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#### COVER NOTE

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From:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	31 October 2019
To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union

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Subject:	COMMISSION STAFF WORKING DOCUMENT IMO – Union submission to be submitted to the 7th session of the Sub-Committee on Ship Systems and Equipment (SSE7) of the IMO in London from 2 – 6 March 2020 concerning the review of SOLAS Chapter II-2 and associated codes to minimize the incidence and consequences of fires on ro-ro spaces and special category spaces of new and existing passenger ships

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Delegations will find attached document SWD(2019) 400 final.

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Brussels, 31.10.2019  
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## COMMISSION STAFF WORKING DOCUMENT

**IMO – Union submission to be submitted to the 7th session of the Sub-Committee on Ship Systems and Equipment (SSE7) of the IMO in London from 2 – 6 March 2020 concerning the review of SOLAS Chapter II-2 and associated codes to minimize the incidence and consequences of fires on ro-ro spaces and special category spaces of new and existing passenger ships**

**COMMISSION STAFF WORKING DOCUMENT**  
**For the Council Shipping Working party**

**IMO – Union submission to be submitted to the 7<sup>th</sup> session of the Sub-Committee on Ship Systems and Equipment (SSE7) of the IMO in London from 2 – 6 March 2020 concerning the review of SOLAS Chapter II-2 and associated Codes to minimize the incidence and consequences of fires on ro-ro spaces and special category spaces of new and existing passenger ships**

**PURPOSE**

The document in Annex contains a draft Union submission to the 7<sup>th</sup> session of the Sub-Committee on Ship Systems and Equipment (SSE7) of the IMO concerning the review of SOLAS Chapter II-2 and associated Codes to minimize the incidence and consequences of fires on ro-ro spaces and special category of new and existing passenger ships. It is hereby submitted to the appropriate technical body of the Council with a view to achieving agreement on transmission of the documents to the IMO prior to the required deadline of 29 November 2019<sup>1</sup>.

Article 6(2)(a)(i) of Directive 2009/45/EC on Safety Rules and Standards for Passenger Ships<sup>2</sup> makes the application of SOLAS in its up-to-date version applicable to new Class A ships. The draft submission concerns consideration of amendments to SOLAS II-2 regulation 20 (Protection of vehicle, special category and ro-ro spaces) that will have a direct impact on Class A ships and therefore the said draft Union submission falls under EU exclusive competence<sup>3</sup>.

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<sup>1</sup> The submission of proposals or information papers to the IMO, on issues falling under external exclusive EU competence, are acts of external representation. Such submissions are to be made by an EU actor who can represent the Union externally under the Treaty, which for non-CFSP (Common Foreign and Security Policy) issues is the Commission or the EU Delegation in accordance with Article 17(1) TEU and Article 221 TFEU. IMO internal rules make such an arrangement absolutely possible as regards existing agenda and work programme items. This way of proceeding is in line with the General Arrangements for EU statements in multilateral organisations endorsed by COREPER on 24 October 2011.

<sup>2</sup> OJ L 163, 25.6.2009, p. 1.

<sup>3</sup> A formal EU position under Article 218(9) TFEU is to be established in due time should the IMO Maritime Safety Committee eventually be called upon to adopt an act having legal effects as regards the subject matter of the said draft Union submission. The concept of ‘acts having legal effects’ includes acts that have legal effects by virtue of the rules of international law governing the body in question. It also includes instruments that do not have a binding effect under international law, but that are ‘capable of decisively influencing the content of the legislation adopted by the EU legislature’ (Case C-399/12 Germany v Council (OIV), ECLI:EU:C:2014:2258, paragraphs 61-64).

## ANNEX

SUB-COMMITTEE ON SHIP SYSTEMS AND  
EQUIPMENT  
7th session  
Agenda item 6

SSE 7/6/XX  
[...] November 2019  
Original: ENGLISH

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### **REVIEW SOLAS CHAPTER II-2 AND ASSOCIATED CODES TO MINIMIZE THE INCIDENCE AND CONSEQUENCES OF FIRES ON RO-RO SPACES AND SPECIAL CATEGORY SPACES OF NEW AND EXISTING RO-RO PASSENGER SHIPS**

#### **Considerations for step two**

**Submitted by the European Commission on behalf of the European Union**

#### **SUMMARY**

*Executive summary:* This submission aims at providing the basis for the technical discussions needed for the completion of step two of this agenda item including a number of considerations for mandatory amendments.

*Strategic direction, if applicable:* Other work

*Output:* OW 36

*Action to be taken:* Paragraph 44

*Related documents:* SSE 5/17, SSE 6/18, SSE 6/6/1, SSE 5/7/2, SSE 6/6, SSE 6/6/2

#### **Introduction**

1 This document is submitted in accordance with section 6.12.3 of the *Guidelines on the Organization and Method of Work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.4/Rev.4).

2 SSE 4 had agreed on a two-step approach, The first step of this approach was completed with the agreement on the Interim Guidelines at SSE 6 and the subsequent approval by MSC 101 (MSC.1/Circ.1615) on the basis of the FIRESAFE studies. The second step was the development of amendments to SOLAS chapter II-2 and associated codes. The current submission aims at providing the basis for the discussion of the second step.

3 SSE 6 also noted that for this second step, the analysis of the report by the FSA Experts Group would be needed. The main focus of this analysis is whether the FIRESAFE studies followed the FSA methodology to validate the results and produce comments from a risk assessment point of view. This input shall be assessed and is expected for the further work on this agenda item, especially in relation to the cost efficiency of the Risk Control Options (RCOs) that have been suggested.

