



Ship Inspection Report (SIRE) Programme

**Vessel Inspection Questionnaires for Oil Tankers,
Combination Carriers, Shuttle Tankers, Chemical
Tankers and Gas Tankers.
(VIQ 6)**

2014 Edition Rev 1.2

1st February, 2016

Record of Revisions to Draft

Rev No and Date	VIQ No	Revision
Rev 1 – 16 th March 2015	Intro section 4.1.1.6	Guide time of approx. 3 hours for documentation included.
Rev 1.2	Intro section	New point 7 in section 4 with respect to inspector rest hours and back to back inspections.
Rev 1 – 16 th March 2015	2.1	Additional mandatory guidance.
Rev 1 – 16 th March 2015	2.2	List of P&I Clubs updated.
Rev 1 – 16 th March 2015	2.4	Guidance amended to clarify definition of 'discipline'.
Rev 1.2 – 1 st Feb 2016	2.10	Question deleted
Rev 1.2 – 1 st Feb 2016	2.11	Question deleted.
Rev 1 – 16 th March 2015	3.3	Guidance note amended
Rev 1.2 – 1 st Feb 2016	3.3	Guidance note further amended.
Rev 1.2 – 1 st Feb 2016	3.5	Guidance note amended.
Rev 1.2 – 1 st Feb 2016	3.7	New guidance of definition of HV systems.
Rev 1 – 16 th March 2015	3.10	New last paragraph of guidance notes.
Rev 1 – 16 th March 2015	4.4/4.8	Guidance note at the end of 4.8 moved to 4.4
Rev 1 – 16 th March 2015	4.5	Typo.
Rev 1 – 16 th March 2015	4.12	Amendment to guidance.
Rev 1 – 16 th March 2015	4.18	Question Amended.
Rev 1.2 – 1 st Feb 2016	4.18	Question and guidance amended
Rev 1.2 – 1 st Feb 2016	4.19	Question and guidance amended
Rev 1 – 16 th March 2015	4.21	Question and guidance notes completely reworded.
Rev 1.2 – 1 st Feb 2016	4.21	Question and guidance amended
Rev 1 – 16 th March 2015	4.22	Amendment to Guidance
Rev 1.2 – 1 st Feb 2016	4.22	Question and guidance amended
Rev 1 – 16 th March 2015	4.25	Additional bullet point added with reference to Air draft.
Rev 1.2 – 1 st Feb 2016	4.25	Additional last para of guidance note
Rev 1 – 16 th March 2015	5.6	Yellow mandatory comment removed.
Rev 1.2 – 1 st Feb 2016	5.6	Guidance amended to remove duplication.
Rev 1 – 16 th March 2015	5.22	Guidance amended.
Rev 1.2 – 1 st Feb 2016	5.22	Guidance amended.
Rev 1 – 16 th March 2015	5.27	Guidance amended.
Rev 1 – 16 th March 2015	5.30	Correction to other question that was referenced, now 5.27 instead of 5.31
Rev 1 – 16 th March 2015	5.39	Revised question to include rescue boats, davit launched liferafts and free fall lifeboats. Amended guidance.
Rev 1 – 16 th March 2015	5.52	MSC/Circ reference updated.
Rev 1.2 – 1 st Feb 2016	5.61	Last sentence of guidance note amended
Rev 1.2 – 1 st Feb 2016	5.62	Second last paragraph of guidance amended.
Rev 1 – 16 th March 2015	6.30	The word 'Class' removed.
Rev 1 – 16 th March 2015	7.7	Amendment to guidance, to tie in cargo tank inspection frequency with Renewal/Intermediate surveys.
Rev 1 – 16 th March 2015	8.11 (Pet)	Question reference in parenthesis changed from 8.9 to 8.8.
Rev 1 – 16 th March 2015	8.16 (Pet)	Guidance amended to include line up verification.
Rev 1.2 – 1 st Feb 2016	8.38 (p)	Guidance included.
Rev 1.2 – 1 st Feb 2016	8.76 (p)	Guidance added.
Rev 1 – 16 th March 2015	8.83(p)	Guidance added concerning carriage of spare hoses where hoses are identical.
Rev 1 – 16 th March 2015	8.6 Chems	Guidance amended with reference to MEPC Circ2.

Rev 1 – 16 th March 2015	8.40 (chems)	Guidance to pressure testing amended to align with 8.21 petroleum.
Rev 1 – 16 th March 2015	8.49 (LNG)	Guidance amended to take into account of ships built before 1 st July 1986.
Rev 1 – 16 th March 2015	8.65 (LNG)	Question changed to 'No question assigned' as a duplicate of 8.53
Rev 1.2 – 1 st Feb 2016	8.70 (LNG)	Question and guidance amended, to change 'Interbarrier' to 'Insulation'.
Rev 1.2 – 1 st Feb 2016	8.74 LNG	Amendment to guidance to include IGC quotation.
Rev 1 – 16 th March 2015	8.119 (LNG)	Guidance amended to take into account vessels that use cargo hoses on a routine basis.
Rev 1.2 – 1 st Feb 2016	9.6	Amended guidance to include reference to snap-back.
Rev 1.2 – 1 st Feb 2016	9.22	Tonnage requirements amended to comply with MEG3 requirements.
Rev 1.2 – 1 st Feb 2016	11.47	Guidance amended for 220v earth readings.
Rev 1 – 16 th March 2015	Ch 12 STS Intro	Numbering of questions in introduction was incorrect, now amended.
Rev 1 – 16 th March 2015	Ch 12 Additional comments	Yellow highlighter section included.
Rev 1 – 16 th March 2015	13.2	Guidance note amended
Rev 1 – 16 th March 2015	Ch 13	Following questions highlighted 'Yellow' mandatory comments required. 13.4, 13.5, 13.7, 13.12, 13.15, 13.16, 13.18,

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SECTION 1

1.1 History of the SIRE Programme

In 1993, OCIMF established a Ship Inspection Report (SIRE) Programme, which enabled OCIMF members to submit their ship inspection reports to OCIMF for distribution to OCIMF members and certain qualifying non-OCIMF members.

Participation in the original programme, as either an inspecting OCIMF Member or a programme recipient, was strictly voluntary and each programme recipient determined independently how to evaluate the information contained in the reports received from OCIMF.

Under the SIRE Programme, the operator of any ship that is the subject of a report was given a copy of that report and the opportunity to submit written comments relating to the report, to both the inspecting OCIMF Member and to OCIMF.

Report recipients accessed the SIRE System Index by computer and this permitted the index to be viewed or downloaded. Programme recipients could order reports and any matching operator comments from the SIRE system. Reports and comments were transmitted by facsimile to the programme recipients' pre-registered facsimile numbers on request.

1.2 Revisions to the Programme

The original SIRE Programme was first revised in 1997 and introduced the means whereby programme recipients were able to receive reports and any operator comments electronically, as well as by facsimile.

Two major changes were also introduced in the 1997 Revised Programme. These were:

1. A Uniform Vessel Inspection Procedure; and,
2. A Vessel Particular Questionnaire (VPQ)¹

The SIRE Programme was again revised in 2000.

The 2004 revisions made further important changes to the inspection procedure whilst also adding numerous new vessel types that are inspected under the programme.² Collectively, these are referred to herein as "Vessels". Subsequent revisions updated the VIQ questions and guidance, but did not add any questions. This 2011 Edition substantially changed the focus of the VIQ to increase the emphasis of the inspection on navigation procedures and cargo and ballast handling operations. Consequently significant changes have been made in this edition. In 2013 a further major revision of the VIQ was undertaken.

1 Under the Original 1993 Programme, the inspecting OCIMF Member was free to choose whatever inspection protocol and report format it desired. In 1997, the Uniform Vessel Inspection Procedure changed this. The Vessel Particular Questionnaire was a newly developed OCIMF document, also introduced in 1997 and was not part of the original programme. The Vessel Inspection Questionnaire was further revised in 2000, and the Vessel Particulars Questionnaire was also revised in 2003 when a Harmonised Vessel Particulars Questionnaire (HVPQ) was introduced. Updated VIQs were published in 2004, 2005, 2008, 2009 and 2012.

2 The SIRE Programme was expanded in 2005 to include the inspection of barges carrying petroleum products, chemicals, or gas, or vessels used in the carriage of packaged petroleum products or gas, or road tankers carrying the same commodities. Towing vessels that are utilised in the handling of barges carrying the above listed products may also be inspected under the SIRE Programme. The inspection of these vessels and associated questionnaires are addressed in separate questionnaires.

1.3 Uniform Vessel Inspection Procedure

The programme requires that participating submitting companies follow a uniform **Vessel Inspection Procedure**. This procedure has an ***Inspection Element*** and a ***Report Element***.

The **Inspection Element** uses a series of detailed inspection questionnaires as appropriate for the type of vessel inspected. These questionnaires address issues associated with safety and pollution prevention. Inspectors who are employed, or contracted by submitting companies must (with certain exceptions) answer all these questions.

Questions are, in many cases, accompanied by guidance notes and/or references to source documents. Their purpose is to aid the Inspector's response.

The **Report Element** is developed from the completed electronic questionnaire that is submitted by the Inspector, either directly to the SIRE web site, or to the submitting company for further processing prior to transmission to the vessel operator and to SIRE.

SECTION 2

2.1 The Vessel Inspection Questionnaires, Inspector Manuals and VIQ Computer Programmes

The 3rd Edition revisions to the SIRE Vessel Inspection Questionnaires and their accompanying Inspection Reports introduced significant changes to the scope and presentation of the Programme.

These were:

1. The inspection of oil tankers (together with combination carriers and shuttle tankers), chemical carriers and gas carriers. Under the revised Programme, these vessels are categorised by size.
2. The inspection of barges carrying petroleum products, chemicals, or gas, or vessels used in the carriage of packaged petroleum products or gas or road tankers carrying the same commodities, and also towing vessels that are utilised in the handling of barges carrying the above listed products. Collectively, in the VIQ documents, the inspection questionnaires that are used are referred to as "Vessel Inspection Questionnaires" ("VIQs")
3. The key question and sub-question concept used in the 1st and 2nd Editions of the VIQ was discontinued in the 3rd and subsequent editions and replaced (except in a few cases) with individual questions. As in the case of previous editions, however, the "Yes" "No", "Not Seen" or "Not Applicable" responses are utilised.

2.2 Inspector Manuals (ROVIQs)

The Inspector Manuals (ROVIQs) were a new feature introduced with the SIRE revisions in 2000. The Manual reorganised the VIQ key questions and guidance notes to follow the order of the route that would normally be taken by an inspector in the course of an inspection³.

As in the case of the previous editions of the VIQ, Inspector Manuals (ROVIQs) will be used with this 2014 Rev 1.2 Edition that set out the questions into the approximate order that an inspector is likely to encounter them during the course of an inspection. Selection of the questionnaire to be used for each particular inspection is made using a "Vessel Selection Wizard" incorporated into the SIRE Report Editor Software programme. This Wizard requires a series of questions to be answered. When the Wizard is completed, the appropriate questionnaire can be printed in a number of different formats, or in the format of the Inspector Manual (ROVIQ). **These Questionnaires must be used during each inspection.** The inspection findings must be transferred from the pocketbook to the appropriate VIQ computer programme after the inspection is completed.

³ Each Inspector Manual (ROVIQ) is laid out on the assumption that an inspection takes the following course: a review of the vessel's Documentation, followed by an inspection of the Wheelhouse and Navigation, Communications, General external areas (including Mooring, Main Deck and Pumproom), Cargo Control Room, Engine and Steering Compartments and finally, the Accommodation.

SECTION 3

3.1 Using the SIRE Vessel Inspection Questionnaires (“VIQs”)

The inspection questionnaires used in this programme contain a series of questions related to safety and pollution prevention applicable to the type of vessel that is inspected. These questions are consecutively numbered and are logically grouped into separate chapters.

Each chapter contains a series of questions to be answered by the inspector. Questions *may* be accompanied by guidance, namely:

1. Guidance notes to inspectors;
2. Reference source(s) citing regulation(s) or industry guidelines pertaining to questions; and
3. An indicator to identify issues when an inspector comment is mandatory.

The above-mentioned guidance, regulatory/industry references amplify the questions and these are provided to assist the inspector to answer the questions.

If the guidance and references lead the inspector to conclude that the question should be answered positively, the box “**Yes**” in the VIQ computer programme should be checked. On the other hand, if the guidance and any reference sources indicate to the inspector that the question should be answered negatively, the “**No**” box should be checked.⁴ Where appropriate, the “**Not Seen**” or “**Not Applicable**” box should be ticked.

The inspector *must* respond to all the questions appropriate to the type of vessel being inspected. ***Failure to do this will mean that the inspection report cannot be transmitted to the SIRE Internet site for processing by the principal who commissioned the inspection.***

The inspector *must* insert an Observation when responding to any question where the response box is marked “**No**”. The Observation *must specify and explain* the reason why a negative response is made. Additionally, where a box is marked “**Not Seen**”, the reason for the “**Not Seen**” response *must* be given in the Observation section accompanying the question. In cases where a “**Not Applicable**” response is required, the “**Not Applicable**” response is treated in the same way as a “**Yes**” response and there is no requirement for the reason to be made in the Observations section accompanying the question. However, if, in the inspector’s judgment an explanatory comment is necessary, the inspector may make such comment in the “**Comments**” section accompanying the question ***provided such comment makes amplification to assist the understanding of a report recipient as to an issue associated with a specific question.*** In some cases, where the type of vessel being inspected results in one or more questions being not applicable to that type of vessel, the Report Editor is programmed to automatically answer those questions “**Not Applicable**”. In many cases, the question does not have a “Not Applicable” option.

For some questions, the inspector is required to comment irrespective of how the question is answered. This requirement is flagged in the printed VIQ by bold, highlighted, italic text in the guidance notes. In the electronic Report Editor software it is highlighted in yellow.

At the end of each chapter there is an **Additional Comments** section. If the inspector has additional comments in respect of subject matter that is not covered by the specific questions in the chapter, the inspector may make such comments in the Additional Comments section.

⁴ A few Questions do not have guidance, in such cases; the Inspector is required to make an unaided answer.

The above listed requirements are summarised below.

Box	Option	Response
Y	Yes	Tick “ Yes ” if, in the inspector’s professional judgement assisted by the guidance (if provided), a positive response can be made to the question. If, in the inspector’s judgement the Yes response requires to be amplified with further positive comments, the inspector may record such comments in the Comments box. Inspectors should keep in mind, that unless an unusual situation needs to be positively described, then a “ Yes ” response without comment is adequate.
N	No	Tick “ No ” if, in the inspector’s professional judgement assisted by the guidance (if provided), a negative response should be made to the question.
NS	Not Seen	Tick “ Not Seen ” if the issue addressed by a question has not been seen or checked by the inspector. The reason why the topic or issue was not seen must be recorded in the Observations box.
NA	Not Applicable	Tick “ Not Applicable ” if the subject matter covered by the question is not applicable to the vessel being inspected. In some cases, the “ Not Applicable ” response is made automatically within the software and is subject to the type of vessel being inspected. In other cases, a “ Not Applicable ” response is not provided to the question and only the “ Yes ”, “ No ” or “ Not Seen ” response options are available. If, in the inspector’s judgement the “ Not Applicable ” response requires to be amplified with further comments, the inspector may record such comments in the Comments box. If, in the inspector’s judgment an explanatory comment is necessary, the inspector may make such comment in the “ Comments ” section accompanying the question provided such comment makes amplification to assist the understanding of a report recipient as to an issue associated with a specific question.
	Observations and Comments	An Observation by the inspector is required for a “ No ” or “ Not Seen ” response. Where the question specifically calls for inspector comment irrespective of how the response box is checked, such comments are required to be recorded in the “ Comments ” section that accompanies the question. Inspectors are free to record comments even where a box is checked “ Yes ” provided such comment makes amplification to assist the understanding of a report recipient as to an issue associated with a specific question.
	Additional Comments	The Additional Comments section at the end of each chapter may be used to record comments in respect of the chapter that are <i>additional</i> to those which the inspector may make when responding to the specific questions.

