated “A” class division tested. Since the group did not reach consensus on the use of plate thermometers, the Sub-Committee agreed to instruct the correspondence group to further consider this issue and provide relevant draft text for inclusion in part 3 of the draft revised FTP Code.

Damper issues

4.26 The Sub-Committee noted that the group had agreed, in principle, to a proposal by Finland that steel coaming of specimen for dampers should be extended 50 mm on its unexposed side in order to fit a thermo-couple to measure the temperature and had invited the delegation of Finland to provide a written proposal to the correspondence group so that the group could develop relevant text to accommodate the proposal.

Colour of specimen

4.27 The Sub-Committee noted that the group had agreed in principle to a proposal by Japan (FP 52/4/14) on the method of selection of colour of the specimen for tests in part 5 of the draft revised FTP Code and agreed that the correspondence group should be instructed to provide necessary text for part 5 to accommodate the proposal.

Modifications to the draft revised FTP Code

4.28 The Sub-Committee agreed, in principle, on modifications to the draft revised FTP Code (FP 52/4), as set out in annex 3 to document FP 52/WP.1, taking into account the comments in the report of the correspondence group (FP 52/4/1 to FP 52/4/12) and documents FP 52/4/13, FP 52/4/14, FP 52/4/15 and FP 52/INF.9.

Part 2 of the report of the working group

4.29 The Sub-Committee noted that, due to the pending finalization of relevant ISO standards and also time constraints, the group was not able to finalize the text of the draft revised FTP Code at this session and, therefore, agreed that part 2 of the report of the working group, containing the consolidated text of the draft revised FTP Code, would be submitted to FP 53 by the Chairman of the group as soon as possible after the meeting.

Establishment of a correspondence group

4.30 Having considered the above issues, the Sub-Committee agreed to re-establish the Correspondence Group on Comprehensive Review of the FTP Code, under the co-ordination of Japan^{*}, and instructed it to:

- .1 finalize the text of the draft revised FTP Code, on the basis of part 2 of the report of the working group and document FP 52/WP.1, paying special attention to the following issues:
 - .1.1 approval and test methods for much larger fire doors (FP 52/4/5);
 - .1.2 testing and evaluation of large fire doors (second part of the IACS UI FTP 3 contained in document FP 51/9/2);
 - .1.3 lightweight constructions (FP 52/4/15);
 - .1.4 use of plate thermometers (FP 52/4/5, FP 52/4/13);
 - .1.5 test arrangements in fire resistance tests of fire dampers;
 - .1.6 non-combustibility and low flame-spread characteristics (FP 52/4/5);
 - .1.7 organic content (FP 52/4/5);
 - .1.8 colour selection of specimen (FP 52/4/14);
 - .1.9 toxicity criteria;
 - .1.10 harmonization of test procedures in the parts of the Code; and
 - .1.11 use of combustible materials on board (FP 50/11/6); and
- .2 submit a report, containing the complete text of the draft revised FTP Code, to FP 53.

Extension of target completion date

4.31 In view of the above developments, the Sub-Committee invited the Committee to extend the target completion date for the item to 2009.

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5 REVIEW OF FIRE SAFETY OF EXTERNAL AREAS ON PASSENGER SHIPS

General

5.1 The Sub-Committee recalled that, at MSC 81, after having approved the draft amendments to SOLAS chapter II-2 related to the safety of cabin balconies in the light of the cabin balcony fire on board the **Star Princess**, the Committee had instructed the Sub-Committee to consider the safety of all external areas on passenger ships.

5.2 The Sub-Committee also recalled that, at FP 51, it had established a Correspondence Group on Review of Fire Safety of External Areas on Passenger Ships and approved terms of reference, as set out in paragraphs 14.4 of document FP 51/19, instructing the group to submit a report to FP 52.

Report of the correspondence group

5.3 The Sub-Committee considered the report of the aforementioned correspondence group (FP 52/5) and, having approved it in general, agreed that the working group should further consider the draft Guidelines on the categorization of external areas on passenger ships (FP 52/5, annex 1) and the draft Guidelines for simplified risk assessments on external areas (FP 52/5, annex 2), with a view towards finalization. With regard to the draft amendments to SOLAS chapter II-2 (FP 52/5, annexes 3 and 4) prepared by the group, the Sub-Committee decided not to develop SOLAS amendments on this matter.

5.4 In considering the views expressed by some delegations that human element and security issues should be taken into account in the Guidelines, particularly in regard to passenger ships, the Sub-Committee agreed that the working group should take the above issues into account when considering the categorization of external areas.

Establishment of the working group

5.5 Recalling its relevant decision at FP 51 regarding a working group, the Sub-Committee, established the Working Group on Review of Fire Safety of External Areas on Passenger Ships and instructed it, taking into account the above comments and decisions made in plenary, to finalize the draft Guidelines on categorization and risk assessments for external areas prepared by the correspondence group (FP 52/5, annexes 1 and 2).

Report of the working group

5.6 Having received the report of the working group (FP 52/WP.3), the Sub-Committee approved it in general and, having considered the draft Guidelines prepared by the group and its views on the matter, agreed to the draft Guidelines for evaluation of fire risk of external areas on passenger ships and the associated draft MSC circular, set out in annex 11, for submission to MSC 84 for approval.

5.7 Having completed the work on this item, the Sub-Committee invited the Committee to delete this item from its work programme.

6 MEASURES TO PREVENT FIRES IN ENGINE-ROOMS AND CARGO PUMP-ROOMS

General

6.1 The Sub-Committee recalled that, at FP 49, it had considered documents FP 49/16, FP 49/16/4 and FP 49/INF.6 (Republic of Korea), proposing that guidelines be developed on measures to prevent fire in engine-rooms and cargo pump-rooms, and noted that the goal of the proposal was to provide practical and comprehensive engine-room and cargo pump-room fire safety guidelines for shipbuilders, ship operators, recognized organizations and Administrations.

6.2 The Sub-Committee also recalled that FP 51 had established a correspondence group to progress the work on this matter, with the terms of reference set out in paragraphs 8.9 and 8.10 of document FP 51/19, and instructed the group to submit a report to FP 52.

6.3 The Sub-Committee noted that matters related to the application of SOLAS regulation II-2/4.5.1.1 would be discussed under agenda item 12 (Consideration of IACS unified interpretations) and that matters related to fixed hydrocarbon gas detection systems on double-hull oil tankers would be dealt with under agenda item 13 (Fixed hydrocarbon gas detection systems on double-hull oil tankers) (see paragraphs 12.2, 13.2 and 13.3).

Report of the correspondence group

6.4 The Sub-Committee had for its consideration under this agenda item the report of the Correspondence Group on Measures to Prevent Fire in Engine-Rooms and Cargo Pump-Rooms (FP 52/6) and document FP 52/6/1 (Republic of Korea) and, having considered the report of the correspondence group (FP 52/6) together with document FP 52/6/1, approved the report in general and took action as outlined in paragraphs 6.5 to 6.8.

6.5 The Sub-Committee noted that the correspondence group had agreed that the guidelines should be applied to new ships only, however, that part VII (Human element) of the draft Guidelines and document FP 52/6/1 addressed operational issues, such as training, which normally apply to all ships.

6.6 With regard to parts VI (Ergonomic arrangement) and VII (Human element) of the draft Guidelines, the Sub-Committee noted the views of several delegations that matters on human element and ergonomics should be considered carefully by other relevant IMO bodies, considering that these parts of the draft Guidelines may affect the Fire Training Manual and the STCW Convention. In considering part V (Pump-rooms and other spaces adjacent to cargo tanks), the Sub-Committee noted the opinion of some delegations that part V was outside the scope of this work programme item and should be deleted.

6.7 The Sub-Committee also noted the views expressed by several delegations that seafarers are expected to be aware of an ever-increasing amount of regulations and guidelines and the Sub-Committee should be mindful of this when producing guidelines in order to avoid confusion.

6.8 Having considered the above views, the Sub-Committee agreed that the draft Guidelines should only apply to new ships and that parts V, VI and VII should be deleted. In addition, the Sub-Committee decided to delete paragraph 1.2.1 of chapter 4 of part III, concerning clarification of SOLAS regulation II-2/4.2.2.3.2 on matters related to forward tank position, proposed by IACS (FP 51/8/3), taking into account that this matter was not directly relevant to the guidance under development.

Establishment of the drafting group

6.9 Recalling its relevant decision at FP 51 regarding a drafting group, the Sub-Committee, recognizing the necessity to make progress on this item, established the Drafting Group on Measures to Prevent Fire in Engine-Rooms and Cargo Pump-Rooms and instructed it, taking into account the comments and decisions made in plenary, to:

- .1 further develop the draft Guidelines for measures to prevent fires in engine-rooms and cargo pump-rooms, based on the draft text set out in the annex to document FP 52/6, taking into account document FP 52/6/1; and
- .2 prepare the terms of reference for the correspondence group for consideration by the Sub-Committee.

Report of the drafting group

6.10 Having received the report of the drafting group (FP 52/WP.6), the Sub-Committee approved it in general and, having noted the progress made on the draft Guidelines for measures to prevent fires in engine-rooms and cargo pump-rooms and, having decided not to re-establish the correspondence group on the item at this stage, invited Member Governments and international organizations to submit relevant comments and proposals to FP 53, taking into account the latest draft text contained in the annex to document FP 52/WP.6.

7 FIRE RESISTANCE OF VENTILATION DUCTS

7.1 The Sub-Committee recalled that, at MSC 81, the Committee, having considered a proposal by the United Kingdom (MSC 81/23/1) to amend SOLAS chapter II-2 to require ventilation system ducts to be of steel or equivalent material where the current requirement is for non-combustibility; and to amend both SOLAS chapter II-2 and the HSC Code, to specify a suitable limit on the calorific potential per unit area, in respect of the parts of ventilation ducts which are permitted to be combustible but of low flame spread, had agreed to a new item on "Fire resistance of ventilation ducts", with a target completion date of 2007, for inclusion in the Sub-Committee's work programme and the provisional agenda for FP 51.

7.2 The Sub-Committee also recalled that, at FP 51, it had agreed to instruct the Correspondence Group on Comprehensive Review of the Fire Test Procedures Code to consider the above matter, taking into account documents FP 51/11 and MSC 81/23/1 (United Kingdom) and submit a report to FP 52.

7.3 The Sub-Committee noted that, at MSC 83, the Committee had considered document MSC 83/25/11 (Denmark) and had agreed to expand the existing work on this item to cover all SOLAS regulations for ventilation systems and extended the target completion date to 2009.

Report of the correspondence group

7.4 The Sub-Committee considered the relevant part of the report of the correspondence group (FP 52/4/1, annex, paragraphs 15 to 17) and noted the group's views regarding editorial amendments to the proposal contained in document MSC 81/23/1 (United Kingdom) and that further consideration of the matter was necessary at this session of the Sub-Committee. In this context, the Sub-Committee considered also document FP 52/7 (Denmark), proposing to amend

SOLAS regulation II-2/9.7.5.2 to ensure that closing arrangements are fitted at both ends of the exhaust ducts from galley ranges.

7.5 Following discussion on the proposals made in the above documents, the Sub-Committee agreed to the draft amendments to SOLAS regulation II-2/9.7 on matters related to fire resistance of ventilation ducts, as set out in annex 12, for submission to MSC 84 with a view to approval and subsequent adoption. In this context, the Sub-Committee agreed that the above amendments should be applied to new ships only.

7.6 Taking into account the target completion date of 2009 and the comments by some delegations that there may be a need for further work on this issue, the Sub-Committee invited Member Governments and international organizations to submit comments and proposals to FP 53.

8 REVIEW OF THE SPS CODE

General

8.1 The Sub-Committee recalled that, at FP 51, it had decided to delay the work on this item until DE 50 (co-ordinator) had considered the report of its Correspondence Group on Review of the SPS Code (DE 50/9). In this regard, the Sub-Committee also recalled that FP 51 had agreed to invite the Committee to extend the target completion date of the item to 2008 and had invited Member Governments and international organizations to submit relevant comments and proposals to FP 52, which should take into account the outcomes of DE 50, SLF 50 and DSC 12 on this matter.

8.2 In considering document FP 52/8 (Secretariat), containing information on the outcomes of DE 50, SLF 50 and DSC 12, the Sub-Committee noted that:

- .1 DE 50 had considered the draft amendments to the Code prepared by its correspondence group established on the matter (DE 50/9) and, having agreed that all references to “class A ships” and to “trainees” should be removed, had agreed to re-establish the correspondence group to further develop the amendments to the SPS Code for finalization at DE 51, the report of which was issued as document DE 51/5;
- .2 SLF 50 had agreed to the draft amendments to chapter 2 (Stability and subdivision) of the SPS Code and forwarded it to DE 51 for inclusion in the draft revised SPS Code, having agreed that the square brackets concerning the figures and terminology for special personnel or persons in paragraph 2.2 should be decided on by the DE Sub-Committee; and
- .3 DSC 12 had noted the relevant outcomes of MSC 82, DE 50 and SLF 50 and, having considered a proposal by the United Kingdom (DSC 12/7), which provided text for inclusion in chapter 7 of the SPS Code to address all classes of dangerous goods carried on special purpose ships, finalized the work under its purview and forwarded the draft text to DE 51 for inclusion in the revised SPS Code.

8.3 The Sub-Committee, having considered documents FP 52/8 and DE 51/5, agreed to chapter 6 of the draft SPS Code relating to fire protection, as developed by the correspondence group established at DE 50 (DE 51/5), and decided that the number of persons used as criterion

for application of chapter 6 of the Code should be agreed by the DE Sub-Committee, taking into account other parts of the Code.

8.4 In view of the above developments, the Sub-Committee agreed to invite the Committee to delete this item from its work programme and requested the Secretariat to inform DE 51 of the above outcome.

9 APPLICATION OF REQUIREMENTS FOR DANGEROUS GOODS IN PACKAGED FORM IN SOLAS AND THE 2000 HSC CODE

General

9.1 The Sub-Committee recalled that, at MSC 81, the Committee, having considered a proposal by Japan (MSC 81/23/5) to develop amendments to SOLAS regulation II-2/19 and chapter 7 of the 2000 HSC Code and to prepare guidance on matters related to the application of requirements for dangerous goods in packaged form for SOLAS and the 2000 HSC Code, had agreed to include, in the FP and DSC Sub-Committees' work programmes and the provisional agendas for FP 51 and DSC 11, a new item on "Application of requirements for dangerous goods in package form in SOLAS and the 2000 HSC Code", with a target completion date of 2007. The Committee, at MSC 82, assigned the Sub-Committee as co-ordinator on this matter.

9.2 The Sub-Committee also recalled that, as instructed by MSC 82, it had considered proposed amendments to SOLAS regulation II-2/19 and chapter 7 of the 2000 HSC Code and a draft MSC circular on Application of requirements for dangerous goods in packaged form for SOLAS and the 2000 HSC Code proposed by Japan in document MSC 81/23/5 and, having requested MSC 83 to extend the target completion date for the item, invited Member Governments and international organizations to submit relevant comments and proposals to FP 52.

9.3 In considering document FP 52/9/1 (Secretariat), containing information on the outcome of DSC 12, the Sub-Committee noted that:

- .1 DSC 12 had agreed to the deletion of 'X' in table 19.3 for the row relevant to SOLAS regulation II-2/19.3.4.2 and invited the Sub-Committee to examine, in the context of the aforementioned amendments, the application of the requirements for explosion proof mechanical ventilation; and
- .2 having agreed to prohibit underdeck stowage of products UN 1082 and UN 3399 PG I and II, DSC 12 had agreed that appropriate amendments should be included in the IMDG Code to ensure that the aforementioned products are not allowed underdeck stowage and instructed the E and T Group to prepare corresponding amendments to the IMDG Code.

9.4 The Sub-Committee, having considered document FP 52/9 (Japan), proposing modifications to the draft amendments to SOLAS chapter II-2 and the 2000 HSC Code prepared by DSC 12 (DSC 12/19, annexes 11 and 12), decided to instruct the Working Group on Comprehensive Review of the FTP Code established under agenda item 4 (Comprehensive review of the Fire Test Procedures Code) to finalize the draft amendments to SOLAS chapter II-2 and the 2000 HSC Code on the application of requirements for the carriage of dangerous goods, taking into account the proposed modifications contained in document FP 52/9.

Report of the working group

9.5 Having considered the part of the report of the working group (FP 52/WP.1) relating to this item, the Sub-Committee took action as outlined in the following paragraphs.

9.6 The Sub-Committee, having considered modifications proposed by the group to the draft amendments prepared by DSC 12 (FP 52/WP.1, paragraph 33), agreed to the draft amendments to the SOLAS Convention and to the 2000 HSC Code, concerning the application of requirements for the carriage of dangerous goods, set out in annexes 13 and 14 respectively, for submission to MSC 84 for approval with a view to adoption.

9.7 In this context, the Sub-Committee noted that the delegation of China had reservations regarding the above draft amendments (see paragraph 9.6 above) and was of the view that the draft amendments should also be considered by the DSC Sub-Committee. Taking that into consideration, the Sub-Committee invited the delegation of China to submit comments on this matter to MSC 84 and recommended the Committee to instruct DSC 13 to comment on the draft amendments set out in annexes 13 and 14 to MSC 85, when the draft amendments will be considered with a view to adoption.

9.8 Noting that generic requirements on prohibition of underdeck stowage of “class 2.3 having subsidiary risk class 2.1” and “class 4.3 liquids having a flashpoint less than 23°C” had not been incorporated in the draft 2008 amendments to the IMDG Code, the Sub-Committee agreed to invite the Committee to instruct the DSC Sub-Committee to consider incorporating such requirements in the IMDG Code.

Completion of the item

9.9 Since work on the item has been completed, the Sub-Committee invited the Committee to delete it from its work programme.

10 UNIFIED INTERPRETATION ON THE NUMBER AND ARRANGEMENT OF PORTABLE EXTINGUISHERS

10.1 The Sub-Committee recalled that MSC 81, having considered document MSC 81/23/15 (China), proposing to develop a unified interpretation or a guideline on the number and arrangement of portable fire extinguishers on board, had agreed to include a new item in the Sub-Committee’s work programme and agenda for FP 51.

10.2 The Sub-Committee also recalled that, at FP 51, it had agreed, in principle, to the draft unified interpretation of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers and the associated draft MSC circular, as set out in the annex to document FP 51/WP.6, for further consideration at FP 52.

10.3 Having considered the documents submitted by:

- .1 Japan (FP 52/10), containing proposed amendments to the draft unified interpretation on the number and arrangement of portable fire extinguishers on board ships (FP 51/WP.6);
- .2 China (FP 52/10/1), containing comments and proposals to the outstanding issues in the annex to document FP 51/WP.6; and

- .3 Sweden (FP 52/10/2), commenting on document FP 52/10 (Japan) and proposing few amendments that differ slightly from the amendments proposed by Japan,

the Sub-Committee instructed a drafting group to finalize the text of the draft unified interpretation of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers on board ships and the associated MSC circular, taking into account documents FP 52/10, FP 52/10/1 and FP 52/10/2 and comments made in plenary.

Report of the drafting group

10.4 Having received the report of the drafting group (FP 52/WP.7), the Sub-Committee approved it in general and, having made minor modifications to the text prepared by the group, agreed to the draft unified interpretations of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers on board ships and the associated draft MSC circular, set out in annex 15, for submission to MSC 84 for approval.

Completion of the item

10.5 Having completed its work on this item, the Sub-Committee invited the Committee to delete this item from its work programme.

11 DEVELOPMENT OF PROVISIONS FOR GAS-FUELLED SHIPS

11.1 The Sub-Committee recalled that FP 51 had noted that a draft Interim Guidelines would be prepared at BLG 11 for referral to DE 51, FP 52 and STW 39 for consideration of matters under their purview, and had decided to delay the work on this item until the aforementioned draft Interim Guidelines are available. In this regard, FP 51 invited the Committee to extend the target completion date of the item to 2009 and invited Member Governments and international organizations to submit pertinent comments and proposals to FP 52, which should take into account the outcomes of DE 50 and BLG 11 (co-ordinator) on this matter, as appropriate.

11.2 In considering document FP 52/11 (Secretariat), containing information on the outcomes of DE 50 and BLG 11, the Sub-Committee noted that:

- .1 DE 50 had considered document DE 50/7/1 (Germany), proposing that provisions for gas-fuelled ships be based on the principles of goal-based standards, and agreed to refer the aforementioned document to BLG 11 for consideration;
- .2 BLG 11 had forwarded to FP 52 for consideration those sections of the draft Interim Guidelines (BLG 11/6, annex 1) that fall under the purview of the Sub-Committee and agreed to a long-term action plan for the work on the provisions for gas-fuelled ships with a view to finalization of the draft Interim Guidelines at BLG 13 (2009), taking into account the input from the DE, FP and STW Sub-Committees; and
- .3 BLG 11 had further agreed to commence development of the draft International Code of Safety for Gas-fuelled Engine Installations in Ships (IGF Code) at BLG 13, using the Interim Guidelines as a base document and taking into account the work of the correspondence group, with a view to finalizing the draft IGF Code at BLG 15.

11.3 The Sub-Committee, having also considered a document submitted by the United States (FP 52/11/1), containing a detailed review of the fire protection-related aspects of the draft Interim Guidelines on safety for gas-fuelled engine installations in ships prepared by BLG 11 and proposing modifications to the draft text, agreed that further consideration of this matter was necessary.

11.4 Consequently, the Sub-Committee established the Correspondence Group on Development of Provisions for Gas-Fuelled Ships, under the co-ordination of Norway*, and instructed it, taking into account the comments and decisions made in plenary, to:

- .1 review the fire protection-related provisions of the draft Interim guidelines on safety for gas-fuelled engine installations in ships, as contained in the annex to document FP 52/11, taking into account document FP 52/11/1, and prepare modifications thereto, as appropriate, for consideration at FP 53; and
- .2 submit a report to FP 53.

11.5 Following the above decision, the Sub-Committee requested the Secretariat to inform DE 51 and BLG 12 (co-ordinator) accordingly.

12 CONSIDERATION OF IACS UNIFIED INTERPRETATIONS

General

12.1 The Sub-Committee recalled that FP 51, in considering document FP 51/9/8 (IACS), which discussed the application of SOLAS regulations II-2/9.2.2.4.2.2 and II-2/9.6.3 relative to closed and open ro-ro spaces on passenger ships carrying not more than 36 passengers, had agreed that more detailed consideration was needed to resolve this matter and invited Member Governments and international organizations to submit comments and proposals to FP 52.

12.2 The Sub-Committee also recalled that, at FP 51, in considering documents:

- .1 FP 51/9/9 (IACS), containing the revised unified interpretation SC 178 on emergency fire pumps on cargo ships, the Sub-Committee requested the Secretariat to refer the aforementioned document to SLF 50 for consideration for matters that fell under their purview; and
- .2 FP 51/9/10 (Secretariat), on the outcome of MSC 82 concerning an interpretation of SOLAS regulation II-2/4.5.1.1 with regard to pump-rooms intended solely for ballast transfer or fuel oil transfer, the Sub-Committee decided to refer this matter

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to the Correspondence Group on Measures to Prevent Fires in Engine-Rooms and Cargo Pump-Rooms for detailed consideration.

12.3 The Sub-Committee further recalled that documents FP 52/12/2, FP 52/12/3, FP 52/12/4 (IACS) and FP 52/12/7 (Japan) were forwarded to the working group established under agenda item 3 (Performance testing and approval standards for fire safety systems) for consideration (see paragraphs 3.32 and 3.33).

Arrangements for gaseous fuel for domestic purposes

12.4 The Sub-Committee considered IACS unified interpretation SC 214 on Portions of open decks utilized for the storage of gas bottles (FP 52/12), which was developed to clarify the criteria to be adopted by IACS members when determining the portions of open decks areas that can be utilized for the storage of gas bottles in accordance with SOLAS regulation II-2/4.3. In particular, the Sub-Committee noted that SC 214 permits recesses in deck structures, machinery casings, deck houses, etc., to be considered acceptable for the storage of gas bottles. Subsequently, the Sub-Committee agreed to prepare an appropriate unified interpretation (see paragraph 12.9).

Emergency fire pumps on cargo ships

12.5 The Sub-Committee considered document FP 52/12/1 (Secretariat), on the outcome of SLF 50 with regard to the revised IACS Unified Interpretation SC 178 on Emergency fire pumps in cargo ships, and noted that, as requested by FP 51, the SLF Sub-Committee had considered the relevant parts of document FP 51/9/9 (IACS), containing the revised IACS Unified Interpretation SC 178, and agreed that the combination of heave and pitch, as well as heave and roll, contained in the revised IACS Unified Interpretation SC 178 were acceptable.

12.6 In this context, the Sub-Committee noted the views of several delegations that, although the IACS Unified Interpretation SC 178 was considered acceptable to SLF 50 for matters under their purview, the unified interpretation contained construction issues that should be further addressed in detail and agreed that further consideration was needed to resolve this matter. The Sub-Committee, therefore, invited Member Governments and international organizations to submit comments and proposals on this matter to FP 53.

Arrangement of ducts

12.7 In considering document FP 52/12/5, containing IACS Unified Interpretation SC 221 on Separation of galley exhaust ducts from spaces (SOLAS regulation II-2/9), which was developed to provide a harmonized understanding of the term “passing through” for duct arrangements in cases that one or more boundaries are exposed, the Sub-Committee agreed to prepare an appropriate unified interpretation (see paragraph 12.9).

Inconsistency between SOLAS regulations II-2/9.2.2.4.2.2 and II-2/9.6.3

12.8 The Sub-Committee considered document FP 52/12/6 (China), providing comments and proposals on document FP 51/9/8 (IACS), which discussed the application of SOLAS regulations II-2/9.2.2.4.2.2 and II-2/9.6.3 relative to closed and open ro-ro spaces on passenger ships carrying not more than 36 passengers and, having noted the views by some delegations that the proposals constituted draft amendments to SOLAS regulation II-2/9.6 which are outside the scope of this work, invited Member Governments and international organizations to submit

proposals to the Committee in accordance with the Guidelines on the organization and method of work (see also paragraph 3.5).

Unified interpretations of SOLAS chapter II-2

12.9 Having requested the Secretariat to prepare the final text of the unified interpretations referred to in paragraphs 12.4 and 12.7, the Sub-Committee considered document FP 52/WP.8 (Secretariat) and agreed to the draft unified interpretations of SOLAS chapter II-2 and the associated draft MSC circular, set out in annex 16, for submission to MSC 84 for approval.

Other matters

12.10 The Sub-Committee recalled it had reviewed matters considered in the report of the Correspondence Group on Measures to Prevent Fires in Engine-Rooms and Cargo Pump-Rooms on:

- .1 clarification of SOLAS regulation II-2/4.2.2.3.2, on matters related to forward tank position, proposed by IACS (FP 51/8/3) (see also paragraph 6.8); and
- .2 interpretation of SOLAS regulation II-2/4.5.1.1, with regard to pump-rooms intended solely for ballast transfer or fuel oil transfer (FP 51/9/10) (see also paragraph 6.3),

and agreed that further consideration was needed to resolve the above issues. The Sub-Committee, therefore, invited Member Governments and international organizations to submit comments and proposals on the aforementioned matters to FP 53.

13 FIXED HYDROCARBON GAS DETECTION SYSTEMS ON DOUBLE-HULL OIL TANKERS

General

13.1 The Sub-Committee recalled that at MSC 82, the Committee, having agreed to include, in the Sub-Committee's work programme, a high priority item on "Fixed hydrocarbon gas detection systems on double-hull oil tankers", had instructed FP 51 to give a preliminary consideration to the matter and to include the item in the provisional agenda for FP 52.

13.2 The Sub-Committee also recalled that FP 51, having considered document MSC 82/21/12 (Austria *et al*), had agreed to instruct the Correspondence Group on Measures to Prevent Fires in Engine-Rooms and Cargo-Pump Rooms to consider the proposal contained in the aforementioned document and to submit the results to FP 52.

Report of the correspondence group

13.3 In considering the part of the report of the correspondence group (FP 52/6) relating to the item, the Sub-Committee noted that the group was of the opinion that an FSA analysis should be carried out since there is no assurance of benefit from the installations of fixed hydrocarbon gas detection system at the moment.

13.4 The Sub-Committee, having considered documents:

- .1 MSC 82/21/12 (Austria, *et al*), containing detailed amendments to SOLAS regulation II-2/4.5.7, in order to make the installation of fixed hydrocarbon gas detection systems on board double-hull tankers of 20,000 dwt and above mandatory, and to adopt a new chapter 16 of the FSS Code; and
- .2 FP 52/13 (Republic of Korea), containing a preliminary analysis to assess the effectiveness of fixed gas measurement system for double-hull spaces and double-bottom spaces of tankers and identifying five areas that should be addressed in considering this matter,

agreed, in principle, to document MSC 82/21/12 and noted the comments by the delegation of France that, in addition to the fixed hydrocarbon gas detection system on double-hull oil tankers, it is necessary to consider the issue of inerting double-hull spaces after detection of hydrocarbon gas, taking into account that those are related matters.

13.5 In this context, several delegations expressed the view that inert gas is highly corrosive and could affect the double-hull structure and, therefore, it would be necessary to have the consideration of experts from other bodies of IMO on this matter. Additionally, those delegations were also of the opinion that inerting double-hull spaces after detection of hydrocarbons was outside the scope of this work programme item.

13.6 Following the above debate, the Sub-Committee decided to invite the delegation of France and other interested delegations to submit a proposal to MSC 84 to expand the scope of the item for matters related to inerting double-hull spaces after detection of hydrocarbon gas, in accordance with the Guidelines on the organization and method of work (paragraphs 13.4 and 13.5).

13.7 Having considered the above issues, the Sub-Committee established the Correspondence Group on Fixed Hydrocarbon Gas Detection Systems on Double-Hull Oil Tankers, under the co-ordination of INTERTANKO*, and instructed it, taking into account the comments and decisions made in plenary, to:

- .1 develop amendments to SOLAS regulation II-2/4.5.7, taking into account documents MSC 82/21/12 and FP 52/13, in order to make the installation of fixed hydrocarbon gas detection systems on board double-hull tankers of 20,000 dwt and above mandatory;
- .2 develop a new chapter 16 of the FSS Code to detail the specifications for such systems as required by SOLAS chapter II-2; and
- .3 submit a report to FP 53.

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14 CLARIFICATION OF SOLAS CHAPTER II-2 REQUIREMENTS REGARDING INTERRELATION BETWEEN CENTRAL CONTROL STATION AND SAFETY CENTRE

General

14.1 The Sub-Committee recalled that at MSC 82, the Committee had considered document MSC 82/21/18 (Argentina and ICCL), proposing to clarify the definitions for control station, manned central control station and safety centres, the latter being introduced in the recently adopted SOLAS regulation II-2/23 which is expected to enter into force on 1 July 2010, and agreed to include, in the Sub-Committee's work programme, a high priority item on "Clarification of SOLAS requirements regarding interrelation between central control station and safety centre", with two sessions needed to complete the item.

14.2 The Sub-Committee considered the submission by Argentina (FP 52/14), containing its views on the need to clarify the arrangements for the "safety centre" (new SOLAS regulation II-2/23) and central control station (SOLAS regulations II-2/7.9.3 and II-2/9.4.1.1.4.3), and, following the discussion, agreed to refer the matter to the Working Group on Review of Fire Safety of External Areas on Passenger Ships established under agenda item 5 (Review of fire safety of external areas on passenger ships) to further consider the clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre, taking into account document FP 52/14 and decisions made in plenary.

Report of the working group

14.3 Having considered the part of the report of the working group (FP 52/WP.3) relating to this item, the Sub-Committee took action as outlined in the following paragraphs.

14.4 The Sub-Committee noted that the group, in discussing document FP 52/14 (Argentina), referring to the interrelation between central control station and safety centre, had agreed that the content of the aforementioned document was a valuable starting point for discussing the issue, but a number of aspects still need to be investigated in detail, in particular:

- .1 whether SOLAS chapter II-2 should be revised as far as the requirements for continuously manned control stations are concerned and in relation to the presence of safety centre. In this context, it was also pointed out that the safety centre may not be normally manned;
- .2 verification of the existing requirements for power supply of systems listed in SOLAS regulation II-2/23.6 towards the proposal set out in paragraph 2.1 of the annex to document FP 52/14; and
- .3 human factor related to the management of response from different centres of authority.

14.5 Taking into account the above aspects, the Sub-Committee established a correspondence group, under the co-ordination of CLIA*, and instructed it to:

- .1 further consider document FP 52/14 together with the comments contained in paragraph 11 of document FP 52/WP.3 and paragraph 23 of document FP 52/WP.2 and prepare a draft unified interpretation for consideration by the Sub-Committee, taking into account:
 - .1.1 the interrelation between manned control stations and safety centres, in particular when the latter are manned;
 - .1.2 the hierarchy of control between continuously manned control stations and safety centres; and
 - .1.3 the individual systems listed under SOLAS regulation II-2/23.4 so as to identify to what extent the requirements in respect to alarm, control, monitoring and power supply are related to the navigation bridge, continuously manned control stations and safety centres; and
- .2 submit a report to FP 53.

15 ANALYSIS OF FIRE CASUALTY RECORDS

15.1 The Sub-Committee recalled that, under agenda item 20 (Measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes) it had noted that MSC 83 agreed to refer the reports of investigation into the **Chassiron**, **Panam Serena** and **Bow Mariner** casualties to the Sub-Committee for consideration in the context of the work on incidents of explosions on chemical and product tankers. In this context, the Sub-Committee noted that the analyses, as well as the full investigation reports on the aforementioned casualties, are now available to Members in the GISIS module on Maritime Casualties and Incidents (see paragraph 20.2).

15.2 The Sub-Committee had for its consideration under this agenda item document FP 52/INF.5 (Japan), providing information on fire and explosion casualties in container cargo spaces to facilitate discussion on the above-mentioned safety measures when considering the new work programme item on Review of fire protection requirements for on-deck cargo areas at FP 53, and noted the information provided.

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16 WORK PROGRAMME AND AGENDA FOR FP 53

Work programme and agenda for FP 53

16.1 The Sub-Committee revised its work programme (FP 52/WP.4) based on that approved by MSC 83 (FP 52/2/1, annex) and, taking into account the progress made during this session, prepared a draft revised work programme and draft provisional agenda for FP 53. While reviewing the work programme, the Sub-Committee agreed to invite the Committee to:

- .1 delete the following work programme items, as work on them has been completed:
 - .1.1 item H.3 – Review of the SPS Code;
 - .1.2 item H.7 – Application of requirements for dangerous goods in SOLAS and the 2000 HSC Code;
 - .1.3 item H.8 – Unified interpretation on the number and arrangements of portable extinguishers; and
 - .1.4 item H.9 – Review of fire safety of external areas on passenger ships;
- .2 extend the target completion date of the following work programme items:
 - .2.1 item H.2 – Comprehensive review of the Fire Test Procedures Code, to 2009; and
 - .2.2 item H.18 – Recommendation on evacuation analysis for new and existing passenger ships, to 2010;
- .3 replace the number of sessions needed for completion of the following work programme items by the target completion date, as the items have been included in the provisional agenda for FP 53:

.3.1	item H.8	- Harmonization of the requirements for the location of entrances, air inlets and openings in the superstructures of tankers;	2010
.3.2	item H.9	- Amendments to SOLAS chapter II-2 related to the releasing controls and means of escape for spaces protected by fixed carbon dioxide systems;	2010
.3.3	item H.11	- Review of fire protection requirements for on-deck cargo areas; and	2011
.3.4	item H.12	- Means of escape from machinery spaces	2010;
- .4 renumber the work programme items accordingly.

16.2 The Committee was invited to approve the draft revised work programme and draft provisional agenda for FP 53, as set out in annex 17.

Arrangements for the next session

16.3 The Sub-Committee agreed to establish, at its next session, working groups on the following subjects:

- .1 performance testing and approval standards for fire safety systems;
- .2 comprehensive review of the Fire Test Procedures Code; and
- .3 measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes.

16.4 The Sub-Committee also agreed to establish drafting groups on:

- .1 clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre; and
- .2 development of provisions for gas-fuelled ships and amendments to the MODU Code.

16.5 Taking into account decisions made under various agenda items, the Sub-Committee agreed to establish correspondence groups on the following subjects, due to report to FP 53:

- .1 performance testing and approval standards for fire safety systems;
- .2 comprehensive review of the Fire Test Procedures Code;
- .3 fixed hydrocarbon gas detection systems on double-hull oil tankers;
- .4 development of provisions for gas-fuelled ships; and
- .5 clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre.

16.6 The Sub-Committee noted that its fifty-third session had been tentatively scheduled to take place from 19 to 23 January 2009.

17 ELECTION OF CHAIRMAN AND VICE-CHAIRMAN FOR 2009

17.1 In accordance with the Rules of Procedure of the Maritime Safety Committee, the Sub-Committee unanimously re-elected Mr. J.C. Cubisino (Argentina) as Chairman and Mr. C. Abbate (Italy) as Vice-Chairman, both for 2009.