4 At the same time it is important to note that the FIRESAFE studies produced a number of recommendations for decision-making. In the following paragraphs and in the Annex the text proposals stemming from the studies and the Interim Guidelines (MSC.1/Circ.1615) are being presented.

### Retroactivity

5 The RCOs investigated in the FIRESAFE II study were reviewed for their implementation on new and existing ships. The analysis was carried out for three different types of RoPax with different basic design characteristics in terms of lane meters, number/existence of side openings, ship size, etc., tailor made for their commercial activity (Cargo, Standard or Ferry RoPax). A number of these RCOs were found to be cost-effective (GCAF values <1) for existing ships. As it can be seen in Table 1, the result of the cost-effectiveness analysis depended heavily on the design characteristics of the RoPax.

Table 1 - GCAF Factors for the different RCOs on each generic vessel (Existing ships)

RCO #	Description	Existing ships		
		Cargo RoPax	Standard RoPax	Ferry RoPax
EI1	Robust connection boxes	0.13	0.08	0.06
EI2	Only ship cables	2.05	0.70	0.46
EI3	IR camera	0.26	0.08	0.05
EI4	Training for awareness	0.04	0.01	0.01
EI5	Only crew connections	0.04	0.01	0.01
EI6	Cable reeling drums	8.09	6.16	4.04
Det1	Combined heat & smoke and alarm system design & integration	2.44	0.37	0.06
Det2	Ban / closure of side (PS & SB) openings (open ro-ro spaces)	N/A	2.77	N/A
Det3	Increased frequency fire patrols	13.28	2.74	3.29
Dec1	Alarm System Design & Integration (smoke)	3.85	0.60	0.11
Dec2	Improved markings/signage for wayfinding and localisation	0.12	0.02	0.01
Dec3	Preconditions for Early Activation of Drencher System	1.98	0.35	0.20
Su1	Remote control	5.13	0.61	0.33
Su3	Rolling shutters (PS & SB side) (Open ro-ro spaces)	N/A	5.14	N/A

Su4	Efficient activation routines	0.01	0.00	0.00
Su5	Fresh water activation/flushing	0.66	0.07	0.04
Su6	CCTV	4.78	0.59	0.34
Su7	CCTV + Remote control	5.33	0.65	0.36
Cont1	Ban/closure of side & end openings (closed and open ro-ro spaces)	4.33	2.83	15.14
Cont2	Fire monitors on weather deck	0.27	0.13	0.09

6 Based on the results of the FIRESAFE studies and the comments received by the FSA Experts Group, it is suggested to consider any retroactive implementation of RCOs on a case-by-case basis. Regarding specifically the ban/closure of side openings for ro-ro spaces, it was found that the relevant costs were too high to justify such mandatory measures for existing ships, although it would be strongly recommended to operators to review their ship designs and minimise openings as far as practicable, also in order to provide safe distances to LSA.

### **Ban/closure of side and end openings**

7 For newbuildings, the RCOs suggesting the banning of side and end openings is arguably the most important one in terms of risk reduction and impact. This RCO was found cost-effective only for the “ferry RoPax” type i.e., those RoPax with limited openings in their current designs and a high number of persons onboard.

8 It was also found that the relative risk reduction was above 30% for both the “standard” and “ferry” RoPax categories being the RCO with the highest risk reduction for the “ferry RoPax”, while for the “cargo” RoPax it was above 15% although in this case it translates mainly to the closure of the aft-end opening. It should be noted that the assumptions made to estimate the cost of implementing this RCO on Standard RoPax (not considering any major change on ship design to accommodate for the loss of cargo due to the closure of the side openings) were highly influential on the cost effectiveness results (high recurring costs for 40 years instead of a significant investment cost).

9 Finally, as also noted in SSE 6/6/1, this RCO was identified in the accident investigation report of the Norman Atlantic as a safety recommendation, which in combination with these levels of relative risk reduction suggest that the RCO should be considered for mandatory implementation on newbuildings.

### **Combined heat and smoke detection**

10 The intent of this RCO is to ensure that both heat elevation and smoke would trigger fire detection. The RCO assessment in FIRESAFE II was carried out considering conventional combined heat and smoke detectors. It should be noted that this RCO was deemed to be highly cost effective for all categories of new and existing ships except for the existing “cargo ropax” due to the extent of closed ro-ro spaces in combination with a relatively low number of persons onboard.

11 It should be further noted that two key interpretations are associated with the main regulation affected, SOLAS II-2/20.4.1; the appropriate text proposals are included in the Annex.

12 Finally, the study also recommends, following an extensive analysis, the removal of the possibility of exemption of a fixed fire detection and fire alarm systems in SOLAS II-2/20.4.3.1 in case an efficient fire patrol system is in place.

### **Decision related RCOs**

13 In relation to the RCO related to the alarm system and design, which is already included in the Interim guidelines, it was deemed to be highly cost effective for all categories of new and existing ships except for the existing “cargo RoPax”.

14 Similarly, regarding the RCO on signage and markings in the ro-ro spaces, already included in the Interim Guidelines, it was deemed to be highly cost effective for all categories of ships.

15 It is suggested, therefore, to consider both proposals for inclusion in the FSS Code and SOLAS respectively as described in the Annex.

### **Fire monitors on weather decks**

16 It should be noted that this RCO was deemed to be highly cost-effective for all categories of RoPax. The purpose of this RCO is to require fire monitors on weather decks intended for the carriage of vehicles to extinguish or contain a fire and to cool down adjacent boundaries to limit structural damage.

