

SUB-COMMITTEE ON SHIP SYSTEMS AND
EQUIPMENT
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Agenda item 2

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DECISIONS OF OTHER IMO BODIES

General practice of IACS members regarding the arrangements of cargo/vapour piping and related gas-freeing piping/ducts on tankers

Submitted by IACS

SUMMARY

Executive summary: This document explains the general practice of IACS members regarding the arrangements of cargo/vapour piping and related gas-freeing piping/ducts on tankers, which is offered with a view to facilitating the consistent and global implementation of the relevant provisions in SOLAS, the IBC Code and the IGC Code

Strategic direction, if applicable: 6

Output: 6.4

Action to be taken: Paragraph 6

Related documents: III 5/4, III 5/14; MSC 101/24; III 6/2/Add.1, III 6/15; and SSE 7/2

Introduction

1 In document III 5/4 containing the report of the Correspondence Group on Analysis of Marine Safety Investigation Reports, a potential safety issue was identified in the fire incidents on board oil/chemical tankers **Liang Sheng**, **Royal Diamond 7** and **Border Heather**. In all three cases, cargo and/or cargo vapours were present in the forecastle spaces, which led to serious marine casualties. MSC 101 subsequently instructed SSE 7 to consider the issue and the relevant details provided by the Secretariat, for advice to the Committee, as appropriate (MSC 101/24, paragraph 10.5). III 6, having considered the report of the Working Group on Analysis of Marine Safety Investigation Reports (III 6/WP.3), agreed to complement the information to be provided to this session with the details of the safety issue regarding the presence of cargo vapours in non-hazardous closed spaces (III 6/15, paragraph 4.19 and annex 2).

Discussion

2 In annex 2 of III 6/15, it is stated that:

"In the case of the oil/chemical tanker **Liang Sheng** (C0009521), cargo vapours entered the forecastle stores, or bosun's stores, via cargo piping connected to a pipe that extended from the forecastle stores' ventilation ducting to the cargo deck; the purpose of the line being to evacuate gas from the vessel's cargo tanks using the ventilation fan"; and

"In the cases of the 2008-built oil/chemical tanker **Royal Diamond 7** (C0008579) and the 2004-built oil/chemical tanker **Border Heather** (C0006331), cargo vapours entered the forecastle stores when the gas evacuation line was connected to the cargo piping. The cargo vapours entered the forecastle stores through openings in the supply duct for the gas extractor fan."

3 From the official investigation reports, the reasons for these incidents are given as:

.1 On board **Liang Sheng**, unauthorized ventilation pipes were fitted and connected to the cargo system by spool pieces. "In this incident, the two ventilation pipelines have been connected to the cargo lines before the fan was started. Through these ventilation pipelines, the LAB vapour might have spread into the forecastle store room".

.2 On board **Border Heather**, the gas-freeing fan was located in the gas-freeing fan room located in the forecastle area and the gas-freeing piping was permanently connected to the main cargo lines. "The safe operation of the system relied on the operators closing the isolating valves on every occasion, when the system was shut down, it further relied on these valves not leaking. In the event of human error, resulting the isolating valves being left open, the only device that could maintain the system's integrity was the non-return valve between the two systems. Failure of this valve could then, while loading cargo, result in leakage of cargo into the gas-freeing room".

4 In this regard, the Sub-Committee is advised, as follows, regarding the general practice of IACS members: the cargo piping systems are confined within cargo areas; the cargo tank venting systems are confined within cargo areas; and the gas-freeing fan(s)/blower(s), as well as relating air supplying piping/ducts, may be located outside of cargo areas with some limitations on their arrangement and operation.

5 Taking into account the foregoing, IACS has developed a document explaining the general practice of IACS members regarding the arrangements of cargo/vapour piping and related gas-freeing piping/ducts on tankers, a copy of which is provided in the annex to this document.

Action requested of the Sub-Committee

6 The Sub-Committee is invited to consider the foregoing and the IACS members' general practice, as set out in the annex, and decide, as appropriate.

ANNEX

GENERAL PRACTICE OF IACS MEMBERS REGARDING THE ARRANGEMENTS OF CARGO/VAPOUR PIPING AND RELATED GAS-FREEING PIPING/DUCTS ON TANKERS

This general practice is related to the following provisions in SOLAS, the IBC Code and the IGC Code:

SOLAS regulation II-2/4.5.6.1

5.6.1 Arrangements for purging and/or gas-freeing shall be such as to minimize the hazards due to dispersal of flammable vapours in the atmosphere and to flammable mixtures in a cargo tank.

SOLAS regulation II-2/16.3.2.1 and II-2/16.3.2.2

3.2.1 When the ship is provided with an inert gas system, the cargo tanks shall first be purged in accordance with the provisions of regulation 4.5.6 until the concentration of hydrocarbon vapours in the cargo tanks has been reduced to less than 2% by volume. Thereafter, gas-freeing may take place at the cargo tank deck level.

3.2.2 When the ship is not provided with an inert gas system, the operation shall be such that the flammable vapour is discharged initially through:

- .1 the vent outlets as specified in regulation 4.5.3.4;
- .2 outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas-freeing operation; or
- .3 outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 20 m/s and which are protected by suitable devices to prevent the passage of flame.

IBC Code, sections 3.1.2 and 3.1.4

3.1.2 Cargo piping shall not pass through any accommodation, service or machinery space other than cargo pump-rooms or pump-rooms.

3.1.4 If cargo piping systems or cargo ventilation systems are to be separated, this separation may be achieved by the use of design or operational methods. Operational methods shall not be used within a cargo tank and shall consist of one of the following types:

- .1 removing spool-pieces or valves and blanking the pipe ends;
- .2 arrangement of two spectacle flanges in series, with provisions for detecting leakage into the pipe between the two spectacle flanges.