18 ANY OTHER BUSINESS

Amendments to the MODU Code

18.1 In considering document FP 51/18 (Secretariat) on the outcome of DE 50 with regard to the amendments to the MODU Code on items relating to fire-extinguishing systems and portable fire extinguishers, the Sub-Committee noted that:

- .1 DE 50 had established a drafting group to progress the work on the draft amendments to the MODU Code and, having considered the group's report, referred the items relating to fire-extinguishing systems and portable fire extinguishers to the Sub-Committee for consideration and comments;
- .2 DE 50 had discussed the view of several delegations that the MODU Code should be made mandatory and agreed that the current work programme item only referred to the development of amendments to the Code; and
- .3 the parts of the draft Code for consideration by the Sub-Committee had been reproduced in the annex to document FP 52/18, for ease of reference.

18.2 In the course of the consideration of the above document, the Sub-Committee was informed that the correspondence group established at DE 50, had prepared additional amendments on items relating to fire safety and noted that the text of the draft amendments proposed for consideration of the Sub-Committee (FP 51/18, annex) was not updated. Consequently, the Sub-Committee decided to hold this matter in abeyance until an updated draft amendments to the MODU Code were prepared by the DE Sub-Committee for consideration. In this context, the Sub-Committee agreed that the DE Sub-Committee's correspondence group, if re-established, should not consider matters related to fire safety.

18.3 The Sub-Committee requested the Secretariat to inform the DE Sub-Committee of the above outcome.

Revision of the Code on Alarms and Indicators

18.4 In considering document FP 51/18/1 (Secretariat) on the outcome of DE 50 with regard to the draft revised Code on Alarms and Indicators on items relating to fire protection, the Sub-Committee noted that:

- .1 DE 50, noting that there was general agreement on the latest draft of the revised Code and recalling that MSC 79 instructed it to co-operate on this item with other sub-committees, as necessary, had agreed to refer the draft revised Code (DE 50/10/2/Rev.1) to NAV 53, DSC 12, FP 52 and BLG 12 for comments on issues under their purview;
- .2 DE 50 had further agreed to finalize the draft revised Code at DE 51 and invited Member Governments and international organizations to submit comments on the draft revised Code; and
- .3 the parts of the draft Code for consideration by the Sub-Committee had been reproduced in the annex to document FP 52/18/1, for ease of reference.

18.5 In this regard, the Sub-Committee considered document FP 52/18/3 (United States), annexing proposed modifications to the parts of the draft revised Code forwarded to it by DE 50 with a view to harmonizing the text with the relevant parts of SOLAS chapter II-2 and the FSS Code, taking into account the Sub-Committee's ongoing work on the revision of the FSS Code, in particular chapters 9 and 10, and the recently adopted amendments for onboard safety centres on passenger ships. In this context, the Sub-Committee noted the views of the United States that the DE Sub-Committee should be requested to harmonize the amendments with the new passenger ship safety initiatives. In particular, consideration should be given to revising chapters 8 and 9 and their related tables, taking into account the outcome of the

Sub-Committee's deliberations regarding onboard safety centres and continuously manned central control stations. This work may also impact the provisions of section 7.2 of chapter VII of the LSA Code for the arrangement of the general emergency alarm system and public address system. The Sub-Committee requested the Secretariat to bring this view to the attention of the DE Sub-Committee.

18.6 In considering how best to progress the work on this matter, the Sub-Committee agreed to instruct the Working Group on Review of Fire Safety of External Areas on Passenger Ships, established under agenda item 5 (Review of fire safety of external areas on passenger ships), to finalize the draft amendments to the Code on Alarms and Indicators on matters related to fire safety, taking into account documents FP 52/18/1 and FP 52/18/3.

18.7 Having reviewed the part of the report of the working group (FP 52/WP.3) relating to the item, the Sub-Committee agreed to the proposed amendments to the parts of the draft Revised Code on Alarms and Indicators, as set out in annex 2 to FP 52/WP.3, for referral to DE 51 for co-ordination purposes and requested the Secretariat to act accordingly.

Safety of small fishing vessels

18.8 In considering documents FP 51/18/2 and Add.1 (Secretariat) on the outcome of SLF 50 with regard to the safety of small fishing vessels on items relating to fire protection, the Sub-Committee noted that:

- .1 SLF 50 had agreed, in principle, to the proposed modifications to the text of the draft Safety recommendations for decked fishing vessels of less than 12 m in length and undecked fishing vessels, and requested the Secretariat to prepare a consolidated text of the draft safety recommendations for dissemination to the relevant sub-committees for consideration of matters under their purview;
- .2 in this context, SLF 50 had agreed to refer the preamble, chapters 1 and 5 and annex 1 of the consolidated text of the draft Safety recommendations (SLF 51/5, annex) to the Sub-Committee for comments and proposals, as appropriate, and requested the Sub-Committee to report back to SLF 51; and
- .3 SLF 50 had also endorsed the recommendation of the working group to finalize this work in 2010 and submit the final draft of the Safety recommendations to the Committee for approval.

18.9 Having noted that the SLF Sub-Committee intended to finalize the work on the draft of the Safety recommendations in 2010, the Sub-Committee invited Member Governments and international organizations to submit relevant comments and proposals to FP 53, which should take into account the outcome of SLF 51 on this matter.

Drainage of fire-fighting water from the vehicle decks of ro-ro ships

18.10 The Sub-Committee considered document FP 52/18/4 (Secretariat) on the outcome of MSC 83 with regard to matters on drainage of fire-fighting water from the vehicle decks of ro-ro ships and noted that:

- .1 the Committee, at MSC 83, had considered documents MSC 83/25/2 (Egypt) and MSC 83/3/2 (Denmark, Norway and Sweden), proposing to improve the drainage of fire-fighting water from the vehicle decks of ro-ro ships, and had acknowledged

the need to take urgent action on the matter in light of the tragic loss of life caused by the sinking of the passenger ferry **Al-Salam Boccaccio 98**;

- .2 consequently, MSC 83 had approved draft amendments to SOLAS chapters II-1 and II-2 to address the drainage of special category and ro-ro spaces to prevent accumulation of water on the vehicle deck of ro-ro ships, for adoption at MSC 84, and approved MSC.1/Circ.1234 on Drainage of fire-fighting water from closed vehicle and ro-ro spaces and special category spaces for passenger and cargo ships, informing the parties affected of the coming new requirements;
- .3 in light of the aforementioned decision, MSC 83 had agreed that the appropriate Guidelines should be developed to assist Administrations in the implementation of the new amendments and decided to include, in the work programmes of the FP and SLF Sub-Committees and the provisional agenda for SLF 51, a high priority item on “Guidelines for drainage systems in closed vehicle and ro-ro spaces and special category spaces”, with a target completion date of 2009; and
- .4 in doing so, the Committee had assigned this Sub-Committee as the co-ordinator and instructed FP 52 to give a preliminary consideration to the matter and include the item in the provisional agenda for FP 53.

18.11 Notwithstanding the above and considering how best to proceed on this matter, the Sub-Committee decided to instruct the Correspondence Group on Performance Testing and Approval Standards for Fire Safety Systems, established under agenda item 3 (Performance testing and approval standards to fire safety systems), to further develop the Guidelines with a view to finalization at FP 53 (see also paragraph 3.36).

Test laboratories recognized by the Administrations

18.12 The Secretariat informed the Sub-Committee that the latest annual FP circular on Test laboratories recognized by the Administrations had been published as FP.1/Circ.34 dated 7 January 2008.

Halon banking and reception facilities

18.13 The Sub-Committee noted information provided by the Secretariat that the latest annual FP circular on Halon banking and reception facilities had been published as FP.1/Circ.35 dated 7 January 2008.

Long-term availability of halons

18.14 The Sub-Committee was informed by the Secretariat of the outcome of the nineteenth meeting of the Parties to the Montreal Protocol, held in September 2007 in Montreal, and noted, in particular, that:

- .1 the United Nations Environment Programme (UNEP), through its Technology and Economics Assessment Panel and its Halons Technical Options Committee (HTOC), keeps Parties to the Montreal Protocol apprised of the status of the transition away from the use of halons;
- .2 the nineteenth meeting requested HTOC to further investigate the issue of major regional imbalances in the worldwide distribution of halons; and

- .3 the Ozone Secretariat was requested, by Decision XIX/16: Follow-up to the 2006 assessment report by HTOC, to communicate with IMO and ICAO to draw attention to the decreasing availability of halons for marine and aviation uses and to the need to take all actions necessary to reduce reliance on halons in the respective sectors.

18.15 In commenting on the above information, a delegate of the United States (a UNEP representative), pointed out that UNEP had limited success in collecting data on halons for the maritime sector and requested, on behalf of UNEP, that IMO assist in this effort by encouraging its Member States to collect data on the number of halons systems, number of ships so equipped and total amount of halons installed on their merchant fleets and convey this information to the UNEP Ozone Secretariat for its use in completing the assignment it has received from the Members of the Parties to the Montreal Protocol.

18.16 In this context, the Secretariat informed the Sub-Committee that it was preparing relevant notes to the Committees for consideration and action as appropriate. Accordingly, the Sub-Committee invited the Committee to note the request of the UNEP representative.

19 RECOMMENDATION ON EVACUATION ANALYSIS FOR NEW AND EXISTING PASSENGER SHIPS

General

19.1 The Sub-Committee recalled that at FP 51, having finalized the Guidelines on evacuation analysis for new and existing passenger ships for submission to MSC 83, it had invited MSC 83 to delete the item from the work programme.

19.2 The Sub-Committee noted that MSC 83, having approved the Guidelines for evacuation analysis for new and existing passenger ships, which were disseminated by means of MSC.1/Circ.1238 and having considered document MSC 83/8/2 (Germany), proposing that the item related to the aforementioned Guidelines be retained in the Sub-Committee's work programme so that unresolved issues could still be further considered by the Sub-Committee, had agreed to retain the item on the Sub-Committee's work programme and included it in the provisional agenda for FP 52.

19.3 In considering documents FP 52/19 (Secretariat), FP 52/19/1, FP 52/INF.7 and FP 52/INF.8 (Germany), the Sub-Committee noted the proposal (FP 52/19/1) to develop a mandatory requirement to perform an evacuation analysis at an early stage of design for passenger ships other than ro-ro passenger ships, and the assumptions that the evacuation analysis should assume that passengers proceed according to the evacuation procedures for the ship, and agreed that more time is necessary to collect relevant data on the issue before evacuation analysis guidelines be considered for mandatory application.

19.4 Taking into account the above and the general view that a correspondence group should not be established at this stage, the Sub-Committee agreed to invite the Committee to extend the target completion date of the item to 2010 and invited Member Governments and international organizations to submit relevant comments and proposals to FP 53.

Statement by the delegation of Germany

19.5 In noting the above decision, the delegation of Germany reiterated its opinion that, in order to effectively progress the work on the item, an appropriate correspondence group should be established and informed the Sub-Committee of its intention to prepare an appropriate document on the subject for consideration at FP 53 and invited contributions from Member Governments and international organizations.

20 MEASURES TO PREVENT EXPLOSIONS ON OIL AND CHEMICAL TANKERS TRANSPORTING LOW-FLASHPOINT CARGOES

General

20.1 The Sub-Committee recalled that at FP 51, following consideration of the report of the Inter-Industry Working Group (IIWG) established to study incidents of fires and explosions on chemical and product tankers, which had recommended to consider amending SOLAS chapter II-2 to provide for application of inert gas system to new oil tankers of less than 20,000 dwt and new chemical tankers, and proposals submitted by Member Governments, the Sub-Committee had recommended to the Committee that a new item be included in the Sub-Committee's work programme to develop measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes.

20.2 In considering documents FP 52/20 and FP 52/20/4 (Secretariat), on the outcome of MSC 83 on this matter, the Sub-Committee noted that MSC 83, having considered the outcomes of FP 51 and DE 50, had endorsed the recommendations of FP 51 and, in particular:

- .1 had included, in the Sub-Committee's work programme and the provisional agenda for FP 52, a high-priority item on "Measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes", with a target completion date of 2009, in co-operation with the BLG and DE Sub-Committees as necessary and when requested by the FP Sub-Committee;
- .2 had agreed that, under the aforementioned work programme item, the Sub-Committee should first consider measures for new ships, taking into account the different operational demands on chemical tankers and the need that essential data is submitted and considered first and, depending on the outcome of their consideration, the Committee would then consider the extension of the item towards appropriate measures for existing oil and chemical tankers transporting low-flashpoint cargoes, taking into account the comments made during the discussion;
- .3 had agreed that the Sub-Committee should take into account the concerns raised by Sweden in respect of dangerous atmospheres (FP 52/20, annex) and encouraged Member Governments to use the contact details provided by Sweden for the provision of information about similar cases; and
- .4 had referred the reports of investigation into the **Chassiron**, **Panam Serena** and **Bow Mariner** casualties to the Sub-Committee for consideration.

20.3 In addition to the above, the Sub-Committee noted that MSC 83 had agreed to DE 50's recommendation to consider developing international safety standards for the design and operation of in-tank pumps after IACS had submitted the result of their work on a relevant unified requirement.

20.4 The Sub-Committee had the following documents for consideration:

- .1 FP 52/20/1 (Japan), describing, in detail, the tank cleaning operation of chemical tankers on routes with short voyage time between ports, incurring many cycles of tank cleaning operation per year, to emphasize that the operation is time consuming, in addition to the fact that explosion hazard during gas-freeing remain existent, even with the introduction of inert gas system (IGSs) in chemical tankers;
- .2 FP 52/20/2 (Norway), supporting the inerting of the cargo tanks when the ship is carrying cargo with flashpoint not exceeding 60°C regardless of ship size, age, tank size, capacity of nozzles of washing machines and the washing machines' total throughput, which they call "property based approach";
- .3 FP 52/20/3 (Norway), commenting on the Japanese FSA study (FP 52/INF.2) on the cost/benefits of the application of requirements for IGSs to tankers of less than 20,000 dwt and emphasizing that, in their opinion, the analysis contained in document FP 52/INF.2 is based on assumptions that need further consideration; and
- .4 FP 52/INF.2, providing the results of an FSA study on safety of chemical tankers, particularly Net Cost for Averting a Fatality (NET CAF), taking into account the comments made at MSC 83, and showing that, according to the results, inert gas system is not justified for such tankers of less than 20,000 dwt.

20.5 In the course of considering the above documents, the Sub-Committee noted the following views expressed during the discussion:

- .1 investigation into the application of the "property based approach" and a review of the relevant parts of SOLAS is needed to verify how the above approach could be incorporated for new tankers;
- .2 there is still a lack of information on human element issues such as maintenance procedures, tank cleaning, etc., and how such procedures actually work in practice, which emphasizes the importance of industry participation in this work;
- .3 cost and benefit studies should be considered as part of this work, including port costs associated with shore-based inerting of tanks;
- .4 casualty data should be collected to determine if the introduction of inert gas systems reduces the fires and explosions on tankers or increases tank entry casualties; and
- .5 there is a need for detailed information on low-flashpoint cargoes in order to determine what substances are referred to and the type and number of ships engaged in the transport of low-flashpoint cargoes.

20.6 Taking into account the above views and the specific instructions by MSC 83, the Sub-Committee decided to establish a working group at FP 53 to progress the matter and urged Member Governments and international organizations to submit the essential data on the subject to FP 53 for consideration and action, as appropriate.

21 ACTION REQUESTED OF THE COMMITTEE

21.1 The Maritime Safety Committee is invited to:

- .1 approve the draft MSC circular on Amendments to Revised Guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848) (paragraph 3.8 and annex 1);
- .2 approve the draft MSC circular on Guidelines for the approval of fixed pressure water-spraying and water based fire-extinguishing systems for cabin balconies (paragraph 3.13 and annex 2);
- .3 adopt the draft MSC resolution on Amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)) (paragraph 3.16 and annex 3);
- .4 approve the draft MSC circular on 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) (paragraph 3.19 and annex 4);
- .5 approve the draft MSC circular on Revised Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces (paragraph 3.21 and annex 5);
- .6 approve the draft MSC circular on Guidelines for high expansion foam using inside air for the protection of machinery spaces and cargo pump-rooms and endorse the Sub-Committee's decision that the Guidelines should be effective on 1 July 2009 (paragraph 3.24 and annex 6);
- .7 approve the draft MSC circular on Guidelines for the approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V) and endorse the Sub-Committee's decision that the Guidelines should be implemented as soon as possible to allow the industry to begin installing such systems (paragraph 3.26 and annex 7);
- .8 approve the draft amendments to SOLAS regulation II-2/10, regarding recharging requirements and the appropriate number of spare charges for the required breathing apparatus (paragraph 3.30 and annex 8);
- .9 note the Sub-Committee's outcome with regard to the revised work plan for the development of performance testing and approval standards for fire-safety systems (paragraph 3.34);

- .10 approve the draft amendments to SOLAS regulation II-2/9, concerning the control of the installation of fire doors with three-sided frames and note that these amendments should apply to new ships only (paragraph 4.11 and annex 9);
- .11 approve the draft MSC circular on Unified interpretations of the FTP Code (paragraph 4.15 and annex 10);
- .12 approve the draft MSC circular on Guidelines for evaluation of fire risk of external areas on passenger ships (paragraph 5.6 and annex 11)
- .13 approve the draft amendments to SOLAS regulation II-2/9.7 on matters related to fire resistance of ventilation ducts (paragraph 7.5 and annex 12);
- .14 note the outcome of the Sub-Committee's consideration of matters related to the review of the SPS Code (paragraphs 8.3 and 8.4);
- .15 approve the draft amendments to SOLAS chapter II-2, concerning the application of requirements for the carriage of dangerous goods and endorse the Sub-Committee's recommendation to instruct DSC 13 to consider the draft amendments and submit comments to MSC 85 (paragraphs 9.6 and 9.7 and annex 13);
- .16 approve, in principle, the draft amendments to the 2000 HSC Code, concerning the application of requirements for the carriage of dangerous goods and endorse the Sub-Committee's recommendation to instruct DSC 13 to consider the draft amendments and submit comments to MSC 85 (paragraphs 9.6 and 9.7 and annex 14);
- .17 instruct the DSC Sub-Committee to consider incorporating generic requirements on prohibition of underdeck stowage of "class 2.3 having subsidiary risk class 2.1" and "class 4.3 liquids having a flashpoint less than 23°C" in the IMDG Code (paragraph 9.8);
- .18 approve the draft MSC circular on Unified interpretations of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers on board ships (paragraph 10.4 and annex 15);
- .19 note the outcome of the Sub-Committee's consideration of matters related to the development of provisions for gas-fuelled ships (paragraphs 11.3 to 11.5);
- .20 approve the draft MSC circular on Unified interpretations of SOLAS chapter II-2 (paragraphs 3.6.2, 12.4, 12.7 and 12.9 and annex 16);
- .21 approve the draft revised work programme of the Sub-Committee and the draft provisional agenda for FP 53 (paragraphs 16.2 and annex 17);
- .22 note the outcome of the Sub-Committee's consideration of matters related to the revision of the Code on Alarms and Indicators (paragraphs 18.5 to 18.7);

- .23 note the information on the outcome of the nineteenth meeting of the Parties to the Montreal Protocol and to consider the request of the UNEP representative for IMO to assist UNEP in its efforts to collect data on halons from the maritime sector, in particular, to encourage Member States to collect data on the number of halon systems still in use on board their ships and the total amount of halons in their respective merchant fleets, and to convey this information to the UNEP Ozone Secretariat and take action as appropriate (paragraphs 18.14 to 18.16);
- .24 note the Sub-Committee's consideration of matters related to measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes (paragraphs 20.5 and 20.6); and
- .25 approve the report in general.

ANNEX 1**DRAFT MSC CIRCULAR****AMENDMENTS TO REVISED GUIDELINES FOR THE APPROVAL
OF EQUIVALENT FIXED GAS FIRE-EXTINGUISHING SYSTEMS,
AS REFERRED TO IN SOLAS 74, FOR MACHINERY SPACES
AND CARGO PUMP-ROOMS (MSC/CIRC.848)**

1 The Committee, at its [eighty-fourth session (7 to 16 May 2008)] approved amendments to the Revised Guidelines for approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848), set out in the annex.

2 Member Governments are invited to apply the amendments to the Revised Guidelines when approving equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.

ANNEX

**AMENDMENTS TO THE REVISED GUIDELINES FOR THE APPROVAL
OF EQUIVALENT FIXED GAS FIRE-EXTINGUISHING SYSTEMS,
AS REFERRED TO IN SOLAS 74, FOR MACHINERY SPACES
AND CARGO PUMP-ROOMS (MSC/CIRC.848)**

1 In paragraph 1, the references “SOLAS regulation II-2/7 and II-2/63” are replaced by the references “SOLAS regulation II-2/10.4 and II-2/10.9” and the reference “SOLAS regulation II-2/5” is replaced by the reference “the FSS Code, chapter 5”.

2 In paragraph 2, the references “SOLAS regulation II-2/5.1, 5.3.1, 5.3.2 to 5.3.3” are replaced by the reference “the FSS Code, chapter 5, regulation 2.1”.

3 The existing paragraph 6 is replaced by the following:

“6 All systems should be designed to allow evacuation of the protected spaces prior to discharge.* Means should also be provided for automatically giving audible and visual warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm should operate for the period of time necessary to evacuate the space, but not less than 20 s before the medium is released. Unnecessary exposure, even at concentrations below an adverse effect level, should be avoided.

6.1 Even at concentrations below an adverse effect level, exposure to gaseous fire extinguishing agents should not exceed 5 min. Halocarbon agents may be used up to the No Observed Adverse Effect Level (NOAEL) calculated on the net volume of the protected space at the maximum expected ambient temperature without additional safety measures. If a halocarbon agent is to be used above its NOAEL, means should be provided to limit exposure to no longer than the time specified according to a scientifically accepted physiologically based pharmacokinetic** (PBPK) model or its equivalent which clearly establishes safe exposure limits both in terms of extinguishing media concentration and human exposure time.

6.2 For inert gas systems, means should be provided to limit exposure to no longer than 5 min for inert gas systems designed to concentrations below 43% (corresponding to an oxygen concentration of 12%, sea level equivalent of oxygen) or to limit exposure to no longer than 3 min for inert gas systems designed to concentrations between 43% and 52% (corresponding to between 12% and 10% oxygen, sea level equivalent of oxygen) calculated on the net volume of the protected space at the maximum expected ambient temperature.

* Refer to guidelines to be developed by the Organization.

** Refer to document FP 44/INF.2 – Physiologically based pharmacokinetic model to establish safe exposure criteria for halocarbon fire extinguishing agents.”

6.3 In no case should a halocarbon agent be used at concentrations above the Lowest Observed Adverse Effect Level (LOAEL) nor the Approximate Lethal Concentration (ALC) nor should an inert gas be used at gas concentrations above 52% calculated on the net volume of the protected space at the maximum expected ambient temperature.

4 The existing paragraphs 10 and 11 are replaced by the following:

“10 Provisions should be made to ensure that escape routes which are exposed to leakage from the protected space are not rendered hazardous during or after discharge of the agent in the event of a fire. In particular, hydrogen fluoride (HF) vapour can be produced in fires as a breakdown product of the fluorocarbon fire extinguishing agents and cause health effects such as upper respiratory tract and eye irritation to the point of impairing escape. Control stations and other locations that require manning during a fire situation should have provisions to keep HF and HCl below 5 ppm at that location. The concentrations of other products should be kept below concentrations considered hazardous for the required duration of exposure.

11 Where agent containers are stored within a protected space, the containers should be evenly distributed throughout the space and meet the following provisions:

- .1 a manually initiated power release, located outside the protected space, should be provided. Duplicate sources of power should be provided for this release and should be located outside the protected space, and be immediately available;
- .2 electric power circuits connecting the containers should be monitored for fault conditions and loss of power. Visual and audible alarms should be provided to indicate this;
- .3 pneumatic, electric or hydraulic power circuits connecting the containers should be duplicated and widely separated. The sources of pneumatic or hydraulic pressure should be monitored for loss of pressure. Visual and audible alarms should be provided to indicate this;
- .4 within the protected space, electrical circuits essential for the release of the system should be fire resistant according to standard IEC 60331 or other equivalent standards. Piping systems essential for the release of systems designed to be operated hydraulically or pneumatically should be of steel or other equivalent heat-resisting material to the satisfaction of the Administration;
- .5 each pressure container should be fitted with an automatic overpressure release device which, in the event of the container being exposed to the effects of fire and the system not being operated, will safely vent the contents of the container into the protected space;
- .6 the arrangement of containers and the electrical circuits and piping essential for the release of any system should be such that in the event of damage to any one power release line or container valve through mechanical damage, fire or explosion in a protected space, i.e., a single

fault concept, at least the amount of agent needed to achieve the minimum extinguishing concentration can still be discharged having regard to the requirement for uniform distribution of medium throughout the space; and

- .7 the containers should be monitored for decrease in pressure due to leakage and discharge. Visual and audible alarms in the protected area and on the navigation bridge or in the space where the fire control equipment is centralized should be provided to indicate this condition.”

- 5 The existing paragraph 14 is replaced by the following:

“14 For all ships, the fire-extinguishing system design manual should address recommended procedures for the control of products of agent decomposition, including HF vapour generated from fluorocarbon extinguishing agents which could impair escape. Clearly, longer exposure of the agent to high temperatures would produce greater concentrations of these types of gases. The type and sensitivity of detection, coupled with the rate of discharge, should be selected to minimize the exposure time of the agent to the elevated temperature. The performance of fire-extinguishing arrangements on passenger ships should not present health hazards from decomposed extinguishing agents, for example on passenger ships, the decomposition products should not be discharged in the vicinity of muster (assembly) stations. Other mitigating steps include evacuation, and donning masks.”

- 6 In the appendix, section 3 (Method of test), paragraph 3.4.2.2, the percent of the manufacturer’s recommended design concentration “83%” is replaced by the percent of the manufacturer’s recommended design concentration “77%”.

ANNEX 2**DRAFT MSC CIRCULAR****GUIDELINES FOR THE APPROVAL OF FIXED PRESSURE WATER-SPRAYING
AND WATER-BASED FIRE-EXTINGUISHING SYSTEMS
FOR CABIN BALCONIES**

1 The Committee, at its [eighty-fourth session (7 to 16 May 2008)], having recognized the need for guidelines for fixed pressure water-spraying fire-extinguishing systems for cabin balconies, taking into account the amendments to SOLAS chapter II-2 and the FSS Code adopted by resolutions MSC.216(82) and MSC.217(82), approved Guidelines for the approval of fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies.

2 Member Governments are invited to apply the annexed Guidelines when approving fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies on passenger ships for systems to be installed on or after 1 July 2008 and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.

ANNEX

GUIDELINES FOR THE APPROVAL OF FIXED PRESSURE WATER-SPRAYING AND WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR CABIN BALCONIES

1 General

Fixed pressure water-spraying fire-extinguishing systems, as required by SOLAS regulation II-2/10.6.1.3, for the protection of cabin balconies where furniture and furnishings other than those of restricted fire risk are used should be shown by testing to have the capability of suppressing typical fires expected in such areas, and preventing them from spreading to the adjacent cabins and to other balconies. These Guidelines should be applied when approving fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies on passenger ships to be installed on or after 1 July 2008.

1.2 Definitions

1.2.1 *Automatic system* is a system with automatic nozzles. Each head should be individually activated by heat from the fire before water will be discharged.

1.2.2 *Manually released system* is a pipework system with open nozzles, controlled by section valves. When a section valve is opened, all of the connected nozzles will discharge water simultaneously.

2 Principal requirements for the system

2.1 The system should either be automatic or capable of manual release from a location remote from the protected area.

2.2 The system should be capable of fire suppression based on testing conducted in accordance with the appendix to these Guidelines.

2.3 The system should be capable of fire suppression on open deck areas with expected wind conditions while the vessel is underway. The fire test does not require the use of actual wind velocities; instead, a nominal wind speed is included to account for variables in balcony geometry and related issues. Although the test ventilation conditions are intended to provide a safety factor, it is recognized that in an actual fire, the master and crew are expected to take appropriate actions to manoeuvre the ship to assist the suppression system.

2.4 The system should be available for immediate use and capable of continuously operating for at least 30 min.

2.5 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging and corrosion normally encountered on open deck areas. Open head nozzles should be tested in accordance with appendix A of MSC/Circ.1165*. Automatic nozzles should be tested in accordance with appendix 1 of resolution A.800(19)*.

* These IMO instruments have been amended by MSC/Circ.[...] and resolution MSC...[...], respectively.

2.6 The location, type and characteristics of the nozzles should be within the limits tested, as referred to in the appendix. Nozzle positioning should take into account obstructions to the spray of the fire-fighting system. Automatic nozzles should have fast response characteristics as defined in ISO standard 6182-1:2004.

2.7 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.

2.8 The minimum capacity and design of the supply system for a manually released system should be based on the complete protection of the most hydraulically demanding section. The minimum capacity and design of the supply system for an automatic system should be based on the complete protection of the eight most hydraulically remote balconies, but not to exceed 50 m².

2.9 The water supply for cabin balcony systems may be fed from an independent supply, or they may be fed from the supply to another water-based fire-fighting system providing that adequate water quantity and pressure are available as indicated below:

- .1 Manually released systems: The water supply should be capable of supplying the largest balcony section and, if supplied by the sprinkler system, the capacity should be adequate to supply eight adjacent cabins. If supplied by the fire main, the system should be capable of supplying the largest balcony section plus the two jets of water required by SOLAS regulations II-2/10.2.1.3 and II-2/10.2.1.6.
- .2 Automatic systems: The water supply should be capable of supplying the eight most hydraulically demanding balconies, but not to exceed 50 m². If combined with the sprinkler system, the design area in total need not exceed 280 m².

2.10 The system should be grouped into sections. A manually released section should not serve cabin balconies on both sides of the ship, except that the same section may serve balconies located on one side of the ship and balconies in the fore or aft end of the ship.

2.11 The system section valves and operation controls should be located at easily accessible positions outside the protected space, not likely to be cut off by a fire in the cabin balconies.

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

2.13 Activation of any water supply pump should give a visual and audible alarm at a continuously manned central control station or onboard safety centre.

* 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:

<u>Pipe type</u>	<u>C factor</u>
Black or galvanized mild steel	100
Copper and copper alloys	150
Stainless steel	150

2.14 Any parts of the system which may be subjected to freezing temperatures in service should be suitably protected against freezing.

2.15 The system should be provided with a redundant means of pumping or otherwise supplying the discharge nozzles. The capacity of the redundant means should be sufficient to compensate for the loss of any single pump or supply source. The system should be fitted with a permanent sea inlet and be capable of continuous operation using seawater.

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

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

2.18 Dry pipe systems should be arranged such that water will discharge from the farthest sprinkler within 60 s of actuation of the sprinkler.

APPENDIX

TEST METHOD FOR FIXED PRESSURE WATER-SPRAYING AND WATER-BASED FIRE-EXTINGUISHING SYSTEMS FOR CABIN BALCONIES

1 SCOPE

1.1 This test method is intended for evaluating the effectiveness of fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies.

1.2 It was developed for ceiling or sidewall mounted nozzles located to protect external cabin balconies that are open to the atmosphere with natural wind conditions.

1.3 Systems for the protection of cabin balconies are intended for either automatic or manual operation.

2 GENERAL REQUIREMENTS

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 Temperatures should be measured using plain K-type thermocouple wires not exceeding 0.5 mm in diameter. The thermocouple beads should be shielded to protect against direct water impingement.

2.3 Unless otherwise stated, the following tolerances should apply:

- .1 Length $\pm 2\%$ of value
- .2 Pressure $\pm 3\%$ of value
- .3 Temperature $\pm 2\%$ of value

2.4 System water pressure should be measured by using suitable equipment. Total water flow rates should be determined by a direct measurement or indirectly by using the pressure data and k-factor of the nozzles.

2.5 Wind velocity should be measured by using suitable equipment.

2.6 The temperature and pressure measurements should be made continuously, at least once in every two seconds throughout the tests.

2.7 The tests should simulate the conditions of an actual installed system regarding objectives such as time delays between the activation of the system and minimum system water pressure or water delivery. In addition, the use of a pre-primed fire suppression enhancing additive, if applicable, should be taken into account.

3 FIRE TESTS

3.1 Test principles

3.1.1 These tests are intended to evaluate the fire-suppression capabilities of nozzles used for the protection of cabin balconies against external fires in furniture and furnishings of other than restricted fire risk. The primary objective of the test is to evaluate the ability of the system to prevent a fire on a cabin balcony from spreading to the adjacent cabin and to other balconies.

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

- .1 the maximum coverage (length and width) of a single nozzle; and
- .2 the minimum operating pressure.

3.2 Test description

3.2.1 *Fire test compartment*

3.2.1.1 These tests are intended to evaluate the nozzle's fire-suppression capabilities against external fires on open cabin balconies. The tests may be conducted inside a well ventilated test hall having a specified area of at least 100 m², a specified height of at least 5 m and adequate natural or forced ventilation to ensure that there is no restriction in air supply to the test fires. The fire test hall should have an ambient temperature of $20 \pm 5^\circ\text{C}$ at the start of each test.

3.2.2 *Apparatus*

3.2.2.1 The fire tests should be conducted in a test apparatus consisting of a balcony mock-up in accordance with figure 1. The balcony ceiling should be smooth to allow an unobstructed flow of gases.

3.2.2.2 The mock-up should be constructed of nominally 12 mm thick non-combustible wallboard panels. Plywood panels should be attached to the wall below the ventilation channel opening, and on the back wall, covering at least 2 m horizontally, starting from the fan side corner. The panels should be 2 m high and 3 to 4 mm thick. The ignition time of the panel should not be more than 35 s and the flame spread time at 350 mm position should not be more than 100 s as measured in accordance with the FTP Code. Prior to the test, the plywood panels should be conditioned at $21 \pm 2.8^\circ\text{C}$ and $50 \pm 10\%$ relative humidity for at least 72 h.

3.2.2.3 The dimensions of the balconies should be in accordance with figure 1, or may be increased up to the maximum coverage area (length and width) to be protected by one nozzle.

3.2.2.4 A fan should be attached to the balcony mock-up, as indicated in figure 1. The fan should provide an average air velocity of $5 \pm 0.2\text{m/s}$ measured as an average over several locations. Typically, sufficient dimensions of the fan are 0.8 m in diameter with a power of 5.5 kW.

3.2.2.5 For ceiling nozzles, the velocity measurements should be done at nine locations; at the nozzle and around it on a circle of 0.5 m radius (figure 3(a)). For sidewall nozzles, the measurement should be done in six locations, at the nozzle and around it on a half-circle of 0.5 m radius (figure 3(b)). In vertical direction, the measurement should be done in the middle of the

wind channel (25 cm from the ceiling). The intention is to distribute measurement locations over the region where the wind affects the suppression medium flow.

3.2.3 Fire source

3.2.3.1 The fire source should consist of a wood crib, two simulated chairs and a table mock-up.

3.2.3.2 Each chair should be fitted with two 0.5 m by 0.8 m by 0.1 m polyether cushions. The cushions should be made of non-fire retardant polyether and they should have a density of approximately 33 kg/m³. When tested according to standard ISO 5660-1 (ASTM E-1354), the polyether foam should give results as given in the table below. Prior to the test, the cushions should be conditioned at 21 ± 2.8°C and 50 ± 10% relative humidity for at least 72 h.

The frame of the chairs should be of steel nominally 2 mm thick consisting of rectangular bottom and backrest frames constructed of steel angles, channels or rectangular stock of at least 3 mm thickness. The frame dimensions should be 0.5 m x 0.8 m (figure 2). The seat and backrest cushions should be supported on each frame by steel bars 20-30 mm wide x 0.80 m long located in the centre of the frames and welded to the edges. Steel plates should not be used to support the cushions. The assembled frames should be supported by four legs 500 mm in height constructed of similar steel stock. The frames should be equipped with a metal wire net to support the cushions, and the backrest should be tied in place, to keep from falling over during the test. The backrest should be placed on top of the seat cushion.

ISO 5660: Cone calorimeter test

Test conditions:

Irradiance 35 kW/m²
Horizontal position
Sample thickness 50 mm
No frame retainer should be used

Test results

Foam

Time to ignition (s)	2-6
3 min average HRR, q ₁₈₀	270 ± 50
Minimum heat of combustion (MJ/kg)	25
Total heat release (MJ/m ²)	50 ± 12

3.2.3.3 A table should be constructed of a similar steel stock as the chairs. The table should have a 0.5 m by 0.5 m metal frame, supported by four legs, 520 mm in height. A 0.5 m by 0.5 m table plate should be fitted into the frame, made of 2 mm thick steel.

3.2.3.4 The two chairs should be placed in the fan side corner of the balcony, in such a way that the polyether foam is 0.1 m from the plywood panel, according to figures 3 and 4, corners of the cushions touching. The table should be placed in the corner, edges aligned with the ends of the chairs.