3.2 VIQ Availability to Operators

Vessel operators, who require copies of the questionnaires set out in this programme, may obtain them directly from the www.ocimf.com web site at no cost to the vessel operator.

SECTION 4

Conduct of Inspections

4.1 Mandatory Inspection Requirements

The following mandatory inspection requirements **must** be followed by inspectors in the conduct of their shipboard inspection in order for reports to meet the requirements of the SIRE Programme:

4.1.1 General Requirements.

1. The inspector must introduce himself or herself to the Master or the Master's authorised deputy, explain the scope of the inspection and discuss the preferred order in which it will be carried out, prior to commencement of the inspection. Inspectors should co-operate fully to conduct the inspection in the order that will cause the least disruption to the vessel's operations. The inspector must be accompanied by a member of the ship's staff at all times during the course of the inspection.
2. The inspector must set a good example with respect to his or her own personal safety procedures whilst on board the vessel and in the terminal and must wear appropriate personal protection equipment at all times.
3. Electrical or electronic equipment of non-approved type, whether mains or battery powered, must not be active, switched on or used within any gas-hazardous or other hazardous areas. This includes torches, radios, mobile telephones, radio pagers, calculators, computers, photographic equipment and any other portable equipment that is electrically powered but not approved for operation in a gas-hazardous area. It should be borne in mind that equipment such as mobile telephones and radio pagers, if switched on, can be activated remotely and a hazard can be generated by the alerting or calling mechanism and, in the case of mobile telephones, by the natural response to answer the call. Any specific Terminal requirements must be adhered to.
4. Any Observations that the inspector intends to record in the VIQ must be pointed out and discussed 'on site' at the time with the member of the ship's staff assigned to accompany the inspector. This ensures that the nature of the Observations are fully understood and can also avoid extended discussion at the end of the inspection.
5. On completion of the inspection, some Submitting Companies require the inspector to provide a list of the inspection findings in the form of written observations, others do not. In either case, the inspector must discuss the inspection findings with the Master or the Master's authorised deputy before leaving the vessel. Other than to prepare these observations, however, the inspector must not remain on the vessel to complete the inspection report. It is recognised that on occasions this may not be possible, especially when leaving and joining the vessel is done by helicopter on vessels doing STS operations.
6. The guide time for an inspection as specified in 4.3.4 below is 8-10 hours and as a guide the documentation checks should not exceed 3 hours, and this time should be used to conduct the inspection of the vessel, compile the observation list if appropriate, and conduct the close out meeting. The completion of the report using the report editor software before the inspector leaves the vessel must not occur as this reduces the time that the inspector will spend conducting the physical inspection of the vessel. As specified in 4.1.1.5 above, the inspector must leave the vessel on completion of the inspection and must not remain on board to complete entering the report details into the report editor.
7. The guide time as specified below in 4.3.4 is 8-10 hours, however the actual time to conduct the inspection will be greater than this taking in account travel time to and from the vessel. All inspectors should take into account their own rest hours and fatigue levels when conducting inspections. 'Back to back' inspections are discouraged and inspectors should complete the report for one vessel before commencing an inspection on another vessel.

4.1.2 Additional Requirements.

In addition to the general mandatory requirements list above, the Inspector:-

1. **Must** respond by entering the requested information or by checking one response box for each question;
2. **Must**, where guidance to a question is provided, consider all the guidance to determine how the question should be answered;
3. **Must** carefully consider and provide a proper response to every question;
4. **Must** use objective evidence when answering each question (the assurance of the vessel's staff is insufficient evidence or proof);
5. **Must** include an explanatory Observation in the Observation section that accompanies a question when it is answered "No" or "Not Seen". Where the VIQ question is answered "**Not Applicable**" or in cases where the guidance requires a comment regardless of how a question is answered, such comment must be recorded in the "**Comments**" section.
6. **Must not** use a "Yes" response to any question where an inspector's Observation or Other comment contains negative elements (if there is such negative Observation or Other comment then the answer to that question should be "No");
7. **Must not**, in any **Other Comment** or **Additional Comments**, include -
 - i. Any overall or partial ship rating or indication of ship acceptability / non-acceptability;
 - ii. Any matter unrelated to the topic of a VIQ chapter and, in particular, any matter unrelated to ship safety and pollution prevention; and,
 - iii. Any overall chapter ending or other partial summary of the inspector's findings;
8. **Must** give the factual basis and specific reasons for any opinions or subjective comments made by the inspector;
9. **Must** note any deficiencies or inspector-observed conditions, to which action was taken whilst the inspector was on board, and
10. **Must not** offer any comments or opinions with regard to actions to be taken in respect of any deficiencies or observed conditions noted by the inspector.
11. **Must not** use the expression "we" in any Observation or Other comment unless the inspection was conducted by more than one inspector.
12. **Must not** at any time give any verbal indication of ship acceptability / non-acceptability.
13. **Must not** discuss or communicate by any means (verbal, written, electronic or otherwise) any findings, information gained or outcome of the inspection with any third party other than those with a legitimate involvement in the inspection process for that vessel.

4.2 Permitted Inspection Actions

Inspectors *may*:

1. Include in the "Comments" section accompanying any question, inspector comments even where the question is answered with a "Yes" **provided** such comments give useful information to the report recipient;
2. Respond to questions or provide comments on the basis of material not included in the guidance specified for the question but must note this reliance and explain reason for the reliance;
3. Include in the "**Additional Comments**" for each chapter, any comments in respect of the subject matter not addressed by questions contained in the chapter additional to those that the inspector may make in response to the specific questions in the chapter; and
4. Respond to questions which are not applicable to either the vessel or its cargo by checking such questions "**Not Applicable**".

4.3 Other Inspection Requirements.

1. Unless authorised by the OCIMF Inspecting Member and agreed by the vessel's operator, inspections should not take place at night.
2. The inspector should consider requesting that equipment be run and tested to confirm that it is in operational order and that officers and crew are familiar with its operation, but must ensure that such requests do not cause delay or interfere with the safety and normal operation of the vessel.
3. It should be recognised that the overall objective of the inspection is to provide the user of a SIRE Report with a factual record of the vessel's condition and standard of operation at the time of the inspection and, in turn, allow an assessment of the risk that use of the vessel might pose.
4. The scope of a SIRE inspection is expected to enable an inspection to be accomplished within an 8-10 hour period. Inspectors must take into account the hours of rest requirements that must be observed and ensure that the SIRE inspection does not interfere with these.
5. Under normal circumstances, a SIRE inspection will take place when a vessel is alongside in port whilst discharging or loading cargo. During the course of the inspection ballast/void tank entry is discouraged. Physical assessment of the condition of ballast tanks/void spaces etc. can be made only in circumstances where the tank access hatches or plates can be removed and the tank internals sighted from the deck. In any event, actual tank access should only be made at the specific instructions of the inspecting company, with the authority of the Master and provided that port and terminal regulations allow. In all cases, the enclosed space entry procedures set out in ISGOTT Chapter 10 must be strictly observed.

SECTION 5

5.1 The Distributed Report

The responses recorded in the Vessel Inspection Questionnaires (the **Inspection Element**) serve as the basis for development of the second element of the Vessel Inspection Procedure (the **Report Element**) distributed under the programme. The inspector's completed VIQ must be reviewed by the submitting company prior to processing in the SIRE system and transmission to the vessel operator.

The processed VIQ is automatically converted into a report after the submitting company has processed it in the SIRE System. The report does not replicate the pages of the Vessel Inspection Questionnaire but is distributed in abbreviated form. It consists of a conversion of the inspector VIQ responses into a uniform report format. The report is divided into three sections as follows:

Section 1

General information

- Contains the informational responses required in Chapter 1 of the VIQ plus answers to certain questions from other VIQ chapters where specific details or dates are required.

Section 2

Questions marked "Yes" without comment.

- Lists, by index number **only**, the questions in the VIQ which have been checked with a "Yes" response, but without inspector comment.

Section 3

Questions marked "No", "Not Seen", "Not Applicable" or otherwise commented upon and any chapter ending **Additional Comments**.

- Contains; in their entirety,
 - (a) All VIQ questions which have been answered with a "No", or "Not Seen" response, as well as the comments made by the inspector to supplement such responses;
 - (b) All other VIQ questions which have otherwise been commented upon, together with the comment; and,
 - (c) Any additional comments made at the end of the VIQ chapters.
 - (d) In cases where a question has been answered with a "No" response, the element or sub-element of the OCIMF Tanker Management Self-Assessment (TMSA) for the ship to which the "No" response refers, together with the operator's assessment will be displayed, where appropriate. This feature will only be displayed to OCIMF members who have been granted by the operator access to their TMSA submission. Recipient members will not be able to view this TMSA feature within the report.

In some cases, the SIRE Report Editor will automatically enter "Not Applicable" response.

Chapter 1. General Information

1.1 Name of the vessel:

Note: Prefixes (MT, MV, SS etc.) must not be used unless they are actually a part of the registered name of the vessel. The name must be entered exactly as it appears on the Certificate of Registry.

1.2 Vessel IMO Number:

1.3 Date the inspection was completed:

Note: If the inspection extends to two or more days, record the circumstances in comments.

1.4 Port of inspection:

1.5 Flag:

If a change of flag has taken place within the past 6 months, record the date of change and the previous flag in Comments.

1.6 Deadweight: (metric tonnes)

Note: For vessels with multiple load line certificates, record the maximum of the assigned deadweight's.

1.7 Date the vessel was delivered:

Any periods of lay up since delivery should be recorded in Comments.

Note: The date of delivery from the original builder as listed in the IOPPC must be recorded. If the date of delivery is not recorded in the IOPPC Form A or Form B, the date of delivery as contained in Safety Construction Certificate must be recorded. If the vessel has been 're-aged', the original build date must be recorded.

1.8 Name of the OCIMF inspecting company:

Note: The SIRE Report Editor software automatically inserts the name of the inspecting company.

1.9 Date and time the inspector boarded the vessel:

1.10 Date and time the inspector departed the vessel:

If the inspection took place over two or more days, in two or more sessions, or was carried out by more than one inspector, record the arrival and departure details in Comments.

1.11 Time taken for inspection.

Note: Record the time taken to conduct the inspection to the nearest 5 minutes. This is the actual time of inspection and does not include the times the inspection was suspended for any reason (Lunch, PSC inspection etc.) or was conducted over two or more sessions.

1.12 Name of the inspector:

Note: The VIQ software automatically inserts the name of the inspector. This is for use by the Inspecting Company and for OCIMF internal purposes only and will not be displayed on the delivered report.

1.13 Vessel's operation at the time of the inspection:

Loading	Discharging	Bunkering	Ballasting	Deballasting	At anchor	Idle	At sea
River transit	Repairs afloat	In drydock	STS loading	STS discharging	Cooling Down	Gassing-up	

Note: If the vessel is conducting any other operation than that listed, such as desloping, etc., the vessel's operation is to be recorded as 'Idle' and the activity being performed recorded in comments.

1.14 Product(s) being handled:

Crude Oil	Dirty petroleum products (low flash)	Dirty petroleum products (high flash)	Clean petroleum products	Vegetable oils
Animal oils	Chemicals	Liquefied gas	Other (specify)	

Notes: A volatile product is petroleum having a flash point below 60°C as determined by the closed cup method of testing.

If a cargo is being handled at a temperature within 10°C of its flashpoint, it should be considered volatile. Therefore a cargo with a flashpoint of 80°C should be considered volatile if handled at a temperature of 70°C or above.

On 1 Aug 2007, a further amendment to the revised MARPOL Annex I entered into force. This relates to the definition of "heavy grade oil" in regulation 21 on Prevention of oil pollution from oil tankers carrying heavy grade oil as cargo, replacing the words "fuel oils" with "oils, other than crude oils", thereby broadening the scope of the regulation.

1.15 Vessel type:

Crude Tanker	Crude/Products Tanker	Products Tanker	Chemical carrier Type I	Chemical carrier Type II
Chemical carrier Type III	LPG Type 1G	LPG Type 2G	LPG Type 2PG	LPG Type 3G
LNG Moss Type	LNG Membrane	OBO	Ore-Oil	Shuttle tanker
Bitumen Tanker	Sulphur Tanker	Other (Specify in Comments)		

1.16 Hull type:

Single hull Double hull Double sides Full breadth double bottom Centre tank double bottom

Note: Refer to the IOPPC Form B/5 to determine the construction requirement.

1.17 Name of the vessel's operator:

Note: For the purpose of the SIRE Programme, an 'Operator' is defined as the company or entity which exercises day to day operational control of, and responsibility for, a vessel. The name of this entity can be found in the vessel's Document of Compliance.

The registered owner of a vessel may or may not be the operator.

1.18 Date the current operator assumed responsibility for the vessel:**1.19 Date of the last port State control inspection:**

Note: The date refers to any port State inspection. If at the time of the last Port State Inspection the vessel was under either a different name or different operator, record in comments

1.20 Port of the last Port State Control inspection:

If the vessel was detained, or if significant deficiencies were listed, record the reason for the detention or the nature of those deficiencies in comments.

Note: IMO has encouraged the establishment of regional port State control organizations and agreements on port State control - Memoranda of Understanding or MOUs - have been signed covering all of the world's oceans: Europe and the North Atlantic (Paris MOU); Asia and the Pacific (Tokyo MOU); Latin America (Acuerdo de Viña del Mar); Caribbean (Caribbean MOU); West and Central Africa (Abuja MOU); the Black Sea region (Black Sea MOU); the Mediterranean (Mediterranean MOU); the Indian Ocean (Indian Ocean MOU); and the Arab States of the Gulf (GCC MoU (Riyadh MoU)). With affect from 1st January 2011 the Paris MOU will change to a New Inspection Regime (NIR) and ships will be subject to inspection on the basis of 'Ship Risk Profile' in conjunction with the 'Company Performance. Ships will be categorised as either 'Low Risk Ships (LRS)', 'Standard Risk ships (SRS) or 'High Risk ships (HRS)' taking into account various factors including company performance, the risk rating of the ship will determine its inspection frequency. Port State inspection reports should be retained on board for at least two years.

1.21 Name of Classification society:

If the vessel has dual class, record the name of the classification society issuing the statutory certificates and the name of the second society in comments.

If the vessel has changed class within the past 6 months, record the previous classification society and the date of change as a comment.

Notes: A Classification Society Certificate must be available and the periodic annual and intermediate surveys must have been carried out within the stipulated range dates.

Vessels holding an Ice Class notation must be constructed to meet the requirements specified by the Classification Society and the officers and ratings provided with suitable clothing and appropriate training. Subject to the Ice Class notation to which the vessel was constructed, vessels will be equipped to maintain temperature within the accommodation, protect the hull, deck machinery, pipelines, ventilators, air inlets, sea inlets and ballast system against freezing. Means to receive and display ice charts and ice navigation information should be installed. Protection to prevent the wheelhouse windows from freezing should be provided and if the wheelhouse is not totally enclosed, protected locations on the bridge wings and searchlights on each bridge wing should also be provided. If the vessel holds an Ice notation, inspectors should assess these provisions and provide comments in the Additional comments section at the end of this chapter.

Where the vessel has changed class within the past six months a copy of the previous class latest survey status report must be available.

It is an important requirement of P and I Clubs that the vessel is fully in class with an approved Classification Society throughout the period of club entry.

1.22 Date of expiry of the Class Certificate:

Note: This will usually be the same date as that of the next special survey.

1.23 Date the last special survey was completed:**1.24 Date of departure from the last class-credited drydock/repair period:**

In addition, if the last dry-docking/repair period was unscheduled, record the date and the reason.

Note: The date of the last class-credited drydock or 'In Water Survey' can be found in the Classification Society Survey Status Report. Details relating to the last bottom inspection can be found in the Cargo Ship Safety Construction Certificate.