17 At the same time, during the discussions in the FP WG at SSE 6, several opinions were expressed towards introducing technology-neutral text in the Interim Guidelines. The consideration in the Annex for SOLAS modification is drafted in this way, whereas specific requirements on fire monitors are suggested to be added in the FSS Code.

### **Distance between LSAs and openings**

18 SOLAS regulation II-2/20.3.1.5 requires that “permanent openings in the side plating, the ends or deckhead of the space shall be so situated that a fire in the cargo space does not endanger stowage areas and embarkation stations for survival craft [...]”. However, this regulation is open for different interpretations as neither detailed requirements nor guidelines are available to ensure that the requirements are met. Until the FIRESAFE II study there was no research performed investigating and defining a safe distance between openings and LSAs.

19 In order to determine a safe distance which should be an optimal minimum distance to keep LSAs available and usable in case of fire in a ro-ro space, an investigation has been performed in FIRESAFE II using numerical (CFD) simulations and analytical calculations. The numerical simulations were used to evaluate side openings and analytical calculations were used to evaluate openings in the aft of a ship. These analyses used incident radiant heat fluxes from flames exiting from openings of ro-ro spaces where a fire is developing. The results were used to determine such a distance between openings and LSAs taking into account the fire integrity of LSAs and the impact of smoke.

20 The chosen criterion of a maximum radiant heat flux of 5.0 kW/m<sup>2</sup> was based on the lowest value in the range of critical heat flux for the materials typically used in LSAs, divided by

a safety factor of 2. Some LSAs (e.g. lifeboats), however, include an embarkation station for passengers. For such LSAs, the previous criterion cannot be used. A radiant heat flux higher than 2.5 kW/m<sup>2</sup> is critical and harmful for persons without thermal protection (SFPE, 2002) and is a life-safety criterion stated in MSC.1/Circ.1552 (amendment to MSC/Circ.1002). Hence, two criteria based on radiant heat flux exposure were proposed.

- 21 Based on the above described criteria, the study concluded that:
- LSAs should not be stored within 6m from a side opening to a ro-ro space, nor within 8m from a weather deck intended for the carriage of vehicles
  - During evacuation, passengers should not have to stand within 6m from a side opening to a ro-ro space nor within 12m from a weather deck intended for the carriage of vehicles.

22 The simulations performed were based on specific assumptions, e.g. that in relation to the distance from the aft end opening, a deck height of 5.5m metres was used; a lower deck height would result to a longer safe distance, while a higher deck to a shorter one. Otherwise, alternative fire protection arrangements might be used for the LSAs reaching equivalent safety standards.

23 This analysis suggests that current common practices on this issue have led to designs where a fire in a ro-ro space near to openings will most probably render LSAs inoperable.

24 Taking also into account the possibility of banning openings for newbuildings, it is hereby suggested to take the findings of the FIRESAFE II study into consideration and introduce them in SOLAS regulation II-2/20.3.1.5. If equivalent arrangements are foreseen (i.e. in the suggested II-2/20.3.1.5.2), dedicated Guidelines following the safety criteria of FIRESAFE II should be developed.

### **CCTV in ro-ro spaces**

25 The intent of this RCO is to require CCTV video cameras to be installed in ro-ro spaces as a complement to conventional fixed fire detection and fire alarm systems, in order to provide fire confirmation and detailed information at the bridge in case of fire. It should be noted that it was found to be cost-effective for new and existing “standard and ferry RoPax”.

26 The option to replay the video on demand in case of a fire alarm is a key point, since at the time when the fire alarm is activated, smoke may already obscure video images. Furthermore, the recording capability should also be included.

### **Fire detection system for weather deck**

27 Currently, SOLAS requires a fixed fire detection and fire alarm system to be fitted in all ro-ro spaces apart from weather decks. One of the main issues with weather decks is that conventional fixed detection systems are normally not effective. FIRESAFE II showed that there is at least one cost effective RCO that could provide a significant risk reduction by detecting fires on weather decks.



28 Available and emerging fire detection technologies were evaluated in FIRESAFE II, including a real test on-board a ship of a thermal imaging system. Following the tests where the risk reduction was quantified, the selected RCO was found to be cost effective for all categories of ships investigated.

29 It is also recognised that dedicated guidelines or an approval standard would need to be developed to cover fire detection systems for weather decks intended for the carriage of vehicles. Such guidelines could be either performance-based, i.e. specifying verification tests to be performed to ensure sufficient performance (e.g. including detection of a fire hidden by a container, detection of a fire as far as possible from the detector, etc.) or prescriptive requirements (i.e. specifying a technology such as thermal imaging cameras as well as technical and spacing requirements, etc.).

### **Heat detection systems**

30 During the FIRESAFE II study a linear heat detection system was tested in the open ro-ro space of a ro-ro passenger ship, where also a conventional heat and smoke detection system was installed. During the tests the alarm of the linear heat detection system was always activated before the conventional system, which in several cases was not activated at all.

31 It should be noted that the fibre optic system used a detection criterion based on a rate of temperature rise instead of a given threshold temperature (the criterion used in the tests was a temperature rate of rise of 14°C within 120 s).

32 Based on these tests, a risk reduction of detection failure was shown. The Fibre optic linear heat detection system was found cost-effective for Standard and Ferry RoPax (existing and newbuildings) and should therefore be considered as a feasible alternative.