3.2.3.5 The wood crib should be dimensioned 0.3 m x 0.3 m x 0.15 m (high). The crib should consist of four alternate layers of four trade size nominal 38 mm x 38 mm kiln-dried spruce or fir lumber 0.3 m long. The alternate layers of the lumber should be placed at right angles to the

adjacent layers. The individual wood members in each layer should be evenly spaced along the length of the previous layer of wood members and stapled together. After the wood crib is assembled, it should be conditioned at a temperature of $50 \pm 5^\circ\text{C}$ for not less than 16 h. Following the conditioning, the moisture content of the crib should be measured at various locations with a probe-type moisture meter. The moisture content of the crib should not exceed 5% prior to the fire test.

3.2.3.6 A square steel tray of area 0.1 m^2 and height 0.1 m should be located under the table, so that its corner is next to the point where chairs touch. The wood crib should be supported directly over the tray, edges aligned with the chair ends. The top of the wood crib should be 0.27 m above the floor level (figure 4).

3.2.3.7 For ignition, the tray should be filled with 1 l of water and 250 ml of commercial heptane.

3.2.4 *Nozzle installation requirements*

3.2.4.1 The tests with the given balcony dimensions are intended for a single nozzle protection. The single nozzle has to be located symmetrically in the balcony, at the centreline in the position recommended by the manufacturer's installation instructions, vertically at least 0.4 m above the lower edge of the wind channel. The two most conceivable locations are shown in figure 3.

3.2.4.2 If the nozzle is located closer to the fan side wall than at the centreline, the protection width of the nozzle will be less than 3 m, i.e., twice the tested distance between the nozzle and wall. If a larger than 3 m protection width is aimed at, a wider balcony should be constructed for the test.

3.2.4.3 The nozzle should be connected to a suitable water supply and arranged to operate at the minimum pressure specified by the manufacturer.

3.2.4.4 The tests should be repeated using two nozzle orientations, where applicable. At first, the lowest discharge density should be directed towards the cabin wall, and then, towards the fan side wall.

3.2.5 *Instrumentation*

3.2.5.1 Thermocouples should be installed at four locations; two on the front edge of the balcony ceiling, one 1 m and the other 2 m from the fan side wall, one of the back edge of the ceiling, 2 m from the fan side wall and one in the centre of the side wall opposite the fan. Thermocouples should be installed 30 mm from the ceiling.

3.2.5.2 System water pressure should be measured near the nozzle, and the system water flow rate should be defined with suitable means for the system.

4 TEST METHOD

4.1 Test programme

4.1.1 Two tests should be done for each type of nozzle. One test with wind, and one without.

4.1.2 In the wind test, the fan should be started before ignition and operated continuously during the test. The wind velocity should be measured when it has levelled, before ignition as defined in paragraph 3.2.2.5.

4.1.3 Automatic nozzles should be tested with the fusible element removed.

4.2 Ignition

The heptane in the tray should be ignited using a gas burner, long stick, match or equivalent.

4.3 Determination of pre-burn time

Prior to conducting the nozzle tests, the pre-burn time should be determined using materials from the same lots to be used during system approval testing.

A minimum of two free-burn tests should be conducted with wind and two without wind. In each test, the flame attachment time to the wall should be recorded. The system activation time used during the nozzle tests with wind should be 30 s less than the average flame attachment time recorded in the free-burn tests with wind. The system activation time used during the nozzle tests without wind should be 30 s less than the average flame attachment time recorded in the free-burn tests without wind.

4.4 Test duration

The sprinkler system should be manually activated at the end of the pre-burn period. The test should be conducted for 10 min after the sprinkler system is activated, and any remaining fire should be manually extinguished.

4.5 Observations during the test

During the test, the following observations should be recorded:

- .1 activation time of ventilation system (if applicable);
- .2 time of ignition;
- .3 activation time of the extinguishing system;
- .4 time of ignition of the plywood panels (if any);
- .5 time of extinguishment, if any; and
- .6 time when the test is terminated.

5 ACCEPTANCE CRITERIA

5.1 For all tests, there should be no ignition of the plywood panels.

5.2 For the test without wind, 30 s after activation of the system, none of the thermocouples should show temperatures exceeding 100°C.

6 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 nozzles;
- .5 test method and purpose;
- .6 nozzle identification;
- .7 description of the tested nozzle;
- .8 detailed drawings/photos of the test set-up;
- .9 date of tests;
- .10 measured nozzle pressure and 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 protected area per nozzle; and
 - .2 minimum operating pressures;
- .13 deviations from the test method;
- .14 conclusions; and
- .15 date of the report and signature.

Figure 1: Balcony Mock-up

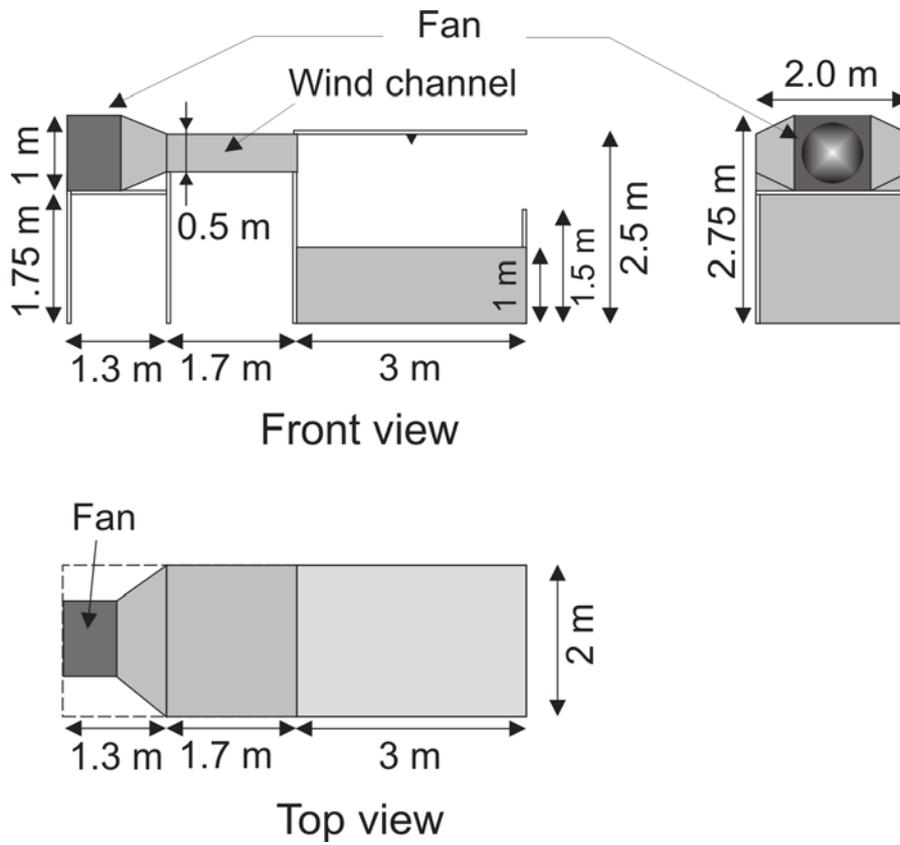


Figure 2: Chair frame

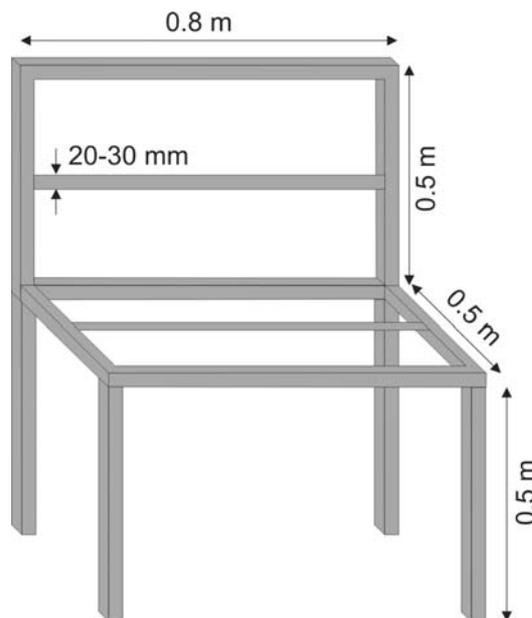


Figure 3: Fire scenario and measurements. Thermocouple locations (x) and wind measurement positions (.) for (a) ceiling nozzle, (b) sidewall nozzle

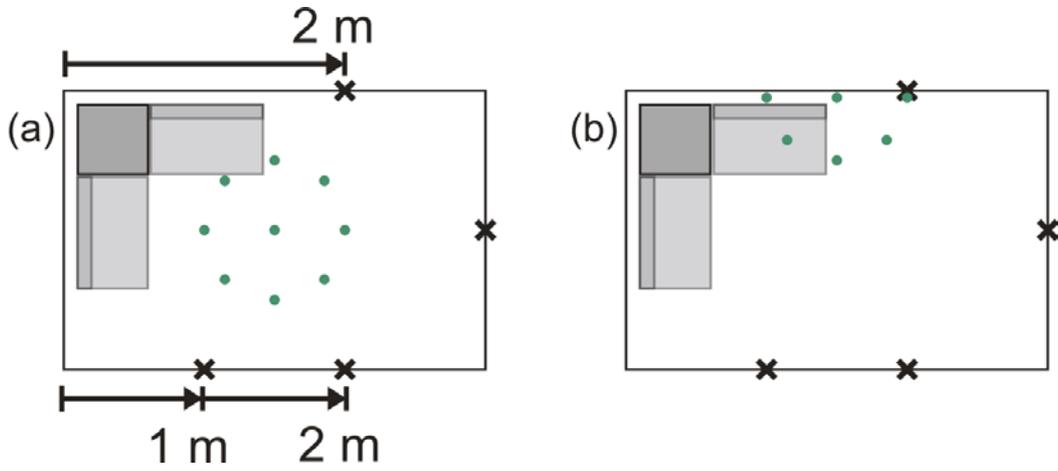
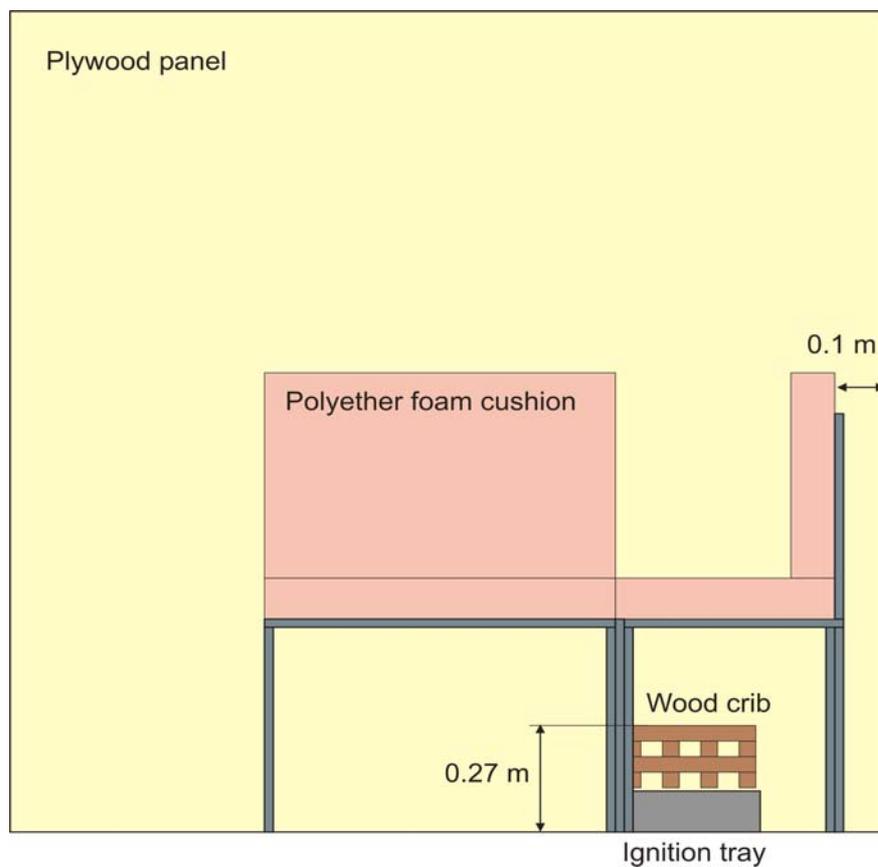


Figure 4: Fire source



ANNEX 3**DRAFT MSC RESOLUTION
(adopted on**)**AMENDMENTS TO THE REVISED GUIDELINES FOR APPROVAL OF
SPRINKLER SYSTEMS EQUIVALENT TO THAT REFERRED TO
IN SOLAS REGULATION II-2/12 (RESOLUTION A.800(19))**

THE MARITIME SAFETY COMMITTEE,

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

NOTING the significance of the performance and reliability of the sprinkler systems approved under provisions of regulation II-2/12 of the International Convention for the Safety of Life at Sea (SOLAS), 1974,

DESIROUS of keeping abreast of the advancement of sprinkler technology and further improving fire protection on board ships,

HAVING CONSIDERED, at its [eighty-fourth session], the text of the proposed amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)),

1. ADOPTS the amendments to the Revised Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)), the text of which is set out in the annex to the present resolution;
2. INVITES Governments to apply the amendments when approving equivalent sprinkler systems on or after [date of adoption of the resolution].

ANNEX

**AMENDMENTS TO REVISED GUIDELINES FOR APPROVAL OF
SPRINKLER SYSTEMS EQUIVALENT TO THAT REFERRED TO IN
SOLAS REGULATION II-2/12 IN THE ANNEX TO RESOLUTION A.800(19)**

1 The following new section 1-1 is added after the existing section 1:

“1-1 APPLICATION

1-1.1 The present Guidelines apply to equivalent sprinkler systems installed on or after [*date of adoption of amendments*].

1-1.2 Existing type approvals issued to confirm compliance of equivalent sprinkler systems with the Revised Guidelines, adopted by resolution A.800(19), should remain valid until 6 years after [*date of adoption of amendments*].

1-1.3 Existing equivalent sprinkler systems installed before [*date of adoption of amendments*], based on resolution A.800(19), should be permitted to remain in service as long as they are serviceable.”.

2 The existing paragraph 3.3 is replaced by the following:

“3.3 The sprinkler system should be capable of continuously supplying the water-based extinguishing medium for a minimum of 30 min. A pressure tank or other means should be provided to meet the functional requirement stipulated in FSS Code, chapter 8, paragraph 2.3.2.1. The design of the system should ensure that full system pressure is available at the most remote nozzle in each section within 60 s of system activation.”

3 The existing paragraphs 3.8 and 3.9 are replaced by the following:

“3.8 There should be not less than two sources of power for the system. Where the sources of power for the pump are electrical, these should be a main generator and an emergency source of power. One supply for the pump should be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders should be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards, and should be run to an automatic changeover switch situated near the sprinkler pump. This switch should permit the supply of power from the main switchboard so long as a supply is available there from, and be so designed that upon failure of that supply it will automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard should be clearly labelled and normally kept closed. No other switch should be permitted in the feeders concerned. One of the sources of power supply for the system should be an emergency source. Where one of the sources of power for the pump is an internal combustion engine, it should, in addition to complying with the provisions of FSS Code, chapter 8, paragraph 2.4.3, be so situated that a fire in any protected space will not affect the air supply to the machinery. Pump sets consisting of two diesel engines each supplying at least 50% of the required water capacity are considered acceptable if

the fuel supply is adequate to operate the pumps at full capacity for a period of 36 h on passenger ships and 18 h on cargo ships.

3.9 The system should be provided with a redundant means of pumping, including drivers, or otherwise supplying a water-based extinguishing medium to the sprinkler system. The capacity of the redundant means should be sufficient to compensate for the loss of any single supply pump or alternative source.

Failure of any one component in the power and control system should not result in a reduction of the automatic release capability or reduction of sprinkler pump capacity by more than 50%. Hydraulic calculations should be conducted to assure that sufficient flow and pressure are delivered to the hydraulically most remote 140 m² in the event of the failure of any one component.”

4 The existing paragraph 3.13 is replaced by the following:

“3.13 Each section of sprinklers should be capable of being isolated by one stop valve only. The stop-valve in each section should be readily accessible in a location outside of the associated section or in cabinets within stairway enclosures. The valve’s location should be clearly and permanently indicated. Means should be provided to prevent the operation of the stop-valves by an unauthorized person. Isolation valves used for service, maintenance or for refilling of antifreeze solutions may be installed in the sprinkler piping in addition to the section stop valves, if provided with a means for giving a visual and audible alarm as required by paragraph 3.17. Valves on the pump unit may be accepted without such alarms if they are locked in the correct position.”

5 The existing paragraph 3.15 is replaced by the following:

“3.15 The sprinkler system water supply components should be outside category A machinery spaces and should not be situated in any space required to be protected by the sprinkler system.”

6 The existing paragraph 3.19 is replaced by the following:

“3.19 Installation plans and operating manuals should be supplied to the ship and be readily available onboard. A list or plan should be displayed showing the spaces covered and the location of the zone in respect of each section. Instructions for testing and maintenance should also be available onboard. The maintenance instructions should include provisions for a flow test of each section at least annually to check for possible clogging or deterioration in the discharge piping.”

7 The existing paragraph 3.22 is replaced by the following:

“3.22 Pumps and alternative supply components should be capable of supplying the required flow rate and pressure for the space with the greatest hydraulic demand. For the purposes of this calculation, the design area used to calculate the required flow and pressure should be the deck area of the most hydraulically demanding space, separated from adjacent spaces by A-class divisions. The design area need not exceed 280 m². For application to a small ship with a total protected area of less than 280 m², the Administration may specify the appropriate area for sizing of pumps and alternate supply components.”

3.23 The nozzle location, type of nozzle, and nozzle characteristics should be within the tested limits determined by the fire test procedures in appendix 2 to provide fire control or suppression as referred to in paragraph 3.2.

3.24 For atriums with intermediate level deck openings exceeding 100 m², ceiling mounted sprinklers are not required.

3.25 The system should be designed in such a way that during a fire occurrence, the level of protection provided to those spaces unaffected by fire is not reduced.

3.26 A quantity of spare water mist nozzles should be carried for all types and ratings installed on the ship as follows:

Total number of nozzles	Required number of spares
< 300	6
300 to 1000	12
> 1000	24

The number of spare nozzles of any type need not exceed the total number of nozzles installed of that type.

3.27 Any parts of the system which may be subjected to freezing temperatures in service should be suitably protected against freezing.”

8 In appendix 1, a new paragraph 5.21.4, is added as follows:

Appendix 1

Component manufacturing standards for water mist nozzles

“5.21.4 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.”

9 The existing appendix 2 is replaced by the following:

“APPENDIX 2

FIRE TEST PROCEDURES FOR WATER MIST SYSTEMS IN ACCOMMODATION, PUBLIC SPACES AND SERVICE AREAS ON PASSENGER SHIPS

1 SCOPE

1.1 These test procedures describe a fire test method for evaluating the effectiveness of water mist systems equivalent to systems covered by chapter 8 of the FSS Code in accommodation and service areas on board ships. It should be noted that the test method is limited to the systems’ effectiveness against fire and is not intended for testing of the quality and design parameters of the individual components of the system.

1.2 In order to fulfil the requirements of paragraph 3.5 of the Guidelines, the system should be capable of fire control or suppression in a wide variety of fire loading, fuel arrangement, room geometry and ventilation conditions.

1.3 Products employing materials or having forms of construction differing from the requirements contained herein may be examined and tested in accordance with the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with this document.

1.4 Products complying with the text of this document will not necessarily be judged to comply, if, when examined and tested, they are found to have other features which impair the level of safety contemplated by this document.

2 HAZARD AND OCCUPANCY CLASSIFICATION

For the purposes of identifying the different fire risk classifications, table 1 is given, which correlates the fire tests with the classification of occupancy defined in SOLAS regulations II-2/9.2.2.3 and II-2/9.2.2.4:

Table 1 – Correlation between fire tests with the classification of occupancy defined in SOLAS regulations II-2/9.2.2.3 and 9.2.2.4

Occupancy classification	Corresponding fire test			
	Section 5 cabin	Section 5 corridor	Section 6 public spaces	Section 8 storage
(1) Control stations			X	
(2) Stairways		X ¹		
(3) Corridors		X ¹		
(6) Accommodation spaces of minor fire risk	X ²		X ³	
(7) Accommodation spaces of moderate fire risk	X ²		X ^{3 4}	
(8) Accommodation spaces of greater fire risk			X ^{3 4}	
(9) Sanitary and similar spaces	X ²		X ³	
(11) Refrigerated chambers			X	
(12) Main galleys and annexes			X	
(13) Store rooms, workshops, pantries, etc.				X
(14) Other spaces in which flammable liquids are stowed				X

Notes:

- ¹ For corridors and stairways wider than 1.5 m, use section 6 public space fire test instead of the corridor fire test.
- ² For spaces up to the area of the cabin applied in tests of section 5.
- ³ For spaces over the area of the cabin applied in tests of section 5.
- ⁴ Refer to annex, item 3.24.

3 DEFINITIONS

3.1 Fire suppression: sharply reducing the heat release rate of a fire and preventing its re-growth by means of a direct and sufficient application of water through the fire plume to the burning fuel surface.

3.2 Fire control: limiting the size of a fire by distribution of water so as to decrease the heat release rate and pre-wet adjacent combustibles, while controlling ceiling gas temperatures to avoid structural damage.

3.3 Fire source: fire source is defined as the combustible material in which the fire is set and the combustible material covering walls and ceiling.

3.4 Igniter: the device used to ignite the fire source.

4 GENERAL REQUIREMENTS

4.1 Nozzle positioning

The fire test procedures are intended for pressurized wet-pipe systems with individually activated (automatic) nozzles.

Water without any fire-extinguishing additives should be used, unless the additives have been approved for fire protection service by an independent authority. The approval of the additives should consider possible adverse health effects to exposed personnel, including inhalation toxicity.

These test procedures are applicable to either overhead nozzles installed on the ceiling, or sidewall nozzles installed on bulkheads below the ceiling. Separate approval tests should be conducted for each nozzle type.

The testing organization should be responsible for assuring that the nozzles for each fire test are installed in accordance with the manufacturer's design and installation instructions. The tests should be performed at the maximum specified spacings, installation height and distances below the ceiling. In addition, if the testing organization finds it necessary, selected fire tests should also be conducted at minimum specified spacings, installation height and distances below the ceiling. Where two types of nozzles are installed in the same area, an overlap of the different nozzle spray patterns should be provided equal to at least one half of the maximum approved nozzle spacing.

4.2 Water pressure and flow rates

The testing organization should be responsible for assuring that all fire tests are conducted at the operating pressure and flow rates specified by the manufacturer.

For all tests, the system should either be:

- .1 pressurized to the minimum operating pressure specified by the manufacturer. Upon activation of the first nozzle, the flowing water pressure should be maintained at the minimum system operating pressure; or

- .2 pressurized to the minimum stand-by pressure specified by the manufacturer. Upon activation of the first nozzle, the flowing water pressure should be gradually increased to the minimum system operating pressure, specified by the manufacturer. The delay time until the minimum system operating pressure is reached should be at least 15 s. The delay time recorded during the tests should be documented and included in the approval of the system.

4.3 Temperature measurements

Temperatures should be measured as described in detail under each chapter. Chromelalumel thermocouple wires not exceeding 0.5 mm in diameter welded together should be used. The temperatures should be measured continuously, at least every 2 s, throughout the tests.

4.4 Fire test hall and environmental conditions

The fire tests are to be conducted inside a well-ventilated fire test hall, in order to minimize enclosure effects affecting the outcome of the testing. The enclosure effects include accumulation of heat, smoke and water droplets within the test area.

The fire test hall should have an ambient temperature of $20 \pm 5^\circ\text{C}$ at the start of each test. Standing water should not be permitted on the floor of the test hall at the start of each test. The suspended ceiling should be dry at the start of each test.

Details of the fire test hall geometry, the ventilation conditions as well as of the environmental conditions with respect to the above should be given in the fire test report.

4.5 Tolerances

Unless otherwise stated, the following tolerances should apply:

- .1 length $\pm 2\%$ of value;
- .2 volume $\pm 5\%$ of value;
- .3 pressure $\pm 3\%$ of value; and
- .4 temperature $\pm 5\%$ of value.

These tolerances are in accordance with ISO Standard 6182-1:1994.

4.6 Observations

The following observations should be made during and after each test:

- .1 time of ignition;
- .2 activation time of each nozzle;

- .3 time when water flow is shut off;
- .4 damage to the fire source;
- .5 temperature recordings;
- .6 system flow rate and pressure; and
- .7 total number of operating nozzles.

4.7 Fire sources

If the requirements for fire sources specified in the following sections of this test method cannot be fulfilled, it is the responsibility of the test laboratory to show that alternative materials used have burning characteristics similar to those of specified materials.

4.8 Product and documentation requirements

The fire test report should identify the critical parameters to be incorporated into the design, installation and operating instruction manual. The instruction manual should reference the limitations of each device and should include at least the following items:

- .1 description and operating details of each device and all accessory equipment, including identification of extinguishing system components or accessory equipment by part or model number;
- .2 nozzle design recommendation and limitations for each fire type;
- .3 type and pressure rating of pipe, tubing and fittings to be used;
- .4 equivalent length values of all fittings and all system components through which water flows;
- .5 discharge nozzle limitations, including maximum dimensional and area coverage, minimum and maximum installation height limitations, and nozzle permitted location in the protected volume;
- .6 range of filling capacities for each size storage container;
- .7 details for the proper installation of each device, including all component equipment;
- .8 reference to the specific types of detection and control panels (if applicable) to be connected to the equipment;
- .9 operating pressure ranges of the system;
- .10 method of sizing pipe or tubing;
- .11 recommended orientation of tee fittings and the splitting of flows through tees; and

- .12 maximum difference in operating (flowing) pressure between the hydraulically closest and most remote nozzle.

5 CABIN AND CORRIDOR TESTS

5.1 Test arrangement

5.1.1 The fire tests should be conducted in a 3 m x 4 m, 2.5 m high cabin connected to the centre of a 1.5 m x 12 m long corridor, 2.5 m high with both ends open. The cabin area may be increased up to the maximum size to be protected with one nozzle. The disabled nozzle test should be conducted in a 3 m x 4 m cabin.

5.1.2 The cabin should be fitted with one doorway opening, 0.8 m wide and 2.2 m high, which provides for a 0.3 m lintel above the opening.

5.1.3 The walls of the cabin should be constructed from an inner layer of nominally 12 mm thick non-combustible wall board with a nominally 45 mm thick mineral wool liner. The walls and ceiling of the corridor and ceiling of the cabin should be constructed of nominally 12 mm thick non-combustible wall boards. The cabin may be provided with a window, having a maximum area of 1 m², in the wall opposite the corridor for observation purposes during the fire tests.

5.1.4 The cabin and corridor ceiling should be covered with cellulosic acoustical panels. The acoustical panels should be nominally 12 mm to 15 mm thick and should not ignite when tested in accordance with part 3 of the FTP Code.

5.1.5 Plywood panels should be placed on the cabin and corridor walls. The panels should be 3 to 4 mm thick. The ignition time of the panel should be not more than 35 s and the flame spread time at 350 mm position should not be more than 100 s as measured in accordance with IMO resolution A.653(16).

5.2 Instrumentation

During each fire test, the following temperatures should be measured using thermocouples of diameter not exceeding 0.5 mm:

- .1 the ceiling surface temperature above the ignition source in the cabin should be measured with a thermocouple embedded in the ceiling material from above such that the thermocouple bead is flush with the ceiling;
- .2 the ceiling gas temperature should be measured with a thermocouple 75 ± 1 mm below the ceiling in the centre of the cabin;
- .3 the ceiling surface temperature in the centre of the corridor, directly opposite the cabin doorway, should be measured with a thermocouple embedded in the ceiling material such that the thermocouple bead is flush with the ceiling (figure 1); and

- .4 the ceiling surface temperature directly above the corridor test fire source (if used) described in paragraph 5.4.2 should be measured with a thermocouple embedded in the ceiling material such that the thermocouple bead is flush with the ceiling surface.

Thermocouples intended for measuring ceiling surface temperatures should be imbedded in a shallow groove filled with thermally conductive cement such that the thermocouple bead is flush with the ceiling surface. The distance from the hole where the thermocouple wire penetrates the ceiling tile to the bead should be at least 25 mm.

5.3 Nozzle positioning

The nozzles should be installed to protect the cabin and corridor in accordance with the manufacturer's design and installation instructions subject to the following:

- .1 if only one ceiling nozzle is installed in the cabin, it may not be placed in the shaded area in figure 2;
- .2 if two or more ceiling nozzles are installed in the cabin the nominal water flux density should be homogeneously distributed throughout the cabin;
- .3 corridor nozzles should not be placed closer to the centreline of the cabin doorway than one half the maximum spacing recommended by the manufacturer. An exception is systems where nozzles are required to be placed outside each doorway; and
- .4 cabin mounted sidewall nozzles should be installed on the centreline of the front wall of the cabin adjacent to the doorway, aimed towards the rear of the cabin.

5.4 Fire sources

5.4.1 Cabin test fire source

Two pullman-type bunk beds having an upper and lower berth should be installed along the opposite side walls of the cabin (figure 1). The bunk beds should be made of nominally 1.5 mm thick steel and should have an outer dimension of approximately 2.0 m by 0.8 m. The bunk beds should have a 0.1 m high rim facing the long side wall of the cabin. No other rims are allowed in order to prevent accumulation of water onto the beds. Each bunk bed should be fitted with 2 m by 0.8 m by 0.1 m polyether mattresses having a cotton fabric cover. Pillows measuring 0.5 m by 0.8 m by 0.1 m should be cut from the mattresses. The cut edge should be positioned towards the doorway. A third mattress should form a backrest for the lower bunk bed. The backrest should be attached in an upright position in a way that prevents it from falling over (figure 3).

The mattresses should be made of non-fire retardant polyether and they should have a density of approximately 33 kg/m³. The cotton fabric should not be fire retardant treated and it should have an area weight of 140 g/m² to 180 g/m². When tested according to ISO Standard 5660-1:2002 (ASTM E-1354), the polyether foam should give results as given in the table below. The frame of the bunk beds should be of steel nominally 2 mm thick.

ISO STANDARD 5660: Cone calorimeter test

Test conditions: Irradiance 35 kW/m². Horizontal position.

Sample thickness 50 mm. No frame retainer should be used.

Test results	Foam
Time to ignition (s)	2-6
3 min average HRR, q ₁₈₀ (kW/m ²)	270 ± 50
Minimum heat of combustion (MJ/kg)	25
Total heat release (MJ/m ²)	50 ± 12

5.4.2 Corridor test fire source

The corridor fire tests should be conducted using eight piled polyether mattress pieces measuring 0.4 m x 0.4 m x 0.1 m, as specified in paragraph 5.4.1, without fabric covers. The pile should be placed on a stand, 0.25 m high, and in a steel test basket to prevent the pile from falling over (figure 4).

5.5 Test method

The following series of fire tests should be performed with automatic activation of the nozzle(s) installed in the cabin and/or corridor as indicated. Each fire should be ignited using an igniter made of some porous material, e.g., pieces of insulating fibreboard. The igniter may be either square or cylindrical, 60 mm square or 75 mm in diameter. The length should be 75 mm. Prior to the test the igniter should be soaked in 120 ml of heptane and positioned as indicated for each cabin fire test. For the corridor fire tests, the igniter should be located in the centre at the base of the pile of the mattress pieces, and on one side of the test stand at the base of the pile of mattress pieces:

- .1 lower bunk bed test. Fire arranged in one lower bunk bed and ignited with the igniter located at the front (towards door) centreline of the pillow;
- .2 upper bunk bed test. Fire arranged in one upper bunk bed with the igniter located at the front (towards door) centreline of the pillow;
- .3 arsonist test. Fire arranged by spreading 1 litre of white spirits evenly over one lower bunk bed and backrest 30 s prior to ignition. The igniter should be located in the lower bunk bed at the front (towards doorway opening) centreline of the pillow;
- .4 disabled nozzle test. The nozzle(s) in the cabin should be disabled. Fire arranged in one lower bunk bed and ignited with the igniter located at the front (towards door) centreline of the pillow. If nozzle(s) in the cabin are linked with nozzle(s) in the corridor such that a malfunction would affect them all, all cabin and corridor nozzles linked should be disabled;
- .5 corridor test. Fire source located against the wall of the corridor under one nozzle; and

- .6 corridor test. Fire source located against the wall of the corridor between two nozzles.

The fire tests should be conducted for 10 min after the activation of the first nozzle, and any remaining fire should be extinguished manually.

The door opening to the cabin is intended to be open during the tests according to paragraphs 5.5.1 through 5.5.4 and closed during the tests according to paragraphs 5.5.5 and 5.5.6.

5.6 Acceptance criteria

Based on the measurements, a maximum 30 s average value should be calculated for each measuring point which forms the temperature acceptance criteria.

Acceptance criteria for the cabin and corridor tests

		Maximum 30 s average ceiling surface temperature in the cabin (° C)	Maximum 30 s average ceiling gas temperature in the cabin (° C)	Maximum 30 s average ceiling surface temperature in the corridor (° C)	Maximum acceptable damage on mattresses (%)		Other criteria
					Lower bunk	Upper bunk	
Cabin tests	Lower bunk bed	360	320	120	40	10	No nozzles in corridor allowed to operate ³
	Upper bunk bed				N.A.	40	
	Arsonist	N.A.	N.A.	120	N.A.	N.A.	N.A.
Corridor tests		N.A.	N.A.	120 ¹	N.A.		Only two Independent and adjacent nozzles in corridor allowed to operate ⁴
Disabled nozzle		N.A.	N.A.	400 ²	N.A.		N.A.

Notes:

- ¹ In each test, the temperature should be measured above the fire source.
 - ² The fire is not allowed to propagate along the corridor beyond the nozzles closest to the door opening.
 - ³ Not applicable, if cabin nozzle(s) are linked to corridor nozzle(s).
 - ⁴ Not applicable, if corridor nozzle(s) are linked together.
- N.A. means not applicable

5.7 Damage calculations

After the test, the fire sources should be examined visually to determine compliance with the required maximum damage. The damages should be estimated using the following formula:

- .1 damage to lower bunk bed = (damage to horizontal mattress (%) + 0.25 x damage to pillow (%) + damage to backrest (%))/2.25;
- .2 damage to upper bunk bed = (damage to horizontal mattress (%) + 0.25 x damage to pillow (%))/1.25; and
- .3 if it is not clearly obvious by visual examination whether the criteria are fulfilled or not, the test should be repeated.

6 PUBLIC SPACE FIRE TESTS

6.1 Test arrangements

The fire tests should be conducted inside a well-ventilated fire test hall as described in item 4.4 under a suspended rectangular ceiling of at least 80 m² in area with no dimensions less than 8 m. There should be at least 1 m space between the perimeters of the ceiling and any wall of the test hall. The ceiling height should be set at 2.5 m and 5 m, respectively.

The ceiling should be horizontal and smooth to allow an unobstructed horizontal flow of gases across the whole ceiling. No lintel is allowed around the perimeter of the ceiling and no opening is permitted in the ceiling. In order to be considered as smooth, the surface structure of the suspended ceiling should not have obstructions deeper than 15 mm.

The volume above the suspended ceiling, should be large enough, or be fitted with a natural or mechanical ventilation system, to vent the combustion gases away from the fire test area.

Details of the ceiling structure and its location in the fire test hall should be given in the fire test report.

Two different tests should be conducted as per paragraphs 6.1.1 and 6.1.2.

6.1.1 *Open public space test*

The fire source should be positioned under the centre of the open ceiling so that there is an unobstructed flow of gases across the ceiling. The ceiling should be constructed from a non-combustible material. At least 1 m² of the ceiling just above ignition should be covered with acoustical panels. The acoustical panels should be nominally 12 mm to 15 mm thick, and should not ignite when tested in accordance with part 3 of the FTP Code.

6.1.2 *Corner public space test*

The test should be conducted in a corner constructed by two at least 3.6 m wide, nominally 12 mm thick, non-combustible wall boards. Plywood panels should be placed on the walls. The panels should be 3 to 4 mm thick. The ignition time of the panel should not be more than 35 s and the flame spread time at 350 mm position should not be more than 100 s measured in accordance with part 3 of the FTP Code. The ceiling should be covered, 3.6 m out from the corner, with cellulosic acoustical panels. The acoustical panels should be nominally 12 mm to 15 mm thick, and should not ignite when tested in accordance with part 3 of the FTP Code.

6.1.3 *Verification of ventilation conditions*

The ventilation rate of the test hall should be verified at the test hall configuration and ventilation conditions to be applied in the fire tests. The verification test should be conducted using a circular 2 m² tray filled with at least 50 mm of light diesel oil on a water-base. Freeboard is to be 150 ± 10 mm. The tray should be centrally located under the suspended open ceiling at the 2.5 m height. The ventilation rate should be high enough to prevent the oxygen concentration measured at radius of 3 m from the centre point of the fire source, 1.25 m (mid-height) above the floor, to decrease below 20% volume during a 10 min free burning test.