1.25 Date of the last class Survey Status Report:

Note: The most recent report should be available and this should be dated not more than four months prior to the date of the inspection. Class Survey Status Reports may not have been updated to reflect the latest status, despite the date of the document. However, class surveyors leave documentation on board at the time of surveys stating what has been carried out and these should be examined to ensure the correct information is reported.

Additional Comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section. Information of a non-confidential nature related to the circumstances surrounding the inspection should also be recorded here. Examples are the presence of the Operator's superintendent, more than one SIRE inspection being conducted, unusual vessel operations that hampered or curtailed the inspection, etc.

Chapter 2. Certification and Documentation

Certification

2.1 Are all the statutory certificates listed below, where applicable, valid and have the annual and intermediate surveys been carried out within the required range dates?

2.1.1	Certificate of Registry
2.1.2	<p>Continuous Synopsis Record</p> <p>The CSR records shall be kept on board the ship and shall be available for inspection at all times. Issued in accordance with SOLAS XI-1/5 by the Administration, from 1st July 2004. The Continuous Synopsis Record (CSR) may be provided in hard copy or in electronic format. Whenever any change to the entries listed in the current CSR document have taken place, pending the issue of a revised and updated CSR, the operator or the Master is required to complete an amendment form (Form 2), the original of which is to be attached to the current CSR. The index of amendments (Form 3) must be updated.</p>
2.1.3	<p>Document of Compliance (DoC)</p> <p>The issuing authority for the DoC and the SMC may be different organisations, but the name of the operator of the vessel must be the same on both.</p> <p>There should be a copy (which need not be a certified copy) of the DoC on board, which shows that the original has been endorsed for the annual verification.</p> <p>The document should detail the cargo types the operator's vessels are certified to carry – i.e. oil, chemicals and/or gas.</p> <p>The Document of Compliance does not need to be endorsed for chemicals if the vessel has only a NLS Certificate and not a Certificate of Fitness.</p> <p>An annual audit should be carried out within three months of the anniversary of the date of issue.</p>
2.1.4	<p>Safety Management Certificate (SMC)</p> <p>The SMC is subject to renewal verification every five years and at least one intermediate verification, which, if only one, shall be between the second and third anniversary.</p>
2.1.5	<p>Safety Equipment Certificate, supplemented by Form E</p> <p>The Safety Equipment Certificate does not need to be endorsed for chemicals if the vessel has only a NLS Certificate and not a Certificate of Fitness. The Long Range Identification and Tracking System enters into force on the 31st December 2008 or the first Radio Survey after that date. It will apply to all cargo ships greater than 300 gt constructed before 31st Dec 2008 operating in Sea Areas A1, A2 and A3 (Not applicable to ships fitted with AIS operating solely in Sea Area A1).</p>
2.1.6	Safety Radio Certificate, supplemented by Form R
2.1.7	<p>Safety Construction Certificate</p> <p>The Safety Equipment, Safety Radio and Safety Construction Certificates might be on the same form, called the Ship Safety Certificate. Form C will be attached instead of Forms E and R. There should be evidence that each annual survey has been carried out.</p> <p>The Safety Construction Certificate does not need to be endorsed for chemicals if the vessel has only a NLS Certificate and not a Certificate of Fitness.</p>
2.1.8	<p>IOPP Certificate, supplemented by Form A or B</p> <p>Form B is only required if carrying oil cargoes or oil-like noxious liquids substances. A list of the oil-like noxious liquid substances allowed to be carried must be included.</p> <p>Statement of Compliance supplement</p> <p>Required for vessels subject to the Condition Assessment Scheme (see question 2.10). A Statement of Compliance should be issued by the Administration every 2½ years.</p>
2.1.9	<p>What is the vessel's designation as recorded in the IOPP Certificate, Form B, Question 1.11?</p> <ul style="list-style-type: none"> • Crude oil tanker; • Product carrier; • Product carrier not carrying fuel oil or heavy diesel oil as referred to in regulation 20.2 or lubricating oil; • Crude oil/product carrier; • Combination carrier; • Ship, other than an oil tanker, with cargo tanks coming under regulation 2.2 of Annex 1 of the Convention; • Oil tanker dedicated to the carriage of products referred to in regulation 2.4;

	<ul style="list-style-type: none"> The ship, being designated as a 'crude oil tanker' operating with COW, is also designated as a 'product carrier' operating with CBT, for which a separate IOPP Certificate has also been issued; The ship, being designated as a 'product carrier' operating with CBT, is also designated as a 'crude oil tanker' operating with COW, for which a separate IOPP Certificate has also been issued;
2.1.10	Minimum Safe Manning Document If the language used is not English, the information (contained in the Min. Safe Manning Doc) given should include a translation into English. IMO Res. A.890 (21) Annex 3.2.
2.1.11	Certificate of Fitness for the Carriage of Chemicals or Gas This will be issued either under the IBC or BCH Code for chemicals, or the IGC, GC or EGC Code for gas. Gas carriers carrying dual code cargoes must have a NLS Certificate. Chemical Certificates of Fitness must have been renewed prior to 1st January 2007.
2.1.12	Noxious Liquid Substances (NLS) Certificate NLS means any substance indicated in the pollution category column on chapter 17 or 18 of the IBC Code or provisionally assessed under the provision of Reg 6.3 as falling into Cat X, Y or Z. An NLS tanker is a ship constructed or adapted for the carriage of any liquid product listed in chapter 17 of the IBC. Gas carriers carrying dual-code cargoes will require both a Certificate of Fitness for gas cargoes and an NLS Certificate for the carriage of noxious liquid substances.
2.1.13	Civil Liability Convention (1992) Certificate The name of the owner should be the same as that on the Certificate of Registry.
2.1.14	Maritime Labour Convention (2006) Entered in force 20th August 2013.

With respect to SOLAS certificates, if the language used is neither English nor French, the text shall include a translation into one of these languages. (SOLAS I/15)

Note: Situations may arise in cases where a Recognised Organisation (RO) issues the original certificates and the vessel's flag State Administration conducts subsequent annual surveys. In such cases, it is acceptable for the flag State to endorse the RO's certificates to attest that the annual surveys have been conducted.

Company and registered owner identification number is required to be recorded on these certificates either from 1 Jan 2009, or on the occasion of renewals of the certificates as may be required by the flag State Administration. It is not required to record the dates of issue, expiry etc. of certificates. **Record an observation whether any certificates have expired.**

2.2 Is the vessel's P and I Club a member of the International Group?

Note: If the P and I club is not a member of the international group, record in comments the name of the organisation, it is NOT necessary to name the P&I club unless it is not listed below:-

- American Steamship Owners Mutual Protection and Indemnity Association Inc.
- Assuranceforeningen Skuld
- Skuld Mutual Protection and Indemnity and Protection Association (Bermuda) Ltd.
- Gard P&I (Bermuda) Ltd
- Assuranceforeningen Gard
- The Britannia Steam Ship Insurance Association Limited
- The Japan Ship Owners Mutual Protection and Indemnity Association
- The London Steam-Ship Owners Mutual Insurance Association Limited
- The North of England Protecting and Indemnity Association Limited
- The Shipowners Mutual Protection and Indemnity Association (Luxembourg)
- The Standard Club Ltd
- The Standard Club Europe Ltd
- The Standard Club Asia Ltd
- The Steamship Mutual Underwriting Association (Bermuda) Limited
- The Steamship Mutual Underwriting Association Ltd.
- Sveriges Angfartygs Assurans Forening / The Swedish Club
- United Kingdom Mutual Steam Ship Assurance Association (Bermuda) Limited
- United Kingdom Mutual Steam Ship Assurance Association (Europe) Ltd.
- The West of England Ship Owners Mutual Insurance Association (Luxembourg).

Safety management and the operator's procedures manuals

2.3 Do the operator's procedures manuals comply with ISM Code requirements?

The Company should ensure that the safety management system operating on board the ship contains a clear statement emphasising the Master's authority. The Company should establish in the safety management system that the Master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the Company's assistance as may be necessary. (ISM Code 5.2)

Notes: It is not a requirement that the manuals be written in English. However, if not, the fact should be recorded in Comments.

Key elements of the ISM Code that should be incorporated into the procedures manuals are that they should be:

- Relevant to the ship;
- User friendly;
- Written in the working language of the crew.

And that they should at least contain:

- A safety and environmental policy;
- Emergency procedures;
Emergency procedures should at least include collision, grounding, flooding, heavy weather damage, structural failure, fire (on deck and in cargo tanks, the engine room, pump room and accommodation), explosion, gas or toxic vapour release, critical machinery failure, rescue from enclosed spaces, serious injury and helicopter operations.
- A description of the Master's and crew's responsibilities;
- Shipboard operation plans;
- Procedures for reporting non-conformities and for corrective action;
- Maintenance programmes;
- Procedures for auditing and reviews;
- Programmes of drills,

The programme of drills must at least include the emergency procedures detailed above and in addition abandon ship, man overboard, pollution clean-up and ship security including dealing with terrorism and piracy.

Occasionally the operator's procedures are available only in computerised versions. Ascertain whether there is adequate access for all personnel to a computer and whether adequate training has been given to all personnel in accessing the operator's procedures using one. In any case, an up to date copy of the operator's navigation policy and procedures must be available on the bridge and officers should demonstrate familiarity with the policy. If the policy is provided in electronic format only, a back-up independent means of power supply to the computer must be provided.

2.4 Does the Operator's representative visit the vessel at least bi-annually?

Record the date of the last visit and of which discipline (Marine Superintendent, Engineer Superintendent, or Naval Architect). In addition record the dates of each discipline's last visit.

Note: The operator's representative must be a Technical/Marine superintendent or person familiar with the company's SMS and responsible for its implementation. The Operator's representative's visits should occur at approximately six month intervals, a tolerance of one month is acceptable.

2.5 Is a recent operator's internal audit report available and is a close-out system in place for dealing with non-conformities?

Note: This audit must be conducted as part of the operator's SMS procedures. Satisfactory evidence should record that corrective action was taken to rectify non-conformities. A close-out system, which includes a time limit for corrective action, informing the operator when completed and the operator ensuring that it has been, should be in place and the inspector should ensure that the required actions have been made within the required time. **Inspectors must not use Operator's audits as a means to record Observations.** Some administrations may permit an extension for this review.

2.6 Does the Master review the safety management system, report to the operator on any deficiencies and does the operator respond to the Master's review?

Note: The master's review should be carried out at least annually and documentary evidence should be available.

Survey and repair history

2.7 Are class survey reports adequately filed?

Note: The file should contain class reports based on annual, intermediate, special and occasional surveys. The survey and repair reports should be adequately filed to facilitate checking.

2.8 Is the vessel free of conditions of class or significant recommendations, memoranda or notations?

Record any conditions of class or significant recommendations, memoranda or notations of any nature, including due dates as an Observation.

Where class records address structural issues of concern, including bottom pitting, areas of substantial corrosion, cracks, buckling or serious indents, record the details as to the extent and the measures taken to arrest further development.

Where a condition of class has been postponed, the details including the condition, original date and the new date for completion should be recorded as an Observation.

If records indicate that measures have been taken to address or restore loss of longitudinal or transverse strength, record the details and the repairs undertaken in Comments. The existence of doublers anywhere within the vessel's structure and deck strapping must be reported as an Observation.

Note: If conditions of class have not been completed by the required due date, then the classification of the vessel may be subject to suspension. If a Class notation requires a ballast tank to be inspected annually, record this as an observation.

Enhanced Survey Programme

2.9 If the vessel is subject to the Enhanced Survey Programme, is the report file adequately maintained?

Key contents of the Condition Evaluation Report should be recorded in Comments, including the date conducted, the tanks inspected and a summary of the condition of the tank coatings.

Note: SOLAS XI-1/2 requires all oil tankers, regardless of size, to be subject to Enhanced Surveys. The regulation refers to SOLAS II-1/2.12, which in turn refers to MARPOL Annex 1/1(5) which states that Oil tanker means a ship constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes combination carriers, any "NLS tanker" as defined in Annex II of the present Convention and any gas carrier as defined in regulation 3.20 of chapter II-1 of SOLAS 74 (as amended), when carrying a cargo or part cargo of oil in bulk. This effectively means that any vessel when carrying a cargo or part cargo of oil in bulk is subject to enhanced survey requirements under SOLAS XI-1/2.

The guidelines for enhanced surveys are contained in IMO Res. A.744 (18). These include the requirement that an oil tanker over five years of age shall have on board a complete file of survey reports, including the results of all scantling measurement required, as well as the statement of structural work carried out. This file may be provided at the time of delivery but should, in all cases, be available on board at least one year prior to the vessel's fifth anniversary. The file shall be accompanied by a Condition Evaluation Report containing conclusions on the structural condition of the ship and its residual scantlings.

'Substantial corrosion' is wastage in excess of 75% of allowable margins, but within acceptable limits.

Each Enhanced Survey File must contain a Condition Evaluation Report for each Enhanced Survey that has been carried out.

Condition Assessment Scheme

2.10 No Question Assigned.

2.11 No Question Assigned.

2.12 Has the vessel been enrolled in a Classification Society Condition Assessment programme (CAP)?

Note: Condition Assessment Programme (CAP) is a voluntary programme to document the quality of a vessel beyond the normal scope of Classification Societies. For vessels greater than 15 years old the question should be answered Y or N as appropriate. For vessels younger than 15 years old the question should be answered N.A

If the vessel is enrolled in CAP then record the following:-

- Which Class society

- Which areas covered (Hull, Machinery, Cargo Systems, cargo containment systems etc.) and what rating was awarded for each.

Date of the CAP survey (The date should be that when the survey was actually completed, not the certificate date).

Additional Comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 3. Crew Management

Note: Co-operation and communication between officers and crew should be observed and evaluated. All parties should share a common goal to operate the vessel safely and efficiently.

Crew management

3.1 Does the manning level meet or exceed that required by the Minimum Safe Manning Document?

Record the required manning and the Actual manning in Comments

The IMO Resolution A.890 (21) Principles of Safe Manning addresses the functions to be addressed when determining the safe manning of a vessel, including navigation, cargo handling, safety, engineering, electrical and electronic engineering, radio communications and maintenance. (Res. A.890 (21) Annex 2)

The Resolution also states that except in ships of limited size or propulsion power (which are not quantified), the determination of the minimum safe manning level should also take into account the provision of qualified officers to ensure that it is not necessary for the master or chief engineer to keep regular watches by adopting a three-watch system. (Res. A.890 (21) Annex 2)

The Administration should take into account any additional workload which may result from the implementation of the Ship Security Plan and ensure that the ship is sufficiently and effectively manned. In doing so the Administration should verify that ships are able to implement the hours of work and other measures to address fatigue which have been promulgated by national law. (ISPS Code Part B 4.28)

Note: Inspectors should review the number of personnel on board against the vessel's trading pattern and level of operation and should consider issues such as whether:

- The bridge is being adequately manned under all sailing conditions;*
- There are sufficient personnel to moor the ship safely;*
- The cargo operation is being effectively controlled (if two deck officers alternate the cargo watches, is the second officer adequately experienced and qualified and are ratings sufficiently familiar with the operation);*
- Safety functions are being adequately addressed (drills, ship security issues, equipment maintenance); and*
- The quality of rest is adequate considering the trading area and the workload.*

3.2 Are the STCW and flag Administration's regulations that control hours of work to minimise fatigue being followed?

Regulation	Work/Rest in any 24 hours	Work/Rest in 7 days	No. and length of Rest Periods	Schedule	Records and Exceptions.
MLC 2006	Max 14hrs of work OR Min 10hrs of rest.	Max 72hrs of work OR Min 77hrs of rest	Not more than 2 periods of rest, one of which must be at least 6hrs. Interval between rest periods not to exceed 14hrs.	Specific format table for all seafarers. Actual times for at sea and in port.	Daily records to be maintained. Competent authority may allow exception if by collective agreement.
STCW 2010 (Manila Amendments)	Min 10hrs of rest.	Min 77hrs of rest.	Not more than 2 periods of rest, one of which must be at least 6hrs. Interval between rest periods not to exceed 14hrs	Specific format table as MLC, but watchkeepers and safety, pollution, security positions only.	Daily records to be maintained. Parties may allow exceptions.