### **Prevention measures related to cables and connections**

33 Since extensive discussions have already taken place on these items, it may be considered that the text adopted in the Interim Guidelines is probably the most broadly accepted on these issues. At the same time, it is recognised that further work needs to take place on these items because some of them may not be suitable for mandatory implementation.

34 It should also be noted that there was also a dedicated submission (SSE 5/7/2) where some of these measures were proposed as amendments to SOLAS or relevant instruments. The main reason for such amendments is the fact that at the time of the FIRESAFE I study it was found that electrical faults in vehicles and cargo units connected to the ship represent a significant percentage of the total number of fires, accounting for approximately 1 in 5 fires on ro-ro decks of passenger ships (19.3%).

35 The items suggested in the Annex are extracted from the Interim Guidelines with minor amendments.

### **Strengthening of the requirement for elimination of sources of ignition**

36 Similar to the previous item, the majority of these issues have already been discussed in previous sessions of SSE and the items suggested in the Annex are extracted from the Interim Guidelines with minor amendments.

### **Addressable fixed fire detection and alarm systems**

37 Similar to the previous item, the majority of these issues have already been discussed in previous sessions of SSE and the items suggested in the Annex are extracted from the Interim Guidelines with minor amendments. It should be noted that the point in the Interim Guidelines on the application of individually addressable detectors on existing ships has been removed.

### **Extinguishment**

38 Similar to the previous item, several of these issues have already been discussed in previous sessions of SSE and the items suggested in the Annex are extracted from the Interim Guidelines with minor amendments. However, in this case some additional proposals are included addressing issues that have been identified mainly in accident investigation reports, as reported in SSE 6/6/1.

### **Containment**

39 Similar to the previous item, this issue has already been discussed in previous sessions of SSE and the item suggested in the Annex is extracted from the Interim Guidelines. Currently, SOLAS does not require any fire insulation horizontally between ro-ro spaces of the same type. There have been many examples of ro-ro ship fires where the fire has spread to the deck above due to heat transfer through the ro-ro deck structure. The requirement for at least A-30 fire insulation instead of A-0 between ro-ro spaces will avoid or at least delay fire spread between ro-ro spaces.

### **Definitions**

40 While it is understood that the definitions of ro-ro spaces, open-ro-ro spaces, special category spaces and weather deck is a secondary aspect of this agenda item, it should however be highlighted that the comments and proposals provided in the Annex 3 of SSE 6/6 on a possible revision of SOLAS II-2/3 are significant and are considered to improve the current text.

41 It is hereby suggested that these comments and proposals are further taken into consideration as they may have significant safety implications. [It should be noted in particular, that recent research has shown that openings to the sides of a ro-ro space, these shall be reduced to at least 4% in order to not be considered as open.]

### **Other issues**

42 It has been noted that there is a duplication related to fire integrity standards that should be deleted. For ships carrying more than 36 passengers, the text included in SOLAS II-2/9.6.1 is duplicated in SOLAS II-2/20.5. Accordingly, it is suggested to delete SOLAS II-2/9.6.1.

43 Regulations SOLAS II-2/20.6.1.4 and 20.6.1.5 refer to MSC.1/Circ.1320, where the specific requirements for drainage and blockage avoidance are included. In principle, open ro-ro spaces are not within the scope of that Circular, even though the main objective of the Guidelines is the prevention of accumulation of large quantities of water coming from fixed fire fighting systems. Considering that open ro-ro spaces are also required to have fixed fire-fighting systems, it is suggested to extend the scope of the Guidelines to include open ro-ro spaces.

44 For the same reasons indicated in the previous paragraph, it is suggested to delete the word “closed” in regulation SOLAS II-2/20.6.1.5.

45 It is hereby suggested that these comments and proposals are further taken into consideration as they may have significant safety implications.

### **Discussion**

46 In the previous paragraphs, a number of items have been briefly analysed. These items are expected to minimise risk stemming from fires on ro-ro decks of passenger ships and are, in their vast majority, part of the Interim Guidelines and/or the FIRESAFE II study proposals presented SSE 6/6/2.

47 Following the issues presented in this document and the analysis and comments of the FSA Experts Group on the FIRESAFE studies, it is hereby suggested to consider the text proposals found in the Annex of this submission as a basis for further technical discussions.

### **Action requested of the Sub-Committee**

48 The Sub-Committee is invited to consider paragraph 47 above and take action as appropriate.

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## ANNEX

It is suggested to discuss the following items as the basis for text amendments in SOLAS or the FSS Code to reduce the risk of fire in passenger ship ro-ro and special category spaces:

### 1. Retroactivity

In case it is decided to make these requirements also applicable to existing ships, the following requirement should be added in SOLAS II-2/1.2

2.9 Ships constructed before XXX\* shall comply with regulations [...] not later than the first renewal survey on or after YYY\*

\*XXX Date of entry into force of the amendments for newbuildings

YYY Date by which existing ships would have to comply with the new requirements.