The fire test report should include details of the ventilation test, if conducted as a part of the test series, or alternatively, reference should be provided to a ventilation test that was performed at the same configuration and ventilation conditions.

6.2 **Instrumentation**

During each fire test, the following temperatures should be measured using thermocouples with diameter not exceeding 0.5 mm.

6.2.1 *Open public space test:*

- .1 the ceiling surface temperature above the ignition source should be measured using a thermocouple embedded in the ceiling material such that the thermocouple bead is flush with the ceiling surface; and
- .2 the ceiling gas temperature should be measured 75 ± 1 mm below the ceiling, at four different positions, at a horizontal radius of 1.8 m from the point of ignition. The thermocouples should be oriented 90° relative to each other and positioned such as to minimize the risk for direct wetting by the water sprays from the nozzles.

6.2.2 *Corner public space test:*

- .1 the ceiling surface temperature above the ignition source should be measured using a thermocouple embedded in the ceiling material such that the thermocouple bead is flush with the ceiling surface; and

- .2 the ceiling gas temperature should be measured using a thermocouple located 75 ± 1 mm below the ceiling within 0.2 m horizontally from the closest nozzle to the corner.

Thermocouples intended for measuring ceiling surface temperatures should be imbedded in a shallow groove filled with thermally conductive cement such that the thermocouple bead is flush with the ceiling surface. The distance from the hole where the thermocouple wire penetrates the ceiling tile to the bead should be at least 25 mm.

6.3 Nozzle positioning

6.3.1 *Open and corner public space tests*

For nozzles with frame arms, tests should be conducted with the frame arms positioned both perpendicular and parallel with the edges of the ceiling or corner walls. For nozzles without framed arms, the nozzles should be oriented so that the lightest discharge density will be directed towards the fire area.

6.3.2 *Open public space tests*

When sofas are positioned between two nozzles, the longitudinal centreline gap between sofas no.1 and no.2 should be oriented at a 90° angle to the line between the nozzles.

6.4 Fire sources

6.4.1 *Open public space*

The fire source should consist of four sofas made of mattresses as specified in section 5.4.1 installed in steel frame sofas. The steel frames for the sofas should consist of rectangular bottom and backrest frames constructed of 25 ± 2 mm square iron of normally 2 mm thickness. The dimensions of the bottom frame should be 2,000 mm x 700 mm and the dimensions of the backrest frame should be 2,000 mm x 725 mm. The seat and backrest mattresses should be supported on each frame by three vertical and one horizontal steel bars, constructed from similar steel stock. The vertical steel bars should be spaced every 500 mm and welded to the inner long sides of the frame. The horizontal steel bar should be welded to the inner short sides of the frame. Both steel frames should be fitted with a 150 mm by 150 mm steel plate, nominally 2 mm thick. The steel plate should be positioned directly under and behind the intended position of the igniter, in order to prevent it from falling to the floor under a test. Each sofa should have a rectangular armrest on each end. The armrest should be constructed of similar steel stock and should be 600 mm in length and 300 mm in height. The front section of the armrest should be attached to the bottom frame 70 mm from the backrest frame. The assembled frames should be supported by four legs constructed of similar steel stock. The two rear legs should be 205 mm in height and the front legs should be 270 mm in height. When installed, the mattress forming the seat should be installed first, with its long side edge close up against the backrest frame. The mattress forming the backrest should be installed thereafter. This mattress should be kept in upright position by four hooks, two on the short sides and two on the long sides of the backrest frame (see figure 5). The hooks should be constructed from nominally 50 mm flat iron bars, of nominally 2 mm thickness. The sofas should be positioned as shown in figure 6, with the top of the backrests spaced 25 mm apart.

One of the middle sofas should be ignited, centrally and at the bottom of the backrest, with an igniter as described in section 5.5.

6.4.2 *Corner public space test*

The fire source should consist of a sofa, as specified in 6.4.1, placed with the backrest 25 mm from the right-hand wall and close up to the left-hand wall. A target sofa should be placed along the right-hand wall with the seat cushion 0.1 m from the first sofa and another target sofa should be placed 0.5 m from it on the left hand side. The sofa should be ignited using an igniter, as described in 5.5, that should be placed at the far left of the corner sofa, at the base of the backrest, near the left-hand wall (figure 7).

6.5 Test method

The fire tests should be conducted for 10 min after the activation of the first nozzle, and any remaining fire should be extinguished manually.

6.5.1 *Open public space tests*

Fire tests should be conducted with the ignition centered under one, between two and below four nozzles. An additional test should be conducted with the ignition centered under a disabled nozzle.

6.5.2 *Corner public space test*

The fire tests should be conducted with at least four nozzles arranged in a 2 x 2 matrix.

6.6 Acceptance criteria

Based on the measurements, a maximum 30 s average value should be calculated for each measuring point which forms the temperature acceptance criteria.

6.6.1 *Acceptance criteria for the public space tests*

		Maximum 30 s average ceiling surface temperature (°C)	Maximum 30 s average ceiling gas temperature (°C)	Maximum acceptable Damage on mattresses (%)
Open space	normal	360	220 ²	50/35 ¹
	disabled nozzle	N.A.	N.A.	70
Corner		360	220	50/35 ¹ (ignition sofa) No charring of target sofas

Notes:

- ¹ 50% is the upper limit for any single test. 35% is the upper limit for the average of the public space tests required in 6 at each ceiling height (excluding the disabled sprinkler test).
 - ² The gas temperature should be measured at four different positions and the evaluation of the results is based on the highest reading.
- N.A. means not applicable.

7 STORAGE AREA FIRE TESTS

7.1 Test arrangements

The fire tests should be conducted inside a well-ventilated fire test hall as described in paragraph 4.4 under a suspended ceiling as described in paragraph 6.1 installed at 2.5 m height.

7.2 Instrumentation

No temperature measurements are required.

7.3 Nozzle positioning

As per paragraph 6.3.

7.4 Fire source

The fire source should consist of two central, 1.5 m high, solid piled stacks of cardboard boxes packed with polystyrene unexpanded plastic cups upside down with a 0.3 m flue space. Each stack should be approximately 1.6 m long and 1.1 m to 1.2 m wide.

A suitable plastic commodity is the FMRC standard plastic commodity. Similar commodities might be used if they are designed in a similar way and are proven to have the same burning characteristics and suppressability. In each test, new dry commodities should be used.

The fire source should be surrounded by six 1.5 m high solid piled stacks of empty cardboard boxes forming a target array to determine if the fire will jump the aisle. The boxes should be attached to each other, for example by staples, to prevent them from falling over (figure 8).

7.5 Test method

Fire tests should be conducted with the ignition centred under one, between two and below four nozzles. Each fire should be ignited using two igniters as described in 5.5. The igniters should be placed on the floor, each against the base of one of the two central stacks and ignited simultaneously. The fire tests should be conducted for 10 min after the activation of the first nozzle, and any remaining fire should be extinguished manually.

When positioned between two nozzles, the gap between the two centric stacks of commodities should be positioned at 90° to the line between the nozzles.

7.6 Acceptance criteria

- .1 no ignition or charring of the target cartons is allowed; and
- .2 no more than 50% of the cartons filled with plastic cups should be consumed.”

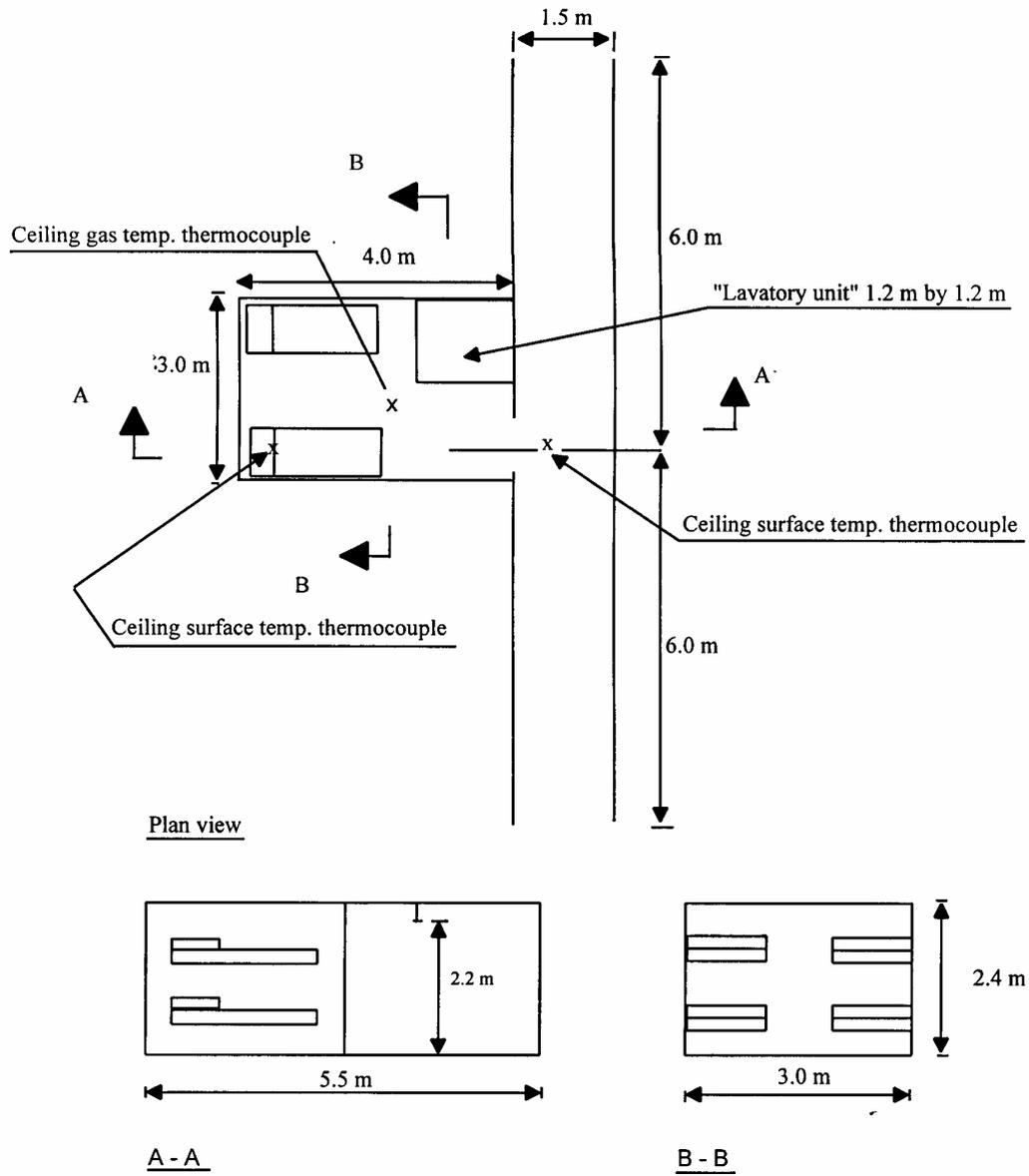


Figure 1

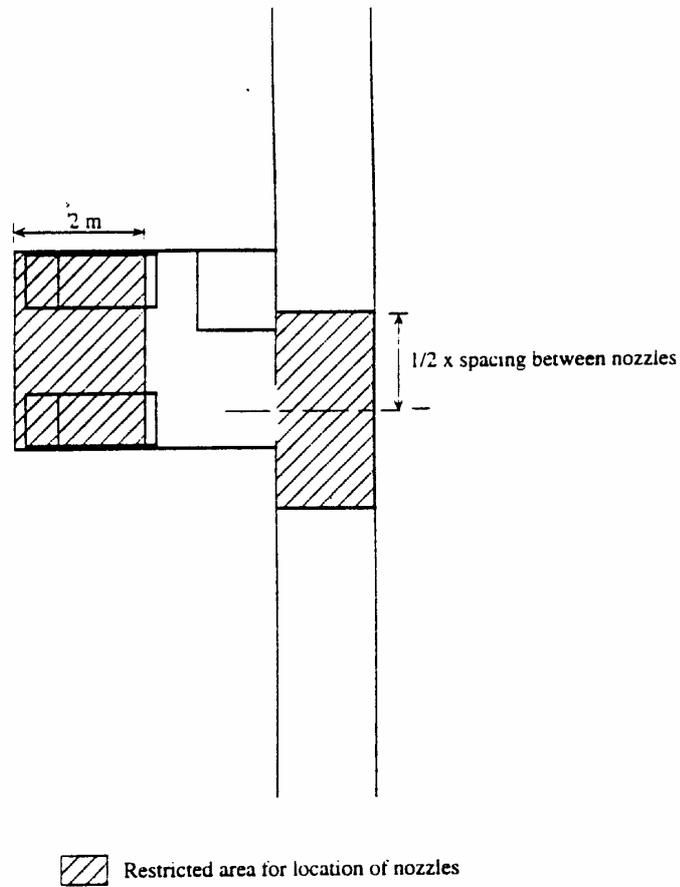


Figure 2

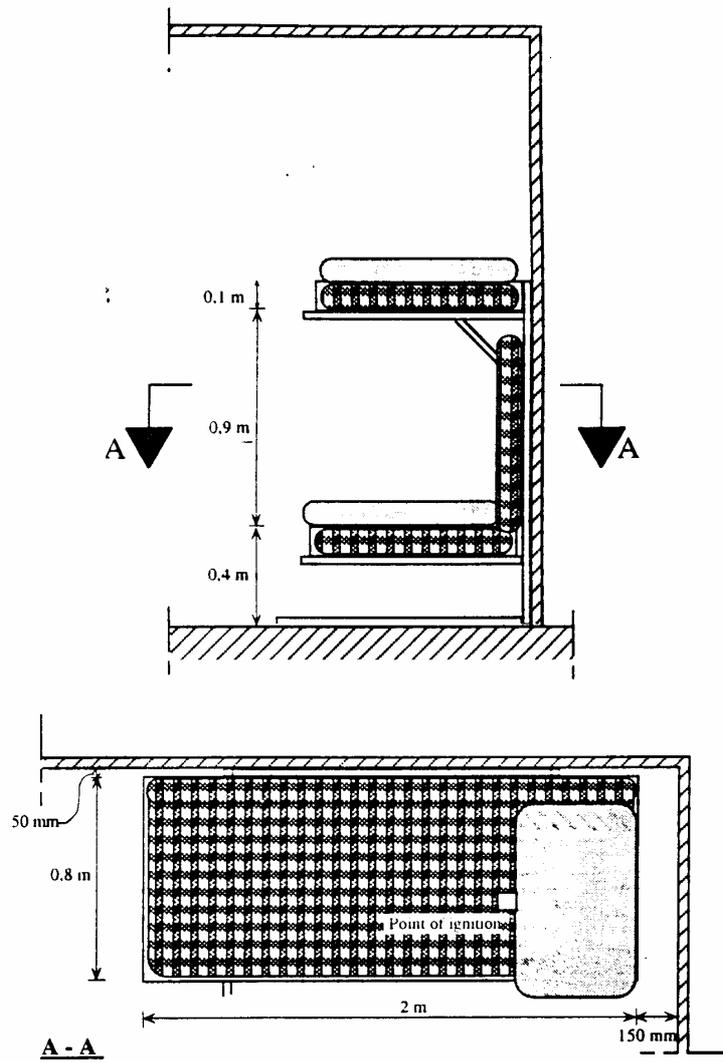


Figure 3

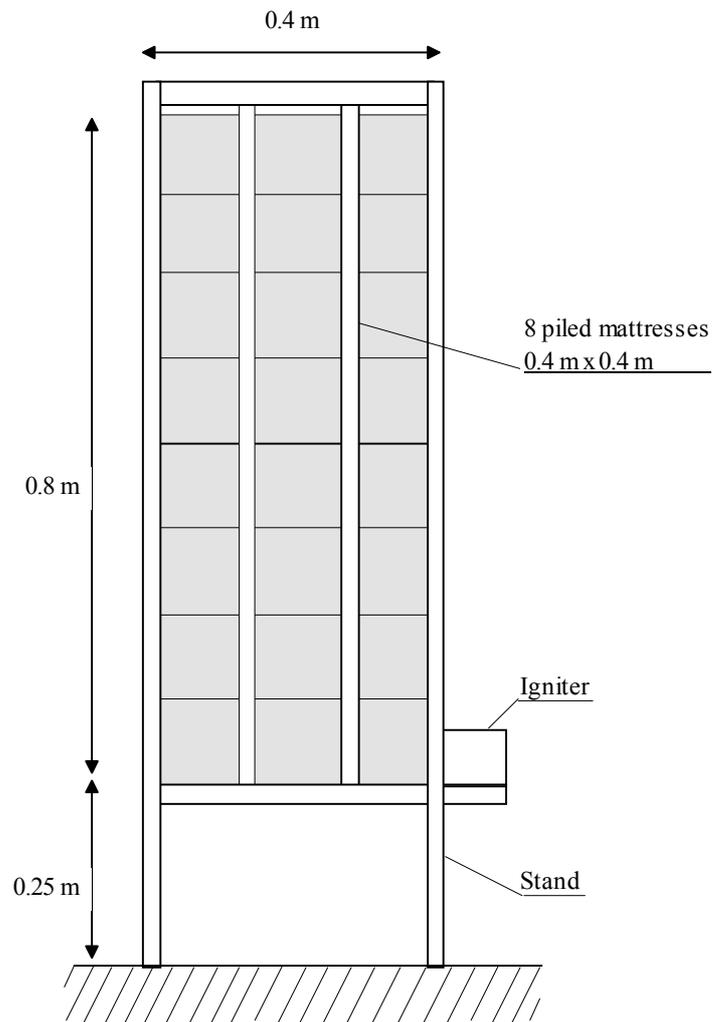
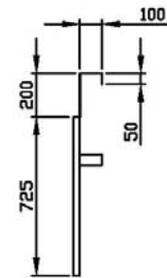
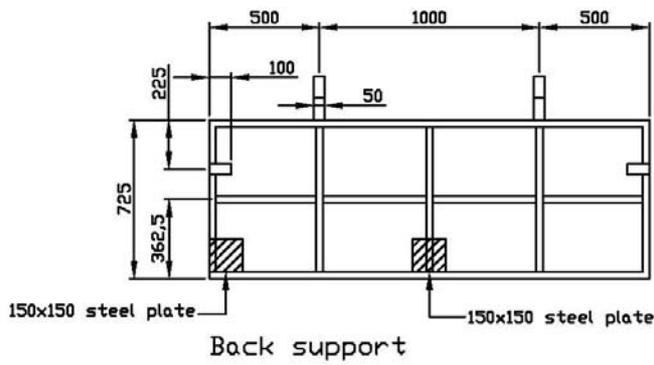
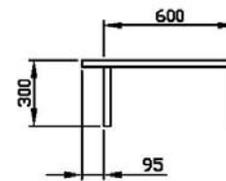
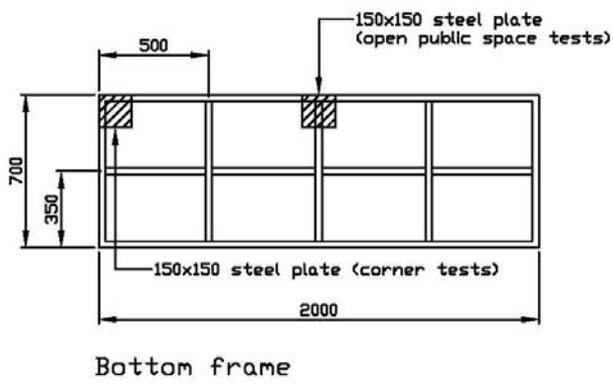


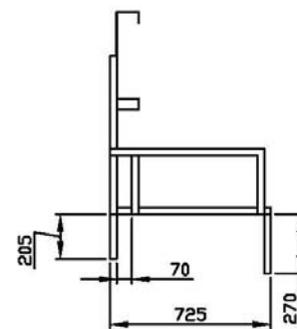
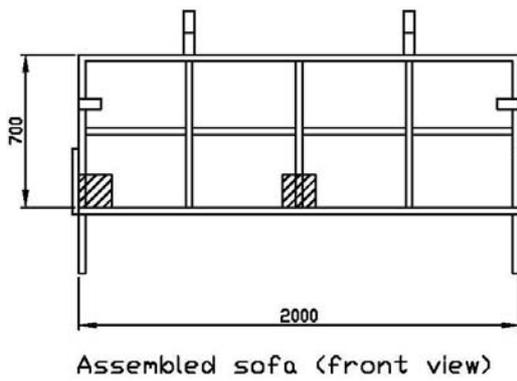
Figure 4



Back support (side view)



Armrest (2 pcs)



Assembled sofa (side view)

Figure 5

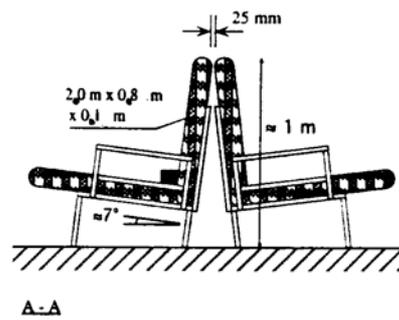
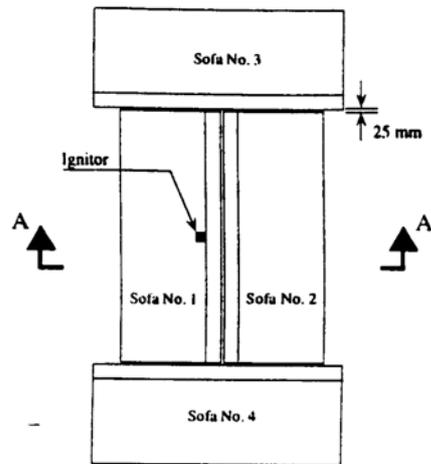
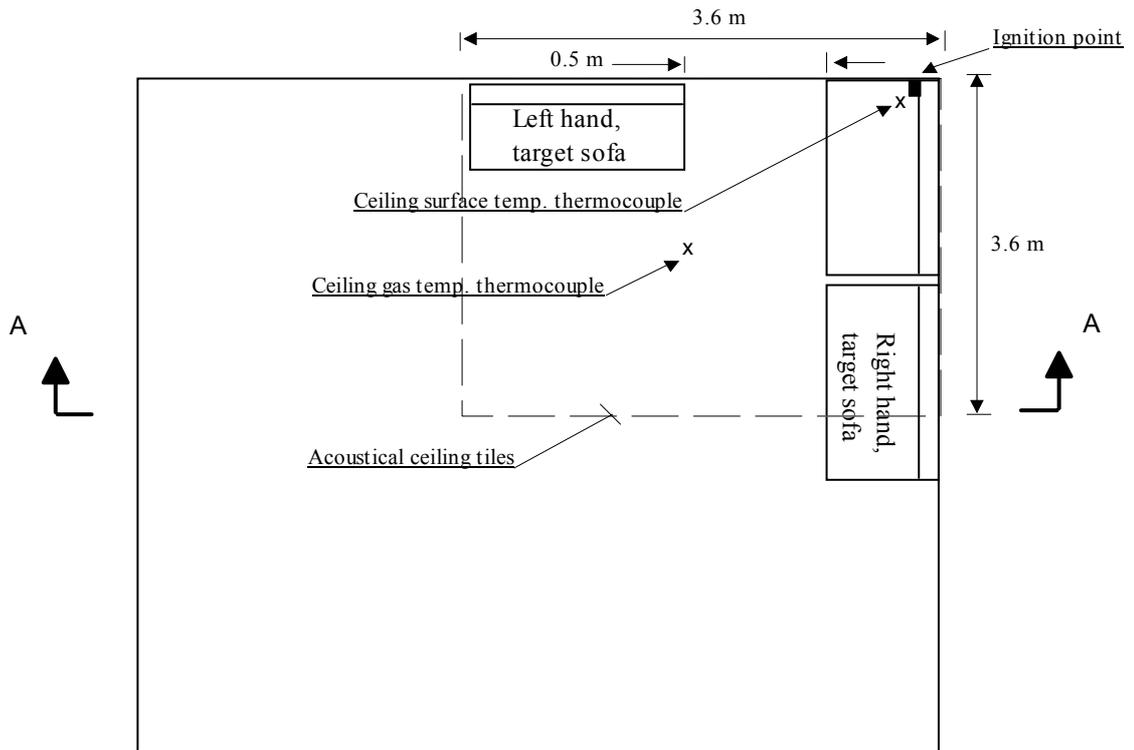
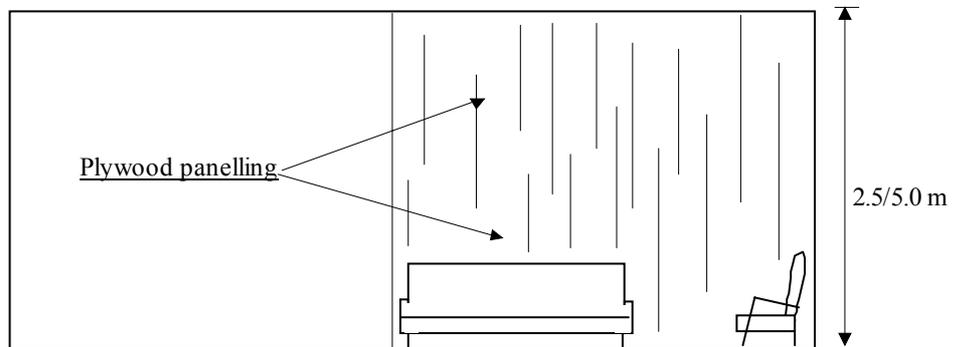


Figure 6

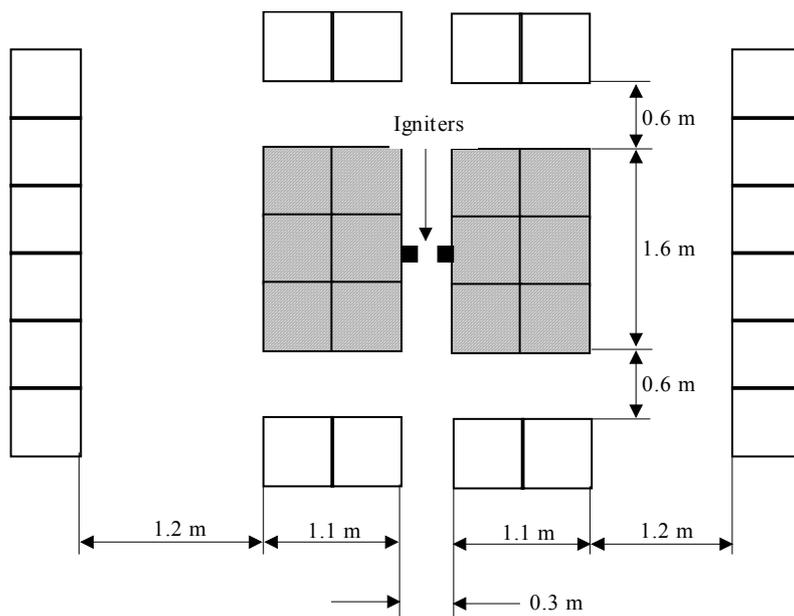


Plan view

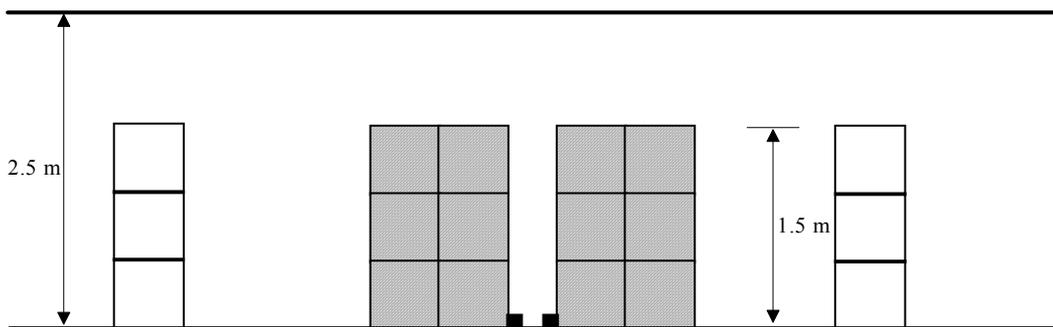


A - A

Figure 7



Plan view



Front view

-  Cardboard cartons packed with polystyrene plastic cups
-  Empty boxes as target arrays

Figure 8

ANNEX 4**DRAFT MSC CIRCULAR****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 Committee, at its eightieth session (11 to 20 May 2005), after having considered the proposal by the forty-ninth session of the Sub-Committee on Fire Protection regarding review on 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 (MSC/Circ.668, as amended by MSC/Circ.728), approved Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165).

2 The Committee, at its eighty-third session (3 to 12 October 2007), after having considered the proposal by the Sub-Committee on Fire Protection at its fifty-first session, approved amendments to figures 1, 2 and 3 of the Revised Guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165) by means of circular MSC.1/Circ.1237.

3 The Sub-Committee on Fire Protection, at its fifty-second session (14 to 18 January 2008), prepared further 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).

4 The Committee, at its [eighty-fourth session (7 to 16 May 2008)], after having considered the above proposal, approved the 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.

5 Member Governments are invited to apply the amendments to the Revised 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 on and after [date of approval of the circular].

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 15, the reference “paragraph 10” is replaced by the reference “paragraph 11”.
- 2 Appendix A is amended as follows:
 - .1 in paragraph 3.2, the round brackets around the reference “6.2” are changed to square brackets;
 - .2 paragraph 3.2.3 is inserted as follows:

“3.2.3 The nominal release temperature that should be marked on the nozzle should be that determined when the nozzle is tested in accordance with 4.6.1, taking into account the specifications of 3.3.”;
 - .3 in paragraph 3.5.1, last sentence, the words “or the nozzle should then comply with the requirements of 4.11” are deleted;
 - .4 paragraph 3.5.2 is replaced by the following:

“3.5.2 The nozzle discharge components should not sustain significant damage as a result of the functional test specified in 4.5 and should have the same flow constant range within 5 % of values previously determined per 3.4.1.”;
 - .5 in paragraph 3.7.2.1, the words “in accordance with 4.9.2.1” are deleted;
 - .6 in paragraph 3.7.2.2, the words “when tested in accordance with 4.9.2.2” are deleted;
 - .7 in paragraph 3.11.1, the references “4.12.1” and “4.12.2” are replaced by the references “4.11.1” and “4.11.2”, respectively;
 - .8 in paragraph 3.11.2, the references “4.12.3” and “4.12.2” are replaced by the references “4.11.3” and “4.11.2”, respectively;
 - .9 in paragraph 3.11.3, all references “4.12.4” are replaced by the reference “4.11.4”;
 - .10 in paragraph 3.11.4, all references “4.12.5” are replaced by the reference “4.11.5”;
 - .11 in paragraph 3.12.1, all references “4.13.1” are replaced by the reference “4.12.1”;
 - .12 in paragraph 3.12.2, all references “4.13.2” are replaced by the reference “4.12.2”;
 - .13 in paragraph 3.13, all references “4.15” are replaced by the reference “4.14”;
 - .14 in paragraph 3.15, all references “4.14” are replaced by the reference “4.13”;

- .15 paragraph 3.15.3 is deleted;
- .16 in paragraph 3.16, all references “4.16” are replaced by the reference “4.15”;
- .17 in paragraph 3.17, the reference “4.17” is replaced by the reference “4.16” and the reference “4.1” is replaced by the reference “4.16”;
- .18 in paragraph 3.18, the references “4.18” and “4.21” are replaced by the reference “4.17”;
- .19 in paragraph 3.19, the references “4.19” and “4.22” are replaced by the reference “4.18”;
- .20 in paragraph 3.20, all references “4.23” are replaced by the reference “4.19”;
- .21 section 3.21 (Water shield) is deleted but existing paragraph numbers should be retained.
- .22 in paragraph 3.22, the references “4.21” and “4.21.3” are replaced by the references “4.20” and “4.20.3”, respectively;
- .23 in paragraph 4.3, the reference “(see 3.6)” is added before the reference “[7.3]”;
- .24 in paragraph 4.6.2, the reference “(see 3.4)” is replaced by the reference “(3.14)”;
- .25 in paragraph 4.11.1.5, the reference “3.1.5” is replaced by the reference “3.5.1”;
- .26 in paragraph 4.11.2.4, the references “4.12.5.5” and “4.12.5.6” are replaced by the references “4.11.1.5” and “4.11.2.6”, respectively;
- .27 in paragraph 4.11.2.5, the reference “4.12.5.2” is replaced by the reference “4.11.2.2”;
- .28 in paragraph 4.11.2.6, the reference “4.12.5.1” is replaced by the reference “4.11.2.2”;
- .29 in paragraph 4.11.4.2, the reference “4.12.3.1” is replaced by the reference “4.11.4.1”;
- .30 in paragraph 4.12.2, the reference “3.1.12.2” is replaced by the reference “3.12.2”;
and
- .31 in paragraph 4.18.2, the reference “3.2.4” is replaced by the reference “3.8”.

3 Appendix B is amended as follows:

- .1 in paragraph 4.3.2.2.1, the words “with the top of the rim 0.85 m below the plate” are inserted after the words “as shown in table 1 and figure 2”;
- .2 in paragraph 4.3.2.2.2, the first and second sentences are replaced as follows:

“Except for the flowing fire, 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. For the flowing fire, the 4 m² fire tray below the engine mock-up should be filled with a 50 mm water base and the 3 m² fire tray on top of the engine mock-up should be filled with a 40 mm water base.”;
- .3 the existing paragraph 4.5.1 is replaced by the following:

“Except for the flowing fire, the trays used in the test should be filled with at least 50 mm fuel on a water base. Freeboard should be 150 ± 10 mm. For the flowing fire, 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.”; and
- .4 in paragraph 4.5.4.1, the words “and thermal management tests” are inserted after the words “the fuel tray fires”.

ANNEX 5

DRAFT MSC CIRCULAR

**REVISED GUIDELINES FOR THE APPROVAL OF FIXED AEROSOL
FIRE-EXTINGUISHING SYSTEMS EQUIVALENT TO FIXED GAS
FIRE-EXTINGUISHING SYSTEMS, AS REFERRED TO IN SOLAS 74,
FOR MACHINERY SPACES**

1 The Maritime Safety Committee, at its seventy-fourth session (30 May to 8 June 2001), approved Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces (MSC/Circ.1007).

2 The Sub-Committee on Fire Protection, at its fifty-second session (14 to 18 January 2008), reviewed the Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces (MSC/Circ.1007) and revised the Guidelines.

3 The Committee, at its [eighty-fourth session (7 to 16 May 2008)], after having considered the above proposal, approved the Revised Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces, as set out in the annex.

4 Member Governments are invited to apply the Revised Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces on and after [*date of approval of the circular*] and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.

5 This circular supersedes circular MSC/Circ.1007.

ANNEX

REVISED GUIDELINES FOR THE APPROVAL OF FIXED AEROSOL FIRE-EXTINGUISHING SYSTEMS EQUIVALENT TO FIXED GAS FIRE-EXTINGUISHING SYSTEMS, AS REFERRED TO IN SOLAS 74, FOR MACHINERY SPACES

General

1 Fixed aerosol fire-extinguishing systems for use in machinery spaces of category A equivalent to fire-extinguishing systems required by SOLAS regulation II-2/10.5 should prove that they have the same reliability which has been identified as significant for the performance of fixed gas fire-extinguishing systems approved under the requirements of the FSS Code, chapter 5. In addition, the system should be shown, by testing according to the appendix, to have the capability of extinguishing a variety of fires that can occur in machinery spaces.

2 Aerosol fire-extinguishing systems involve the release of a chemical agent to extinguish a fire by interruption of the process of the fire.

There are two methods considered for applying the aerosol agent to the protected space:

- .1 condensed aerosols are created in pyrotechnical generators through the combustion of the agent charge; and
- .2 dispersed aerosols that are not pyrotechnically generated and are stored in containers with carrier agents (such as inert gases or halocarbon agents) with the aerosol released in the space through valves, pipes and nozzles.

Definitions

3 *Aerosol* is a fire-extinguishing medium consisting of finely divided solid particles of chemicals released into a protected space as either condensed aerosol or dispersed aerosol.

4 *Generator* is a device for creating a fire-extinguishing medium by pyrotechnical means.

5 *Efficiency coefficient* is the percentage (%) of aerosol forming composition actually discharged from a specific aerosol generator. It is determined by comparing the mass loss of a generator after discharge to its beginning mass.

6 *Design application density (g/m³)* is the mass of an aerosol forming composition per m³ of the enclosure volume required to extinguish a specific type of fire, including a safety factor of 1.3 times the test density.

7 *Agent – medium* for the purpose of these guidelines, these words are interchangeable.

Principal requirements

8 The design application density should be determined and verified by the full-scale testing described in the test method, as set out in appendix 1.

9 The delivered density for each type of generator should be determined and verified by the test method set out in appendix 2.

10 The system discharge time should not exceed 120 s. Systems may need to discharge in a shorter time for other reasons than for fire-extinguishing performance.

11 The quantity of extinguishing agent for the protected space should be calculated at the minimum expected ambient temperature using the design density based on the net volume of the protected space, including the casing.

