日本財団 助成
The Nippon Foundation

研究資料　No. 281R

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船舶の防火に関する調査検討

（平成１６年度報告書）

平成１７年３月

社団法人　日本造船研究協会

（頁調整）

はし がき

本報告書は、日本財団の平成１６年度助成事業「船舶関係諸基準に関する調査研究」の一環として、RR-R2 (防火)において実施した「船舶の防火に関する調査検討」の成果をとりまとめたものである。

RR-R2 (防火) 調査検討会名簿（順不同、敬称略）

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	（山田　浩之	国土交通省海事局安全基準課）
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事務局	中川　直人	（日本造船研究協会　IMO 担当）
	柳瀬　啓	（日本造船研究協会　IMO 担当）
	山岸　進	（日本造船研究協会）

注：（　）内は前任者を示す。

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１．はじめに

本年度は、IMO における防火に係わる問題として、消火装置等の火災安全システムの性能試験及び承認基準の調和に関する検討、大型旅客船の安全、HSC コードの見直し、FTP コードの改正（総会決議 A.653(16)及び A.754(18)の見直し）及び IACS 統一解釈の検討等が行われた。

本部会としては、上記のような IMO の動きにあわせた対応を検討する一方、消火装置等の火災安全システムの性能試験及び承認基準の調和に関し、国内造船所にて、近年採用が増加している発泡器を保護区域に有する高膨張泡消火装置の承認基準案を、国内で行われた試験結果を基に作成し、試験結果も併せてIMOに提案した。また、ＩＭＯにて承認された場合、その影響の大きいＩＡＣＳ統一解釈のうち、非常用消火ポンプに関する統一解釈について国内の意見をまとめ、代案をＩＭＯに提出した。

一方、1998 年から強制化された FTP コードについて、現在、ＩＭＯで多くの統一解釈が作成されていること等を考慮し、ＩＭＯにその改正を提案すべく本部会にて検討を開始した。

２．RR-R2 部会活動の概要

２．１　概要

本年度、本部会は 4 回の会合を開催し、IMO/CG への対応を検討するとともに、MSC78 及び FP49 の関連文書の問題点及び各国の意見、提案について検討を行い、国土交通省海事局に本部会の意見を具申した。また、高膨張泡消火装置の承認に関する指針案を作成し、国内で行われた試験結果とともに IMO への提案文書案を作成、提出した。併せて、海技研で実施された旅客船用避難解析暫定指針（MSC/Circ.1033）に基づく避難解析結果を基に、同暫定指針に関する Information Paper を提出した。また、IACS が MSC78 に提出した非常用消火ポンプのサクション位置に関する統一解釈に対する問題点及び代案を提案文書として作成し、IMO に提出した。同時に、IBC コードの見直しに対する検討も行い、その結果を IMO/BLG 小委員会へ提案した。

２．２　会合議事概要

主な審議内容は下記のとおり。

2.2.1　Working Group

第1回会合に先立ち、早急に対応すべき項目を検討するため、関係者による Working Group を開催した。

主な審議内容は下記の通り。

（１）IBC コード見直し
　　CG に対する回答案の作成

（２）カーペット等の床材の試験基準の見直し
　　仏提案に対する検討

（３）IMO/FP/CG 対応
　　CG で検討中の水系消火装置承認基準改正案、CO2 消火装置改正案及び CO2 消火装置の保守に関する指針案に対する検討

（４）固定式高膨張泡消火装置承認基準案に対する検討
　　本案を日本提案とすべく検討

2.2.2　第 1 回会合(平成 16 年 6 月 28 日)

（１）WG の報告

（２）IMO/FP/CG 対応
　　WG で行った検討結果の検討を行った。

（３）IBC コード見直し
　　IMO 提案文書案を基に審議を行った。

（５）HSC コード見直し
　　IMO/CG で検討中の文書を基に審議を行った。

（６）固定式高膨張泡消火装置承認基準案に対する検討
　　基準案を基に審議を行った。

（７）床表面材承認基準見直し
　　関連試験方法及び取り付け方法を基に検討を行った。

2.2.3　第２回会合(平成 16 年 9 月 21 日)

（１）　IMO 対応

FP49 会合の主要議題に関する説明が行われ、対処案が検討された。

（２）IMO/FP/CG 対応

CG 対応に関する検討が行われた。

2.2.4　第３回会合(平成 17 年 1 月 11 日)

（１）　FP49 対応

FP49 の提案文書に対する対処方針案について検討した。

（２）　FTP コードの総合見直し

FP50 以降の新議題項目としての提案に対する検討が行われ、MSC80 に提案することとなった。

（３）　報告書案

本年度の報告書目次案について検討し、了承された。

2.2.5　第４回会合(平成 17 年 2 月 9 日)

（１）　FP49 報告

FP49 の審議結果についての報告を行った。

（２）　FP50 対応

FP49 の審議結果を基に、FP50 対応を検討した。

（３）　FTP コード

FTP コードの総合見直しに関する検討計画について検討が行われた。

３　防火に関するＩＭＯの動向

３．１　ＭＳＣ７８における審議

事務局より、MSC78/14 に基づき FP48 の報告が行われ、特段の異議なく要請事項が認められ、添付の MSC/Circular 及び床材に対する SO2 判定基準に関する FTP コード改正案が承認された。

３．２　ＦＰ４９への対応と同会合における審議

３．２．１　ＦＰ４９への対応

FP49 対応として、議題ごとに下記のとおり対応案を作成した。

3.2.1.1 **大型旅客船の安全（議題 3 関係、WG）**

(ｱ) 経緯

この議題については、MSC 79 で議題名から"Large"を削除することが決定され、各小委員会への指示が見直された。その際、各種要件の適用を判断するためのパラメータや、他の小委員会における審議との関係について加筆された。MSC 78 から防火小委員会への指示の一つ「船室の非常照明の検討」は、DE に送られた。また、各小委員会の作業の目標年が 2006 年に統一された（FP 50）。

防火小委員会では、前回会合において C.G.を設置し、我が国もこれに参加したが、特段のコメントは出さなかった。

(ｲ) 基本的対処方針

安全対策の適用範囲をむやみに広げないことに留意しつつ、適宜対処。また、火災シナリオについて審議される場合、目標年が 2006 年であることに留意し、可能な限り明確な根拠に基づいて火災シナリオが設定されるよう配慮すること。なお、火災シナリオ及びリスクについては、海技研にて現在研究を継続中であり、FP50 へは成果を報告できる見込み。

(ｳ) 各提案文書の概要と対処

○　FP 49/3 Outcome of MSC 78, Secretariat

MSC 78 の報告である。MSC 78 からは、以下の 7 項目について検討を指示されている。

(2.1)　"safe area" concept に資する機能要件、火災シナリオ及び性能基準を策定すること。

(2.2)　限界火災シナリオと時間経過を考慮して、重要設備を維持するための要件と性能基準を策定すること。

(2.3)　消火活動における即応戦略を策定すること。

(2.4)　船上の安全センターの要件を策定すること。

(3.1)　必要に応じて、MSC/Circ.1033 を"safe area" concept、火災シナリオ、時間経過を考慮して更新すること。

(3.2)　船室の非常用照明の要件を策定すること。（MSC 79 において、DE 送りとなった。）

(3.3)　着岸中の船体放棄（総員退船）の指針の必要性について検討すること。

○　FP 49/3/1 Report of the correspondence group, Germany

C.G.の報告である。C.G.では、MSC 78 の検討結果（MSC 78/WP.14）も考慮されている。C.G.では、火災に係る"safe area" concept 及び関係する要件を具体化しつつある。上記 (2.1) 及び (2.2) に

ついては米国､ICCL 及びドイツが､火災シナリオについてはさらにオランダがコメントを出している。なお、資料のうち ANNEX 6（第 11 節）は議題 9 で審議される。

○ FP 49/3/2 Outcome of MSC 79, Secretariat

MSC 79 の報告である。議題名から"Large"が外されたことを除けば、FP 小委員会への指示に特段の変更は無い。

3.2.1.2 火災安全システムに関する性能試験及び承認基準（議題 4 関係、WP）

(ｱ) CG の検討結果の報告（FP49/4、米）

CG の検討結果として下記の項目が報告されている。

- MSC/Circ.668/728 の改正案
- Class III 機関室消火装置の一般設置指針及び機能目的
- 固定式ガス消火装置用設計基準の改正案
- 固定式 CO2 消火装置の検査及び保守に関する指針案
- 総会決議 A.800(19)の改正案
- SOLAS II-2/9.4.1.3.3 規則の改正案（A-0 窓の冷却に関する要件）

又、FP48 での検討結果である下記の項目に関する状況が報告されている。

- MSC/Circ.913 の改正案
- MSC/Circ.848 の改正案

更に、MSC/Circ.668/728 には、ﾊﾞｯｸｱｯﾌﾟﾎﾟﾝﾌﾟ及び１分間容量のある圧力タンクを持つような冗長性が要求されているが、各装置基準間の調和を計るために、この冗長性をその他の装置（ガス、泡等）に適用することに関する可否の検討を要請している。

各項目に関しては、下記の通り対応することとした。

- MSC/Circ.668/728 の試験基準改正案に関しては、特に我が国のコメントに関する項目を含め、情報収集に努められたい（以下の(2)参照)。
- 固定式ガス消火装置用設計基準の改正案及び固定式 CO2 消火装置の検査及び保守に関する指針案に関しては、我が国コメントが採用されるよう努められたい。又、その他の項目に関しては情報収集に努める。
- MSC/Circ.913 に関しては、２種類の消火性能の違う試験方法が選べるにも拘わらす、１列又はノズル１個の場合の適用は同じという矛盾を訂正すべき旨、指摘する。
- 冗長性に関しては、各装置の特性及び使用実績を考慮して検討すべきで、特にその他の装置に関しては冗長性は必要ない旨、指摘する。
- その他の項目に関しては、情報収集に努める。

(ｲ) 加圧水噴霧消火装置の火災試験方法 MSC/Circ.668,728)の改正（FP49/4/1、スウェーデン）

現行で区画全体に対する加圧水噴霧消火装置の性能を測る唯一のパラメーターは、消火時間であるが、この計測は再現性に乏しく、FP48 において、遮蔽された炎の放熱率及び試験区画内のガス温の計測をベースにしたパラメーター及び判定基準が提案された。この方法は、区画の大きさ、通気条件、炎の大きさ、燃料のタイプ等に関係なく、様々の消火装置のランク付けが可能であり、その再現性はこれまでで最も高く、あるサイズの区画からより大きなサイズの区画へのスケーリングを可能としている。

検討されたパラメータ及び判定基準に関する情報収集に努め、また、これらを設けることだけではなく、消火性能はノズルの配置にも影響をうけるため、ノズル配置に関する検討も同時に行う必要がある旨、指摘する。

(ウ) 発泡器を保護区域に備えた高膨張泡消火装置の承認基準案（FP49/4/2、日）

近年、泡原液が無害であること及び装置がコンパクトである等の理由を基に、泡発泡器を保護区域の内部に持つ高膨張泡装置が、多くの船舶の機関室に設置されるようになってきている。一方、高膨張泡装置の要件は FSS コードの第 6 章 2.2 項に規定されているが、これらの規定は発泡器が保護区域の外部にあり、発泡した泡をダクトで保護区域（機関室）へ流し込む装置を基に作成されている。

また、火災安全システムに関する性能基準及び承認基準に関する WG/CG において、高膨張泡消火装置の基準を検討する予定であったが、検討は行われなかった。

このため、当該装置の承認手順及び設置を統一するため、泡原液及びこの装置の特徴を考慮し、MSC/Circ.668/728 に規定されている関連試験手順を基に当該装置の承認に関する指針案を提案している。FP49 では我が国提案の実現に努める。

(エ) FSS コード５章 2.2.1.5 項の改正（FP49/4/3、韓国）

韓国から、放出時間についての計算を実施し得られた結果に基づいた FSS コード５章 2.2.1.5 項の改正提案。CO2 消火装置の放出時間については、詳細な要件が FSS コードに規定されておらず、また明確な要件及び指針が無いため、一貫した設計・搭載が出来ない懸念がある。2.2.1.5 項改正案文は以下の通り。

“2.2.1.5 機関区画では、固定配管は、85%のガスが 2 分以内に放出できるようなものでなければならない。もし、固定式高圧 CO2 消火装置の配管口径の決定に摩擦損失計算法が用いられる場合には、CO2 ノズルの設計放出圧力は 21bar（絶対圧力）以上であること。そして、CO2 ノズルの放出係数（オリフィス効率）は、主管庁の承認又は決定を受けること。さらに、枝配管の流量配分を考慮すること。”

圧力損失計算のガイドラインを設けることには基本的には賛成する。ただし、次の点を考慮し、別紙のコメント案をベースとして、各国の動向を見ながら適宜指摘する。

① CO2 ノズルの放出係数（オリフィス効率）については、公的機関の承認ではなく、各メーカーの基準に基づき適正なオリフィス効率を考慮したノズルを使用することで十分に目的は達せられる。
② 枝配管の流量配分を考慮するのは、複数の区画に対して同時放射する場合に限定すればよく、単一区画に放射する場合は、厳密に流量配分を考慮する必要はない。

※消防設備規則の検査心得では、枝配管の場合その分岐管の長さはほぼ同じにしなければならないと規定しており、等流量配分が基本である。

(オ) FP49/4/2 に対するコメント（FP49/4/4、韓）

我が国提案の高膨張泡消火装置承認基準案に対するコメントを述べている。基準案作成には賛意を表しているため、基準案の詳細検討について適宜対応すること。なお、本部会で検討した対応案を添付 3.1 に示す。

(カ) FSS code 及び MSC/Circ.913 に対する追加要件(FP49/4/5、露)

管系の詰まりによる消火剤の投入時間の増加をなくすため、乾式の管系を持つ消火装置及び局所消火装置には圧縮空気による掃気用装置を取り付けるよう、FSS Code 及び MSC/Circ.913 を改正するよう提案している。掃気用装置が圧縮空気接合用 Flange で満足するものであれば、定期的検査時の通気用に設置されていることから、本提案を支持して差し支えない。但し、掃気後は配管接続及びフランジをもとの状態に復帰し、これを確認する要件を追加する必要があることを指摘する。

(ｷ) 居住区における CO2 消火装置の使用(FP49/INF.5、米国)

米国は、最近、通常、人が立ち入る区域の CO2 装置使用の適否についての情報提供のため追加研究を行い、当該区域の CO2 装置禁止に関する見解のレポートをまとめた。これらのレポートは、CO2 装置に関する危険、すなわち、当該区域で使用することから生じる人身の危険の可能性についての情報を提供し、CO2 装置の危険と便益とをハロン及び他の代替ハロン装置のそれと比較している。

CO2 の潜在的な危険性については我が国も充分認識しているが、潜在的な危険がある場合、如何なる対策をしてもヒューマンエラーには対処できないのが現状である。通常、人が立ち入る区域に対する CO2 の使用を禁止するというのではなく、現時点での現実的な対策として、例えば、

① システムをより操作の簡便なものにする。
② 事故の大半がメンテナンスの時に発生していることから、メンテナンス作業時の安全対策を強化し、一定の訓練を受け承認された業者以外は点検をさせない。
③ メンテナンス時には、作業者は通信手段を携帯して、緊急連絡に備える。

などの安全対策を厳重に規定し、ヒューマンエラーが発生しても人身事故に至らないシステムにすることを検討すべき旨を適宜指摘し、情報収集に努める。

3.2.1.3 2000 年 HSC コードの見直し及び DSC コードと 1994 年 HSC コードの改正（議題 5 関係。WG）

(ｱ) 経緯

前回 FP48 において、豪州より 2000 年 HSC コードの見直し及び DSC コードと 1994 年 HSC コードの改正についての提案があり、豪州をコーディネーターとしてＣＧを設立し検討してきた。

CG の TOR：

.1 MSC/Circ.1001、MSC/Circ.1102 及びを考慮して 2000HSC コードの防火関連要件の見直し及び改正リスト案の用意

.2 上記に関連して高速旅客船の簡易避難解析に関する暫定指針の実施から得た知見の検討及び適当な勧告の作成

.3 アスベスト使用に関する問題点の検討及び適当な勧告の作成

.4 DSC コードと 1994 年 HSC コードに関する 1974SOLAS 条約及び 2000HSC コード改正に伴う要件整合の観点からの見直し及び適当な勧告の作成

(ｲ) CG からの報告

.1 2000HSC については、MSC/Circ.1102 の内容を組み入れ、改正コードに関して解釈による補足（脚注も）なしで Authentic 文書に包括させること。

Open Vehicle space の acceptable end openings の規定（コード para1.4.40, FP48/10）については、CG で合意されず、テキストの修正をせずに現行のままにしてある。小委員会での検討が求められている。

.2　避難時間の決定方法について、本 CG 及び DE 下の CG で検討を行ってきた結果を FP 小委員会はノートし、避難時間の決定のための実用的な方法を構築するための検討を求められている。

.3　CG は、アスベストの使用禁止について SOLAS Ⅱ-1/3-5 規則と同様に以下のテキストを新設することに合意した。

構造、機関、電気設備及びこのコードを適用する船舶の機器にアスベストが含まれる新規搭載材料は、以下を除いて禁止する。

.1 ロータリーベーン圧縮機及びロータリーベーン真空ポンプに使用される羽根

.2 火災、腐食及び毒性のある高温(350℃を超える)又は高圧(7MPa を超える)流体の循環に使用される水密継手及びライニング

.3 1000℃以上に使用される融通及弾性断熱材

.4　DSC コード及び 1994HSC コードの改正については、上記の SOLAS Ⅱ-1/3-5 規則関連以外には、本章委員会の範疇にないと CG は結論した。

(ｳ) 対処方針

CG での合意事項については､支持して差し支えないが､小委員会に検討を委ねている｢Open Vehicle space の acceptable end openings の規定」については、現行 2000HSC コードの規定を変更しないことを支持する。また「避難時間の決定のための実用的な方法の構築」については、我が国の経験から MSC/Circ.1102 に規定されている計算による避難時間を採用することで良い旨、適宜発言する。また、CG に我が国から出したコメント「HSC Code の見直しインターバルについては、同コードがかなり完成されてきていることから４年である必要はなく、より長い期間都として IMO の作業量を軽減すべき」を適宜主張する。

3.2.1.4 防火扉の性能要件に関する決議 A.754(18)の改正（議題 6 関係、DG）

(ｱ) 経緯

FP48 において、「幅 2cm 以下の紐状に表面に露出する mastics 及び sealants の新しい試験方法（仏案)」が提案された（FP48/15）が、本件については、各国の意見を FP49 に提出することとなった。

仏は FP49/6 にて、仏における一般的な表面燃焼性試験での試験結果の追加説明を加え、仏案の有効性を明示している。

(ｲ) 基本的対処方針

支持して差し支えない。

3.2.1.5 シール材及び樹脂材の試験片準備手順の改正（決議 A.653(16)）（議題 7 関係、DG）

(ｱ) 経緯

FP48 において、「FTP コード Part3 の防火戸の試験において、防火戸下部の隙間についてはφ6 ㎜ の Gap gauge の使用せず、コットン試験にて代用する（仏案)」が提出された（FP48/14）。本件は各国持ち帰り対応案を FP49 に提出することとなった。

仏は FP49/7 にて「防火戸下部の隙間の上限値を 15㎜ 以下とする」補足及び追加提案を提出した。

(ｲ) 基本的対処方針

現在のφ6 ㎜ の Gap gauge 試験では、防火戸設計上問題があるとするフランス案の趣旨は理解でき、以

下の事項を明確にした上で適宜対処されたい。

(a) 防火戸下部の隙間（負圧）への、コットン試験の有効性は疑わしい。

(b) 防火戸下部の隙間の上限値 15㎜ 以下を評価するために、現在のφ6 ㎜ の Gap gauge に替わり、φ15 ㎜ の Gap gauge を使用するべきではないか？

(c) エンジンルーム、厨房、CO_2ルーム等、A60 の防火特性を要求され、液体可燃物や煙の通過の抑制が要求される場所においては、「防火戸下部の隙間の上限値 15㎜」は適当でない。（居室等の、B-classの場所などでは、問題ないと考える。）

3.2.1.6 LHNS 指針の防火要件の見直し（議題 8 関係、DG）

(ｱ) 経緯

オフショアサポート船舶の制限付きばら積み危険及び有害液体物質の積付物の輸送及び取り扱いに関する指針（LHNS 指針：A.673(16)）の 3.9 項防火要件の SOLASⅡ-2 章引用項について更新することが前回 FP48 で合意された。

(ｲ) 対処方針

事務局が SOLAS2000 年改正に基づき作成した当該更新項について検討される。LHNS コードの適用形態を踏まえて 3.9.1.6 項に含まれる機関室局所消火装置の適用（SOLASⅡ-2/10.5.6）について充分検討されるよう適宜指摘する。

3.2.1.7 避難誘導システムの性能要件（議題 9 関係）

(ｱ) 経緯

FP 小委員会では、これまで音による避難誘導装置について審議してきており、英国の音響誘導装置メーカーが出席し、説明してきた。また、旅客船における実験等も実施され、有効性がアピールされてきたが、FP 小委員会においては L.L.L.との同等性が認められず、同等性を評価するための性能基準を策定することになった。

(ｲ) 対処方針

この議題に関係する提案文書は FP 49/3/1- ANNEX 6 である。文書中の目的にある通り、この文書は L.L.L.の代替手段の性能基準を示すためのものである。必要に応じて、A.752(18)（ISO 15370-2001）を考慮して適宜対処すること。

3.2.1.8 新・既存旅客船の避難解析に関する勧告（議題 10 関係）

(ｱ) 経緯

MSC/Circ.1033 については、従前より見直しが予定されていたが、我が国が Information Paper（FP 47/INF.4: Preliminary study on the Interim Guidelines for evacuation analyses for new and existing passenger ships）を提出したこと等を契機として、FP 48 から見直しが開始され、今次会合でも審議される。作業の目標年は 2005 年であるが、WG/DG が予定されていないことから、今次会合で最終化を図るのは困難と予想される。

(ｲ) 基本的対処方針

我が国提案については説明に努めるとともに、全体については、適宜対処されたい。C.G.の設置や会期間会合（FP 50 の直前）に話が及んだ場合は、積極的に対応されたい。また、旅客船における避難解析の強制適用に話が及んだ場合は、適用範囲をむやみに広げないことに留意しつつ、適宜対処する。

(ｳ) 各提案文書の概要と対処

○ FP 49/INF.3 Study on evacuation analysis and comments on MSC/Circ.1033, 我が国
海技研のエキスパートによる検討結果を示している。提案文書の説明を行う。

○ FP 49/INF.8 Data available as input to ship evacuation simulation tools,
FP 49/INF.9 Critical review of models of evacuation analysis, and
FP 49/INF.10 Collection and analysis of available data from controlled experiments, drills and actual evacuations, by 英国
研究プロジェクトの概要紹介である。INF.8 は全体、INF.9 は Prof. Vassalos 等が実施した各種避難解析モデルの比較検討結果、INF.10 は Prof. Galea 等が実施した各種実験結果等の Review の結果を紹介している。

○ MSC 78/INF.8 An experimental study on the walking speed prediction in evacuation analysis, 韓国
MSC 78 において、この文書の検討は、FP 49 に委ねられた。傾斜時及び動揺時の歩行速度に関する実験結果が紹介されている。

3.2.1.9 **火災事故記録の解析（議題 11 関係）**

提出文書無し。適宜対処。

仏文書 MSC79/22/8 が MSC79 から回されている。同様の事故（ケミカルタンカーのタンク洗浄時の爆発）は我が国でも発生しているところ、このような事故の発生頻度、リスク等を解析して、さらに要件の追加が必要か慎重に検討すべき旨、適宜指摘する。

3.2.1.10 **ガス燃料船に関する要件の策定（議題 12 関係）**

(ｱ) 背景

MSC78 において、DE 及び BLG 小委員会での新規作業計画としてノルウェーから LNG 船以外の全ての LNG を燃料として内燃機関で燃焼し、推進力を得る全ての船舶に適用する要件（SOLAS 新章及び新コード）の策定に関する提案があり、作業計画に入れることが承認された。本件について FP 小委員会の範疇である防火安全関連要件について検討し DE へ報告することとなっている。完了目標は 2007 年。DE では、DE48 から検討が開始される。

(ｲ) 対処方針

今次会合からの議題である。MSC78/24/8 の ANNEX2、コード目次案の 3 章火災安全に関する議論が要請されているが、具体的な提案がないところ、次回へ提案の提出を要請されるのみと思われる。適宜対処。

3.2.1.11 IACS **統一解釈の検討（議題 13 関係）**

(ｱ) 背景

MSC78 に IACS から提出された IACS UI（MSC78/22/1）の FP 小委員会の範疇である項目についての検討を要請されている。

(ｲ) 対処方針

我が国から、「IACS UI SC178 貨物船の非常用消火ポンプ」について修正案（FP49/13）を提出している。また、非常用消火ポンプの搭載について、現実的な船舶設計及び操船を考慮した合理的な統一解釈を構築されることが望ましく、改めて検討することを要請している。我が国提案の実現に努めること。

3.2.1.12 **その他の議題（議題 16 関係）**

(ｱ) 機関室及び貨物ポンプ室の防火手段（FP49/16、FP49/16/4、FP49/INF.16：韓国）

MSC79 で新規作業計画として作業計画に入れることが承認され、FP50 から議題に取り入れられ、3 セッションを割くこととなった。本提案は、「機関室及び貨物ポンプ室の防火手段」ついての MSC/Circ.案（指針案）の策定をするものであり、それに付随する情報として韓国で行った「機関室で使用される種々の可燃性油の引火条件(FP49/16/4)」の試験結果及び「スプレーシールドの効果と必要性(FP49/INF.6)」が提出されている。支持して差し支えない。

(ｲ) 火災安全の代替設計及び配置－SOLAS 条約証書の参照（FP49/16/2：ノルウェー）

代替設計及び配置を行った船舶についての安全証書の取り扱いについて、検討を要請する提案。SOLAS Ⅰ/ 15 及びⅡ-2/17 規則は、強制であり、それに基づいて MSC/Circ.1002 に準拠して設計及び配置を行った場合、MSC/Circ.1002 は、非強制であることから、強制力を持つ安全証書の書式になり得ない。その点について検討を求めている。適宜対処。

(ｳ) 持運び式消火器の数及び配置（FP49/16/2、中国）

持運び式消火器の数及び配置について、SOLAS Ⅱ-2/10.3.2.1 及び 10.5.4 規則で主管庁が満足するところとしており、そのスペアを規定している 10.3.3.1 及び 10.3.3.2 規則が非常にあいまいである。主管庁によって数を決めきれていないこともあり、本件に関して IMO で MSC/Circ.1120 をモデルとして指針又は統一解釈を作ることを提案している。適宜対処。

(ｴ) SOLASⅡ-2/54 又は 19 規則の適合書類の有効期間（FP49/16/3：仏）

危険物積載適合書類（DOC）の有効期限について、貨物船については明確に規定されているのに対し、旅客船に対しては、非常に読み取り難く、貨物船と同様の適用は出来ない。現行、仏で発行する際の解釈を提起する。旅客船の DOC の有効期限は、旅客船安全証書の有効期限の 12 ヶ月を越えるものであってはならない。支持して差し支えない。

(ｵ) 通風装置の耐火試験結果（FP49/INF.2、英国）

A-60 の鋼甲板を貫通する通風ダクトの耐火テストの結果を報告し、その結果、今後建造する船舶の通風ダクトの材料を変更する提案を行う事前の情報として提出した。FP49 会期中に 1 部/代表団でフルレポート（WFRC report No.137853）が配布される予定。情報として了知する。

３．２．２　ＦＰ４９における審議

平成 16 年 1 月 24 日から 28 日まで、IMO 本部で行われた FP49 の主な審議内容は下記の通り。

なお、会議は、51 ヶ国、12 団体が参加し、議長はクビシーノ氏（アルゼンチン）、副議長はアバテ氏（イタリア）により行われた。本部会に関する主な審議結果は下記のとおり。

3.2.2.1 大型旅客船の安全（議題 3 関係、WG）

(ｱ) 経緯

この議題については、MSC 79 で議題名から "Large" を削除することが決定され、各小委員会への指示が見直された。MSC 78からは、以下の7項目について検討を指示されており、MSC 79において、一つは、DE小委員会に送られた。

（2.1）"safe area" concept に資する機能要件、火災シナリオ及び性能基準を策定すること。

（2.2）限界火災シナリオと時間経過を考慮して、重要設備を維持するための要件と性能基準を策定すること。

（2.3）消火活動における即応戦略を策定すること。

（2.4）船上の安全センターの要件を策定すること。

（3.1）必要に応じて、MSC/Circ.1033 を "safe area" concept、火災シナリオ、時間経過を考慮して更新すること。

（3.2）船室の非常用照明の要件を策定すること。（MSC 79 において、DE 小委員会に送ることとなったので、FP 小委員会では検討しない。）

（3.3）着岸中の船体放棄（総員退船）の指針の必要性について検討すること。

今次会合では、

(1) 安全対策の適用範囲をむやみに広げないことに留意すること。

(2) 火災シナリオについて審議される場合目標年が 2006 年であることに留意し可能な限り明確な根拠に基づいて火災シナリオが設定されるよう配慮すること。

との方針の下、対処した。

(ｲ) プレナリー（WG 設置前）における審議

C.G. の報告（FP 49/3/1）及び MSC 78 及び 79 の結果（FP 49/3及びFP 49/3/2）が紹介された後、WG 議長（伊・アバテ氏）より、C.G. の報告にある事項のうち、火災シナリオについては MSC で既に検討されているため、WG の検討事項から外すべき旨が指摘され、合意された。また、WG 議長より、前回会合の WG の報告（FP 48/WP.7/Rev.1）では、火災予防に関する事項を含めることになっていたが、MSCでは検討事項とされなかった点が指摘され、火災予防についても検討することとなった。

(ｳ) WG における審議

新造旅客船に適用する各種のコンセプト（"Safe area", "Safe return to port", "Habitability time flame"）に係る機能要件が策定され、これに基づき、SOLAS 条約第II-2 章及び FSS Code の改正案候補がまとめられた（c.f. FP 49/WP.1 ANNEX 1 Possible draft amendments to SOLAS II-2 and FSS Code）。また C.G. の設置が合意され、SOLAS 改正案候補としての "On-board Safety Centre" に係る要件の見直し及び火災予防措置について検討するとの T.O.R. が用意された。

(ｴ) プレナリー（WG 設置後）における審議

WG の報告において、ANNEX 1（Possible draft amendments to SOLAS II-2 and FSS Code）に関する記述、特に要請事項が、WG で合意した文と異なり、「改正案に原則（in principle）合意されたい」といった書きぶりになっていた。そのため、WGでは、要件を強制要件とするか勧告とするかといったことについては議論していない旨を指摘し、その旨を明らかにするべく発言し、ドイツの支持により合意された。また、

ANNEX 1については、されにC.G.でも議論することとなり、T.O.R.が追加された。結果として C.G.（Coordinator：ドイツ）が設置された。

3.2.2.2 火災安全システムに関する性能試験及び承認基準（議題 4 関連、WG）

(ｱ)　プレナリーでの審議（WG 設置前）

コーディネーターである米国より統一解釈に関する CG の報告（FP49/4）があり、中国よりポンプの冗長性の考え方は消火装置毎に違うとの指摘があった。又、英国から Annex5 に関し、最新の NFPA を IMO/Circ. に準拠し使用すべきとの指摘が、仏より Annex7 には非強制の決議を強制する記述があることが指摘された。ノルウェーより、旅客船の安全に関する WG1 と本件に関する WG2 は相互にリンクする項目があるので相互に調整しながら検討する必要があるとの発言があった。

スウェーデン提案である FP49/4/1 に関しては、シンガポールより II-2 章の 2000 年改正が反映されていないこと、障害物がある場合の適用性に関するデータが含まれていないこと及びサイジングが消火性能に与える影響に関する試験が行われていないとの指摘があった。

高膨張泡消火装置の承認基準案に関し、FP49/4/2（日）、FP49/4/4（韓）及び FP49/INF.4（日）の説明が行われた後、英国から保護区域内の爆発による発泡器の損傷及び当該装置は保護区域内の熱せられた燃焼物質を含んだ空気により発泡を行う必要があるため十分な発泡ができない可能性があるとの懸念が表明され、中国及びポーランドがこれを支持した。

又、米国より FP49/13/1 にある局所消火装置に関する IACS 統一解釈 SC176 の検討は本 WG で行うべきとの指摘があり、本 WG で検討されることとなった。

議長より、下記の事項が付託され審議を行うこととなった。

- 機関区域水系消火装置の火災試験方法の最終化
- 固定式ガス及びアエロゾル消火装置に関する事項の検討
- ウオーターミスト消火装置に関する事項の検討
- 高膨張泡消火装置に関する事項の検討
- 改正 MSC.Circ.913 に提案された修正、解釈を含めることの検討
- FP４７／WP。９の付属書のアクションプランの見直し
- CG 設立の必要性の検討及び小委員会による検討事項についての準備

(ｲ)　WG での審議

(i)　コレスポンデンスグループ（CG）の報告（FP49/4）（米）

(a)　機関区域水系消火装置の火災試験方法（FP49 /4 Annex1 及び FP49/4/1（スウェーデン））及び Class III 水ミスト火災試験（FP 49/4　ANNEX2）

Class III（容積 3000m^{3}超）の機関室では、容積が大きいため区域毎の保護ができるためゾーン型装置を使用することが合意された。このため新たな試験基準の作成を行うこととなった。審議では、意見が分かれ、結果、新たな判定基準を作成には更なる試験及び経験が必要との判断により基準案は合意に至らなかった。しかしながら、新基準の早期作成が必要なことから、現MSC/Circ.668/728 の要素とスウェーデン提案（FP49/4/1）を基に、同等水系消火装置に関する新たな火災試験基準案を作成し、本基準案では従来のClass分類を削除した。

新試験基準案はすべての機関室の全体消火装置として使用されるため、すべての試験火災を装置の起動後、5 分以内に規定の温度まで冷却できること及び 15 分以内に消火することが要求された。

なお、本件の早期適用の必要性が指摘され、FP47 の合意にかかわらず、できれば MSC80 で承認をうけ、MSC サーキュラーを発行することを小委員会に要請することとなった。

また、試験を行った容積から実際の適用船舶の機関室容積までスケーリングするため、科学的手法の必要性が認識され、当該手法を今後 CG 及び WG で検討、作成することが合意された。

さらに、ＷＧでは大容積を持つ機関室用ゾーン型装置の新試験要領に関する作業の継続することが確認された。

なお、我が国から、消火剤として清水のみではなく海水のみの使用も問題なく、また、この場合、バックアップ装置は必要ないとの意見を述べた。我が国意見は、基本的には合意されたが、更なる検討が必要との見解になり、今後ＣＧで検討されることとなった。

(b)　FSS コード 5 章改正（FP 49/4 Annex3）

機械通風の自動停止については、各国から、保守及び検査時のブラックアウトによるデッドシップの問題が指摘され削除された。

摩擦損失計算に関する要件は、２分以内に 85%の CO2 を放出する要件がすでにあり、これに適合することで問題無いとの見解になったため、改正提案は採用されなかった。ＦＳＳコードではなく MSC サーキュラーとすることとなった。

また、低圧方式の要件は、MSC/Circ.1120 にある解釈を適宜改正し当該改正案に入れた。

放出警報は、電気式のみではなく他の手段も認めることとなり、可聴警報だけではなく、可視警報も要求することとなった。

なお、セーフガードの要件は、FSS コードに規定すべき内容で無いので削除し、設置検査のうち、放出試験も過大な要件であるので削除した。

(c)　固定式 CO2 消火装置の検査及び保守に関する指針案（FP49/4 Annex 4）

年次検査は、主管庁によって承認された技術者により安全に注意し行うこととした。

また、検査対象には、制御装置を含む全てのフレキシブルホースを含むこととした。

高圧ガスシリンダーの重量計測を年次検査で義務つけるのは、多大な負担となるとの ICCL の提案を考慮し、２年毎の検査となった。本件に関しては、我が国から、検査を２年毎とするのは、IMO 決議 A.948（23）に規定された検査間隔（Periodical and renewal survey 時にこれらを行う。）と矛盾するので、混乱を生じる恐れがあるため、本改正案を FSI 小委員会に送付し、A.948（23）と調和を計るべきと主張し、また、中国もコンテナ船等の CO2 シリンダを多く積載している船舶に適用すれば、時間的な問題があるため Periodical and renewal survey 時に行うべきと主張したが、WG の多数は、本改正案は保守のための指針であり、強制ではないこと、及び WG の数カ国が 2 年間隔で当該検査を行っていることから A.948（23）と差異があっても問題ないとのことで採用されなかった。

低圧タンクの水圧試験は、残留水によるトラブル等を考慮し削除され、外観試験のみとなったが、英より内部が空になった場合は、内部検査を行うこととが提案され、これらは WG で合意されたが、低圧タンクに関する要件は更なる検討が必要との判断により、今回は取り入れられなかった。

通気試験における CO2 の使用は、適切な手段／場所であれば、主管庁判断により使用可能と判断し記述を変更した。

(d)　同等ガス消火装置の承認ガイドライン（FP49/4　Annex5）

2001 年ＮＦＰＡのＰＢＰＫモデルに基づき、消火装置のガスにさらされる時間は、５分を超えないこと、５分間人命の安全が確保できる以上のガス集中でのハロカーボンの使用禁止、及びガス集中の計算は保護区画の通常温度の最大値で行うことという内容の Circ.848 改正提案に対して、2001 年ＰＢＰＫモデルは、陸上オペレーションをベースとして作成されたもので、海上のオペレーションが考慮されてない為、避難時間及び通常温度の範囲が異なっている。また、犬を使って試験しているので、人間に当てはめるのに問題が有るとの指摘があった。この結果、「５分間」等について、合意には至らず、CG でさらに検討することとなった。なお、ハロン代替物質の安全係数を、２０％から３０％に上げることについては合意にされた。

(ii) 人が立ち入る区画の CO2 消火装置の使用　（FP49/INF.5（米））

米国より、CO2 の人身事故についての調査概要が報告された。

WG の多数は、現在の状況から、早急な CO2 消火装置の使用禁止をすべきではないと判断したため、CG で更に検討することとなった。

なお、我が国より、ヒューマンエラーによる人身事故防止のため、CO2 システムをよりシンプルなものにすること、メンテナンス時には資格を持たない作業者には点検をさせない等の処置を文書に規定し、厳格に実施すれば、人身事故の減少に繋がる事を指摘した。

(iii) FSS コード及び MSC/Circ.913 への追加要件　（FP49/4/5（露））

ロシア提案に対し、我が国から、基本的に支持するが、管内の掃気には非常に高圧の空気が必要なため掃気用の装置としては適当ではなく、通気試験時の通気のための装置として使用すべきとの指摘を行ったところ合意され、FSS コード及び MSC/Circ.913 改正案に取り入れられることとなった。

(iv) 高膨張泡消火装置の承認指針案（FP49/4/2（日）、FP49/4/4（韓）、FP49/INF.4（日））

我が国から、提案の背景及び指針案の概要を説明した後審議が行われた。

英より、爆発による泡発生器の損傷について、及び火災により発生する高温の燃焼ガスで泡が発生しない可能性があることを考慮すべきであるとの懸念が示された。我が国から、これらの懸念に対する対応は指針案に取り入れられていることを説明したところ、高温ガスに関する懸念は合意されたが、蘭から爆発に関しては機関室に２系統の配管を設置するべき等の意見が出された。

MSC/Circ.668/728 を基に作成されている我が国提案の指針案は、基本的に基準案作成の方向性適切であることが合意され、今後、本案を基に更なる検討を行うことも併せて合意された。

また、本装置は、現在多数の船舶に採用されていることが確認され、指針案の早期完成の必要性が認識された。なお、今回は審議の時間が十分なかったため、FP50 での完成を目指し CG で検討を続けることとなった。

また、本指針案に対する韓国のコメントに関しては、会議の休憩時間等を利用し、韓国代表と検討を行い合意に達した。この検討結果を基に添付 3.2 の改正案を作成し、FP 会議中に韓国代表及びＣＧコーディネーターに本改正案を渡したため、今後のＣＧでの検討は、添付 3.2 の資料を基に進められると考えられる。

(v) 今後の作業計画

短期、中期、長期の作業計画を審議、作成した。

(vi) ＣＧの設立

今回の検討結果を考慮し、以下の付託事項とするＣＧの必要性が確認された。

- 居住、業務及び制御区域用固定式水噴霧装置の検討
- 高膨張泡消火装置
- 以下の短期検討課題に関する関連改正案の作成
  - (1) 固定式加圧水噴霧消火装置
  - (2) 保護区域内の空気を使用する固定式高膨張泡消火装置
  - (3) 固定式低膨張泡装置
  - (4) 持運び式泡放射器
- 車両区域､Ro-Ro 区域及び特殊分類区域用固定式水ミスト及び固定式加圧水噴霧消火装置に関する関連改正案の作成
- MSC/Circ.848 の改正に関する検討
- CO2 消火装置の使用禁止の検討
- 報告書の FP50 への提出

(ｳ)　プレナリーでの審議

(a) 試験室容量を超えた機関室への適用のためのスケーリングに関する科学的手法の開発に関するＷＧの提案は特段の反対もなく認められた。

(b) 同等水系消火装置基準案（FP49/WP.2 Annex 1）
特段の反対もなく合意され承認のため MSC に送付されることになった。なお、仏より、使用者の利便のため、現在の MSC/Circ.668 と本改正案を合わせたものを作成するように提案があり、合意された。