Note: The requirements to be included in FSS Code are not covered by this proposal, and indeed, it is not deemed practical to ask for retroactive application of the requirements given in 13.2.3. Should they need to be considered retroactive too, it could be proposed to include the following paragraph in FSS Code Chapter 1, after existing 1.3:

1.4 Ro-ro passenger ships the keels of which were laid, or which were at a similar stage of construction before XXX shall comply shall comply with requirements [9.2.5.1.2 & 9.2.5.1.3] not later than the first renewal survey on or after YYY

### 2. Ban/closure of side and end openings

It is suggested to include the following requirement in SOLAS II-2/20.2:

2.2.4. Vehicle spaces and ro-ro spaces are to be either closed spaces or weather decks. [If some openings are needed for practical purposes, rolling shutters (A-0 fire rated) with remote control from a safe location, that in the event of a fire can be closed from outside the space, should be provided for them]

### 3. Combined heat and smoke detection

It is suggested to amend SOLAS II-2/20.4.1 as follows:

4.1 ~~Except as provided in paragraph 4.3.1,~~ There shall be provided a fixed fire detection and fire alarm system complying with the requirements of the Fire Safety Systems Code. On passenger ships, the fixed fire detection and fire alarm system shall provide smoke and heat detection throughout vehicle, special category and ro-ro spaces; on cargo ships, the type of detectors shall be to the satisfaction of the Administration. The fixed fire detection system shall be capable of rapidly detecting the onset of fire. ~~The type of detectors and their spacing of the detectors and their location~~ shall be to the satisfaction of the Administration, taking into account the effects of ventilation and other relevant factors. [...]

The wording and location requirement are in line with those used in SOLAS II-2/7.5.2 to require smoke detectors in the accommodation, service spaces and control stations of passenger ships. The deletion of the reference to paragraph 4.3.1 is related to the exemption from the installation of the fire detection system if the fire patrol system is maintained.

4.3.1 An efficient fire patrol system shall be maintained in special category spaces. ~~However, if an efficient fire patrol system is maintained by a continuous fire watch at all times during the voyage, a fixed fire detection and fire alarm systems is not required.~~

If it is decided to include a retroactive requirement addressing open ro-ro spaces, since this was found to be cost effective for existing ships, the text from the Interim Guidelines could also be used:

In open ro-ro spaces on all ro-ro passenger ships, if smoke detectors are installed they should be supplemented with other effective means of detection e.g. flame detectors, heat detectors.

IACS UI SC73 and an interpretation included in IMO MSC/Circ.1120. IACS UI SC73 states: *“The requirements for a fixed fire extinguishing system, fire detection, foam applicators and portable extinguishers need not apply to weather decks used for the carriage of vehicle with fuel in their tanks.”* This interpretation should remain valid and relevant with the amendment for consideration.

With respect to SOLAS II-2/20.4.1, IMO MSC/Circ.1120 clarifies that smoke detectors may be temporarily disconnected for e.g. loading/unloading sequences. The following amendment is suggested in order to clarify that heat detectors should not be disconnected under such circumstances. Indeed, one of the identified gains of having combined heat and smoke detection is to improve detection during loading/unloading sequences.

#### *Regulation 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 and heat detectors, if installed, should not be capable of being disconnected by the arrangements referred to above.*

#### **4. Decision related RCOs**

It is suggested to insert the following requirements in FSS Code Chapter 9, after existing §2.5.1.1, and the next requirements should be re-numbered accordingly:

2.5.1.2. In ro-ro passenger ships, alarm notifications shall follow a consistent alarm presentation scheme (wording, vocabulary, colour, position). Alarms shall be immediately recognisable on the bridge and shall not be compromised by noise or poor placing.

2.5.1.3. In ro-ro passenger ships, the interface shall provide alarm addressability, allow the crew to identify the alarm history, the most recent alarm and the means to suppress alarms while ensuring the alarms with ongoing trigger conditions are still clearly visible.

It is suggested to add the following requirement in SOLAS II-2/20.6:

6.1.6. In passenger ships, closed vehicle and ro-ro spaces and special category spaces, where fixed pressure water-spraying systems are fitted shall be provided with suitable signage and marking on deck and on the vertical boundaries allowing easy identification of the sections of the fixed fire-extinguishing system. Signage and markings shall be adapted to typical patterns of crew movement and shall not be obstructed by cargo or fixed installations. Section number signs shall be of photoluminescent material complying with ISO 15370. The section numbering indicated inside the space shall be same as section valve identification and section identification at the safety centre or continuously manned control station.

## 5. Fire monitors on weather decks

It is suggested to add the following requirement in SOLAS II-2/20.6, after the existing regulation II-2/20.6.1, and to renumber the following regulations accordingly:

### 6.2 Fixed fire-extinguishing measures on weather decks

Additional fire-extinguishing measures such as fire monitors and drainage systems shall be installed on weather decks intended for the carriage of vehicles. [In case fire monitors are installed, these shall comply with the provisions of the Fire Safety Systems Code]. Remotely controlled fire monitors may allow for safe operation of the monitors, but where suitable, manually operated fire monitors may also be used.

Accordingly, it is suggested to introduce a new subparagraph 2.5 in FSS Code Chapter 7:

### 2.5 Water monitors on weather decks of passenger ships

2.5.1 The arrangement, length and height of throw of the water monitors shall be sufficient to reach 90% of:

.1 The area intended for the storage of vehicles on the weather deck; and

.2 The area, including superstructure boundaries, located within [8m] measured horizontally from the area intended for vehicle storage.

2.5.2 The combined capacity of all water monitors shall be such as to provide an average coverage of 2L/min per square meter of protected area.

2.5.3 Where the ship's required fire pumps are used to feed the water monitors:

.1 It shall be possible to segregate the ship's fire main from the water monitors by means of a valve in order to operate both systems separately or simultaneously

.2 The capacity of the pumps shall be sufficient to serve both systems simultaneously

2.5.4 Where the pump dedicated to the fixed pressure water spraying system required by regulation of SOLAS Ch.II-2/20.6.1.2 is used to feed the water monitors, it shall be possible to segregate both systems by means of a valve and both systems need not be able to operate simultaneously.