11.1 The net volume of a protected space is that part of the gross volume of the space, which is accessible to the fire-extinguishing agent.

11.2 When calculating the net volume of a protected space, the net volume should include the volume of the bilge, the volume of the casing and the volume of free air contained in air receivers that in the event of a fire may be released into the protected space.

11.3 The objects that occupy volume in the protected space should be subtracted from the gross volume of the space. They include, but are not necessarily limited to:

- .1 auxiliary machinery;
- .2 boilers;
- .3 condensers;
- .4 evaporators;
- .5 main engines;
- .6 reduction gears;
- .7 tanks; and
- .8 trunks.

11.4 Subsequent modifications to the protected space that alter the net volume of the space should require the quantity of extinguishing agent to be adjusted to meet the requirements of this paragraph and paragraphs 10.1, 10.2, 10.3, 10.4, 12.2, 12.3, 12.4 and 12.5.

12 No fire suppression system should be used which is carcinogenic, mutagenic or teratogenic at application densities expected during use. The discharge of aerosol systems to extinguish a fire could create a hazard to personnel from the natural form of the aerosol, or from certain products of aerosol generation (including combustion products and trace gases from condensed aerosols). Other potential hazards that should be considered for individual systems are the following: noise from discharge, turbulence, cold temperature of vaporizing liquid, reduced visibility, potential toxicity, thermal hazard and potential toxicity from the aerosol generators, and eye irritation from direct contact with aerosol particles. Unnecessary exposure to aerosol media, even at concentrations below an adverse effect level, and to their decomposition products should be avoided. All aerosols used in fire-extinguishing systems should have non-ozone depleting characteristics.

12.1 All systems should be designed to allow evacuation of the protected spaces prior to discharge through the use of two separate controls for releasing the extinguishing medium. Means should also be provided for automatically giving visual and audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarms should operate for the period of time necessary to evacuate the space, but not less than 20 s before the medium is released.

12.2 Condensed aerosol systems for spaces that are normally occupied should be permitted in concentrations where the aerosol particulate density does not exceed the adverse effect level as determined by a scientifically accepted technique* and any combustion products and trace gases produced by the aerosol generating reaction do not exceed the appropriate excursion limit for the critical toxic effect as determined in acute inhalation toxicity tests.

12.3 Dispersed aerosol systems for spaces that are normally occupied should be permitted in concentrations where the aerosol particulate density does not exceed the adverse effect level as determined by a scientifically accepted technique. Even at concentrations below an adverse affect level, exposure to extinguishing agents should not exceed 5 min. If the carrier gas is a halocarbon, it may be used up to its No Observed Adverse Affect Level (NOAEL) calculated on the net volume of the protected space at the maximum expected ambient temperature without additional safety measures. If a halocarbon carrier gas is to be used above its NOAEL, means should be provided to limit exposure to no longer than the corresponding maximum permitted human exposure time specified according to a scientifically accepted physiologically based pharmacokinetic** (PBPK) model or its equivalent which clearly establishes safe exposure limits both in terms of extinguishing media concentration and human exposure time.

12.4 If the carrier is an inert gas, means should be provided to limit exposure to no longer than 5 min for inert gas systems designed to concentrations below 43% (corresponding to an oxygen concentration of 12%, sea level equivalent of oxygen) or to limit exposure to no longer than 3 min for inert gas systems designed to concentrations between 43% and 52% (corresponding to between 12% and 10% oxygen, sea level equivalent of oxygen) calculated on the net volume of the protected space at the maximum expected ambient temperature.

12.5 In no case should a dispersed aerosol system be used with halocarbon carrier gas concentrations above the Lowest Observed Adverse Effect Level (LOAEL) nor the Approximate Lethal Concentration (ALC) nor should a dispersed aerosol system be used with an inert gas carrier at gas concentrations above 52% calculated on the net volume of the protected space at the maximum expected ambient temperature.

13 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging, electromagnetic compatibility and corrosion normally encountered in machinery spaces. Generators in condensed aerosol systems should be designed to prevent self-activation at a temperature below 250°C.

* Reference is made to the United States' EPAs Regional Deposited Dose Ratio Program "Methods of Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry" EPA/600/8-90/066F. October 1994.

** Refer to document FP 44/INF.2 (United States) – Physiologically based pharmacokinetic model to establish safe exposure criteria for halocarbon fire-extinguishing agents.

14 The system and its components should be designed, manufactured and installed in accordance with standards acceptable to the Organization. As a minimum, the design and installation standards should cover the following elements:

- .1 safety:
 - .1 toxicity;
 - .2 noise, generator/nozzle discharge;
 - .3 decomposition products;
 - .4 obscuration; and
 - .5 minimum safe distance required between generators and escape routes and combustible materials;
- .2 storage container design and arrangement:
 - .1 strength requirements;
 - .2 maximum/minimum fill density, operating temperature range;
 - .3 pressure and weight indication;
 - .4 pressure relief; and
 - .5 agent identification, production date, installation date and hazard classification;
- .3 agent supply, quantity, quality standards, shelf life and service life of agent and igniter;
- .4 handling and disposal of generator after service life;
- .5 pipes and fittings:
 - .1 strength, material properties, fire resistance; and
 - .2 cleaning requirements;
- .6 valves:
 - .1 testing requirements; and
 - .2 elastomer compatibility;
- .7 generators/nozzles:
 - .1 height and area testing requirements;

- .2 elevated temperature resistance; and
- .3 mounting location requirements considering safe distances to escape routes and combustible materials;
- .8 actuation and control systems:
 - .1 testing requirements; and
 - .2 backup power requirements;
- .9 alarms and indicators:
 - .1 pre-discharge alarm, agent discharge alarms and time delays;
 - .2 supervisory circuit requirements;
 - .3 warning signs, audible and visual alarms; and
 - .4 annunciation of faults;
- .10 enclosure integrity and leakage requirements:
 - .1 enclosure leakage;
 - .2 openings; and
 - .3 mechanical ventilation interlocks;
- .11 electrical circuits for pyrotechnic generators
 - .1 requirements for mounting and protection of cables;
- .12 design density requirements, total flooding quantity;
- .13 agent flow calculation:
 - .1 verification and approval of design calculation method;
 - .2 fitting losses and/or equivalent length; and
 - .3 discharge time;
- .14 inspection, maintenance, service and testing requirements; and
- .15 handling and storage requirements for pyrotechnical components.

15 The generator/nozzle type, maximum generator/nozzle spacing, maximum generator/nozzle installation height and minimum generator/nozzle pressure should be within limits tested.

- 16 Installations should be limited to the maximum volume tested.
- 17 Where agent containers are stored within a protected space, the containers should be evenly distributed throughout the space and meet the following provisions:
- .1 a manually initiated power release, located outside the protected space, should be provided. Duplicate sources of power should be provided for this release and should be located outside the protected space and be immediately available;
 - .2 electric power circuits connecting the generators should be monitored for fault conditions and loss of power. Visual and audible alarms should be provided to indicate this;
 - .3 pneumatic, electric or hydraulic power circuits connecting the generators should be duplicated and widely separated. The sources of pneumatic or hydraulic pressure should be monitored for loss of pressure. Visual and audible alarms should be provided to indicate this;
 - .4 within the protected space, electrical circuits essential for the release of the system should be fire resistant according to standard IEC 60331 or equivalent standards. Piping systems essential for the release of systems designed to be operated hydraulically or pneumatically should be of steel or other equivalent heat-resisting material to the satisfaction of the Administration;
 - .5 each dispersed aerosol pressure container should be fitted with an automatic overpressure release device which, in the event of the container being exposed to the effects of fire and the system not being operated, will safely vent the contents of the container into the protected space;
 - .6 the arrangement of generators and the electrical circuits and piping essential for the release of any system should be such that in the event of damage to any one power release line or generator through mechanical damage, fire or explosion in a protected space, i.e., a single fault concept, at least the amount of agent needed to achieve the test density can still be discharged having regard to the requirement for uniform distribution of medium throughout the space; and
 - .7 dispersed aerosol containers should be monitored for decrease in pressure due to leakage and discharge. Visual and audible alarms in the protected area and on the navigation bridge, in the onboard safety centre or in the space where the fire control equipment is centralized should be provided to indicate this condition.
- 18 The release of an extinguishing agent may produce significant over and under pressurization in the protected space. Constructive measures to limit the induced pressures to acceptable limits may have to be provided.
- 19 For all ships, the fire-extinguishing system design manual should address recommended procedures for the control and disposal of products of agent decomposition. The performance of fire-extinguishing arrangements on passenger ships should not present health hazards from decomposed extinguishing agents, (e.g., on passenger ships, the decomposition products should not be discharged in the vicinity of assembly stations).

20 Spare parts and operating and maintenance instructions, including operational tests for the system should be provided as recommended by the manufacturer.

21 The temperature profile of the discharge stream from condensed aerosol generators should be measured in accordance with appendix 1. This data should be used to establish the minimum safe distances away from the generator where the discharge temperatures do not exceed 75°C and 200°C.

22 The casing temperature of condensed aerosol generators should be measured in accordance with appendix 1. This data should be used to establish the minimum safe distances away from the generator where the discharge temperatures do not exceed 75°C and 200°C.

23 Generators should be separated from escape routes and other areas where personnel may be present by at least the minimum safe distances determined in paragraphs 21 and 22 above for exposure to 75°C.

24 Generators should be separated from combustible materials by at least the minimum safe distances determined in paragraphs 21 and 22 above for exposure to 200°C.

25 The useful life of condensed aerosol generators should be determined by the manufacturer for the temperature range and conditions likely to be encountered on board ships. Generators should be replaced before the end of their useful life. Each generator should be permanently marked with the date of manufacture and the date of mandatory replacement.

APPENDIX 1

TEST METHOD FOR FIRE TESTING OF FIXED AEROSOL FIRE-EXTINGUISHING SYSTEMS

1 SCOPE

1.1 This test method is intended for evaluating the extinguishing effectiveness of fixed aerosol fire-extinguishing systems for the protection of machinery spaces of category A.

1.2 The test method is applicable to aerosols and covers the minimum requirements for fire-extinguishing.

1.3 The test programme has two objectives:

- .1 establishing the extinguishing effectiveness of a given agent at its tested concentration; and
- .2 establishing that the particular agent distribution system puts the agent into the enclosure in such a way as to fully flood the volume to achieve an extinguishing concentration at all points.

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 METHOD OF TEST

3.1 Principle

This test procedure is intended for the determination of the effectiveness of different aerosol agent extinguishing systems against spray fires, pool fires and class A fires. It also establishes the minimum safe distances from condensed aerosol generators to personnel and combustible materials.

3.2 Apparatus

3.2.1 *Test room*

The tests should be performed in 100 m² room, with no horizontal dimension less than 8 m, with a ceiling height of 5 m. The test room should be provided with a closable access door measuring approximately 4 m² in area. In addition, closable ventilation hatches measuring at least 6 m² in total area should be located in the ceiling. A larger room may be employed if approvals are sought for larger volumes.

3.2.2 *Integrity of test enclosure*

The test enclosure should be nominally leaktight when doors and hatches are closed. The integrity of seals on doors, hatches and other penetrations (e.g., instrumentation access ports) should be verified before each test.

3.2.3 *Engine mock-up*

3.2.3.1 An engine mock-up of size (width x length x height) 1 m x 3 m x 3 m should be constructed of sheet steel with a nominal thickness of 5 mm. The mock-up should be fitted with two steel tubes diameter 0.3 m and 3 m length that simulate exhaust manifolds and a solid steel plate. At the top of the mock-up, a 3 m² tray should be arranged (see figures 1, 2 and 3).

3.2.3.2 A floor plate system 4 m x 6 m x 0.75 m high should surround the mock-up. Provision should be made for placement of the fuel trays, as described in table 1, and located as described in table 2.

3.2.4 *Instrumentation*

Instrumentation for the continuous measurement and recording of test conditions should be employed. The following measurements should be made:

- .1 temperature of the generator casing;
- .2 temperature of the generator discharge stream measured at 0.5 m, 1.0 m and 2.0 m away from the discharge ports;
- .3 temperature at three vertical positions (e.g., 1 m, 2.5 m and 4.5 m);
- .4 enclosure pressure;
- .5 gas sampling and analysis, at mid-room height, for oxygen, carbon dioxide, carbon monoxide and other relevant products;
- .6 means of determining flame-out indicators;
- .7 fuel nozzle pressure in the case of spray fires;
- .8 fuel flow rate in the case of spray fires;
- .9 discharge nozzle pressure; and
- .10 means of determining generator discharge duration.

3.2.5 *Generators/nozzles*

3.2.5.1 For test purposes, generators/nozzles should be located as recommended by the manufacturer.

3.2.5.2 If more than one generator/nozzle is used, they should be symmetrically located.

3.2.6 Enclosure temperature

The ambient temperature of the test enclosure at the start of the test should be noted and serve as the basis for calculating the concentration that the agent would be expected to achieve at that temperature and with that agent weight applied in the test volume.

3.3 Test fires and programme

3.3.1 Fire types

The test programme, as described in table 3, should employ test fires as described in table 1 below.

Table 1
Parameters of test fires

Fire	Type	Fuel	Fire size, MW	Remarks
A	76 – 100 mm ID can	Heptane	0.0012 to 0.002	Tell tale
B	0.25 m ² tray	Heptane	0.35	(See Note 1)
C	2 m ² tray	Diesel/fuel oil	3	(See Note 1)
D	4 m ² tray	Diesel/fuel oil	6	
E	Low pressure, low flow spray	Heptane 0.03 ± 0.005 kg/s	1.1	
F	Wood crib	Spruce or fir	0.3	(See Note 2)
G	0.10 m ² tray	Heptane	0.14	
H	Polymeric sheets	PMMA, Polypropylene, ABS		(See Note 3)

Notes to table 1:

- 1 Diesel/Fuel oil means light diesel or commercial fuel oil.
- 2 The wood crib should be substantially the same as described in standard ISO 14520-1: 2006 (Gaseous fire extinguishing systems, Physical properties and system design, Part 1: General Requirements). The crib should consist of six members of trade size 50 mm x 50 mm x 450 mm, kiln dried spruce or fir lumber having a moisture content between 9 and 13%. The members should be placed in 4 alternate layers at right angles to one another. Members should be evenly spaced forming a square structure. Ignition of the crib should be achieved by burning commercial grade heptane in a square steel tray 0.25 m² in area. During the pre-burn period the crib should be placed centrally above the top of the tray a distance of 300 to 600 mm.
- 3 The polymeric sheet test should be substantially the same as described in standard ISO 14520-1: 2006 (Gaseous fire extinguishing systems, Physical properties and system design, Part 1: General Requirements).

Table 2
Spray fire test parameters

Fire type	Low pressure, low flow (E)
Spray nozzle	Wide spray angle (80°) full cone type
Nominal fuel pressure	8.5 Bar
Fuel flow	0.03 ± 0.005 kg/s
Fuel temperature	20 ± 5°C
Nominal heat release rate	1.1 ± 0.1 MW

3.3.2 Test programme

3.3.2.1 The fire test programme should employ test fires singly or in combination, as outlined in table 3 below.

Table 3
Test programme

Test No.	Fire combinations (see table 1)
1	A: Tell tales, 8 corners. (see note)
2	B: 0.25 m ² heptane tray under mock-up G: 0.10 m ² heptane tray on deck plate located below solid steel obstruction plate Total fire load: 0.49 MW
3	C: 2 m ² diesel/fuel oil tray on deck plate located below solid steel obstruction plate F: Wood crib positioned as in figure 1 E: Low pressure, low flow horizontal spray – concealed – with impingement on inside of engine mock-up wall. H: Polymeric sheets positioned as in figure 1 Total fire load: 4.4 MW
4	D: 4 m ² diesel tray under engine mock-up Total fire load: 6 MW

Note to table 3:

- 1 Tell-tale fire cans should be located as follows:
 - .1 in upper corners of enclosure 150 mm below ceiling and 50 mm from each wall; and
 - .2 in corners on floors 50 mm from walls.

3.3.2.2 All applicable tests of table 3 should be conducted for every new fire-extinguishing media.

3.3.2.3 Only test 1 is required to evaluate new nozzles and related distribution system equipment (hardware) for systems employing fire-extinguishing media that have successfully completed the requirements of paragraph 3.3.2.2 above. Test 1 should be conducted to establish and verify the manufacturer's minimum nozzle design pressure.

3.4 Extinguishing system

3.4.1 *System installation*

The extinguishing system should be installed according to the manufacturer's design and installation instructions. The maximum vertical distance should be limited to 5 m.

3.4.2 *Agent*

3.4.2.1 Design application density

The agent design application density is the net mass of agent per unit volume (g/m^3) required by the system designer for the fire protection application.

3.4.2.2 Test density

The test density of agent to be used in the fire-extinguishing tests should be the design application density specified by the manufacturer, except for test 1, which should be conducted at not more than 77% of the manufacturer's recommended design application density.

3.4.2.3 Quantity of aerosol agent

The quantity of aerosol agent to be used should be determined as follows:

$$W = \frac{V \times q}{f} \text{ (g)},$$

where:

- W = agent mass (g);
- V = volume of test enclosure (m^3);
- q = design application density (g/m^3); and
- f = efficiency coefficient of the manufacturer's generator (%)

3.5 Procedure

3.5.1 *Fuel levels in trays*

The trays used in the test should be filled with at least 30 mm fuel on a water base. Freeboard should be 150 ± 10 mm.

3.5.2 *Fuel flow and pressure measurements*

For spray fires, the fuel flow and pressure should be measured before and during each test.

3.5.3 *Ventilation*

3.5.3.1 Pre-burn period

During the pre-burn period the test enclosure should be well ventilated. The oxygen concentration, as measured at mid-room height, should not be less than 20% volume at the time of system discharge.

3.5.3.2 End of pre-burn period

Doors, ceiling hatches and other ventilation openings should be closed at the end of the pre-burn period.

3.5.4 *Duration of test*

3.5.4.1 Pre-burn time

Fires should be ignited such that the following burning times occur before the start of agent discharge:

- .1 sprays – 5 to 15 s;
- .2 trays – 2 min;
- .3 crib – 3 separate tests, one of 2 min, one of 4 min and one of 6 min; and
- .4 polymeric sheets – 210 s.

3.5.4.2 Discharge time

Aerosol agents should be discharged at a rate sufficient to achieve 100% of the minimum design density in 120 s or less.

3.5.4.3 Hold time

After the end of agent discharge the test enclosure should be kept closed for 15 min.

3.5.5 *Measurements and observations*

3.5.5.1 Before test:

- .1 temperature of test enclosure, fuel and engine mock-up;
- .2 initial weights of agent containers;
- .3 verification of integrity agent distribution system and nozzles; and
- .4 initial weight of wood crib.

3.5.5.2 During test:

- .1 start of the ignition procedure;
- .2 start of the test (ignition);
- .3 time when ventilating openings are closed;
- .4 time when the extinguishing system is activated;
- .5 time from end of agent discharge;
- .6 time when the fuel flow for the spray fire is shut off;
- .7 time when all fires are extinguished;
- .8 time of re-ignition, if any, during hold time;
- .9 time at end of hold time;
- .10 at the start of test initiate continuous monitoring as per paragraph 3.2.4 above; and
- .11 for condensed aerosol generators:
 - .1 temperature of the casing during the fire test and hold time period; and
 - .2 temperature profile of the generator discharge stream versus distance away from the discharge ports.

3.5.6 *Tolerances*

Unless otherwise stated, the following tolerances should apply:

- .1 length $\pm 2\%$ of value;
- .2 volume $\pm 5\%$ of value;
- .3 pressure $\pm 3\%$ of value;
- .4 temperature $\pm 5\%$ of value; and
- .5 concentration $\pm 5\%$ of value.

These tolerances are in accordance with ISO 6182-1: 2004.

4 CLASSIFICATION CRITERIA

4.1 Class B fires should be extinguished within 30 s of the end of discharge. At the end of the hold period there should be no re-ignition upon opening the enclosure.

4.2 The fuel spray should be shut off 15 s after extinguishments. At the end of the hold time, the fuel spray should be restarted for 15 s prior to reopening the door and there should be no re-ignition.

4.3 The ends of the test fuel trays should contain sufficient fuel to cover the bottom of the tray.

4.4 The wood crib weight loss should be no more than 30% during the 2 min pre-burn test, 50% during the 4 min pre-burn test and 60% during the 6 min pre-burn test.]

4.5 A re-ignition test should be conducted after the successful extinguishments of the tell-tale fires in test 1 (Fire A) within 30 s after completion of discharge. The test should involve the attempted ignition of two of the tell-tale fire containers. One container should be at the floor level and the other at the ceiling level at the diagonally opposite corner. At 10 min after extinguishment of the fires, a remotely operated electrical ignition source should be energized for at least 10 s at each container. The test should be repeated at 2 min intervals two more times, the last at 14 min after extinguishment. Sustained burning for 30 s or longer of any of these ignition attempts constitutes a re-ignition test failure.

4.6 For the polymeric sheets, the laboratory extinguishing factor for each fuel is that which achieves satisfactory extinguishment of the fire over three successive tests (no flaming 60 s after end of discharge and no re-ignition after 10 min from end of discharge). The design factor is the highest of the laboratory extinguishing factors for the three fuels multiplied by 1.3.

5 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 system components;
- .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;
 - .1 drawings;
 - .2 descriptions;
 - .3 assembly instructions;

- .4 specification of included materials; and
- .5 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 identification of the test equipment and used instruments;
- .14 conclusions;
- .15 deviations from the test method, if any;
- .16 test results including measurements and observations during and after the test; and
- .17 date and signature.

APPENDIX 2

TEST METHOD FOR DETERMINATION OF AEROSOL GENERATOR EFFICIENCY COEFFICIENT

1 SCOPE

1.1 This test method is intended for measuring the mass of aerosol forming composition that is actually discharged by a fixed aerosol generator.

1.2 The test method is applicable to condensed aerosols.

1.3 The objective of the test programme is to establish the difference between the total mass of aerosol forming composition in the generator and the mass of composition that is discharged.

2 METHOD

2.1 The mass of aerosol forming composition in each type generator should be specified by the manufacturer.

2.2 The gross weight of each type generator should be determined by weighing on a laboratory scale.

2.3 An average of five generators should be discharged in an appropriate facility. After the generators have cooled, the average net weight of the empty generators should be determined using the same laboratory scale used in paragraph 2.2.

3 CLASSIFICATION CRITERIA

3.1 The efficiency coefficient (%) should be determined by subtracting the average weight of the generator after discharge from the weight prior to discharge, and dividing by the manufacturer's stated mass of aerosol forming composition.

ANNEX 6**DRAFT MSC CIRCULAR****GUIDELINES FOR HIGH EXPANSION FOAM USING INSIDE AIR FOR
THE PROTECTION OF MACHINERY SPACES AND CARGO PUMP-ROOMS**

1 The Committee, at its [eighty-fourth session (7 to 16 May 2008)], having considered the proposal by the fifty-second session of the Sub-Committee on Fire Protection, approved Guidelines for high expansion foam using inside air for the protection of machinery spaces and cargo pump-rooms, as set out in the annex.

2 Member Governments are invited to apply the attached Guidelines when approving inside air foam systems for ships of which the building contract is placed on or after 1 July 2009 and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.

ANNEX

GUIDELINES FOR THE APPROVAL OF INSIDE AIR FOAM SYSTEMS FOR THE PROTECTION OF MACHINERY SPACES AND CARGO PUMP-ROOMS

1 GENERAL

These guidelines apply to fixed high-expansion foam systems using inside air for the protection of machinery spaces in accordance with SOLAS regulation II-2/10.4.1.1, and cargo pump-rooms in accordance with regulation II-2/10.9.1.2. These guidelines do not apply to cargo pump-rooms of chemical tankers carrying liquid cargoes referred to in SOLAS regulation II-2/1.6.2. Fixed high expansion foam fire-extinguishing systems using inside air should demonstrate by test that they have the capability of extinguishing a variety of fires, which may occur in a ship's engine-room. Systems complying with these guidelines are not subject to the criteria stated in chapter 6 of the FSS Code.

2 DEFINITIONS

2.1 *Foam* is the extinguishing medium produced when foam solution passes through a foam generator and is mixed with air.

2.2 *Foam solution* is a solution of foam concentrate and water.

2.3 *Foam concentrate* is the liquid which, when mixed with water in the appropriate concentration forms a foam solution.

2.4 *Foam mixing rate* is the percentage of foam concentrate mixed with water forming the foam solution.

2.5 *Foam generators* are discharge devices or assemblies through which foam solution is aerated to form foam that is discharged directly into the protected space, typically consisting of a nozzle or set of nozzles and a casing. The casing is typically made of perforated steel / stainless steel plates shaped into a box that enclose the nozzle(s).

2.6 *Inside air foam system* is a fixed high expansion foam fire extinguishing system with foam generators located inside the protected space and drawing air from that space. A high expansion foam system using inside air consists of both the foam generators and the foam concentrate.

2.7 *Nominal flow rate* is the foam solution flow rate expressed in l/min.

2.8 *Nominal application rate* is the nominal flow rate per area expressed in l/min/m².

2.9 *Nominal foam expansion ratio* is the ratio of the volume of foam to the volume of foam solution from which it was made.

2.10 *Nominal foam production* is the volume of foam produced per time unit, i.e., nominal flow rate times nominal foam expansion ratio, expressed in m³/min.

2.11 *Nominal filling rate* is the ratio of nominal foam production to the area, i.e., expressed in m/min.

2.12 *Nominal filling time* is the ratio of the height of the protected space to the nominal filling rate, i.e., expressed in minutes.

2.13 *Design filling rate* is the minimum filling used during the approval tests in accordance with appendix 2.

3 PRINCIPAL REQUIREMENTS FOR THE SYSTEM

3.1 Principal performance:

- .1 the system should be capable of manual release. Automatic release of the system should not be permitted unless appropriate operational measures or interlocks are provided to prevent the local application system from interfering with the effectiveness of the system;
- .2 the system should be capable of fire extinction, and tested in accordance with appendix 2 to this Guidelines;
- .3 the foam concentrates should be tested in accordance with MSC/Circ.670;
- .4 the foam generators should be successfully tested in accordance with appendixes 1 and 3 to these Guidelines; and
- .5 onboard procedures should be established to require personnel re-entering the protected space after a system discharge to wear breathing apparatus to protect them from oxygen deficient air and products of combustion entrained in the foam blanket.

3.2 Requirements for the system

- .1 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;
- .2 the system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, clogging and corrosion normally encountered in machinery spaces or cargo pump-rooms in ships, and manufactured and tested to the satisfaction of the Administration in accordance with the requirements given in appendix 1 to these Guidelines. Piping, fittings and related components inside the protected spaces should be designed to withstand 925°C;

- .3 system piping, components and pipe fittings in contact with the foam concentrate should be compatible with the foam concentrate and be constructed of corrosion resistant materials such as stainless steel, or equivalent. Other system piping and foam generators should be galvanized steel or equivalent;
- .4 means for testing the operation of the system and assuring the required pressure and flow should be provided by pressure gauges at both inlets (water and foam liquid supply) and at the outlet of the foam proportioner. A test valve should be installed on the distribution piping downstream of the foam proportioner, along with orifices which reflect the calculated pressure drop of the system. All sections of piping should be provided with connections for flushing, draining and purging with air;
- .5 the quantity of foam concentrate available should be sufficient to produce a volume of foam equal to at least five times the volume of the largest protected space at the nominal expansion ratio, but in any case not less than enough for 30 min of full operation for the largest protected space;
- .6 means should be provided for the crew to safely check the quantity of foam concentrate and take periodic control samples for foam quality;
- .7 operating instructions for the system should be displayed at each operating position;
- .8 spare parts should be provided in accordance with the manufacturer's instruction;
- .9 the design filling rate for the system should follow the results of the tests to be conducted in accordance with appendix 2, and should be adequate to completely fill the largest protected space in 10 min or less;
- .10 if an internal combustion engine is used as a prime mover for the seawater pump for the system, the fuel oil tank to the prime mover should contain sufficient fuel to enable the pump to run on full load for at least 3 h and sufficient reserves of fuel should be available outside the machinery space of category A to enable the pump to be run on full load for an additional 15 h. If the fuel tank serves other internal combustion engines simultaneously, the total fuel tank capacity should be adequate for all connected engines;
- .11 means should be provided for automatically giving audible and visual warning of the release of the system. The alarms should operate for the length of time needed to evacuate the space, but in no case less than 20 s;
- .12 the arrangement of foam generators and piping in the protected space should not interfere with access to the installed machinery for routine maintenance activities;
- .13 the system source of power supply, foam concentrate supply and means of controlling the system should be readily accessible and simple to operate, and should be arranged at positions outside the protected space not likely to be cut off by a fire in the protected space;

- .14 the arrangement of foam generators should in general be designed based on the approval test results. The number of generators may be different, but the minimum design filling rate determined during approval testing should be provided by the system. A minimum of two generators should be installed in every space containing combustion engines, boilers, purifiers, and similar equipment. Small workshops and similar spaces may be covered with only one foam generator;
- .15 foam generators should be uniformly distributed under the uppermost ceiling in the protected spaces including the engine casing. The number and location of foam generators should be adequate to ensure all high risk areas are protected in all parts and at all levels of the spaces. Extra foam generators may be required in obstructed locations. The foam generators should be arranged with at least 1 m free space in front of the foam outlets, unless tested with less clearance. The generators should be located behind main structures, and above and away from engines and boilers in positions where damage from an explosion is unlikely;
- .16 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; and
- .17 for spaces greater than 500 m³, the arrangement of the protected spaces should be such that they may be ventilated as the space is being filled with foam. Procedures should be provided to ensure that upper level dampers, doors and other suitable openings are kept open in case of a fire.

3.3 Testing requirements:

- .1 after installation, the pipes, valves, fittings and assembled systems should be tested to the satisfaction of the Administration, including functional testing of the power and control systems, water pumps, foam pumps, valves, remote and local release stations and alarms. Flow at the required pressure should be verified for each section using orifices fitted to the test line. In addition, all distribution piping should be blown through with air to ensure that the piping is free of obstructions; and
- .2 functional tests of all foam proportioners or other foam mixing devices should be carried out to confirm that the mixing ratio tolerance is within + 30 to -0% of the nominal mixing ratio defined by the system approval. For foam proportioners using foam concentrates of Newtonian type with kinematic viscosity equal to or less than 100 cSt at 0°C and density equal to or less than 1.1 kg/dm³, this test can be performed with water instead of foam concentrate. Other arrangements should be tested with the actual foam concentrate.

* 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:

<i>Pipe type</i>	<i>C</i>
Black or galvanized mild steel	100
Copper or copper alloys	150
Stainless steel	150

APPENDIX 1

COMPONENT MANUFACTURING STANDARDS FOR INSIDE AIR FOAM SYSTEMS

1 Foam generator nozzles for inside foam systems should be tested in accordance with the following items stipulated in appendix A of MSC/Circ.1165:

3.1 Dimensions

3.4.1 Flow constant: the value of the flow constant K should be determined by measuring the flow at the maximum operational pressure, minimum operational pressure and the middle operational pressure.

3.11.1 Stress corrosion: a representative sample extracted from the generator may be used.

3.11.2 Sulphur dioxide corrosion: visual inspection only may be carried out.

3.11.3 Salt spray corrosion: the test may be carried out at NaCl concentration of 5%. Paragraph 3.14.2 in appendix A of circular MSC/Circ.668 need not to apply.

3.15 Resistance to heat: where the components are made of steel, this test need not be applied.

3.17 Impact test: only, the nozzles need to be tested.

3.22 Clogging test: where the diameter of the opening of the nozzle exceeds 1.5 mm, this test need not apply.

2 Foam generators should also be tested in accordance with the following items stipulated in standard EN 13565-1:

.1 clause 4: General construction requirements (4.1 – connections, 4.5 – corrosion resistance of metal parts, 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 4.16 of appendix A of MSC/Circ.1165. After the vibration test, the generators should show no visible deterioration and should meet the requirements of clauses 5 and 9 of standard EN13565-1.

Equivalent alternative testing standards may be used as determined by the Administration.

APPENDIX 2

FIRE TEST METHOD FOR INSIDE AIR FOAM SYSTEMS

1 SCOPE

The test method is intended for evaluating the extinguishing performance of inside-air high-expansion foam fire-fighting 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 inside-air high-expansion foam fire-extinguishing systems against spray and pool fires, which are obstructed by a simulated engine.

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 $20 \pm 5^\circ\text{C}$ 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.

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 a 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 $1,200\text{ m}^3$, but not greater than $3,500\text{ m}^3$, 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 20 m^2 total

ventilation area, distributed in the ceiling and/or along the walls, just below the ceiling. The foam generators should not be positioned near the openings. 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 m² 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 m² 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 to 15 mm diameter rod 1 m away; and
 - .2 fire in trays under (4 m²) and on top (3 m²) 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 m² 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 (Test fuel: heptane).

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 *Installation requirements for tests*

3.2.4.1 Foam generators should not be installed above the simulated engine in such a way that the foam flow directly hits the test fires. The generators should also not be located near ventilation openings.

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

3.2.4.3 The number and spacing of foam generators should be in accordance with the manufacturer's system design and installation manual.

3.2.4.4 The inlet water supply pressure to the foam generators should be maintained within the acceptable range determined in paragraph 3.2.5 below, throughout the tests.

3.2.5 *Foam generator test*

Representative foam generators should be tested according to appendix 3. The results of the testing should be reflected in the manufacturer's design and installation manual.

4 TEST PROCEDURE

4.1 Preparation

4.1.1 Combination fire (paragraph 3.2.3.1 above): the 4 m² 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 m² 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 m² fire tray is blocked off by an appropriate means, e.g., steel plate).

4.1.2 Low pressure concealed fire and 0.1 m² tray fire (paragraph 3.2.3.3 above): the 0.1 m² 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 m² fire tray below the engine mock-up should be filled with a 50 mm water base and the 3 m² 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 Fresh water 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 fresh water 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. If the system is tested in more than one test compartment, the seawater test should be performed in test compartment 2. The temperature of the water and foam concentrate should be 20 ± 5°C at the beginning of the test.

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

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, if used should be shut off 15 s after the fire has been judged extinguished.

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 foam generators begin producing foam;
- .5 time when the fire is extinguished;
- .6 time when the system is shut off;

- .7 time when the fire is re-ignited, if any;
- .8 time when the oil flow for the spray fire is shut off; and
- .9 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 concentrate);
- .11 nominal flow rate, nominal application rate and nominal filling rate;
- .12 foam mixing rate;
- .13 foam expansion;

- .14 water supply pressure;
- .15 pressure at inlet to foam generator;
- .16 ventilation conditions;
- .17 conclusions;
- .18 deviations from the test method, if any;
- .19 test results including observation and measurement before, during and after the test; and
- .20 date and signature.

7 APPLICATION OF TEST RESULTS

Systems that have been successfully tested to the provisions of paragraph 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 m³;
- .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.