(c) FSS コード改正案（FP49/WP.2 Annex 2）
中及び英より、改正案中の関連 ISO の Footnote 引用の書きぶりでは強制になるのでは無いかとの懸念が表明されたが、強制ではないとの説明が米よりあり、合意された。
また、英より低圧式のノズルでの圧力に関する規定は強制すべきではないとの意見が合意され、関連規定が削除された。
我が国から、低圧式の警報場所 ”Central control station”の central を削除すべきとの提案は、米及び事務局より MSC/Circ.1120 から引用したもので、変更する必要はないとの意見が出され、原案のままとすることとなった。改正案は承認及びその後の採択のため MSC に送付されることとなった。

(d) 固定式 CO2 消火装置の保守及び検査の指針案（FP49/WP.2 Annex 3）
ICS より、保守及び検査間隔は A.948（23）と調和させること及び実際に行うには問題のある要件が数カ所あることを指摘し、再度 CG で検討することを提案した。ICS の指摘及び提案は我が国を含む多くの国から支持され、本改正案は CG で再検討することとなった。

(e) 局所消火装置の改正案（FP49/WP.2 Annex 4）
本改正案は特段の意見なく合意された。

(f) 作業計画（FP49/WP.2 Annex 5）
本改正案は特段の意見なく合意された。

(g) CG の設立
付託事項で指示のあった提案文章に関し、本 WG にて審議が完了しなかった為、下記）の付託事項の下に米をコーディネーターとする CG を設置し検討を進めることが合意された。

- 居住、業務及び制御区域用固定式水噴霧装置の検討
- 高膨張泡消火装置
- 以下の短期検討課題に関する関連改正案の作成
  (1) 固定式加圧水噴霧消火装置
  (2) 固定式低膨張泡装置
  (3) 持運び式泡放射器
- 車両区域､Ro-Ro 区域及び特殊分類区域用固定式水ミスト及び固定式加圧水噴霧消火装置に関する関連改正案の作成
- MSC/Circ.848 の改正に関する検討
- CO2 消火装置の今後の使用に関する検討
- 固定式 CO2 消火装置の保守及び検査に関する指針案
- 報告書の FP50 への提出

3.2.2.3　2000 年 HSC Code の見直し及び DSC Code と 1994 年 HSC Code の改正（議題 5 関係）

(ｱ)　プレナリー（WG 設置前）における審議

プレナリーにおいて、FP 48 にて設立されたコレスポンデンスグループ（C.G.）のコーディネーターであったオーストラリアより C.G. のレポートが紹介された。これに対して我が国は C.G. の合意事項については原則的に支持する旨を述べるとともに、以下について発言した。

(1) Open Ro-Ro space の acceptable end opening の規定について、現行の 2000 HSC コードの規定を変更しないこと、
(2) 「避難時間の決定のための実用的な方法の構築」については、第 47 回設計設備委員会（DE 47）に提出されたデモンストレーション試験中の事故（DE 47/11/4）も考慮し、MSC/Circ.1001 を採用しても良い事にする。
(3) コードの完成度を鑑み、見直しの間隔は 4 年より長くすべき
(4) 2000 年 HSC コードの表 17.7-3 中の番号を現状の規則に合わせて修正すること

退船時間の決定方法については、ノルウェーは、実船を用いたデモンストレーションが必要、即ち、計算のみによるべきではないが、現在より少ない人数によるデモンストレーションを認めてはどうかとの提案があり、仏がこれを支持した。また、ドイツも、計算のみによるべきではないとの意見であった。

アスベスト使用の禁止に関しては、仏が第 1 章に組み込まれることを提案したが、WG において検討することとなった。

区画の定義については、アルゼンチンも、Vehicle Spaces, Special Category Spaces 等の明確化及び open/close の明確化について検討すべきとの意見であった。

(ｲ)　WG における審議

WG における検討の結果、2000 年 HSC コード、1994 年 HSC コード及び DSC コードに SOLAS II-1/3-5 規則と同様に、以下の用途以外のアスベスト用の禁止条項を取り入れることになった。

- ロータリーベーン圧縮機及びロータリーベーン真空ポンプに使用される羽根
- 火災、腐食及び毒性のある高温（350°C を超える）又は高圧（7 MPa を超える）流体の循環に使用される水密継手及びライニング
- 1000°C 以上に使用される融通及弾性断熱材

MSC/Circ.1001 については、改正案が作成された。

各種検討の結果、2000 HSC Code, 1994 HSC Code 及び DSC Code の改正案が用意された。その際、open ro-ro space の定義（2000 HSC Code 1.4.40）は改正されなかった。また、表 7.17-3 中の番号等が改正された。このうち 2000 HSC Code 7.17 節（危険物に係る防火措置）については、確認のため DSC 小委員会に送る（その後 DE 49 に送る。）ことが提案された。

(ウ) プレナリー（WG 終了後）における審議

WG の検討結果が了承され、本件については、FP 小委員会における審議を終了した。

3.2.2.4 シール材及び樹脂材の試験片準備手順（総会決議 A.653(16) ）の改正（議題 6 関係）

シール材及び樹脂材の試験方法に関する仏提案（FP 49/6）について審議され、英、米からはシール材及び樹脂材の露出部は少量であり、主管庁判断にて処理が可能との見解が出された。また、アルゼンチンは、仏提案を支持したが、議長より、我が国より「FTP コードの総合見直し」(MSC 80/21/5)を FP 小委員会の新議題として提案していることが報告され、さらに、本議題については FTP コードの総合見直しを行う過程で検討することが提案され、本議題の目標年の延長が合意された。即ち、本議題の目標年は 2006 年とし、MSC 80において「FTPコードの総合見直し」に関する我が国の提案が承認された場合は、本議題は FTP コードの総合見直しに統合されることとなった。

3.2.2.5 防火扉の性能要件に関する総会決議 A.754(18) の改正（議題 7 関係）

防火扉の耐火試験において、扉下部隙間について 6 mm の隙間ゲージを使用せずコットン試験にて代用し、扉下部最大隙間を 15 mm とする仏提案（FP 49/7）について審議され、我が国は基本的に仏提案を支持するものの、A 級防火扉についての適用は不適当の旨を主張した。英は、「A 級防火扉および避難経路の B 級防火扉には、扉下部最大隙間 6 mm を適用、その他の防火扉には 25 mm でも可」との見解を示した。また、米、独、伊は、仏提案を支持し、ギリシャ、フィンランド、デンマークは、扉下部最大隙間 15 mm については、DG で検討を要す旨を主張した。仏、ノルウェーは、DG ではなくプレナリーで議論する事を主張し、DG は作られず、審議はプレナリーで行われた。

英、仏、米、独（非公式 DG ）にて意見が取りまとめられ「A 級及び B 級については、扉下部の最大隙間を 12 mm とし（12 mm の隙間ゲージを使用し、許容値は 150 mm 移動まで)、その他の防火扉の下部最大隙間は 25 mm とし、コットン試験を要求する。」案が作成され、プレナリーにて一度は合意されたものの、本案は、FP 49 報告書案の最終検討時に、中国、豪、デンマーク、スウェーデン等の「A 級防火扉については、6 mm の基準を維持すべき」との意見が表明され、審議の結果、本件は FP 50 にて再検討することとなったため、各国は FP 50 に提案文書を出すよう要請された。

3.2.2.6 LHNS 指針の防火要件の見直し(議題 8 関連)

我が国より対策資料に従い発言を行ったところ、局所消火装置（II-2/10.5.6）及び発火の危険性（II-2/4.5.4）は合意されたが、タンカーの隔壁及び甲板の保全防熱性の適用範囲（II-2/9.2.4）は.II-2/9.2.4.2 に適用が変更され、また、タンカーの貨物ポンプ室の保護に関する要件（II-2/4.5.10）は合意されなかった。その他は、事務局の準備した改正案(FP49/8)が合意され、改正案が作成され、DE 小委員会に送付されることとなった。又、小委員会は事務局に BLG10 及び関連小委員会にも本改正案を報告することを要請した。

3.2.2.7 避難誘導システムの性能要件（議題 9 関係）

(ｱ) プレナリー（WG 設置前）における審議

議題 3「大型旅客船の安全」の C.G. の報告 FP 49/3/1 の ANNEX 6 について審議した。避難誘導装置（Evacuation Guidance Systems: EGS）について検討した機能要件は、他の避難誘導装置（L.L.L.）にも適用可能であろうとの指摘はあったが、審議の結果、既存の装置（L.L.L.）の要件は変更しないことになった。

(ｲ) WG における審議

FP 49/3/1 ANNEX 6 基礎として、L.L.L. を含む避難誘導装置が満たすべき機能要件及び性能基準に関する指針案を作成した。その際、試験基準の取り扱いが議論になり、試験基準は、これに承認基準と整備基準を加え、「L.L.L. の代替となる避難誘導装置（音響避難誘導装置以外にも、新しい装置があれば適用するとの意味)」が満たすべき暫定指針案としてまとめられた。

(ｳ) プレナリー（WG 設置後）における審議

WG の報告が了承され、二つの指針案が承認のため MSC に送られることになった。

なお、本件については、現時点では、特段の対処は要しないと考えられる。

3.2.2.8 新・既存旅客船の避難解析に関する勧告（議題 10 関係）

新・既存旅客船の避難解析の暫定指針（MSC/Circ.1033, 2002年6月承認）については、従前より見直しが予定されていたが、我が国が Information Paper（FP 47/INF.4: Preliminary study on the Interim Guidelines for evacuation analyses for new and existing passenger ships）を提出したこと等を契機として、FP 48から見直しが開始された。作業の目標年は 2005 年であるが、WG/DG が予定されていないことから、今次会合で最終化を図るのは困難と考えられていた。

提案文書（FP 49/INF.3）の説明において、我が国は、何らかの Group の設置が必要であろうとの考えを述べた。議長は、今次会合には Information Paper（FP 49/INF.3, INF.8, INF.9, INF.10 & MSC 78/INF.8）しか提案されていなかったため、暫定避難解析指針の見直しが進んでいない旨を述べ、C.G. や W.G. の設置について意見を求めた。英国、ドイツ、イタリアが C.G. の設置を支持したが、コーディネーターを引き受けるとの発言はなかったため、我が国が Coordinator を引き受ける旨を述べ、米国（次回会合における WG の設置も支持)、フランス、ポーランドも我が国に謝辞を述べるとともに C.G. を支持した。その結果、我が国（海技研太田氏）をコーディネーターとする C.G. が設置された。

3.2.2.9 火災事故記録の解析（議題 11 関係）

仏より MSC 79 提出文書 79/22/8 について概要説明があった後、わが国から日本でも仏同様のタンカー爆発事故例が多いことに鑑み、仏提案への理解を示す一方、事故防止に向けた新たな要件導入の是非については事故例を収集・検証した上で検討すべき旨発言した。

英からは、仏の Chassiron 号事故最終報告書提出および関係業界からの情報提供に期待が示されるとともに、わが国同様、新しい規制の要否については証拠材料に基づいて検討すべき旨発言あった。また、米、INTERTANKO は、まず仏が検討要望内容を MSC に対し新規活動項目として提案する必要がある旨主張。各国意見に対し、仏からは事故最終報告書は FSI13 提出に向け、昨年 12 月中に IMO に提出済である旨、また、わが国に対して同種事故例に関する情報提供を要請する旨発言があった。今次会合においては、仏

文書 MSC 79/22/8 は参考情報として留意するに止めるとともに、仏に対しては、SOLAS 第 II-2 章改正案を含む提案内容を MSC 新規活動計画に盛り込むべき項目として IMO に提出するよう要請された。

3.2.2.10 ガス燃料船に関する要件の策定（議題 12 関連）

小委員会はガス燃料船の防火及び消火に関する規定を作成することを再確認した。ノルウェーより、DE48 に関連提案文書を送付したこと及び DE 48 の検討結果を考慮した提案文書を FP 50 に送付する旨報告があった。

3.2.2.11 IACS 統一解釈の検討（議題 13 関連）

(ｱ) 本議題の審議に先立ち、会議初日の夕刻、IACS UI/SC178 に対する我が国提案の詳細を説明するためのプレゼンテーションが、約 30 人の出席者に対しおこなわれた。

(ｲ) プレナリーでの審議

我が国提案の説明後、IACS の統一解釈毎に審議が行われた。

(a) 統一解釈 SC173 及び SC175 は今回合意され、MSC/Circ.案が作成され承認のため MSC80 に送付されることとなった。

(b) SC79、SC174、SC189

本解釈は、現在の IMO 基準等でカバーできるため特に対応をとる必要が無いことが合意された。

(c) SC165

アルゼンチンより、本統一解釈は既に同様のものが MSC/Circ.1120 にあるとの指摘があり、合意されなかった。

(d) SC176

米より議題４で検討することが提案、合意されたため、議題４で検討されることとなった。

(e) SC177

事務局より本 UI は SOLAS 1996 年改正のおける現存船用のものであるが、規則改正に当たるため MSC81 へ規則改正の提案をするよう指摘があった。これに対し、IACS 及び ICS から Industry への影響が大きいため、至急適用するよう要請があった。このため、本件に関する規則改正を行うための新作業提案を作成し MSC80 に送付することとした。また、適用に関しては当該要件の適用に関する MSC/Circ.案を作成し、対応することとなった。

(f) SC178（非常用消火ポンプのサクション位置に関する統一解釈）

我が国の指摘を受け、IACS より、再度 IACS 内で専門家による検討を行い、FP 50 に提案する旨の発言があった。韓国及び中国は我が国を支持し、本会合で審議を行うことを要請したが、多くの国が FP 50 での審議を支持したため、FP 50 で検討されることとなった。なお、ICS は IACS の 10°は大きすぎるが、2°は小さすぎるとの指摘があった。又、議長から、各国に FP 50 に提案文書を提出するよう要請があったため、本件に関しては、至急、我が国提案の更なる改正の要否を含め、国内にて検討の上、FP 50 での対応が必要である。

3.2.2.12 その他の議題（議題 16 関連）

機関室及び貨物ポンプ室の防火手段についての指針を MSC サーキュラーとして作成すべきとの韓国の提案については次回 FP の議題となっていることから、次回 FP 50 へ文書を提出することが要請された。

SOLAS II-2/17 の代替措置を安全証書に記載するべく証書の様式を変更すべきとのノルウェー提案（FP 49/16/1）と消火器の個数を厳密に規定するべきという中国提案（FP 49/16/2）については、現在の FP の議題にないことから MSC へ新規作業として提案するよう要請された。

旅客船安全証書の有効期限（1 年）に危険物適合証書の有効期限を合わせるべきとの仏提案（FP 49/16/3）については、適合証書の有効期限 1 年と主張する国と 5 年と主張する国に意見が分かれ、更なる検討を要することになったが、現在の FP の議題に含まれていないことから、次回 MSC に仏が新規作業項目を提案することとされた。

３．２．３　ＦＰ５０以降の課題

FP49 での審議結果を受け、本部会にて FP50 以降の対応案を検討し、現状での FP50 対応として添付 3.3 のとおり作業内容及び担当を決定した。

（添付 3.1）

FP49/4/4(韓国提案)対応案

FP49/4/2（Japan）	FP49/4/4(Korea)	回答案(カシワ・ヤマト)	対応案
3.1.3 The foam concentrates of the system should be approved by the Administration in accordance with MSC/Circ.670.	**Proposal**: 3.1.3 The … with MSC/Circ.670 and the fire test in accordance with MSC/Circ.670, Annex, 3.8 need not to apply. And the measurement of expansion ratio in accordance with MSC/Circ.670, Annex, 3.6 should be carried out with foam concentrate and foam generator will be type approved. **Reason**: According to the requirements of MSC/Circ.670, App.2, 3.8, fire test should be carried out. However, such fire test is not needed because more severe fire test is required according to appendix 2 of this guideline. Also, according to the requirements of MSC/Circ.670, App.2, 3.6, the expansion ratio measurement should be carried out and outside air type foam making apparatus in accordance with ISO7203-2 may be used for the measurement. However, for the purpose of expansion ratio measurement, the measurement should be carried out using a set of foam concentrate and foam generator (inside air type). Therefore, the wording for omission of fire test and addition of instruction to warn against the use of outside air type foam making apparatus should be included.	(K)基本的に韓国案に賛成 (Y)韓国案に賛成	泡原液の基本的性能を確認するために必要と考えるが適宜対応としたい。
3.1.4 The nozzles of the generators should be successfully tested in accordance with Appendix 1 to this guideline.	**Proposal**: The ~~nozzles of the generators~~ [foam generators and foam generator nozzles] should be successfully tested in accordance with Appendix 1 to this guideline. **Reason**: Please refer to comment and proposal for Appendix 1.	(K)ノズルのみに適用すべき (Y)同上。発泡部分の部材はサイズが大きく環境試験の実施は非現実的。	ノズルのみに適用すればよい。 （下記 Added after paragraph .8 参照）
3.2.2 The system … in machinery spaces or cargo pump room in ships.	**Proposal**: The system … machinery spaces of category A [~~or cargo pump room~~][of category A or cargo pump room and the foam concentrate used for cargo pump room should be type approved with consideration of chemical reaction such as corrosion, explosion, etc. between foam and cargo] in ships. **Reason**: The requirements of MSC/Circ.670 are the approval standards for foam concentrate which are used for machinery spaces. And, the foam concentrate used for cargo pump rooms	(Y)運送予定貨物が水と反応して爆発等の危険性がある場合、具体的にその荷役貨物を列記し、適用 h かとの特記をすることで対応する。	運送予定貨物が水と反応して爆発等の危険性がある場合、貨物ポンプ室への適用は認められない。

	should be tested and approved with consideration of chemical reaction between cargo liquid, cargo vapour and foam.		
3.2.3 The piping system of the system in the protected spaces should not be passed near the equipment/devices having a high risk of the explosion to prevent piping damage by explosion [and should be of at least two routes and provided with pressure gauge on each route].	**Proposal**: 3.2.3 The piping system of the system in the protected spaces should not be passed near the equipment/devices having a high risk of the explosion to prevent piping damage by explosion [~~and should be of at least two routes and provided with pressure gauge on each route~~]. **Reason**: This sentence is not clear. If this sentence is requiring that the system be consisted of two main lines, this is excessive because, in the opinion of the Republic of Korea, a single line could sufficiently extinguish engine room fire. Therefore, this sentence should be deleted.	(K)爆発による配管損傷例を調査して是非を検討してはどうか。 (Y)一系列でも安全性が担保できるという定量的説明がない。全域消火設備であるため二系列も止むおえない。ただし、CO2 装置も同様の冗長性の要否の検討が必要。	爆発に対する対応は必要と考えるが、過度の対策は不要。水系消火装置も同様な危険性有り。
3.2.6 Means should be provided for the crew to safely and easily check the quantity of foam concentrates in the containers.	**Proposal**: Means should be provided for the crew to safely and easily check the quantity and quality of foam concentrates in the containers. **Reason**: According to the requirements of paragraph 4 of Annex to MSC/Circ.670, the means of check and inspection should be provided to confirm the quality of foam concentrate frequently.	(K)Quality は Maker における専門的な Analysis の結果でなければ判断できないので”Quality と Analysis のための Sampling が可能な構造とすること”と変更する。 (Y)この項は、泡原液タンクに関する要件を規定しているため、泡原液分析の要件記述はこの項以外でよい。	Quality に関しては、泡原液の分析が必要なため、タンクに当該要件を要求することは意味がない。
Added	**Proposal**: 3.2.10 The means of control of the system should be provided at wheel house and fire control station (if arranged) and the system includes sea water pumps should be activated and controlled remotely at each means of control. The clear instruction should be provided for each means of controls.	(K)　Agree (Y)制御装置の要件に関しては他の装置に準じるべき。	他の消火装置との整合性を考えれば、船橋以外でも迅速に近づくことができる場所に制御装置を設ければよい。
Added	**Proposal**: 3.2.11 The sea water pump and its sea chest used for the system should be located outside the protected space and the pump should be activated manually at pump position. If the emergency fire pumps were used for the system, the operation of the system at its required output shall permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.	(K)　Agree (Y)要件としては妥当と考えるが、基準にそこまで記述する必要性に疑問あり。	SOLAS II-2/10.4.4 に規定があるため、本要件は不要。

Added	**Proposal**: 3.2.12 If the internal combustion engine used as prime mover of the sea water pump for the system, fuel oil tank to the prime mover should contain sufficient fuel to ensure the pump to run on full load during operation time which the system discharge whole foam concentrate are provided onboard. And if the tank services to other internal combustion engine simultaneously, the required capacity for other engine should be added to total required capacity of the tank.	(K) Agree (Y) 3.2.11 項と同じ	支持できる。
Added	**Proposal**: 3.2.13 For easily escape of personnel, the visual and distinct audible pre-discharge alarms should give automatically in the protected space in 20 seconds and above.	(K) Agree (Y)Alarm system を要求することは賛成。20 秒の要件は不要。	支持できるが、泡が人体に無害である場合（どのように証明するかが難しい。）、20 秒の要件は不要。
Appendix 1			
Added after paragraph .8	**Proposal**: All test items should be applied to the foam generator nozzles, and the test item .1 and .6 should be applied to foam generator. **Reason**: To reduce the confusion of application, the test items for foam generator and foam generator nozzles should be clearly defined.	(K) Agree (Y) 3.1.4 項と同じく反対	支持できる。適宜対処
3.2.1.1.1 100 m^2 in area. The height of the enclosure should be 5 m (Class 1).	**Proposal**: deleted **Reason**: For the water mist system, the fire test should be separated class 1, 2 & 3 because the fire extinguishing mechanism of the system very complex. However, because the mechanism of hi-ex system is very simple, we do not think class 1 fire test is needed.	(K)Class 1 及び 3 の設定は実際の機関室における区画の中で火災負荷が異なるため、それらの負荷に応じた装備量の決定を可能とするために必要である。 (Y)Class 1 での試験は必要と考えるが、火災規模は現実に起こりうる規模を考慮してもよいのではないか。	最も厳しい火災負荷の条件下でも消火性能を保持することを確認する必要あり。Class 1 での試験を行わない場合、適用を 3000m3 以上の機関室に限定すべき。
Added	**Proposal**: 4.1.3 The mixing ratio of mixing apparatus used for mixing of foam concentrate and sea water should be confirmed before the other tests are carried out. The operating time of mixing apparatus should not exceed [1 minute] to avoid be	(K)Shop における Test については許容できるが船上試験では±10%の計測精度を得ることは不可能であるので、両者の相違を明確にすべき。 (Y)Mixing Ratio の確認は重要なこ	承認試験時に、過酷な条件下でも発泡できることを確認しているため、船上での確認は不要と

	time independent condition and the “measured mixing ratio” should be defined as mean value of operating time. The allowable mixing ratio of tested mixing ratio is [±10%] of design mixing ratio of manufacturer. **Reason**: In the opinion of the Republic of Korea, the mixing ratio of the mixing apparatus is very important parameter of fire extinguishing capability of the system. Therefore, the mixing capability of the mixing apparatus should be confirmed before the other tests are carried out.	と考えるが、船上で行うのは困難なため、工場で確認しておくことと考える。	考える。必要であれば、泡原液を使用しないで、混合率の確認を行う Demonstration を要求すればよい。
4.2.2 flow and pressure for the water with foam concentrates in the system; and	**Proposal**: 4.2.2 ~~flow and~~ pressure at the foam generator nozzles for ~~the water, with~~ ~~foam concentrates~~ foam solutions in the system; and **Reason**: In the opinion of the Republic of Korea, the pressure at foam generator nozzles is most important parameter and the flow rate at the nozzles easily calculated by K-factor. And “the water, with foam concentrates” means foam solutions (refer to the “1.2 definition” of MSC/Circ.670).	(K) Agree (Y)Nozzle Pressure 測定のみでもよい。	船上での確認試験時も使用できるため Flow も計測したほうがよい。適宜対処 Foam solution の定義を規定する。

（添付 3.2）

ANNEX

Guidelines for the Approval of Fixed High Expansion Foam Fire Extinguishing System providing foam generators inside the protected space

1. General

SOLAS provides for and accepts the use of high expansion foam systems inside machinery spaces. The fixed high expansion foam fire-extinguishing system providing foam generators inside the protected space should demonstrate by a test to have the capability of extinguishing a variety of fires, which may occur in a ship's engine room.

2. Definitions

2.1 Foam solution: a solution of foam concentrate and water

2.2 Foam concentrate: the liquid which, when mixed with water in the appropriate concentration, given a foam solution.

3. Principal requirements for the system

3.1 Principal performance

.1 Automatic release of the system should not be permitted, except as permitted by the Administration.

.2 The system should be capable of fire extinction, and tested in accordance with Appendix 2 to this guideline.

~~.3 The foam concentrates of the system should be approved by the Administration in accordance with MSC/Circ.670.~~

.4 The nozzles of the generators should be successfully tested in accordance with Appendix 1 to this guideline.

3.2 Requirements for system

.1 Electrical powers for the system should be supplied from emergency power.

.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 room in ships. Components inside the protected spaces should be designed to withstand the elevated temperatures, which could occur during a fire.

.3 The piping system of the system in the protected spaces should not be passed near the equipment/devices having a high risk of the explosion to prevent piping damage by explosion ~~[and should be of at least two routes and provided with pressure gauge on each route]~~.

.4 Foam generators and the piping system inside the protected space should be of steel or equivalent.

.5 The quantity of foam concentrates available should be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected, or the quantity

needed at the test, whichever the large. The expansion ratio of the foam should not exceed 1,000 to 1.

.6 Means should be provided for the crew to safely and easily check the quantity of foam concentrates in the containers and sample them for checking the quality.

.7 The operational manual of the system should be displayed at each control position.

.8 Spare parts should be provided in accordance with the manufacturer's instruction.

.9 Filling rate for the system should be followed the results of the test to be conducted in accordance with Appendix 2. Where the volume of the machinery space in question is more than that of class 3 test enclosure, the test data of filling rate conducted in the class 3 test enclosure can be used for approval.

3.3 Requirements for arrangement onboard

.1 Foam generators and the piping system should be arranged not to disturb the maintenance works for machinery and equipment in the protected space.

.2 Power supply of the system, foam concentrates 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.

.3 Power supplies, the foam concentrate and controls should also be outside of the protected space.

.4 Arrangements and number of foam generators should be designed based on the test results for approval.

.5 Foam generators should be installed under the uppermost ceiling in the protected spaces except engine casing. Additional foam generator(s) should be installed under the uppermost ceiling of engine casing and the ceiling of area(s) where foam from the generators installed the uppermost ceiling seems to be difficult to flow in.

.6 Foam generators should be arranged in order to be sufficient to produce enough volume of foam not less than the filling rate, which is demonstrated by the test for approval. In any case, filling rate should be not less than 1m/min.

.7 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.

.8 The control system of ventilation fans**, discharge alarm and oil pumps** should be available at the position(s) where this extinguishing system is controlled.

NOTE;
*: Refer to the Hazen-Williams Method or the Darcy-Weisbach Equation.
**: These are covered by SOLAS II-2 regulation 5.2.2.2 and 5.2.2.3.

Appendix 1 ；Component for foam generator manufacturing standards

~~Components~~ Nozzles of the system installed in the protected space should be tested in accordance with the following items stipulated in Appendix A to MSC/Circ.668 and Generators should be tested in accordance with the following items 1 and 6.

- Dimension

- Flow constant
  The value of the flow constant K should be fixed by measuring the flow at the maximum operational pressure, minimum operational pressure and the middle operational pressure.

- Stress corrosion

- Sulphur dioxide corrosion
  Visual inspection only may be carried out

- Salt spray corrosion
  The test may be carried out at NaCl concentration of 5%. Paragraph 3.14.2 in Appendix A to MSC/Circ.668 need not to apply.

- Resistance to heat
  Where the components are made of steel, this test need not to apply.

- Impact test
  Only, the nozzles may be tested.

- Clogging test
  Where the diameter of the opening of the nozzle exceed [1.5mm], this test need not to apply.

Appendix 2

Test Method for High Expansion Foam Fire-fighting System

1. Scope

This test method is for evaluating the effectiveness of fixed high expansion foam fire-fighting systems. The test method verifies the design criteria for the system. The test method is intended to evaluate the expansion ratio and the filling rate.

2. Sampling

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

3. Fire tests

3.1 Test principles

This test procedure enables the determination of design criteria and the effectiveness of high expansion foam fire-extinguishing system 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 Tests for fire extinguishing of the system should be carried out using the following test enclosures. The floors of test enclosures should be square as far as practicable.

.1 100m^2 in area. The height of the enclosure should be 5m. (Class 1)

.2 At least 300m^2 in area. The height of the enclosure should be at least 10m. (Class 3)

3.2.1.2 Any test enclosure should be provided with natural or forced ventilation to ensure that the oxygen concentration at the fire location remains above 20% (by vol.) during the fire test. The ventilation should be arranged so that fresh air from the ventilation should not been taken into the foam generators directly.

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) 1m x 3m x 3m constructed of sheet steel with a nominal thickness of 5mm. The simulated engine is fitted with two steel tubes of 0.3m in diameter and 3m in length, which simulate exhaust manifolds and a grating. At the top of the simulated engine a 3m^2 tray is arranged. See figure 1.
2. a floor plate system of 4m x 6m and 0.5m in height surrounding the simulated engine with a tray (4m^2 in area), underneath. See figure 1.

3.2.3 Test Program

The fire test should be carried out using following fire scenarios.

1. Combination of the following fire programs. (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-degree angle to strike a 12 – 15 mm diameter rod 1 m away.
   (2) Fire in trays under (4m^2) and on top (3m^2) of the simulated engine.
2. High-pressure horizontal spray fire on top of the simulated engine. (Test fuel: Commercial fuel oil or light diesel oil)
3. Low pressure low flow concealed horizontal spray fire on the side of the simulated engine with oil spray nozzle positioned 0.1m in from the end of the simulated engine and 0.1m^2

tray positioned 1.4m in from the engine end at the inside of floor plate. (Test fuel: Commercial fuel oil or light diesel oil)

4. $4m^2$ tray under the simulated engine. (Test fuel: Heptane)

Fire Type	Low pressure	Low Pressure, Low flow	High pressure
Spray nozzle	Wide spray angle (120 to 125 degree) Full corn type	Wide spray angle (80 degree) Full corn type	Standard angle (at 6 bar) Full corn type
Nominal oil Pressure	8 bar	8.5 bar	150 bar
Oil flow	0.16 ± 0.01 kg/s	0.03 ± 0.005 kg/s	0.050 ± 0.002 kg/s
Oil temperature	20 ± 5 degree	20 ± 5 degree	20 ± 5 degree
Nominal heat release rate	5.8 ± 0.6 MW	1.1 ± 0.1 MW	1.8 ± 0.2 MW

3.2.4 Installation requirements for tests

.1 Foam generators should not be installed above the simulated engine.

.2 Foam generators should be installed as high as possible.

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

4. Test procedure

4.1 Preparation

.1 The tray(s) used in the test should be filled with at least 30mm oil on a water base. Freeboard should be 150 ± 10mm.

.2 Sea water or simulated sea water specified in paragraph 3.6.3 of MSC/Circ.670 should be used for the fire test, except the case where it is shown that fresh water gives the same level of performance as sea water.

4.2 Measurements

The followings should be measured during the test.

.1 oil flow and pressure

.2 flow and pressure for the foam solution in the system

.3 oxygen concentration at the fire location. Measurement may be terminated when the foam fills up to the oxygen meter.

4.3 Pre-burning

After ignition of all fuel sources, 2 minutes pre-burn time for the tray fires and 10 to 15 seconds for the spray and heptane fires before the extinguishing agent is discharged.

4.4 Duration of test

Extinguishing agent should be discharged for 50% of the discharge time recommended by the manufacturer or 15 minutes whichever is less. The oil spray, if used, should be shut of 15 seconds after the end of agent discharge.

4.5 Observations before fire test

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

4.6 Observations during fire test

The following observations should be recorded.

.1 The start of ignition procedure;

.2 The start of the test (ignition));
.3 The time when the system is activated;
.4 The time when the fire is extinguished;
.5 The time when the system is shut off;
.6 The time when the fire is re-ignited, if any;
.7 The time when the oil flow for the spray fire is shut off; and
.8 The time when the test is finished.

4.7 Observations after fire test

The followings should be recorded.

.1 Damage to any system components;
.2 The level of fuel in the tray(s) to make sure that no limitation of fuel occurred during the test; and
.3 Temperatures of test room, fuel and the simulated engine.

5. Classification criteria

At the end of discharge of foam and fuel at each test, 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 of the test product;
.7 Date of the test;
.8 Test methods;
.9 Drawing of each test configuration
.10 Identification of the test equipment and instruments used (including type and manufacturer of the foam concentration);
.11 Conclusions;
.12 Deviations from the test method, if any;
.13 Test results including observation and measurement before, during and after the test; and
.14 Date and signature.

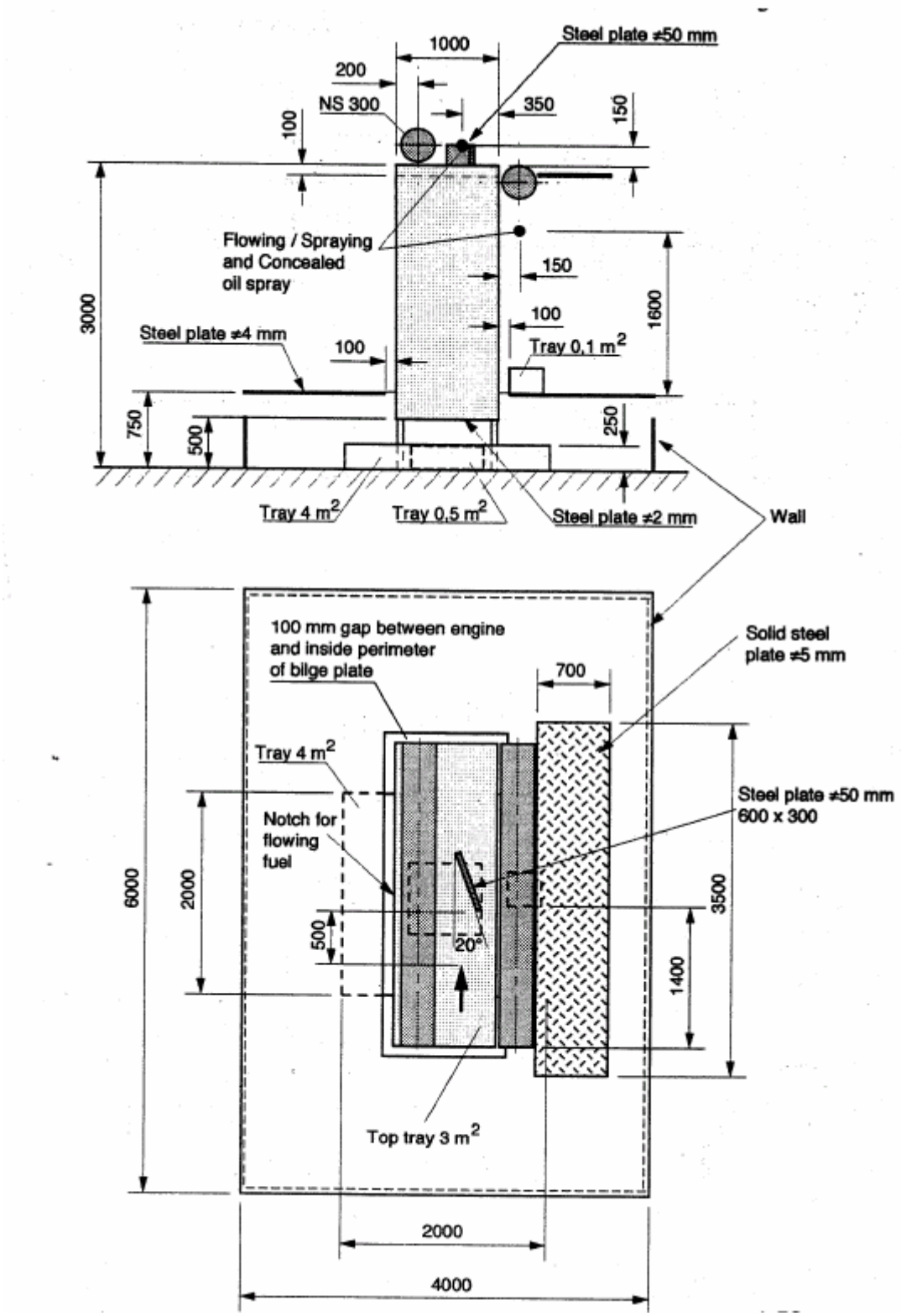

1000
Steel plate ≠50 mm
200
NS 300
350
150
100
Flowing / Spraying
and Concealed
oil spray
150
3000
100
1600
Steel plate ≠4 mm
100
Tray 0,1 m2
750
500
250
Tray 4 m2
Tray 0,5 m2
Steel plate ≠2 mm
Wall
100 mm gap between engine
and inside perimeter
of bilge plate
700
Solid steel
plate ≠5 mm
Tray 4 m2
Steel plate ≠50 mm
600 x 300
Notch for
flowing
fuel
6000
2000
500
20°
3500
1400
Top tray 3 m2
2000
4000

Figure 1

（添付 3.3）　　FP50 に向けた今後の検討課題

1．CG 対応

（1） 火災安全システムの性能基準及び承認基準（CG 対応を含む。）

項目	作業内容	検討主体	備考
下記項目に関する関連改正案の作成 ・居住、業務及び制御区域用固定式水噴霧装置 ・高膨張泡消火装置 ・以下の短期検討課題に関する関連改正案の作成 (1)固定式加圧水噴霧消火装置 (2) 固定式低膨張泡装置 (3) 持運び式泡放射器 ・車両区域、Ro-ro 区域及び特殊分類区域用固定式水ミスト及び固定式加圧水噴霧消火装置に関する関連改正案の作成 ・MSC/Circ.848 の改正に関する検討	・基準案作成（又は CG 対応） ・高膨張泡消火装置のコメント対応 ・基準案の作成（又は CG 対応） ・基準案の作成（平成 15 年度の研究結果を基に） （注；Scope を明確にして作業を進める必要有り。 又、既存の設備の取扱いにも注意のこと。） ・CG 対応	HK、製安セ、メーカー NK HK、製安セ、メーカー 製安セ、メーカー、NK メーカー	詳細は非公式小グループにおいて検討
CO2 消火装置の今後の使用に関する検討	・ 安全、経済性の観点からの検討（CG 対応） ・ 国内の意見調査及び調整	HK、製安セ、メーカー、船協、造工、海技研、NK	同上
固定式 CO2 消火装置の保守及び検査に関する指針案	FP49 で作成された案の検討	同上	同上

（2）旅客船の安全（CG 対応を含む。）

項目	作業内容	検討主体（取りまとめ）	備考
・ SOLAS II-2 章及び FSS Code の改正案候補の検討 ・ 火災の防止に関する新作業リストの検討及び勧告	・ CG 対応 ・ MSC, SLF, NAV, STW, DE, FP, COMSAR への対応の国内での総合的検討が必要 ・ 同時並行で、各種要件の内航旅客船への適用に関する検討。免除する場合の根拠の明確化	海事局（海技研） Contact: 安基鈴木 Contact: NMRI 太田	外航旅客船協会、日本旅客船協会、造工、NK、

（3）新及び既存旅客船の避難解析に関する勧告（CG 対応を含む。）

項目	作業内容	検討主体（取りまとめ）	備考
・ 避難解析の暫定指針（MSC/Circ.1033）改正案の作成 ・ 退船時間に関するクライテリアの SOLAS 等へ取り入れに関する助言	・ CG 対応 ・ 船上における避難に係るユニバーサルデザインへの対応の予備的検討	海技研、海事局、造工 Coordinator: 太田 Contact: NMRI 宮崎 Contact: RIME 村山	

（4）FTP コードの総合見直し

項目	作業内容	検討主体（取りまとめ）	備考
・ A.653(16)の改正 ・ A.754(18)の改正（防火扉） ・ FTP コードの見直し	仏提案改正案の検討 FP49 審議結果（FP49/WP.7）の検討 FTP コード見直しの骨子の検討	製安セ	NK、造工、海技研

2．その他

項目	作業内容	検討主体	備考（協力）
ガス燃料船に関する要件の策定	DE48 の審議結果の検討及びﾉﾙｳｪｰ提案文書の検討	造工、舶用工、NK	海技研
機関室及び貨物ポンプ室の防火対策	韓国提案の検討（日本提案を作成する？）	造工、NK	韓国から事前に情報収集する。
SPS コードの検討	コードの見直し（IMO での審議状況の監視）	海事局	
避難誘導システムの性能要件	特になし（IMO での審議状況の監視）	（海技研）	
IACS の統一解釈	我が国提案（FP49/13）の再検討及び提案文書作成	造工、中小型造工、NK	
火災事故記録の解析	我が国からの MO 提案文書の提出の要否及び他国からの提出文書の検討	船主協会、海事局	造工、製安セ、NK
20,000DWT 未満タンカーへの IGS の適用の検討（火災事故記録の解析関連）	我が国の方針決定及び MSC、FSI、FP 等への提案文書の検討	海事局、船主協会、内タン	造工、船協、製安セ、NK
MSC80 対応	FP49 からの提案文書の検討	海事局	海技研、NK