Records should be kept for the Master, officers and all other members of the ships complement to the specific ILO format.

Given the importance attached to ensuring the proper management and recording of seafarers' hours of work and rest, it is recommended that purpose-developed software is used. However, the basis for calculating hours of rest should be demonstrated as being consistent with the Conventions' requirements and, where applicable, with the interpretations of the OCIMF paper.

OCIMF require that the term 'any 24 hours' is interpreted and applied literally and is not linked to calendar days or a fixed time of starting work or rest.

It should be ensured that, at any time during the working period, in the past 24 hours the seafarer should always be in compliance with the requirements for a minimum of 10 hours rest which has been divided into no more than 2 periods, one of which is to be a minimum of 6 hours.

The ILO format "Working Hours Record" contains columns for:

- "Hours of rest in 24 hour period"
- "Hours of Rest in any 24 hour period" A figure of less than 10 in this column indicates a day when non-conformance has occurred.
- A third column should indicate the "Hours of rest in any 7 day period" A figure of less than 77 in this column indicates a non-conformance has occurred.

Inspectors should observe if the records are not to ILO format or have columns that have not been completed unless another method of confirming conformance is available.

Although the regulations only require monitoring of hours to be undertaken on board, it is important that managers ashore have access to meaningful summary data that enables them to monitor the work and rest hours of individuals.

The Inspector should record an observation:

- If "any 24 hours" is not interpreted literally, or
- a lack of evidence of conformance/non-conformance calculations, or
- any lack of evidence that managers are informed at least monthly of compliance levels on board, or
- a failure by the manager to acknowledge significant levels of non-conformance (3 or more days containing "non-conformance" by any individual on board)

3.3 Do all personnel maintain hours of rest records and are the hours of rest in compliance with MLC or STCW requirements?

Note: The Management System on board must require the recording of all hours worked for the ship. This will include any watch keeping or work duties either during or outside of the individuals scheduled period of work, and any other period of working that disturbs a scheduled rest period such as drills; Meetings; ER rounds; response to alarms; mooring stations or any stand-by conditions on the bridge, deck or engine room. The Inspector should randomly sample completed monthly records for the ships complement to confirm the records are accurately kept by cross reference to other records on board. 3 or more days in a calendar month containing "non-conformance" by any individual on board should be recorded as an observation.

3.4 Are all personnel able to communicate effectively in a common language?

Record the common working language in Comments.

On all ships, to ensure effective crew performance in safety matters, a working language shall be established and recorded in the ship's logbook. The company or the Master as appropriate shall determine the appropriate working language. Each seafarer shall be required to understand and, where appropriate, give orders and instructions and to report back in that language. If the working language is not an official language of the flag of the State the ship is entitled to fly, all plans and lists required to be posted shall include a translation into the working language. (SOLAS V/14.3)

3.5 Have all deck officers attended either a Bridge Resource Management, or Bridge Team Management course?

Note: These should be formal shore-based courses of at least three days duration and officers should have evidence of having attended them. If Masters and officers are holders of CoCs, which are valid only until 31.12.2016, then the competence BRM / BTM should be documented by having attended shore-based courses of at least three days duration. However, Holders of CoCs according to Regulations II/1 and II/2 of the Annex to the STCW-Convention which are valid with a date after 01.01.2017 fulfil this requirement.

3.6 Has the Master attended a ship handling course where applicable?

The STCW Code Part B Section B-V/a refers.

Note: The IMO Model course 1.22 – Ship Simulator and Bridge Teamwork may be of assistance in the preparation of courses. A Master with less than three years sea time in rank, or who has practical experience of less than thirty port entry/departures as Master, must have attended a ship handling course or have sufficient practical experience. Practical experience may include training at chief officer rank under a Masters' supervision, provided this is properly documented. In the event that the master has in excess of ten years' experience, this question should be answered NA.

3.7 If the vessel is fitted with High Voltage equipment, is staff suitably trained?

Note: High voltage is defined in STCW (Section B-III/ 2) as shipboard systems operating at voltages greater than 1000volts. If the vessel has high voltage equipment are staff suitably trained and deemed competent to conduct maintenance on it. A High Voltage (over 1000V) system is where voltage is generated and distributed at high voltage or transformed to and distributed at high voltage. It does not include systems where high voltage is utilised locally e.g. ignition systems, radio transmission, radar and other navigational equipment. Holders of a CoC according to regulations III/6 of the annex to the STCW-Convention fulfil this requirement. If the vessel does not have High Voltage systems the question is to be answered 'NA'

Record which officers have undergone Shipboard High Voltage Training and the nature of such training.

3.8 Where the vessel carries chemicals, has a formal programme of regular and appropriate medical examinations for personnel been implemented?

Note: Inspection of the programme to be undertaken but individual records are not to be reviewed.

Crew qualifications**3.9 Does the officers' matrix posted for the vessel on the SIRE website accurately reflect the information relating to the officers on board at the time of the inspection?**

Note: The operator is responsible to maintain up-to-date records relating to the officers on board the vessel at any given time, using the electronic Officer Matrix that forms part of the SIRE HVPQ for each vessel which has been submitted to SIRE. Prior to boarding, inspectors must access and download the HVPQ including the Officers' Matrix. **The Matrix must be either printed out or downloaded and used during the inspection to check officer qualifications and experience.** In the case of the senior officers (Master, Chief Engineer, Chief Officer and Second Engineer/First Assistant engineer), the actual details must be checked against the data contained in the Matrix and an Observation made in the event of any irregularities. Spot checks must be made of the actual records applicable to junior officers. Inspectors must take into account that where recent changes of personnel have taken place, it is not realistic to instantly update the matrix and allowances must be made. **Observations must not be made unless the personnel change(s) took place more than seven days before the date of the inspection.** It is not essential that the Officers Matrix is provided in paper form and inspectors are not expected to seek a paper copy from the vessel.

If the officers' certificates are not issued by the same Administration as the flag State of the vessel, then an endorsement (or a separate document) is required which attests to the recognition of that certificate by the vessel's Administration. An Administration may allow a seafarer to serve for a period not exceeding 3 months, provided that documentary proof of an application is readily available.

The operator's policy should ensure that the Master and chief officer and the chief engineer and second engineer, are not relieved at the same time and that there is a suitable handover period for all four ranks

3.10 Are those officers who have immediate responsibility for cargo transfer, in possession of the Certificates of Specialized Training as applicable to the type of cargo being carried?

Officers and ratings assigned duties and responsibilities related to cargo or cargo equipment on oil or chemical tankers shall hold a certificate in basic training for oil and chemical operations. (STCW Reg V/1-1.1)

Officers and ratings assigned duties and responsibilities related to cargo or cargo equipment on liquefied gas tankers shall hold a certificate in basic training for liquefied gas tanker operations. (STCW Reg V/1-2.1)

Masters, chief engineer officers, chief mates, second engineer officers and any person with immediate responsibility for loading, discharging, care in transit, handling of cargo tank cleaning or other cargo-related operations on oil tankers shall hold a certificate in advanced training for oil tanker cargo operations. (STCW Reg V/1-1.3)

Masters, chief engineer officers, chief mates, second engineer officers and any person with immediate responsibility for loading, discharging, care in transit, handling of cargo tank cleaning or other cargo-related operations on chemical tankers shall hold a certificate in advanced training for chemical tanker cargo operations. (STCW Reg V/1-1.5)

Masters, chief engineer officers, chief mates, second engineer officers and any person with immediate responsibility for loading, discharging, care in transit, handling of cargo tank cleaning or other cargo-related operations on liquefied gas tankers shall hold a certificate in advanced training for liquefied gas tanker cargo operations. (STCW Reg V/1-2.3).

The qualification and experience requirements for obtaining such basic and advanced training certificates are set out in STCW Regulations V/1-1 and V/1-2.

The term "Person with immediate responsibility" as used in paragraphs 3 and 5 of regulation V/1-1 and paragraph 3 of regulation V/1-2 means a person being in a decision making capacity with respect to loading, discharging, care in transit, handling of cargo, tank cleaning or other cargo related matters". (STCW Code B V-1)

Note: It is interpreted that a 'Person with immediate responsibility' includes all watch keeping officers in charge of cargo related operations whether the vessel is at sea or in port. This includes 2nd Officer, 3rd Officer, 4th officer, Gas/Cargo engineer.

It is recognised that there are many officers as specified above currently serving who do not have the Advanced Training Certificate, and that it will take time for all officer to obtain the Advanced Training Certificate. All officers specified above must obtain an advanced training certificate by 1st January 2017.

It is recognised that some administrations will not endorse junior officer certificates of competency, but they have completed the required training. In these cases make a note in comments.

Drug and alcohol policy

3.11 Does the operator's Drug and Alcohol policy meet OCIMF guidelines?

3.12 What was the Operator's defined maximum level of blood alcohol content?

OCIMF recommends that officers and ratings observe a period of abstinence from alcohol prior to scheduled watchkeeping duty or work periods. The objective should always be to ensure that, prior to going on scheduled duty the blood alcohol content of the seafarer is theoretically zero.

(OCIMF Guidelines for the control of drugs and alcohol)

3.13 What was the recorded frequency of unannounced drug testing?

3.14 What was the recorded frequency of unannounced alcohol testing?

The frequency of unannounced testing should be sufficient so as to serve as an effective deterrent to abuse.

(OCIMF Guidelines for the control of drugs and alcohol)

3.15 What was the date of the last unannounced on-board alcohol test?

3.16 What was the date of the last unannounced drug and alcohol test undertaken by an external agency?

Note: This should be the date of the test carried out on board either by an independent agency or under controlled conditions by ship's personnel with specimens being forwarded to an independent agency.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 4. Navigation

Inspection of the bridge will normally take place when the vessel is alongside a terminal therefore the inspector must closely inspect charts, log books and other records to determine that the vessel has been safely navigated and that the bridge has at all times been adequately manned. Compliance with the operator's navigation procedures should be evaluated both by observation and by discussion with the Master and officers. The operator's navigation procedures must be supplemented as required by the Master's Standing Orders and the Bridge Order Book. The objective should be to ascertain that such policies are understood and are being complied with.

All navigation equipment should be in an operational condition regardless as to whether or not it is required by SOLAS. Any bridge equipment which is not functioning must be recorded as an Observation.

Policies, Procedures and Documentation

4.1 Is the vessel provided with adequate operator's navigation instructions and procedures?

Every shipowning or management company should have a safety management policy and procedures. It should provide practical guidance concerning safe navigation and include a clear statement emphasising the Master's authority. The company should establish in the SMS that the Master has the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the company's assistance as may be necessary. The guidance should cover:

- allocation of bridge watchkeeping duties and responsibilities for navigational procedures;
- procedures for voyage planning and execution;
- chart and nautical publication correction procedures;
- procedures to ensure that all essential navigation equipment and main and auxiliary machinery are available and fully operational;
- advice concerning emergency responses;
- ship position reporting procedures;
- accident and near miss reporting procedures;
- recording of voyage events;
- procedures for familiarisation training and handover at crew changes;
- a recognised system for identifying special training needs;
- company contacts, including the designated person under the ISM Code

(BPG 1.3)

Note: An up to date copy of the operator's navigation policy and procedures must be available on the bridge and officers should demonstrate familiarity with the policy. If the policy is provided in electronic format only, a back-up independent means of power supply to the computer must be provided.

4.2 Has the Master written his own Standing Orders and are Bridge Orders being completed and have the deck officers countersigned them as being read and understood.

At daily intervals, the Master should write in the bridge order book what is expected of the OOW, with particular reference to his requirements during the hours of darkness. These orders must be signed by each OOW when going on watch. (BPG 1.3.1.1)

Standing Order and Bridge Order Books (documentation) should be checked to ascertain that all officers are instructed as to their responsibilities. Standing orders should be written by the Master to reflect his own requirements particular to the vessel, the trade and the experience of the deck officers aboard at the time. The Master's Standing Orders must not conflict with the ship's SMS.

4.3 Are deck log books and engine movement (bell) books correctly maintained and is an adequate record being kept of all the navigational activities, both at sea and under pilotage?

All ships engaged on international voyages shall keep a record of navigational activities and incidents which are of importance to safety of navigation and which must contain sufficient detail to restore a complete record of the voyage. (SOLAS V/28)

Note: Information which should be recorded includes that concerning position, course and speed, the times and positions when passing waypoints, land or sea marks, weather and sea conditions and incidents and events including pilot embarkation/disembarkation, times of attendance and connection and disconnection of tugs, times of berthing and un-berthing, hazardous occurrences and accidents. Effectiveness of the radar(s) as measured by the performance monitor(s) should be recorded by the OOW at the end of each watch whenever the radar(s) are operational to ensure that optimal efficiency is being maintained. A numeric, percentage, graphical, or other measurement value should be recorded.

Records should be maintained whether the vessel is on international voyages or not. Records may be kept either in paper format or electronic means provided such information can be readily available.

Log books and engine movement (bell) books should be checked to ensure that they are up to date with entries properly made in ink and not in pencil.

An electronic chart display and information system (ECDIS) with GPS input (provided the equipment is in good order and the datum used in each case is the same) provides a good record of the navigational activities. Where controllable pitch propellers are fitted, the times of significant changes of pitch should be recorded if this information is not automatically logged.

4.4 Are the vessel's manoeuvring characteristics displayed on the bridge?

For all ships of 100 metres in length and over and all chemical tankers and gas carriers regardless of size, a pilot card, wheelhouse poster and manoeuvring booklet should be provided. (IMO Res. A.601 (15))

Note: The recommended form of the wheelhouse poster is contained in IMO Res. A.601 (15) and in the Bridge Procedures Guide (Annex A4, Page 82)

The wheelhouse poster should be permanently displayed in the wheelhouse. It should be of such a size to ensure ease of use. (IMO Res. A.601 (15))

4.5 Are procedures in place for the testing of bridge equipment before arrival and departure?

The administration may waive the requirements to carry out the checks for ships which regularly engage on voyages of short duration. Such ships shall carry out these checks and tests at least once a week. (SOLAS V 26.5).

Note: Procedures for testing of bridge equipment shall follow the checklist B2 in the Bridge Procedures Guide (BPG 4th Ed 2007). Evidence of completion of checklist should be sought.

4.6 Are records maintained of fire and safety rounds being completed after each watch?

Note: A lookout should not leave the bridge during the watch as this contravenes the requirements of SOLAS and STCW. Rounds of the vessel should be conducted after the end of each watch during the hours of darkness, typically from 2200 to 0600. It is recognised that in the summer months in the higher latitudes of the Northern Hemisphere that permanent daylight will occur and it is expected that rounds of the vessel should be conducted from 2200 to 0600hrs.

4.7 Are checklists for pre-arrival, pre-departure, watch handover, Pilot-Master exchange and pilot card effectively completed?

Note: The Master and pilot information exchanges must be completed by both the Master and the pilot. Each Master to pilot exchange must include a minimum under keel clearance calculation and limitations relating to the maximum permissible bollard pull from tugs that are to be utilised, taking into consideration the SWL of the fairleads and bitts. Details of defective equipment that might affect the safe navigation of the vessel must be recorded on the Master to pilot exchange.

4.8 Does the operator provide guidance on minimum under keel clearance and squat?

Record in Comments, the operator's policy relating to under keel clearance requirements for ocean passage, shallow water, within port limits and while alongside the berth or at SBM/CBM mooring.

Note: The operator's policy relating to under keel clearance should be included as part of the Master/Pilot interchange in the form of a written under keel calculation. The policy must provide a minimum allowed under keel clearance for both coastal, river navigation, while alongside and guidance on the action to be taken in shallow water to ensure the minimum clearance is maintained.