2.5.5 Suitable scupper or freeing ports are to be provided to ensure efficient drainage of water accumulating on deck surfaces when the fire monitors are in operation. Discharge valves for scuppers shall be kept open while the ship is at sea.

Regarding the consideration above and especially in relation to a possible application to existing ships, additional considerations could be made:

- That a reduced coverage may be acceptable; e.g. 90% coverage recommended, minimum 70% mandatory
- The system capacity could be based on the existing drencher pump capacity and the layout of the deck. A fixed flowrate may be omitted.
- Existing monitor installations covering at least 50% of the area may not need to be replaced.

## 6. Distance between LSAs and openings

It is suggested to amend SOLAS regulation II-2/20.3.1.5 as follows:

### 3.1.5 *Permanent openings*

3.1.5.1 [Permanent openings in the side plating, the ends or deckhead of the space shall be so situated that a fire in the cargo space does not endanger stowage areas and embarkation stations for survival craft and accommodation spaces, service spaces and control stations in superstructures and deckhouses above the cargo spaces.][Permanent openings in the side plating, the ends or deckhead of the space of passenger ships shall not be permitted]

3.1.5.2 For [new and] existing ships, the following safety distances (measured horizontally) shall be kept to avoid jeopardizing life-saving appliances and embarkation stations in case of fire in ro-ro and special category spaces:

.1 survival craft and marine evacuation systems stowed and in a position to be deployed:

.1 more than 6 m from a cargo space side opening; and

.2 more than 8 m from cargo on weather deck; and

.2 survival craft embarkation stations and muster stations located:

.1 more than 6 m away from a cargo space side opening; and

.2 more than 13 m from cargo on weather deck.

.3 equivalent arrangements to the satisfaction of the Administration, providing at least the same level of protection could be considered.

## 7. CCTV in ro-ro spaces



It is suggested to include the following new requirement in SOLAS II-2/20.4:

#### 20.4.4 Video monitoring

4.4.1 For [new and existing] passenger ships, effective television surveillance systems shall be arranged in ro-ro and special category spaces for continuous video monitoring of these spaces and be provided with immediate playback capability to allow for quick identification of fire location, as far as practicable. Video cameras shall be installed alternately on each side of the deck and high enough to see over cargo and vehicles after loading.

4.4.2 The videos recorded by this television system shall be available for replay at a continuously manned control station or at the safety centre for at least [XX] hours and the correspondence between any one video camera and the section of the fixed fire-extinguishing system it is covering shall be clearly displayed close to the video monitor. Continuous monitoring of the video image by the crew needs not be ensured.

### 8. Fire detection system for weather deck

In relation to the consideration of fixed fire detection systems becoming mandatory on weather decks, the following modifications are suggested on SOLAS II-2/20.4.1:

#### 4.1 Fixed fire detection and fire alarm systems

4.1.1 Except as provided in paragraph 4.3.1, there shall be provided a fixed fire detection and fire alarm system complying with the requirements of the Fire Safety Systems Code in open and closed ro-ro and vehicle spaces. The fixed fire detection system shall be capable of rapidly detecting the onset of fire. The type of detectors and their spacing and location shall be to the satisfaction of the Administration, taking into account the effects of ventilation and other relevant factors. After being installed, the system shall be tested under normal ventilation conditions and shall give an overall response time to the satisfaction of the Administration.

4.1.2 A fixed fire detection and fire alarm system shall be provided for weather decks of passenger ships intended for the carriage of vehicles. The fixed fire detection system shall be capable of rapidly detecting the onset of fire anywhere on the weather deck. The type of detectors and their spacing and location shall be to the satisfaction of the Administration, taking into account the effects of ventilation, cargo obstruction and other relevant factors. Different settings may be used for specific operation sequences, such as during loading or unloading and during voyage, in order to reduce the false alarms.

Additionally, it was identified that the above consideration should also lead IACS to revise UI SC73 accordingly, possibly as per the below suggestion:

The requirements for a fixed fire extinguishing system, ~~fire detection~~, foam applicators and portable extinguishers need not apply to weather decks used for the carriage of vehicle with fuel in their tanks.

### 9. Heat detection systems

Currently, there is no regulation forbidding the use of a linear heat detection system for open or closed ro-ro spaces. However, it should be noted that such system is not considered in the FSS



Code, Ch 9, which covers the fixed fire detection and fire alarm system required by SOLAS II-2/20.4.1. It should also be noted that fibre optics / linear heat fire detection systems are covered by EN 54-22, which is part of the EN 54 series, i.e. the reference approval standard for fire detectors as per the FSS Code, Ch 9 §2.3. Therefore, the following amendment of FSS Code Ch 9 §2.3.1.1 is suggested:

2.3.1.1 Detectors shall be operated by heat, smoke or other products of combustion, flame, or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration provided that, they are no less sensitive than such detectors. Detectors may be of point or linear type.

It was further noted that the FSS Code, Ch 9 §2.3.1.3 may also be considered applicable for linear heat detectors.

The following amendment of FSS Code, Ch 9 §2.4.2.2 may also be suggested as a complement:

2.4.2.2 The maximum spacing of point detectors shall be in accordance with the table below:

Table 9.1 - Spacing of detectors

Type of detector	Maximum floor area per detector (m <sup>2</sup> )	Maximum distance apart between centres (m)	Maximum distance away from bulkheads (m)
Heat	37	9	4.5
Smoke	74	11	5.5

The maximum spacing between two lines of a linear heat detection system shall not exceed 9 m. The spacing between a bulkhead and a line of a linear heat detection system shall not exceed 4.5 m.