IBC Code, section 3.5.3

3.5.3 Bilge pumping arrangements for cargo pump-rooms, pump-rooms, void spaces, slop tanks, double-bottom tanks and similar spaces shall be situated entirely within the cargo area except for void spaces, double-bottom tanks and ballast tanks where such spaces are separated from tanks containing cargo or residues of cargo by a double bulkhead.

IBC Code, section 8.6.1

8.6.1 The arrangements for gas-freeing cargo tanks used for cargoes other than those for which open venting is permitted shall be such as to minimize the hazards due to the dispersal of flammable or toxic vapours in the atmosphere and to flammable or toxic vapour mixtures in a cargo tank. Accordingly, gas-freeing operations shall be carried out such that vapour is initially discharged:

- .1 through the vent outlets specified in 8.3.4 and 8.3.5; or
- .2 through outlets at least 2 m above the cargo tank deck level with a vertical exit velocity of at least 30 m/s maintained during the gas-freeing operation; or
- .3 through outlets at least 2 m above the cargo tank deck level with a vertical exit velocity of at least 20 m/s which are protected by suitable devices to prevent the passage of flame.

When the flammable vapour concentration at the outlets has been reduced to 30% of the lower flammable limit and, in the case of a toxic product, the vapour concentration does not present a significant health hazard, gas-freeing may thereafter be continued at cargo tank deck level.

IGC Code (resolution MSC.370(93)), section 5.2.2.1

5.2.2.1 Any piping system that may contain cargo liquid or vapour shall:

- .1 be segregated from other piping systems, except where interconnections are required for cargo-related operations such as purging, gas-freeing or inerting. The requirements of 9.4.4 shall be taken into account with regard to preventing back-flow of cargo. In such cases, precautions shall be taken to ensure that cargo or cargo vapour cannot enter other piping systems through the interconnections;
- .2 except as provided in chapter 16, not pass through any accommodation space, service space or control station or through a machinery space other than a cargo machinery space;
- .3 be connected to the cargo containment system directly from the weather decks except where pipes installed in a vertical trunkway or equivalent are used to traverse void spaces above a cargo containment system and except where pipes for drainage, venting or purging traverse cofferdams;
- .4 be located in the cargo area above the weather deck except for bow or stern loading and unloading arrangements in accordance with 3.8, emergency cargo jettisoning piping systems in accordance with 5.3.1, turret compartment systems in accordance with 5.3.3 and except in accordance with chapter 16; and

- .5 be located inboard of the transverse tank location requirements of 2.4.1, except for athwartship shore connection piping not subject to internal pressure at sea or emergency cargo jettisoning piping systems.

General Practice

For tankers, all cargo piping (including cargo tank venting piping, relief valve discharge piping, cargo tank purging and gas-freeing piping/ducts) except for bow or stern loading and unloading arrangement, should be arranged within the cargo areas, as defined in SOLAS regulation II-2/3.6, section 1.3.6 of the IBC Code and section 1.2.7 of the IGC Code, and meet other related requirements in SOLAS, the IBC Code and the IGC Code. However, gas-freeing air-supply fan(s)/blower(s) and related air-supply piping/ducts may be located in the forecandle area, outside of the cargo area, subject to the following:

- .1 the air-supply piping/ducts should not be permanently connected to cargo piping or cargo tank venting piping/ducts and;
 - .1 the connection should be made with detachable connections (e.g. spool pieces, detachable ducts/hoses, etc.) and shut-off valves or dampers;
 - .2 a shut-off valve/damper should be fitted at the fan/blower side, with a shut-off valve/damper and a non-return valve at the cargo side;
 - .3 the shut-off valve or damper at the fan/blower side should be open after air-supply fan(s)/blower(s) is/are started;
 - .4 the shut-off valve or damper at the fan/blower side should be automatically closed when air-supply fan(s)/blower(s) is/are stopped;
 - .5 when the air-supply duct is arranged penetrating through forecandle space bulkhead, the shut-off valve should be fitted directly on the bulkhead; and
- .2 the air-supply piping/duct, from air inlet of the fan(s)/blowers till the connection to detachable duct, hose, or spool pieces, as well as its air intake, should be arranged out of cargo area and in gas safe areas; and the air intake should be directly led from weather deck;
- .3 when not being used in gas-freeing operation, such a connection (detachable duct, hose, or spool pieces) should be dismantled, with all the openings closed with blank flanges; and a warning plate should be provided at vicinity of each opening, stating "This opening is to be closed with blank flange when not in gas-freeing operation";
- .4 the air-supply fan(s)/blower(s), as well as the associated piping/ducts, should not be used for any other purpose;
- .5 the air-supply fan(s)/blower(s) should be of non-sparking type, as per IACS UR F29;

- .6 electrical motor(s) driving the air-supply fan(s)/blower(s) should be of the explosion-proof type when fitted in the duct;
- .7 suitable and clear operational procedures should be provided stating, *inter alia*:
 - .1 the flexible hose, detachable duct or spool piece can only be connected and fixed to the piping/duct just or within 10 minutes before the gas-freeing operation; and
 - .2 the shut-off valves or dampers can only be opened after the air-supply fan(s)/blower(s) are put into operation; and
- .8 for tankers only carrying oil and/or chemical non-toxic products with a flash point exceeding 60°C, the shut-off valve or damper does not need to be of the non-return type or the non-return valve is not necessarily to be provided; and the openings do not need to be closed with blank flanges.