FP 50 予定議題及び担当予定機関

No.	議題	主担当
1	Adoption of the agenda	-
2	Decisions of other IMO bodies	-
3	Passenger ship safety	未定
4	Performance testing and approval standards for fire safety systems	HK
5	Recommendation on evacuation analysis for new and existing passenger ships	NMRI
6	Development of provisions for gas-fuelled ships	-
7	Measures to prevent fires in engine-rooms and cargo pump-rooms	NK
8	Review of the SPS Code	-
9	Performance standards for evacuation guidance systems	-
10	Amendments to resolution A.653(16) relating to the preparation of specimens for sealants and mastics	RIME
10BIS	Amendments to resolution A.754(18)	RIME
11	Consideration of IACS unified interpretations	NK
12	Analysis of fire casualty records	JSA（IGS 関係）
13	Work programme and agenda for FP 51	-
14	Election of Chairman and Vice-Chairman for 2007	在英日本大使館
15	Any other business	-
16	Report to the Maritime Safety Committee	-

４．IMO 提案文書の概要

本部会で検討の結果、FP49 へは、下記の 4 つの文書を提出した。

- Draft Guidelines for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space（FP49/4/2）
- Tests for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space（FP49/INF.4）
- Study on evacuation analysis and comments on MSC/Circ.1033（FP49/INF.3）
- Proposal for the reconsideration of IACS Unified Interpretation SC178 on Emergency fire pumps in cargo ships（FP49/13）

各々の概要は下記のとおり。

- FP49/4/2

  第 48 回小委員会において米国のコーディネートの下に、会議間に火災安全システムの性能試験及び承認基準に関する作業をすすめるためＣＧが設置され、以下の付帯事項が合意された。

  (FP48/19, 5.5.2 項抜粋)

  .2 以下の機関室及び貨物ポンプ室消火装置に関連する短期優先事項テーマに関する関連改正の作成

  .1 固定式加圧水噴霧装置

  .2 固定式高膨張泡消火装置

  .3 固定式低膨張泡消火装置

  .4 持運び式泡放射器

  しかしながら、固定式高膨張泡消火装置に関する指針又は基準、特に、発泡器を保護区域内に設置する装置については、ＣＧで議論されなかった。

  そこで、当部会では、IMO 指針のない当該消火装置の指針及び/又は基準の必要性を考慮し、日本は保護区域内に発泡器を設置した固定式高膨張泡消火装置の承認のための指針案を作成し、提案することとした。提案作成の背景は下記のとおり。

  近年、下記の理由を基に、泡発泡器を保護区域の内部に持つ高膨張泡装置が、多くの船舶の機関室に設置されるようになってきている。

  (1) 泡原液は無害である。
  (2) 泡装置は、保護区域を冷却する特徴がある。
  (3) 消火後、保護区域内の状況を容易に確認できる。
  (4) 装置はコンパクトで、発生された泡を保護区域内に移動するダクトは必要ない。

  一方、高膨張泡装置の要件は FSS コードの第 6 章 2.2 項に規定されている。しかしながら、これらの規定は発泡器が保護区域の外部にある装置を基に作成されている。

このため、日本では、発泡器を保護場所の内部に持つ装置は、泡原液及びこの装置の特徴を考慮し、MSC/Circ.668/728 に規定されている関連試験手順を用いた試験の結果を基に承認されている。

なお、基準案は、国内で行われた承認試験結果（FP49/INF.4 参照)、MSC/Circ.668/728 に規定された関連試験手順及び各船級の設置要件を基に作成された。

参考のため、承認基準案の仮訳を添付に示す。

・ FP49/INF.4

国内では、2 つの製造者により、MSC/Circ.668 及び 728 に規定されている試験手順に基づいた試験を実施し、良好な結果を得られている。このたび、発泡器を保護区域内に備える固定式高膨張泡消火装置の承認に関する指針案（FP49/4/2）をさくせいし、IMO へ提案することに伴い、本試験結果を技術資料として IMO に提供するため、承認試験結果を取りまとめ、INF ペパーとして提出することとした。

・ FP49/INF.3

FP 小委員会では、旅客船用避難解析暫定指針（MSC/Circ.1033）の見直しを実施しており、各国には、暫定指針の改正に資する情報の提供が求められていた。

この暫定指針については、過去に我が国から、以下の海技研の技術的コメントを紹介した（FP 47/INF.4)。

.1 局所的な混雑の指標ない。

.2 反応時間(避難タイミング)に広い幅を持たせたことが､避難解析を無意味なものにしている。

.3 避難経路が使用できなくなるシナリオが２種類しかなく、また、十分に検討されたものではない。

その後海技研は、この暫定指針に基づく避難解析を実施したため、この経験を踏まえ、同暫定指針に関する Information paper の提案を提案した｡この Information paper を FP 49 に提案することは、国際貢献の観点から望ましく、また、今後避難解析の分野において、我が国の発言力を維持することにも資すると考えられるため、本部会では、特に反対もなく了承した。

提案文書では、まず、暫定避難解析指針を採択してから現在までの FP 小委員会における議論を整理して示した。この中では、前述の我が国提案のみならず、FP 48/INF.2 by カナダ、FP 48/4 by ドイツ（C.G. coordinator)、FP 48/4/1 by ドイツの内容にも言及し、また、FP 47、FP 48 における審議結果から、関係する部分を抽出した。

ANNEX の Appendix 1 では、同指針に基づく大型旅客船（乗船者 4,000 人以上）に関する解析結果を紹介し、以下の通り結論した。

現時点では適切な局所的混雑の評価指標及び評価基準を提示するには至らなかったが、避難解析

（advanced analysis）の最も重要な役割は、各混雑場所における混雑時間を船舶の設計者に示すことと考えられる。この観点から、暫定指針は、局所的混雑の指標を取り入れるよう、見直されるべきである。

ANNEX の Apependix 2 では､同指針の改正に際しての論点として､以下をリストアップしている。

1 局所的な混雑の指標の導入（仮の案を示している。）
2 反応時間の幅を無くしてはどうか
3 安全余裕の取り方
4 一部の経路が使えないシナリオの見直し
5 簡易避難解析の必要性の見直し
6 審議方法（C.G.や WG の設置）

後述の通り、この提案文書及び他の Information Papers（それ以外の提案文書は無かった）を審議した結果、太田委員（海技研）を Coordinator とする C.G.が設置された。よって今後は、暫定避難解析指針の問題点を整理し、2005 年 9 月頃までに、我が国が中心となって、新たな避難解析指針案を作成することになる。

・ FP49/13

MSC 78 において各小委員会に検討が指示された IACS 統一解釈（提案文書：MSC 78/22/1）には、ANNEX 13 として、貨物船の非常用消火ポンプに関する統一解釈 SC178 が含まれている。

同統一解釈は､FSS コード第 12 章の 2.2.1.3 の規定で､”under all conditions of list, trim, roll and pitch likely to be encountered in service”において非常用消火ポンプが所定の要件を満足することが要求されていることについて、検討すべき船舶の状態を与えるものである。しかしながら、同統一解釈で与えられている pitch 及び roll は非常に過大なもので､現行の設計を大きく変更せざるを得なくなると考えられる。このため、本部会でも、当該統一解釈を各種の船舶に適用し、その問題点を明確にするとともに、代替案を作成し、IMO に提案することとした。提案文書の概要は下記とおり。

提案文書案では、para.3 から para.10 において、SC178 を適用した場合に特に大きな影響を与えるであろう pitch について実船への試適用を行い、要求される pitch 角が如何に過大であるかを例示の上、適用した場合の以下のような問題点を列挙している。

(1) 非常用消火ポンプを現状のように船尾に設ける場合
  (a) 海水取入口を機関室内の前方に設けざるを得ないが、海水取入口及び配管類を機関区域外部に設けるという SOLAS Reg.II-2/10.2.1.4.1 の趣旨に反することになる。SOLAS の趣旨に合致するため、機関室内の二重底内に配管することも考えられるが、小型船のように二重底が低い場合、配管が困難となる。
  (b) 消火ポンプに対して過大な揚程が要求されることになる。（非常用消火ポンプとして使用可能なものとして一般的に市場にあるものの suction head は 6-7 m 程度。）

(2) 非常用消火ポンプを船尾以外に設ける場合

機関区域外部であることが要求されている（SOLAS Reg.II-2/10.2.1.4.1）とともに、上記ロール及びピッチを考慮すれば船体中央部に近いところとせざるを得ないため、消火ポンプを配置できる場所が限定される。このため、非常用消火ポンプを設置する区画を設けるために貨物タンク／貨物倉容積を減らさざるを得なくなる船も出てくるであろうし、海水取入口の弁の操作も含めて遠隔操作機能が必要となる。

(a) タンカーの場合

(i) 当該ポンプの駆動力が設置できないため、貨物ポンプ室への設置は困難。

(ii) 貨物エリア内への設置も困難。（SOLAS Reg.II-2/4.5.1.1）

(iii) 船首バラストポンプ室等がある場合は当該区画に設けることは可能であるが、海水取入口は中央部付近に設ける必要がある。

(iv) 船首隔壁より前方に設ける場合、多くの場合に FPT 内にリセスを造り設置することになると思われるが、整備性が悪化することによるトラブルが懸念される。FPT 上に設ける場合は過大な揚程が要求されることになる。また、前(iii)と同様に海水取入口は中央部付近に設ける必要があり、船首隔壁付き弁の遠隔操作について検討する必要が生じる。（SOLAS Reg.II-1/11.4）

(b) タンカー以外の場合（Ro-Ro、コンテナ運搬船等を除く。）

前(a)の(iii)及び(iv)に加えて、次のようなことが考えられる。

(i) Lower Stool 等に設ける場合、整備性が悪化することによるトラブルが懸念される。

(ii) 船種によっては配置上困難であるが、貨物区域内の甲板上（又は Upper Stool 等の甲板に近い区画内）に設けることは可能。ただし、現行に比べて揚程はかなり上げざるを得ない。

(c) Ro-Ro、コンテナ運搬船等

比較的に設置は容易であるが、非常時のアクセスの確保、整備時のアクセスの確保、電気機器のグレード等に注意する必要は有る。

更に、para.11 から para.17 において、FSS コード第 12 章の 2.2.1.3 の規定において考慮すべき状況について、以下のような検討を行った。

(1) ローディングマニュアルに記載されている航海状態のうち、最も排水量の小さいバラスト状態（バラスト兼用倉等を漲水しない状態）で検討すればよいと考えられる。また、喫水、トリム及びヒールといった静的な状態については、ローディングマニュアル等に記載されたそれぞれの積付状態に従うことで問題ないと考えられる。あえて言えば、非常用消火ポンプの使用による機関区域の浸水を考慮すべきかもしれない。

(2) 非常用消火ポンプの使用による機関区域の浸水を考慮する場合、非常用消火ポンプによる 1 時間（海水吸入管が機関室内を通過する場合の防熱基準（A-60）に対応させた。）の放水量を考えることとし、これによる船舶の姿勢変化を、機関室を船尾に有する船舶について試計算してみる。横傾斜については、放水された海水が全て片舷に集まっていると仮定しているが、いずれの傾斜角も極めて小さな値となっている。

(3) この結果自体は、船尾にトリムすることになるため、船尾側に設置される非常用消火ポンプに対しては楽になることを示しているが、同様に船首側の区画に対して放水するようなケースを考えれば、船首側へも同じ角度の傾斜を考慮するようにすれば適切な基準になると考えられる。ある

程度余裕を含んだ数値として、上記航海状態について縦傾斜については+/- 1 度、横傾斜については+/- 5 度をそれぞれ考慮することとすれば十分に安全であると考えられる。

(4) 考慮すべき pitching 角等を規定することは困難であるが、上述の機関区域浸水による船舶の姿勢変化に相当する角度を考慮しておけば、それでカバーされると考える。

これらの結果より、現実的な問題を無視し、実際の設計への影響を何ら評価しないまま、このような統一解釈を作成することに反対し、更に時間をかけて検討することを要請している。また、今後の検討に資するものとして SC178 の修正案を提案している。

(添付４)

保護区域内に発泡器を配置する高膨張泡消火装置の承認基準に関する指針

１．一般

SOLAS 条約は機関室内の高膨張泡消火装置の使用を認めている。保護区域に発泡器を配置する固定式高膨張泡消火装置は、機関室で発生する種々の火災を消火できる能力を試験により立証しなければならない。

２．定義

2.1 閉囲区域とは［要作成］

３．装置の基本要件

3.1 基本性能

.1 主管庁が認めた場合を除き、装置の自動軌道は認められない。

.2 装置は Appendix 2 に従った火災試験を行い、これを消火できる能力があること。

.3 装置の泡原液は、MSC/Circ.670 に従い、主管庁により承認されていること。

.4 発泡器のノズルは、本指針の Appendix 1 を満足すること。

3.2 装置の要件

.1 装置は非常用電源から給電されること。

.2 装置及びその付属物は、船舶の機関室又は貨物ポンプ質で、通常遭遇する温度変化、湿度、振動、目詰まり及び腐食に耐えるよう設計されること。保護区域内の付属物は、火災の間に上昇する温度に耐えるよう設計すること。

.3 保護区域内の管系は爆発による管系の損傷を防ぐため、爆発の危険性が高い装置及び機器の付近を通過させないこと。［管系統は 2 系統以上とし、それぞれに圧力計を設けること。］

.4 保護区域内の発泡器及び管系は鋼製又は同等なものからできていること。

.5 有効な泡原液の量は、保護場所の最大容積の 5 倍に相当する量の泡を発生するために十分なもの又は試験による必要な量のどちらか大きいもの以上であること。泡膨張率は 1000 分の 1 以下であること。

.6 乗組員が安全に、かつ容易に容器中の泡原液の量を確認する手段を設けること。

.7 装置の操作要領を各操作場所に掲示すること。

.8 予備品は製造者の説明書に従って準備されること。

.9 filling rate は Appendix 2 に従って行われた試験結果によること。機関室の容積が Class 3 を超える容積の場合、Class 3 試験室で行った試験結果を使用しても良い。

3.3 船上配置に関する要件

.1 発泡器及び管系は、保護区域内の機関及び機器の通常保守作業の妨げにならないよう配置すること。

.2 動力供給源、泡原液及び制御装置は、迅速に近づくことができ、かつ、容易に操作できるものでなければならず、また、保護区域の火災により遮断される恐れのない場所に配置すること。

.3 装置の電源、泡原液及び制御装置は保護区域の外側とすること。

.4 泡発泡器の配置は、承認試験の試験結果を基に設計されること。

.5 機関室内（Engine casing を除く。）の最上段の天井下に発泡器を設置すること。また、追加の泡発泡器は、Engine casing の最上段の天井下及び最上段の天井下に設置された発泡器からの泡が到達しにくい場所に設置すること。

.6 泡発泡器は、承認試験により立証された filling rate 以上の割合で泡を満たすために、十分な量の泡を発生するように配置すること。いずれの場合も filling rate は毎分 1m 以上とすること。

.7 管系統は、装置が正しく作動するために要求される流量および圧力を確保するため、水力計算技法*に従って寸法を決めること。

.8 通風装置**、放出警報及び油ポンプ**の制御装置は消火装置が制御できる場所で有効であること。

注：

* ：Hazen-Williams 法又は Darcy-Weisbach 式を参照のこと。

**：SOLAS II-2 章 5.2.2.2 及び 5.2.2.3 規則によりカバーされている。

Appendix１；
ノズルの試験要件

保護区域内に設置される装置の付属物は MSC/Circ.668 の付録 A に規定されている以下の項目に従い試験を行うこと。

- Dimension

- Flow constant
  最少、最大使用圧力及びその中間の圧力における流量を計測し、K 値を求める。

- Stress corrosion

- Sulphur dioxide corrosion
  目視検査のみ行えばよい。

- Salt spray corrosion
  ５％の塩水で行ってよい。MSC/Circ.668 の付録 A の 3.14.2 項は適用する必要はない。

- Resistance to heat
  付属物が鋼製の場合、試験を行う必要はない。

- Impact test
  ノズルのみ試験を行う。

- Clogging test
  ﾉｽﾞﾙの開口が、[1.5mm]以上の場合、試験を行う必要はない。

Appendix 2
固定式高膨張泡消火装置の試験方法

１．目的

(TBD)

２．試供品

試験を行う構成品は、構成品の確認をするのに十分な設計及び設置基準、操作説明書、図面及び技術データと共に、製造者から供給されること。

３．火災試験

3.1 試験原則

本試験方案は模擬機関により妨げられたスプレー及びプール火災に対する高膨張泡消火装置の設計基準及び有効性を立証できるようにする。

3.2 試験詳細

3.2.1 閉囲試験場

3.2.1.1 装置の消火試験は下記の閉囲試験場を用いて行うこと。閉囲試験場の床は、できるだけ正方形とすること。

1. 面積 100m2 以上。試験場の高さは少なくとも 5m 以上とすること。 (Class 1)
2. 面積 300m2 以上。試験場の高さは少なくとも 10m 以上とすること。 (Class 3)

3.2.1.2 いずれの試験場も火災試験中の火災場所の酸素濃度が 20%を越えるよう、自然又は強制通風を備えること。通風は通風からの新鮮な空気が直接泡発泡器に入らないように配置すること。

3.2.2 模擬機関

火災試験は、以下のものからなる装置で行うこと。

.1 厚さ 5mm の鋼板よりなる寸法 1m x 3m x 3m (幅 x 長さ x 高さ)の模擬機関。模擬機関は排気マニホールド及び格子を模擬した直径 0.3mm 及び長さ 3m の 2 本の鋼管を取り付けること。模擬機関の上部には 3m2 のトレイを設けること。図 1 参照。

.2 模擬機関の下部の周りに面積 4m2 のトレイを持った 4m x 6m x 0.5m(高さ)の床板装置を設けること。図 1 参照。

3.2.3 試験プログラム

火災試験は、以下の火災シナリオを用い、Class 1 及び class 3 の試験場で行うこと。

1. 以下の試験プログラムの組み合わせ（試験用燃料：商用燃料油又は軽油）
   (1) 中央に置かれた模擬機関の上部の 1m 離れた直径 12 - 15mm の棒を打つために上方に 45 ° の角度をもった低圧スプレー
   (2) 模擬機関の下(4m2)及び上方(3m2)のトレイ火災
2. 模擬機関の上部の高圧水平スプレー火災（試験用燃料：商用燃料油又は軽油）

3. 模擬機関の端部から 0.1m に置かれた油スプレーノズルから機関の横方向の低圧、低流量巣ペレー火災及び床板の内側で機関から 1.4m に置かれた 0.1m2 のトレイ火災（試験用燃料：商用燃料油ま又は軽油）
4. 模擬機関の下方の 4m2 トレイ(試験火災：ヘプタン)

火災の型式	低　圧	低圧、低流量	高　圧
スプレーノズル	広域スプレー角度 (120 ° ～ 125 °) Full corn type	広域スプレー角度 (80 °) Full corn type	標準角度 (at 6 bar) Full corn type
油　圧	8 bar	8.5 bar	150 bar
油　量	0.16 ± 0.01 kg/s	0.03 ± 0.005 kg/s	0.050 ± 0.002 kg/s
油　温	20 ± 5℃	20 ± 5℃	20 ± 5℃
熱放射率	5.8 ± 0.6 MW	1.1 ± 0.1 MW	1.8 ± 0.2 MW

3.2.4 設置要件

.1 泡発生器は模擬機関の上に設置しないこと。

.2 泡発生器は出来るだけ高く設置すること。

.3 泡発生器の数及び間隔は、製造者の設計基準及び設置手引書に従うこと。

４．試験手順

4.1 準備

.1 試験に使用されるトレイは、水面上少なくとも 30mm満たすこと。水面上の高さは 150±10mmとすること。

.2 MSC/Circ.670 の 3.6.3 項に規定されている海水又は模擬海水を、清水が海水と同等の性能があると証明されている場合を除き、試験では使用すること。

4.2 計測

以下の項目を試験中に計測すること。

.1 油の流量及び圧力

.2 装置の泡原液を含んだ水の流量及び圧力　及び

.3 火災位置における酸素濃度（計測は酸素計に泡が充満したとき終了しても良い。）

4.3 事前燃焼時間

燃料源の発火後、消火剤の放出前に、トレイ火災は 2 分間、スプレー及びヘプタン火災は 10 から 15 秒間の事前燃焼を行うこと。

4.4 試験時間

消火剤を製造者の推奨する放出時間の 50%又は 15 分間の内、短い時間放出すること。もし、使用するなら、油スプレーは、消火剤の放出終了後 15 秒たって遮断すること。

4.5 火災試験前の観察事項

燃料及び模擬機関の温度及び室温を計測し、記録すること。

4.6 火災試験中の観察事項

以下の観察事項を記録すること。

.1 着火手順の開始;

.2 試験の開始(着火);

.3 装置の起動した時刻;

.4 火災の消火した時刻;

.5 装置を停止した時刻;

.6 もしあれば、再発火した時刻;

.7 スプレー火災の油を停止した時刻、及び

.8 試験を終了した時刻

4.7 火災試験終了後の観察事項

以下の項目を記録すること。.

.1 装置の損傷;

.2 試験の間、燃料の制限がないことを確認するためのトレイ内の燃料液位、及び

.3 燃料及び模擬機関の温度及び室温

5．判定基準

各試験時、泡および燃料の放出後、再発火及び火災の広がりがないこと。

6．試験報告書

試験報告書は以下の項目を含むこと。

.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 of the test product;

.7 Date of the test;

.8 Test method;

.9 Drawing of each test configuration

.10 Identification of the test equipment and using instruments;

.11 Conclusions;

.12 Deviations from the test method, if any;

.13 Test results including observation and measurement before, during and after the test, and

.14 Date and signature.

———

５．FTP コード総合見直しの検討

５.１　FTP コード総合見直しの背景

SOLAS 条約Ⅱ-2 章の 1996 改正(MSC 決議 57(67):1996 年 12 月採択)は、同章に規定する船舶防火材料の判定のための火災試験方法コード（FTP Code : International Code for Application of Fire Test procedures）（MSC 決議 61(67)）を強制要件として導入した。これらの改正及び Code は、1998 年 7 月 1 日から発効し、制定以来 8 年間が経過した現在、下記のように、様々な改正、見直しの必要性が生じている。

１）FTP Code の運用実施以降、統一的な試験方法の確立等ため、多くの解釈案が IMO に提案され、その内の幾つかは MSC/Circular として承認されている。

２）一方、提案された解釈案の内、その幾つかは規則改正にあたると判断され、実質審議が行われていないものがある。

３）FTP Code の試験方法として引用している IS0 規格には、その後の改正されているものがある。

４）FTP Code の運用実績から、同 Code の改善点が指摘されている。

５）新技術の開発により、同 Code の想定外の船舶防火材料及びシステムが出現し、船舶の火災安全性を確保する上で適正な対応が必要となっている。

６）HSC Code の採択により、FTP code Part10&Part11 が新たに制定されたが、認知度が低い。

本見直し作業は、造船・海運国としての我が国の地位の確保の一貫として、又、試験実施時の我が国の取扱い及び当該艤装品製造者の意見をコードに反映するためにも国際的に率先して推進する必要がある。

５.２　作業計画及び作業内容

上記の背景及び必要性を踏まえ、IMO の FTP Code を総合的に見直し、同コードの総合的な改正案を作成、提案し、同コードの改正を実現する必要がある。

５.２.１　作業内容

１）IMO への提案

IMO 対応として下記の予定で提案文書を提出する。

- IMO/FP への新作業提案:として MSC80(2005 年 5 月開催予定)に火災試験方法コード改正作業を提案する。（IMO に提出。MSC80/21/5 参照）
- FP への対応: FP50(2006 年 1 月予定)に同コード改正提案骨子を提案する。
  FP51 及び FP52 に、同コード改正案を提示し、審議を推進する。
  同時に国内で行った試験結果及び考察を改正案の根拠として提示する。

２）国内での調査研究

下記の項目に関し調査研究を行い、その結果を必要に応じ IMO 提案文書に反映させる。

- FTP Code に関する IMO 統一解釈及び IMO 検討時に規則改正に当たるとされ採用されなかった項目の改正 FTP Code への取り入れの検討
- 引用 ISO 規格最新版の取り入れの検討
- 運用実績を基にした改正案の検討
- 最新技術の導入を容易にするための改正案の検討

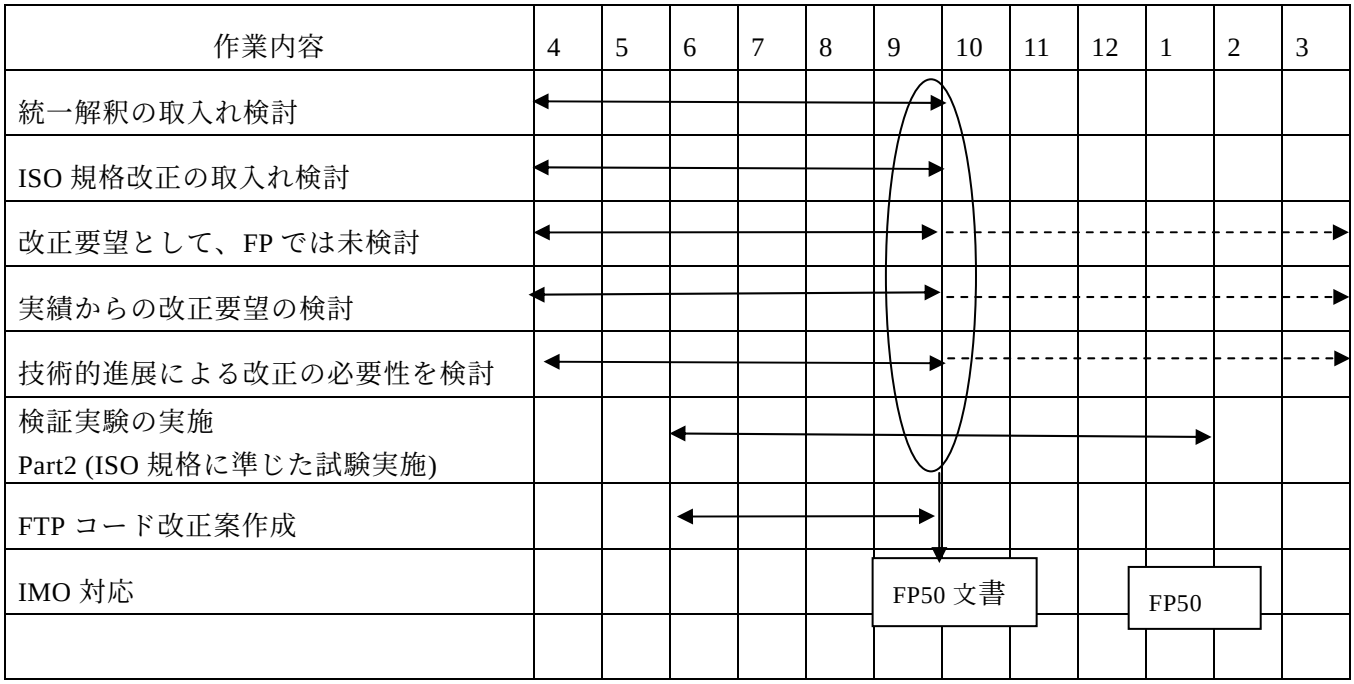
・　検証試験の実施及び試験結果の改正 FTP Code への取り入れの検討
・　火災試験方法コード改正案の作成

5.2.2　作業計画

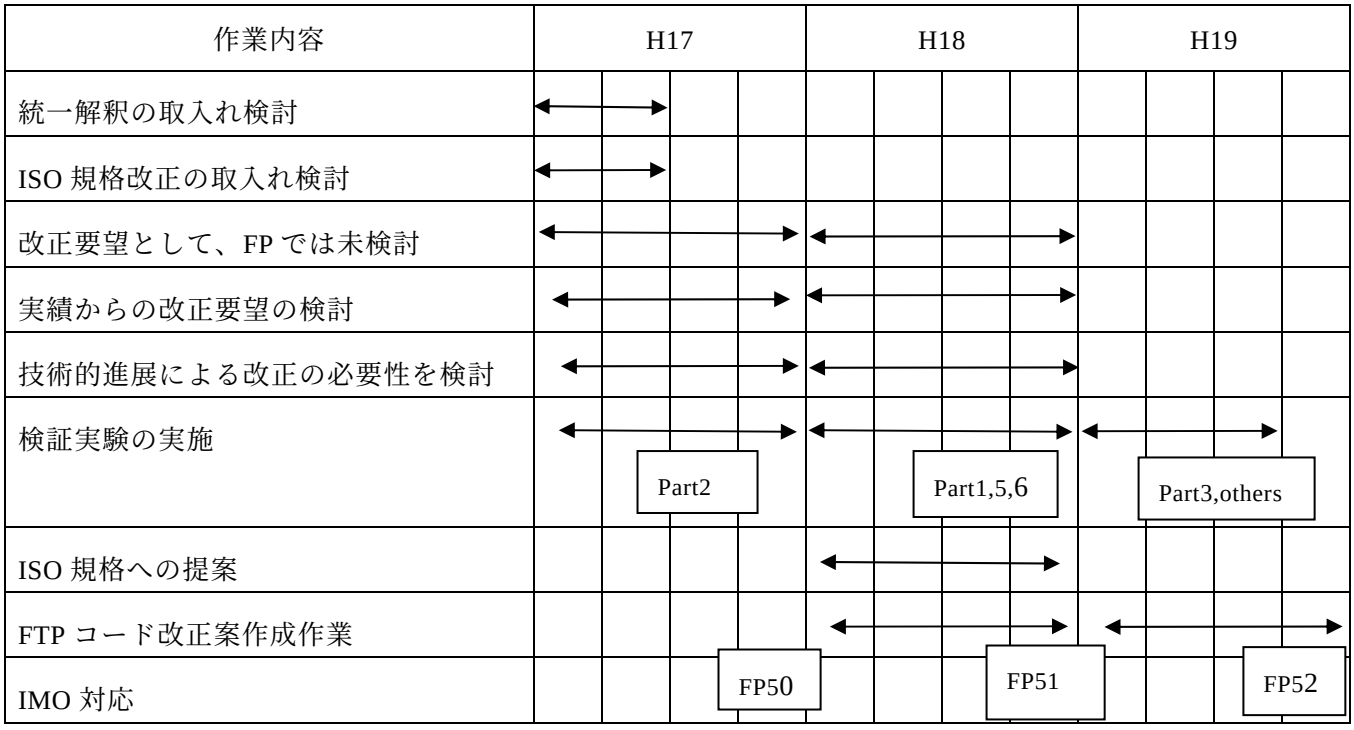
これらを鑑みて、平成 17 年度より、3 年計画にて「火災試験方法コード改正」作業を進める必要がある。この作業の完成目標は、火災試験方法コード改正案の完成を 2007 年(平成 19 年度)とし、IM0 における改正案の承認と採択の目標をそれぞれ 2008 年、2009 年とする。

具体的な、作業計画の線表を下記に示す。

FTP コード総合見直しの為の、国内計画（H１７年度計画_参考）



FTP コード総合見直しの為の、国内計画（3 年計画_参考）



５.３　総合見直しの内容検討

現時点で考えられる総合見直しの一部検討結果を以下に示す。

１）FTP Code の解釈案（MSC/Circular）

Relevant document	Para.	Interpretation or reference	No of MSC/Circ	Action
FTP code	5.1.6.5	For cases where an unsuccessful test had been conducted prior to the final approval test, the fire test report should include a description of the modifications made to the test specimen that resulted in the successful test.	1004	Add text to the code.
FTP code	5.2.4	Type approval certificates for windows should state which side of the window was exposed to the heating condition during the test. The certificate should include a reference to optional test(s) such as hose stream test and/or thermo radiation test.	1036	Add text to the code.
Part 1-Non-combustibility test	2.1	The test exposure need not exceed a 30 minute duration.	964	Add text to the code
Part 1-Non-combustibility test	2.1	For the purposes of this Part, ISO 1182:2002 may be used in lieu of ISO 1182:1990.	(FP48)	Revise ISO number on the code.
Part 2- Smoke and toxicity test	2.6.2	Not only the FTIR (Fourier Transform Infrared Spectrometer) method but also other methods such as GC/MS (Gas Chromatography/Mass Spectrometer) which can produce traceable results can be used for the gas analysis.	916, revised by 1008	Add text to the code
Part 3-Test for "A","B", and"F" class divisions	2.1	"B" class doors should be fire tested in B class steel bulkheads of dimensions as stated in paragraph 2.4.1 of resolution A.754(18), otherwise approval should be limited to the type of construction in which the door was tested.	916	Add text to the code
Resolution A.754(18) Annex	2.6.2.2	"B" class doors should be fire tested in B class steel bulkheads of dimensions as stated in paragraph 2.4.1 of resolution A.754(18), otherwise approval should be limited to the type of construction in which the door was tested.	916	Add text to A.754(18)
Part 3-Test for "A","B", and"F" class divisions	2.2.1	The minimum bulkhead panel height should be a standard height of the manufactured panel with a dimension of 2.400 mm.	964	Add text to the code
Part 3-Test for "A","B", and"F" class divisions	3.1	The calcium silicate board described as a dummy specimen specified in paragraph 3.3 of resolution A.653(16) should be used as a standard substrate for adhesives.	916	Add text to the code

Relevant document	Para.	Interpretation or reference	No of MSC/Circ	Action
Part 3-Test for "A","B", and"F" class divisions	4.1	Sealing materials used in penetration systems for “A” class divisions are not required to meet non-combustibility criteria provided that all other applicable requirements of FTP Code, part 3, are met.	(FP48)	Add text to the code
Resolution A.754(18) Annex	1.2	The thickness of insulation on the stiffeners need not be same as that of the steel plate.	916	Add text to A.754(18)
Resolution A.754(18) Annex	1.6	Doors, windows and other division penetrations intended to be installed in fire divisions made of material other than steel should correspond to prototype(s) tested on a division made of such material, unless the Administration is satisfied that the construction, as approved, does not impair the fire resistance of the division regardless of the division construction.	1004	Add text to A.754(18)
Resolution A.754(18) Annex	1.7	"B" class constructions should be tested without finishes. For constructions where this is not possible, finishes should be included in the non-combustibility test of the construction.	916	Add text to A.754(18)
Resolution A.754(18) Annex	2.8.2	Where testing is conducted on a perforated ceiling system, equally constructed non-perforated ceilings and ceilings with a lesser degree of perforations (in terms of size, shape, and perforations per unit area) may be approved without further testing.	(FP48)	Add text to A.754(18)
Resolution A.754(18) Annex	9	There exist no expectations that “A” and “B” class fire doors remain functional, in the ability to be opened/closed, during or after the specified test duration.	(FP48)	Add text to A.754(18) Annex 9.1.2
Resolution A.754(18) Appendix A.I Windows	2.1	The test should be conducted on a window of the maximum size (in terms of both the height and the width) and the type of the glass pane and/or the minimum thickness of the glass pane or panes and gaps, if appropriate, for which approval is sought. Test results obtained on this configuration should, by analogy, allow approval of windows of the same type, with lesser dimensions in terms of height and width and with the same or greater thickness.	1036	Need to study following comments. Considering the behaviour of the glass panes and the effect that weight may have to the efficiency of the securing frame, it has been decided to delete “or greater” which was present in the last line in respect of glass panes’ thickness.
Resolution	5.3	The window should be considered to have failed the	(FP48)	Add text to

Relevant document	Para.	Interpretation or reference	No of MSC/Circ	Action
A.754(18) Appendix A.I Windows		hose-stream test if an opening develops that allows an observable projection of water from the stream beyond the unexposed surface during the hose stream test. Gap gauges need not be applied during or after the hose stream test.		A.754(18)
Resolution A.754(18) Appendix A.II Fire dampers	2.2.4	The distance between the fire damper and the structural core specified in paragraph 2.2.4 means the distance between the fire damper centre and the structural core.	964	Add text to A.754(18)
Resolution A.754(18) Appendix A.II Fire dampers	4	If evaluation of insulation is required, it should prevent a temperature rise at any point on the surface not exceeding 180°C above the initial temperature. The average temperature rise is not relevant.	964	Add text to A.754(18)
Resolution A.754(18) Appendix A.III Pipe and duct penetrations	4.1	Penetrations and transits should meet both integrity and insulation criteria.	916	Add text to A.754(18)
Resolution A.754(18) Append. A.IV Cable transits	4.1	Penetrations and transits should meet both integrity and insulation criteria**.**	916	Add text to A.754(18)
Part 5 - Test for surface flammability	1	Where a product is approved based on a test of a specimen applied on a non-combustible substrate, that product should be approved for application to any non-combustible substrate with similar or higher density (similar density may be defined as a density ≥ 0.75 x the density used during testing) or with a greater thickness if the density is more than 400 kg/m^3. Where a product is approved on the basis of a test result obtained after application on a metallic substrate (e.g. thin film of paints or plastic films on steel plates), such a product should be approved for application to any metallic base of similar or higher thickness (similar thickness is obtained as a thickness ≥ 0.75 x the thickness of metallic substrate used during testing).	1004	Add text to the code

Relevant document	Para.	Interpretation or reference	No of MSC/Circ	Action
Resolution A.653(16) Annex	7	Where a product is approved based on a test of a specimen applied on a non-combustible substrate, that product should be approved for application to any non-combustible substrate with similar or higher density (similar density may be defined as a density ≥ 0.75 x the density used during testing) or with a greater thickness if the density is more than 400 kg/m^3. Where a product is approved on the basis of a test result obtained after application on a metallic substrate (e.g. thin film of paints or plastic films on steel plates), such a product should be approved for application to any metallic base of similar or higher thickness (similar thickness is obtained as a thickness ≥ 0.75 x the thickness of metallic substrate used during testing).	1004	Add text to A.653(16) Annex
Resolution A.653(16) Annex	7.3	Vapour barriers used in conjunction with insulation should be tested without any other components of “A” or “B” class constructions that will shield the barrier being tested from the radiant panel.	(FP48)	Add text to A.653(16) Annex, and FTP code Annex1 Part5
Resolution A.653(16) Annex	8.3.1	In the first line of the first sentence, the word “or” should read “of”'.	1004	Correct text A.653(16) Annex,
Resolution A.653(16) Annex	10	The sentence should be understood to mean: “Materials giving average values for all of the surface flammability criteria as listed in the following table ... (etc).	1036	Correct text A.653(16) Annex,
Resolution A.653(16) Annex	9.3	Q_{sb} means an average of three values of average heat for sustained burning, as defined in paragraph 9.3.	1004	Add text to A.653(16) Annex
Part 6 - Test for primary deck coverings	2.1	For the purpose of this part, the total heat release value (Q_t) for floor coverings given in section 10 of the annex to resolution A.653(16) is replaced by ≤ 2.0 MJ.	(FP48)	Revise the table of A.653(16) Annex
Part 6 - Test for primary deck coverings	2.2	Fire test procedure The test may be terminated after 40 min.	1004	Revise text of FTP code

2）規則改正にあたると判断され、審議が行われていない案件（要再検討）

Code	Ref.	Description	FP	Remarks
Part5	FP44/6(米) Annex2	Para7: clarify paragraph 3.1 of part 5 of the FTP Code regarding calorific value determination	(FP44)	Not agreed
Part1	FP44/6/3(中)	Para.2-2:Part1-A799(19)の使用	(FP44)	ISO ができるまで見送り
Part3	FP44/6/3(中)	Para.4:MSCc916 に示す B 級隔壁を明確にすべき（鋼板 0.6mm、防熱 50mm）	(FP44)	Not necessary

Code	Ref.	Description	FP	Remarks
Part3	FP44/6/3(中)	Para.5:Part3-A 級パネル隔壁について	(FP44)	解釈でなく改正案と判断し見送り
Part3	FP44/6/3(中)	Para.6:Part3 のバインダー含有量の試験温度を160℃とする。	(FP44)	Not action
Part5	FP44/6/3(中)	Para.9:Part5-試験方法について	(FP44)	解釈でなく改正案と判断し見送り
Part5	FP44/6/3(中)	Para.10:Part5-試験における金網について	(FP44)	Not necessary
Part5	FP44/6/3(中)	Para.11:Part5 の適用について A653 Para10 の追加	(FP44)	Not necessary
Part3	FP44/6/7(独)	Light-weight constructions" (honeycomb type, etc.) of steel or suitably insulated aluminium may be used as non load-bearing internal "A"-class bulkheads or decks in accommodation and service space areas on passenger and cargo ships	(FP44)	解釈でなく改正案と判断し見送り
Fire resistance test for Lifeboat	FP44/8(米)	Fire resistance test for material of Lifeboats	(FP45)	Agreed -> 解釈（MSC/Circ1006） Should be add to New FTP code (?)
Part3	FP 46/5(米)	Watertight door の試験（放水試験、熱輻射測定）	(FP46)	解釈でなく改正案と判断し見送り
Part3	FP 46/5(米)	大きいサイズの防火戸の試験		No action
Part3	FP 46/5/2 (仏)	防火扉の性能要件に関する A.754(18) の改正 防火戸下部隙間には 6mm ゲージを使用しない	(FP46)	解釈でなく改正案と判断し見送り
Part5	FP 46/5/3 (仏)	継ぎ目部及びシール材（樹脂材）の試験方法（仏）	(FP46)	No action
Part2	FP 46/5/4 (仏)	Part2 のガス（SO_2）測定方法について	(FP46)	解釈でなく改正案と判断し見送り
Part3 – bulkhead	FP47/3/3	波型隔壁の A 級隔壁防火試験に関する統一解釈（露）	(FP47)	解釈でなく改正案と判断し見送り
Part3 – bulkhead	FP47/3/5	アルミニウム隔壁の試験方法に関する統一解釈（伊）	(FP47)	詳細データ不足。解釈でなく改正案と判断し見送り
Part 5 - Test for surface flammability	FP47/3/9 FP 45/16, FP 46/16, FP 46/5/4	1) Rapid flash over surface の定義 2) 光沢面の試験時の黒色塗装について 3) 完全に燃えつきていない試験体部分の落下が認められた場合に使用する金属製網について（仏）	(FP47)	Not agreed 新たな解釈案は、特に必要なしと判断。
Part3 – bulkhead	FP48/3/3 FP44/6(米) Annex2 - 5	A-60 級として試験に合格した防熱材であれば、防熱材の厚さを 75%又は 50%としたものをそれぞれ A-30 級又は A-15 級として認める旨の統一解釈案(米)	(FP48)	Not agreed
-	FP48/3/4	2) 冷凍区画の仕切りへの可燃材料の使用	(FP48)	Not agreed