Under keel clearance can be affected by several factors and the under keel calculations should include, but not necessarily be limited to;

- The predicted height of the tide;
- Changes in the predicted tidal height, which are caused by wind speed and direction and high or low barometric pressure;
- Nature and stability of the bottom – i.e. sand waves, siltation etc.;
- Accuracy of hydrographic data, (References to reliability is often included on charts);
- Change of water density and the increase in draught due to fresh water allowance;
- The vessel's size and handling characteristics and increase in draught due to heel;
- Wave response allowance, which is the vertical displacement of the hull due to heave, roll and pitch motions;
- The reliability of draft observations and calculations, including estimates of hogging and sagging;
- Reduced depths over pipelines and other obstructions.

Once the available under keel clearance has been calculated taking into account all the applicable factors, including those above, it can then be determined whether any speed reduction is required to counter the effects of squat.

Squat information relevant to the vessel for both loaded and ballast passages should be readily available on the bridge.

Where there is doubt that sufficient clearance can be maintained during any part of the voyage, the Master must:

- Inform the operator at the earliest opportunity;
- If within port limits, obtain the latest sounding information, including the nature of the bottom, directly from the local authorities or terminal well before arrival. Should this not be available, the Master should request guidance from the operator;
- If alongside, vacate the berth if in any doubt about the risk of grounding. It should be recognised that occasionally smaller vessels 'take the ground' – i.e. sit on the bottom - at some ports. This may even be to the extent that the berth dries out completely. In such circumstances considerable reliance is placed on previous experience, as often there is no other information available to ensure that the berth is safe. In such circumstances, documentary evidence should be sought to demonstrate that the operator is aware that the vessel takes the ground at these particular ports and that the situation has been fully assessed, including the effects of stress and stability and the nature and level of the bottom. Adequate procedures should be in place for maintaining services such as firefighting and engine cooling water.

4.9 Has the Bridge been adequately manned at all stages of the voyage and at Anchor and were lookout arrangement adequate?

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate to the prevailing circumstances and conditions as to make a full appraisal of the situation and the risk of collision. (Colregs Rule 5)

The look-out must be able to give his full attention to the keeping of a proper look-out and no other duties shall be undertaken or assigned which could interfere with that task. (STCW A-VIII/2-3.1/14)(STCW A-VIII/2-3.1/14)

The officer in charge of the navigational watch may be the sole look-out in daylight provided that on each occasion:

- The situation has been carefully assessed and it has been established without doubt that it is safe to do so
- Full account has been taken of all relevant factors including but not limited to:-
 - State of weather
 - Visibility
 - Traffic density
 - Proximity of dangers to navigation; and
- The attention necessary when navigating in or near traffic separation schemes
- Assistance is immediately available to be summoned to the bridge when any change in the situation requires. (STCW A-VIII/2-3. 1/15)

It is of special importance that at all times the officer in charge of the navigational watch ensures that a proper look-out is maintained. In a ship with a separate chartroom the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that is safe to do so and that a proper look-out is maintained. (STCW A-VIII/2-3.1/32)

Note: The operator's navigational instructions and procedures must contain guidance relating to circumstances when the officer of the watch may be the sole lookout, including considerations that the OOW has had sufficient rest prior to starting the watch.

The experience of the watch officers, weather and traffic conditions will dictate the required bridge manning composition at any specific time. Each stage of the voyage must be reviewed to establish that sufficient personnel were on the bridge and that an effective communications and teamwork structure was in place. Inspectors must take into account the impact of additional bridge manning upon the work load of any individual and impact of hours of rest regulations.

Navigation Equipment

4.10 Is navigation equipment appropriate for the size of the vessel and in good order?

Note: Regardless of whether a vessel is required by legislation to carry specific navigational equipment, if equipment is fitted then it should be operational. Such equipment may be a course recorder, off-course

alarm, and electronic chart display or engine order logger/printer. Random checks should be made to ensure that equipment is operational.

The following applies to all vessels constructed (i.e. keel laid) before 1st July 2002.

All ships, irrespective of size

4.10.1	A receiver for a global navigation satellite system or terrestrial navigation radio navigation system. <i>Or other means, suitable for use at all times throughout the intended voyage to establish and update the ship's position by automatic means. (SOLAS V/19.2.1.6)</i>
4.10.2	A Navtex receiver. <i>Every ship shall be provided with a receiver capable of receiving international NAVTEX service broadcasts if the ship is engaged on voyages in any area in which an international NAVTEX service is provided. (SOLAS IV/7.1.4)</i> <i>Notes: The Navtex system broadcasts coastal warnings which cover the area from the fairway buoy out to about 250 miles from the transmitter, or occasionally up to 400 miles in unusual propagational conditions.</i> <i>Each Navtex message begins with ZCZC, followed by a space and four characters. The first, B₁, identifies the station, the second, B₂, the subject (i.e. navigation warning, weather forecast, gale warning, distress alert, etc.) and the third and fourth the consecutive number of the message from that station.</i> <i>The Navtex should be programmed to the stations for the area in which the vessel is sailing and to the type of B₂ messages which are required to be received. Message types A, B and D are mandatory, but it is recommended that the receiver be programmed to receive most types.</i>
4.10.3	A whistle, bell and gong. <i>A whistle and bell for vessels of 12 metres or more in length and a gong for vessels of 100 metres or more in length. (Colregs D/33.a)</i>
4.10.4	Shapes. <i>Three balls, a cylinder and a diamond shape should be carried. (Colregs)</i>

All ships of 150 gt and upwards:

4.10.5	A properly adjusted standard magnetic compass. <i>A spare magnetic compass, interchangeable with the standard magnetic compass, shall be carried unless a steering compass or gyro compass is fitted.</i> <i>The magnetic compass shall be properly adjusted and its table or curve of residual deviations shall be available at all times.</i>
4.10.6	A steering magnetic compass. <i>Unless heading information provided by the standard compass above is made available and is clearly readable by the helmsman at the main steering position.</i> <i>Spare magnetic compasses should be stored upside down to avoid wear of the needle bearing.</i>
4.10.7	Means for taking bearings. <i>As nearly as practicable over an arc of the horizon of 360°.</i>
4.10.8	A spare magnetic compass. <i>This should be interchangeable with the standard compass.</i> <i>A spare magnetic compass is not required if a steering compass or a gyro compass is fitted.</i>
4.10.9	A telephone. <i>Ships with emergency steering positions shall at least be provided with a telephone or other means of communication for relaying heading information.</i>
4.10.10	A daylight signalling lamp. <i>All ships of over 150 gt, when engaged on international voyages, shall have on board an efficient daylight signalling lamp which shall not be solely dependent on the ship's main source of electrical power. (SOLAS 1974 V/11)</i>

All ships of 300 gt and upwards on international voyages

4.10.11	<p>An automatic identification system (AIS). <i>Ships fitted with AIS shall maintain AIS in operation at all times except where international agreements, rules or standards provide for the protection of navigational information.</i> (SOLAS 2004 V/19.2.4.7)</p> <p><i>AIS is required to be operating while a ship is underway and while at anchor. Some port authorities may request that the AIS is kept on when a ship is alongside. The AIS operates on a VHF frequency and transmits and receives information automatically, and the output power ranges between 2 watts and 12.5 watts. Automatic polling by another station (e.g. by port authority equipment or another ship) could cause equipment to transmit at the higher (12.5 watt) level, even when it is set to low power (2 watts).</i></p> <p><i>When alongside a terminal or port area where hydrocarbon gases may be present, the AIS should either be switched off or the aerial isolated and the AIS given a dummy load. Isolating the aerial preserves manually input data that may be lost if the AIS was switched off. If necessary, the port authority should be informed.</i></p> <p><i>When alongside terminal or port areas where no hydrocarbon gases are likely to be present, and if the unit has the facility, the AIS should be switched to low power. If the AIS is switched off or isolated whilst alongside, it must be reactivated upon leaving the berth. The use of AIS equipment may affect the security of the ship or the terminal at which it is berthed. In such circumstances, the use of AIS may be determined by the port authority, depending on the security level within the port. (ISGOTT 4.8.4)</i></p> <p><i>Where either or both ships involved in STS operations are required to have an AIS operating while under way or at anchor, the AIS equipment should remain in use at all times including during STS operations. The AIS equipment used for the AIS broadcasts need not be set to low power output during STS operations. (STS Transfer Guide petroleum 3.5.5.4)</i></p> <p><i>Notes: If the AIS is not interfaced with either a radar or electronic chart display, it should be positioned adjacent to one of them. Certain manufacturers have modified their AIS equipment to provide a "Tanker Mode" that permits selection of a 1W output.</i></p>
4.10.12	<p>A VHF radio. <i>All ships of 300 gt and upwards shall be provided with a VHF installation capable of transmitting and receiving on Channels 6, 13, 16 and 70 (DSC). It shall be possible to initiate the transmission of distress alerts on channel 70 from the position from which the ship is normally navigated.</i></p>

All ships of 500 gt and upwards

4.10.13	<p>A gyro compass and repeaters. <i>A gyro compass shall be fitted on ships of 500 gt and upwards constructed on or after 1st September 1984 and on ships of 1,600 gt and upwards on international voyages.</i></p> <p><i>Ships of 1,600 gt and upwards shall be provided with a gyro repeater or repeaters suitably placed for taking bearings as nearly as practicable over the arc of the horizon of 360°.</i></p> <p><i>All ships shall have a gyro-compass, or other means, to determine and display their heading by ship borne non-magnetic means, being clearly readable by the helmsman at the main steering position.</i></p>
4.10.14	<p>Visual compass readings to the emergency steering position. <i>Arrangements shall be provided for ships constructed on or after 1st February 1992.</i></p>
4.10.15	<p>A radar installation. <i>A radar capable of being operated in the 9 GHz (3 cm, 'X' band) shall be installed on ships of 500 gt and upwards constructed on or after 1st September 1984 and on ships of 1,600 gt and upwards constructed before 1st September 1984.</i></p> <p><i>However, ships of 10,000 gt and upwards shall be fitted with 2 radars, each being capable of being operated independently of the other and one of which must be capable of operating in the 9 GHz (3 cm, 'X' band).</i></p>
4.10.16	<p>Radar plotting equipment. <i>Facilities for plotting radar readings shall be provided on the navigation bridge of ships fitted with radars.</i></p> <p><i>In ships of 1,600 gt and upwards constructed after 1st September 1984 the plotting facilities shall be at least as effective as a reflection plotter.</i></p>

4.10.17	An echo sounder. <i>When engaged on international voyages, ships of 500 gt and upwards constructed on or after 25th May 1980 and ships of 1,600 gt and upwards constructed before 25th May 1980 shall be fitted with an echo sounder.</i> <i>Performance of the echo sounder should be tested on all ranges and scales to verify recordings against depths shown on the chart.</i>
4.10.18	A speed and distance indicator. <i>When engaged on international voyages ships of 500 gt and upwards constructed on or after 1st September 1984 shall be fitted with a device to indicate speed and distance.</i>
4.10.19	Rudder angle, RPM, variable pitch and bow/stern thruster indicators. <i>Ships of 1,600 gt and upwards constructed before 1st September 1984 and all ships of 500 gt and upwards constructed on or after 1st September 1984 shall be fitted with indicators showing the rudder angle, the rate of revolution of each propeller and in addition, where fitted with variable pitch propellers or lateral thrust propellers, the pitch and operational mode of such propellers. All these indicators shall be readable from the conning position.</i>

All ships of 10,000 gt and upwards

4.10.20	Radar installations. <i>Two radar installations shall be provided, each capable of operating independently.</i> <i>At least one of the installations shall operate in the 9 GHz (3 cm, 'X' band).</i>
4.10.21	An ARPA. <i>Tankers of 10,000 gt and upwards shall be fitted with an automatic radar plotting aid.</i> <i>Vessels required to be fitted with an ARPA shall be equipped with a device to indicate speed and distance through the water. (i.e. an electromagnetic or pitot log.) If the speed through the water log is not operational, the speed of the vessel must be entered manually.</i>

All ships of 100,000 gt and upwards

4.10.22	A rate of turn indicator. <i>Required for vessels of 100,000 gt and upwards constructed after 1st September 1984.</i>
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The following applies to all vessels constructed (i.e. keel laid) after 1st July 2002. (SOLAS 2004 V/19)

All ships, irrespective of size

4.10.23	A receiver for a global satellite navigation system or terrestrial navigation radio navigation system. <i>Or other means, suitable for use at all times throughout the intended voyage to establish and update the ship's position by automatic means.</i>
4.10.24	A Navtex receiver. <i>Every ship shall be provided with a receiver capable of receiving international NAVTEX service broadcasts if the ship is engaged on voyages in any area in which an international NAVTEX service is provided.</i> <i>(SOLAS IV/7.1.4)</i> <i>Notes: The Navtex system broadcasts coastal warnings which cover the area from the fairway buoy out to 250 miles from the transmitter, or occasionally up to 400 miles in unusual propagational conditions.</i> <i>Each Navtex message begins with ZCZC, followed by a space and four characters. The first, B₁, identifies the station, the second, B₂, the subject (i.e. navigation warning, weather forecast, gale warning, distress alert, etc.) and the third and fourth the consecutive number of the message from that station.</i> <i>The Navtex should be programmed to the stations for the area in which the vessel is sailing and to the type of messages which are required to be received. Message types A, B and D are mandatory, but it is recommended that the receiver be programmed to receive most types.</i>
4.10.25	A whistle, bell and gong. <i>A whistle and bell for vessels of 12 metres or more in length and a gong for vessels of 100 metres or more in length.</i> <i>(Colregs D/33.a)</i>
4.10.26	Shapes. <i>Three balls, one cylinder and one diamond shape should be carried.</i> <i>(Colregs)</i>
4.10.27	A properly adjusted magnetic compass.