If fresh water is used in the fire tests, any differences in expansion ratios between fresh water 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 fresh water 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 fresh water with nominal filling rate of 2 m/min, corresponding to a nominal application rate of 4 l/min/m² and nominal expansion ratio with fresh water of 500. Tests according to “small scale test method” and standard EN13565-1, annex G, showed that the lowest expansion ratio is 425 with seawater. The design application rate should in this case be at least:

$$4.0 \cdot (500/425) = 4.7 \text{ l/min/m}^2.$$

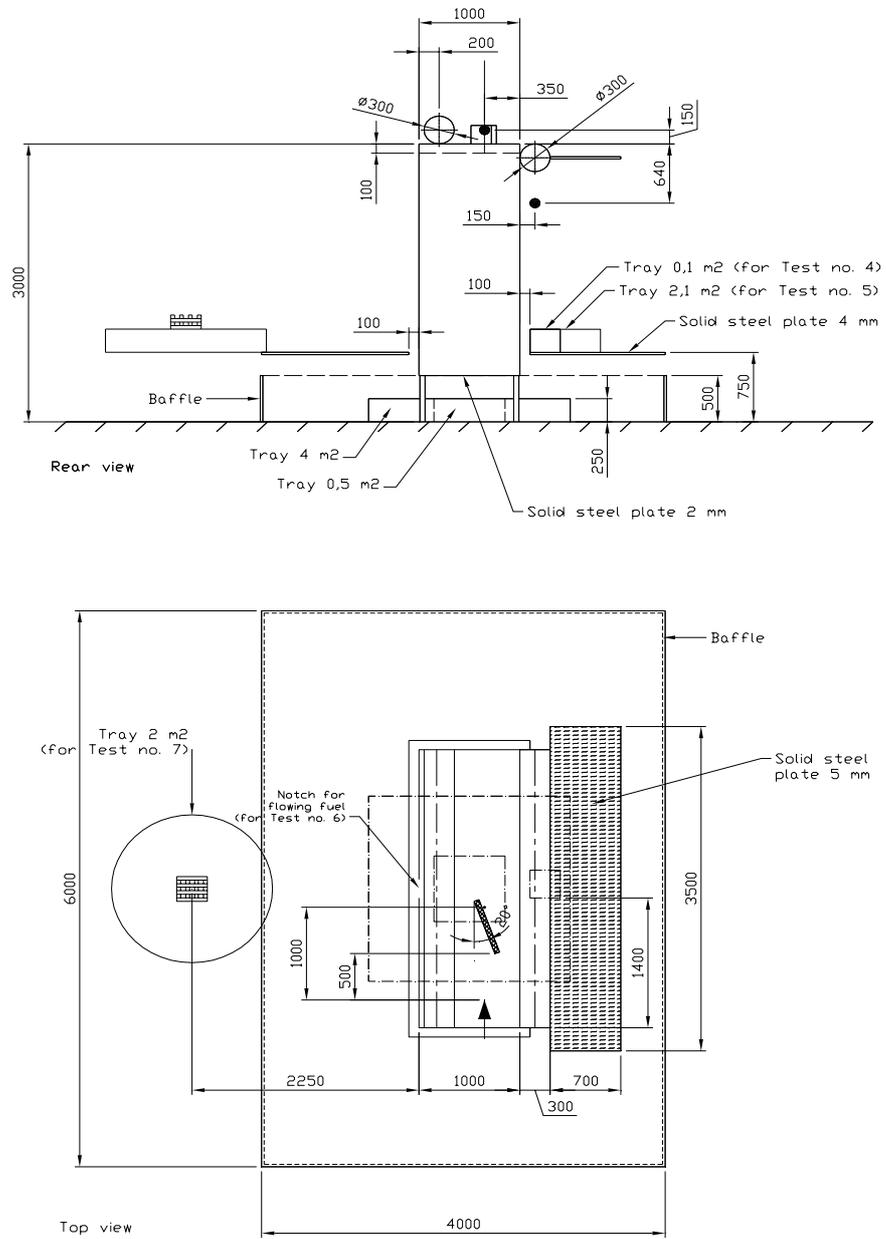


Figure 1

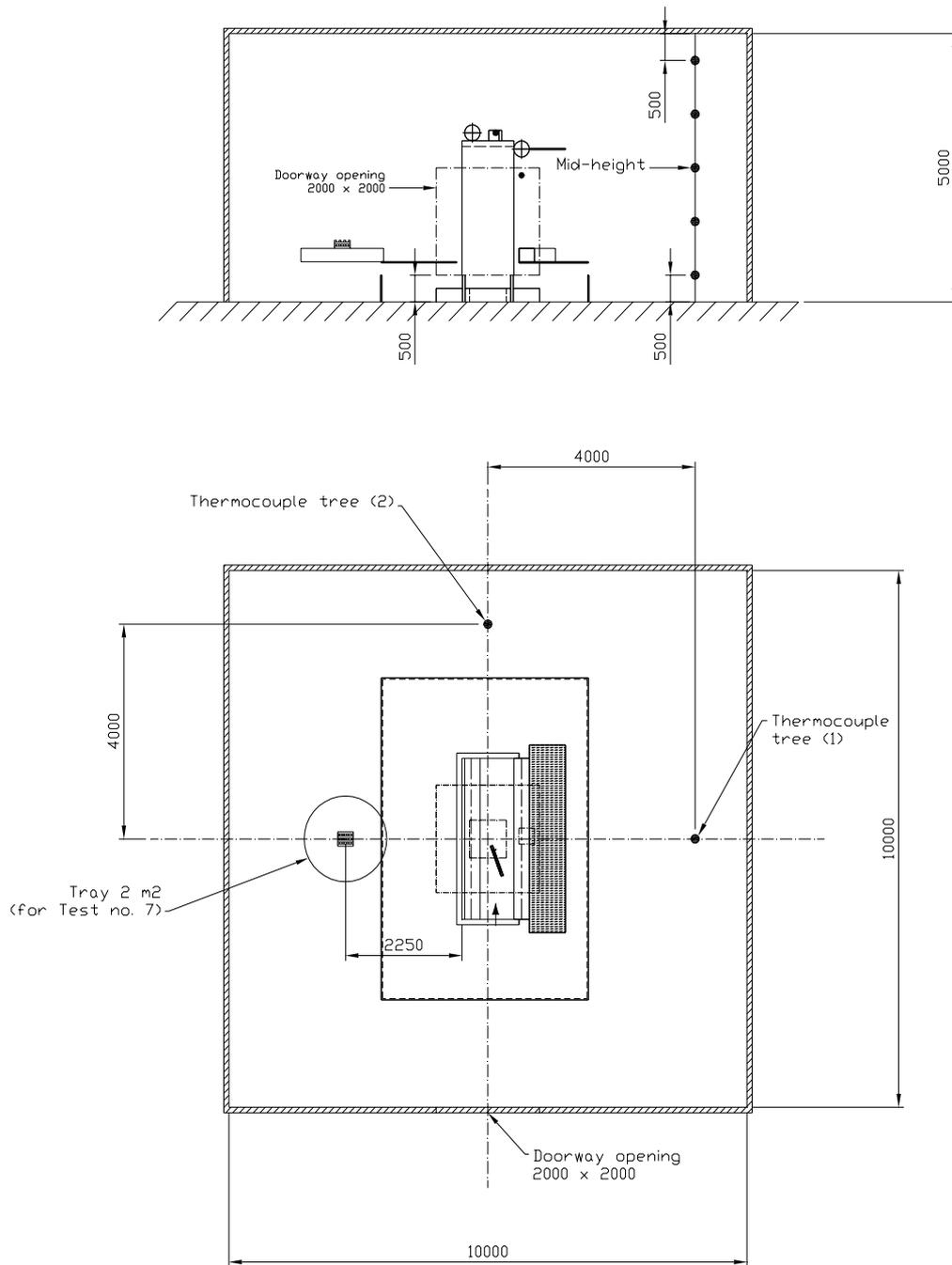


Figure 2

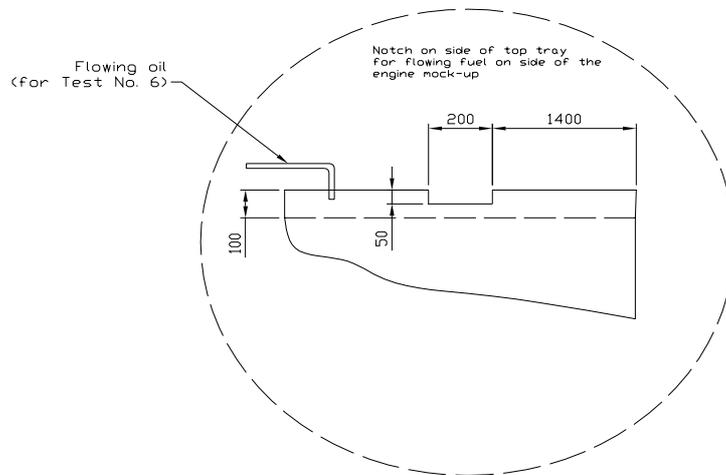
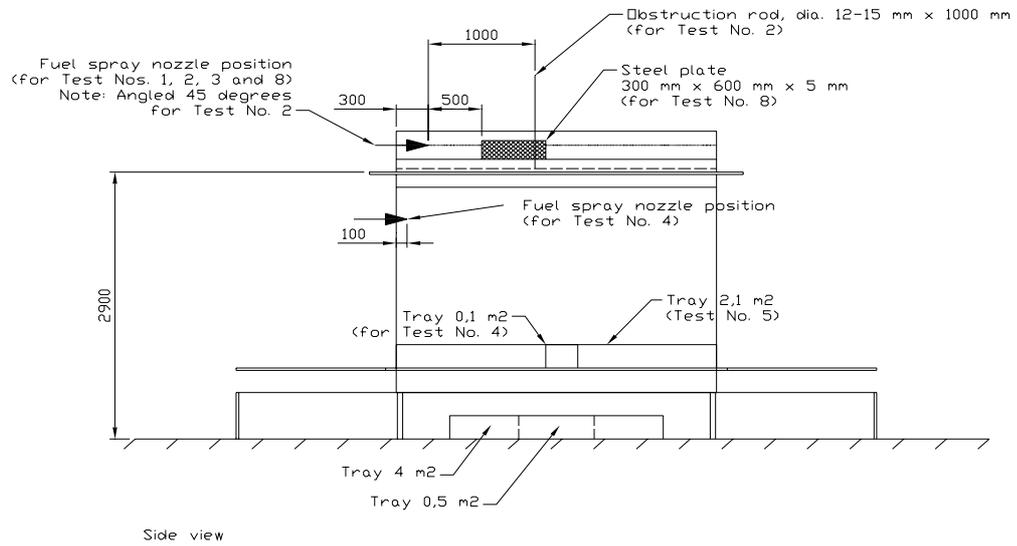


Figure 3

APPENDIX 3

FOAM GENERATOR TESTS

1 Foam generator capacity test

1.1 Representative foam generators should be tested to demonstrate their nominal foam production rate over the manufacturer's specified range of inlet pressures.

1.2 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.

1.3 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 m³/min.

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

1.5 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

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 fresh water.

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 EN13565-1, 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

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.

Normally the foam properties should be measured both with fresh and with simulated seawater specified in standards ISO 7203-2:1995, 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: $\pm 2\%$ of value;
- .2 volume: $\pm 5\%$ of value;
- .3 time: ± 5 s; and
- .4 temperature: $\pm 2\%$ of value.

The tolerances are not applicable to the evaluation parameters.

5 THE FIRE TEST COMPARTMENT^{*}

5.1 General

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.

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

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

5.2 Dimensions

The inner dimensions of the compartment should be:

- .1 length: 2,400 mm;
- .2 width: 1,200 mm; and
- .3 height: 2,400 mm.

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

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.

* Refer to figures 1 and 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 centrally 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

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.

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

6 PREMIX PRESSURE VESSEL AND PIPING

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.

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

The high-expansion foam generator should be a suitable type for the considered foam concentrates. For testing for evaluation of concentrates after the approval of such concentrates in combination with the system, foam generators used in the tests at the approval should be used.

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

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

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 $20 \pm 5^\circ\text{C}$;
- .2 the water temperature, measured prior to the test, should be $15 \pm 5^\circ\text{C}$; and
- .3 the premix temperature, measured prior to the test, should be $17.5 \pm 2.5^\circ\text{C}$.

9.2 Verification of the temperature in the test compartment

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

The temperature should be reached within 3 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.

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 have been concluded that the above temperatures at given heat release rates is reached within 3 to 6 min (see appendix 2 for examples).

9.3 Fire test procedures

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 the foam system pressure should be adjusted 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.

The procedure should be repeated at each temperature level, as described in section 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

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.

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

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

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

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.

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

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.

Fire Test Compartment

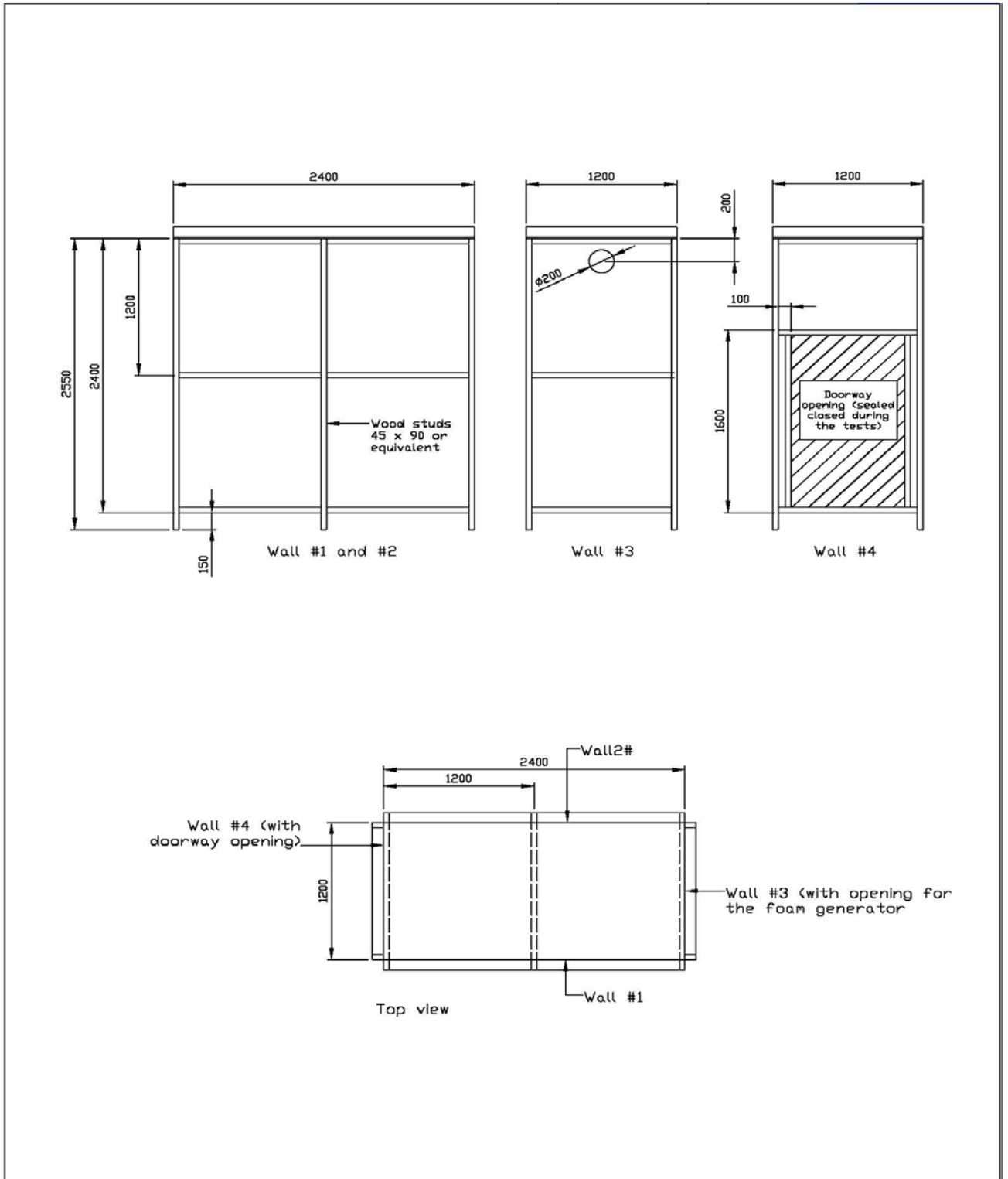


Figure 1

Interior of fire test compartment
With principal layout of the foam system

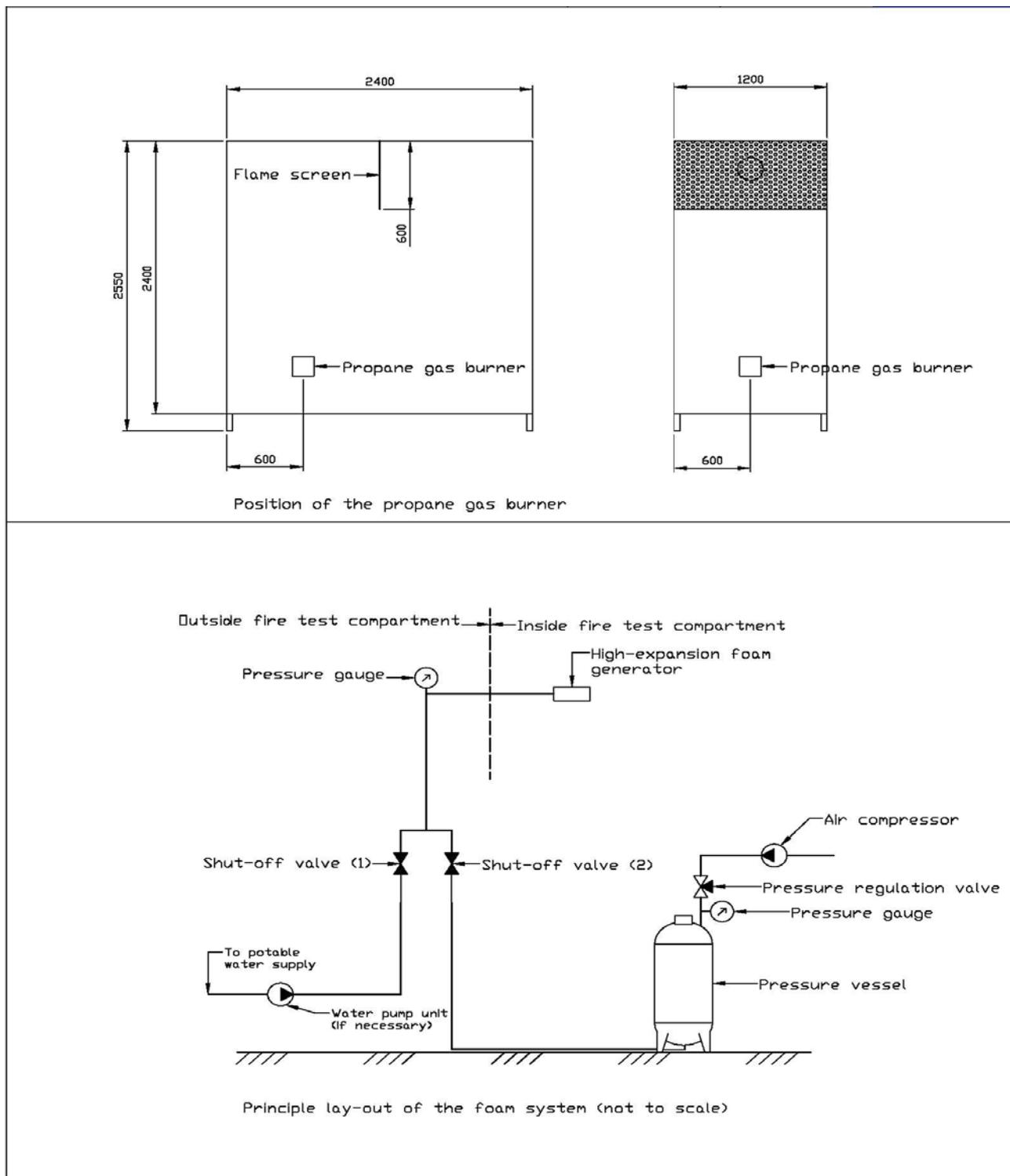


Figure 2

ANNEX 7

DRAFT MSC CIRCULAR

GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO SPACES AND SPECIAL CATEGORY SPACES EQUIVALENT TO THAT REFERRED TO IN RESOLUTION A.123(V)

- 1 The Committee, at its [eighty-fourth session (7 to 16 May 2008)], having considered the proposal by the fifty-second session of the Sub-Committee on Fire Protection, approved Guidelines for the approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V), as set out in the annex.
- 2 Member Governments are invited to apply the attached Guidelines when approving fixed water-based fire-fighting systems for ro-ro spaces and special category spaces on or after [*date of approval of the circular*] and bring them to the attention of ship designers, ship owners, equipment manufacturers, test laboratories and other parties concerned.
- 3 This circular supersedes MSC/Circ.914.

ANNEX

GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO SPACES AND SPECIAL CATEGORY SPACES EQUIVALENT TO THAT REFERRED TO IN RESOLUTION A.123(V)

1 GENERAL

These guidelines have been developed in recognition of reasonable and realistic performance-based requirements for fixed water-based fire-fighting systems for ro-ro spaces and special category spaces.

These guidelines and the fire tests are intended for closed ro-ro spaces and special category spaces defined by SOLAS regulations II-2/3.12 and II-2/3.46, respectively. Deluge systems can be applied on open ro-ro spaces when the actual wind condition is taken into consideration. Systems using automatic sprinklers are only permitted for closed ro-ro and special category spaces or other spaces where wind conditions are not likely to affect system performance.

2 DEFINITIONS

2.1 *Area of operation* is a design area for wet-pipe, automatic sprinkler system (to be determined for each system by the test procedure described in the appendix to these Guidelines).

2.2 *Deluge system, automatic and manual release* is a system employing open nozzles attached to a piping system connected to a water supply through a valve that can be opened by signals from a fire detection system and by manual operation. When this valve is opened, water flows into the piping system and discharges from all nozzles attached thereto.

2.3 *Deluge system, manual release* is a system employing open nozzles attached to a piping system connected to a water supply through a valve that is opened by manual operation. When this valve is opened, water flows into the piping system and discharges from all nozzles attached thereto.

2.4 *Dry pipe system* is a system employing automatic sprinklers attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) 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 sprinklers.

2.5 *Fire control* limits the size of a fire by distribution of water so as to decrease the heat release rate, while controlling gas temperatures and pre-wetting adjacent combustibles and/or reducing heat radiation to avoid structural damage.

2.6 *Fire suppression* is the sharp reduction of the heat release rate of a fire and the prevention of regrowth.

2.7 *Preaction system* is a system employing automatic sprinklers attached to a piping system containing air that may or may not be under pressure, with a supplemental detection system installed in the same area as the nozzles or sprinklers. Actuation of the detection system opens a

valve that permits water to flow into the piping system and to be discharged from any sprinklers that have operated.

2.8 *Water-based extinguishing medium* is fresh water or seawater with or without additives mixed to enhance fire-extinguishing capability.

2.9 *Wet pipe, automatic sprinkler system* is a system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire.

3 PRINCIPAL REQUIREMENTS

3.1 The system may be automatically activated, manually activated or automatically activated with manual release capabilities. Automatic activation should be approved by the Administration, taking into account the implications of such activations.

3.2 The system should be capable of fire suppression and control and be tested to the satisfaction of the Administration in accordance with the appendix to these Guidelines.

3.3 The capacity of the system water supply should be sufficient for the total simultaneous coverage of the hydraulically most demanding area defined by the minimum coverage area of table 3-1 and the vertically applicable area as defined in paragraph 3.5, and the requirements of paragraph 3.4.

Table 3-1

Type of system (Definition number)	Min. coverage area
A. Wet pipe, automatic sprinkler heads (2.9)	280 m ² or Area of operation as defined in the fire tests – whichever is larger
B. Deluge system, automatic ¹ and manual release (2.2)	280 m ² (as per paragraph 3.6) and the overlapping or adjacent section as defined by paragraph 3.4 ²
C. Deluge system, manual release (2.3)	2 sections each of min 20 m x w ^{2,3}
D. Other systems (2.4, 2.7)	Equivalent to the above systems and to the satisfaction of the Administration

Notes:

- ¹ The automatic release should comply with the requirements of paragraphs 4.1 to 4.5.
- ² The pump should be sized to cover the largest sections for type B systems and the two largest horizontally adjacent sections for type C systems.
- ³ Width of cargo space (measured as distance between tight steel divisions).

3.4 The section arrangement for a deluge system with automatic and manual release (system B) should be such that a fire in any location of the border zone between two or more sections would be completely surrounded by activated spray heads, either by activating more than one section or by overlapping sections (whereby two or more sections cover the same area in the vicinity of the border between sections). In case of overlapping sections, such overlap should be a minimum of two times the required spray head spacing of the section in question or

five metres, whichever is larger. These overlapping sections need not comply with the minimum width and length requirements of paragraph 3.6.

3.5 Vertically the applicable area of all decks, including hoistable decks or other intermediate decks, between reasonably gas-tight steel decks (or equivalent materials), should be included for simultaneous coverage (example: with one hoistable deck, both the layer above and below this deck with a dimensioning area complying with table 3-1 should be included in the water supply calculations). Decks with ramps are accepted as reasonably gas-tight decks assuming that the ramps are always in their closed position at sea and the ramps and the decks which these ramps are part of are reasonably gas-tight.

3.6 The system should be divided into sections, each with its own section valve. The length of a section (along the lanes) should not be less than 20 m and the width of the section should not be less than 14 m. Further, the sections need not be longer or wider than the distance between reasonably gas-tight steel bulkheads (or equivalent materials). The maximum size of a section on any single deck should be 48 m multiplied with width of cargo space (measured as distance between tight steel divisions). Vertically one section can cover up to three decks.

3.7 Each section should be capable of being isolated by one section control valve. The section control valves should be located outside the protected space, be readily accessible, independent of the protected spaces and their locations should be clearly and permanently indicated. It should be possible to manually open and close the section control valves either directly on the valve or via a control system routed outside the structural fire protection of the protected spaces. Means should be provided to prevent the operation of the section control valves by an unauthorized person.

3.8 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. The design of the system should ensure that full system pressure is available at the most remote nozzle in each section within 60 s of activation.

3.9 The system supply equipment should be located outside the protected spaces and all power supply components (including cables) should be installed outside of the protected space. The electrical components of the pressure source for the system should have a minimum rating of IP 54.

3.10 The system should be provided with a redundant means of pumping or otherwise supplying a water-based extinguishing medium to the system. The capacity of the redundant means should be sufficient to compensate for the loss of any single supply pump or alternative source. Failure of any one component in the power and control system should not result in a reduction of the automatic release capability or reduction of required pump capacity by more than 50% in case of automatic sprinklers and 100% in case of open head systems. However,

* 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:

<i>Pipe type</i>	<i>C</i>
Black or galvanized mild steel	100
Copper and copper alloys	150
Stainless steel	150

systems requiring an external power source need only be supplied by the main power source. Hydraulic calculations should be conducted to assure that sufficient flow and pressure are delivered to the hydraulically most demanding section both in normal operation and in the event of the failure of any one component.

3.11 The system should be fitted with a permanent sea inlet and be capable of continuous operation during a fire using seawater.

3.12 The system and its components should be designed to withstand ambient temperatures, vibration, humidity, shock, impact, clogging and corrosion normally encountered.

3.13 The system and its components should be designed and installed based on international standards acceptable to the Organization*. The nozzles should be manufactured and tested based on the relevant sections of appendix A to MSC/Circ.1165.

3.14 The nozzle location, type of nozzle and nozzle characteristics should be within the limits tested to provide fire suppression and control as referred to in paragraph 3.2. In addition, nozzles should be located to protect spaces above and below intermediate decks, hoistable decks and ramps. Nozzles below hoistable decks should be capable of protecting all applicable heights.

3.15 System designs should be limited to the use of the maximum and minimum temperature ratings of the thermally sensitive fire detection devices tested to provide fire suppression and control as referred to in paragraph 3.2.

3.16 Activation of the system should give a visual and audible alarm at a continuously manned station. The visual and audible alarms should be activated when for instance an automatic sprinkler operates or when a section valve is opened. The alarm in the continuously manned station should indicate the specific section of the system that is activated. The system alarm requirements described within this paragraph are in addition to, and not a substitute for, the detection and fire alarm system required by SOLAS regulation II-2/20.4.

3.17 A means for testing the automatic operation of the system and, in addition, assuring the required pressure and flow should be provided.

3.18 If the system is pre-primed with water containing a fire suppression enhancing additive and/or an antifreeze agent, periodic inspection and testing, as specified by the manufacturer, should be undertaken to assure that their effectiveness is being maintained. Fire suppression enhancing additives should be approved for fire protection service by an independent authority. The approval should consider possible adverse health effects to exposed personnel, including inhalation toxicity.

3.19 Wet pipe systems on board vessels that can operate in areas where temperatures below 0°C can be expected, shall be protected from freezing either by having temperature control of the ro-ro space, heating coils on pipes, antifreeze agents or other equivalent measures.

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

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

3.21 Installation plans and operating manuals should be supplied to the ship and be readily available on board. A list or plan should be displayed showing spaces covered and the location of the zone in respect of each section. Instructions for testing and maintenance should be available on board.

3.22 Spare parts and operating and maintenance instructions should be provided as recommended by the manufacturer. In the case of automatic sprinkler systems, the total number of spare sprinkler heads for each type of sprinklers should be 6 for the first 300, 12 for the first 1,000.

3.23 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.

3.24 All installation, operation and maintenance instruction/plans for the system should be in the working language of the ship. If the working language of the ship is not English, French, nor Spanish, a translation into one of these languages should be included.

4 DETAIL REQUIREMENTS; FIRE DETECTION AND FIRE CONFIRMATION (SYSTEM B)

4.1 For systems of type B (see table 3-1) an efficient fire detection and fire confirmation system covering all parts of the ro-ro or special category spaces should be provided.

4.2 The fire detection system should consist of flame detectors and smoke detectors of approved types. The flame detectors should be installed under fixed continuous decks according to the limitation and application defined by the maker and the approval certificate. The smoke detector arrangement shall comply with the International Code for Fire Safety Systems (FSS Code). Smoke detectors with a spacing not exceeding 11 m should be installed under hoistable ramps.

4.3 A colour TV monitoring system should cover all parts of the ro-ro or special category spaces. Cameras need not be installed below hoistable decks if the camera arrangement can identify smoke (confirm fire) based on positions under a fixed continuous deck.

4.4 The relevant section of the deluge system should be automatically released when two detectors covering this area activate. Systems being released when only one detector activates may also be accepted. The automatic release should not prevent manual operation (both opening and closing) of the section valves. The automatic release may be disconnected during on- and off-loading operations, provided that this function is automatically re-connected after a pre-set time being appropriate for the operations in questions.

4.5 All release controls for the deluge system, monitor(s) for the CCTV system and the control panel (or an indication panel) for the fire detection system should be available and grouped together in a continuously manned control station.

APPENDIX

TEST METHOD FOR FIXED WATER-BASED FIRE-FIGHTING SYSTEMS FOR RO-RO SPACES AND SPECIAL CATEGORY SPACES

1 SCOPE

1.1 This test method is intended for evaluating the effectiveness of fixed water-based fire-fighting systems installed in ro-ro spaces and special category spaces with deck heights up to and including 5 m and/or up to and including 2.5 m.

1.2 The test programme has two objectives:

- .1 establishing nozzle location, nozzle characteristics, minimum water delivery rate and minimum water pressure for systems which will provide the required level of system response time, suppression and control; and
- .2 establishing the minimum area of operation of the system for the purpose of determining hydraulic design requirements for wet pipe, dry pipe and preaction systems.

2 GENERAL REQUIREMENTS

2.1 Sampling

The nozzles and other 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.

2.2 Tolerances

Unless otherwise stated, the following tolerances should apply:

- .1 length: $\pm 2\%$ of value;
- .2 volume: $\pm 5\%$ of value;
- .3 pressure: $\pm 3\%$ of value; and
- .4 temperature: $\pm 2\%$ of value.

2.3 Observations

The following observations should be made during and after each test:

- .1 time of ignition;
- .2 activation time of first nozzle;
- .3 time when water flows out through first nozzle;

- .4 time when water flow is shut off;
- .5 time when the test is terminated; and
- .6 total number of activated nozzles.

2.4 Test hall and environmental conditions

The test hall where the tests are conducted should have a minimum floor area of 300 m² and a ceiling height in excess of 8 m. The test hall may be equipped with a forced ventilation system, or be natural ventilated, in order to ensure that there is no restriction in air supply to the test fires. The test hall should have an ambient temperature of between 10 and 25°C at the start of each test.

2.5 Measurement equipment

Temperatures should be measured using plain K-type thermocouple wires not exceeding 0.5 mm in diameter. The thermocouple head should be protected against direct water impingement, e.g., by tin cans.

System water pressure should be measured by using suitable equipment. Total water flow rate should be determined by a direct measurement or indirectly by using the pressure data and k factor of the nozzles.

The measurements should be made continuously throughout the tests.

2.6 System operational conditions

The tests should simulate the conditions of an actual installed system regarding objectives such as time delays between the activation of the system and minimum system water pressure or water delivery. In addition, the use of a pre-primed fire suppression enhancing additive, if applicable, should be taken into account.

3 DETERMINATION OF FIRE SUPPRESSION AND CONTROL CAPABILITIES

3.1 Principle

These test procedures test the effectiveness of a water-based fire-fighting system against two different scenarios: a cargo fire in a simulated freight truck, and a passenger vehicle fire.

3.2 Fire source

3.2.1 The primary fire source for both scenarios consists of EUR standard wood pallets (ISO 6780:2003), stored inside with the moisture content of $14 \pm 2\%$. Figure 3.2.1 shows details of a EUR pallet.

3.2.2 Plywood panels made of pine or spruce are used as targets. The panels should be approximately 12 mm thick. The ignition time of the panel should not be more than 35 s and the flame spread time at 350 mm position should not be more than 100 s as measured in accordance with resolution A.653(16).

3.2.3 For ignition, commercial heptane is to be applied.

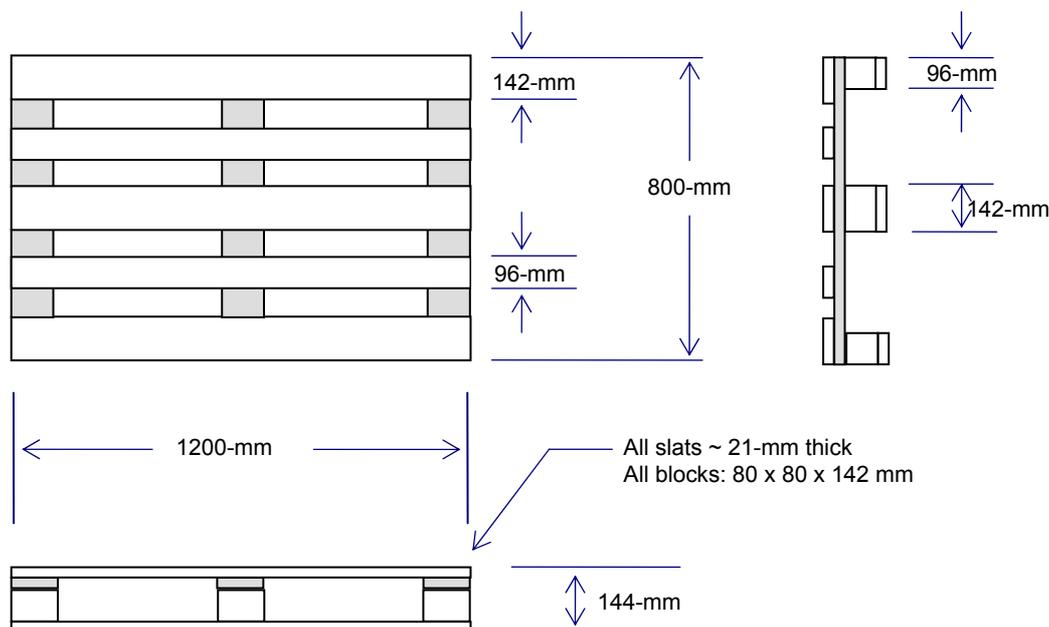


Figure 3.2.1 – Typical dimensions of the standard EUR pallet

3.3 Apparatus

3.3.1 Test area

The tests should be conducted in a test hall as specified in paragraph 2.4 under a flat, smooth, non-combustible ceiling of at least 100 m². There should be at least a 1 m space between the perimeters of the ceiling and any wall of the test hall.

3.3.2 Fire scenario 1: cargo fire in a simulated freight truck (see figures 3.3.2.1 to 3.3.2.3)

3.3.2.1 The primary fuel package consists of 112 wood pallets arranged in an array of 2 (wide) x 7 (high) x 8 (long) and raised up on a level of 2.8 m so that the top level of the fuel package is at 3.8 to 3.9 m above the floor.

3.3.2.2 The support frame for the wood pallet array of paragraph 3.3.2.1 should be constructed using open steel racks. The wood pallet piles should be standing freely on horizontal steel beams without any solid bottoms.

3.3.2.3 The fuel pallet array should be half-shielded by a 4.5 m long, 2.6 m wide steel plate (thickness at least 2 mm) at 4 m height. The plate should be properly fixed so that during a test it does not bend to provide an unobstructed passage of water onto the fuel package.

3.3.2.4 Plywood panel targets (acting also as obstructions) of dimensions 3.6 m (wide) x 2.4 m (high) should be arranged symmetrically on both sides of the fuel package at 1 m distance so that the top edge is at the same level as the top level of the wood pallet array.

3.3.2.5 The fire should be ignited by two steel trays centrally located under the fuel package as shown in figures 3.3.2.1 to 3.3.2.3. The square trays are 25 cm high and 0.1 m² of free surface area. The trays should be filled with water and 1 l of heptane so that the free rim height above the liquid surface is 4 cm. The distance between the bottom of the wood pallet piles and liquid surface is 29 cm.