Code	Ref.	Description	FP	Remarks
-	FP48/3/4	3) 機関区域のパイプ防熱に可燃材料の使用	(FP48)	Not agreed
Part3 – Firedoor	FP48/3/4	6) 防火戸の材料（950 度以上の融点）と要求性能	(FP48)	Not agreed Agreed(要求性能)
Part3 – Fire door	FP48/3/4	7) ステンレス材料の鋼への無試験代用	(FP48)	Not agreed
Part3 – Enlaged fire door	FP 48/4, paragraph 11 and annex 5	The development of performance standards for large fire doors FP48 WG felt that the following needed further consideration: 1) definition of large fire door; 2)definition of input parameters to the Finite Element Method (FEM); and 3) construction principles. Extended application methods for fire doors being developed in CEN/TC 127 (European standards) could be considered in this context.	(FP48)	FTPcode の CG で検討。
Part 2- Smoke and toxicity test	FP48/7(日) FP47/10(英)	床材の二酸化硫黄の濃度制限引き上げ提案(英) 120ppm→200ppm に緩和	FP47, FP48	承認=>Amendment
Part 2 & Part5	FP48/7(日)	クッション材との複合状態での試験の必要性を提案(日)	FP48	Not agreed
Part 5 - Test for surface flammability	FP 49/6 FP48/15 FP 46/5/3	シール材及び樹脂材の試験方法の改正 A.653(16) （仏）	FP48, FP49	FTPcode の CG で検討。
Part3- Fire door	FP 49/7 FP48/14	防火扉の性能要件に関する A.754(18) の改正 Bottom clearance of the fire door（仏）	FP48, FP49	FTPcode の CG で検討。
Part3 – Ventilation system	FP49/INF.2	Test for ventilation dact	(FP49)	必要性の有無を検討。

3）FTP Code の試験方法として引用している IS0 規格には、その後の改正されているものがある。

Relevant document	ISO No	Description	Action	Remarks
Part 1- Non-combustibility test	1182	Original - ISO1182:1990 Updated - ISO1182:2002 既に Interpretation に組み込まれている。	FTPcode の改正	Agreed to add UI
Part 2- Smoke and toxicity test	5659-2	Original - ISO5659-2:1994 (Not revised) ISO/CD21489:Fire tests -Method of	要検討	FTIR によるガス測定方法の ISO 規格

Relevant document	ISO No	Description	Action	Remarks
		measurement of gases using Fourier transform infrared spectroscopy (FTIR) in cumulative smoke test FTIR (Fourier Transform Infrared Spectrometer) test method: under developing now. FTIR によるガス測定方法が、ISO にて開発中であり、2005 年ラウンドロビンテストが予定されている。RIME も本試験に参加する。（H17 年度の検証試験となる）		が確定したら、FTPcode に追加することを検討する。
Part 5 - Test for surface flammability	5658-2	Reference: ISO5658-2:1996 (Not revised yet) (IMO Res. A.653(16)と類似の試験規格) ISO/CD5658-2: Reaction to fire tests – Spread of flame – Part2: Lateral spread on building products in vertical configuration ISO5658-2 が、試験用着火炎をアセチレンガスからプロパンガスに変更、非接触着火炎の試験を省き、接触炎のみで試験する方向で改正作業中。RIME も 2003 年にラウンドロビンテストに参加、近々改正される見込み。 火災試験所の ISO5658-2 の試験は、A653 の試験装置と共用している為、ISO 規格の改正は共通性が崩れる。A653 も同時に改正することが望ましい。	要検討	ISO5658-2 規格が改定されたら、IMO Res. A.653(16)の見直しを検討する。
Part 5 - Test for surface flammability 3.1 gross calorific value	1716	Original - ISO1716:1973 Updated - ISO1716:2002	FTPcode の改正	
Part10 – Test for high-speed craft	5660-1	Original - ISO5660-1:1993 Updated - ISO5660-1:2002	MSC40(64) MSC90(71)	FTPcode への影響を検討
Part10 – Test for high-speed craft	9705			FTPcode への影響を検討

以下の項目については、H17 年度作業にて具体的に検討していく。

４）FTP Code の運用実績から、今後の同 Code の改善点。

５）新技術の開発により、船舶の火災安全性を確保する上で適正な対応。

６）FTP code Part10&Part11 における問題点

６．まとめ

今年開催された IMO/FP49 においては、火災安全システムに関する性能試験および承認基準において、日本提案の固定式高膨張泡消火装置に関する承認試験基準案の検討が行われ、次回 FP 会合での完成を目標に関連 CG で検討が行われることとなった。一方、大型旅客船の安全に関しては、平成 16 年 12 月に開催された MSC79 において「大型」を削除することが合意されたため、今後の検討では、国内対応も視野に入れた対応が必要となる。これらは、FP49 で設置された CG で検討が行われるため、国内意見を適宜まとめ、時宜を得た対応をすることで、わが国の意見を CG の結果に反映させるよう対応することが必要である。

FP49 で検討された非常用消火ポンプのサクション位置に関する IACS の統一解釈に関しては、我が国から提出した提案文書に記載の指摘を受け、本件の更なる検討の必要性が認識され、FP 議長より FP50 に各国の検討結果を提出するよう要請があった。これを受け、FP50 に向け国内の関係者による検討を重ね、再度我が国の提案を IMO に提出する必要がある。

その他、FP50 以降では、MSC80 に我が国が新規作業項目として提案した「FTP コードの総合見直し」に対する作業が FP50 から開始される予定のため、本件に関する検討及び必要な試験を行い、その結果を IMO へ提案する必要がある。また、韓国の提案した「機関室及び貨物ポンプ室の防火対策」及びノルウェーの提案した「ガス燃料船に関する要件の策定」に対する対応も、船舶設計にかかわる事項のため、IMO への提案文書の検討及び IMO での審議状況を監視することで、前広に対応し、必要であれば我が国の意見を審議及び検討結果に反映させる必要があると考えられる。更に、火災事故記録の解析に関し、仏で起こったケミカルタンカー船の事故に関する対応については、今後、審議の経過を監視すると共に、事前に関係者による検討を行う等の対応を行う必要があると考えられる。

添付資料リスト

（頁調整）

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INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON FIRE PROTECTION
49th session
Agenda item 4

FP 49/4/2
22 October 2004
Original: ENGLISH

PERFORMANCE TESTING AND APPROVAL STANDARDS FOR FIRE SAFETY SYSTEMS

Draft Guidelines for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space

Submitted by Japan

SUMMARY

Executive summary:	This document proposes draft Guidelines for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space, based on the test results conducted in Japan.
Action to be taken:	Paragraph 9
Related documents:	FP 48/WP.4/Rev.1, FP 48/19 and FP 49/4

Introduction

1 The Sub-Committee, at its forty-eighth session, established a correspondence group, under the co-ordination of the United States, to progress work intersessionally on performance testing and approval standards for the fire safety systems and agreed to the following terms of reference (FP 48/19, paragraph 5.5.2):

> ".2 prepare relevant amendments for the following short-term priority category of topics relating to machinery space and cargo pump-room fire-extinguishing systems:
>
> .1 fixed pressure water-spraying systems;
>
> .2 fixed high-expansion foam fire-extinguishing systems;
>
> .3 fixed low-expansion foam fire-extinguishing systems; and
>
> .4 portable foam applicator units;"

2 However, any guidelines or standards regarding to the fixed high-expansion foam fire-fighting systems, especially those providing foam generators inside the protected spaces, have never been discussed in the correspondence group.

3 Considering necessity of guidelines and/or standards for such fire-extinguishing systems as shown in the subsequent paragraphs, for which any IMO instrument has not been prepared, Japan proposes the draft text of Guidelines for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space.

Background of the proposal

4 Recently, high-expansion foam system providing foam generators installed inside the protected space shows a tendency to be adopted to many ships for the machinery space, based on the following reasons:

.1 the foam concentrations are not harmful;

.2 foam system has a feature of cooling the protected space;

.3 the condition in the protected space can be easily confirmed after extinguishing; and

.4 the system is compact and duct to convey the produced foam into the protected space is not necessary.

5 The requirements for high expansion foam system are stipulated in paragraph 2.2 of chapter 6 of the FSS Code. However, these requirements have been developed based on the system providing foam generators installed outside the protected space.

6 Therefore, in Japan, the system providing foam generators installed inside of the protected space has been approved based on the results of the tests conducted using the relevant test procedure specified in MSC/Circ.668/728, taking the feature of the foam concentrations and this system into account at present.

Development of the draft Guidelines

7 Taking the above-mentioned situation into account, Japan develops the draft Guidelines for the approval of this system, as set out in annex, based on the test results conducted in Japan and the experiences in the actual installations of the systems, and proposes it to unify the requirements for the approval procedure and installation of this system.

Conduct of the fire test

8 Two Japanese manufacturers conducted fire tests for approval, using the relevant test procedure specified in MSC/Circ.668/728, with satisfactory results. These test results have been also reflected in the draft. The test results are shown in document FP 49/INF.3.

Action requested of the Sub-Committee

9 The Sub-Committee is invited to consider the proposal and take action as appropriate.

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ANNEX

DRAFT GUIDELINES FOR THE APPROVAL OF FIXED HIGH EXPANSION FOAM FIRE EXTINGUISHING SYSTEM PROVIDING FOAM GENERATORS INSIDE THE PROTECTED SPACE

1 General

The SOLAS Convention provides for and accepts the use of high expansion foam systems inside machinery spaces. The fixed high expansion foam fire-extinguishing system providing foam generators inside the protected space should demonstrate by a test to have the capability of extinguishing a variety of fires, which may occur in a ship's engine room.

2 Definitions

2.1 Enclosed space [To be developed]

3 Principal requirements for the system

3.1 Principal performance:

.1 Automatic release of the system should not be permitted, except as permitted by the Administration.

.2 The system should be capable of fire extinction, and tested in accordance with Appendix 2 to this guideline.

.3 The foam concentrates of the system should be approved by the Administration in accordance with MSC/Circ.670.

.4 The nozzles of the generators should be successfully tested in accordance with Appendix 1 to this guideline.

3.2 Requirements for system

.1 Electrical powers for the system should be supplied from emergency power.

.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 room in ships. Components inside the protected spaces should be designed to withstand the elevated temperatures, which could occur during a fire.

.3 The piping system of the system in the protected spaces should not be passed near the equipment/devices having a high risk of the explosion to prevent piping damage by explosion [and should be of at least two routes and provided with pressure gauge on each route].

.4 Foam generators and the piping system inside the protected space should be of steel or equivalent.

.5 The quantity of foam concentrates available should be sufficient to produce a volume of foam equal to five times the volume of the largest space to be

protected, or the quantity needed at the test, whichever the large. The expansion ratio of the foam should not exceed 1,000 to 1.

.6 Means should be provided for the crew to safely and easily check the quantity of foam concentrates in the containers.

.7 The operational manual of the system should be displayed at each control position.

.8 Spare parts should be provided in accordance with the manufacturer's instruction.

.9 Filling rate for the system should be followed the results of the test to be conducted in accordance with Appendix 2. Where the volume of the machinery space in question is more than that of class 3 test enclosure, the test data of filling rate conducted in the class 3 test enclosure can be used for approval.

3.3 Requirements for arrangement onboard

.1 Foam generators and the piping system should be arranged not to disturb the maintenance works for machinery and equipment in the protected space.

.2 Power supply of the system, foam concentrates and means of controlling the system should be readily accessible and simple to operate, and should be arranged at positions not likely to be cut off by a fire in the protected space.

.3 Power supplies, the foam concentrate and controls should also be outside of the protected space.

.4 Arrangements and number of foam generators should be designed based on the test results for approval.

.5 Foam generators should be installed under the uppermost ceiling in the protected spaces except engine casing. Additional foam generator(s) should be installed under the uppermost ceiling of engine casing and the ceiling of area(s) where foam from the generators installed the uppermost ceiling seems to be difficult to flow in.

.6 Foam generators should be arranged in order to be sufficient to produce enough volume of foam not less than the filling rate, which is demonstrated by the test for approval. In any case, filling rate should be not less than 1m/min.

.7 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.

.8 The control system of ventilation fans**, discharge alarm and oil pumps** should be available at the position(s) where this extinguishing system is controlled.

Notes:
*: Refer to the Hazen-Williams Method or the Darcy-Weisbach Equation.
**: These are covered by SOLAS II-2 regulation 5.2.2.2 and 5.2.2.3.

APPENDIX 1

COMPONENT FOR FOAM GENERATOR MANUFACTURING STANDARDS

Components of the system installed in the protected space should be tested in accordance with the following items stipulated in Appendix A to MSC/Circ.668:

.1 Dimension

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

.3 Stress corrosion

.4 Sulphur dioxide corrosion: Visual inspection only may be carried out

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

.6 Resistance to heat: Where the components are made of steel, this test need not to apply.

.7 Impact test: Only, the nozzles may be tested.

.8 Clogging test: Where the diameter of the opening of the nozzle exceed [1.5 mm], this test need not apply.

APPENDIX 2

TEST METHOD FOR HIGH EXPANSION FOAM FIRE-FIGHTING SYSTEM

1 Scope (To be developed)

2 Sampling

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

3 Fire tests

3.1 Test principles

This test procedure enables the determination of design criteria and the effectiveness of high expansion foam fire-extinguishing system 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 Tests for fire extinguishing of the system should be carried out using the following test enclosures. The floors of test enclosures should be square as far as practicable.

.1 100 m^2 in area. The height of the enclosure should be 5 m (Class 1).

.2 At least 300 m^2 in area. The height of the enclosure should be at least 10 m. (Class 3)

3.2.1.2 Any test enclosure should be provided with natural or forced ventilation to ensure that the oxygen concentration at the fire location remains above 20% (by vol.) during the fire test. The ventilation should be arranged so that fresh air from the ventilation should not been taken into the foam generators directly.

3.2.2 Simulated engine

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

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

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

3.2.3 Test Program

The fire test should be carried out using following fire scenarios.

.1 Combination of the following fire programs (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-degree angle to strike a 12 – 15 mm diameter rod 1 m away.

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

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

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

.4 $4m^2$ tray under the simulated engine. (Test fuel: Heptane)

Fire Type	**Low pressure**	**Low Pressure, Low flow**	**High pressure**
Spray nozzle	Wide spray angle (120 to 125 degree) Full corn type	Wide spray angle (80 degree) Full corn type	Standard angle (at 6 bar) Full corn type
Nominal oil Pressure	8 bar	8.5 bar	150 bar
Oil flow	0.16 $\pm$ 0.01 kg/s	0.03 $\pm$ 0.005 kg/s	0.050 $\pm$ 0.002 kg/s
Oil temperature	20 $\pm$ 5 degree	20 $\pm$ 5 degree	20 $\pm$ 5 degree
Nominal heat release rate	5.8 $\pm$ 0.6 MW	1.1 $\pm$ 0.1 MW	1.8 $\pm$ 0.2 MW

3.2.4 Installation requirements for tests

.1 Foam generators should not be installed above the simulated engine.

.2 Foam generators should be installed as high as possible.

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

4 Test procedure

4.1 Preparation

.1 The tray(s) used in the test should be filled with at least 30mm oil on a water base. Freeboard should be 150 $\pm$ 10 mm.

.2 Sea water or simulated sea water specified in paragraph 3.6.3 of MSC/Circ.670 should be used for the fire test, except the case where it is shown that fresh water gives the same level of performance as sea water.

4.2 Measurements

The following should be measured during the test.

.1 oil flow and pressure;

.2 flow and pressure for the water with foam concentrates in the system; and

.3 oxygen concentration at the fire location (The measurement may be terminated when the foam fills up to the oxygen meter).

4.3 Pre-burning

After ignition of all fuel sources, 2 min pre-burn time for the tray fires and 10 to 15 sec for the spray and heptane fires before the extinguishing agent is discharged.

4.4 Duration of test

Extinguishing agent should be discharged for 50% of the discharge time recommended by the manufacturer or 15 min whichever is less. The oil spray, if used, should be shut of 15 sec after the end of agent discharge.

4.5 Observations before fire test

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

4.6 Observations during 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 the fire is extinguished;

.5 time when the system is shut off;

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

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

.8 time when the test is finished.

4.7 Observations after fire test

The following should be recorded.

.1 damage to any system components;

.2 level of fuel in the tray(s) to make sure that no limitation of fuel occurred during the test; and

.3 temperatures of test room, fuel and the simulated engine.

5 Classification criteria

At the end of discharge of foam and fuel at each test, 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 of the test product;

.7 Date of the test;

.8 Test methods;

.9 Drawing of each test configuration

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

.11 Conclusions;

.12 Deviations from the test method, if any;

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

.14 Date and signature.

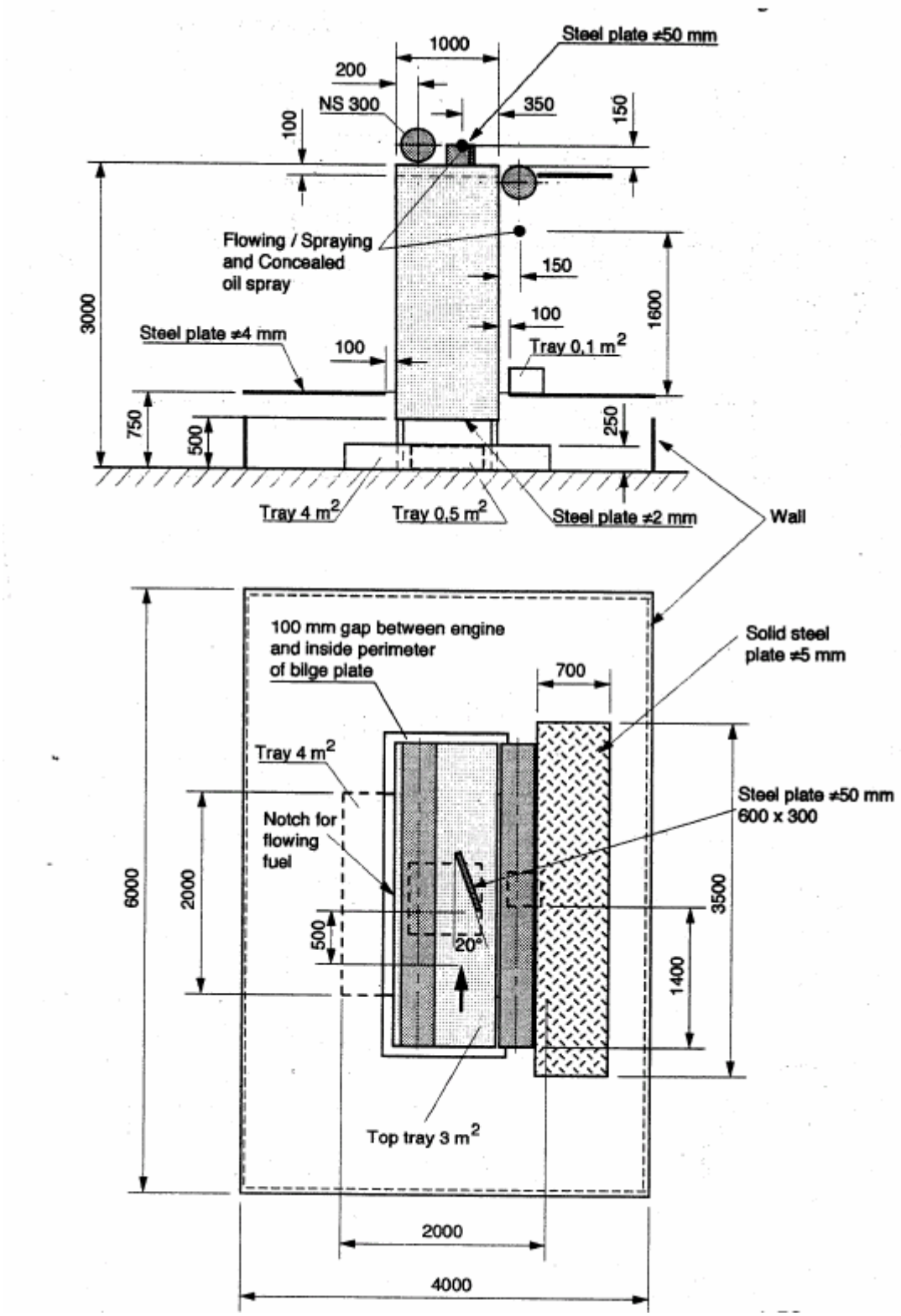
Steel plate ≠50 mm
1000
200
NS 300
350
150
100
Flowing / Spraying
and Concealed
oil spray
150
100
1600
3000
Steel plate ≠4 mm
100
Tray 0,1 m2
750
500
250
Tray 4 m2
Tray 0,5 m2
Steel plate ≠2 mm
Wall
100 mm gap between engine
and inside perimeter
of bilge plate
700
Solid steel
plate ≠5 mm
Tray 4 m2
Steel plate ≠50 mm
600 x 300
Notch for
flowing
fuel
6000
2000
3500
500
20°
1400
Top tray 3 m2
2000
4000

Figure 1

INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON FIRE PROTECTION
49th session
Agenda item 13

FP 49/13
22 October 2004
Original: ENGLISH

CONSIDERATION OF IACS UNIFIED INTERPRETATIONS

Proposal for the reconsideration of IACS Unified Interpretation SC178 on Emergency fire pumps in cargo ships

Submitted by Japan

SUMMARY

Executive summary:	This document provides comments and subsequent proposals of modifications to the IACS Unified Interpretation SC178 "Emergency Fire Pumps in Cargo Ships" annexed to the document MSC 78/22/1.
Action to be taken:	Paragraph 19
Related document:	MSC 78/22/1

Background

1 The Maritime Safety Committee, at its seventy-eighth session, instructed the sub-committees to consider the IACS Unified Interpretations annexed to document MSC 78/22/1, which fall within their purview, and take action as appropriate.

2 This document provides comments and proposals for modifications to the IACS Unified Interpretation SC178, as contained in annex 13 of document MSC 78/22/1.

IACS Unified Interpretation SC178

3 Paragraph 2.2.1.3 of chapter 12 in the FSS Code reads:

> "The total suction head and the net positive suction head of the pump shall be determined having due regard to the requirements of the Convention and this chapter on the pump capacity and on the hydrant pressure under all conditions of list, trim, roll and pitch likely to be encountered in service. The ballast condition of a ship on entering or leaving a dry dock need not be considered a service condition."

4 Japan understands that this paragraph is to provide an appropriate design for emergency fire pumps, taking account of actual ship's condition (draught, trim and heel) in service, including ship's motion (pitch and roll). However, this requirement seems quite vague.

5 In this situation, Japan understands IACS's intention and appreciates their efforts to provide an interpretation on this issue, as provided in SC178 set out annex 13 to document MSC 78/22/1. However, Japan is concerned about the provisions of SC178 may be excessive, which would lead to undesirable effects on the ship's design as highlighted in the subsequent paragraphs.

6 SC178 provides design angles of 22.5 degrees in roll and 10 degrees in pitch, which may be ±11.25 degrees and ±5 degrees judging from the provisions for the relaxation of the pitch angle for ships of 100 m or over in length. Table 1 and figure 1 show results of the application of the pitch angle specified in SC178 to actual ship designs.

Table 1 - Pitch angle and draught in the results of the application of SC178

		Draught (m) in the lightest sea going condition			SC178	Pitch forward		Pitch afterward		Position and Suction Head of Emergency Fire Pump		
L (m)	Type	dm	df	da	Pitch	A	da_pf	A	df_pa	x	h	Head
70.00	Tanker	2.36	1.63	3.09	5.00	-3.81	0.03	6.19	***-1.44***	-35.00	5.20	5.16
84.98	Reefer	2.53	1.57	3.49	5.00	-3.71	***-0.22***	6.29	***-2.16***	-38.89	6.20	6.18
89.50	LPG	3.51	3.34	3.68	5.00	-4.78	***-0.23***	5.22	***-0.58***	-44.75	7.00	7.21
93.50	General	3.69	2.75	4.63	5.00	-3.85	0.55	6.15	***-1.35***	-42.55	7.80	6.96
100.00	Tanker	3.88	3.53	4.23	5.00	-4.60	*-0.14*	5.40	***-0.85***	-45.80	6.80	6.58
111.50	Container	3.89	3.20	4.58	4.48	-3.78	0.21	5.19	***-1.18***	-50.35	7.20	6.62
112.90	Reefer	3.40	2.30	4.50	4.43	-3.31	0.13	5.55	***-2.08***	-56.45	7.70	7.55
123.00	Lime Stone	4.78	3.83	5.73	4.07	-3.18	1.36	4.95	***-0.55***	-54.35	8.60	6.83
133.00	Reefer	4.33	3.15	5.51	3.76	-2.74	1.14	4.78	***-1.23***	-62.90	8.00	6.68
140.00	Cement	4.37	3.25	5.49	3.57	-2.65	1.12	4.49	***-1.12***	-64.75	8.80	7.42
150.00	Container	4.25	3.08	5.42	3.33	-2.44	1.05	4.23	***-1.29***	-68.40	8.40	7.06
162.00	BC	4.99	3.87	6.11	3.09	-2.29	1.74	3.88	***-0.50***	-76.12	8.50	6.55
181.00	BC	5.26	4.26	6.26	2.76	-2.13	1.90	3.40	***-0.11***	-83.30	8.40	6.23
190.00	Container	6.42	5.62	7.22	2.63	-2.15	2.85	3.11	1.25	-83.85	9.61	6.34
217.00	BC	5.42	3.57	7.27	2.30	-1.33	2.91	3.28	***-0.80***	-101.00	10.20	7.12
230.00	Container	7.02	6.05	7.99	2.17	-1.69	3.63	2.66	1.68	-107.30	10.80	6.94
235.00	Tanker	7.04	6.56	7.52	2.13	-1.89	3.16	2.36	2.19	-109.10	10.50	7.06
259.00	LNG	8.07	7.30	8.84	1.93	-1.59	4.48	2.27	2.93	-114.49	13.00	8.10
277.00	BC	6.10	4.10	8.10	1.81	-0.98	3.74	2.63	*-0.27*	-130.50	11.40	7.53
279.00	BC	7.42	6.21	8.63	1.79	-1.30	4.27	2.29	1.84	-130.56	12.40	7.93
290.00	BC	7.01	5.47	8.55	1.72	-1.12	4.19	2.33	1.10	-134.92	12.00	7.62
318.00	Tanker	9.76	8.09	11.43	1.57	-0.97	7.07	2.17	3.72	-146.55	14.83	7.56
324.00	Tanker	8.35	6.30	10.40	1.54	-0.82	6.04	2.27	1.93	-150.30	14.40	8.20

Note:

dm: Draught at midship (m) in the lightest sea going condition
da: Draught at AP (m) in the lightest sea going condition
df: Draught at FP (m) in the lightest sea going condition
A: Angle of ship's keel to horizontal surface in pitch forward/afterward (deg) as given in (+) for trim by stern / (-) for trim by stem
da_pf: Draught at AP (m) in pitch forward*. Value less than zero means that ship's bottom at AP is exposed above the sea surface
df_pa: Draught at FP (m) in pitch afterward*. Value less than zero means that ship's bottom at FP is exposed above the sea surface
x: Position of emergency fire pump in length (m) from the midship as given in (+) for forward / (-) for afterward
h: Height of emergency fire pump from the base line (m)
Head: Required suction head for the emergency fire pump (m) in the condition with pitch forward
* For the simplifying, change of draught by pitching is assumed that ship's pitching motion is occurred around the sea surface at the ship's midship.

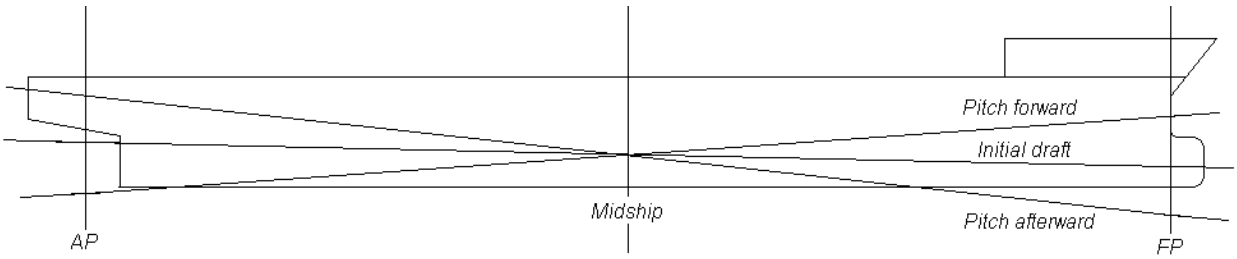

Figure 1 - Draught in the results of the application of SC178 (150,000CF Reefer, L = 84.98 m)

7 Table 1 shows that the required pitch angle afterward causes the forward bottom in many ships to be exposed above the water line. This means that the pitching angle is assuming very severe sea conditions such that it causes bottom slamming and is not appropriate for considering the design of emergency fire pumps, which are provided in case there is a fire within the machinery spaces containing the main fire pumps.

8 Table 1 also shows that required pitch angle in forward causes bottom afterward in some small ships to expose above the water line and it seems to be an unrealistic condition such that it causes propeller racing. Considering the fact that it is also to be taking account of roll, this requirement of pitching angle would be very severe for relatively large ships and it causes many ships to move their emergency fire pumps and/or its seawater inlet forward of the engine room so as to comply with this requirement.

9 For large ships, this pitching angle might not seem so severe. However, required suction head caused by this pitching angle, as shown in Table 1, is very severe for many ships, taking account the capabilities of pumps currently available on the market.

10 Expected problems for the change of design of the emergency fire pumps caused by the application of SC178, are as provided in the followings paragraphs:

.1 In cases where the emergency fire pump is arranged afterward of the engine room (conventional design):

(a) A seawater inlet for an emergency fire pump would be forced to arrange within the machinery space containing main fire pumps, usually the engine room. However, this is counter to the provisions of SOLAS regulation II-2/10.2.1.4.1 which requires that the emergency fire pump, its seawater inlet, piping for suction and delivery and remote control of the relating valve be located outside the machinery space containing the main fire pumps. Of course, Japan knows that certain parts of them have been located within the machinery space partly (as short as possible); however, Japan can not agree to accept that significant parts of them should be arranged within the machinery space by the application of SC178.

(b) Too large a suction head would be required for a emergency fire pump, in spite of difficulties to select pumps having such large suction head in the market (The maximum suction head of usual pumps would be 6 to 7 metres.).

.2 In the case where an emergency fire pump is arranged forward of the engine room:

Possible location accepted for a seawater inlet for a emergency fire pump would be limited and forced to be arranged near the ship's midship section, taking account the provisions of SOLAS regulation II-2/10.2.1.4.1 and ship's motion (roll and pitch) required by SC178. In some cases, cargo volumes would be lost for a space of the emergency fire pump and remote control devices may be required for such pumps in many ships.

(a) In tankers:

(i) it is difficult to arrange the emergency fire pump within cargo pump-rooms since the driving power for such pumps can not be located within such pump-rooms;

(ii) it is prohibited to arrange the emergency fire pump within the cargo area by the provisions of SOLAS regulation II-2/4.5.1.1;

(iii) accordingly, possible location within the ship's aft part would be limited to positions (e.g., a deep well provided within wing FOT or a recess with access trunk from the upper deck with a cofferdam surrounding it within the engine room required by regulation II-2/10.2.2.3.2.2 of the SOLAS) subject to an understanding of less accessibility in emergency and for maintenance;

(iv) forward ballast pump-rooms, if provided, may be possible to arrange an emergency fire pump subject to the conditions that piping for seawater inlet should be arranged near the ship's midship, and forced to be significant long, considering conditions with pitching afterward. Furthermore, in the case of long piping, anti-fouling systems should be arranged not to block the inside of piping by marine growths and operated periodically under the condition of less accessibility; and

(v) where the emergency fire pump is located in the compartment forward of the collision bulkhead, which would be such as a deep well in FPT because of complying with the requirements of suction head in the condition with pitching afterward, in addition to the problems as specified in (iv) above, it is a concern worried to increase troubles due to poor maintenance by less accessibility and appropriate consideration would be required for the control of valves for pipes piercing the collision bulkhead in accordance with the provisions of SOLAS regulation II-1/11.4.

(b) In ships other than tankers (excluding ro-ro ships, container carriers, etc.):

In addition to paragraphs 10.2 (a) (iv) and (v) above, the following problems may be expected:

(i) where the emergency fire pump is located in the lower stool in the cargo space, if provided, it is worried to increase troubles due to poor maintenance by less accessibility; and

(ii) where the emergency fire pump is located in the upper stool in the cargo space or on the upper deck, if possible, larger suction head would be required for emergency fire pump, in spite of difficulties in selecting a pump having such large suction head in the market;

(c) In ro-ro ships, container carriers, etc., alternative location would be found within cargo spaces in comparatively easy; however, in such case, an appropriate consideration is to be made for the accessibility for emergency case and maintenance and the restriction of electrical equipment.

Examination on an appropriate design criteria for emergency fire pumps

11 Ship's conditions in service would be categorized as follows:

(1) cargo and/or ballast loaded conditions in navigation;
(2) intermittent conditions during ballast water exchange; and
(3) intermittent conditions during loading/unloading in port.

12 For conditions categorized in (1) of paragraph 11, Japan agrees with providing appropriate design conditions, taking account of an appropriate ship's motion. However, for heel and trim, it is enough to consider those as given in each cargo and/or ballast loaded conditions. For achieving further safety, there may be room for consideration of additional heel and trim in the engine room flooded condition which may be caused by use of the emergency fire pump.

13 Table 2 shows the results of trim and heel caused by one hour of water supply by the emergency fire pump for ships having the engine room in the their aft. One hour of water supply is corresponding to "A-60" class insulation required for its sea inlet within the engine room by the provisions of SOLAS regulation II-2/10.2.1.4.1. Considering the assumption for the calculation, these values are seemed to be very small.

Table 2 Trim and Heel caused by use of emergency fire pump

		Draught (m) in the lightest sea going condition			Trim and Heel cased by use of Emergency Fire Pump		
L (m)	Type	dm	df	da	Water supply quantities (m^3)	Trim (deg)	Heel (deg)
70.00	Tanker	2.36	1.63	3.09	25.00	0.59	3.44
84.98	Reefer	2.53	1.57	3.49	25.00	0.34	5.00
89.50	LPG	3.51	3.34	3.68	25.00	0.23	0.88
93.50	General	3.69	2.75	4.63	25.00	0.17	0.76
100.00	Tanker	3.88	3.53	4.23	25.00	0.15	0.59
111.50	Container	3.89	3.20	4.58	25.00	0.10	0.36
112.90	Reefer	3.40	2.30	4.50	25.00	0.18	1.73
123.00	Lime Stone	4.78	3.83	5.73	25.00	0.09	0.29
133.00	Reefer	4.33	3.15	5.51	25.00	0.10	0.65
140.00	Cement	4.37	3.25	5.49	25.00	0.05	0.13
150.00	Container	4.25	3.08	5.42	25.00	0.06	0.20
162.00	BC	4.99	3.87	6.11	25.06	0.03	0.13
181.00	BC	5.26	4.26	6.26	32.05	0.02	0.10
190.00	Container	6.42	5.62	7.22	32.36	0.03	0.16
217.00	BC	5.42	3.57	7.27	39.45	0.01	0.11
230.00	Container	7.02	6.05	7.99	40.69	0.02	0.14
235.00	Tanker	7.04	6.56	7.52	49.45	0.01	0.04
259.00	LNG	8.07	7.30	8.84	63.46	0.01	0.09
277.00	BC	6.10	4.10	8.10	63.37	0.01	0.05

		Draught (m) in the lightest sea going condition			Trim and Heel cased by use of Emergency Fire Pump		
279.00	BC	7.42	6.21	8.63	64.03	0.01	0.05
290.00	BC	7.01	5.47	8.55	70.65	0.01	0.04
318.00	Tanker	9.76	8.09	11.43	72.00	0.00	0.02
324.00	Tanker	8.35	6.30	10.40	72.00	0.00	0.03

Note: Angles of trim and heel are calculated in the assumption of the weight of the water supply is acting on the point of 0.4 times of the ship's length (L) afterward from the ship's midship and 0.25 times of the ship's breadth off the ship's centreline.

14 These results only show the conditions with trim by stern. For the conditions with trim forward, trim and heel angles which can be obtained by the calculation in the same manner, are similar as those in the results for the conditions with trim by stern. According to these results with modification for simplifying and including a certain margin, Japan considers that it is enough to take account of +/- 1 degree in trim and +/- 5 degrees in heel as an additional trim and heel for the design of emergency fire pumps.

15 For the effect by the ship's motion, it is very difficult to estimate appropriate angles of roll and pitch for the design criteria. However, from the viewpoint for practical design, Japan seems that angles same as those given for trim and heel may be appropriate for pitch and roll, respectively, to be considered. Accordingly, Japan considers that it is enough to take account of ±2 degree in trim and ±10 degrees in heel as an additional trim and heel for the design of emergency fir pumps, including safe margin for pitch and roll.

16 For conditions categorized in (2) of paragraph 11, Japan supposes that such conditions need not be considered as a condition in service because such conditions are only occurred temporally in calm sea and special attention should be paid by the crews during such an abnormal condition.

17 For conditions categorized in (3) of paragraph 11, Japan supposes that such conditions need not be considered as a condition in service, as same as "*the ballast condition of a ship on entering or leaving a dry dock"* because a shore support for fire fighting may be expected and is given easily and quickly when a fire occurs.

Conclusion

18 Japan agrees with making interpretations for improvement of the safety level on the design of emergency fire pumps; however, Japan can not support the such an impracticable improvement without assessing practical problems and an impact on the actual ship's design as shown in paragraphs 6 to 10 above. Therefore, Japan proposes to take another one session for further discussions/considerations to establish a rational and reasonable interpretation, taking account of the above problems in actual ship's design and experience. For this purpose, Japan proposes a possible modification to IACS SC178, as shown in the annex, on the basis of the examination as shown in paragraphs 11 to17, as a basis for the consideration.

Action requested of the Sub-Committee

19 The Sub-Committee is invited to consider the above comments and proposals and to take action as appropriate.

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ANNEX

POSSIBLE MODIFICATION TO IACS UNIFIED INTERPRETATION SC178 PROPOSED BY JAPAN

1 It should be demonstrated by calculation that this paragraph is satisfied at~~:~~ the lightest seagoing condition, with account being taken of additional heel and trim of ~~22.5~~10° ~~roll~~ and ~~10~~2° ~~**pitch**~~[1] respectively~~; and~~.

1) Where the length of the ship exceeds 100 m, the ~~***pitch***~~ ***additional trim*** *may be taken as* ~~*500*~~*200/L degrees where L = length of the ship, in metres*~~*, as defined in UR S2*~~.

2 ~~a~~ A loading/unloading condition in a port and intermittent conditions during ballast water exchange need not be considered as a service condition in this paragraph~~without cargo or ballast water , with 10% stores and fuel remaining, roll and pitch not being taken into account~~.

（頁調整）

INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON FIRE PROTECTION
49th session
Agenda item 10

FP 49/INF.3
22 October 2004
ENGLISH ONLY

RECOMMENDATION ON EVACUATION ANALYSIS FOR NEW AND EXISTING PASSENGER SHIPS

Study on evacuation analysis and comments on MSC/Circ.1033

Submitted by Japan

SUMMARY

Executive summary:	This document provides the information on the experience of evacuation analysis by the Japanese experts and their comments on the discussion points for revision of MSC/Circ.1033.
Action to be taken:	Paragraph 6
Related documents:	MSC/Circ.1033, FP 47/INF.4, FP 48/INF.2, FP 48/4, FP 48/4/1 and FP 48/19

Background

1 The Interim Guidelines on evacuation analyses for new and existing passenger ships (MSC/Circ.1033) was approved at MSC 75 in May 2002. At FP 47, Japan informed the Sub-Committee of results of a preliminary study on the Interim Guidelines, which was conducted by the National Maritime Research Institute (NMRI).

2 As the results of preliminary study, the NMRI pointed out the following problems of the interim guidelines for the advanced evacuation analysis are as follows:

.1 No clear index for evaluating local congestion is introduced;

.2 Wide variety of response time makes the evacuation analysis meaningless; and

.3 The number of scenarios for reduced escape route availability is only two and the scenarios have not been fully discussed.

The second comment was supported by Germany in document FP 48/4/1 (paragraph 2.1.2).

3 The Sub-Committee, at its forty-eighth session, invited the Members and international organizations to submit, to FP 49, any information that may be relevant for the necessary future upgrading of the present Interim Guidelines (FP 48/19, paragraph 12.2).

4 After FP 47, the NMRI has gained its experience on the evacuation analyses and considered the improvement of the interim guidelines again.

5 Japan would like to introduce the comments of the NMRI on the discussion points for the amendment to the Interim Guidelines together with the information on the experience of evacuation analysis for a passenger ship.