	<i>Or other means independent of any power supply, to determine the ship's heading and display the reading at the main steering position.</i>
4.10.28	A pelorus or compass bearing device. <i>Or other means, independent of any power supply, to take bearings over an arc of the horizon of 360°.</i>
4.10.29	Means of correcting heading and bearings to true at all times.
4.10.30	A sound reception system. <i>Or other means, when the bridge is totally enclosed, to enable the officer in charge of the watch to hear sound signals and determine the direction.</i>
4.10.31	A telephone. <i>Or other means, to communicate heading information to the emergency steering position.</i>

All ships of 150 gt and upwards

4.10.32	A spare magnetic compass. <i>Or other means, interchangeable with the magnetic compass in 4.26.27.</i>
4.10.33	A daylight signalling lamp. <i>All ships of 150 gt and upwards shall be fitted with a daylight signalling lamp, or other means, to communicate by light during day and night using an energy source of electrical power not solely dependent on the ship's power supply.</i>

All ships of 300 gt and upwards

4.10.34	An echo sounding device.
4.10.35	A 9 GHz (3 cm 'X' band) radar.
4.10.36	An electronic plotting aid. <i>To plot electronically the range and bearing of targets to determine collision risk.</i>
4.10.37	A speed and distance measuring device. <i>To indicate speed and distance through the water. If the device is not operational, speed input to the ARPA, where fitted, must be manual.</i>
4.10.38	A properly adjusted transmitting heading device. <i>Or other means, to transmit heading information for input into the 9 GHz radar, the plotting aid and the speed and distance-measuring device.</i>
4.10.39	A VHF radio. <i>All ships of 300 gt and upwards shall be provided with a VHF installation capable of transmitting and receiving on Channels 6, 13, 16 and 70 (DSC). It shall be possible to initiate the transmission of distress alerts on channel 70 from the position from which the ship is normally navigated.</i>

All ships of 300 gt and upwards on international voyages

4.10.40	An automatic identification system (AIS). <i>Ships fitted with AIS shall maintain AIS in operation at all times except where international agreements, rules or standards provide for the protection of navigational information.</i> <p style="text-align: right;">(SOLAS V/19.2.4.7)</p> <i>Notes: If the AIS is not interfaced with either a radar or electronic chart display, it should be positioned adjacent to one of them.</i> <i>See guidance to Q4.26.11.</i>
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All ships of 500 gt and over

4.10.41	A gyro compass. <i>Or other means, to determine and display the heading by ship borne non-magnetic means.</i>
4.10.42	A gyro compass heading repeater. <i>To supply heading information at the emergency steering position, if provided.</i>
4.10.43	A gyro compass bearing repeater. <i>To take bearings over an arc of the horizon of 360°.</i>
4.10.44	Rudder, propeller, thrust, pitch and operational mode indicators. <i>All to be readable from the conning position.</i>
4.10.45	An automatic tracking aid. <i>To plot automatically the range and bearing of other targets to determine collision risk.</i>

All ships of 3,000 gt and upwards

4.10.46	A 3 GHz (10 cm, 'S' band) radar. <i>Or a second 9 GHz (3 cm, 'X' band) radar where considered appropriate by the administration.</i>
4.10.47	A second automatic tracking aid. <i>Functionally independent of the first automatic aid.</i>
4.10.48	A voyage data recorder. (VDR) <i>VDR's shall be subjected to an annual performance test. The test shall be conducted by an approved testing or servicing facility... A copy of the certificate of compliance issued by the testing facility, stating the date of compliance and the applicable performance standards, shall be retained on board the ship (SOLAS V/18.8). To assist in casualty investigations, cargo ships, when engaged on international voyages, shall be fitted with a VDR which may be a simplified voyage data recorder (S-VDR) as follows: .1 in the case of cargo ships of 20,000 gross tonnage and upwards constructed before 1 July 2002, at the first scheduled dry-docking after 1 July 2006 but not later than 1 July 2009; .2 in the case of cargo ships of 3,000 gross tonnage and upwards but less than 20,000 gross tonnage constructed before 1 July 2002, at the first scheduled dry-docking after 1 July 2007 but not later than 1 July 2010; .3 Administrations may exempt cargo ships from the application of the requirements of subparagraphs .1 and .2 when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs .1 and .2 above. (SOLAS V Reg 20.1.)</i>
4.10.49	Electronic Chart Display and Information System (ECDIS) <i>Ships engaged on international voyages shall be fitted with an electronic chart display and information system (ECDIS) as follows: 1. tankers of 3,000 gross tonnage and upwards constructed on or after 1st July 2012 2. tankers of 3,000 gross tonnage and upwards constructed before 1st July 2012, not later than the first survey on or after 1st July 2015.</i>

All ships of 10,000 gt and upwards

4.10.50	An ARPA, equipped with speed through the water input. <i>An ARPA, or other means, to plot automatically the range and bearing of at least 20 other targets, connected to a device to indicate speed and distance through the water, to determine collision risks and simulate a trial manoeuvre.</i>
4.10.51	A heading or track control system. <i>To automatically control and keep to a heading and/or straight track.</i>

All ships of 50,000 gt and upward

4.10.52	A rate of turn indicator. <i>Or other means to determine and display the rate of turn.</i>
4.10.53	A speed and distance measuring device. <i>From 1st July 2002 new ships are to be equipped with a device to indicate speed and distance over the ground in the forward and athwartships direction.</i>

4.11 Are navigation lights in good order?

Note: Primary and secondary systems should be in good order, and there should be a procedure to check the navigation light failure alarm.

4.12 If a bridge navigational watch alarm system (BNWAS) is fitted is it operational at all times when the vessel is at sea?

All ships of 150 gross tonnage and upwards shall be fitted with a bridge navigational watch alarm system (BNWAS), as follows:

- cargo ships of 150 gross tonnage and upwards constructed on or after 1 July 2011;*
- cargo ships of 3,000 gross tonnage and upwards constructed before 1 July 2011, not later than the first survey after 1 July 2012;*
- cargo ships of 500 gross tonnage and upwards but less than 3,000 gross tonnage constructed before 1 July 2011, not later than the first survey after 1 July 2013; and*
- cargo ships of 150 gross tonnage and upwards but less than 500 gross tonnage constructed before 1 July 2011, not later than the first survey after 1 July 2014.*

The bridge navigational watch alarm system shall be in operation whenever the ship is underway at sea. A bridge navigational watch alarm system (BNWAS) installed prior to 1 July 2011 may subsequently be exempted from full compliance with the standards adopted by the Organization, at the discretion of the Administration (SOLAS 19.2.2.3)

Note: A bridge watch alarm system is a device which triggers an alarm if an Officer on Watch (OOW) becomes incapable of performing the OOW's duties. IMO has adopted the performance standard as MSC. 128 (75) and there are ships which have already installed the equipment on a voluntary basis. The BNWAS should be operational whenever the ship's heading or control system is engaged, unless inhibited by the master, however the BNWAS should also be operational when the vessel is at anchor.

4.13 Are the Standard Magnetic compass and Gyro compasses operational, properly maintained and adjusted?

Note: The magnetic compass must be in good working order and the ship's heading clearly displayed at the main steering position. The binnacle lights must be operational. The compass must be provided with an azimuth mirror or other means to take bearings. The compass shall be adjusted if a period of two years has elapsed since the last adjustment and a record of compass deviations has not been maintained, or the recorded deviations are excessive or when the compass shows physical defects.

Masters and Officers should be aware that portable electrical equipment (e.g. radios and tape recorders) or items made of steel can affect the performance of a compass and must ensure that such items are kept away from the compass position. A compass deviation card should be prepared each time the compass is adjusted. Separate deviation cards should be prepared for the standard compass and the transmitting magnetic compass repeater, if fitted (Not required for TMC if attached to the Magnetic Compass). The gyro compass (or compasses) should be checked to ensure that the speed and latitude corrections are properly applied. Gyro maintenance records should be reviewed to confirm that the gyro(s) are operating satisfactorily. This can be done either manually or by automatic input from GPS/Logs. Each of the gyro repeaters, including those that may be fitted in the emergency steering position and the engine control room must be synchronised. Where two gyros are fitted, a change-over device must be fitted and change-over procedures must be posted.

4.14 Are auto to manual steering changeover procedures clearly identified?

Simple operating instructions with a block diagram showing the change-over procedures for remote control systems and steering gear power units shall be permanently displayed on the navigation bridge and in the steering gear compartment. (SOLAS V/26.3.1)

4.15 Are auto to manual steering changeover recorded during periods of river transits and when navigating through restricted Waters?

Note: Times and locations of engaging hand steering should be recorded in the deck log book or bell book (electronic means of recording are also acceptable)

4.16 Are regular gyro and magnetic compass errors being taken and are they being recorded?

Magnetic and gyro compass errors should be checked and recorded each watch, where possible, using either azimuth or transit bearings. A record of magnetic and gyro compass courses to steer and compass errors should be maintained and kept available to the helmsman. (BPG 4.6.3)

Note: The error of the gyro should be determined by external observations – celestial bearings, transits etc. and the gyro and magnetic compass headings then compared to determine the magnetic compass error. Where a gyro repeater is used to take a bearing, an accurate comparison between the repeater and the master gyro should be made. When compass errors cannot be taken it is not necessary to state this in the compass error book.

The previous record completed by a qualified compass adjuster should be retained to prove that adjustment has not been required in the intervening period. A comparison between the magnetic and gyro headings should be made at each substantial course alteration and once each watch. Details must be recorded in the Deck Log Book. Some Administrations require compass errors to be recorded in the Deck Log Book rather than a separate Compass Error Book.

The Magnetic compass errors recorded in the compass error book should broadly agree with the deviation card. The Magnetic compass deviation may be excessive at the time of inspection due to the presence of external metal structures such as loading arms, gangway towers etc.

4.17 Is there a documented procedure for the operation of the VDR and are the Deck Officers familiar with procedure to retain the VDR data in the event of an incident?

Note: In the event of an incident the data retained in the VDR can be invaluable in accident investigations, ship's crew should be aware of how to retain this data and prevent it from being over written. The OCIMF information paper "Recommendations on the Proactive Use of Voyage Data Recorder Information" provides further information on the use of VDRs.

Charts and publications

4.18 Has a system been established to ensure that all Charts, nautical publications (Paper and Electronic) and other publications are on board, current and maintained up to date and is it being implemented?

Nautical charts and nautical publications, such as sailing directions, lists of lights, notices to mariners, tide tables and all other publications necessary for the intended voyage, shall be adequate and up to date. (SOLAS V/27)

All ships should carry adequate and up to date official nautical charts, Sailing Directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage. An on board chart and publication management system is recommended to ensure that records are kept of what charts and publications are carried and when they were last corrected. (BPG 4.1.1.1)

Notes: Charts should be in good condition. The paper surface should be intact and charts should be replaced when torn, not taped together. Procedures should be checked to ensure that the ordering and supply of charts, publications and corrections provides these to the vessel in a timely manner. Many vessels now receive the 'notice to mariners' by electronic means, such as Chartco, Digitrack, Digitrace etc. If received electronically, record in comments the type of service used and method of electronic receipt.

Publications in electronic format may be accepted by certain flag Administrations. 'Block' corrections to navigational charts must be in the same colour scheme as the original chart. 'Block' corrections to ALRS, Tide Tables, and Sailing Directions etc. can be in 'Black and White' even if the original is in colour.

4.19 Are Master and deck officers familiar with the operation of the ECDIS system fitted on board?

The Master and deck officers should be familiar with the operation of the ECDIS. Master and deck officers should be able to demonstrate the operation of the ECDIS including, but not limited to:-

- *Creating and uploading passage plans*
- *Recalling previous voyages*
- *Route checking and management of alarms*
- *Plotting manual fixes (visual bearing and radar range)*
- *Creating parallel index lines*
- *Setting safety depths and safety contours as appropriate to the draught of the vessel*
- *Setting of Safety frame/safety cone*
- *Ensuring system is updated to the latest corrections.*
- *AIS and or Radar overlay if fitted*
- *Understanding of limitations of operating in RCDS mode*
- *Knowledge of SCAMIN and how it is displayed*
- *Knowledge of CATZOCs*
- *Familiarity of deck officers with contingency action in case of ECDIS failure.*

The above list is not exhaustive and the inspector can ask other features to be demonstrated in order assess knowledge of the system. Further guidance to the operation of ECDIS can be found in MSC.1/Circ 1503 "ECDIS – Guidance for Good Practice". If no ECDIS system is fitted on board, answer the question 'NA'.

4.20 Were the charts used for the previous voyage appropriate?

Note: The largest scale charts published, where appropriate, should be used. The Master should have made every effort to obtain the necessary charts if the vessel is ordered to a port not covered by the chart folio system.

4.21 If the vessel is equipped with an Electronic Chart Display and Information System (ECDIS) are the Master and deck officers able to produce appropriate documentation that generic training and type-specific familiarisation has been undertaken.

All tankers over 3000gt are required to be fitted with at least one ECDIS unit, along with a back-up arrangement. Tankers of less than 3000gt may be fitted with at least one ECDIS unit but if so, they must also have a backup arrangement of either a second ECDIS or paper charts.

If the vessel is fitted with an ECDIS unit then the Master and each deck watchkeeper must be in possession of an ECDIS Generic Training certificate. This Generic training must have taken place at an establishment approved by the Flag Administration, address the subjects set out in, and fully address each of the topics contained in the IMO Model Course 1.27, (The operational use of Electronic Chart Display and Information Systems (ECDIS)). An ECDIS Generic Training Certificate conducted on the 2010 syllabus is acceptable.

Holders of CoCs according to Regulations II/1 and II/2 of the Annex to the STCW-Convention which are valid with a date over 01.01.2017 and without an ECDIS limitation fulfil the requirement of generic ECDIS training.

If the equipment on board is of a different type (manufacturer) to which the generic training was undertaken, then evidence of familiarisation of the actual equipment fitted on board should be provided. The checklist contained in "ECDIS - Industry Recommendations for ECDIS Familiarisation" (Published by the Nautical Institute) or an equivalent produced by the manager or equipment manufacturer may be utilised to demonstrate such familiarisation.

Record in comments how the familiarisation training was carried out. If only one ECDIS fitted and paper charts are also provided record which is the primary source of navigation and which is the backup.

4.22 If the vessel is provided with an Electronic Chart Display and Information System (ECDIS) does it meet the requirements of SOLAS and is an approved backup system provided?

Notes: If vessels operate using ECDIS then it must be "type approved" in accordance with IMO Res A.817 (19) as amended, and use only official Electronic Navigation Charts (ENCs). For vessels greater than 3000gt a secondary means of navigation must also be provided. The secondary means may comprise:

A second "type approved" ECDIS powered from the main and emergency power supply and operating independent of the main ECDIS and connected to the ship's main power supply and to an independent GPS input. The secondary ECDIS must have the ENC chart database and voyage plan loaded before commencement of the voyage and must be operational at all times when the ship is in coastal waters, or **A full folio of paper charts** that satisfies SOLAS carriage requirements, corrected to the latest available Notices to Mariners, covering the intended voyage and showing the intended voyage plan. Record of Equipment for Cargo Ship Safety (Form E) attached to the Cargo Ship Safety Equipment Certificate will state if ECDIS is fitted and the method of back-up (either another ECDIS or paper charts). The 'Record of Approved Cargo ship Safety Equipment' will provide additional information of systems provided.

Navigating officers must not become over-reliant on ECDIS. Frequent checks should be made of the ECDIS position fixing system (normally GPS) by the use of other means. Such checks should include:

- Parallel indexing and use of clearing bearings;
- Use of radar to check the accuracy of the charted position by comparing the location of the radar target against the charted symbol;
- Visual cross bearings;
- Comparison of the signal to noise ratio of the GPS system in use.

The full functionality of ECDIS cannot be achieved when operating in the raster chart display (RCDS) mode and thus the system should always be operated in ECDIS mode. ECDIS that is not updated for the latest version of the International Hydrographic Organisation (IHO) standards may not meet the chart carriage requirements set out in SOLAS V Reg 19.2.1.4. The list of current standards is maintained on the IHO web site www.iho.int

Data input from the gyro compass, speed log, echo sounder and other electronic equipment should be periodically monitored to ensure accuracy.

The ECDIS should have the latest software updates to ensure the system is stable and remains compliant with the IHO standards for Hardware and handling of ENC's.

Record in comments what the primary means of navigation comprises and what is the backup system?

Navigation

4.23 Has the vessel been safely navigated and in compliance with international regulations?

A ship shall use a mandatory ship's routeing system and in accordance with the relevant provisions unless there are compelling reasons not to use a particular ships' routeing system. Any such reason shall be recorded in the ship's log. (SOLAS V/10.7)

Note: Charts of at least the complete previous voyage should be checked to determine that the vessel has been safely navigated, including maintenance of a safe distance off the coast particularly in bad weather, the correct use of traffic separation zones, intervals between position fixes, maintenance of a safe distance off the coast, avoidance of prohibited areas and dangerous wrecks, adherence to printed notes on the charts, etc., will provide evidence of safe navigation.

4.24 Is the echo sounder recorder marked with a reference date and time on each occasion it is switched on?

Note: The echo sounder recorder should be switched on prior to each approach to shallow water and port entry and prior to departure and remain in operation while in shallow waters. The date and time of switching on should be marked on the recorder chart. In addition, the date and time of passing significant land or seamarks should be marked on the recorder. Many modern electronic echo sounders have an in-built 24-hour memory which can be recalled. If an electronic memory is not provided, the echo sounder should be provided with a printed record. Where an electronic display history is provided to record trending and a VDR to record times, a "Y" response should be made, together with a short explanation in Comments.

4.25 Was a comprehensive passage plan available for the previous voyage and did it cover the full voyage from berth to berth?