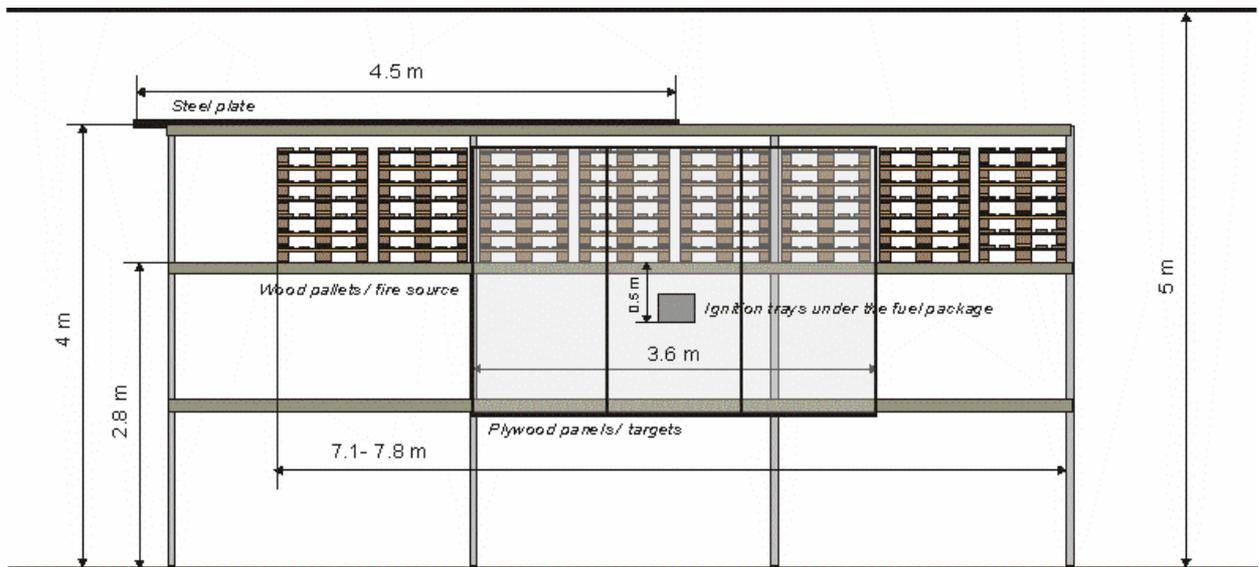


Figure 3.3.2.1 – Side view of the cargo fuel package in a simulated truck

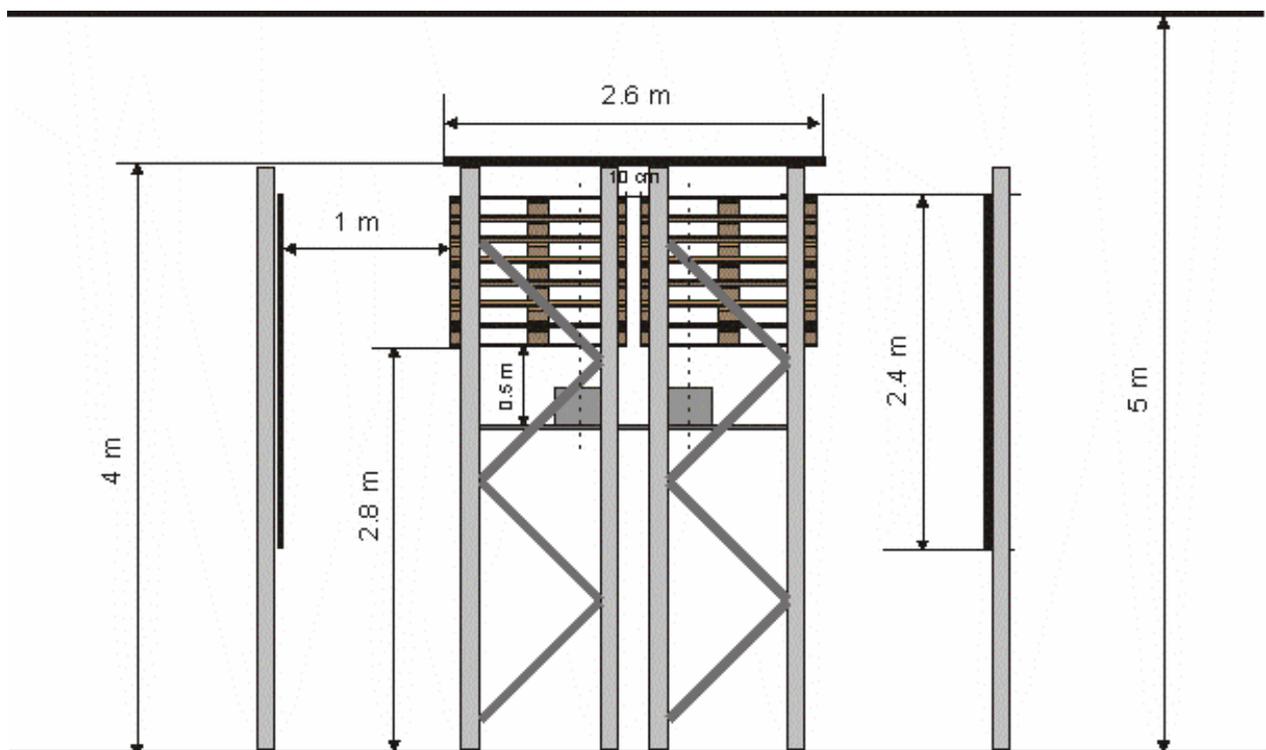


Figure 3.3.2.2 – End view of the cargo fuel package in a simulated truck

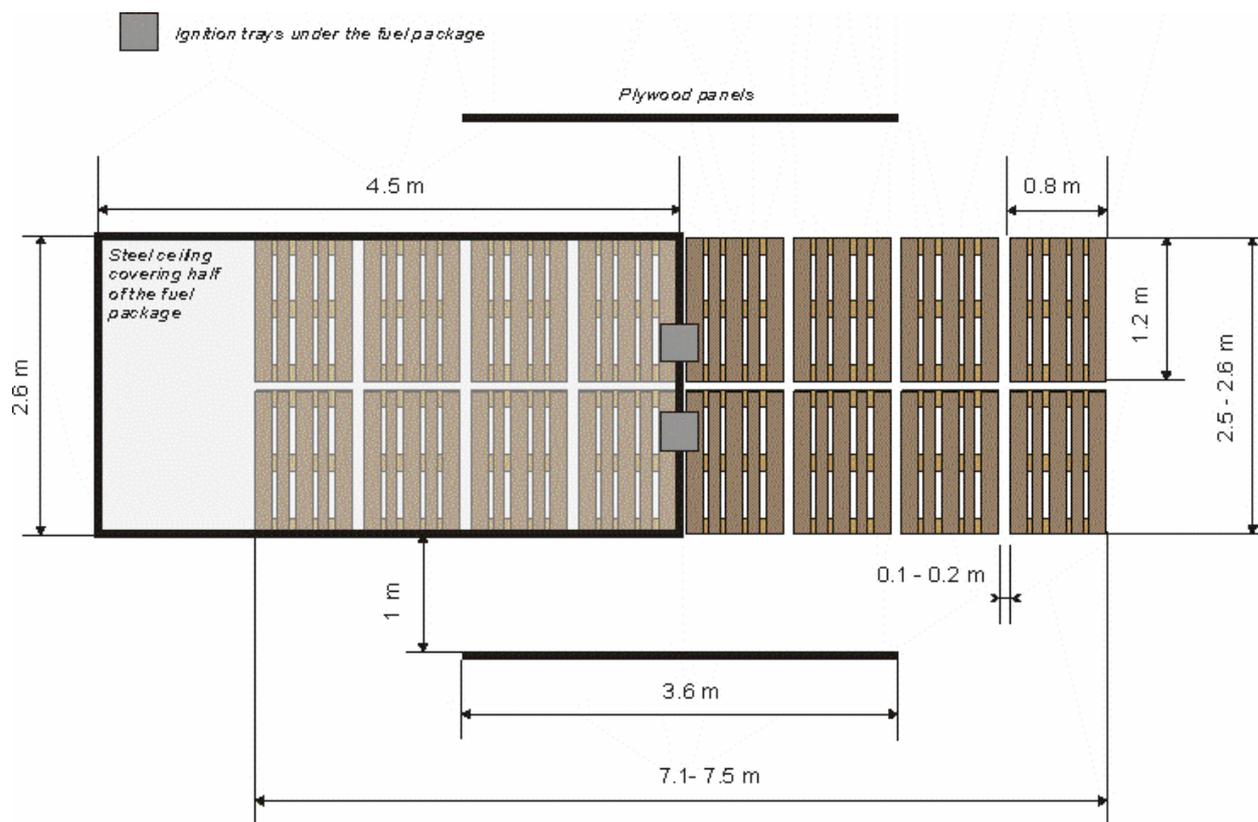


Figure 3.3.2.3 – Top view of the cargo fuel package in a simulated truck

3.3.3 *Fire scenario 2: passenger vehicle fire* (see figures 3.3.3.1 and 3.3.3.2)

3.3.3.1 The primary fuel package consists of 12 wood pallets arranged in an array of 1 pallet (wide) x 6 pallets (high) x 2 pallets (long) constructed inside a passenger vehicle mock-up.

3.3.3.2 The passenger vehicle mock-up is constructed of nominally 2 mm steel.

3.3.3.3 Plywood panel targets (acting also as obstructions) of dimensions 1.2 m (wide) x 1.75 m (high) should be arranged symmetrically on both sides of the mock-up at 0.6 m distance so that the top edge is at the same level as the top level of the mock-up car.

3.3.3.4 The fire should be ignited by a steel tray centrally located under the fuel package as shown in figures 3.3.3.1 and 3.3.3.2. The square tray is 10 cm high and 0.1 m² of free surface area. The tray should be filled with water and 1 l of heptane so that the free rim height above the liquid surface is 4 cm.

3.4 Nozzle positioning

Nozzles should be installed in an array at the ceiling level in accordance with the manufacturer's design and installation criteria. Tests should be repeated with three different relative locations between the nozzle array and the fuel package, i.e., centre of ignition under one nozzle, between two nozzles and between four nozzles, as shown in figure 3.4.1.

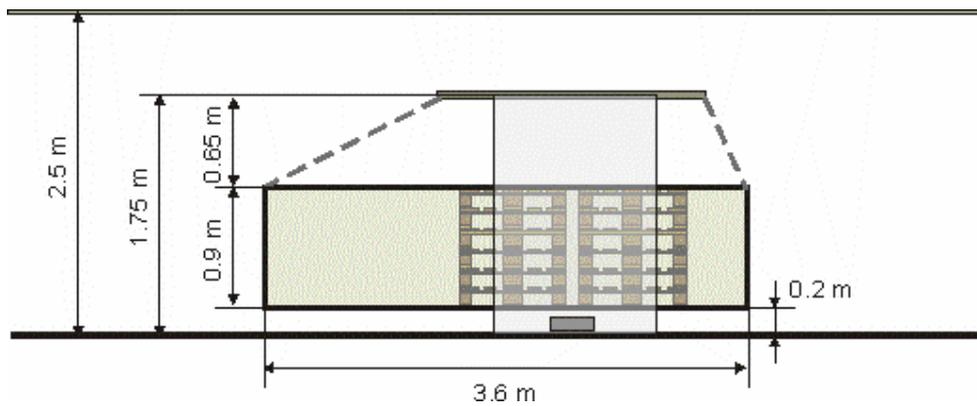


Figure 3.3.3.1 – Side view of the passenger vehicle fuel package
 (The dashed lines visualize the shape of a car; the ceiling plate is to be fixed in its location as found most practical)

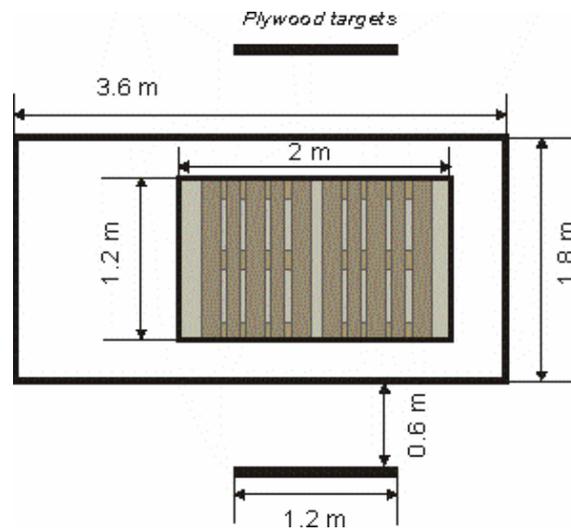


Figure 3.3.3.2 – Top view of the passenger vehicle fuel package

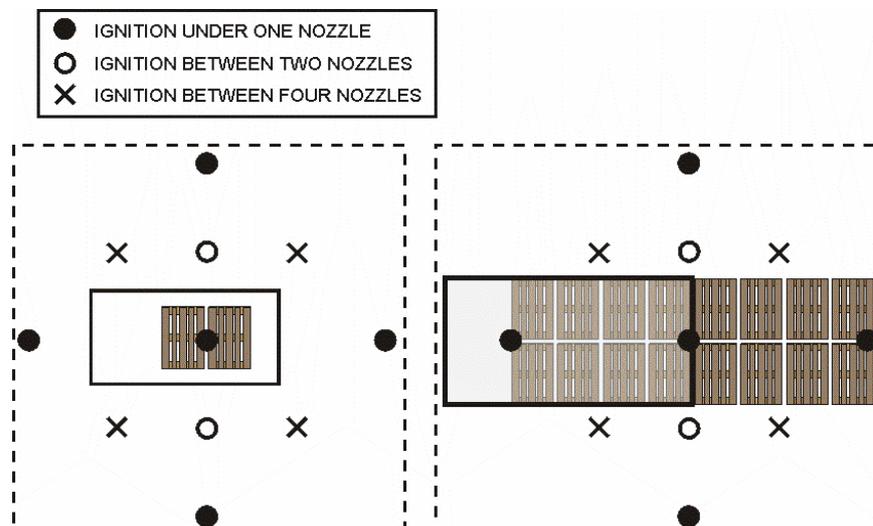


Figure 3.4.1 – Nozzle positioning in the two scenarios

3.5 Instrumentation

Instrumentation for the continuous measuring and recording of test conditions should be employed. At least the following measurements should be made:

- .1 gas temperature at 7.5 cm below the ceiling at locations shown in figure 3.5.1;
- .2 gas temperature at the targets to indicate ignition of targets as shown in figure 3.5.2; and
- .3 system water pressure near the centre of the piping array.

System water flow rate should be defined with suitable means for the system.

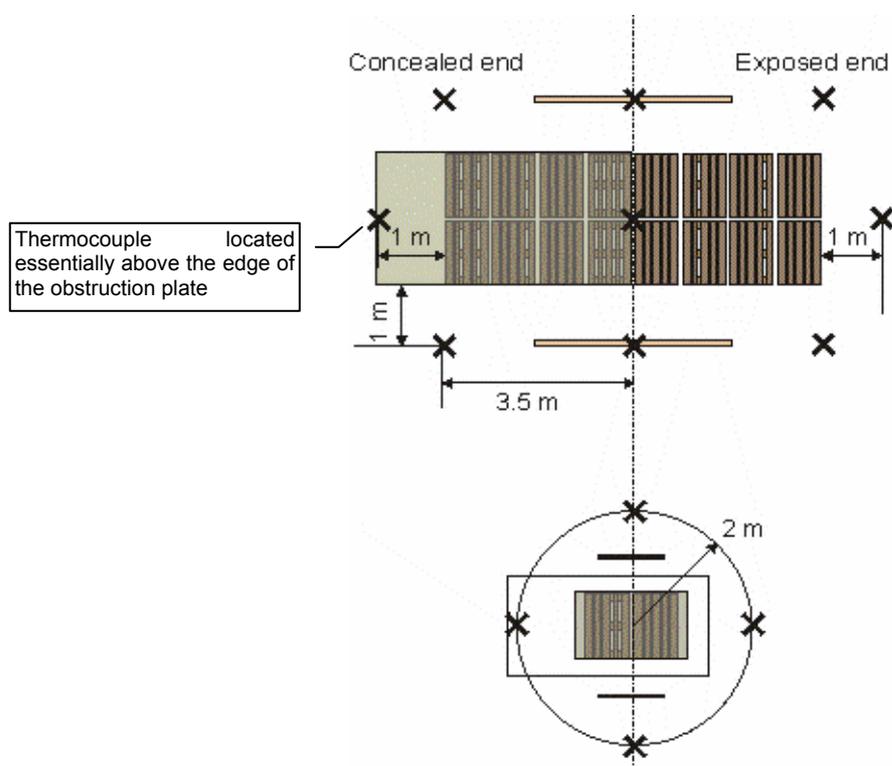
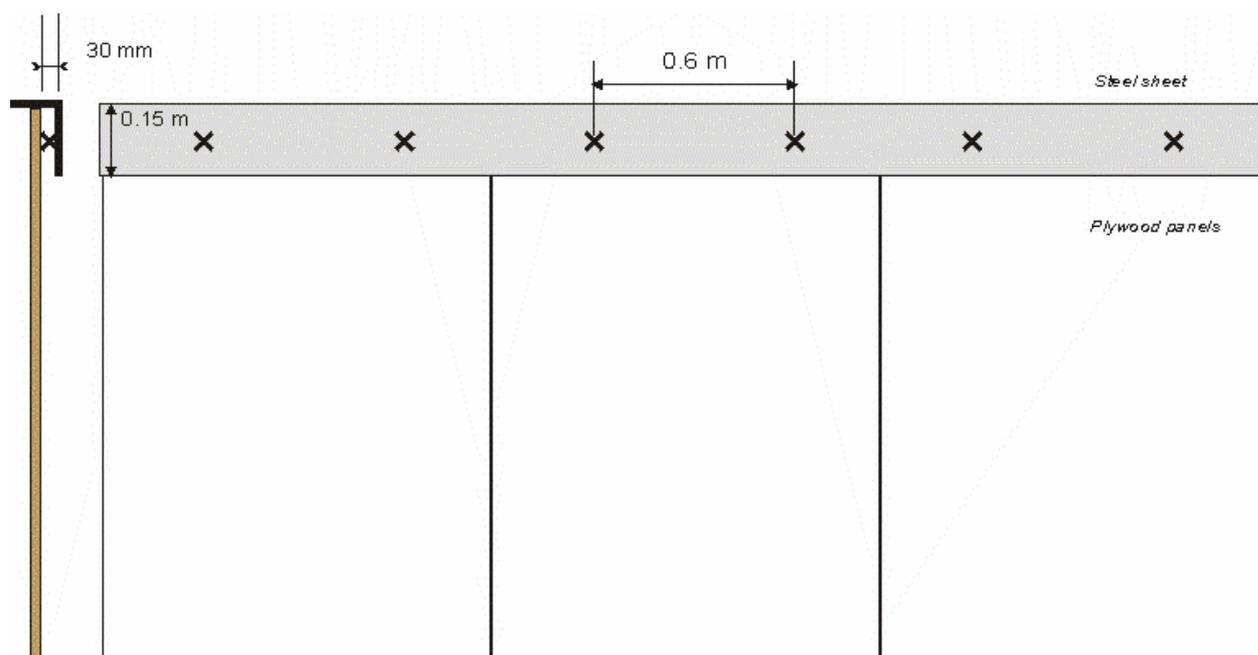


Figure 3.5.1 – Thermocouple locations in the two scenarios *

* For the truck fuel package the three locations at both ends are used for acceptance evaluation, the three locations at and around the centre of ignition are for safety purposes to define during the test whether the ceiling is at danger. For the passenger car fuel package all four locations are used for acceptance evaluation.



**Figure 3.5.2 – Thermocouple locations at the plywood targets
for determining ignition of targets***

3.6 Test programme and test procedure

3.6.1 Test programme

Tests should be conducted at the minimum system water pressure at the minimum distance between the lowest part of the nozzles and the ceiling, as specified by the manufacturer.

Three tests should be conducted at ceiling heights 5 m and/or 2.5 m, with different nozzle grid locations relative to the fuel package as specified in figure 3.4.1.

3.6.2 Test procedure

Prior to starting the test the moisture content of the fuel package should be measured at several locations along the full package with a probe-type moisture meter and the results should be reported.

The actual test procedure for all tests is as follows:

- .1 the water pressure used at the start of the test should be set at the minimum value for the system specified by the manufacturer, flowing six open nozzles. If more than six nozzles operate during the test, the water supply pressure should be adjusted accordingly, to keep the required minimum system water pressure;

* A thin (about 1 mm) steel sheet is bent on top of the plywood panels as shown in the figure. Plain charring of panels is seen as a sharp edge between the black charring on the exposed surface and intact surface under the metal sheet. When ignited in flames charring is seen also under the sheet and verified by significant increase in the gas temperature under the metal sheet.

- .2 the tray should be filled with one litre of heptane on the water base as described in paragraph 3.3.2.5 or 3.3.3.4;
- .3 the measurements are started;
- .4 the flammable liquid pool fire/s should be lit by means of a torch or a match;
- .5 the fire should be allowed to burn freely for a period of 2.5 min;*
- .6 the test is continued for 30 min after system activation;
- .7 any remaining fire should be manually extinguished; and
- .8 the test is terminated.

3.7 Acceptance criteria

The principal acceptance criteria are based on the following factors:

- .1 gas temperatures measured at locations not directly affected by impinging flames;
- .2 damage to the fuel package; and/or
- .3 ignition of targets.

Note 1: Damage to the fuel package is defined by the fraction of charring of the full package. The damage to each individual wood pallet should be evaluated separately and the total fraction calculated based on the detailed results. Totally black, i.e., totally charred pallet is denoted as 100% damage of the pallet (even though the pallet may have maintained its shape) and totally intact pallet is denoted as 0% damage. Partially charred pallets should be visually evaluated. Proper and adequate photographs of the damaged fuel package should be included in the test report.

Note 2: Ignition of targets is defined by the method described in figure 3.5.2, if the visibility during the test is such that it cannot be visually observed.

3.7.1 *Fire scenario 1: cargo fire in a simulated freight truck (ceiling height 5 m)*

The following four criteria should be met:

- .1 after system activation the maximum five minute average at any of the three measurement locations at the exposed end of the fuel package should not exceed 300°C;

* If automatic sprinklers activate already during the 2.5 min pre-burn period, feeding water to the system should be delayed till after the 2.5 min.

- .2 after system activation the maximum five minute average at any of the three measurement locations at the concealed end of the fuel package should not exceed 350°C;
- .3 total damage to the wood pallet array should not exceed 45% as defined after the test; and
- .4 the plywood targets should not ignite during the test.

3.7.2 *Fire scenario 2: passenger vehicle fire*

The following two criteria should be met:

- .1 after system activation the maximum five minute average at any of the four measurement locations should not exceed 350°C; and
- .2 the plywood targets should not ignite during the test.

4 DETERMINATION OF AREA OF OPERATION

Both fire scenarios include hidden fires that burn intensely throughout the tests. The suppression tests as defined in paragraph 3.6.1 can be applied in establishing the area of operation of wet pipe, dry pipe and pre-action systems. The evaluation is based on the test with the largest number of nozzles activating.

The ceiling area of 100 m² as defined in paragraph 3.3.1 most likely is not sufficient for defining the area of operation. The ceiling should be large enough to allow installation of a sufficient number of nozzles so that it is unambiguous that the nozzles activating truly represent the maximum number of active nozzles.

The area of operation is determined by multiplying the largest number of nozzles activating in the tests by two and defining the corresponding coverage area.

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 nozzles;
- .5 test method and purpose;
- .6 nozzle identification;
- .7 description of the tested nozzles and system performance;

- .8 detailed description of the test set-up including drawings and photos of the fuel package and targets before and after the tests;
- .9 date of tests;
- .10 measured nozzle pressure and flow characteristics;
- .11 identification of the test equipment and used instruments;
- .12 test results including observations and measurements made during and after the test;
- .13 deviations from the test method;
- .14 conclusions; and
- .15 date of the report and signature.

ANNEX 8

**DRAFT AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR
THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED****CHAPTER II-2
CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND
FIRE EXTINCTION****Regulation 10 – Fire fighting**

1 The following new paragraph 10.2.6 is inserted after the existing paragraph 10.2.5:

“10.2.6 Passenger ships carrying more than 36 passengers constructed on or after [date of entry into force] shall be fitted with a suitably located means for fully recharging breathing air cylinders, free from contamination. The means for recharging shall be either:

- .1 breathing air compressors supplied from the main and emergency switchboard, or independently driven, with a minimum capacity of 60 l/min per required breathing apparatus, not to exceed 420 l/min; or
- .2 self-contained high-pressure storage systems of suitable pressure to recharge the breathing apparatus used on board, with a capacity of at least 1,200 l per required breathing apparatus, not to exceed 50,000 l of free air.”

ANNEX 9**DRAFT AMENDMENTS TO THE INTERNATIONAL CONVENTION
FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED****CHAPTER II-2
CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND
FIRE EXTINCTION****Part C
Suppression of fire****Regulation 9 – Containment of fire**

- 1 The last sentence of paragraph 4.1.1.2 is moved to a new separate paragraph 4.1.1.3 and the existing following paragraphs are renumbered accordingly.
- 2 The following text is added at the end of paragraph 4.1.1.2:

“Doors approved without the sill being part of the frame, which are installed on or after [date of entry into force], shall be installed such that the gap under the door does not exceed 12 mm. A non-combustible sill shall be installed under the door such that floor coverings do not extend beneath the closed door.”
- 3 The following text is added at the end of paragraph 4.1.2.1:

“Doors approved without the sill being part of the frame, which are installed on or after [date of entry into force], shall be installed such that the gap under the door does not exceed 25 mm.”
- 4 In paragraph 4.2.1, the following text is added after the first sentence:

“Doors approved as “A” class without the sill being part of the frame, which are installed on or after [date of entry into force], shall be installed such that the gap under the door does not exceed 12 mm and a non-combustible sill shall be installed under the door such that floor coverings do not extend beneath the closed door. Doors approved as “B” class without the sill being part of the frame shall be installed such that the gap under the door does not exceed 25 mm.”

ANNEX 10**DRAFT MSC CIRCULAR****UNIFIED INTERPRETATION OF THE FTP CODE**

1 The Maritime Safety Committee, at its [eighty-fourth session (7 to 16 May 2008)], with a view to providing more specific guidance for application of the relevant requirements of part 3 of annex 1 of the FTP Code, approved the Unified interpretation of the FTP Code prepared by the Sub-Committee on Fire Protection, at its fifty-second session, as set out in the annex.

2 Member Governments are invited to use the annexed unified interpretation as guidance when applying relevant provisions of part 3 of annex 1 of the FTP Code for ships constructed on or after [*date of approval of the circular*] and to bring the unified interpretation to the attention of all parties concerned.

ANNEX

UNIFIED INTERPRETATION OF THE FTP CODE

Annex 1, part 3 – Test for “A”, “B”, and “F” class divisions

1 A fire door of marginally larger dimensions than a fire-tested fire door may be individually assessed and accepted for a specific project with the same classification, provided all of the following is met:

- .1 the dimensions (width, height) are not more than 15% above those of the tested door;
- .2 the surface area of the door is not more than 10% above that of the tested door;
- .3 the door design does not deviate in any other aspect from the one tested; and
- .4 the tested door has successfully satisfied both insulation and integrity criteria for the following times, as appropriate:

▪	B-0	0 minutes insulation	36 minutes integrity
▪	B-15	18 minutes insulation	36 minutes integrity
▪	A-0	0 minutes insulation	68 minutes integrity
▪	A-15	18 minutes insulation	68 minutes integrity
▪	A-30	36 minutes insulation	68 minutes integrity
▪	A-60	68 minutes insulation	68 minutes integrity.

ANNEX 11

DRAFT MSC CIRCULAR

GUIDELINES FOR EVALUATION OF FIRE RISK OF EXTERNAL AREAS ON PASSENGER SHIPS

1 The Maritime Safety Committee, at its eighty-first session (10 to 19 May 2006), having approved draft amendments to SOLAS chapter II-2 related to the safety of cabin balconies in response to the fire on board the **Star Princess**, instructed the Sub-Committee on Fire Protection to consider the safety of all external areas on passenger ships.

2 The Maritime Safety Committee, at its [eighty-fourth session (7 to 16 May 2008)], having considered the draft Guidelines for evaluation of fire risk of external areas on passenger ships prepared by the Sub-Committee on Fire Protection at its fifty-second session (14 to 18 January 2008), approved the Guidelines for evaluation of fire risk of external areas on passenger ships, set out in the annex.

3 The annexed Guidelines consist of two parts:

- .1 part 1: Design Guidelines for the evaluation of fire risk of external areas on new passenger ships; and
- .2 part 2: Simplified risk assessments method for external areas on passenger ships.

4 The annexed Guidelines are not intended to apply to external areas where cargoes and/or vehicles are stored.

5 Member Governments are invited to bring the annexed Guidelines to the attention of all Parties concerned and, in particular, recommend that such Parties:

- .1 use part 1 of the annexed Guidelines at the early stage of design of new passenger ships when determining the fire risk of external areas;
- .2 conduct fire risk assessments in accordance to part 2 of the annexed Guidelines whenever an external area on existing passenger ships is subject to change of use; and
- .3 document fire risk assessments when conducted in accordance with part 2 of the annexed Guidelines within the Shipboard Safety Management System.

ANNEX

PART 1

DESIGN GUIDELINES FOR THE EVALUATION OF FIRE RISK OF EXTERNAL AREAS ON PASSENGER SHIPS

1 FOREWORD

1.1 External areas have routinely been assumed to have little or no fire risk, and have not been required to comply with SOLAS chapter II-2 requirements applicable to interior spaces.

1.2 While this assumption may be accurate for general open deck areas, the continual evolution of new types of passenger amenities on open deck areas may be introducing levels of fire risk that are not fully accounted for by the existing regulations.

1.3 These Guidelines are not intended to be applicable to cabin balconies as these areas shall comply with the relevant requirements set out in resolution MSC.216(82).

1.4 These Guidelines have been developed to provide Administrations and designers with a tool that may be used at the early stage of a design to assess the fire risk of external areas.

2 PERFORMANCE OF THE RISK ASSESSMENT

2.1 In considering fire protection for external areas, the fire risk of all external areas as well as the impact of a fire in such areas should be evaluated¹ taking into consideration such factors as:

- .1 use of the space (type of persons who have access to, any restriction of access due to security reasons);
- .2 presence of combustible materials;
- .3 presence of sources of ignition;
- .4 ready accessibility for fire-fighting operations;
- .5 ease of escape;
- .6 proximity of ventilation intakes;
- .7 proximity to essential systems;
- .8 possibility of an external fire spreading to more than one internal fire zone; and
- .9 relationship to escape routes, assembly stations and evacuation routes to survival craft.

¹ Refer as appropriate to part 2 of these Guidelines.

3 EVALUATION OF THE RISK ASSESSMENT

3.1 For ships subject to part 1, the following paragraphs apply in lieu of paragraph 4.12 of part 2.

3.2 Should the results of the risk assessment show that the fire risk of external areas, that are normally categorized as category (4) or (5) in accordance with SOLAS regulation II-2/9.2.2.3.2.2 or category (10) in accordance with SOLAS regulation II-2/9.2.2.4.2.2, as appropriate, is such that actions should be taken to reduce it, the designers should consider:

- .1 mitigation measures (including but not limited to those listed under 4 below), to be used in conjunction with a new risk assessment; or
- .2 the area being constructed in accordance with the fire protection requirements applicable to internal spaces having same or similar fire risk.

3.3 Risk assessment and relevant evaluation resulting in additional fire protection requirements should be communicated to the Administration.

4 POSSIBLE MITIGATION MEASURES TO BE USED IN CONJUNCTION WITH THE RISK ASSESSMENT

4.1 In relation to the results of the risk assessment, it is suggested that the following mitigation measures should be applied, as appropriate:

- .1 Ignitability and smoke and toxicity of primary deck coverings.
Primary deck coverings located in positions where risk of ignition from below is possible should comply with regulations II-2/4.4.4 and 6.3.
- .2 Partial bulkheads.
Partial bulkheads should be constructed of non-combustible materials in accordance with SOLAS regulation II-2/5.3.1.2.1.
- .3 Low flame-spread, smoke and toxicity characteristics of exposed surfaces.
Surface materials such as deck finishes, carpets, decorations and veneers should comply with parts 2 and 5 of annex 1 of the Fire Test Procedures (FTP) Code.
- .4 Fire detection and suppression.
The area should be covered by a fire suppression and detection system.
- .5 Lining of non-combustible material.
Lining of bulkheads and ceilings should be of non-combustible material in accordance with SOLAS regulation II-2/3.1.2.1.
- .6 Furniture and furnishings.
Furniture and furnishings should be of restricted fire risk in accordance with SOLAS regulation II-2/3.40.

- .7 Structural fire protection.
Additional structural fire protection should be provided at boundaries.
- .8 Suspended material.
Suspended materials should have quality of resistance to the propagation of flame in accordance with part 7 of annex 1 of the FTP Code.

PART 2

SIMPLIFIED RISK ASSESSMENT METHOD FOR EXTERNAL AREAS ON PASSENGER SHIPS

1 FOREWORD

1.1 SOLAS regulations II-2/9.2.2.3.2 and 9.2.2.4.2.2 define open deck spaces as areas having no significant fire risk, and for enclosed promenades that furnishings shall be restricted to deck furniture. All external areas should be evaluated using part 2 to determine if there is an increased level of fire risk due to the presence of combustibles or ignition sources.

1.2 Measures to mitigate the risk should be implemented where appropriate.

2 APPROACH

2.1 The intent of part 2 is to present a methodology for performing simplified fire risk assessments of external areas. These Guidelines should not be used to evaluate changes to permanent structure such as bulkheads, decks or surface finishes, or to demonstrate compliance with SOLAS regulation II-2/17.

2.2 The simplified fire risk assessment consists of the following elements:

- .1 description of in the intended use of the area;
- .2 identification of the combustible materials;
- .3 identification of the ignition sources;
- .4 description of the means of escape from, and fire-fighting access to the area;
- .5 description of the materials used for the construction of the decks and bulkheads that bound the area (if any);
- .6 description of the fire-fighting systems and appliances in the area (if any);
- .7 description of the fire detection and alarm systems in the area (if any);
- .8 response procedures;
- .9 identification of essential systems;
- .10 identification of any ventilation intakes or equipment in or near the area;
- .11 effects on other areas; and
- .12 evaluation of the risk assessment.

3 PERSONNEL QUALIFICATIONS

3.1 The individuals performing the assessment should be ship's designers, ship's officers, company representatives or other persons suitably qualified. The individuals should be familiar with the arrangement and construction of the ship, as well as the location and operation of fire-fighting and fire detection systems.

4 ASSESSMENT GUIDANCE

4.1 *Description of the intended use of the area*

The intended use and arrangements of the area should be described in sufficient detail to allow an understanding of the equipment and operations to be conducted, including the expected operation each day and any operational requirement or limitation. The location and area to be occupied should be noted.

4.2 *Identification of combustibles materials*

4.2.1 An assessment should be made of the type and quantity of combustible materials and flammable liquids (except for liquors stored in bars for daily use) in the area as a result of the activity should be prepared.

4.2.2 The potential fire load of any lifesaving equipment such as lifeboats, rescue boats and liferafts need not be included in the fire load assessment.

4.2.3 The assessment should also note if any combustible materials for other purposes are routinely stored in or near the area being considered.

4.2.4 The location of any flammable oil tank vents that are in or adjacent to the area should be noted.

4.3 *Identification of the ignition sources*

Any sources of ignition in the area should be noted, along with a description of any safeguards provided. Ignition sources may include cigarettes, any open flames, cooking appliances and electrical equipment.

4.4 *Description of the means of escape from and fire-fighting access to the area*

4.4.1 The expected number of crew and passengers likely to be present in the area should be estimated for day and night conditions.

4.4.2 The location of emergency equipment lockers should be considered with respect to the area, along with the location of fire main valves and hydrants. Access routes for fire fighting should be evaluated.

4.4.3 Consideration should also be given to the abilities of the persons likely to be in the area that may need additional assistance to escape. (i.e., large number of children in play areas).

4.5 *Description of the materials used for the construction of the decks and bulkheads that bound the area*

The vessel drawings should be consulted to determine the fire integrity of any bulkheads or decks adjacent to the area. All combustible materials and finishes (including paints) in the permanent construction of the ship should be noted, and their location with respect to the area of consideration should be verified. Natural hard wood decking systems need not to be included in the assessment.

4.6 ***Description of the fire-fighting systems and appliances in the area***

Availability of fire-fighting systems and appliances in or near the area should be evaluated with respect to the intended use and activities, the arrangement and the types of fire that would occur in the area.

4.7 ***Description of the fire detection and alarm system in the area***

4.7.1 The fire detection and alarm system in or near the area should be evaluated with respect to the intended use and activities, the arrangement and the types of fire that would occur in the area.

4.7.2 The number of crew in the area and the times they will be present should also to be taken into account. Information regarding the coverage of closed circuit television in the area should also be noted.

4.8 ***Response procedures***

The fire-fighting procedures and instructions applicable to the area should be reviewed.

4.9 ***Identification of essential systems***

Proximity of systems essential for the safe operation of the ship (e.g., ships' propulsion, steering, lifesaving, fire protection systems, internal and external communications) should be considered.

4.10 ***Identification of ventilation intakes or equipment in or near the area***

Any ventilation system equipment that might be affected by a fire in the area should be identified. The distance to any air intakes or similar openings should be noted for the purpose of determining if smoke from a fire could be spread to other areas of the ship.

4.11 ***Effects on other areas***

Effects on assembly stations or evacuation routes and the possibility of the fire spread to more than one fire zone should be considered.