Action requested of the Sub-Committee

6 The Sub-Committee is invited to note the above comments and the information provided in the annex.

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ANNEX*

EXAMPLE OF EVACUATION ANALYSIS AND DISCUSSION POINTS ON MSC/CIRC.1033

1 History of discussion on the interim guidelines on evacuation analyses for new and existing passenger ships after MSC 75

The interim guidelines on evacuation analyses for new and existing passenger ships (MSC/Circ.1033) were prepared at forty-sixth session of the Sub-Committee (FP 46), held in February 2002, and approved at the seventy-fifth session of the Committee (MSC 75), held in May 2002. At the forty-seventh session of the Sub-Committee (FP 47), held in February 2003, Japan provided the following information paper:

> FP 47/INF.4 "Any other business - Preliminary study on the interim guidelines for evacuation analyses for new and existing passenger ships".

In this document, the results of preliminary study by the National Maritime Research Institute (NMRI) were introduced and the following problems in the interim guidelines for the advanced evacuation analysis were pointed out:

.1 No index for evaluating local congestion is introduced;

.2 Wide variety of response time makes the evacuation analysis meaningless; and

.3 The number of scenarios for reduced escape route availability is only two and the scenarios have not been fully discussed.

At the forty-seventh session, the problems of the interim guidelines were not discussed in depth, while mandatory application of the guidelines for large passenger ships was discussed. The relevant part of the report of the Sub-Committee (FP 47/16) was as follows:

> *"7.10 The Sub-Committee considered whether the Interim Guidelines on evacuation analysis for new and existing passenger ships (MSC/Circ.1033) should be made mandatory for large passenger ships and, having noted the opinions of several delegations that more data on application of the Interim Guidelines was needed to validate the methodologies and criteria contained in the above Guidelines, agreed that the Interim Guidelines should not be made mandatory at this time."*

At the forty-eighth session of the Sub-Committee (FP 48), Canada provided the following information paper on the evacuation analysis:

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* This annex was developed by the National Maritime Research Institute (NMRI). For detailed information, please contact to the following persons:

S. Ota: ohta@nmri.go.jp (General)
K. Miyazaki: okuzumi@nmri.go.jp (Evacuation analysis)
K. Yoshida: koichiy@nmri.go.jp (General)
M. Katuhara: kat@nmri.go.jp (Detailed model of the analysis)

FP 48/INF.2 "Recommendation on evacuation analysis for new and existing passenger ships - Ship evacuation analysis for two vessels using the simplified and advanced methods", by Canada;

The conclusions and recommendations of this document were as follows (FP 48/INF.2 annex, paragraph 5 and 6):

"5 Conclusions

In the absence of human behavioural data, the simplified analysis represents a sound basic approach to ship evacuation modelling. However, the guidance available with respect to the application of that method is poor. As a result, the simplified analysis may be more onerous and time consuming than running a user-friendly advanced analysis program.

The assumptions required to conduct the simplified analysis are such that two different modellers would return different results for to the same vessels.

The interim guidelines in their present form are insufficiently detailed to permit the sensible application of the simplified analysis to the assessment of personnel evacuation from passenger vessels.

For the advanced analysis, the guidelines are more likely to enable different modellers to achieve similar results for any given vessel, but the method would benefit from an improved definition of how personnel should be distributed in the various evacuation cases.

Clearly, the results from the two methods can be quite different, with those from the simplified method generally giving a much shorter evacuation time due to the lack of realistic consideration of complex issues such as contra-flow and human behaviour.

However, these results are greatly affected by the "safety factors" defined in the two methods. In the examples herein, the answers from the two methods are within about 10% when the safety factors are removed from both methods.

6 Recommendations

It is recommended that, if the simplified analysis is to remain an acceptable method of evacuation analysis for some time in the future, a number of improvements be made to the guidelines, including:

.1 greater definition of the passenger distribution;

.2 enhanced definition of the geometry to remove doubt concerning the dimensions in complex geometries;

.3 clarification of the method by which the calculations for a single zone can be applied to a whole ship; and

.4 enhanced presentation of the examples provided.

It is recommended that the safety factors proposed for the two methodologies be rationalized and made equivalent, to allow better comparison of the methods.

It is recommended that full-scale evacuation trials be conducted in conjunction with modelling by these two methods to assist in improving understanding of the areas where the methodology can be improved, and safety factors reduced."

Furthermore, the evacuation analyses were discussed in the following two papers:

FP 48/4 "Large passenger ship safety - Report of the correspondence group", by Germany (C.G. co-ordinator); and

FP 48/4/1 "Large passenger ship safety - Comments on document FP 48/4", by Germany.

In the report of the correspondence group (FP 48/4), comments of members on the mandatory application of evacuation analysis for large passenger ships were referred to under "task 3.1", i.e., evacuation analysis in the design process. On this issue, there were various comments.

In document FP 48/4/1, the comments in FP 47/INF.4 were supported as follows:

"2.1.2 The comment by Japan (FP 47/INF.4) is supported. The goal of the analysis is to "identify and eliminate, as far as practicable, congestion which may develop during abandonment, due to normal movement of passengers and crew along the escape routes…" (MSC/Circ.1033, annex 2, 1.1.1). However, since the supposed reaction time span is big, the forming of congestion is reduced significantly. It is therefore recommended to reduce the reaction time span to [one] minute (e.g. night case: 9.5 to 10.5 minutes instead of 7 to 13 minutes). This will not influence the overall travel time significantly, but points of congestion will show up in a stronger way. In view of the "positive alarm sequence" discussed in other tasks, this would be a logical conclusion."

The results of discussion on the evacuation analysis were reported in paragraph 12 of document FP 48/19 as follows:

"12 RECOMMENDATION ON EVACUATION ANALYSIS FOR NEW AND EXISTING PASSENGER SHIPS

12.1 The Sub-Committee considered document FP 48/INF.2 (Canada) and noted with appreciation the information provided on the experience gained with two passenger vessels with regard to the application of the simplified and advanced methods specified in the Interim Guidelines on evacuation analysis for new and existing passenger ships (MSC/Circ.1033).

12.2 The Sub-Committee also considered documents FP 48/4 and FP 48/4/1 (Germany), containing comments and proposed revisions on the Interim Guidelines, and agreed not to revise the aforementioned guidelines until more experience is gained in their application. To this end, Members and international organizations were invited to submit, to FP 49, any information that may be relevant for the necessary future upgrading of the present Interim Guidelines."

In response to the request by the Sub-Committee, some comments of the NMRI on the interim guidelines are provided in this annex.

2 Results of evacuation analyses for a passenger ship

The NMRI carried out the evacuation analyses for a passenger ship in accordance with MSC/Circ.1033. The results of analyses are reported in appendix 1. Based on the experience, some problems on the interim guidelines were found.

3 Discussion points for amendment to MSC/Circ.1033

The discussion points for amendment to MSC/Circ.1033 are set out in appendix 2. The Sub-Committee is invited to note the appendix 2 during the discussion on MSC/Circ.1033.

APPENDIX 1

RESULTS OF EVACUATION ANALYSIS FOR A PASSENGER SHIP

1 Numerical model

1.1 Basic model and nomenclature

The basic numerical model of the evacuation simulation program used for the analysis was so-called "NODE, PASS, SPACE model"[(1)]. Flow rate, length and area of the escape route are specified as the attributes of NODE, PASS and SPACE, respectively. Walking speed is specified for each evacuee. In the numerical simulation, position/movement of each evacuee is calculated at each time step.

For the purpose of explanation, the following nomenclature is used:

.1 $T^{P}_{Ni,\,Pj}$ means the time at which person "j" goes through NODE "i";

.2 $\widetilde{T}^{P}_{Ni,\,Pj}$ means estimated $T^{P}_{Ni,\,Pj}$ under the assumption of no congestion between NODE "i-1" and NODE "i" (NODE "i-1" is in upstream of NODE "i");

.3 $T^{C}_{Ni,\,Pj}$ means the difference between $T^{P}_{Ni,\,Pj}$ and $\widetilde{T}^{P}_{Ni,\,Pj}$;

.4 T^{C}_{Ni} means the maximum value among $T^{C}_{Ni,\,Pj}$ while varying Pj as parameter, specified for the NODE "i";

.5 T^{C} means the maximum value among T^{C}_{Ni};

.6 $\left| T^{C}_{Ni} \right|_{95\%}$ means the value exceeding 95 % of T^{C}_{Ni} calculated through repeated evacuation simulation in regard to NODE "i"; and

.7 $\left| T^{C} \right|_{95\%}$ means the value exceeding 95 % of T^{C} calculated through repeated evacuation simulation.

1.2 Walking speed

Individual walking speed can be set. In case of counter flow, both walking speeds of an evacuee and a crew moving towards opposite direction on a same "PASS" were reduced to 80 % of the original speeds.

1.3 Selection of escape route

The evacuation simulation program has the function of automatic route selection taking into account group psychology. Though this function is useful for determining the escape routes under conditions of reduced capacities or unavailability of escape routes, this function was not used for the analysis referred to in this document. The escape routes were determined by the ship designer and were basically primary escape routes.

2 Calculation conditions

2.1 Ship and number of persons

The gross tonnage and over all length of the ship for analysis were 116,000 tons, 290 m, respectively. The accommodation and service areas, related to evacuation analysis, consisted of 14 decks and 7 main vertical zones. The arrangement of such areas except crew's spaces is illustrated in figure 1, while the detailed escape route arrangements for the analyses were not completely the same as in the figure.

Number of passengers for calculation was 3,115. Number of crew for night cases and day cases were 1,188 and 1,122, respectively, by order of the customer. Therefore, the numbers of persons for night cases and day cases were 4,303 and 4,237, respectively.

2.2 Calculation conditions

Eight cases were calculated. The calculation conditions are specified in table 1. The calculations under conditions A to C were deterministic and repetition was not necessary.

2.3 Initial distribution of persons

The initial distribution of persons in "Modified case 1", for which was set under conditions A to D, as follows:

.1 passenger cabins were fully occupied with maximum berthing capacity;

.2 2/3 of crew members were in their cabins;

.3 50 % of the residual crew members (1/3) were in service spaces;

.4 25 % of the residual crew members (1/3) were not explicitly modelled (emergency stations); and

.5 25 % of the residual crew members (1/3) were in passengers cabin quarters.

In other words, the counter flow specified in paragraph 4.1.3 of "method to determine the travel time (t) by simulation tools for the advanced evacuation analysis", i.e., appendix of annex 2 to MSC/Circ.1033, has not been taken into consideration under conditions A to D.

The initial distribution for conditions A to D, i.e., "Modified case 1", is illustrated in figure 2. The initial distribution for conditions E and F, i.e., "Case 1" and "Case 3", is illustrated in figure 3. The initial distribution for conditions G and H, i.e., "Case 2" and "Case 4", is illustrated in figure 4.

In these figures, green areas (with horizontal lines) are assembly stations and blue areas (with slant lines) are public spaces other than assembly stations. The stairways are expressed in red (with vertical lines). In figure 3 and figure 4, the arrows indicate counter flow, i.e., the movement of crew which were initially located at assembly stations.

2.4 Response time

Response time distribution to be used in the calculations is specified in paragraph 3.2.2 of "method to determine the travel time (t) by simulation tools for the advanced evacuation analysis", i.e., the appendix of annex 2 to MSC/Circ.1033. Based on the appendix, it is possible to interpret that variety of response time is taken into account for determining individual travel time. On the other hand, in paragraph 2.4 of "interim guidelines for the advanced evacuation analysis of new and existing passenger ships", i.e., annex 2 to MSC/Circ.1033, individual assembly time is determined as follows:

> *"2.4 Individual assembly time is the sum of the individual response time and the individual travel time."*

Based on this description, it may be appropriate that travel time is calculated without taking into account variety of response time.

In this paper, the former interpretation was applied that variety of response time is taken into account for determining individual travel time.

3 Results

For conditions D to H, calculations were carried out 50 times for each condition. Figure 5 shows the assembly times, including response time and excluding safety margin, for condition D. Figures 6 and 7 show the assembly times, including response time and excluding safety margin, for conditions E to H. Figure 8 shows the congestion times T^C determined in paragraph 1.1.5 for condition D. Figures 9 and 12 show the congestion times $\left|T^C\right|_{95\%}$ determined in paragraph 1.1.7 for conditions E to H.

The total assembly times, including safety margin, under conditions A to C and total values exceeding 95 % of calculated assembly times under conditions D to H are given in table 2. The congestion times T^C under conditions A to C and congestion times $\left|T^C\right|_{95\%}$ under conditions D to H are also given in table 2. The unit of time is second. In the table, "representative congestion point" means a congestion point corresponding to T^C, under conditions A to C, and such congestion point most frequently appears, under conditions D to H.

As shown in figure 6, there is no significant deference between graphs of assembly time, excluding safety margin, under conditions E and F, i.e., "case 1" and "case 3", respectively. The reason can easily be understood based on figures 9 and 10, i.e., figures on congestion time, that the congestion is not significant. Comparing with figures 8, 9 and 10, it can be supposed that the short congestion times under conditions E and F is mainly caused by the wide variety of response time.

In the interim guidelines, it is not required to distinguish evacuees and fire-fighters, which are initially located in assembly stations to create counter flow. In figures 9 to 12, the congestion times of evacuees and of fire-fighters are shown, separately. As shown in figure 12, long congestion time was observed for a fire-fighter under "case 4". Such long congestion time was caused by the following situation:

.1 In case of this calculation, response time of a fire-fighter, which was in an assembly station, was long;

.2 Due to flow of evacuees, the fire-fighter could not enter into a stairway from the assembly station until most of all evacuees went out the stairway;

.3 Then, the congestion time of the fire-fighter was made long, while congestion time of evacuees was not so long.

If "congestion time" is determined as the time during which a space in an escape route is filled by persons at a certain density, such congestion time could be much longer than the value expressed by T^C determined in paragraph 1.1.5. It is considered that more essential index for evaluating congestion is T^C rather than the time during which a space in an escape route is filled by persons at a certain density.

4 Consideration

Paragraph 3.7.2 of "interim guidelines for the advanced evacuation analysis of new and existing passenger ships" is as follows:

"3.7.2 If any identified congestion region is found to persist for longer than 10% of the simulated overall assembly time, it is considered to be significant."

In accordance with this provision, congestion, determined in paragraph 3.7.1 of the annex, is not significant unless it becomes longer than two to three minutes, because total assembly times are twenty to thirty minutes as shown in table 2. In this context, significance of congestion may be decreased when longer safety margin is introduced.

The following values were calculated:

Time for moving = Total assembly time - Average response time - Safety margin.

Table 3 gives the time for moving under each condition. It should be noted that movement to assembly station can usually be conducted within several minutes after start of travelling. Even in such a big ship, as calculated, movement to assembly station took about ten minutes and the major part of time for movement to assembly station is not congestion. It should further be noted that under condition E, i.e., "case 1" in the interim guidelines, total assembly time never be shorter than 1,380 seconds, because of the response time and safety margin.

On the other hand, as already pointed out in FP 47/INF.4, it is required by chapter 13 of the FSS Code that stairway shall not be less than 10 mm for every one person in clear width. The basic requirement on the width of escape route can be interpreted as that the maximum allowable time for waiting on a local queue due to congestion should be within a certain time, e.g., 75 seconds, taking into account the value of specific unit flow rate referred to in the interim guidelines, i.e., 1.33 (80/60) persons/m·sec.

Taking into account the above mentioned issues, it is considered that method for identifying local congestion in the interim guidelines should be reconsidered. The congestion time of a node represented by $\left| T_{Ni}^{C} \right|_{95\%}$, determined in paragraph 1.6 of this appendix, can be a good index for identifying congestion.

At present, the value T_{Ni}^{C}, determined in paragraph 1.1.4 of this appendix, is not calculated and recorded by the evacuation simulation program. The program will be modified to enable to provide T_{Ni}^{C} and $\left| T_{Ni}^{C} \right|_{95\%}$ for all significant "NODE".

For the calculation and evaluation of T_{Ni}^{C}, it should be noted that T_{Ni}^{C} may depend on setting of NODEs. This can be understood that in the case that significant queue over NODEs take place in an escape route, as illustrated in figure 13, each T_{Ni}^{C} (T_{N2}^{C} to T_{N6}^{C}) becomes less than the time for waiting on the queue, because T_{Ni}^{C} is calculated with estimated time for passing through NODE "i" without congestion at the time a person passing through NODE "i-1". If the time for passing through NODE "i" without congestion is estimated at the time a person passing through NODE "i-2" or "i-3", etc., the congestion time, which is the difference between calculated time with congestion and estimated time without congestion, may differ from T_{Ni}^{C}.

To solve such problem in the numerical model, it may be effective to calculate congestion time at a NODE based on the estimated time for passing through the NODE without congestion, at the time a person passing through NODE of which identification is designated as the input of calculation. Such modification of the evacuation simulation program is now under consideration.

5 Conclusion

Though it is impossible to provide good index and criterion for identifying local congestion, at present, the most important task of the advanced analysis is deemed to be providing the congestion time corresponding to each congestion point to the designer of a ship. In view of this, the interim guidelines should be reconsidered to introduce clearer index of local congestion.

Reference

(1) Katuhara, M., Matsukura, H. and Ota, S. (2001), "Evacuation Analysis of Ship by Multi-Agent Simulation Using Model of Group Psychology", Proc. of Traffic and Granular Flow '01, 2001

Table 1 Calculation conditions

ID	Initial distribution of persons[*1]	Response time	Walking speed	Safety margin in time
A	Modified case 1	600	Constant high[*2]	600 sec
B	Modified case 1	600	Constant middle[*3]	600 sec
C	Modified case 1	600	Constant low[*4]	600 sec
D	Modified case 1	600	As in the guidelines[*5]	600 sec
E	Case 1[*1]	420 to 780 sec	As in the guidelines[*5]	600 sec
F	Case 3[*1]	420 to 780 sec	As in the guidelines[*5]	200 sec
G	Case 2[*1]	210 to 390 sec	As in the guidelines[*5]	600 sec
H	Case 4[*1]	210 to 390 sec	As in the guidelines[*5]	200 sec

Note 1: Refer to the interim guidelines for the advanced evacuation analysis of new and existing passenger ships, i.e., annex 2 to MSC/Circ.1033, in particular section 3.3.
2: Walking speeds in corridor, up staircase and down staircase for all passengers and crew were 1.11, 0.50 and 0.76 m/s, respectively.

3: Walking speeds in corridor, up staircase and down staircase for all passengers and crew were 0.71, 0.44 and 0.49 m/s, respectively.
4: Walking speeds in corridor, up staircase and down staircase for all passengers and crew were 0.37, 0.23 and 0.29 m/s, respectively.
5: Refer to the method to determine the travel time (t) by simulation tools for the advanced evacuation analysis, i.e., appendix of annex 2 to MSC/Circ.1033, in particular paragraph 3.2.

Table 2 Total assembly times and congestion times

Condition	Total assembly time	Congestion time	Representative congestion point
A	1461.2	54.9	Entrance to stairway on deck 2 in zone 4.
B	1511.0	60.8	Entrance to stairway on deck 9 in zone 6.
C	1769.8	124.2	In stairway on deck 3 between zone 4 & 5.
D	1659.6	61.1	Entrance to stairway on deck 9 in zone 6.
E	1800.4	5.5	Exit of stairway, to assembly station, in zone 4.
F	1400.4	9.8	Exit of stairway, to assembly station, in zone 4.
G	1465.1	22.1	In stairway, go up to deck 5 to 6, between zone 4 & 5.
H	1065.1	61.8	In stairway, go up to deck 5 to 6, between zone 4 & 5.

Table 3 Time for moving

Condition	A	B	C	D	E	F	G	H
Time for moving	261.0	311.0	569.8	459.6	600.4	600.4	565.1	565.1

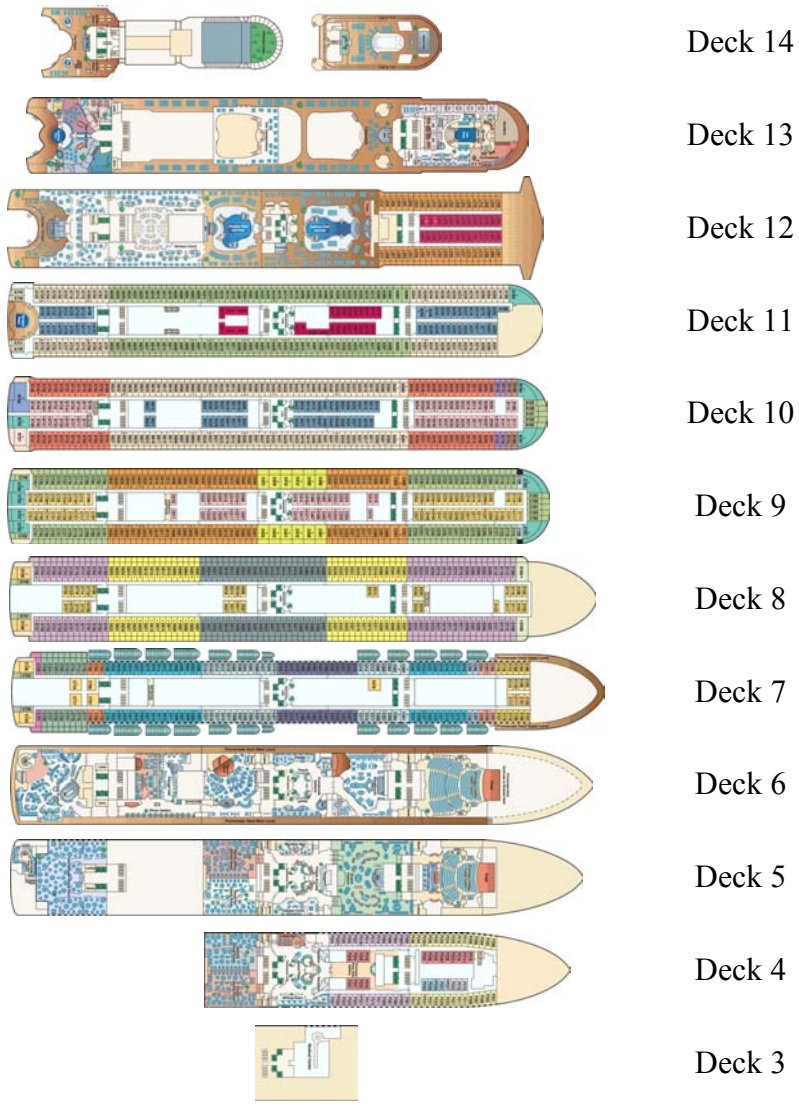

Figure 1: Arrangement of accommodation and service area except for crew's spaces

Deck	Zone 7	6	5	4	3	2	1
14	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
12	0	0	0	0	25	116	14
11	127	67	55	81	119	116	10
10	118	91	95	105	81	118	21
9	114	91	103	53	71	116	32
8	129	87	52	62	88	114	77
7	102	67	63	63	59	63	70
6	0	0	0	0	0	0	0
5	0	30	0	0	0	0	32
4	0	30	0	0	115	148	32
3	10	10	49	23	32	93	17
2	10	0	109	94	130	119	0
1	0	0	18	72	12	0	0

Figure 2: Initial distribution of persons in "Modified case 1"

Deck	Zone 7	6	5	4	3	2	1
14	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
12	0	0	0	0	25	113	14
11	123	64	53	79	116	113	10
10	115	88	93	103	78	115	21
9	111	88	101	51	68	113	29
8	126	84	50	60	85	111	74
7	99	64	61	61	56	60	67
6	16	15	20	0	18	18	0
5	0	30	0	0	0	12	32
4	0	30	0	0	112	145	32
3	10	10	49	23	32	93	17
2	10	0	109	94	130	119	0
1	0	0	18	72	12	0	0

Figure 3: Initial distribution of persons in "Case 1" and "Case 3"

Deck	Zone 7	6	5	4	3	2	1
14	136	0	0	0	0	0	0
13	49	1	0	0	73	121	0
12	188	170	0	0	21	21	0
11	21	21	21	21	21	21	0
10	21	21	21	21	21	21	0
9	21	21	21	21	21	21	21
8	21	21	21	21	21	21	21
7	21	21	21	21	21	21	21
6	34	34	68	219	33	56	0
5	331	31	307	128	234	36	28
4	175	32	300	78	22	22	32
3	15	15	25	14	17	0	12
2	10	0	12	24	39	34	0
1	0	0	18	48	0	0	0

Figure 4: Initial distribution of persons in "Case 2" and "Case 4"

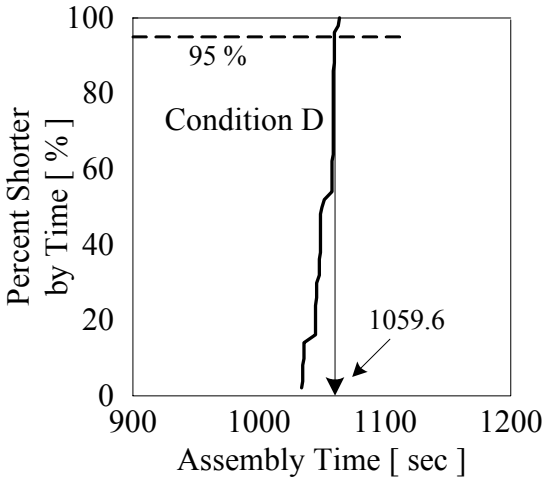

Figure 5: Assembly time for "D"

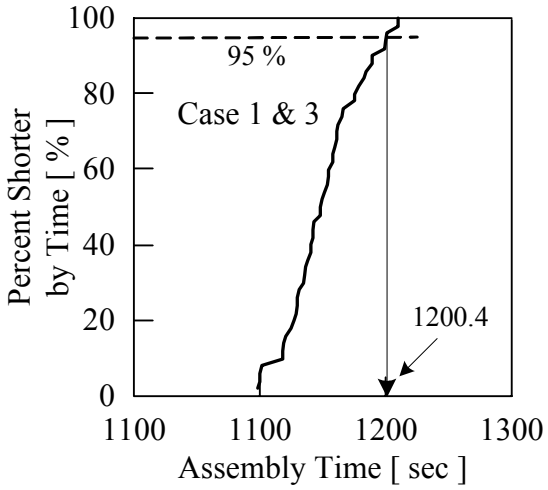

Figure: 6 Assembly times for "E" and "F"

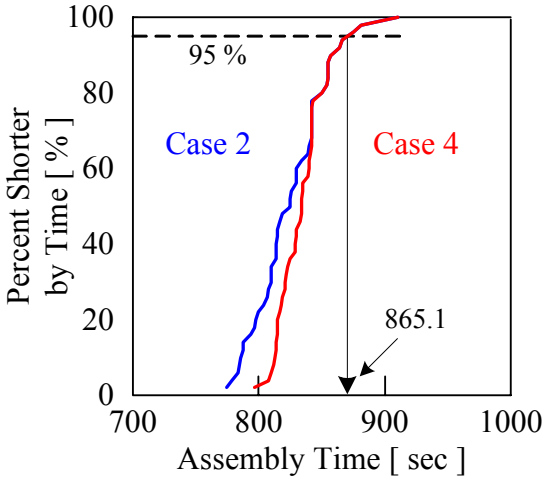

Figure 7: Assembly times for "G" and "H"

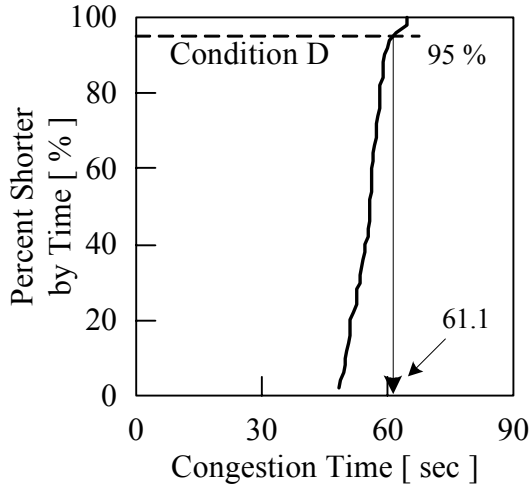

Figure 8: Congestion time for "D"

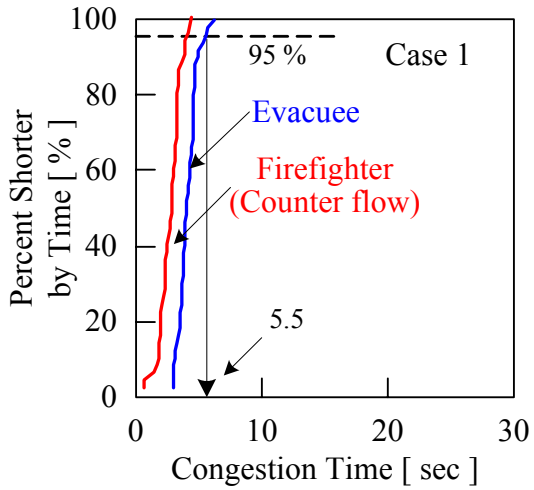

Figure 9: Congestion times for "E"

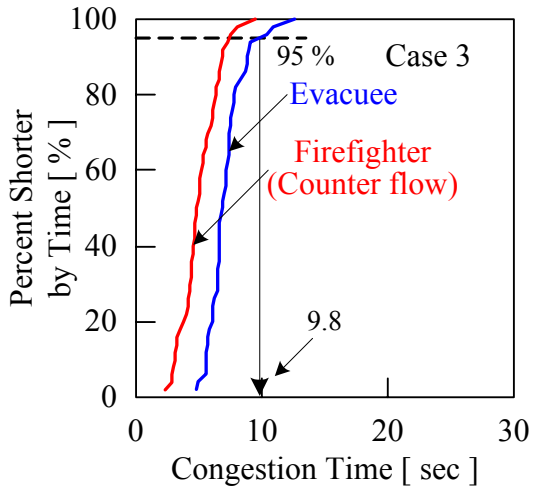

Figure 10: Congestion times for "F"

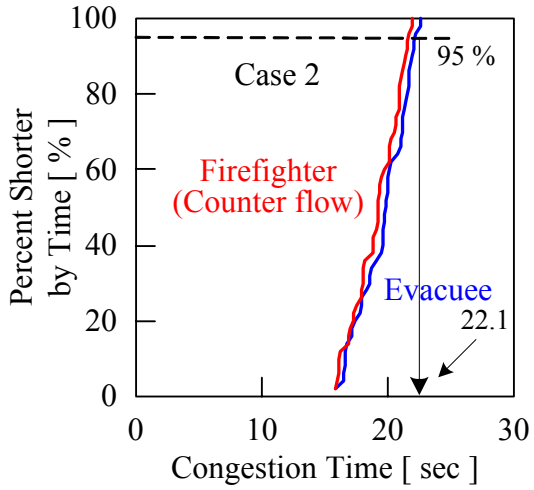

Figure 11: Congestion times for "G"

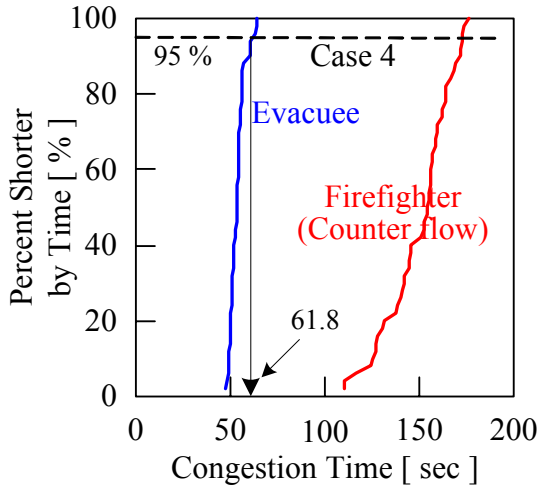

Figure 12: Congestion times for "H"

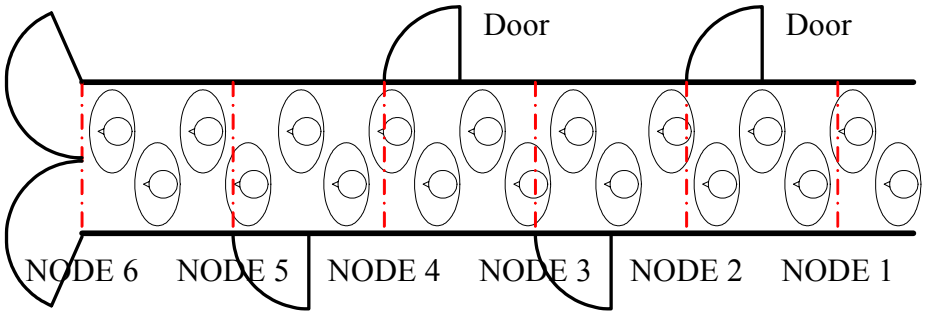

Figure 13: Illustration of significant queue over NODEs

APPENDIX 2

DISCUSSION POINTS FOR AMENDMENT TO MSC/CIRC.1033

1 Introduction of clearer index for local congestion

1.1 Introduction of clearer index of **local** congestion should be considered, because the major purpose of evacuation analysis is to identify and eliminate congestion as required for new ro-ro passenger ships by regulation II-2/7.4 of SOLAS Convention.

1.2 A congestion time of a point, such as $\left| T_{Ni}^{C} \right|_{95\%}$ determined in paragraph 1.6 in appendix 1 can be a good index for identifying congestion point when properly determined.

1.3 Necessity and possibility should be considered in regard to determination of the criterion of congestion time or similar value for approval of an escape route plan. Determination of a unique criterion for such purpose is impractical until the index is determined and experience will be gained.

1.4 Discrimination of evacuees and fire-fighters should be considered.

2 Response time

2.1 Deletion of response time should be considered. See paragraph 1 of the annex to this document.

2.2 Relations among assembly time, travel time and response time should be reconsidered. See paragraph 4 of appendix 1.

3 Safety margin

Safety margin, which are 600 or 200 seconds, should be reconsidered. See paragraph 3 of appendix 1.

4 Reduced escape route availability

Scenarios for reduced escape route availability should be reconsidered. See FP 47/INF.4.

5 Simplified analysis

The necessity of the simplified analysis should be reconsidered taking into account the comment in paragraph 5 of the annex to document FP 48/INF.2 (paragraph 1 of appendix 1 of the annex to this document).

6 Discussion procedure

Extension of the target year, establishment of the correspondence group and establishment of working/drafting group at the next session (FP 50) should be considered for the finalization of this work taking into account that working/drafting group on this issue is not scheduled at this session (see document FP 49/1/1).

INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON FIRE PROTECTION
49th session
Agenda item 4

FP 49/INF.4
22 October 2004
ENGLISH ONLY

PERFORMANCE TESTING AND APPROVAL STANDARDS FOR FIRE SAFETY SYSTEMS

Tests for the approval of fixed high-expansion foam fire-extinguishing systems providing foam generators inside the protected space

Submitted by Japan

SUMMARY

Executive summary:	This document contains relevant information of the test results for fixed high-expansion foam fire extinguishing system providing foam generators inside the protected space conducted in Japan.
Action to be taken:	Paragraph 4
Related documents:	MSC/Circ.668, FP 48/WP.4/Rev.1, FP 49/4 and FP 49/4/2

1 Tests for fire-extinguishing systems providing foam generators installed inside protected spaces were conducted at two Japanese manufacturers in Japan according to the relevant test procedures specified in MSC/Circ.668/728, with satisfactory results.

2 The proposed guidelines contained in document FP 49/4/2 (Japan) have been developed based on the aforementioned test results to unify the requirements for the approval procedures and installation of these systems.

3 This document provides the information obtained from the tests and the test results for the aforementioned fire-extinguishing system, which is set out in the attached annex.

Action requested of the Sub-Committee

4 The Sub-Committee is invited to note the test results related to document FP 49/4/2 and take action as appropriate.

***

ANNEX

FIRE TEST FOR FIXED HIGH-EXPANSION FOAM FIRE-EXTINGUISHING SYSTEMS PROVIDING FOAM GENERATORS INSIDE THE PROTECTED SPACE

1 Scope

Recently, high-expansion foam system providing foam generators installed inside the protected space shows a tendency to be adopted to many ships for the machinery space. Two Japanese manufacturers also conducted fire tests for approval, using the relevant test procedures specified in MSC/Circ.668/728, with satisfactory results. Here is a brief test report of the system conducted in Japan.

2 Specifications of the system

Table-1 shows details of the fixed high-expansion foam fire-extinguishing system.

Table-1 Specification of the fixed high-expansion foam fire extinguishing system

Manufacturer		**A**			**B**		
Form Generator	Model	A-1	A-2	A-3	B-1	B-2	B-3
	Form capacity (m^3/min)	>15	>30	>60	>15	>30	>60
	Operation pressure	0.4 MPa			0.4 MPa		
	Expansion rate	> 620			> 650		
Form Proportionar	Form solution	2 %			2 %		
	Max.-operating Pressure	1.4 MPa			1.4 MPa		
Form solution		2 % admixture to seawater or fresh water					
Application		Against hydrocarbon fire					

Note: Foam concentrations of two manufacturers have been approved in accordance with MSC/Circ.670.

3 Test method

3.1 Test standards

The tests were carried out in accordance with MSC/Circ.668 “Guidelines for the approval of equivalent water-based fire-extinguishing systems as referred to in SOLAS 74 for machinery spaces and cargo pump rooms” and Appendix B “Interim test method for fire testing equivalent water-based fire-extinguishing systems for machinery spaces of category A and cargo pump-rooms”.

3.2 Test Enclosure and Operating condition

Table-2 shows details of Test Enclosure and operating condition. For the test mock-up, refer to figure-1 and for the test enclosure, refer to figure-2 and figure-3.

The tests in a small room (Class I) are more stringent than those in a large room (Class III), because the high atmospheric temperature and also the high concentration of the generated smoke might disturb the production of the high expansion foam. Therefore, in the design of the foam system for the rooms onboard the vessels, which are normally as large as or more than Class III enclosure, the filling rate can be lower than the values tested in Class I enclosure as long as the required performance for extinguishing is maintained.

An opening (2 x 2m) was provided on wall of each test enclosure in order to supply fresh air to the spray fire. These openings were kept as practicable as possible by shifting the opening upward or fitted the wire mesh. The fact that the test fires were kept burning till filling the generated foam up to the fire points were confirmed by visual and/or infrared camera.

Table-2 Test Enclosure and Operating condition

Manufacturer	**A**		**B**	
Test enclosure	Class □	Class □	Class □	Class □
Test enclosure capacity	500 m^3	3,880 m^3	500 m^3	4,520 m^3
Dimension of test enclosure (L x B x H) (m)	10 x 10 x 5	18 x 18 x 12	10 x 10 x 5	11 x 27.4 x 15
Opening (W x H) on wall	2m x 2m		2m x 2m	
Required Form solution (ℓ/min)	475	1,075	450 *1 (400)	900
Filling Rate (m /min.)	2.95	2.0	3.0 *1 (2.6)	2.0
Water used	Water (*2)	Water (*2)	Simulated sea water (*3)	Actual sea water

Note:

*1) No.10 fire scenario described in Table-3 was carried out under this condition.

*2) Fresh water was used for those tests, based on the comparison of test results using fresh water and seawater.

*3) Simulated seawater is prepared dissolving following components in each litre of potable water in accordance with paragraph 3.6.3 of MSC/Circ.670.

NaCl	25.0 g /L
$MgCl_2$ $6H_2O$	11.0 g /L
$CaCl_2$ $2H_2O$	1.6 g /L
Na_2 SO_4	4.0 g /L

3.3 Selection of fire scenarios

Thirteen (13) fire scenarios specified in MSC/Circ.668, Appendix B, Table 2, were reviewed and following test scenarios were applied to the tests in order to obtain the various data, taking the test results and the features of foam concentrations and the system.

(1) Class Ⅰ - test enclosure

Tests for all of 13 fire scenarios were carried out.

(2) Class III - test enclosure

Tests for five/six scenarios in 13 fire scenarios, which were severe test results at the test in a small test enclosure (Class I), were carried out.

4 Test results

4.1 Class I - test enclosure

All fire tests were carried out with the results of extinguish "good" on the operation condition of the Systems. Test results are shown in Table-3.

Appearances of tests for CLASS I test enclosure are shown in attached photo pages. The systems have satisfied the requirements of the Appendix B of MSC/Circ.668 in the condition of the specification.

4.2 Class III - test enclosure

All fire tests were carried out with the results of extinguish "good" on the operation condition of the Systems. Test results are shown in Table-4.

Appearances of tests for CLASS III engine rooms are shown in attached photographs.

With respect to the test for Class III test enclosure, five/six tests, which are seemed stringent, were selected and were carried out with the results of extinguish “good” on the operation condition of the Systems. Thus, it is expected that the systems may satisfy the requirements of the Appendix B of MSC/Circ.668 in the condition of the specification.

5 Conclusions

The fixed high-expansion foam fire-extinguishing system providing foam generators inside the protected space can satisfy the requirements of the Appendix B of MSC/Circ.668 for Class I and Class III test enclosures.

In addition, it is supposed that these systems are superior and efficient fire-extinguishing systems for machinery spaces of category A and cargo pump-rooms.