Prior to proceeding to sea, the Master shall ensure that the intended voyage has been planned using appropriate charts and publications for the area concerned. (SOLAS V/34 and IMO Res. A.893)

Notes: The passage plan should be completed by the navigating officer and verified and approved by the Master. It should be comprehensive, contain full details of the voyage and be easy to interpret.

The passage plan should be written on each applicable chart, which may be supported by a conning notebook, or equivalent. Excessive information in the navigational areas of a chart must be avoided by recording the information away from the track and drawing attention to it by a line or reference letter.

The following **should be marked on the chart**, where it enhances safe navigation:

- Parallel indexing (not from floating objects unless they have been first checked for position);
- Chart changes;
- Methods and frequency of position fixing;
- Prominent navigation and radar marks;
- No-go areas (the excessive marking of no-go areas should be discouraged – see below);
- Landfall targets and lights;
- Clearing lines and bearings;
- Transits, heading marks and leading lines;
- Significant tides or current;
- Safe speed and necessary speed alterations;
- Changes in machinery status;
- Minimum under keel clearance;
- Positions where the echo sounder should be activated;
- Crossing and high density traffic areas;
- Safe distance off;
- Anchor clearance;
- Contingency plans;
- Abort positions;
- VTS and reporting points, etc.
- Air draft when passing under bridges/power lines/cable cars etc.

In the event that ECDIS is the primary means of navigation, the above should be taken into account.

Charted passage planning information should not obscure printed details, nor should the information on charts be obliterated by the use of highlight or felt-tip pen, red pencil, etc.

No-go areas should be highlighted, but should be reserved for those areas where the attention of the navigator needs to be drawn to a danger such as shallow water or a wreck close to the course line. Extensive use of no-go areas should be discouraged. No-go areas vary with change of draft and tide and will therefore also vary with the time of passage. They should not therefore be permanently marked.

All courses previous to the last voyage should have been erased. Course lines must not be marked in ink, although it is acceptable to plot alter course positions in ink where these are frequently in use.

If the vessel is ECDIS compliant and has one ECDIS and paper charts, either is designated as the primary means of navigation and the other the back up. If the back-up is ECDIS it must be loaded with relevant official charts and the voyage plan before commencement of the voyage. Similarly, if paper charts is being used as the back-up, they must be readily available and the voyage plan must be indicated on the charts. The back-up arrangement must be ready for immediate use, particularly when in confined waters.

4.26 Was position fixing including the use of parallel indexing satisfactory throughout the previous voyage and the frequency of plotted fixes in accordance with the passage plan?

Good navigational practice demands that the officer of the watch:

- Understands the capabilities and limitations of the navigational aids and systems being used and continually monitors their performance;
- Uses the echo sounder to monitor changes in water depth;
- Uses dead reckoning techniques to check position fixes;
- Cross-checks position-fixes using independent sources of information: this is particularly important when electronic position-fixing systems, such as GPS are used as the primary means of fixing the position of the ship;
- Uses visual navigation aids to support electronic position-fixing methods, i.e. landmarks in coastal areas and celestial navigation in open waters;
- Does not become over reliant on automated navigational equipment, including electronic chart systems, thereby failing to make proper navigational use of visual information;
- Plots historical ship track forward to identify the projected/anticipated position.

(BPG 3.3.1.2)

Notes: At least two methods of position fixing should be charted, where possible. Visual and radar position fixing and monitoring techniques should be used whenever possible. GPS derived positions should always be verified by alternative methods. The frequency of position fixing should be such that the vessel cannot run into danger during the interval between fixes. Fixed points such as lighthouses and headlands should always be used in preference to floating objects, which should be carefully checked for position before being used for parallel indexing.

4.27 During pilotage, was the position of the vessel adequately monitored?

The safe progress of the ship as planned should be monitored closely at all times. This will also include track monitoring and regular fixing of the position of the ship, particularly after each course alteration, and monitoring under keel clearance.

Verbal orders from the pilot also need to be checked to confirm that they have been carried out correctly. This will include monitoring both the rudder angle and rpm indicators when helm and engine orders are given.

(BPG 3.3.3.4)

4.28 Has the GPS been adjusted to the correct datum?

Notes: GPS is referenced to WGS84 and it is recommended that the GPS receiver is maintained referenced to that datum. Hydrographic offices are gradually changing all charts to WGS84 and these charts include the legend "WGS84 positions can be plotted directly on this chart". Some charts contain information on latitude and longitude shift values that should be applied to GPS positions before they are charted. Occasionally these can be significant, and many charts still show the land or obstructions in the wrong position when compared with GPS data.

Accuracy of positions using GPS can be affected, amongst other things, by differences in datum's, solar activity and powerful radar or radio transmissions, including deliberate jamming.

Discrepancies in charted positions of obstructions can also introduce significant differences between GPS derived positions and more traditional methods.

4.29 Is there an adequate system for dealing with navigation warnings and are they being charted?

Notes: A system should be in place for monitoring navigational warnings appropriate to the ship's trading area and for ensuring relevant navigational warnings are brought to the attention of the watchkeeping officers.

Such a system must include an adequate, up to date filing system for Temporary and Preliminary Notices, Navarea and Navtex warnings. Relevant warnings must be charted and the chart they have been entered on must be recorded on the warning notice in order that the warning can be removed when the notice is cancelled.

Navtex warnings should be monitored by the officer on watch at the time of receipt. He should ensure that the system is maintained by initialling the warnings received to show that they have been checked as to whether they are relevant to the current voyage. Those which are relevant should be charted.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 5. Safety Management

- 5.1 Has a safety officer been designated, trained to undertake this role and is there evidence to show that they are effectively performing duties associated with this role?**
Note: One of the primary functions of the safety officer, who preferably should be an experienced seafarer, is to inspect all areas of the vessel on a regular basis for safety compliance and to report any deficiencies noted. The purpose is to raise awareness, prevent accidents and to identify regular occurrences that might require the operator's intervention on a fleet-wide basis. The function of the safety officer may not involve equipment maintenance, although it does include identifying equipment deficiencies. Evidence that the Safety Officer has undertaken an appropriate Safety Officer training course should be provided. Training records must match the job description for the Safety Officer within the Safety Management System.
- 5.2 Are the ship's officers familiar with the operation of fire fighting, lifesaving and other emergency equipment?**
Note: Ship's officers should be familiar with the operation of the fixed firefighting systems, the main and emergency fire pumps, the emergency steering gear, the donning and use of breathing apparatus and oxygen resuscitation equipment
- 5.3 Is personal protective equipment such as boiler suits, safety footwear, eye and ear protection, safety harnesses and chemical protective equipment etc. provided and as required, being worn?**
Note: Documented guidance relating to the use of this equipment should be provided.
- 5.4 Are all hand torches approved for use in gas-hazardous areas?**
Only torches that have been approved by a competent authority for use in flammable atmospheres must be used on board tankers. (ISGOTT 4.3.4)
Note: This includes torches in use on deck, in the engine room and those supplied for use with the firemen's outfits.
- 5.5 Are regular safety meetings held, are the minutes recorded and does the operator provide shore management responses?**
Note: Safety Committee Meetings are intended to permit discussion among the vessel's officers and ratings where these relate to safety. Safety meetings should not be used for the purposes of instruction or training.
- 5.6 Is there a procedure for the reporting, investigation and close-out of accidents, incidents, non-conformities and near misses? Is this procedure being followed up with proper reporting, recording, investigation and close out of action items?**
Note: Check that all incident, accidents and near misses are properly recorded and reported to the shore office. Any action items generated are tracked and closed out.
- 5.7 Is a completed ISGOTT Ship/Shore Safety Check List (SSSCL) available and are its provisions being complied with?**
Any non-compliance should be recorded as an Observation.
Notes: The ISGOTT SSSCL may be used or alternatively a checklist provided by the terminal or the operator which is to an equivalent standard.
The code letter 'A' (Agreement) against an item in the checklist indicates that agreement of a procedure should be made in the 'Remarks' column of the Check-List or communicated in some other mutually acceptable form. The code letter 'P' (Permission) indicates that in the case of a negative answer, operations should not be conducted without written permission from the appropriate authority. The code letter 'R' (Re-check) indicates items that are to be re-checked at agreed intervals by both parties, at periods stated in the declaration. The SSSCL should confirm that these items are being re-checked at the agreed intervals.
- 5.8 Are smoking regulations posted and being adhered to and are smoke rooms adequately identified?**
The designated smoking areas should be agreed between the responsible officer and the Terminal Representative before operations start. The responsible officer should ensure that all persons on board the tanker are informed of the selected places for smoking and that suitable notices, in addition to the tanker's permanent notices, are posted.

Certain criteria should be met in the selection of smoking places whenever petroleum cargoes are being handled or when ballasting into non-gas free cargo tanks, purging with inert gas, gas freeing or tank cleaning operations are taking place.

The criteria are:

- Smoking places should be confined to locations within the accommodation.
- Smoking places should not have doors or ports that open directly on to open decks.
- Account should be taken of conditions that may suggest danger, such as an indication of unusually high petroleum gas concentrations, particularly in the absence of wind, and when there are operations on adjacent tankers or on the jetty berth.

In the designated smoking places, all ports should be kept closed and doors into passageways should be kept closed except when in use

While the tanker is moored at the terminal, even when no operations are in progress, smoking can only be permitted in designated smoking places or, after there has been prior agreement in writing between the Responsible Officer and the Terminal Representative, in any other closed accommodation.

When stern loading/discharge connections are being used, particular care must be taken to ensure that no smoking is allowed in any accommodation or space, the door or ports of which open onto the deck where the stern loading/discharge manifold is located. (ISGOTT 4.2.2.3)

Safety matches or fixed (car-type) electrical cigarette lighters should be provided in approved smoking locations. All matches used on board tankers should be of the safety type. Matches should not be carried on the tank deck or in any other place where petroleum gas may be encountered. The restrictions of the use of 'E-cigarettes' should be the same as for normal cigarettes.

The use of all mechanical lighters and portable lighters with electrical ignition sources should be prohibited on-board tankers. Disposable lighters present a significant risk as an uncontrolled ignition source. The unprotected nature of their spark producing mechanism allows them to be easily activated accidentally. The carriage of matches and lighters through terminals should be prohibited. Severe penalties may be levied under local regulations for non-compliance. (ISGOTT 4.2.2.4)

5.9 Are external doors, ports and windows kept closed in port?

A tanker's accommodation and machinery spaces contain equipment that is not suitable for use in flammable atmospheres and it is therefore important that petroleum gas is kept out of these spaces.

All external doors, ports and similar openings should be closed when cargo operations are being conducted. If external doors have to be opened for access, they should be closed immediately after use. Where practical, a single door should be used for working access in port. Doors that must be kept closed should be clearly marked.

Allowance must be made to permit doors and openings to be open if the vessel is storing provided there is no possibility of gas entering the accommodation and that doors do not remain open for longer than is necessary.

Doors should not normally be locked in port. However, where there are security concerns, measures may need to be employed to prevent unauthorised access while at the same time ensuring that there is a means of escape for the personnel inside.

Although discomfort may be caused to personnel in accommodation that is completely closed during conditions of high temperatures and humidity, this discomfort should be accepted in the interests of safety. (ISGOTT 24.1)

Engine room vents may be open. However, consideration should be given to closing them where such action would not adversely affect the safe operation of the engine room spaces served.

(ISGOTT SSSCL Guidelines No.17)

5.10 Is the accommodation space atmosphere being maintained at a higher pressure than that of the ambient air??

Air conditioning intakes must be set to ensure that the atmospheric pressure inside the accommodation is always greater than that of the external atmosphere. Air conditioning systems must not be set to 100% recirculation, as this will cause the pressure of the internal atmosphere to fall to less than that of the external atmosphere, due to extraction fans operating in sanitary spaces and galleys. (ISGOTT 4.1)

5.11 Is all loose gear on deck, in stores and in internal spaces properly secured?

Drills, Training and Familiarisation

Note: In accordance with the summarised SMS requirements accompanying question 2.2, drills involving relevant personnel should be carried out at regular intervals taking into account the ship type, personnel changes and any other relevant circumstances. Each drill should be as realistic as circumstances allow and there should be a review upon completion. Any action required to improve effectiveness should be noted and acted upon. Use of electronic interactive training aids can be beneficial, provided their use is structured and progress of individuals is monitored.

5.12 Is there a procedure for familiarisation for new personnel?

On-board training in the use of the ship's life-saving appliances, including survival craft equipment and in the use of the ship's fire extinguishing appliances shall be given as soon as possible but not later than two weeks after a crew member (first) joins a ship. (SOLAS III/19.4.1)

5.13 Are drills for emergency procedures being carried out?

Note: Emergency procedures should at least include collision, grounding, flooding, heavy weather damage, structural failure, fire (on deck and in cargo tanks, the engine room, pump room and accommodation), explosion, gas or toxic vapour release, critical machinery failure, rescue from enclosed spaces, serious injury, emergency towing equipment, helicopter operations and pollution cleanup.

Pollution clean-up drills in accordance with the requirements of the SOPEP or SMPEP should be held at regular intervals. On vessels carrying noxious liquids, drills should also be regularly carried out in dealing with chemical spills.

5.14 Are lifeboat and fire drills regularly held?

Every crew member shall participate in at least one abandon ship drill and one fire drill every month. The drills of the crew shall take place within 24 hours of the ship leaving a port if more than 25% of the crew have not participated in abandon ship and fire drills on board that particular ship in the previous month.

(SOLAS III/19.3.2)

Except as provided in paragraphs 3.3.4 and 3.3.5, each lifeboat shall be launched, and manoeuvred in the water by its assigned operating crew, at least once every three months during an abandon ship drill.'

(SOLAS III/19.3.3.3)

In the case of a lifeboat arranged for free-fall launching, at least once every three months during an abandon ship drill, the crew shall board the lifeboat, properly secure themselves in their seats and commence launch procedures up to, but not including, the actual release of the lifeboat (i.e., the release hook shall not be released). The lifeboat shall then either be free-fall launched with only the required operating crew on board, or lowered into the water by means of the secondary means of launching with or without the operating crew on board. In both cases, the lifeboat shall thereafter be manoeuvred in the water by the operating crew. At intervals of not more than six months, the lifeboat shall either be launched by free fall with only the operating crew on board, or simulated launching shall be carried out in accordance with the guidelines developed by the Organization. (See MSC.1/Circ.1206/Rev.1)

(SOLAS III/19.3.3.4)

Fire drills should be planned in such a way that due consideration is given to regular practice in the various emergencies that may occur depending on the type of ship and the cargo. (SOLAS III/19.3.4.1)

Crew members shall be trained to be familiar with the arrangements of the ship as well as the location and operation of any fire-fighting systems and appliances that they may be called upon to use.

(SOLAS 2004 II-2/15.2.2.1)

Each fire drill shall include:

- 1. Reporting to stations and preparing for the duties described in the muster list;*
- 2. Starting a fire pump, using at least the two required jets of water to show that the system is in proper working order;*
- 3. Checking of fireman's outfit and other personal rescue equipment;*
- 4. Checking of relevant communication equipment;*
- 5. Checking the operation of watertight doors, fire doors, fire dampers and main inlets and outlets of ventilating systems in the drill area; and,*
- 6. Checking the necessary arrangements for subsequent abandoning of the ship. (SOLAS III/19.3.4.2)*

5.15 Is regular training in the use of life-saving equipment being undertaken?

Instructions in the use of the ship's fire extinguishing appliances, life-saving appliances and in survival at sea shall be given at the same interval as the drills. Individual instruction may cover different parts of the ship's life-saving and fire-extinguishing appliances, but all shall be covered within any period of two months.