The Administration may require or permit other spacing based upon test data which demonstrate the characteristics of the detectors. Detectors located below moveable ro-ro decks shall be in accordance with the above.

The FSS Code, Ch.9 §2.3.1.3 requires that heat detectors are type tested according to EN 54-5:2001, which includes several criteria for detectors, including a maximum application temperature criterion and a rate of temperature rise criterion. However, the FSS Code in Ch.9 §2.3.1.3 specifically states that the temperature range (54-78°C) in which fire detectors should detect fire only applies “when the temperature is raised to those limits at a rate less than 1°C per min”. This is a very slow temperature rise and means that only a fixed temperature criterion must be considered. To include a requirement to also consider the rate of temperature rise, the following amendment of FSS Code Ch 9 §2.3.1.3 was foreseen:

2.3.1.3 Heat detectors shall be certified to operate before the temperature exceeds 78°C but not until the temperature exceeds 54°C, when the temperature is raised to those limits at a rate less than 1°C per min, and within the response limits defined in Table X for the rate of temperature rise, when tested according to standards EN 54:2001 and IEC 60092-505. Alternative testing standards may be used as determined

by the Administration. At higher rates of temperature rise, the heat detector shall operate within temperature limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or oversensitivity.

For the purpose of defining “Table X” and the range of response limits to be required for the added rate of temperature rise criterion of heat type fire detectors, reference can be made to “Table 4” in clause 5.4 of EN 54-5:2001, here reproduced in Table 28. However, it should be noted that the upper limits in this table may need to be lowered to ensure quick detection based on the rate of temperature rise but may not be suitable to apply directly as a criterion.

**Table 28. Response time limits for the rate of temperature rise of different classes of heat type fire detectors**

Rate of rise of air temperature  K min <sup>-1</sup>	Class A1 detectors				Class A2, B, C, D, E, F & G detectors			
	Lower limit of response time		Upper limit of response time		Lower limit of response time		Upper limit of response time	
	min	s	min	s	min	s	min	s
1	29	0	40	20	29	0	46	0
3	7	13	13	40	7	13	16	0
5	4	9	8	20	4	9	10	0
10	1	0	4	20	2	0	5	30
20		30	2	20	1	0	3	13
30		20	1	40		40	2	25

It was further noted that the FSS Code, Ch 9 §2.3.1.3 may be considered applicable for linear heat detectors. However, it should be noted that Table 28 comes from EN54-5 which is dedicated to point heat detectors, while no equivalent table is found in EN54-22, applicable for fibre optics linear heat detection. The criteria and test definition may thus need to be adapted for linear heat type fire detectors.

## 10. Prevention measures related to cables and connections

The items below are extracted from the interim Guidelines and should be further discussed for a possible mandatory implementation. The numbering below follows the Interim Guidelines, however these items should be considered as suggestions for SOLAS amendments, possibly as additions to SOLAS II-2/20.3.2.

### 1.1 Inspection of ship's power supply equipment and cables

1.1.1 Electrical cables, sockets, and their associated equipment in ro-ro and special category spaces intended for power supply to vehicles or cargo units shall be inspected, in principle prior to their use, by trained crew or other trained personnel according to an established procedure.

1.1.2 Non-ship cables provided and connected by drivers present an increased risk of overheating or short circuit; therefore, only ship power supply equipment and cables shall be used.

### **1.2 Maintenance plan for electrical cables and their sockets in ro-ro and special category spaces intended for power supply to vehicles or cargo units**

A maintenance plan shall be developed for electrical cables, sockets, and their associate equipment in ro-ro and special category spaces intended for power supply to vehicles or cargo units.

### **1.3 Electrical cables**

1.3.1 In addition to SOLAS regulation II-1/45.5.1 to .6, electrical cables intended for power supply to vehicles or cargo units that may be damaged by vehicles or cargo units during loading and unloading operations shall be suitably protected, even when armoured, unless the ship's structure provides adequate protection. The arrangement shall be sufficiently protected against corrosion and effectively earthed.

1.3.2 When not in use, electric cables intended for power supply to vehicles or cargo units shall be [disconnected and] stored in a way that they cannot be damaged by loading/unloading operations.

### **1.4 Shock/waterproof rating of electrical connections**

1.4.1 In addition to SOLAS regulation II-2/20.3.2, sockets shall be provided with a degree of protection of at least IP56 in accordance with standard IEC 60529.

1.4.2 The socket shall be provided with means to maintain the same degree of protection after the plug is removed from the socket. Where a loose cover is used for this purpose, it shall be anchored to its socket, for example by means of a chain.

### **1.5 Circuit breakers**

The electrical system shall detect potentially detrimental loads or earth faults, so that the affected socket will be isolated.

### **1.6 Electrical connections and disconnections of cargo units and electrical vehicles**

Only trained personnel or other persons under the supervision of ship's crew shall perform the electrical connection and disconnection of cargo units and electrical vehicles.

### **1.7 ~~Check points at patrols~~ Portable thermal imaging devices**

~~1.7.2~~ Portable thermal imaging devices shall be used for screening during fire rounds and upon suspicion to detect hot areas and overheated electrical equipment.

## **11. Strengthening of the requirement for elimination of sources of ignition**

The items below are extracted from the interim Guidelines and should be further discussed for a possible mandatory implementation. The numbering below follows the Interim Guidelines,

however these items should be considered as suggestions for SOLAS amendments, possibly as additions to SOLAS II-2/20.3.4.