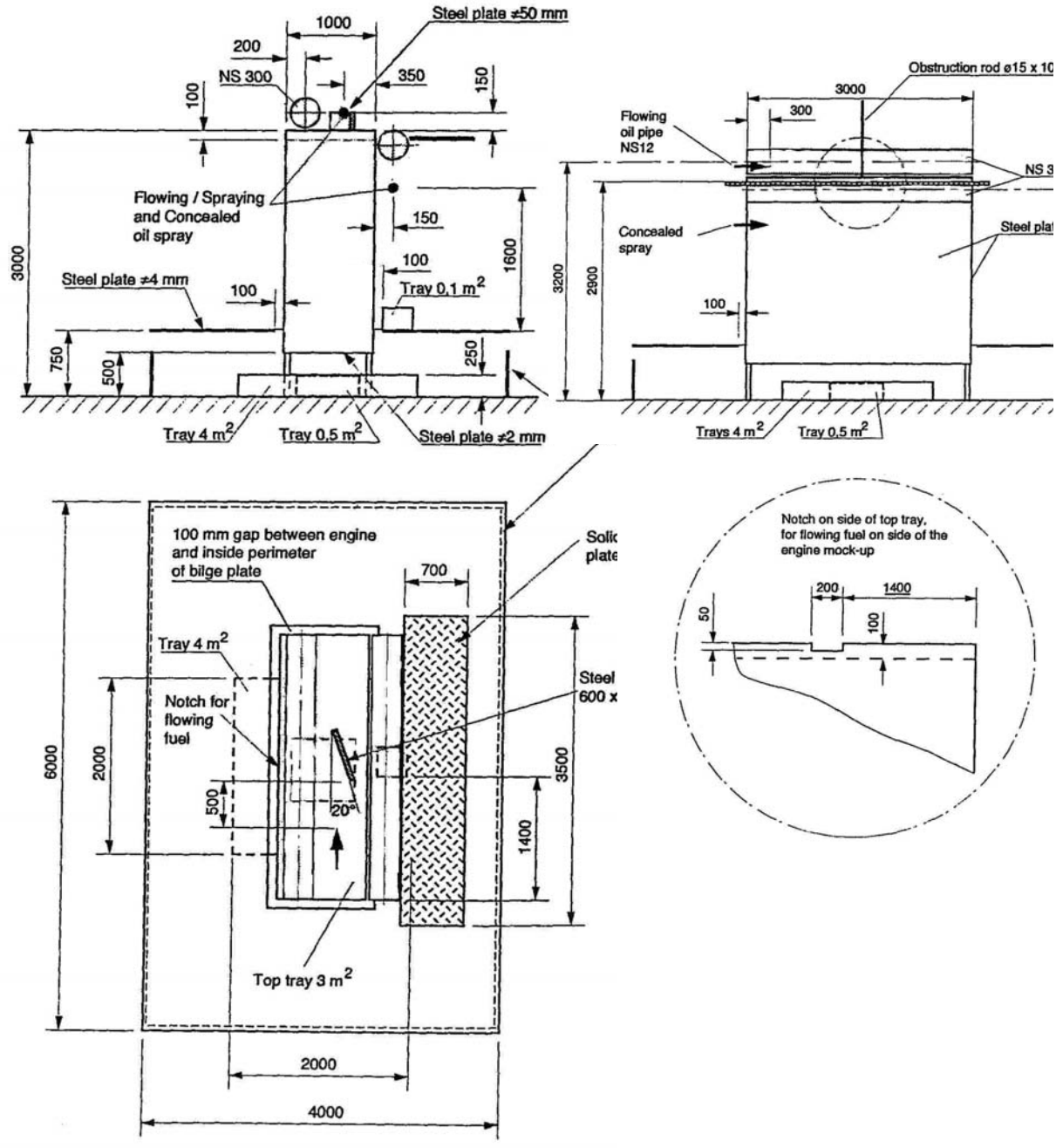


Figure 1 - Engine mock-up of MSC/Circ.668 Appendix B

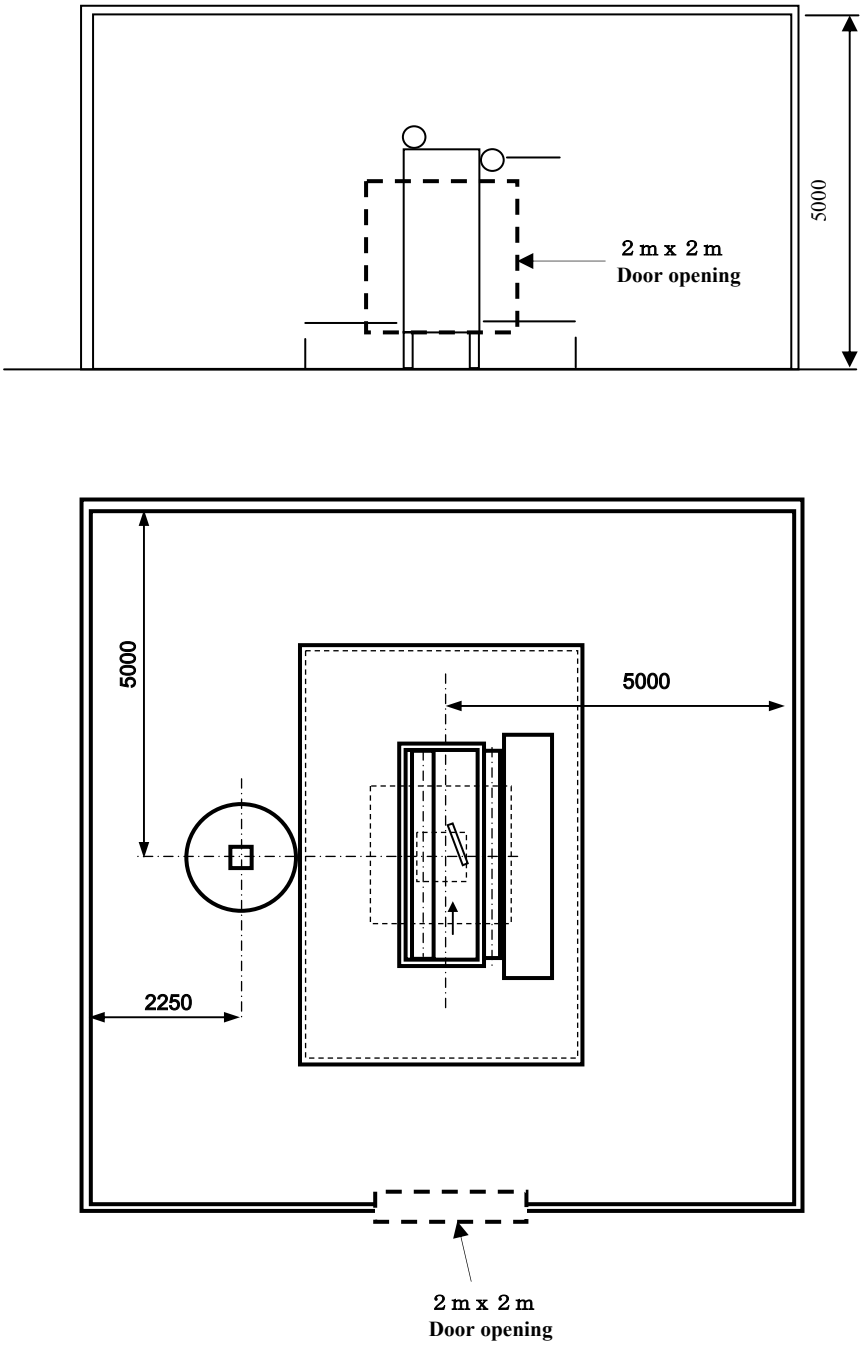
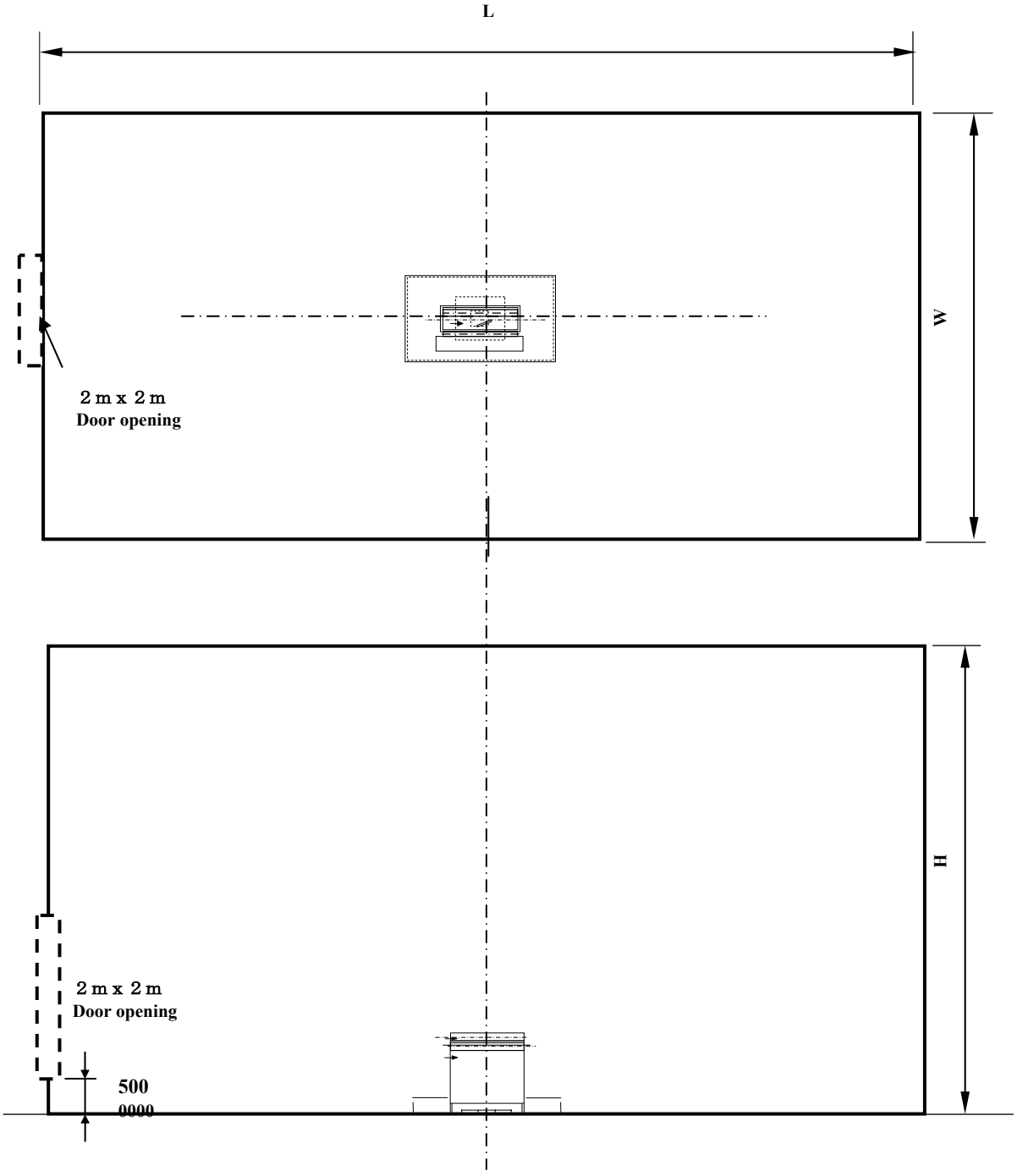


Figure 2 - Class Ⅰ - Test Enclosure

Table-3 - Test result of Class I- engine room

Test result of each Manufacturer			A		B	
No	Fire scenario	Fire source	Extinguished time (s)	Reignition	Extinguished time (s)	Reignition
1	Low-pressure horizontal spray (6 MW fire) on top of simulated engine between agent nozzles.	Light Diesel Oil	110 s	No	3 s	No
2	Low-pressure spray (6 MW fire) on top of simulated engine centred with nozzle angled upward at a 45°angle to strike a 15mm diameter rod 1metre away.	Light Diesel Oil	Omitted		14 s	No
3	Low pressured concealed horizontal spray fire (6 MW fire) on side of simulated engine with oil spray nozzle positioned 0.1m in from the end of engine.	Light Diesel Oil	166 s	No	50 s	No
4	Combination of worst fire test result based on the test result of test no.1 to no.3 (No.3 was selected.) $3m^2$ pool fire on top of the simulated engine 4 m^2 pool fire under the simulated engine	Light Diesel Oil	160 s	No	26 s	No
5	High-pressure horizontal spray fire (2 MW fire) on top of the simulated engine.	Light Diesel Oil	80 s	No	56 s	No
6	Low-pressure low flow concealed horizontal spray fire (1 MW fire) on the side of simulated engine with oil spray nozzle positioned 0.1m in from the end of engine. $0.1m^2$ pool fire positioned 1.4m in from the engine end at the inside of floor plate.	Light Diesel Oil	79 s	No	136 s/Tray 506 s/Spray	No
7	0.5 m^2 pool fire at central under mock-up.	n-heptane	48 s	No	45 s	No
8	0.5 m^2 pool fire at central under mock-up.	Lubrication oil	30 s	No	76 s	No
9	0.5 m^2 heptane pool fire on top of bilge plate centred under exhaust plate.	n-heptane	25 s	No	293 s	No
10	Flowing heptane fire 0.25kg/s from top of mock-up.(See Fig-3 on MSC circ.668 Annex B)	n-heptane	116 s	No	481 s (*1)	No
11	Class A fires wood crib fire （wood crib 32 woods, 8 stages）in 2 m^2 pool fire with 30s preburn. 2 m^2 pool fire try should be 0.75m above the floor.	Wood crib n-heptane	56 s	No	173 s	No
12	A steel plate (30cm×60cm×5cm) offset 20° to the spray (6 MW fire) is heated to 350℃ by the top of the simulated engine.	n-heptane	138 s	No	4 s	No
13	4 m^2 pool fire at central under mock-up. （Bilge fire simulated）	Light Diesel Oil	Omitted		72 s	No



Manufacturer	A	B
Capacity	3,880 m^3	4,520 m^3
Dimension	18m W x 18m D (12m_height)	11m W x 27.4m D (15m_height)
Opening	2m Wide x 2m height	2m Wide x 2m height

Figure 3 - Class III - Test Enclosure

Table-4 - Test result of Class III- engine room

Test result of each Manufacturer			A		B	
No	Fire scenario	Fire source	Extinguished time (s)	Reignition	Extinguished time (s)	Reignition
1	Low-pressure horizontal spray (6 MW fire) on top of simulated engine between agent nozzles.	Light Diesel Oil	Omitted		Omitted	
2	Low-pressure spray (6 MW fire) on top of simulated engine centred with nozzle angled upward at a 45°angle to strike a 15mm diameter rod 1metre away.	Light Diesel Oil	Omitted		Omitted	
3	Low pressured concealed horizontal spray fire (6 MW fire) on side of simulated engine with oil spray nozzle positioned 0.1m in from the end of engine.	Light Diesel Oil	Omitted		Omitted	
4	Combination of worst fire test result based on the test result of test no.1 to no.3 (No.3 was selected.) $3m^2$ pool fire on top of the simulated engine 4 m^2 pool fire under the simulated engine	Light Diesel Oil	210 s	No	284 s	No
5	High-pressure horizontal spray fire (2 MW fire) on top of the simulated engine.	Light Diesel Oil	101 s	No	86 s	No
6	Low-pressure low flow concealed horizontal spray fire (1 MW fire) on the side of simulated engine with oil spray nozzle positioned 0.1m in from the end of engine. $0.1m^2$ pool fire positioned 1.4m in from the engine end at the inside of floor plate.	Light Diesel Oil	215 s	No	11 s/Tray 339 s/Spray	No
7	0.5 m^2 pool fire at central under mock-up.	n-heptane	Omitted		Omitted	
8	0.5 m^2 pool fire at central under mock-up.	Lubrication oil	Omitted		Omitted	
9	0.5 m^2 heptane pool fire on top of bilge plate centred under exhaust plate.	n-heptane	Omitted		Omitted	
10	Flowing heptane fire 0.25kg/s from top of mock-up. (See Fig-3 on MSC circ.668 Annex B)	n-heptane	187 s	No	371 s	No
11	Class A fires wood crib fire （wood crib 32 woods, 8 stages）in 2 m^2 pool fire with 30s preburn. 2 m^2 pool fire try should be 0.75m above the floor.	Wood crib n-heptane	Omitted		159 s	No
12	A steel plate (30cm×60cm×5cm) offset 20° to the spray (6 MW fire) is heated to 350℃ by the top of the simulated engine.	n-heptane	265 s	No	322 s	No
13	4 m^2 pool fire at central under mock-up. （Bilge fire simulated）	Light Diesel Oil	Omitted		Omitted	

A – Class I -No.3

Date: 13th April 1999 (Tue)
Test No. MSC CIRC.668 No.3
Low Press. High Flow spray on side of mock-up
In the Class-1 Fire test room

Start the Diesel Oil spray fire.

65 seconds after Foam discharge.
The foam attacks the spray fire.

Start the Foam discharge
after 12 seconds pre-burn.

98 seconds after Foam discharge.
The fire extinguished completely.

A – Class I -No.4

Date :12th April 1999 (Mon)
Test No. MSC CIRC.668 No.4+2
Two tray fire and worst spray fire.
In the Class-1 Fire test room

Start the both tray fire, and Start the spray fire after Two minutes pre-burn.

100 seconds after Foam discharge.
The foam attacks the spray fire.

Start the foam discharge after Two minutes pre-burn.

130 seconds after Foam discharge.
The foam attacks the spray fire.

30 seconds after Foam discharge.
The foam attacks the tray fire.

160 seconds after Foam discharge.
The fire extinguished completely.

A – ClassⅢ-No.1

Date : 01.July.1998
MSC CIRC.668 No.1 Test
Class-3 Test room

32 sec.
after foam discharge

85 sec.
after foam discharge

97 sec. after foam discharge

Spray fire is about to
be buried in foam.

Fire was extinguished after
155 sec. after Foam discherge.

A – ClassⅢ-No.10

Test Date: 8.July.1998
MSC Circ.668 No.10
CLASS-3 Test room

Ignitre to Cascade N-Hentane

11 seconds after Foam discharge

85seconds after Foam discharge

39 seconds after Foam discharge

121 seconds after Foam discharge.
Fire was extinguished 187 seconds
after Foam discharge

B – Class I -No.7

Test Date: 29 July 2002
CLASS1 Test Room
TEST No.7

Ignition at 0.5m^2 fire tray
under mock-up

28 s after ignition

15 s after ignition
(Before form discharge)
0.5m^2 pool fire glows larger

65 s after ignition
(47 s after form discharge)
0.5m^2 pool fire was extinguished.

B – Class I -No.10

Test Date: 31 July 2002
CLASS1 Test Room
TEST No.10

$3m^2$ Tray fire on the test mock-up
Started flowing heptane fire.

232s after ignition (220s after form discharge)
Height of form discharged: 2m

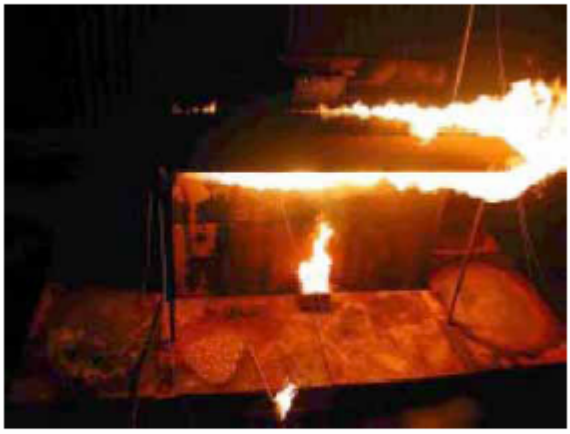
62s after ignition (50s after form discharge)
$3m^2$ Tray fire and flowing heptane fire
are still burning

After test finished.
Test room was filled by form discharged.

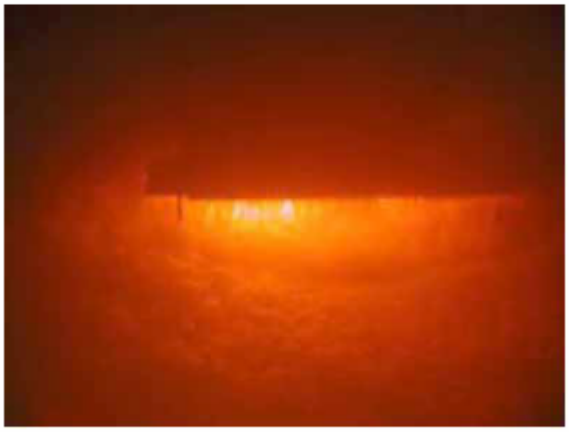
182s after ignition (170s after form discharge)
From discharged glows higher

B– ClassⅢ-No.6

Test Date: 31 Oct. 2002
CLASSⅢ Test Room
TEST No. 6



Low-pressure low flow concealed horizontal spray fire (1 MW fire) and 0.1m2 pool fire



446 s after ignition
(309 s after system activated).
1 MW spray fire almost covered by form discharged

149 s after ignition
(12 s after system activated).
Extinguished 0.1m2 pool fire
1 MW spray fire still remaining.

465 s after ignition
(328 s after system activated).
Spray fire was almost covered by form discharged

205 s after ignition
(68 s after system activated).
Floor was covered by form discharged.

B– ClassⅢ-No.11

Test Date: 6 Nov. 2002
CLASSⅢ Test Room
TEST No. 11

40 s after ignition (Before form discharge)

190 s after ignition
(148 s after form discharged)
Fire tray was almost covered by form discharged.

42 s after ignition (Start of form discharge)

360 s after ignition
(318 s after form discharged)
Test mock-up was completely covered by form discharged.

110 s after ignition (68 s after form discharged)

INTERNATIONAL MARITIME ORGANIZATION

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MARITIME SAFETY COMMITTEE
80th session
Agenda item 21

MSC 80/21/5
12 January 2005
Original: ENGLISH

WORK PROGRAMME

Sub-Committee on Fire Protection

Proposal of the comprehensive review on International code for Application of Fire Test Procedures (FTP Code)

Submitted by Japan

SUMMARY

Executive summary:	This document proposes a new work programme item entitled "Comprehensive review on Fire Test Procedures Code" as a new work item for the Sub-Committee on Fire Protection (FP) with a view to resolving the numerous problems related to the FTP Code
Action to be taken:	Paragraph 18
Related document:	FTP Code

BACKGROUND

1 Japan proposes, by this document, a new work programme item entitled "Comprehensive review on Fire Test Procedures Code" as a work item of the FP Sub-Committee in accordance with the Guidelines on the organization and method of the work of the Maritime Safety Committee and the Marine Environment Protection Committee and other subsidiary bodies (MSC/Circ.1099 - MEPC/Circ.405).

SCOPE OF THE PROPOSAL

Background

2 The Committee, on December 1996 at the sixty-seventh session of the Committee, adopted resolution MSC.57(67) “Adoption of amendments to the international convention for the safety of life at sea (SOLAS), 1974” and resolution MSC.61(67) “Adoption of the international code for application of fire test procedures (FTP Code)”. FTP Code has become a mandatory instrument under SOLAS chapter II-2, since the SOLAS amendments entered into force on 1 July 1998.

Interpretations to FTP Code

3 After adoption of the FTP Code, based on the evolution of the shipbuilding and related technologies and the actual results of the application of FTP Code, a lot of unified interpretation related to the FTP Code have been developed by the FP Sub-Committee, and approved by the Committee. These unified interpretations were circulated by several MSC circulars. In addition, various possible interpretations have been raised among the maritime administrations, and, sometime, some of them were put into discussions at FP Sub-Committee. Therefore, it should be considered whether these unified interpretations should be included into the FTP Code as mandatory provisions and whether further improvement of FTP Code is necessary to enhance the uniform application of the Code.

ISO Fire test standards

4 Meanwhile, ISO fire test standards, which were referred to in the FTP Code, were revised, based on the evolution of the technology, in order to facilitate to conduct the fire tests. Therefore, references, in the FTP Code, to these ISO fire test standards should be reviewed and revised if necessary.

New technologies

5 In addition, new fire protection systems and materials have been developed and are being developed based on the evolution of the shipbuilding and related technologies. However, those were not expected or assumed at the stage of the development of the FTP Code. Therefore, an appropriate action should be taken to accommodate such development of fire protection technologies to enhance the fire safety of ships.

High speed craft

6 Part 10 and part 11 have been added to the FTP Code by resolution MSC.101(73) in relation to the 2000 High-Speed Craft Code. These parts have basic requirements, which need further clarifications for unified application of these parts to constructions and materials of high-speed craft.

Proposal

7 In considering above-mentioned issues, in particular in paragraphs 3, 4, 5 and 6, Japan believes that the FTP Code should be reviewed in light of these issues, and should be revised, if it deems necessary. Such revisions will not create any new requirement, but will be aimed at making FTP Code user-friendly and at providing more uniform application.

CONSIDERATION OF THE PROPOSAL

8 In accordance with paragraph 2.10.2 of MSC/Circ.1099 - MEPC/Circ.405, the proponent provides some considerations on the issues listed in paragraph 2.9 of the circular, as follows.

Compelling need

9 Approval of fire protection construction and materials for ships under SOLAS is one of the major activities of the Administrations and the organizations recognized by the Administration. Matters mentioned in paragraphs 3, 5 and 6 are to be solved as soon as possible for such activities to maintain and enhance the fire safety of ships. For the purpose of conducting the fire tests specified in the FTP Code, improvements of fire test procedures in newest ISO fire test standards as mentioned in paragraph 4 should be incorporated into FTP Code.

Scope of IMO objectives

10 FTP Code is one of the important mandatory elements, within IMO, to support SOLAS. Improvement of the Code, by which the fire safety of ships would be enhanced, should be within the scope of IMO objectives.

Available standards

11 MSC circulars mentioned in paragraph 3 and ISO standards mentioned in paragraph 4 are available.

Benefit

12 Revision of the FTP Code will keep the level of fire safety uniformly world-wide, and provide further enhancement of the fire safety of ships under SOLAS Convention. The revision will also solve any problems raised in application of the FTP Code in the Administrations.

Cost and implication to the maritime industry

13 Because the revision will not bring any new or additional requirements, there should be no increase of cost in maritime industry. On the other hand, the revision will provide the way of further development of fire safety technology by solving problems mentioned in paragraph 5, and provide positive encouragement to the maritime industry for enhancement of fire safety of ships.

Achievability

14 Basis for the work programme has already existed as mentioned in paragraphs 3 and 4. Consideration of the matters in paragraphs 5 and 6 has been also taken place in various occasions within and outside IMO, and should be handled without any difficulties. It is anticipated that the FP Sub-Committee is able to achieve the goal within three sessions.

Implication to other IMO instruments

15 There should not be any impact to other IMO instruments including SOLAS Convention. There is no need to revise SOLAS, which specifies the basic functional requirement for fire protection construction and materials. The FTP Code supports SOLAS chapter II-2.

Legislative and administrative burden

16 National regulations and/or codes in Member Government to SOLAS should be revised to follow the revision of the FTP Code.

CONCLUSION

17 It is the opinion of Japan that the proposed work programme item on "Comprehensive review on Fire Test Procedures Code" meets the need of IMO and maritime industry, and is achievable. It is also the opinion of Japan that fire safety of ships can be further enhanced by the outcome of the work item. Therefore, Japan proposes that the new item be placed in the work programme of the Sub-Committee on Fire Protection with three sessions for completion.

ACTION REQUESTED OF THE COMMITTEE

18 The Committee is invited to:

.1 consider the proposal of new work programme item and related aspects mentioned in above paragraphs; and

.2 approve the proposed new work item.

INTERNATIONAL MARITIME ORGANIZATION
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Ref. T4/4.01

MSC/Circ.1120
2 June 2004

UNIFIED INTERPRETATIONS OF SOLAS CHAPTER II-2, THE FSS CODE, THE FTP CODE AND RELATED FIRE TEST PROCEDURES

1 The Maritime Safety Committee, at its seventy-eighth session (12 to 21 May 2004), with a view to providing more specific guidance for vague expressions such as "to the discretion of the Administration", which are open to different interpretations contained in IMO instruments, approved the unified interpretations of SOLAS chapter II-2, the FSS Code, the FTP Code and related fire test procedures prepared by the Sub-Committee on Fire Protection, 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, the FSS Code, the FTP Code and related fire test procedures to fire protection construction, installation, arrangements and equipment to be installed on board ships on or after 1 July 2004 and to bring the unified interpretations to the attention of all parties concerned.

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ANNEX

UNIFIED INTERPRETATIONS OF SOLAS CHAPTER II-2, THE FSS CODE, THE FTP CODE AND RELATED FIRE TEST PROCEDURES

INTERPRETATIONS OF VAGUE EXPRESSIONS AND OTHER VAGUE WORDING WITH REFERENCES TO SOLAS CHAPTER II-2, AS AMENDED BY RESOLUTION MSC.99(73)

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
A	1.3.2	**Examples of repairs, alterations and modifications** 1 Example of substantial alteration of the dimensions of a ship: *Lengthening by adding a new midbody; the new midbody should comply with chapter II-2 of SOLAS 1974, as amended.* 2 Example of substantial alteration of the passenger accommodation spaces: *A vehicle deck converted to passenger accommodation spaces; new accommodation spaces should comply with chapter II-2 of SOLAS 1974, as amended.* 3 Example of substantial increase of a ship's service life: *Renewal of passenger accommodation spaces on one entire deck; renewed accommodation spaces should comply with chapter II-2 of SOLAS 1974, as amended. However, in this case, means of escapes in the areas not subject to renewal are not required to be reviewed in the light of new requirements.*
A	3.1	**Devices in pantries or isolated pantries containing no cooking appliances** Pantries or isolated pantries containing no cooking appliances may contain: .1 coffee automats, toasters, dish washers, microwave ovens, water boilers, induction heaters and similar appliances each of them with a maximum power of 5 kW; and .2 electrically heated cooking plates and hot plates for keeping food warm each of them with a maximum power of 2 kW and a surface temperature not above 150°C. A dining room containing such appliances should not be regarded as a pantry. This interpretation also covers regulations 9.2.2.3.2.2(9), 9.2.2.4.2.2(3), 9.2.3.3.2.2(3) and 9.2.4.2.2.2(3).
A	3.2.1 3.2.2	**Application of "light-weight constructions"** “Light-weight constructions” (honeycomb type, etc.) of steel or equivalent material may be used as non load-bearing internal "A" class division in accommodation and service spaces provided they have successfully passed the relevant standard fire test according to the FTP Code. These “light-weight constructions” should not be used as an integral part of main fire zone bulkheads and stairway enclosures on passenger ships.
A	3.9.9	**Explanations to communication systems** The communication systems here mean only internal communication systems, which are required by the regulations.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
A	3.10	**Adhesives in "C" class construction** Adhesives used in the construction of the "C" class divisions are not required to be non-combustible; however, they are to have low flame-spread characteristics.
A	3.18	**Explanation for control stations** 1 Main navigational equipment includes, in particular, the steering stand and the compass, radar and position-finding equipment. 2 Steering gear rooms containing an emergency steering position are not considered to be control stations. 3 Where in the regulations of chapter II-2 relevant to fixed fire-extinguishing systems there are no specific requirements for the centralization within a control station of major components of a system, such major components may be placed in spaces which are not considered to be a control station. 4 Spaces containing, for instance, the following battery sources should be regarded as control stations regardless of the battery capacity: .1 emergency batteries in separate battery room for power supply from black-out till start of the emergency generator; .2 emergency batteries in separate battery room as reserve source of energy to radio installation; .3 batteries for start of the emergency generator; and .4 in general, all emergency batteries required in pursuance of regulation II-1/42 or II-1/43.
A	3.45	**Devices in main pantries, pantries containing cooking appliances and galleys** 1 Main pantries and pantries containing cooking appliances may contain: .1 coffee automats, toasters, dish washers, microwave ovens, water boilers, induction heaters and similar appliances each of them with a power of more than 5 kW; and .2 electrically heated cooking plates and hot plates for keeping food warm each of them with a maximum power of 5 kW. This interpretation also covers regulations 9.2.2.3.2.2(13) and 9.2.2.4.2.2(9). 2 Spaces containing any electrically heated cooking plate or hot plate for keeping food warm with a power of more than 5 kW should be regarded as galleys.
B	4.2.1.4	**Use of fuel oil having a flashpoint of 43°C or less and crude oil or slop for tanker boilers** 1 Machineries and piping systems for the usage of fuel oil having a flashpoint of 43°C or less should comply with the following: .1 provisions for the measurement of oil temperature should be provided on the suction pipe of oil fuel pump; .2 stop valves and/or cocks should be provided to the inlet side and outlet side of the oil fuel strainers; and .3 pipe joints of welded construction or of circular cone type or spherical type union joint should be applied as much as possible.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
		2 Reference is made to IACS requirement M 24 – "Requirements concerning use of crude oil or slop as fuel for tanker boilers".
B	4.2.2.3.4	**Controls for remote operation of the valve for emergency generator fuel tank** The wording "separate location" does not mean separate spaces.
B	4.2.2.4 4.2.3.1	**Position of air pipe outlets** Air pipes from oil fuel tanks or heated lubricating oil tanks should be led to a safe position on the open deck. They should not terminate in any place where a risk of ignition is present. Air pipes from unheated lubricating oil (including hydraulic oil) tanks may terminate in the machinery space, provided that the open ends are so situated that issuing oil cannot come into contact with electrical equipment or heated surfaces.
B	4.2.4	**Arrangements for other flammable oils** The second sentence of regulation 4.2.4 is not applicable to hydraulic valves and cylinders located on weather decks, in tanks, cofferdams, or void spaces.
B	4.4.1	**Electric Radiators** Reference is made to IEC Publication 60092 - Electrical installations in ships.
B	4.4.2	**Waste receptacles** This regulation is not intended to preclude the use of containers constructed of combustible materials in galleys, pantries, bars, garbage handling or storage spaces and incinerator rooms provided they are intended purely for the carriage of wet waste, glass bottles and metal cans and are suitably marked.
B	4.4.3	**Surface protection of insulation** The fire insulation in such spaces can be covered by metal sheets (not perforated) or by vapour barrier glass cloth accurately sealed at the joint.
B	4.5.1	**Construction of "cofferdams" and prohibition of containment of cargo, wastes and goods** The expression "cofferdam" means, for the purpose of this regulation, an isolating space between two adjacent steel bulkhead or decks. The minimum distance between the two bulkheads or decks should be sufficient for safe access and inspection. In order to meet the single failure principle, in the particular case when a corner-to-corner situation occurs, this principle may be met by welding a diagonal plate across the corner (see figure of regulation 4.5.1 in the appendix). No cargo, wastes or other goods should be contained in cofferdams.
B	4.5.1.1	**Separation of cargo oil tanks** Pump-rooms intended solely for ballast transfer need not comply with the requirements of regulation 4.5.10. The requirements of regulation 4.5.10 are only applicable to the pump-rooms where pumps for cargo, such as cargo pumps, stripping pumps, pumps for slop tanks, pumps for COW or similar pumps are provided.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
B	4.5.2.2	**Gastightness test for navigation bridge external doors and windows** The navigation bridge external doors and windows which are located within the limits of regulation 4.5.2.1 should be tested for gastightness. If a water hose test is applied, the following may be taken as a guide: - nozzle diameter: minimum 12 mm; - water pressure just before the nozzle: not less than 0.2 N/mm^2; and - distance between the nozzle and the doors or windows: maximum 1.5 m.
B	4.5.3.4.1.3	**Area classification and selection of electrical equipment** 1 Areas on open deck, or semi-enclosed spaces on open deck, within a vertical cylinder of unlimited height and 6m radius centred upon the center of the outlet, and within a hemisphere of 6m radius below the outlet which permit the flow of large volumes of vapour, air or inert gas mixtures during loading/discharging/ballasting are defined as Zone 1. Permitted electrical equipment: - Certified safe type equipment for Zone 1. 2 Areas within 4 m beyond the zone specified in 1 above are defined as Zone 2. Permitted electrical equipment: - Certified safe type equipment for Zone 1; - Equipment of a type, which ensures the absence of sparks, "hot spots" during its normal operation; - Equipment having an enclosure filled with a liquid dielectric, the application, or encapsulated; - Pressurized equipment; and - Equipment specifically designed for Zone 2 (for example type "n" protection in accordance with IEC 60079-15). Note: Zones 1 and 2 are those defined in IEC Publication IEC 60092 Electrical installations in ships - Part 502: Tankers - Special features
B	4.5.3.4.1.4	**Reference to IEC 60092-502** Electrical equipment fitted in compliance with IEC Publication 60092- Electrical installations in ships - Part 502: Tankers - Special features is not considered a source of ignition or ignition hazard.
B	4.5.5.3.3	**Meaning of "closed ullage system"** "Closed ullage system" means a system which allows cargo measurement without breaking the integrity of the tank.
B B	4.5.6.1	**Location of outlets and reference to MSC/Circ.677 and MSC/Circ.731** 1 The outlets mentioned in regulation 4.5.6.1 should be located in compliance with regulation 4.5.3.4.1.3 as far as the horizontal distance is concerned. 2 Refer to MSC/Circ.677, as amended by MSC/Circ.1009 - Revised standards for the design, testing and locating of devices to prevent the passage of flame into cargo tanks in oil tankers, and to MSC/Circ.731 - Revised factors to be taken into consideration when designing cargo tank venting and gas-freeing arrangements.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
B	4.5.10.1.2	**Emergency lighting** Where the lighting in cargo pump-rooms can be commonly used as the emergency lighting, this lighting should be interlocked with the ventilation systems. However, this interlock should not prevent operation of the emergency lighting in case of the loss of the main source of electrical power.
B	4.5.10.1.3	**Monitoring the concentration of hydrocarbon gases in cargo pump-rooms on oil tankers** 1 Sequential sampling is acceptable as long as it is dedicated for the pump room only, including exhaust ducts, and the sampling time is reasonably short. 2 Detection positions are the zones where air circulation is reduced (e.g. recessed corners).
B	4.5.10.1.4	**Bilge level monitoring devices** Bilge high-level alarms are acceptable as an alternative means for the level monitoring devices.
B	5.2.2.4	**Location of ventilation controls in category A machinery spaces** In machinery spaces of category A, controls to close off ventilation ducts and pipes should be installed with due regard to the hot gases produced by a fire in the space concerned.
B	5.3 6.2	**Materials used on passenger ships for bulkheads of accommodation spaces as defined in regulation 3.1** With respect to materials and components used for bulkheads in accommodation spaces, as defined in regulation 3.1, see tables for regulations 5.3 and 6.2 in the appendix.
B	5.3 6.2	**Fire protection materials for cargo ships** With respect to materials and components used for bulkheads in accommodation spaces, as defined in regulation 3.1, see tables for regulations 5.3 and 6.2 in the appendix.
B	5.3.1.1	**Meaning of "cold service systems"** Cold service is understood to mean refrigeration systems and chilled water piping for air-conditioning systems.
B	5.3.2.2	**Calorific value** Reference is made to the recommendations published by the International Organization for Standardization, in particular, Publication ISO 1716:2002 on ***Determination of the heat of combustion***.
B	5.3.2.4	**Application to materials used on surfaces of bulkheads, ceilings and linings** Surfaces referred to in regulation 5.3.2.4 are those of bulkheads, decks, floor coverings, wall linings and ceilings as appropriate. The requirements described within these regulations are not meant to apply to plastic pipes, electric cables, and furniture.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
B	6.2	**Application to materials used for bulkheads and on surfaces of bulkheads, ceilings and linings** Surfaces referred to in regulation 6.2 are those of bulkheads, decks, floor coverings, wall linings and ceilings as appropriate. The requirements described within these regulations are not meant to apply to plastic pipes, electric cables, and furniture.
C	7.8.3	**Degree of protection and audibility of two-way portable telephone apparatus used in special cargo spaces** 1 On ships provided with special category spaces, ro-ro spaces or cargo spaces for the carriage of dangerous goods, the two-way portable telephone apparatus should be of certified safe type for use in zone 1 areas as defined in IEC Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres. 2 Two-way portable telephone apparatus should be audible from most parts of the ship. As a minimum, they should be audible where the fire patrol makes their rounds such as key box locations and the routes specified on fire patrol checklist. If necessary, extra antennas should be fitted to obtain effective communication.
C	8.2	**Equally effective local ventilation closing arrangements for control stations** Equally effective local closing arrangements means that in case of ventilators these should be fitted with fire dampers or smoke dampers which could be closed easily within the control station in order to maintain the absence of smoke in the event of fire.
C	8.3.3	**Location of ventilation controls in category A machinery spaces** In machinery spaces of category A, controls to close off ventilation ducts and pipes should be installed with due regard to the hot gases produced by a fire in the space concerned.
C	8.4	**Construction and location of draught stops** 1 Any of the following methods of construction may be used to construct draught stops: .1 the extension of the "B" Class bulkhead, ceiling or lining; .2 the extension of the "C" Class bulkhead, ceiling or lining; .3 1 mm thick minimum steel sheet, stiffened where necessary, intermittently welded to the ship's structure and the top profile of the bulkhead, or fastened mechanically to the ceilings or linings; .4 non-combustible board type material fastened mechanically to the ship's structure, bulkheads, ceilings or linings; or .5 non-combustible mineral wool insulation, not less than 20 mm in thickness, faced on each side with expanded metal mesh, the mesh on one side being attached to the ship's structure, or expanded metal mesh may be fitted on one side and non-combustible cloth (glass-cloth) on the other side of mineral wool insulation. Other equivalent arrangements may be accepted. 2 Draught stops are not required in public spaces with open ceilings (perforated ceilings) with openings of 40% or more.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	8.5	**Arrangement of exhaust fans for smoke extraction systems** The application of this regulation does not imply the arrangement of additional exhaust fans other than those normally dedicated to the space considered, if these latter fans are of sufficient size to meet the required capacity.
C	9.2.2.1	**Main vertical zones and horizontal zones** If a stairway serves two main vertical zones, the maximum length of one main vertical zone should be measured from the far side of the main vertical zone stairway enclosure. In this case, all boundaries of the stairway enclosure be insulated as main vertical zone bulkheads and access doors leading into the stairway should be provided from the zones (see figures 1 to 4 for regulation 9.2.2.1 in the appendix). However, the stairway should not be included in calculating the size of the main vertical zone if it is treated as its own main vertical zone.
C	9.2.2.2.2.1	**Construction of extended bulkhead behind continuous ceilings or linings** The extension of the bulkhead should be made of non-combustible material and the construction of the extension should correspond to the fire class of extended bulkhead. If the extended bulkhead is of B-0, then the extension may be made of thin steel plates of 1 mm thickness and tightened (e.g. with mineral wool). Alternatively, B-0 class extensions may be constructed of a suitably supported mineral wool (density at least 100 kg/m^3, thickness at least 50 mm).
C	9.2.2.2.3	**Bulkheads within a main vertical zone** Refer to MSC/Circ.917
C	9.2.2.3.2.2 (7)	**Electrical distribution boards** Distribution boards may be located behind panels/linings within accommodation spaces including stairway enclosures, without the need to categorize the space, provided no provision is made for storage. If distribution boards are located in an identifiable space having a deck area of less than 4 m^2, this space may be categorized in (7), according to regulation 9.2.2.3.2.2, or (5), according to regulations 9.2.2.4.2.2, 9.2.3.3.2.2 and 9.2.4.2.2.2
C	9.2.2.3.2.2 (7)	**Devices in diet kitchens** Diet kitchens (containing no open flame) should be in compliance with the interpretation for pantries as stated under regulation 3.1.
C	9.2.2.4.2.2 (5)	**Electrical distribution boards** Distribution boards may be located behind panels/linings within accommodation spaces including stairway enclosures, without the need to categorize the space, provided no provision is made for storage. If distribution boards are located in an identifiable space having a deck area of less than 4 m^2, this space may be categorized in (7), according to regulation 9.2.2.3.2.2, or (5), according to regulations 9.2.2.4.2.2, 9.2.3.3.2.2 and 9.2.4.2.2.2.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	9.2.2.4.5	**Construction and arrangements of saunas** The space categories mentioned in regulation 9.2.2.3.4.1 should be replaced, when applying this regulation, by (5), (7) and (10).
C	table 9.3 table 9.4	**Interpretation of machinery spaces having little or no fire risk** For the definition of machinery spaces having little or no fire risk in footnote "f" see regulation 9.2.2.3.2.2 (10).
C	9.2.3.1.1.3	**Increased area of public spaces** The area of public spaces may be permitted to increase up to 75 m^2.
C	9.2.3.2.4	**Increased area of public spaces** The area of public spaces may be permitted to increase up to 75 m^2.
C	table 9.5 table 9.6	**Interpretation of machinery spaces having little or no fire risk** For the definition of machinery spaces having little or no fire risk in footnote "i" see regulation 9.2.2.3.2.2 (10).
C	9.2.3.3.2.2 (5)	**Electrical distribution boards** Distribution boards may be located behind panels/linings within accommodation spaces including stairway enclosures, without the need to categorize the space, provided no provision is made for storage. If distribution boards are located in an identifiable space having a deck area of less than 4 m^2, this space may be categorized in (7), according to regulation 9.2.2.3.2.2, or (5), according to regulations 9.2.2.4.2.2, 9.2.3.3.2.2 and 9.2.4.2.2.2.
C	9.2.3.3.5	**Construction and arrangements of saunas** The space categories mentioned in regulation 9.2.2.3.4.1 should be replaced, when applying this regulation, to categories (5), (7) and (10).
C	9.2.3.4.1	**Construction of protected stairways** The required protection of stairways penetrating more than a single deck can be achieved by: .1 a stairway enclosure allowing access from one stair to a superimposed stair within such enclosure, the entrances to which should consist self-closing "A" class fire doors at each deck level (see figure 1 of regulation 9.2.3.4.1 in the appendix); or .2 a stairway enclosure enclosing the stairs only, in combination with self-closing "A" class fire doors at each deck-level and at each end of a stair. No requirements apply to the stairs except that they should be of steel frame structure or be made of equivalent material (see figure 2.1 of regulation 9.2.3.4.1 in the appendix); or .3 stairways that penetrate only one single deck should be protected, at a minimum, at one level by at least "B-0" class division and self-closing doors (see figure 2.2 of regulation 9.2.3.4.1 in the appendix).