4.12 ***Evaluation of the risk assessment***

4.12.1 Based on the information provided in paragraphs 4.1 to 4.11 of this part 2, an evaluation should be performed to determine the relative level of fire risk associated with the new intended use of the area, the potential fire damage to the ship, and whether the fire protection is adequate for the expected level of risk.

4.12.2 If necessary, mitigation measures should be implemented to eliminate or reduce the fire to an acceptable level.

ANNEX 12

DRAFT AMENDMENTS TO THE INTERNATIONAL CONVENTION
FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDEDCHAPTER II-2
CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION
AND FIRE EXTINCTIONPart C
*Suppression of fire***Regulation 9 – Containment of fire**

1 In paragraph 7.1.1, first and second sentence, the words “non-combustible” are replaced by the words “steel or equivalent”.

2 The words “subject to paragraph 7.1.1.2” are added at the beginning of paragraph 7.1.1.1, and the article “a” before the word “material” is replaced by the article “any”.

3 The following new paragraph 7.1.1.2 is added after the existing paragraph 7.1.1.1 and the existing subsequent paragraphs are renumbered accordingly:

“2 on ships constructed on or after [*date of entry into force*], the ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame-spread characteristics and, in each case, a calorific value^{**} not exceeding 45 MJ/m² of their surface area for the thickness used;

^{**} Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 1716:2002, *Determination of calorific potential*.”

4 In paragraph 7.4.4.2, the words “non-combustible” are replaced by the words “steel or equivalent”.

5 In paragraph 7.4.4.3, the words “non-combustible” are replaced by the words “steel or equivalent”.

6 The words “subject to paragraph 7.4.4.3.2” are added at the beginning of paragraph 7.4.4.3.1, and the article “a” before the word “material” is replaced by the article “any”.

7 The following new paragraph 7.4.4.3.2 is added after the existing paragraph 7.4.4.3.1 and the existing subsequent paragraphs are renumbered accordingly:

“3.2 on ships constructed on or after [*date of entry into force*], the ducts shall be made of heat resisting non-combustible material, which may be faced internally and externally with membranes having low flame-spread characteristics and, in each case, a calorific value* not exceeding 45 MJ/m² of their surface area for the thickness used;”

* Refer to the recommendations published by the International Organization for Standardization, in particular publication ISO 1716:2002, *Determination of calorific potential*.”

8 The words “and, in addition, a fire damper in the upper end of the duct” are added at the end of paragraph 7.5.2.1.2.

ANNEX 13**DRAFT AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED****DRAFT RESOLUTION MSC.[...](85)
(adopted on [... December 2008])****ADOPTION OF AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING FURTHER article VIII(b) of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as “the Convention”), concerning the amendment procedure applicable to the Annex to the Convention, other than to the provisions of chapter I thereof,

HAVING CONSIDERED, at its [eighty-fifth] session, amendments to the Convention, proposed and circulated in accordance with article VIII(b)(i) thereof,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the Annex to the present resolution;
2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on [1 July 2009], unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world’s merchant fleet, have notified their objections to the amendments;
3. INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on [1 January 2010] upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the Annex to all Contracting Governments to the Convention;
5. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CONVENTION
FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED**

**CHAPTER II-2
CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND
FIRE EXTINCTION**

Regulation 1 – Application

1 The following new paragraph 2.3 is added:

“2.3 The following ships, with cargo spaces intended for the carriage of packaged dangerous goods, shall comply with regulation 19.3, except when carrying dangerous goods specified as classes 6.2 and 7 and dangerous goods in limited quantities* and excepted quantities** in accordance with tables 19.1 and 19.3 not later than the date of the first renewal survey on or after the [*date of entry into force of the amendments*]:

- .1 passenger ships and cargo ships of 500 gross tonnage and upwards constructed on or after 1 September 1984 but before [*date of entry into force of the amendments*]; and
- .2 cargo ships of less than 500 gross tonnage constructed on or after 1 February 1992 but before [*date of entry into force of the amendments*].

Notwithstanding these provisions:

- .3 passenger ships and cargo ships of 500 gross tonnage and upwards constructed on or after 1 September 1984 but before 1 July 1986 need not comply with regulation 19.3.3 provided that they comply with regulation 54.2.3 as adopted by the resolution MSC.1(XLV);
- .4 passenger ships and cargo ships of 500 gross tonnage and upwards constructed on or after 1 July 1986 but before 1 February 1992 need not comply with regulation 19.3.3 provided that they comply with regulation 54.2.3 as adopted by the resolution MSC.6(48);
- .5 passenger ships and cargo ships of 500 gross tonnage and upwards constructed on or after 1 September 1984 but before 1 July 1998 need not comply with regulations 19.3.10.1 and 19.3.10.2; and
- .6 cargo ships of less than 500 gross tonnage constructed on or after 1 February 1992 but before 1 July 1998 need not comply with regulations 19.3.10.1 and 19.3.10.2.

* Refer to chapter 3.4 of the IMDG Code.

** Refer to chapter 3.5 of the IMDG Code.”

Regulation 19 – Carriage of dangerous goods

2 The existing note 1 to table 19.1 is replaced by the following:

“¹ For classes 4 and 5.1 solids not applicable to closed freight containers. For classes 2, 3, 6.1 and 8 when carried in closed freight containers the ventilation rate may be reduced to not less than two air changes per hour. For classes 4 and 5.1 liquids when carried in closed freight containers, the ventilation rate may be reduced to not less than two air changes per hour. For the purpose of this requirement a portable tank is a closed freight container.”

3 In note 10 to table 19.2, the words “the Code of Safe Practice for Solid Bulk Cargoes, adopted by resolution A.434(XI)” are replaced by the words “the International Maritime Solid Bulk Cargoes (IMSBC) Code, as adopted by resolution MSC.[...](85)”.

4 The existing table 19.3 is replaced by the following table:

“Table 19.3 – Application of the requirements to different classes of dangerous goods except solid dangerous goods in bulk

Regulation 19	Class																						
	1.1 to 1.6	1.4S	2.1	2.2	2.3 flammable	2.3 non-flammable	3 FP ¹⁵ < 23°C	3 FP ¹⁵ ≥ 23°C to ≤ 60°C	4.1	4.2	4.3 liquids	4.3 solids	5.1	5.2 ¹⁶	6.1 liquids FP ¹⁵ < 23°C	6.1 liquids FP ¹⁵ ≥ 23°C to ≤ 60°C	6.1 liquids	6.1 solids	8 liquids FP ¹⁵ < 23°C	8 liquids FP ¹⁵ ≥ 23°C to ≤ 60°C	8 liquids	8 solids	9
3.1.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.1.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
3.1.3	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.1.4	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.2	X	-	X	-	X	-	X	-	-	-	X ¹⁸	-	-	-	X	-	-	-	X	-	-	-	X ¹⁷
3.3	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-
3.4.1	-	-	X	-	-	X	X	-	X ¹¹	X ¹¹	X	X	X ¹¹	-	X	X	-	X ¹¹	X	X	-	-	X ¹¹
3.4.2	-	-	X	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	X ¹⁷
3.5	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	X	X	-	X	X ¹⁹	X ¹⁹	-	-
3.6	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X ¹⁴
3.7	-	-	-	-	-	-	X	X	X	X	X	X	X	-	X	X	-	-	X	X	-	-	-
3.8	X ¹²	-	X	X	X	X	X	X	X	X	X	X	X ¹³	X	X	X	-	-	X	X	-	-	-
3.9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.10.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.10.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

- 11 When “mechanically-ventilated spaces” are required by the IMDG Code, as amended.
- 12 Stow 3 m horizontally away from the machinery space boundaries in all cases.
- 13 Refer to the IMDG Code, as amended.
- 14 As appropriate for the goods to be carried.
- 15 FP means flashpoint.
- 16 Under the provisions of the IMDG Code, as amended, stowage of class 5.2 dangerous goods under deck or in enclosed ro-ro spaces is prohibited.
- 17 Only applicable to dangerous goods evolving flammable vapour listed in the IMDG Code.
- 18 Only applicable to dangerous goods having a flashpoint less than 23°C listed in the IMDG Code.
- 19 Only applicable to dangerous goods having a subsidiary risk class 6.1.”

5 In paragraph 2.1, the words “and excepted quantities” with the following footnote are added after the text “except when carrying dangerous goods in limited quantities”:

“Refer to chapter 3.5 of the IMDG Code.”

6 The following text is added at the end of the first sentence of paragraph 3.6.1:

“and shall be selected taking into account the hazards associated with the chemicals being transported and the standards developed by the Organization according to the class and physical state* .

* For solid bulk cargoes, the protective clothing should satisfy the equipment provisions specified in the respective schedules of the IMSBC Code for the individual substances. For packaged goods, the protective clothing should satisfy the equipment provisions specified in emergency procedures (EmS) of the Supplement to the IMDG Code for the individual substances.”

7 At the end of paragraph 4, the words “and excepted quantities” are added.

ANNEX 14**DRAFT AMENDMENTS TO THE 2000 HSC CODE****DRAFT RESOLUTION MSC.[...](85)
(adopted on [... December 2008])****ADOPTION OF AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY
FOR HIGH-SPEED CRAFT, 2000 (2000 HSC CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution MSC.97(73), by which it adopted the International Code of Safety for High-Speed Craft, 2000 (hereinafter referred to as “the 2000 HSC Code”), which has become mandatory under chapter X of the International Convention for the Safety of Life at Sea (SOLAS), 1974, (hereinafter referred to as “the Convention”),

NOTING ALSO article VIII(b) and regulation X/1.2 of the Convention concerning the procedure for amending the 2000 HSC Code,

HAVING CONSIDERED, at its [eighty-fourth] session, amendments to the 2000 HSC Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2000 HSC Code, the text of which is set out in the Annex to the present resolution;
2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on [...] unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world’s merchant fleet, have notified their objections to the amendments;
3. INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on [...] upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the Annex to all Contracting Governments to the Convention;
5. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY
FOR HIGH-SPEED CRAFT, 2000 (2000 HSC CODE)**

**CHAPTER 7
FIRE SAFETY**

- 1 The existing note 1 to table 7.17-1 is replaced by the following:
 - “¹ For classes 4 and 5.1 solids not applicable to closed freight containers. For classes 2, 3, 6.1 and 8 when carried in closed freight containers the ventilation rate may be reduced to not less than two air changes per hour. For classes 4 and 5.1 liquids when carried in closed freight containers, the ventilation rate may be reduced to not less than two air changes per hour. For the purpose of this requirement a portable tank is a closed freight container.”
- 2 The existing table 7.17-3 is replaced by the following:

“Table 7.17-3

Application of the requirements of section 7.17.3 to different classes of dangerous goods except solid dangerous goods in bulk

Section	Class																							
	1.1 to 1.6	1.4S	2.1	2.2	2.3 flammable	2.3 non-flammable	3 FP ¹² < 23°C	3 FP ¹² ≥ 23°C to ≤ 60°C	4.1	4.2	4.3 liquids	4.3 solids	5.1	5.2 ¹³	6.1 liquids FP ¹² < 23°C	6.1 liquids FP ¹² ≥ 23°C to ≤ 60°C	6.1 liquids	6.1 solids	8 liquids FP ¹² < 23°C	8 liquids FP ¹² ≥ 23°C to ≤ 60°C	8 liquids	8 solids	9	
7.17.3.1.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7.17.3.1.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
7.17.3.1.3	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7.17.3.1.4	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7.17.3.2	X	-	X	-	X	-	X	-	-	-	X ¹⁵	-	-	-	X	-	-	-	X	-	-	-	X ¹⁴	
7.17.3.3	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-	
7.17.3.4.1	-	-	X	-	-	X	X	-	X ⁸	X ⁸	X	X	X ⁸	-	X	X	-	X ⁸	X	X	-	-	X ⁸	
7.17.3.4.2	-	-	X	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	X ¹⁴	
7.17.3.5	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	X	X	-	X	X ¹⁶	X ¹⁶	-	-	
7.17.3.6	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X ¹¹	
7.17.3.7	-	-	-	-	-	-	X	X	X	X	X	X	X	-	X	X	-	-	X	X	-	-	-	
7.17.3.8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
7.17.3.9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
7.17.3.10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

⁸ When “mechanically-ventilated spaces” are required by the IMDG Code, as amended.

⁹ Stow 3 m horizontally away from the machinery space boundaries in all cases.

¹⁰ Refer to the IMDG Code, as amended.

¹¹ As appropriate for the goods to be carried.

¹² FP means flashpoint.

¹³ Under the provisions of the IMDG Code, stowage of class 5.2 dangerous goods under deck or in enclosed ro-ro spaces is prohibited.

- ¹⁴ Only applicable to dangerous goods evolving flammable vapour listed in the IMDG Code.
- ¹⁵ Only applicable to dangerous goods having a flashpoint less than 23°C listed in the IMDG Code.
- ¹⁶ Only applicable to dangerous goods having a subsidiary risk class 6.1.”
- 3 In paragraph 7.17.1, the words “and excepted quantities” with the following footnote are added after the text “except when carrying dangerous goods in limited quantities”:
“Refer to chapter 3.5 of the IMDG Code.”
- 4 The following text is added at the end of the first sentence of paragraph 7.17.3.6.1:
“and shall be selected taking into account the hazards associated with the chemicals being transported and the standards developed by the Organization according to the class and physical state* .

* For solid bulk cargoes, the protective clothing should satisfy the equipment provisions specified in the respective schedules of the IMSBC Code for the individual substances. For packaged goods, the protective clothing should satisfy the equipment provisions specified in emergency procedures (EmS) of the Supplement to the IMDG Code for the individual substances.”

ANNEX 15**DRAFT MSC CIRCULAR****UNIFIED INTERPRETATION OF SOLAS CHAPTER II-2 ON THE NUMBER AND ARRANGEMENT OF PORTABLE FIRE EXTINGUISHERS ON BOARD SHIPS**

1 The Maritime Safety Committee, at its [eighty-fourth session (7 to 16 May 2008)], with a view to providing more specific guidance for vague expressions such as “to the satisfaction of the Administration”, which are open to different interpretations contained in IMO instruments, approved the Unified interpretations of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers on board ships prepared by the Sub-Committee on Fire Protection at its fifty-second session, as set out in the annex.

2 Member Governments are invited to use the annexed unified interpretations as guidance when applying relevant provisions of SOLAS chapter II-2 on the number and arrangement of portable fire extinguishers on board ships on or after 1 January 2009 and to bring the unified interpretations to the attention of all parties concerned.

ANNEX

DRAFT UNIFIED INTERPRETATION ON THE NUMBER AND ARRANGEMENT OF PORTABLE FIRE EXTINGUISHERS ON BOARD SHIPS

1 Scope and application

1.1 The unified interpretation provides guidance on the number and arrangement of portable fire extinguisher on board ships as required by SOLAS regulations II-2/10.3, II-2/10.5.1.2, II-2/10.5.2.2, II-2/10.5.3.2.2, II-2/10.5.4, II-2/18.5.1.1, II-2/18.5.1.2, II-2/19.3.7 and II-2/20.6.2.1 and chapter 4 of the FSS Code.

1.2 This unified interpretation should be used for ships constructed on or after 1 January 2009. For ships constructed before 1 January 2009, shipowners are encouraged to implement this unified interpretation.

1.3 SOLAS regulation II-2/10.3.2.3 (regarding the allowed spaces to arrange carbon dioxide fire extinguishers) and paragraph 4.2.1.1.1 of the FSS Code (regarding the quantity of medium of portable fire extinguishers) should be applied to ships constructed on or after 1 January 2009.

2 Unified interpretation on the number and arrangement of portable fire extinguishers in the various types of spaces on board ships

2.1 The table below should be applied for the number and arrangement of portable fire extinguishers in accommodation spaces, service spaces, control stations, machinery spaces of category A, other machinery spaces, cargo spaces, weather deck and other spaces on board ships.

2.2 SOLAS regulation II-2/10.3.2.2 requires that “one of the portable fire extinguishers intended for use in any space be stowed near the entrance to that space. It is recommended that the remaining portable fire extinguishers in the public spaces and workshops be located at or near the main entrances and exits.

2.3 If a space is locked when unmanned, portable fire extinguishers required for that space may be kept inside or outside the space.

2.4 Unless expressly provided by MSC/Circ.1120 or SOLAS regulation II-2/10.5, the following table should be applied to the number and arrangement of portable fire extinguishers in machinery spaces of category A.

3 The selection of portable fire extinguishers

The selection of portable fire extinguishers should be appropriate to the fire hazard(s) in the space in accordance with the Guidelines for marine portable fire extinguishers, as adopted by resolution A.951(23). The classes of portable fire extinguishers in the table are only for reference.

Table – Minimum numbers and distribution of portable fire extinguishers in the various types of spaces on board ships

Type of Spaces		Minimum number of extinguishers	Class(es) of extinguisher(s)
Accommodation spaces	Public spaces	1 per 250 m ² of deck area or fraction thereof	A
	Corridors	Travel distance to extinguishers should not exceed 25 m within each deck and main vertical zone	A
	Stairway	0	
	Lavatories, cabins, offices, pantries containing no cooking appliances	0	
	Hospital	1	A

Type of Spaces		Minimum number of extinguishers	Class(es) of extinguisher(s)
Service spaces	Laundry drying rooms, pantries containing cooking appliances	1 ²	A or B
	Lockers and store rooms (having a deck area of 4 m ² or more), mail and baggage rooms, specie rooms, workshops (not part of machinery spaces, galleys)	1 ²	B

Type of Spaces		Minimum number of extinguishers	Class(es) of extinguisher(s)
	Galleys	1 Class B and one additional Class F or K for galleys with deep fat fryers	B , F or K
Service spaces	Lockers and store rooms (deck area is less than 4 m ²)	0	
	Other spaces in which flammable liquids are stowed	In accordance with SOLAS regulation II-2/10.6.3	
Control stations	Control stations (other than wheelhouse)	1	A or C
	Wheelhouse	2 if the wheelhouse is less than 50 m ² only one extinguisher is required ³	A or C
Machinery spaces of category A	Central control station for propulsion machinery	1, and 1 additional extinguisher suitable for electrical fires when main switchboards are arranged in central control station	A and/or C
	Vicinity of the main switchboards	2	C
	Workshops	1	A or B
	Enclosed space with oil-fired inert gas generators, incinerators and waste disposal units	2	B
	Separately enclosed room with fuel oil purifiers	0	
	Periodically unattended Machinery spaces of category A	1 at each entrance ¹	B

Type of Spaces		Minimum number of extinguishers	Class(es) of extinguisher(s)
Other spaces	Workshops forming part of machinery spaces and other machinery spaces (auxiliary spaces, electrical equipment spaces, auto – telephone exchange rooms, air conditioning spaces and other similar spaces)	1	B or C
	Weather Deck	0 ⁴	B
	Ro-ro spaces and vehicle spaces	No point if space is more than 20 m walking distance from an extinguisher at each deck level ^{4, 5}	B
	Cargo spaces	0 ⁴	B
	Cargo pump-room	2	B
	Helidecks	In accordance with SOLAS regulation II-2/18.5.1	B

NOTES:

- 1 A portable fire extinguisher required for a small space may be located outside and near the entrance to that space.
- 2 For service spaces, a portable fire extinguisher required for that small space placed outside or near the entrance to that space may also be considered as part of the requirement for the space in which it is located.
- 3 If the wheelhouse is adjacent with the chartroom and has a door giving direct access to chartroom, no additional fire extinguisher is required in the chart room. The same applies to safety centres if they are within the boundaries of the wheelhouse in passenger ships.
- 4 Two portable fire extinguishers, each having a capacity of not less than 6 kg of dry powder or equivalent, should be provided when dangerous goods are carried on the weather deck, in open ro-ro spaces and vehicle spaces, and in cargo spaces as appropriate. Two portable fire extinguishers, each having a suitable capacity, should be provided on weather deck for tankers.
- 5 No portable fire extinguisher needs to be provided in cargo holds of container ships if motor vehicles with fuel in their tank for their own propulsion are carried in open or closed containers.

ANNEX 16**DRAFT MSC CIRCULAR****UNIFIED INTERPRETATIONS OF SOLAS CHAPTER II-2**

1 The Maritime Safety Committee, at its [eighty-fourth session (7 to 16 May 2008)], with a view to providing more specific guidance for application of the relevant requirements, of the 1974 SOLAS Convention, approved the unified interpretations of SOLAS chapter II-2 prepared by the Sub-Committee on Fire Protection, at its fifty-second session, as set out in the annex.

2 Member Governments are invited to use the annexed unified interpretations as guidance when applying relevant provisions of SOLAS chapter II-2 to fire protection construction, installation, arrangements and equipment to be installed on board ships of which the building contract is placed on or after [*date of approval of the circular*] and to bring the unified interpretations to the attention of all parties concerned.

ANNEX

UNIFIED INTERPRETATIONS OF SOLAS CHAPTER II-2

Regulation II-2/4.3 – Arrangements for gaseous fuel for domestic purposes

1 A portion of open deck, recessed into a deck structure, machinery casing, deck house, etc., utilized for the exclusive storage of gas bottles is considered acceptable for the purpose of regulation II-2/4.3 provided that:

- .1 such a recess has an unobstructed opening, except for small appurtenant structures, such as opening corner radii, small sills, pillars, etc. The opening may be provided with grating walls and door; and
- .2 the depth of such a recess is not greater than 1 m.

2 A portion of open deck meeting the above should be considered as open deck in applying tables 9.1 to 9.8 of SOLAS chapter II-2.

Regulations II-2/9.7.2.1, 9.7.2.2 and 9.7.5.2.1 – Separation of galley exhausts ducts from spaces

1 With respect to the application of SOLAS regulations II-2/9.7.2.1, 9.7.2.2 and 9.7.5.2.1 for determining fire insulation for trunks and ducts which pass through an enclosed space, the term “pass through” pertains to the part of the trunk/duct contiguous to the enclosed space.

2 The following sketches are given as examples:

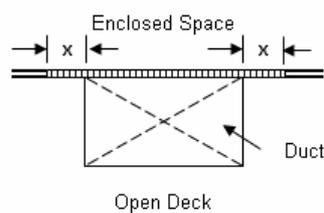


Figure 1

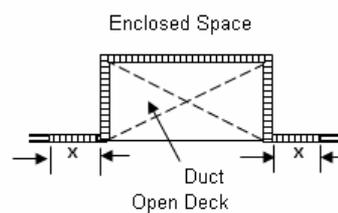


Figure 2

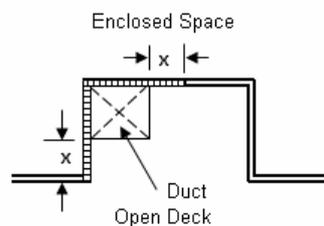


Figure 3

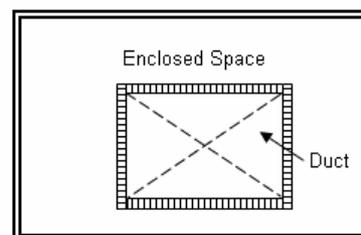
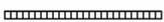


Figure 4

 = fire insulation
 $x = 450 \text{ mm}$

Examples of galley ducts contiguous to enclosed space

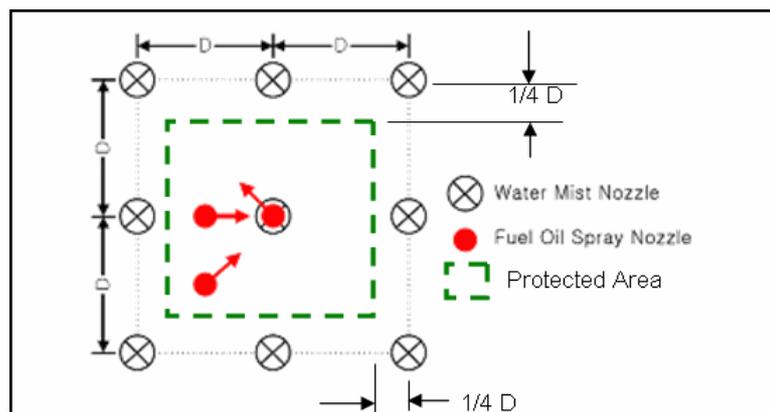
Regulation II-2/10.5.6 – Fixed local application fire-extinguished systems*

- 1 The end nozzles of a single line of nozzles should be positioned:
 - .1 outside the hazard where paragraph 3.4.2.1 of the appendix to the annex to MSC/Circ.913 is applicable, to the distance established in testing, and
 - .2 at the edge or outside of the protected area where paragraph 3.4.2.2 of the appendix to the annex to MSC/Circ.913 is applicable.

A single nozzle should be located above the fire source and at the centre of an area having dimensions $D/2 \times D/2$.

Sketches of acceptable arrangements are as follows:

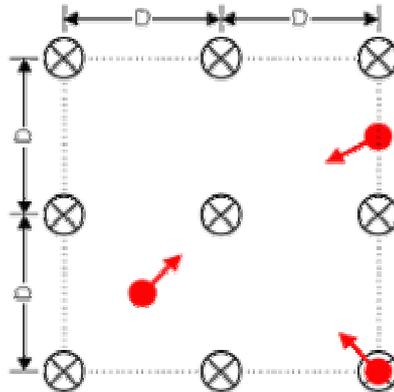
1.1 System (utilizing a 3 x 3 nozzle grid) that extinguishes fires referred to in paragraphs 3.3.2.1 to 3.3.2.3 of the appendix to the annex to MSC/Circ.913



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

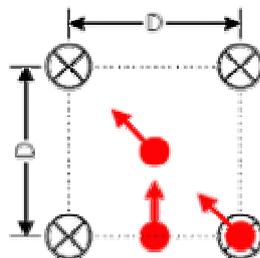
* The fixed local application fire-fighting systems shall be approved based on the standards contained in the Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces (MSC/Circ.913).

1.2 System (utilizing a 3 x 3 nozzle grid) that extinguishes fires referred to in paragraphs 3.3.2.3 to 3.3.2.5 of the appendix to the annex to MSC/Circ.913



For this system, outer nozzles can be located either at the edge of the protected area or outside of the protected area.

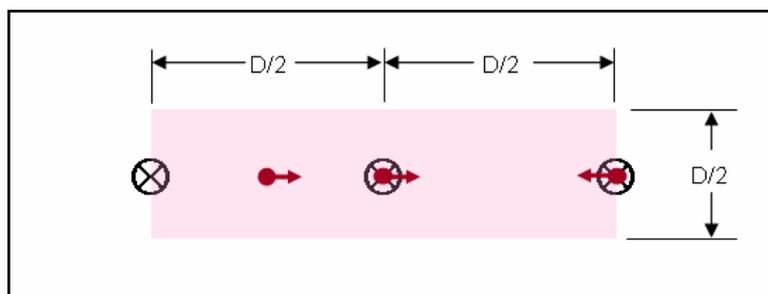
1.3 System (utilizing a 2 x 2 nozzle grid) that extinguishes fires referred to in paragraphs 3.3.2.3 to 3.3.2.5 of the appendix to the annex to MSC/Circ.913



For this system, outer nozzles can be located either at the edge of the protected area or outside of the protected area.

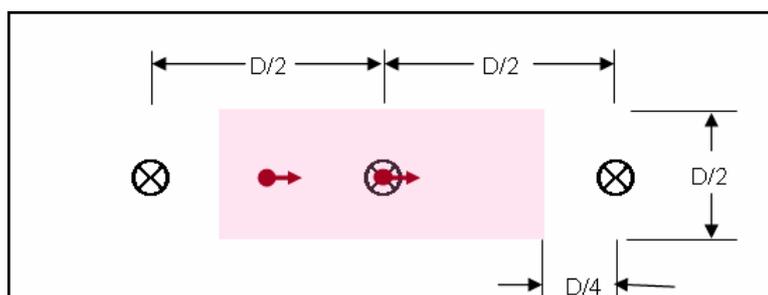
1.4 A single row of nozzles

1.4.1 System that extinguishes fires referred to in paragraphs 3.3.2.3 to 3.3.2.5 of the appendix to the annex to MSC/Circ.913



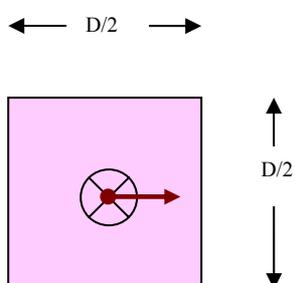
For this system, outer nozzles should be placed at least at the edge of the protected area.

1.4.2 System that extinguishes fires referred to in paragraphs 3.3.2.1 to 3.3.2.3 of the appendix to the annex to MSC/Circ.913



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

1.5 Single nozzle



Regulation II-2/10.8.1 – Fixed deck foam fire extinguishing systems

Where an enclosed pipe trunk is situated within the cargo tanks deck area, the pipe trunk:

- .1 should be protected by a fixed fire-extinguishing system in accordance with regulation II-2/10.9. The extinguishing system should be operated from a readily accessible position outside the pipe trunk;
- .2 is not considered part of the cargo tanks deck area;
- .3 the area of the pipe trunk need not be included in the calculation of the foam solution rate of supply for the deck foam system required by regulation II-2/10.8;
- .4 should be adequately ventilated and protected in accordance with regulations II-2/4.5.10.1.2 and II-2/4.5.10.1.3; and
- .5 should contain no flammable gas sources other than pipes and flanges. If the pipe trunk contains any other source of flammable gas, i.e., valves and pumps, it should be regarded as a cargo pump-room.

ANNEX 17

**PROPOSED REVISED WORK PROGRAMME OF THE SUB-COMMITTEE AND
PROVISIONAL AGENDA FOR FP 53**

PROPOSED REVISED WORK PROGRAMME OF THE SUB-COMMITTEE

		Target completion date/number of sessions needed for completion	Reference
1	Analysis of fire casualty records	Continuous	MSC 75/24, paragraph 22.18; FP 52/21, section 15
2	Consideration of IACS unified interpretations <i>Strategic direction: 1.1</i> <i>High-level action: 1.1.2</i> <i>Planned output: 1.1.2.1</i>	Continuous	MSC 78/26, paragraph 22.12; FP 52/21, section 12
H.1	Performance testing and approval standards for fire safety systems <i>Strategic direction: 2</i> <i>High-level action: 2.1.1</i> <i>Planned output: 2.1.1.2</i>	2009	MSC 74/24, paragraph 21.12; FP 52/21, section 3
H.2	Comprehensive review on the Fire Test Procedures Code <i>Strategic direction: 2</i> <i>High-level action: 2.1.1</i> <i>Planned output: 2.1.1.1</i>	2008 2009	MSC 80/24, paragraph 21.11; FP 52/21, section 4
H.3	Review of the SPS Code (co-ordinated by DE) <i>Strategic direction: 2</i> <i>High-level action: 2.1.1</i> <i>Planned output: 2.1.1.2</i>	2008	MSC 78/26, paragraph 24.9; FP 51/19, section 6

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- Notes:**
- 1 “H” means a high priority item and “L” means a low priority item. However, within the high and low priority groups, items have not been listed in any order of priority.
 - 2 Struck-out text indicates proposed deletions and the shaded text shows proposed additions or changes.
 - 3 Items printed in bold letters have been selected for the provisional agenda for FP 53.

		Target completion date/number of sessions needed for completion	Reference
H.4 H.3	Development of provisions for gas-fuelled ships (co-ordinated by BLG) <i>Strategic direction:</i> 5.2 <i>High-level action:</i> 5.2.1 <i>Planned output:</i> 5.2.1.1	2009	MSC 78/26, paragraph 24.19; FP 52/21, section 11
H.5 H.4	Measures to prevent fires in engine-rooms and cargo pump-rooms <i>Strategic direction:</i> 2 <i>High-level action:</i> 2.1.1 <i>Planned output:</i> 2.1.1.2	2009	MSC 79/23, paragraph 20.11; FP 52/21, section 6
H.6 H.5	Fire resistance of ventilation ducts <i>Strategic direction:</i> 5.2 <i>High-level action:</i> 5.2.1 <i>Planned output:</i> 5.2.1.1	2009	MSC 81/25, paragraph 23.13; MSC 83/28, paragraph 25.22
H.7	Application of requirements for dangerous goods in package form in SOLAS and the 2000 HSC Code (in co-operation with DSC) <i>Strategic direction:</i> 5.2 <i>High-level action:</i> 5.2.3 <i>Planned output:</i> 5.2.3.1	2008	MSC 81/25, paragraph 23.14; FP 51/19, section 12
H.8	Unified interpretation on the number and arrangement of portable extinguishers <i>Strategic direction:</i> 2 <i>High-level action:</i> 2.1.1 <i>Planned output:</i> 2.1.1.2	2008	MSC 81/25, paragraphs 23.15 and 23.16; FP 51/19, section 13
H.9	Review of fire safety of external areas on passenger ships <i>Strategic direction:</i> 5.1 <i>High-level action:</i> 5.1.1 <i>Planned output:</i> 5.1.1.1	2009	MSC 81/25, paragraph 23.17.1;

		Target completion date/number of sessions needed for completion	Reference
H.10 H.6	Fixed hydrocarbon gas detection systems on double-hull oil tankers (in co-operation with BLG as necessary and when requested by FP) <i>Strategic direction:</i> 2 <i>High-level action:</i> 2.1.1 <i>Planned output:</i> 2.1.1.1	2009	MSC 82/24, paragraph 21.18; FP 52/21, section 13
H.11 H.7	Clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre <i>Strategic direction:</i> 2 <i>High-level action:</i> 2.1.1 <i>Planned output:</i> 2.1.1.2	2009	MSC 82/24, paragraph 21.20; FP 52/21, section 14
H.12 H.8	Harmonization of the requirements for the location of entrances, air inlets and openings in the superstructures of tankers (in co-operation with BLG as necessary and when requested by FP)	2 sessions 2010	MSC 83/28, paragraph 25.24.2; FP 52/21, paragraph 16.1
H.13 H.9	Amendments to SOLAS chapter II-2 related to the releasing controls and means of escape for spaces protected by fixed carbon dioxide systems	2 sessions 2010	MSC 83/28, paragraph 25.24.1; FP 52/21, paragraph 16.1
H.14 H.10	Guidelines for drainage systems in closed vehicle and ro-ro spaces and special category spaces (in co-operation with SLF) <i>Strategic direction:</i> 5.1 <i>High-level action:</i> 5.1.1 <i>Planned output:</i> 5.1.1.2	2009	MSC 83/28, paragraph 25.20 FP 52/21, paragraph 18.5
H.15 H.11	Review of fire protection requirements for on-deck cargo areas (in co-operation of DSC as necessary and when requested by FP)	3 sessions 2011	MSC 83/28, paragraph 25.21; FP 52/21, paragraph 16.1
H.16 H.12	Means of escape from machinery spaces	2 sessions 2010	MSC 83/28, paragraph 25.23; FP 52/21, paragraph 16.1

		Target completion date/number of sessions needed for completion	Reference
H.17 H.13	Measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes (in co-operation with BLG and DE as necessary and when requested by FP) <i>Strategic direction:</i> 5.2 <i>High-level action:</i> 5.2.3 <i>Planned output:</i> 5.2.3.4	2009	FP 51/19, paragraph 10.8; MSC 83/28, paragraph 9.26; FP 52/21, section 20
H.18 H.14	Recommendation on evacuation analysis for new and existing passenger ships <i>Strategic direction:</i> 5.1 <i>High-level action:</i> 5.1.1 <i>Planned output:</i> 5.1.1.1	2008 2010	MSC 73/21, paragraph 4.16; MSC 83/28, paragraph 8.7; FP 52/21, section 19
L.1	Smoke control and ventilation	2 sessions	FP 39/19, section 9; FP 46/16, section 4

DRAFT PROVISIONAL AGENDA FOR FP 53*

- Opening of the session
- 1 Adoption of the agenda
 - 2 Decisions of other IMO bodies
 - 3 Performance testing and approval standards for fire safety systems
 - 4 Comprehensive review of the Fire Test Procedures Code
 - 5 Measures to prevent explosions on oil and chemical tankers transporting low-flashpoint cargoes
 - 6 Fire resistance of ventilation ducts
 - 7 Guidelines for drainage systems in closed vehicle and ro-ro spaces and special category spaces
 - 8 Clarification of SOLAS chapter II-2 requirements regarding interrelation between central control station and safety centre
 - 9 Recommendation on evacuation analysis for new and existing passenger ships
 - 10 Measures to prevent fires in engine-rooms and cargo pump-rooms
 - 11 Development of provisions for gas-fuelled ships
 - 12 Consideration of IACS unified interpretations
 - 13 Fixed hydrocarbon gas detection systems on double-hull oil tankers
 - 14 Harmonization of the requirements for the location of entrances, air inlets and openings in the superstructures of tankers
 - 15 Amendments to SOLAS chapter II-2 related to the releasing controls and means of escape for spaces protected by fixed carbon dioxide systems
 - 16 Means of escape from machinery spaces
 - 17 Review of fire protection requirements for on-deck cargo areas
 - 18 Analysis of fire casualty records
 - 19 Work programme and agenda for FP 54

* Agenda item numbers do not necessarily indicate priority.

- 20 Election of Chairman and Vice-Chairman for 2010
 - 21 Any other business
 - 22 Report to the Maritime Safety Committee
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