1.8.1 The company should establish a fire-fighting plan that, in particular, identifies any risks specific to alternatively powered vehicles, including battery-powered vehicles, and outlines the most appropriate fire-fighting techniques for such vehicles. The company shall ensure adequate training and good access to any specialized fire-fighting equipment for alternatively powered vehicles.

1.8.2 During voyages when vehicles powered by compressed natural gases or hydrogen are carried, the hazards associated with accumulation of flammable gases and gases lighter than air under ceilings, need to be identified and measures as appropriate shall be taken.

1.8.3 [Pipes with combustible liquid, such as hydraulic oil shall be protected from damage. Combustible liquid from a damaged pipeline in contact with a source of ignition, for example, a refrigerating unit of a truck working during the voyage, can cause a fire.] [For new and existing passenger ships, pipes of combustible hydraulic oil systems and systems with liquid fuel/ oil under pressure joint by connections other than welding, installed under the ceiling of vehicle, ro-ro and special category spaces, shall be protected by a steel cover against damage caused by fire of vehicles carried in these spaces]

## **12. Addressable fixed fire detection and alarm systems**

The items below are extracted from the interim Guidelines and should be further discussed for a possible mandatory implementation. The numbering below follows the Interim Guidelines, however these items should be considered as suggestions for SOLAS amendments, possibly as additions to SOLAS II-2/20.4.

2.1.2 If a fixed water-based deluge system is used for ro-ro spaces and special category spaces then a fire detection and alarm system addressable to the same sections of the deluge systems shall be arranged.

2.1.3 In the design of the fire detection alarm system, it shall be designed with a system interface which provides logical and unambiguous presentation of the information, to allow a quick and correct understanding and decision-making. In particular, the alarm system section numbering shall coincide with the sections of other systems, such as fixed water-based fire-extinguishing system or television surveillance system, if available.

## **13. Extinguishment**

The items below are extracted from the interim Guidelines and should be further discussed for a possible mandatory implementation. The numbering below follows the Interim Guidelines, however these items should be considered as suggestions for SOLAS amendments, possibly as additions to SOLAS II-2/20.6.2.2 (item 3.1) a new SOLAS II-2/20.7 (items 3.2 & 3.3)

### **3.1 Additional fire-fighting equipment for ro-ro passenger ships**

Additional fire-fighting equipment shall be made available for prompt fire-fighting in all ro-ro spaces and special category spaces including at least [one][two] claw bar[s], [a

fog nail, a portable IR-camera and firefighters outfits suitable for fighting fires with AFVs].

### **3.2 Appropriate training and drills**

3.2.1 Relevant crew members shall be trained on fire-fighting strategies and risks associated with alternatively powered vehicles such as battery or gas driven vehicles.

3.2.2 Relevant crew members shall receive adequate training and conduct drills in order to be familiar with the specific arrangements of the ship, as well as the location, operation, and limitations of the fire-fighting systems and appliances that they may be called upon for use in ro-ro spaces and special category spaces.

3.2.3 Decision-making at the early stages of a fire in a ro-ro space shall be explicitly included in recurring training and onboard drills. Training shall enable all relevant personnel to act in the case of fire and be varied to reflect different combinations of personnel available at the time of a fire alarm, while ensuring that crew actions are supported by sufficient competence and mandate.

### **3.3 Organizational preconditions for early activation of Drencher System**

The distribution of responsibilities in case of a fire shall be evaluated for sufficient redundancy to increase the likelihood of early drencher activation.

[In addition to the above, the following proposals are being made:

### **SOLAS II-2/13.5 Means of escape on passenger ships from special category and open ro-ro spaces to which any passengers carried can have access**

5.1 In the special category and open ro-ro spaces, to which any passenger may have access, the number and arrangement of escape routes both below and above the bulkhead deck shall be to the satisfaction of the Administration. Moreover, the safety of access to the embarkation deck must be at least equivalent to that provided for under paragraphs 3.2.1.1, 3.2.2, 3.2.4.1 and 3.2.4.2. Such spaces shall be provided with designated longitudinal walkways leading to the means of escape with a breadth of at least 600 mm, clearly marked on the space floor. The parking arrangements for the vehicles shall maintain the walkways clear at all times. On passenger ships with a length of 120 m or more, or having more than three main vertical zones, special category spaces and ro-ro spaces, shall also be provided with transverse walkways from side to side of the space with a breadth of at least 600 mm spaced 40 m and clearly marked on the space floor.

**Paragraph 3.2 of Annex to MSC.1/Circ.1430 – should be amended as follows:**

The section valves shall be also remotely controlled from a continuously manned control station or from a safety centre. The control panel of these section valves should be provided with a pump start button and an indicator of open/close position of section valves.

**Paragraph 3.8 of Annex to MSC.1/Circ.1430 – should be amended as follows:**

However, systems requiring an external power source need only be supplied by the main power source. Systems requiring an external power source shall be supplied by the main and emergency source of power.]

**14. Containment**

The item below is extracted from the interim Guidelines and should be further discussed for a possible mandatory implementation. The numbering below follows the Interim Guidelines, however these items should be considered as suggestions for SOLAS amendments, possibly as a new SOLAS II-2/9.6.2:

**4.1 Fire integrity of ro-ro decks and decks in special category spaces**

The fire integrity of ro-ro decks separating ro-ro spaces should be at least A-30.