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	9.2.3.4.1	**Construction of dumb-waiters** Dumb-waiters are to be regarded as lifts.
C	9.2.4.2.2.2 (5)	**Electrical distribution boards** Distribution boards may be located behind panels/linings within accommodation spaces including stairway enclosures, without the need to categorize the space, provided no provision is made for storage. If distribution boards are located in an identifiable space having a deck area of less than 4 m^2, this space may be categorized in (7), according to regulation 9.2.2.3.2.2, or (5), according to regulations 9.2.2.4.2.2, 9.2.3.3.2.2 and 9.2.4.2.2.2
C	9.2.4.2.7	**Construction and arrangements of saunas** The space categories mentioned in regulation 9.2.2.3.4.1 should be replaced, when applying this regulation, by (5), (7) and (10).
C	table 9.7 table 9.8	**Interpretation of machinery spaces having little or no fire risk** For the definition of machinery spaces having little or no fire risk in footnote "e" see regulation 9.2.2.3.2.2 (10).
C	9.3.1	**Reference to resolution A.753(18)** Reference is made to resolution A.753(18) – Guidelines for the application of plastic pipes on ships.
C	9.3.4	**Prevention of heat transmission by insulation and structural details for drainage** 1 Details of measures to be adopted for avoiding heat transmission at intersections and terminal points of insulation of decks or bulkheads are given in figures 1 and 2 of regulation 9.3.4 in the appendix. Alternative details may be accepted provided that the effectiveness of such design is verified by an appropriate test in the same manner as those specified in the FTP Code. 2 In the case where the lower part of insulation has to be cut for drainage, the construction should be in accordance with the structural details as given in figure 3 for regulation 9.3.4 in the appendix.
C	9.4.1.1	**Reference to MSC/Circ.541** Reference is made to MSC/Circ.541 - Guidance notes on the integrity of flooding boundaries above the bulkhead deck of passenger ships for proper application of regulations II-1/8 and 20, paragraph 1, of the 1974 SOLAS Convention, as amended.
C	9.4.1.1.2	**Doors in divisions of a higher standard and fire testing of watertight doors** 1 Where required divisions are replaced by divisions of a higher standard, the door need only conform to the required division. 2 Watertight doors constructed in accordance with SOLAS regulation II-1/15 and fitted below the bulkhead deck that are required to be watertight need not be tested to the FTP Code provided that the doors meet the requirements for water tightness in SOLAS regulation II-1/18. Doors fitted above the bulkhead deck, which are required to meet both the fire protection and watertight requirements (see MSC/Circ.541), should be tested to the FTP Code.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	9.4.1.1.4.6	**Lift door indicators located in continuously manned central control station** Lift door indication signals should meet the following: .1 the signal showing that "A" class lift doors are in the closed position should be activated only when the order to close the main fire doors has been given by the continuously manned central control station; and .2 when there are several lifts giving access to the same stairway, the lift door indicators located in the continuously manned central control station should be capable of indicating that all the lift doors giving access to the same landing are properly closed. This indication should be shown on the panel.
C	9.4.1.1.8	**Type of means of manual closing of fire dampers** Manual closing may be achieved by mechanical means of release or by remote operation of the fire damper by means of a fail-safe electrical switch or pneumatic release (spring-loaded, etc.) on both sides of the division.
C	9.4.1.3	**Reference is made to the following ISO standards:** ISO 614:1989 Shipbuilding and marine structures - Toughened safety glass panes for rectangular windows and side scuttles - Punch method of non-destructive strength testing ISO 1095:1989 Shipbuilding and marine structures - Toughened safety glass panes for side scuttles ISO 1751:1993 Shipbuilding and marine structures - Ship's side scuttles ISO 3254:1989 Shipbuilding and marine structures - Toughened safety glass panes for rectangular windows ISO 3903:1993 Shipbuilding and marine structures - Ships' ordinary rectangular windows ISO 3904:1990 Shipbuilding and marine structures - Clear view screens
C	9.4.2.1	**Doors in divisions of a higher standard** Where required divisions are replaced by divisions of a higher standard, the door need only conform to the required division. **Doors in fire-resisting divisions of cargo ships** Steel or equivalent material is acceptable for the construction of doors and door frames in “A” class divisions.
C	9.7	**Definition of “free sectional area”** The term “free sectional area” means, even in the case of a pre-insulated duct, the area calculated on the basis of the inner diameter of the duct.
C	9.7.3.1.2	**Type of means of closing** Manual closing may be achieved by mechanical means of release or by remote operation of the fire damper by means of a fail-safe electrical switch or pneumatic release (spring-loaded, etc.) on both sides of the division.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	9.7.4.3	**Ventilation system penetrating decks** A duct, irrespective of its cross section, serving more than one tweendeck should be fitted, near the penetration of each deck served, with a fire or smoke damper. Such dampers should close automatically by means of a fusible link or other suitable device, and manually from the deck in which the passage of smoke, due to a fire in the deck immediately below which is served by the same duct, will be avoided. Where, within a main vertical zone, a fan serves more than one tweendeck through separate ducts, each of these dedicated to a single tweendeck, each duct should be provided with a manually operated smoke damper fitted close to the fan.
C	9.7.5.1.2	**Meaning of "lower end of the duct" and "upper end of the duct" in galley range ducts** 1 "Lower end of the duct" means a position at the junction between the duct and the galley range hood. (See also interpretation of regulation 41-2.4.3.2.) 2 "Upper end of the duct" means a position close to the outlet of the duct.
C	9.7.5.1.5	**Location of hatches for inspection and cleaning in galley range ducts** 1 One hatch should be provided close to the exhaust fan. 2 In the galley exhaust duct, the grease will accumulate more in the lower end. Therefore, hatches should be fitted also in this part of the duct.
C	10.2.1.1	**Prevention of freezing in pipes** Special attention should be given to the design of the continuously pressurized pipelines for prevention of freezing in pipes where low temperatures may exist.
C	10.2.1.5.1	**Location of hydrant in machinery spaces** At least one hydrant with hose, nozzle and coupling wrench should be provided in machinery spaces of category A.
C	10.2.2.3.2.2	**Electrical cables for the emergency fire pump** The electrical cables to the emergency fire pump are not to pass through the machinery spaces containing the main fire pumps and their source(s) of power and prime mover(s). They are to be of a fire resistant type, in accordance with IACS unified Requirement E 15 Electrical Services Required to be Operable Under Fire Conditions and Fire Resistant Cables, paragraph 1, where they pass through other high fire risk areas.
C	10.2.2.3.3	**Connection of a pump to fire main** This paragraph does not force designers to choose pumps with capacity and pressure characteristics other than that being optimal for the service intended, just to make their connection to the fire main possible, provided the required number and capacity of fire pumps are already fitted.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	10.4.3	**Storage rooms for fire-extinguishing medium** The following requirements are applicable only for the storage rooms for fire-extinguishing media of fixed gas fire-extinguishing systems: .1 the storage room should be used for no other purposes (last part of the first sentence*); .2 if the storage space is located below deck, it should be located no more than one deck below the open deck and should be directly accessible by a stairway or ladder from the open deck (3rd sentence); .3 spaces which are located below deck or spaces where access from the open deck is not provided, should be fitted with a mechanical ventilation system designed to take exhaust air from the bottom of the space and should be sized to provide at least 6 air changes per hour (4th sentence); and .4 access doors should open outwards, and bulkheads and decks including doors and other means of closing any opening therein, which form the boundaries between such rooms and adjacent enclosed spaces should be gas tight (5th sentence). * Refers to the sentences in regulation 10.4.3.
C	10.5	**Fire extinguishing arrangements in machinery spaces** The number of systems, appliance and extinguisher required by regulation 10.5 are summarized in the table for regulation 10.5 in the appendix.
C	10.5.2.2.2	**Relaxation of fire-extinguishing equipment for cargo ships** A relaxation for cargo ships should be accepted as follows: - The 45 *l* foam type extinguisher or its equivalent may be arranged outside of the space concerned.
C	10.5.6.3.1	**Definition of areas to be protected by local application systems (internal combustion machinery)** Hot surfaces such as exhaust pipes without insulation or with insulation likely to be removed frequently for maintenance and high-pressure fuel oil systems installed nearby the hot surfaces should be protected. The term "insulation likely to be removed frequently" means insulation fitted in accordance with the requirements of regulation 4.2.2.6.1, but which might not be secured firmly because it may be removed frequently for periodic maintenance, such as pipes between cylinders and exhaust manifold. For typical diesel engines, the area on top of the engine, fuel oil injection pumps and turbo chargers should be protected. Where the fuel oil injection pumps are located in sheltered position such as under the steel platform, the pump need not be protected by the system.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	10.5.6.3.2	**Definition of areas to be protected by local application systems (boiler fronts)** The area around the burners without insulation or with insulation likely to be removed frequently for maintenance should be protected. The term "insulation likely to be removed frequently" means insulation fitted in accordance with the requirements of regulation 4.2.2.6.1, but which might not be secured firmly because it may be removed frequently for periodic maintenance. Oil-fired inert gas generators should be also protected in the same manner.
C	10.5.6.3.3	**Definition of areas to be protected by local application systems (incinerators)** The area around the burner(s) without insulation or with insulation likely to be removed frequently for maintenance should be protected. The term "insulation likely to be removed frequently" means insulation fitted in accordance with the requirements of regulation 4.2.2.6.1, but which might not be secured firmly because it may be removed frequently for periodic maintenance.
C	10.7.1.3	**Cargo spaces for which a fixed fire-extinguishing system is ineffective and reference to MSC/Circ.671** For cargoes for which a fixed gas fire-extinguishing system is ineffective and for which a fire-extinguishing system giving equivalent protection should be available, reference is made to MSC/Circ.671, annex, and table 2.
C	10.7.2	**Equivalent protection** Water supplies defined in regulation 19.3.1.2 are considered as an acceptable protection for cargoes listed in table 2 of MSC/Circ. 671. **Ships carrying dangerous goods on deck only** Any cargo space in a ship engaged in the carriage of dangerous goods on deck or in cargo spaces should be provided with a fixed gas fire-extinguishing system complying with the provisions of the FSS Code or with a fire-extinguishing system which, in the opinion of the Administration, gives equivalent protection for the cargoes carried.
C	11.3.1	**Insulation of aluminium decks and interpretation of "load-bearing divisions"** 1 If an aluminium deck is tested with insulation installed below the deck, then the result will apply to decks, which are bare on the top. Aluminium decks may not be provided with deck coverings on the top unless tested with the deck covering, to verify that the 200°C temperature of the aluminium is not exceeded. However, when needed, any approved primary deck covering (not specifically the one used during the standard fire test of the deck) may be used for meeting this requirement. 2 When spaces of categories (1) to (10) in regulation 9.2.2.3 or of categories (1) to (5) and (10) in regulation 9.2.2.4 are located on top of aluminium decks, the deck does not need to be insulated from the upper side, provided the deck is protected by an approved deck covering. 3 "Load-bearing division" is a deck or bulkhead including stiffeners, pillars, stanchions and other structural members which, if eliminated, would adversely affect the designated structural strength of the ship.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
C	11.6.2.2	**Area classification and selection of electrical equipment** 1 Areas on open deck, or semi-enclosed spaces on open deck, within 3 m of cargo tank ventilation outlets which permit the flow of small volumes of vapor, air or inert gas mixtures caused by thermal variation are defined as Zone 1. Permitted electrical equipment: - Certified safe type equipment for Zone 1. 2 Areas within 2 m beyond the zone specified in 1 above are defined as Zone 2. Permitted electrical equipment: - Certified safe type equipment for Zone 1, - Equipment of a type, which ensures the absence of sparks, "hot spots" during its normal operation, - Equipment having an enclosure filled with a liquid dielectric, the application, or encapsulated, - Pressurised equipment, - Equipment specifically designed for Zone 2 (for example type "n" protection in accordance with IEC Publication 60079-15). Note**:** Zones 1 and 2 are those defined in IEC Publication IEC 60092 Electrical installations in ships - Part 502: Tankers - Special features.
C	11.6.2.2	**Electrical equipment in areas next to cargo tank ventilation outlets which permit flow of small volumes of vapour** Permitted electrical equipment: .1 Areas on open deck within 3 m of cargo tank ventilation outlets which permit the flow of small volumes of vapour caused by thermal variation: - certified safe type equipment. .2 Areas 2 m beyond the zone specified in .1 above: - certified safe type equipment; or - equipment of a type which ensures absence of sparks or arcs and absence of ignition capable surface during normal operation; or - equipment specifically designed for Zone 2 as defined in IEC Publication 60092 Electrical installations in ships - Part 502: Tankers - Special features.
D	13.3.2.3	**Direct access to stairway enclosures** Direct access to escape stairway enclosures is only intended for those areas of an accommodation space as defined in regulation 3.39 for public spaces. Portions of an accommodation space that serve a purpose different than that of a public space such as theatre backstage areas, should not have direct access to escape stairway enclosures.
D	13.3.2.4.1	**Means of escape** The stairway arrangement required by regulation 13.3.2.4.1 for below bulkhead deck compartments of one main vertical zone can be arranged by: - one enclosed stairway which provides a continuous fire shelter from the level of its origin to the embarkation deck in one watertight compartment; - each of the other compartments have an enclosed stairway which provides a continuous fire shelter from the level of its origin to the bulkhead deck; and

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
		- the continuous fire shelter is also provided on the bulkhead deck through a route protected as a category 2 space (horizontal stairway). See figure of regulation 13.3.2.4.1 in the appendix. In applying this interpretation, the content of regulation 13.3.2.1.1 should also be taken into account.
D	13.3.2.4.4	**Size of enclosed means of escape in atriums** Such enclosed means of escape should be sized taking into account the total number of persons at each level of the atrium considered.
D	13.3.3	**Locking arrangements and accessibility to embarkation decks** 1 The escape routes are routes for escape and also for access. Accordingly, the locking arrangement should be such that it does not obstruct these two objectives (escape and access). Doors along any designated escape routes which require keys to unlock them when moving in the direction of escape should not be permitted. 2 The embarkation deck should be accessible from the open decks to which escapes routes lead.
D	13.4.1.1.1	**Arrangement of means of escape (passenger ships)** Ladders having strings of flexible steel wire ropes are not acceptable in such escape routes.
D	13.4.2.1.1	**Arrangement of means of escape (cargo ships)** Ladders having strings of flexible steel wire ropes are not acceptable in such escape routes.
D	13.6	**Arrangement of escape routes in ro-ro cargo spaces** The escape (and access) routes should be so arranged to ensure safe escape also during loading and unloading such as indication of escape lane on deck with minimum clearance of 600 mm in width.
D	13.7.4	**Evacuation Analysis** Reference is made to MSC/Circ.1033 - Interim Guidelines for evacuation analysis for new and existing passenger ships.
	15.2.4	**Fire control plans** Reference is made to Assembly resolution A.952(23) – Graphical symbols for shipboard fire control plans and ISO 17631:2002.
G	19.2.2.2	**Meaning of "purpose-built container spaces"** A purpose-built container space is a cargo space fitted with cell guides for stowage securing of containers.
G	19.2.2.3	**Extended meaning of "ro-ro spaces"** Ro-ro spaces include special category spaces (see regulation 20).

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
G	19.3.1	**Water supplies for open-top container spaces in ships** 1 The water spray system required in paragraphs 9.2, 9.3 and 9.4 of MSC/Circ.608/Rev.1 - Interim guidelines for open-top container ships - will also satisfy the requirement for dangerous goods. 2 The amount of water required for fire-fighting purposes in the largest hold should allow simultaneous use of the water spray system plus four jets of water from hose nozzles.
G	19.3.1.2	**Hydrants for dangerous goods** The number and position of hydrants should be such that at least two of the required four jets of water, when supplied by single lengths of hose, may reach any part of the cargo space when empty; and all four jets of water, each supplied by single lengths of hose may reach any part of ro-ro cargo spaces.
G	19.3.1.4	**Acceptance of high expansion foam systems in case of dangerous goods** A fixed high expansion foam system, complying with the FSS Code, chapter 6, section 2.2, is acceptable, except if cargoes dangerously react with water (see IMDG Code).
G	19.3.2	**Sources of Ignition** Reference is made to the recommendations of the International Electrotechnical Commission, in particular, IEC Publication 60092 Electrical installations in ships – Part 506: Special feature-Ships carrying specific dangerous goods and materials hazardous only in bulk.
G	19.3.4	**Ventilation requirements for individual cargoes and open-top container cargo holds** 1 General If adjacent spaces are not separated from cargo spaces by gastight bulkheads or decks, ventilation requirements should apply as for the cargo space itself, required under regulation 19.3.4.2 and its interpretations. 2 Requirements for individual cargoes: .1 Cargoes liable to give off vapours or gases which can form an explosive mixture with air (See the BC Code, Appendix B, e.g. IMO Class 4.3 materials): Two separate fans should be permanently fitted or being of a portable type adapted for being permanently fitted prior to loading and during voyage. The fans should be either explosion proof or arranged such that the escaping gas flow is separated from electrical cables and components. The total ventilation should be at least six air changes per hour, based upon the empty space. Ventilation should be such that any escaping gases cannot reach living spaces on or under deck. .2 Cargoes liable to spontaneous combustion (only applicable to seed cake (b) and (c)): Two separate fans should be permanently fitted or being of a portable type adapted for being permanently fitted prior to loading and during voyage. The fans should be either explosion proof or arranged such that the escaping gas flow is separated from electrical cables and components. The total ventilation should be at least six air changes per hour, based upon the empty space. Ventilation should be such that any escaping gases cannot reach living spaces on or under deck.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
		3 For open-top containerships Power ventilation should be required only for the lower part of the cargo hold for which purpose ducting is required. The ventilation capacity should be at least two air changes per hour, based on the empty hold volume below weather deck.
G	19.3.4.2	**Degree of protection of exhaust fans and use of wire mesh guards** 1 Exhaust fans should be of non-sparking type in accordance with IACS Requirement F 29, as revised. 2 The purpose of "suitable wire mesh guards" is to prevent foreign objects from entering into the fan casing. The standard wire mesh guards should have a size of 13 mm x 13 mm.
G	19.3.5.4	**Arrangements of bilge drainage systems for cargo spaces** Electrical equipment in the space should comply with IEC Publication 60092.- Electrical installations in ships.
G	19.3.6.1	**Type and suitability of protective clothing** 1 When selecting the protective clothing the danger of the chemicals according to the class and liquid or gaseous state should be taken into account. 2 The required protective clothing is for emergency purposes. 3 For solid bulk cargoes the protective clothing should satisfy the equipment requirements specified in Appendix E of the BC Code for the individual substances. For packaged goods the protective clothing should satisfy the equipment requirements specified in emergency procedures (EmS) of the Supplement to IMDG Code for the individual substances.
G	19.4	**Certification of special dangerous goods** Certification for carriage of solid dangerous bulk cargoes covers only those cargoes listed in Appendix B of the BC Code except cargoes of MHB. Other solid dangerous bulk cargoes may only be permitted subject to acceptance by the Administrations involved.
G	20.2.2.1	**Horizontal fire zone concept** The "total overall clear height" is the sum of distances between deck and web frames of the decks forming one horizontal zone.
G	20.3.1.1	**Capacity of ventilation systems** Reference is made to MSC/Circ.729 - Design guidelines and operational recommendations for ventilation systems in ro-ro cargo spaces.
G	20.3.1.3	**Alarm in case of loss of ventilation capacity** The requirement to indicate any loss of ventilating capacity is considered complied with by an alarm on the bridge, initiated by fall-out of starter relay of fan motor.

SOLAS Chapter II-2		Interpretation or reference
Part	**Regulation**	**Application**
G	20.3.1.4.2	**Arrangement and construction of ventilation ducts on cargo ships** Ventilation ducts should not pass through machinery spaces of category A unless fire insulated to A-60 standard.
G	20.3.2.2	**Degree of protection of electrical equipment 450 mm above deck** For equipment above a height of 450 mm above deck the degree of protection of electrical equipment required by this regulation will be realized: .1 by an enclosure of at least IP 55 as defined in IEC Publication 600529 - Classification of Degree of Protection Provided by Enclosures; or .2 by apparatus for use in zone 2 areas as defined in Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres (Temperature class T3).
G	20.3.3	**Degree of protection of electrical equipment in exhaust ventilation ducts and of exhaust fans** 1 The electrical equipment referred to in these regulations should be of certified safe type and wiring, if fitted, and should be suitable for use in zone 1 areas as defined in IEC Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres (Gas group II A and temperature class T3). 2 Exhaust fans should be of non-sparking type in accordance with IACS Requirement F 29, as revised.
G	20.4.1	**Arrangements for disconnecting detector sections during loading and unloading** The smoke detector sections in vehicle, special category, and ro-ro spaces may be provided with an arrangement, (e.g. a timer) for disconnecting detector sections during loading and unloading of vehicles to avoid "false" alarms. The time of disconnection should be adapted to the time of loading/unloading. The central unit should indicate whether the detector sections are disconnected or not. However, manual call points should not be capable of being disconnected by the arrangements referred to above.
G	20.6.1.4.1.1	**Sizing of scuppers and drainage pumps** For the sizing of scuppers and drainage pumps the capacity of both the water spraying system pumps and the water discharge from the required number of fire hose nozzles specified in regulations 10.2.1.5.1 and 19.3.1, as applicable, should be taken into account.
G	20.6.2.1	**Portable fire extinguishers on weather decks used as ro-ro cargo space** The requirements set out in this regulation need not to be applied to weather decks used as ro-ro cargo spaces.

INTERPRETATIONS OF VAGUE EXPRESSIONS, OTHER VAGUE WORDING AND REFERENCES IN THE FIRE SAFETY SYSTEMS (FSS) CODE

FFS Code		Interpretation or reference
Chapter	**Paragraph**	
3	2.1.1.4	**Personal Equipment** Reference is made to IEC Publication 60079- Electrical Apparatus for Explosive Gas Atmospheres.
4	--	**Fire Extinguishers** Reference is made to resolution A.951(23) - improved Guidelines for marine portable fire extinguishers, as amended by resolution A.951(23).
4	2.1.1.2	**Equivalents of fire extinguishers** Reference is made to the international standard on fire protection equipment - portable fire extinguisher - performance and construction, to be developed by ISO *(ISO/DIS 7156E).*
4	3.1.2	**Recharging of spare charges** Partially emptied extinguishers should also be recharged.
5	2.1.1.1	**Separation of spaces** Two spaces can be considered as separated spaces where fire divisions as required by regulations 9.2.2, 9.2.3 and 9.2.4, as appropriate, or divisions of steel are provided between them.
5	2.1.1.3	**Means for checking the quantity of medium in containers** Means for checking the quantity of medium in containers should be so arranged that it is not necessary to move the containers completely from their fixing position. This is achieved, for instance, by providing hanging bars above each bottle row for a weighing device or by using suitable surface indicators.
5	2.1.3.2	**Certain spaces for which the automatic warning of release of the extinguishing medium is required** Ordinary cargo holds need not comply with regulation 2.1.3.2. However, ro-ro cargo spaces, holds in container ships equipped for integrated reefer containers and other spaces where personnel can be expected to enter and where the access is therefore facilitated by doors or manway hatches should comply with the above regulation. .

FFS Code		Interpretation or reference
Chapter	**Paragraph**	
5	2.2	**Low pressure CO_2 systems** Where a low pressure CO_2 system is fitted to comply with this regulation, the following applies: 1 The system control devices and the refrigerating plants should be located within the same room where the pressure vessels are stored. 2 The rated amount of liquid carbon dioxide should be stored in vessel(s) under the working pressure in the range of 1.8 to 2.2 N/mm^2. The normal liquid charge in the container should be limited to provide sufficient vapour space to allow for expansion of the liquid under the maximum storage temperatures than can be obtained corresponding to the setting of the pressure relief valves but should not exceed 95% of the volumetric capacity of the container. 3 Provision should be made for: - pressure gauge; - high pressure alarm: not more than setting of the relief valve; - low pressure alarm: not less than 1.8 N/mm^2; - branch pipes with stop valves for filling the vessel; - discharge pipes; - liquid CO_2 level indicator, fitted on the vessel(s); - two safety valves. 4 The two safety relief valves should be arranged so that either valve can be shut off while the other is connected to the vessel. The setting of the relief valves should not be less than 1.1 times working pressure. The capacity of each valve should be such that the vapours generated under fire condition can be discharged with a pressure rise not more than 20% above the setting pressure. The discharge from the safety valves should be led to the open. 5 The vessel(s) and outgoing pipes permanently filled with carbon dioxide should have thermal insulation preventing the operation of the safety valve in 24 hours after de-energizing the plant, at ambient temperature of 45^{o}C and an initial pressure equal to the starting pressure of the refrigeration unit. 6 The vessel(s) should be serviced by two automated completely independent refrigerating units solely intended for this purpose, each comprising a compressor and the relevant prime mover, evaporator and condenser. 7 The refrigerating capacity and the automatic control of each unit should be so as to maintain the required temperature under conditions of continuous operation during 24 hours at sea temperatures up to 32^{o}C and ambient air temperatures up to 45^{o}C. 8 Each electric refrigerating unit should be supplied from the main switchboard busbars by a separate feeder. 9 Cooling water supply to the refrigerating plant (where required) should be provided from at least two circulating pumps one of which being used as a stand-by. The stand-by pump may be a pump used for other services so long as its use for cooling would not interfere with any other essential service of the ship. Cooling water should be taken from not less than two sea connections, preferably one port and one starboard. 10 Safety relief devices should be provided in each section of pipe that may be isolated by block valves and in which there could be a build-up of pressure in excess of the design pressure of any of the components. 11 The piping system should be designed in such a way that the CO_2 pressure at the nozzles should not be less than 1 N/mm^2.

FFS Code		Interpretation or reference
Chapter	**Paragraph**	
		12 Audible and visual alarms should be given in a central control station when: - the pressure in the vessel(s) reaches the low and high values according to 2; - any one of the refrigerating units fails to operate; - the lowest permissible level of the liquid in the vessels is reached. 13 If the system serves more than one space, means for control of discharge quantities of CO_2 should be provided, e.g. automatic timer or accurate level indicators located at the control position(s). 14 If a device is provided which automatically regulates the discharge of the rated quantity of carbon dioxide into the protected spaces, it should be also possible to regulate the discharge manually.
7	2.1.1.2	**Areas for increased application rates** An indication of areas for which increased application rates may be required is given below: ***Protected Area*** — ***Application rate*** Boiler fronts or roof, firing areas, oil fuel units, centrifugal separators (not oily water separators), oil purifiers, and clarifiers. — 20 *l*/min/m^2 Hot oil fuel pipes near exhausts or similar heated surfaces on main or auxiliary diesel engines — 10 *l*/min/m^2
8	2.1.1	**Dry pipe systems in saunas** For the definition of "dry pipe system" see resolution A.800(19), Annex, paragraph 2.3.
8	2.5.2.3	**Definition of nominal area** Nominal area is defined as being the gross, horizontal projection of the area to be covered.
9	2.4.1.1	**Acceptable activating arrangements** The following arrangement may be acceptable to: .1 activate a paging system; .2 activate the fan stops; .3 activate the closure of fire doors; .4 activate the closure of fire dampers; .5 activate the sprinkler system; .6 activate the smoke extraction system; and .7 activate the low-location lighting system.
9	2.1.4	**Relevant definitions** *Loop* means electrical circuit linking detectors of various sections in a sequence and connected (input and output) to the indicating unit(s). *Zone address identification capability* means a system with individually identifiable fire detectors.

FFS Code		Interpretation or reference
Chapter	**Paragraph**	
9	2.1.3	**Testing of detectors within cold spaces** Detectors installed within cold spaces such as refrigerated compartments should be tested according to IEC Publication 60068-2-1 - Section one - Test Aa.
10	2.1.2	**Calculation of intervals** The interval (I) should depend on the number of scanning points (N) and the response time of the fans (T). (See interpretation of paragraph 2.2.2 chapter 10 below.) With a 20 % allowance: $I = 1.2 \times T \times N$ However, the maximum allowable interval should not exceed 120 s (I_{max} = 120 s).
10	2.2.2	**Response time for fans** Depending on the capacity of the fans and the length of system piping the maximum response time of the fans in combination with the system piping should be around 15 s.
12	2.2.2.1	**Heating of diesel driven power sources and other means of starting** 1 If the room for the diesel driven power source is not heated, the diesel driven power source for the pump should be fitted with electric heating of cooling water or lubricating oil. 2 The other means of starting include those by compressed air, electricity, or other sources of stored energy, hydraulic power or starting cartridges.
13	2.2.4	**Size of landings and intermediate landings** If landings can be entered directly via entrance doors, situated in stairway enclosures, the area of such landings should comply with the requirements of paragraph 2.2.4 of chapter 13. However, if landings cannot be entered by entrance doors, such landings should be considered as intermediate landings which should comply with the capacity requirements as given in paragraph 2.3.1 of chapter 13.
14	2.1.3	**Capacity, use and handling of deck foam systems** A common line for fire main and deck foam line can only be accepted provided it can be demonstrated that the hose nozzles can be effectively controlled by one person when supplied from the common line at a pressure needed for operation of the monitors. Additional foam concentrate should be provided for operation of 2 nozzles for the same period of time required for the foam system. The simultaneous use of the minimum required jets of water should be possible on deck over the full length of the ship, in the accommodation, service spaces, control stations and machinery spaces.
14	2.3.2.3	**Foam systems positions of aft monitors** Port and starboard monitors required by this regulation may be located in the cargo area as defined in regulation 3.6, provided they are aft of cargo tanks and that they protect below and aft of each other.
14	2.3.3	**Application to tankers** This paragraph applies to all tankers regardless of their size.

FFS Code		Interpretation or reference
Chapter	**Paragraph**	
15	2.3.2.7	**Arrangements for isolation of inert gas supply mains and cargo piping systems** As a guide, the effective isolation required by this paragraph may be achieved by the two arrangements shown in figures 1 and 2 of chapter 15 and paragraph 2.3.2.7 in the Appendix of this circular.

INTERPRETATIONS OF VAGUE EXPRESSIONS, OTHER VAGUE WORDING AND REFERENCES IN THE FIRE TEST PROCEDURE (FTP) CODE AND FIRE TEST PROCEDURES REFERRED TO IN THE CODE

Relevant document	Paragraph	Interpretation or reference
Fire Test Procedure Code		
FTP Code, Approval	5.1.6.5	For cases where an unsuccessful test had been conducted prior to the final approval test, the fire test report should include a description of the modifications made to the test specimen that resulted in the successful test.
FTP Code, Approval	5.2.4	Type approval certificates for windows should state which side of the window was exposed to the heating condition during the test. The certificate should include a reference to optional test(s) such as hose stream test and/or thermo radiation test.
Non-combustibility test		
FTP Code, Annex 1 Part 1	2.1	The test exposure need not exceed a 30 min duration. For the purposes of this Part, ISO 1182:2002 may be used in lieu of ISO 1182:1990.
Smoke and toxicity test		
FTP Code, Annex 1 Part 2	2.6.2	Not only the FTIR (Fourier Transform Infrared Spectrometer) method but also other methods such as GC/MS (Gas Chromatography/Mass Spectrometer) which can produce traceable results can be used for the gas analysis.
Test for "A", "B", and "F" class divisions including windows, fire dampers, pipe penetrations and cable transits		
FTP Code, Annex 1 Part 3 Resolution A.754(18),	2.1 2.6.2.2	"B" class doors should be fire tested in B class steel bulkheads of dimensions as stated in paragraph 2.4.1 of resolution A.754(18), otherwise approval should be limited to the type of construction in which the door was tested.
FTP Code, Annex 1 Part 3	2.2.1	The minimum bulkhead panel height should be a standard height of the manufactured panel with a dimension of 2.4 mm.
FTP Code, Annex 1 Part 3	3.1	The calcium silicate board described as a dummy specimen specified in paragraph 3.3 of resolution A.653(16) should be used as a standard substrate for adhesives.
FTP Code, Annex 1 Part 3	4.1	Sealing materials used in penetration systems for "A" class divisions are not required to meet non-combustibility criteria provided that all other applicable requirements of FTP Code, part 3, are met.
Resolution A. 754(18)	1.2	The thickness of insulation on the stiffeners need not be same as that of the steel plate.

Relevant document	Paragraph	Interpretation or reference
Resolution A.754(18)	1.6	Doors, windows and other division penetrations intended to be installed in fire divisions made of material other than steel should correspond to prototype(s) tested on a division made of such material, unless the Administration is satisfied that the construction, as approved, does not impair the fire resistance of the division regardless of the division construction.
Resolution A.754(18)	1.7	"B" class constructions should be tested without finishes. For constructions where this is not possible, finishes should be included in the non-combustibility test of the construction.
Resolution A.754(18)	2.8.2	Where testing is conducted on a perforated ceiling system, equally constructed non-perforated ceilings and ceilings with a lesser degree of perforations (in terms of size, shape, and perforations per unit area) may be approved without further testing.
Resolution A.754(18)	9	There exist no expectations that “A” and “B” class fire doors remain functional, in the ability to be opened/closed, during or after the specified test duration.
Resolution A.754(18), Appendix A.I Windows	2.1	The test should be conducted on a window of the maximum size (in terms of both the height and the width) and the type of the glass pane and/or the minimum thickness of the glass pane or panes and gaps, if appropriate, for which approval is sought. Test results obtained on this configuration should, by analogy, allow approval of windows of the same type, with lesser dimensions in terms of height and width and with the same or greater thickness.
Resolution A.754(18), Appendix A.I Windows	5.3	The window should be considered to have failed the hose-stream test if an opening develops that allows an observable projection of water from the stream beyond the unexposed surface during the hose stream test. Gap gauges need not be applied during or after the hose stream test.
Resolution A.754(18), Appendix A.II Fire dampers	2.2.4	The distance between the fire damper and the structural core specified in paragraph 2.2.4 means the distance between the fire damper centre and the structural core.
Resolution A.754(18), Appendix A.II Fire dampers	4	If evaluation of insulation is required, it should prevent a temperature rise at any point on the surface not exceeding 180°C above the initial temperature. The average temperature rise is not relevant.
Resolution A.754(18), Appendix A.III Pipe and duct penetrations	4.1	Penetrations and transits should meet both integrity and insulation criteria.
Resolution A.754(18), Appendix A.IV Cable transits	4.1	Penetrations and transits should meet both integrity and insulation criteria**.**

Relevant document	Paragraph	Interpretation or reference
Test for surface flammability		
FTP Code, Annex 1 Part 5	1	Where a product is approved based on a test of a specimen applied on a non-combustible substrate, that product should be approved for application to any non-combustible substrate with similar or higher density (similar density may be defined as a density ≥ 0.75 x the density used during testing) or with a greater thickness if the density is more than 400 kg/m^3. Where a product is approved on the basis of a test result obtained after application on a metallic substrate (e.g. thin film of paints or plastic films on steel plates), such a product should be approved for application to any metallic base of similar or higher thickness (similar thickness is obtained as a thickness ≥ 0.75 x the thickness of metallic substrate used during testing).
Resolution A.653(16)	7	Where a product is approved based on a test of a specimen applied on a non-combustible substrate, that product should be approved for application to any non-combustible substrate with similar or higher density (similar density may be defined as a density ≥ 0.75 x the density used during testing) or with a greater thickness if the density is more than 400 kg/m^3. Where a product is approved on the basis of a test result obtained after application on a metallic substrate (e.g. thin film of paints or plastic films on steel plates), such a product should be approved for application to any metallic base of similar or higher thickness (similar thickness is obtained as a thickness ≥ 0.75 x the thickness of metallic substrate used during testing).
Resolution A.653(16)	7.3	Vapour barriers used in conjunction with insulation should be tested without any other components of "A" or "B" class constructions that will shield the barrier being tested from the radiant panel.
Resolution A.653(16)	8.3.1	In the first line of the first sentence, the word "or" should read "of"'.
Resolution A.653(16)	10	The sentence should be understood to mean: "Materials giving average values for all of the surface flammability criteria as listed in the following table ... (etc.)." Q_{sb} means an average of three values of average heat for sustained burning, as defined in paragraph 9.3.
Test for primary deck coverings		
FTP Code, Annex 1 Part 6	2.1	For the purpose of this part, the total heat release value (Q_t) for floor coverings given in section 10 of the annex to resolution A.653(16) is replaced by ≤ 2.0 MJ.
FTP Code, Annex 1 Part 6	2.2	Fire test procedure The test may be terminated after 40 min.

APPENDIX

EXPLANATORY SKETCHES

This appendix contains explanatory sketches to some interpretations of regulations in SOLAS chapter II-2, as amended, and interpretations of paragraphs in the Fire Safety Systems Code as follows:

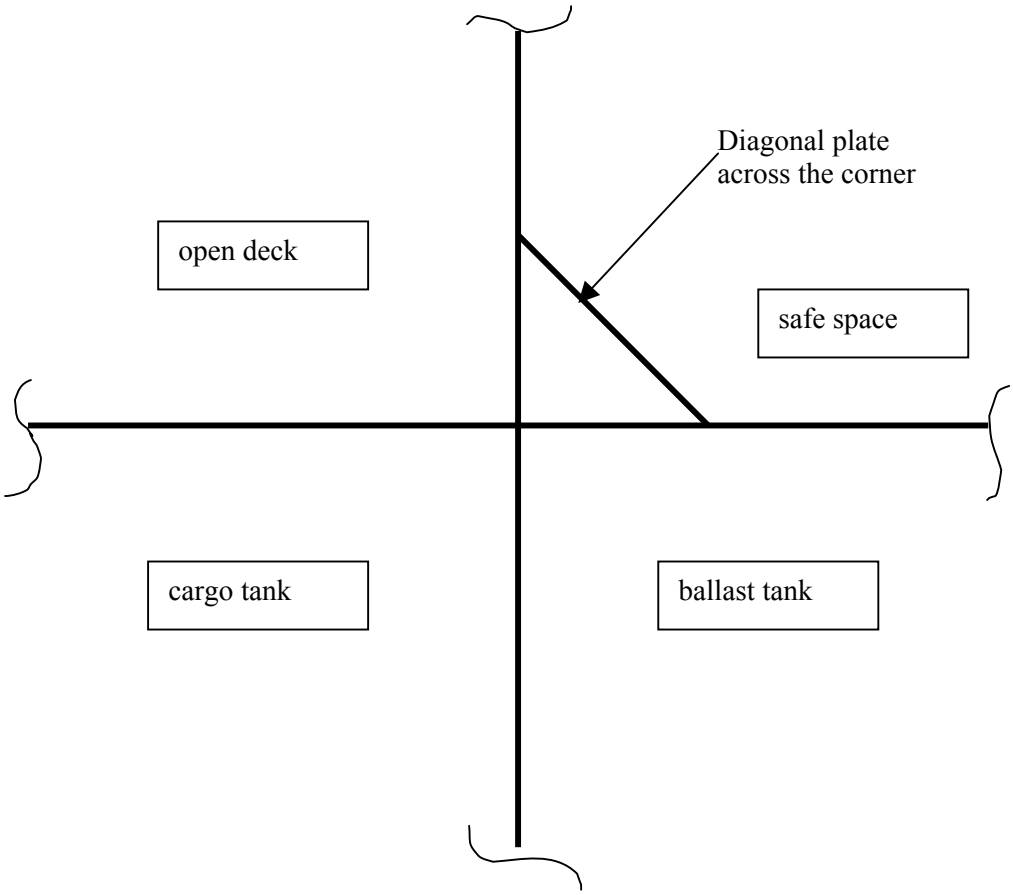
SOLAS Chapter II-2

Regulation 4.5.1:	Corner-to-corner situation in a cofferdam (figure)
Regulation 5.3 and 6.2:	Materials used on passenger ships for bulkheads of accommodation spaces as defined in regulation 3.1 (table)
Regulation 5.3 and 6.2:	Materials used in accommodation spaces, as defined in regulation 3.1, of cargo ships (table)
Regulation 9.2.2.1:	Arrangement of main vertical zones (figures 1 to 4)
Regulation 9.2.3.4.1:	Construction of protected stairway enclosures of cargo ships (figures 1, 2.1 and 2.2)
Regulation 9.3.4:	Prevention of heat transmission by insulation and structural details for drainage (figures 1, 2 and 3)
Regulation 10.5:	Number of systems, appliances and extinguishers in machinery spaces
Regulation 13.3.2.4.1:	Continuous fire shelter of means of escape (figure)

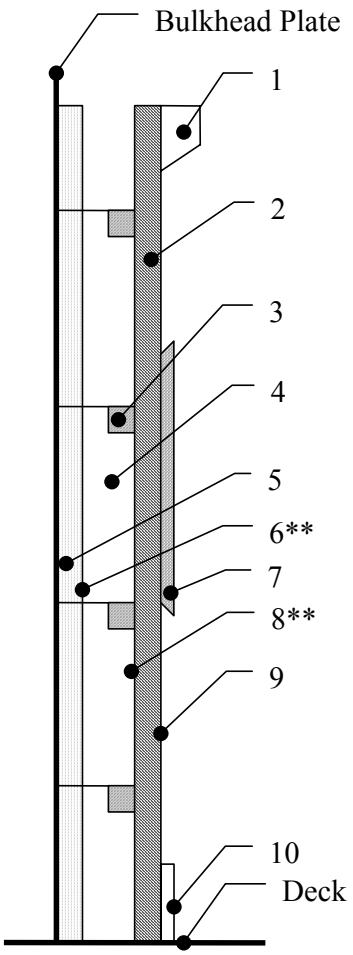
Fire Safety Systems Code

Chapter 15 paragraph 2.3.2.7:	Isolation arrangements in inert gas main (figures 1 and 2)

Regulation 4.5.1: Corner-to-corner situation in a cofferdam



Regulations 5.3 and 6.2: Materials used on passenger ships for bulkheads of accommodation spaces as defined in regulation II-2/3.1



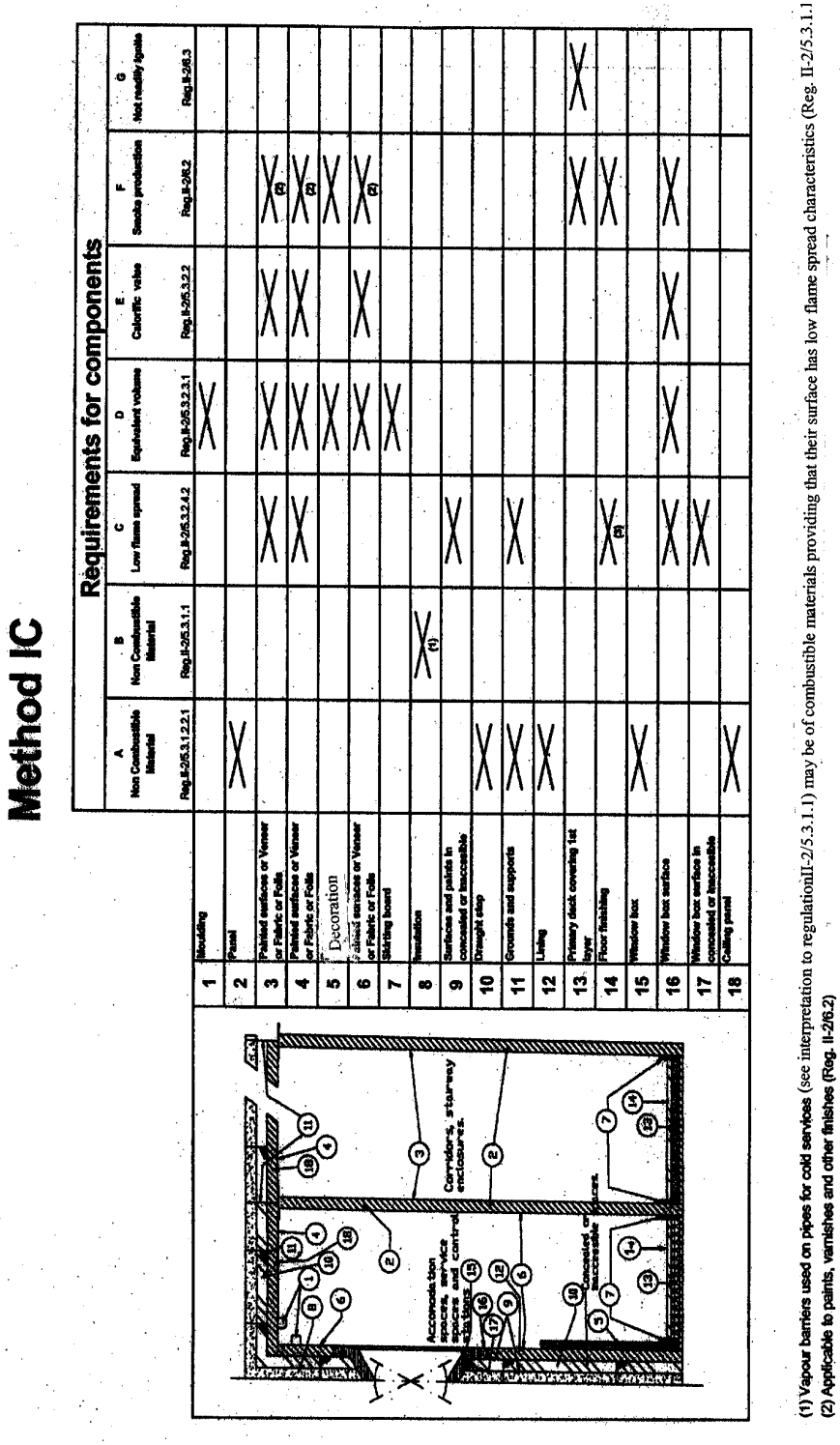
Materials used for bulkheads of accommodation spaces as defined in regulation II-2/3.1					
Bulkhead components	Requirements in SOLAS chapter II-2 for components				
	Non-combustible material (5.3.1.1) (5.3.1.2.1)	Calorific value (5.3.2.2)	Equivalent volume (5.3.2.3)	Low flame spread (5.3.2.4)*	Smoke production, *toxic products* (6.2)
	(A)	(B)	(C)	(D)	(E)
1 moulding			X		
2 wall panel (lining)	X				
3 grounds and supports	X				
4 draft stops	X				
5 insulation	X				
6 insulation surface**				X (5.3.2.4.1.2)	
7 decoration			X		
8 painted surface** or fabric or veneer**		-- X		X (5.3.2.4.1.2) X (5.3.2.4.1.2)	
9 painted surface or fabric or veneer		-- X	X X	X (5.3.2.4.1.1) X (5.3.2.4.1.1)	X X
10 skirting board			X		

NOTES:

* Exposed surfaces of corridors and stairway enclosures referred to in regulation II-2/5.3.2.4.1.1 includes floor coverings.

** Where the wall panel is an integral part of the fire insulation in accordance with regulation II-2/9.2.2.3.3, these components are to be of non-combustible material.

Regulations 5.3 and 6.2: Materials used in accommodation spaces, as defined in regulation II-2/3.1, of cargo ships



Method IIC - IIIC

		Requirements for components						
		A Non Combustible Material Reg.II-2/5.3.1.2.2.2	B Non Combustible Material Reg.II-2/5.3.1.1	C Low flame spread Reg.II-2/5.3.2.4.2	D Equivalent volume Reg.II-2/5.3.2.3.1	E Calorific value Reg.II-2/5.3.2.2	F Smoke production Reg.II-2/5.2	G Not readily ignitio Reg.II-2/5.3
1	Moulding				X (6)			
2	Panel	X (4)						
3	Painted surfaces or Veneer or Fabric or Foils			X	X (5)	X	X (5)	
4	Painted surfaces or Veneer or Fabric or Foils			X	X (5)	X (2)	X (5)	
5	Decoration [1]				X (5)		X	
6	Painted surfaces or Veneer or Fabric or Foils				X (5)	X (2)	X (5)	
7	Skirting board				X (5)			
8	Insulation		X (1)					
9	Surfaces and paints in concealed or inaccessible			X				
10	Draught stop	X (4)						
11	Grounds and supports	X (4)		X				
12	Lining	X (4)						
13	Primary deck covering 1st layer						X	X
14	Floor finishing			X (6)			X	X
15	Window box	X (4)						
16	Window box surface			X (2)	X (3)	X (2)	X	
17	Window box surface in concealed or inaccessible			X				
18	Ceiling panel	X (4)						

(1) Vapour barriers used on pipes for cold services (see interpretation to regulation II-2/5.3.1.1) may be of combustible materials providing that their surface has low flame spread characteristics (Reg. II-2/5.3.1.1)
(2) Where the material is fitted on non combustible bulkheads, ceiling and lining in accommodation and service spaces (Reg.II-2/5.3.2.2)
(3) To be applied to those accommodation and service spaces bounded by non combustible bulkheads, ceiling and linings (Reg.II-2/5.3.2.3.1)
(4) Only in corridors and stairway enclosures serving accommodation and service spaces and control stations (Reg. II-2/5.3.1.2.2.2)
(5) Applicable to paints, varnishes and other finishes (Reg. II-2/5.2)
(6) Only in corridors and stairway enclosures

Regulation 9.2.2.1: Arrangement of main vertical zones*

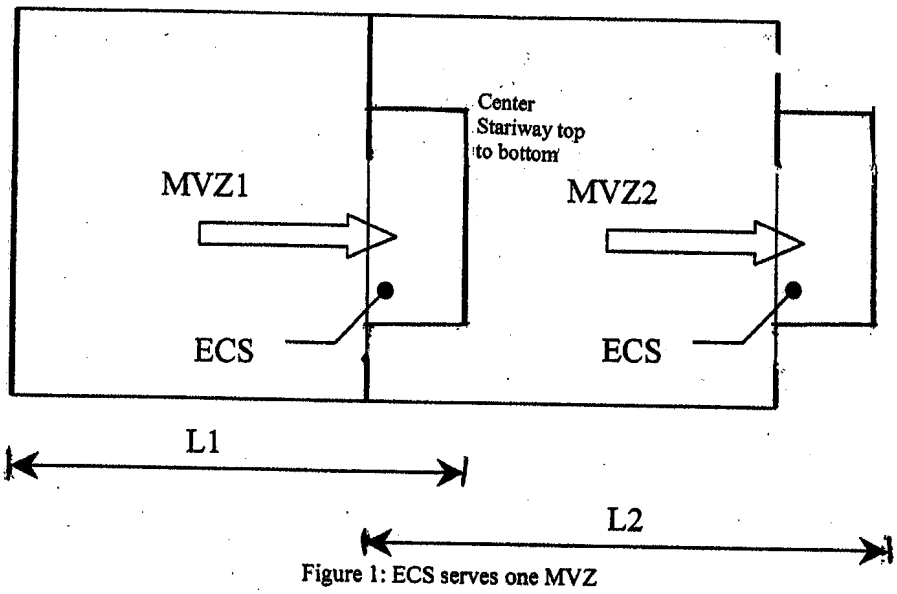
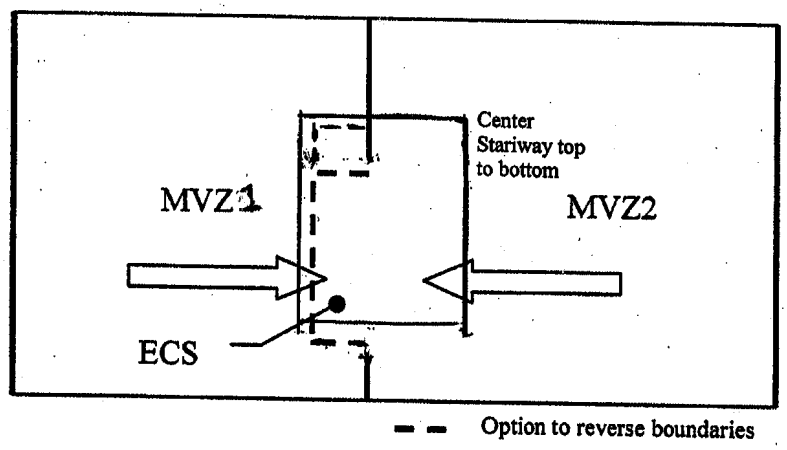
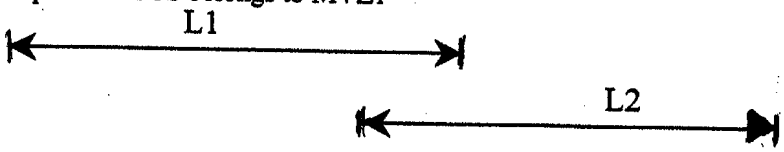


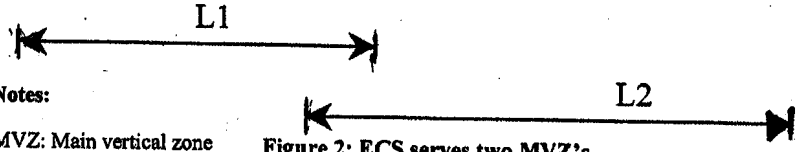
Figure 1: ECS serves one MVZ



Option 1: ECS belongs to MVZ1



Option 2: ECS belongs to MVZ2



Notes:

*MVZ: Main vertical zone
ECS : ESCAPE Stairway
⇨ : Direction of escape

Figure 2: ECS serves two MVZ's

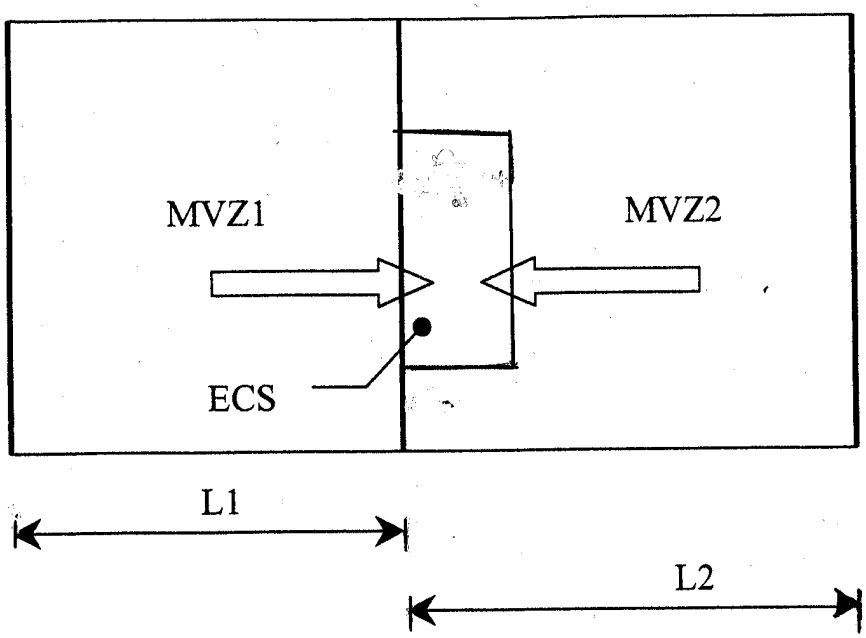
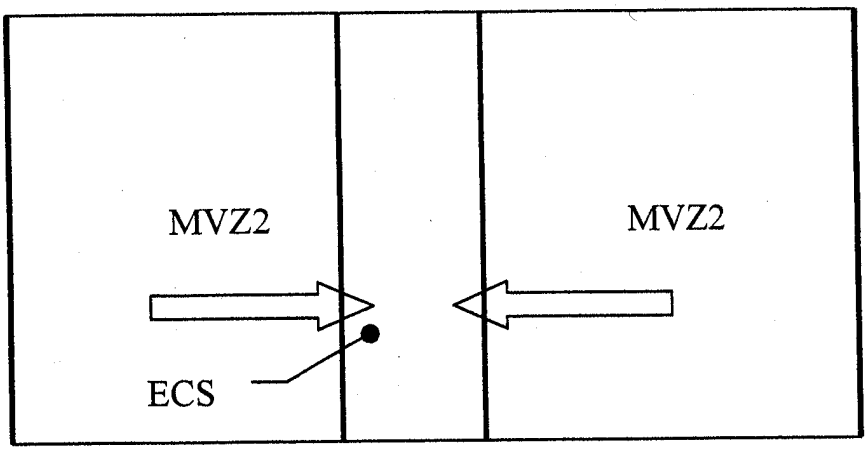
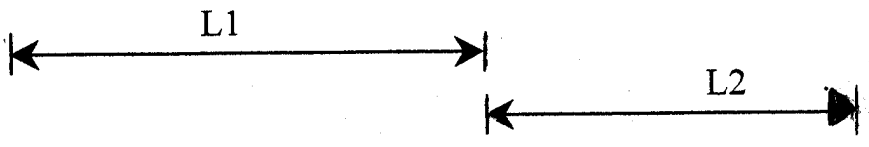


Figure 3: ECS serves two MVZ's (ECS belongs to MVZ2)



Option 1: ECS belongs to MVZ1



Option 2: ECS should be treated as MVZ

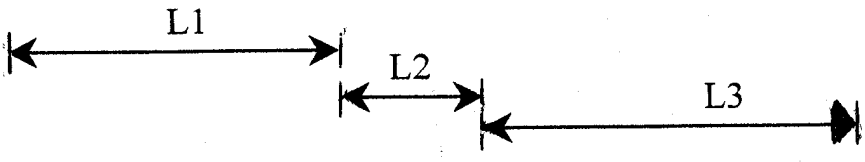


Figure 4: ECS serves two MVZ's

Regulation 9.2.3.4.1: Construction of protected stairways of cargo ships

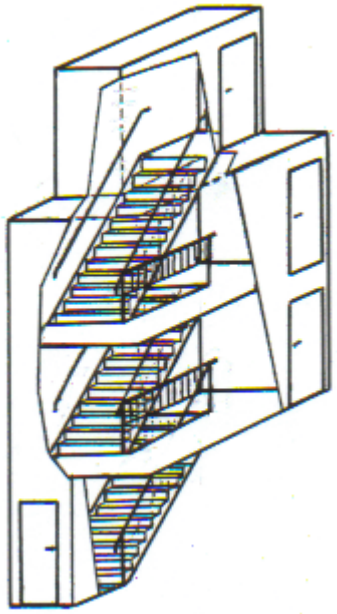


Figure 1

staircase well with going round entrances on each deck level, self-closing doors

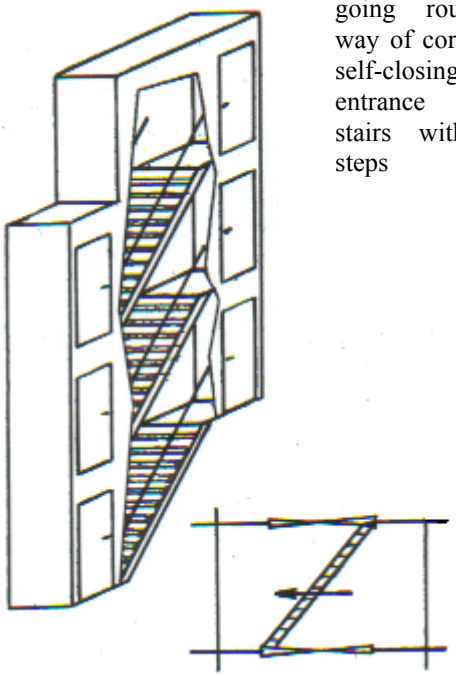


Figure 2.1

staircase well - going round by way of corridor all self-closing entrance doors, stairs with open steps

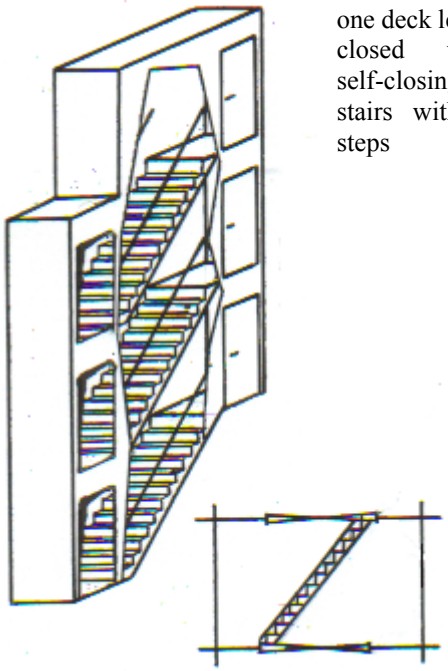


Figure 2.2

each stairway on one deck level to be closed with a self-closing door, stairs with closed steps

Regulation 9.3.4: Prevention of heat transmission by insulation and structural details for drainage*

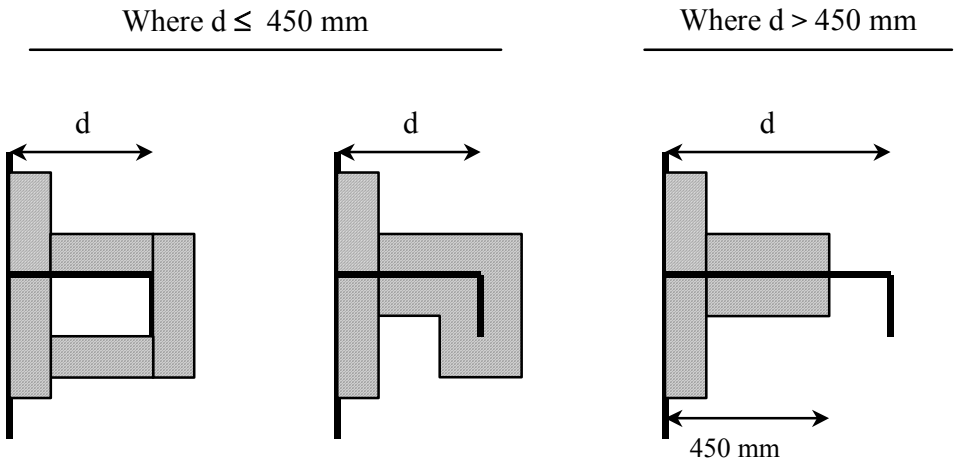


Figure 1

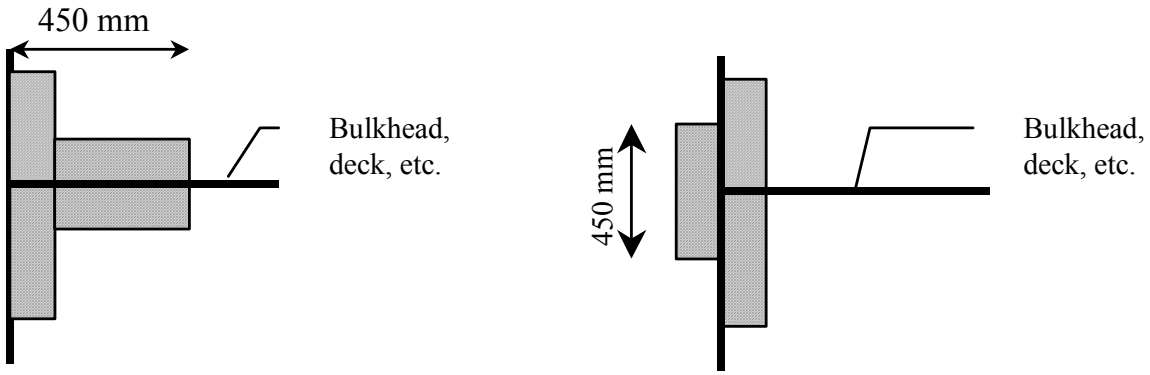


Figure 2

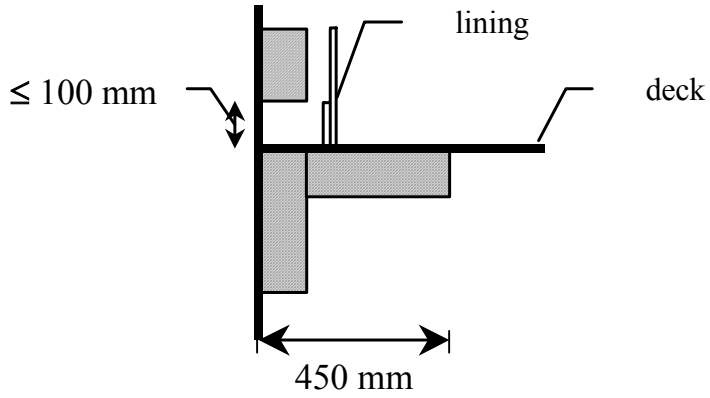


Figure 3

***Note:**
d = Depth of stiffener on girder.

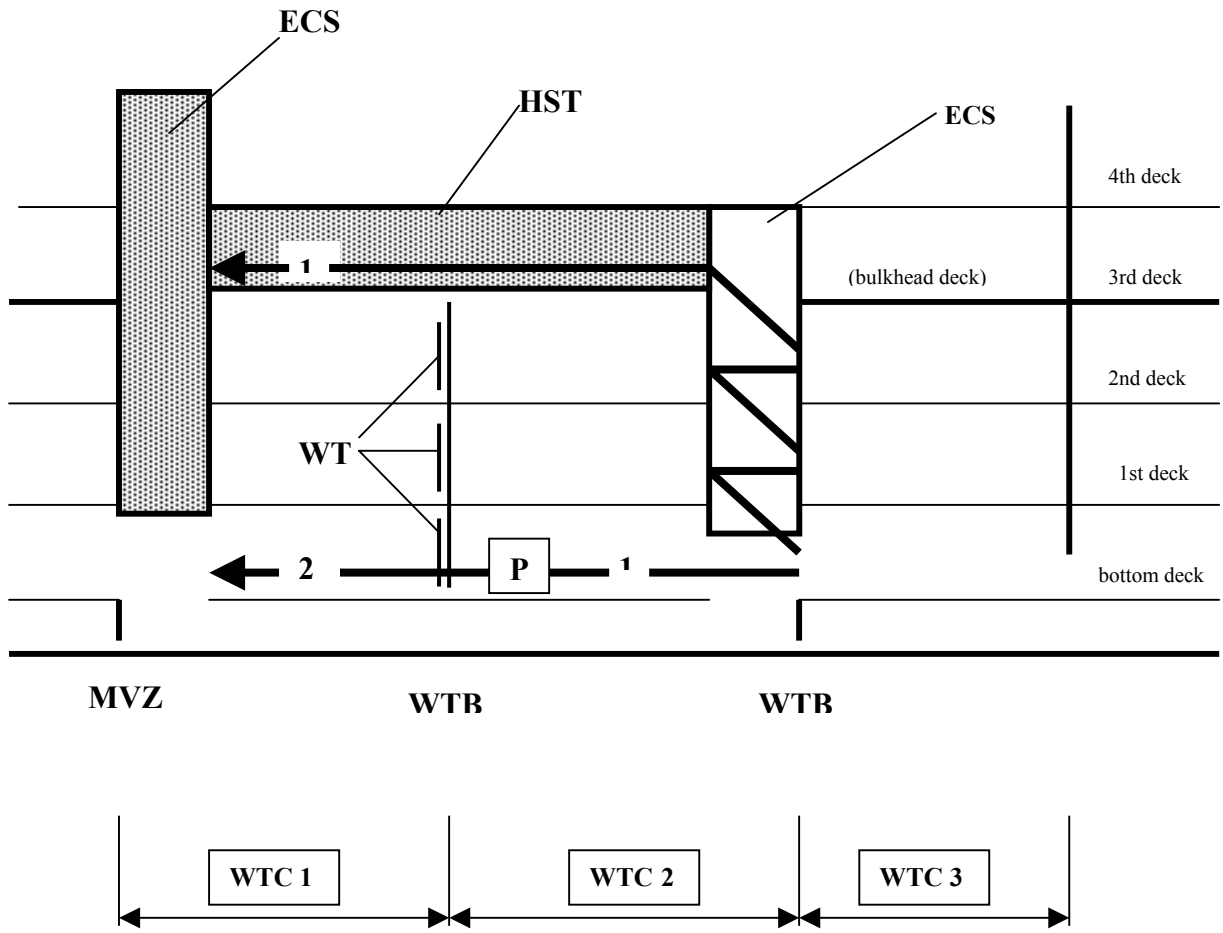
Regulation 10.5: Number of systems, appliances, and extinguishers required in machinery spaces

Systems appliances & extinguishers → **Category A Machinery spaces ↓**	**Fixed fire extinguishing system**	**Portable foam applicator** *1	**Portable foam extinguishers**	**Add'l Portable foam extinguishers**	**135 *l* foam extinguisher**	**45 *l* foam extinguishers** *2	**Sand boxes** *3
SOLAS paragraph →	10.5.1.1, 10.5.2.1	10.5.1.2.1 10.5.2.2.1	10.5.1.2.2	10.5.2.2.2	10.5.1.2.2	10.5.2.2.2	10.5.2.2.2
Oil-fired boilers	1	1	2N	NA	1*4	-	N
Oil-fired boilers and oil fuel units	1	1	2N+2	NA	1*4	-	N
Engine room containing:							
Oil fuel units only	1	-	2	NA	-	-	-
Internal combustion machinery	1	1	x		-	y	-
Internal combustion machinery and oil fuel units	1	1	x		-	y	-
Combined engine/boiler room containing:							
Internal combustion machinery, oil fired boilers and oil fuel units	1	1	(2N+2) or x whichever is greater		1*4	y*5	N
N = number of firing spaces. "2N" means that two extinguishers are to be located in each firing space. X = sufficient number, minimum two in each space, so located that there are at least one portable fire extinguisher within 10 m walking distance from any point. y = sufficient number to enable foam to be directed onto any part of the fuel lubricating oil pressure systems, gearing and other fire hazard.							

Notes:

*1. May be located at outside of the entrance to the room.
*2. May be arranged outside of the space concerned for smaller spaces of cargo ships.
*3. The amount of sand is to be at least 0.1 m^3.
*4. Not required for such spaces in cargo ships wherein all boilers contained therein are for domestic services and are less than 175kW.
*5. In case of machinery spaces containing both boilers and internal combustion engines (case not explicitly considered in regulation 10.5) regulation 10.5.1 and 10.5.2 apply, with the exception that one of the foam fire-extinguishers of at least 45 *l* capacity or equivalent (required by regulation 10.5.2.2.2) may be omitted on the condition that the 135 *l* extinguisher (required by regulation 10.5.1.2.2) can protect efficiently and readily the area covered by 45 *l* extinguisher.
*6. Oil fired machinery other than boilers such as fired inert gas generators, incinerators and waste disposal units are to be considered the same as boilers insofar as the required number and type of fire fighting appliances are concerned.

Regulation 13.3.2.4.1: Continuous fire shelter of means of escape



Figure

NOTES:

ECS: stairway enclosed in a continuous fire shelter
HST: "horizontal stairway"; route protected as a category 2 space
MVZ: main vertical zone
WTB: watertight bulkhead
WTC: watertight compartment
WTD: watertight door
P: group of persons

Chapter 15, paragraph 2.3.2.7: Isolation arrangements in inert gas main

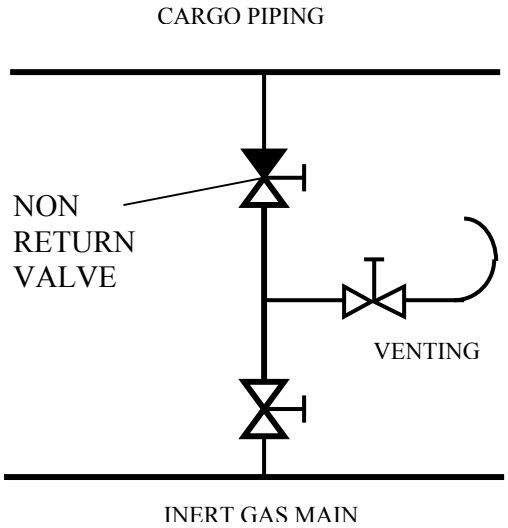


Figure 1

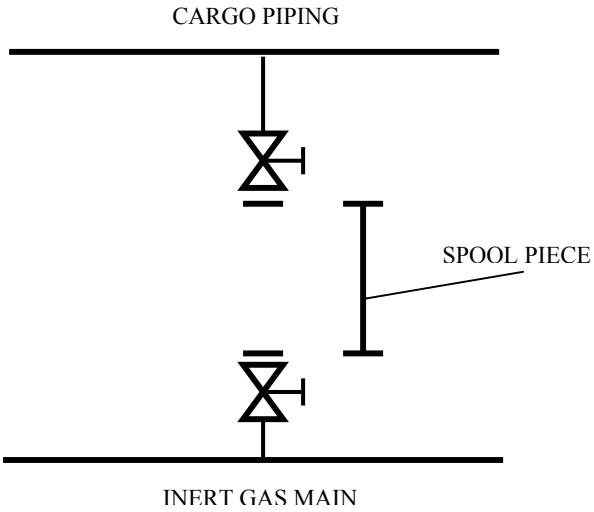


Figure 2

INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON BULK LIQUIDS AND GASES
9th session
Agenda item 5

BLG 9/5
28 January 2005
Original: ENGLISH

REVISION OF FIRE PROTECTION REQUIREMENTS OF THE IBC, IGC, BCH AND GC CODES

Proposed revisions to the fire protection requirements in the IBC Code

Submitted by Japan

SUMMARY

Executive summary:	This document provides comments and subsequent proposals of modifications to the proposed revisions to IBC Code contained in the documents MSC 79/3/1 and MSC 79/3/1/Add.1. These proposals are mainly of editorial nature.
Action to be taken:	Paragraph 15
Related documents:	MEPC 52/24, MEPC 52/24/Add.1, MEPC 52/WP.11/Add.1, MSC 79/WP.14

Background

1 The 2004 amendments to the IBC Code were adopted by the Marine Environment Protection Committee, at its fifty-second session, by resolution MEPC.119(52). At that session, Japan, before the adoption by MEPC 52, proposed some editorial corrections to the amendments to the IBC Code in regard to the fire protection requirements. However, MEPC 52 decided that the proposals by Japan had a substantive nature, and agreed to forward those proposals to the BLG Sub-Committee for consideration (see paragraph 5.63.6 of document MEPC 52/24).

2 The amendments to the IBC Code were also considered by the Maritime Safety Committee at its seventy-ninth session from the maritime safety point of view, and subsequently adopted.

3 According to the agreement of MEPC 52, Japan submits this document, which contains the proposed revision to the fire protection requirements of the IBC Code as amended in 2004, for consideration by the Sub-Committee. At the time of this submission, the final text of the revised IBC Code adopted by MSC 79 was not available. Therefore, the document was prepared based on the documents MEPC 52/24/Add.1, MEPC 52/WP.11/Add.1 and MSC 79/WP.14.

Requirements for installation of local application fire-fighting systems in machinery spaces

4 SOLAS regulation II-2/10.5.6 for the requirements for installation of local application fire-fighting systems in machinery spaces applies, for cargo ships, to those 2,000 GT and upward if the volume of the machinery space is 500 m^3 and upward. Because such local application fire-fighting systems provide equivalent protection to any main fire-fighting systems in a machinery space of a smaller ship and/or smaller machinery space, such a small ship need not be required of installation of local application fire-fighting systems.

5 The thought on the application as described in the above paragraph is also applicable to those tankers to which the IBC Code applies.

6 Therefore, Japan proposes to modify the paragraph 11.1.1.3 of the IBC Code as amended by inserting "(except 10.5.6)" as follows:

> ".3 regulations 10.2, 10.4 and 10.5 (except 10.5.6) shall apply as they would apply to cargo ships of 2,000 tons gross tonnage and over."

Type of gases in spaces

7 SOLAS chapter II-2 applies to oil tankers and the vapour/gas in such ships would be "hydrocarbon gases". On the other hand, chemical tankers, to which the IBC Code applies, would carry flammable gases which are not always categorized as "hydrocarbon gases".

8 Therefore, for a clarification purpose, Japan proposes to add a new subparagraph .6 under 11.1.1 of the IBC Code as amended, as follows:

> ".4 the provisions of 11.3 shall apply in lieu of regulation 10.8~~; and~~
>
> .5 the provisions of 11.2 shall apply in lieu of regulation 10.9~~.~~; and
>
> .6 regulation 4.5.10 shall apply subject that "hydrocarbon gases" in this SOLAS regulation is read as "flammable gases"."

Requirement for shut-off valves and fire-fighters' outfit

9 The requirements for shut-off valves and fire-fighters' outfit contained in SOLAS regulations II-2/10.2.1.4.4 and 10.10.2.3 have applied to tankers, which only carry non-flammable cargoes, because such regulations are originated in regulations II-2/4.3.6 and 17.3.1.2 in Part A for general application, but not in Part D for tankers, of the 1983 SOLAS Amendments.

10 Therefore, from a viewpoint of the continuation of the requirements, Japan proposes to add "(except 10.2.1.4.4 and 10.10.2.3)" in the paragraph 11.1.2 of the IBC Code, as amended, as follows:

> "11.1.2 Notwithstanding the provisions of 11.1.1, ships engaged solely in the carriage of products which are non-flammable (entry "NF" in column "I" of the table of minimum requirements) need not comply with requirements for tankers specified in SOLAS chapter II-2 (except regulations 10.2.1.4.4 and 10.10.2.3), provided that they comply with the requirements for cargo ships of that chapter, except that regulation 10.7 need not apply to such ships and 11.1 and 11.3, hereunder, need not apply."

Retro-application of requirements for cargo pump-rooms in existing ships

11 Technical provision of system for continuous monitoring of the concentration of flammable gases has been changed by the 2000 Amendments to SOLAS chapter II-2 (as in the SOLAS regulations II-2/4.5.10.1.1 and 4.5.10.1.4).

12 The IBC Code applies to existing ships. Therefore, Japan believes a phase-in procedure of such requirement for existing ships is necessary, as the same manner described in SOLAS regulation II-2/1.6.7.

13 Japan, on this understanding, proposes to add following new 11.1.4 to paragraph 11.1 of the IBC Code:

> "11.1.4 In lieu of the provisions of SOLAS regulation II-2/1.6.7, the requirements of regulations II-2/4.5.10.1.1 and 4.5.10.1.4, and a system for continuous monitoring of the concentration of flammable gases shall be fitted on ships constructed before [entry date of the amendment] by the date of the first scheduled dry-docking after [entry date of the amendment], but not later than [3 years after entry date of the amendment]. Sampling points or detector heads should be located in suitable positions in order that potentially dangerous leakages are readily detected. When the flammable gas concentration reaches a pre-set level which shall not be higher than 10% of the lower flammable limit, a continuous audible and visual alarm signal shall be automatically effected in the pump-room and cargo control room to alert personnel to the potential hazard. However, existing monitoring systems already fitted having a pre-set level not greater than 30% of the lower flammable limit may be accepted. Notwithstanding the above provisions, the Administration may approve exemption of the above requirements for ships of less than 500 gross tonnage and ships not engaged on international voyages, which were constructed before [entry date of the amendment]."

Treatment of the proposals

14 Noting that the amendments to the IBC Code adopted by MEPC 52 and MSC 79 will not enter into force until 1 January 2007, the proposals mentioned above may not take place as amendments until such date. Therefore, the proposal should be treated as unified interpretations until these proposals become official amendments to the IBC Code.

Action requested of the Sub-Committee

15 The Sub-Committee is invited to consider the above comments and, in particular, the proposals contained in paragraphs 6, 8, 10, 13 and 14, and to take action as appropriate.

（頁調整）

執筆担当者 (RR-R2)

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（五十音順）

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