(SOLAS III/19.4.1)

Every crew member shall be given instructions which shall include but not necessarily be limited to:

- 1. Operation and use of the ship's inflatable liferafts;*

2. Problems of hypothermia, first-aid treatment for hypothermia and other appropriate first-aid procedures;
3. Special instructions necessary for use of the ship's life-saving appliances in severe weather and severe sea conditions; and,
4. Operation and use of fire-extinguishing appliances. (SOLAS III/19.4.2)

As far as is reasonable and practicable, rescue boats other than lifeboats which are also rescue boats, shall be launched each month with their assigned crew aboard and manoeuvred in the water. In all cases this requirement shall be complied with at least every three months. (SOLAS III/19.3.3.6)

On board training in the use of davit-launched liferafts shall take place at intervals of not more than four months on every ship fitted with such appliances. (SOLAS III/19.4.3)

Ship Security

Notes: The International Ship and Port Facility Security Code came into force on 1st July 2004.

Inspectors should not request to sight sensitive material, but confirm only with the Master, that procedures or records are available or maintained.

5.16 Are ship security records related to port calls being maintained?

The ship shall keep records for the last ten calls at port facilities. (SOLAS XI-2/9.2.3)

Note: The required detail of the records is considerable and is contained in SOLAS XI-2/9.2.1.

5.17 Are ship security records related to the ship security plan being maintained?

Records should include:

- Training, drills and exercises;
- Security threats and security incidents;
- Breaches of security;
- Changes in security level;
- Communications relating to the direct security of the ship such as specific threats to the ship or to port facilities the ship is, or has been, in;
- Internal audits and reviews of security activities;
- Periodic review of the ship security plan;
- Implementation of any amendments to the plan;
- Maintenance, calibration and testing of any security equipment provided on board, including testing of the ship security alert system. (ISPS Code Part A/10.1)

5.18 Has a security officer been designated and trained to undertake this role?

The duties and responsibilities of the ship security officer shall include, but are not limited to:

- Undertaking regular security inspections of the ship to ensure that appropriate security measures are maintained;
- Maintaining and supervising the implementation of the ship security plan, including any amendments to the plan;
- Co-ordinating the security aspects of the handling of cargo and ship's stores with other shipboard personnel and with the relevant port facility security officers;
- Proposing modifications to the ship security plan;
- Reporting to the company security officer any deficiencies and non-conformities identified during internal audits, periodic reviews, security inspections and verifications of compliance and implementing any corrective actions;
- Enhancing security awareness and vigilance on board;
- Ensuring that adequate training has been provided to shipboard personnel, as appropriate;
- Reporting all security incidents;
- Co-ordinating implementation of the ship security plan with the company security officer (CSO) and the relevant port facility security officer; and,
- Ensuring that security equipment, if any, is properly operated, tested, calibrated and maintained. (ISPS Code Part A/12.2)

Note: The suggested training is detailed in the ISPS Code Part B/13.1 and 2 and includes adequate knowledge of the ship and of the ship security plan and related procedures.

5.19 Is an adequate deck watch being maintained to prevent unauthorised access?

Note: The deck watch should ensure that access to the ship is denied to all unauthorised persons.

Enclosed Space and Pump Room Entry Procedures

Notes: Procedures relating to enclosed space entry are covered by, IMO Assembly resolution A1050 (27) (Revised Recommendations for Entering Enclosed Spaces aboard ships), MSC.1/Circ 1401 (Guidelines for Tank entry on Board Tankers using Nitrogen as an Inerting Medium) and ISGOTT Chapter 10.

Enclosed space means a space which has any of the following characteristics:

- 1- limited openings for entry and exit;
- 2 -inadequate ventilation; and
- 3 -is not designed for continuous worker occupancy,

and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, cargo pump rooms, cargo compressor rooms, cofferdams, chain lockers, void spaces, duct keels, inter-barrier spaces, boilers, engine crankcases, engine scavenge air receivers, sewage tanks, and adjacent connected spaces. This list is not exhaustive and a list should be produced on a ship-by-ship basis to identify enclosed spaces. (A1050/27)

An enclosed space is a space that has limited openings for entry and exit, unfavourable natural ventilation, and that is not designed for continuous worker occupancy. (ISGOTT Definitions p xxvi)

Enclosed spaces include, but are not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, pump rooms, cofferdams, void spaces, duct keels, inter-barrier spaces, engine crankcases and sewage. The Master and responsible officer are responsible for determining whether entry into an enclosed space may be permitted. It is the duty of the responsible officer to ensure:

- That the space is ventilated.
- That the atmosphere in the compartment is tested and found satisfactory.
- That safeguards are in place to protect personnel from the hazards that are identified.
- That appropriate means for controlling entry are in place.

Personnel carrying out work in an enclosed space are responsible for following the procedures and for using the safety equipment specified.

Prior to entry into an enclosed space, a risk assessment should be completed to identify the potential hazards and to determine the safeguards to be adopted. The resulting safe working practice should be documented and approved by the responsible officer before being countersigned by the Master, who confirms that the practice is safe and in compliance with the ship's Safety Management System. The permit, or other enabling document, should be sighted and completed by the person entering the space, prior to entry.

The controls required for safe entry vary with the task being performed and the potential hazards identified during the risk assessment. However, in most cases an Entry Permit System will provide a convenient and effective means of ensuring and documenting that essential precautions have been taken and, where necessary, that physical safeguards have been put in place. The adoption of an Entry Permit System, which may include the use of a check list, is therefore recommended.

Permission to continue work should only be given for a period sufficient to complete the task. Under no circumstances should the period exceed one day.

A copy of the permit should be prominently displayed at the entrance to the space to inform personnel of the precautions to be taken when entering the space and of any restrictions placed upon the activities permitted within the space.

The permit should be rendered invalid if ventilation of the space stops or if any of the conditions noted in the check list change.

Restricting the issue of approvals, such as entry permits, so that all cargo tanks which are safe to enter are shown on one document, may be found to simplify the paper Administration, avoid overlapping and the possibility of confusion as to which approval applies to which tank. However, if such a system is used, there must be rigorous control to ensure cancellation of existing permits, and that the atmospheres of all named tanks are correctly tested at the time of issue so that an effective extension of a period of validity does not occur by default. It will be particularly important to ensure that the permit process is supplemented by the marking of tank lids with notices indicating which tanks are safe to enter.

Inspection of cargo tanks after cleaning and before loading can require an independent surveyor to enter the tank. All relevant tank entry procedures must be observed.

(ISGOTT 10.4)

Note: The OCIMF Guidelines on Safety Management Systems for Hot Work and Entry into Enclosed Spaces (1st Ed September 2008) information paper must be taken into account in the development of enclosed space entry procedures.

5.20 Has the vessel adequate enclosed space entry procedures?

Notes: Procedures relating to enclosed space entry are covered by, IMO Assembly resolution A1050 (27) (Revised Recommendations for Entering Enclosed Spaces aboard ships), MSC.1/Circ 1401 (Guidelines for Tank entry on Board Tankers using Nitrogen as an Inerting Medium) and ISGOTT Chapter 10.

In order to simplify the administrative process all cargo tanks which have been tested and found to be safe for entry may be shown on one permit, but the permit must record the readings for each compartment and the same entry procedures must be applied for each compartment entered.

Under such circumstances compartments should be tagged to indicate which are safe to enter and which are not and rigorous control must be in place to ensure that permits are cancelled and the tags changed when entry has been completed.

To be considered safe for entry a reading of not more than 1% LFL must be obtained on suitable monitoring equipment. Entry into a compartment which has not been cleaned or proved safe for entry must only be considered in an emergency situation. The operator should be involved in any decision to enter such a compartment.

The use of personal analyzers capable of continuously monitoring the oxygen content of the atmosphere, the presence of hydrocarbon vapour and, if appropriate, toxic vapour is strongly recommended.

Permission to work should only be given for a period sufficient to complete the task and a specific risk assessment has been carried out. Under no circumstances should the period exceed one day. NB: The term "one day" means a duration which must not exceed 12 hours.

5.21 Are pump room entry procedures being complied with?

Cargo pumprooms are to be considered as enclosed spaces and the requirements of this Chapter should be followed to the maximum extent possible. However, because of their location, design and operational need for the space to be routinely entered by personnel, pumprooms present a particular hazard and therefore necessitate special precautions, which are described in the following Sections.

(ISGOTT 10.10)

Before anyone enters a pumproom, it should be thoroughly ventilated, the oxygen content of the atmosphere should be verified and the atmosphere checked for the presence of hydrocarbons and any toxic gas associated with the cargo being handled.

Only where a fixed gas detection system is correctly calibrated and tested and provides gas readings as a percentage LFL (%LFL) to a level of accuracy equivalent to portable gas instruments, at representative locations within the pumproom, should it be used to provide information for safe entry into the space.

Formal procedures should be in place to control pumproom entry. The procedure used should be based on a risk assessment, should ensure that risk mitigation measures are followed, and that entries into the space are recorded.

A communications system should provide links between the pumproom, navigation bridge, engine room and cargo control room. In addition, audible and visual repeaters for essential alarm systems, such as the general alarm and the fixed extinguishing system alarm, should be provided within the pumproom.

Arrangements should be established to enable effective communication to be maintained at all times between personnel within the pumproom and those outside. Regular communication checks should be made at pre-agreed intervals and failure to respond should be cause to raise the alarm.

VHF/UHF communication should not be used as a primary communication method where it is known that reception may not be reliable or practicable due to noise. Where communication by VHF/UHF is difficult, it is recommended that a standby person is positioned on the pumproom top and that a visual and remote communication procedure is put in place.

The frequency of pumproom entry for routine inspection purposes during cargo operations should be reviewed with a view to minimising personnel exposure.

Notices should be displayed at the pumproom entrance prohibiting entry without formal permission. (ISGOTT 10.10.2)

Note: For the purpose of this question a pumproom may either be a Cargo pumproom, Ballast pumproom, or Fuel oil transfer Pumproom.

5.22 Are pump room spaces adequately ventilated?

Cargo pump rooms shall be mechanically ventilated and discharges from the exhaust fans shall be led to a safe place on deck. The ventilation of these rooms shall have sufficient capacity to minimise the possibility of accumulation of flammable vapours. The number of changes of air shall be at least 20 per hour. The ventilation shall be of the suction type using fans of non-sparking type. (SOLAS II-2/4.5.4.1)

On vessels constructed after 1st July 2002, lighting in cargo pump-rooms, except emergency lighting, shall be interlocked with ventilation such that the ventilation shall be in operation when switching on the lighting. Failure of the ventilation system shall not cause the lighting to go out. (SOLAS 2004 II-2/4.5.10.1.2)

Notes: Pumproom fans must be operating in the extraction mode. If only one extraction fan is installed, arrangements must be provided to provide extraction in case of failure. On some vessels with ballast or fuel oil transfer pumprooms only one extraction fan is fitted. In the event of failure alternative temporary arrangements combined with a risk assessment/enclosed space entry permit must be made prior to entry.

Pump-rooms intended solely for ballast transfer need not comply with the requirements of regulation II-2/4.5.10. The requirements of regulation II-2/4.5.10 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. "Similar pumps" includes pumps intended for transfer of fuel oil having a flashpoint not exceeding 60C. Pump-rooms intended for transfer of fuel oil having a flashpoint exceeding 60C need not comply with the requirements of regulation II-2/4.5.10. (IACS Unified Interpretation)

Note: For the purpose of this question a pumproom may either be a Cargo pumproom, Ballast pumproom, or Fuel oil transfer Pumproom. Bow thruster spaces need not comply with SOLAS regulation II-2/4.5.10

5.23 Are pump room fire and flooding dampers clearly marked as to their operation and in good order?

Note: Often the venting system is fitted with high level suction at or above the bottom gratings, the flaps of which are operable from the pump room top. The purpose of these suction is to allow the fans to be operated when the bilges are flooded. The high level suction flaps under normal conditions should be closed.

5.24 Are permanent arrangements provided for lifting an incapacitated person from the cargo and, if applicable, the ballast pumproom, including provision of a suitable stretcher or harness and is the equipment in good order?

The pump room rescue harness and rope should be checked regularly to ensure it is fit for use and rigged for immediate operation. (ISGOTT 10.11.3)

Note: It is recommended that stretcher be provided in lieu of a harness if it can be effectively used.

Monitoring Non-Cargo Spaces

Note: Void and ballast tank spaces within the cargo tank block should be routinely monitored to check that no leakage has occurred from adjacent cargo tanks. Monitoring should include regular checks for hydrocarbon content and regular sounding/ullaging of the empty spaces, particularly to ensure that ballast, before it is discharged, is clean.

5.25 Are spaces adjacent to cargo tanks, including pipe ducts, regularly monitored for accumulations of gas?

Suitable portable instruments for measuring oxygen and flammable vapour concentrations shall be provided. In selecting these instruments, due attention shall be given to their use in combination with the fixed gas sampling line systems referred to in paragraph 5.7.2.2 (SOLAS II-2/4.5.7.2.1)

Where the atmosphere in double hull spaces cannot be reliably measured using flexible gas sampling hoses, such spaces shall be fitted with permanent gas sampling lines. The configuration of gas sampling lines shall be adapted to the design of such spaces. (SOLAS II-2/4.5.7.2.2)

Note: There should be a procedure for the regular monitoring of all spaces adjacent to the cargo tanks for accumulations of gas. If monitoring is made by use of portable instruments, the method, frequency of checking and adequacy of records should be established.

5.26 Where a fixed system to monitor flammable atmospheres in non-cargo spaces is fitted, are recorders and alarms in order?

Note: In the event of failure of the main system, manual checks must be made. Records should be reviewed to ensure that these have been conducted. Manufacturers' instructions for the maintenance of the system should be followed.

Gas Analysing Equipment

5.27 Are portable gas and oxygen analyser appropriate to the cargoes being carried and are they in good order and is there a record of regular testing and calibration?

Tankers shall be equipped with at least one portable instrument for measuring oxygen and one for measuring flammable vapour concentrations, together with a sufficient set of spares. Suitable means shall be provided for the calibration of such instruments. (SOLAS II-2/4.5.7.1)

Notes: Each vessel should carry at least two each oxygen, % volume hydrocarbon, LEL and toxic gas analysers. Personal oxygen and hydrocarbon analysers, which can be carried in a pocket or on a belt, should be available for tank, enclosed space or pump room entry. The manufacturers' recommended intervals for servicing the equipment must be observed and procedures in place for the replacement of parts such as filters, at the manufacturers' recommended intervals.

Use of a self-test facility does not necessarily mean that an analyser is operating correctly. An instrument may self-test satisfactorily, but then fail to register a lack of oxygen or the presence of gas. The only way to be sure that a machine is operating satisfactorily is to use a sample check gas.

5.28 Are officers familiar with use and calibration of portable oxygen and hydrocarbon analysers?

Notes: A procedure must require that all oxygen and hydrocarbon analysers are checked for correct operation before each use. Nitrogen must generally be used when calibrating oxygen analysers, but some multiple function analysers use a test gas which serves all the functions of the analyser with one sample gas and which has oxygen content of 20.9%.

In the case of hydrocarbon gas analysers, the correct test gas specified in the manufacturers' documentation must be used and officers must know what the result of using that test gas should be. This applies to each type of analyser on board. As above, some multiple function analysers use a test gas which tests all the functions with one sample gas.

5.29 Is span calibration gas available for the types of fixed and portable analysers on board?

5.30 On vessels fitted with an inert gas system, are instruments capable of measuring hydrocarbon content in an oxygen deficient atmosphere available and in good order?

Notes: Vessels equipped with inert gas should in addition to the analysers in question 5.27 carry two analysers capable of measuring hydrocarbon content in an inert atmosphere.

Personnel should ensure that the analyser being used for measuring hydrocarbon content in an inert gas atmosphere is in fact capable of doing so accurately. An example of an analyser specifically designed to do so is the MSA Tankscope. Analysers which measure hydrocarbons using an infra-red principle are designed for use in oxygen-deficient atmospheres. If this type of instrument is provided, a Tankscope is not required to be carried.

In cases where a vessel is not fitted with an inert gas system, but does employ nitrogen blanketing, these instruments must be provided.

5.31 Where toxic gases may be encountered, are appropriate toxic gas detection analysers available and in good order?

Many crude oils come out of the well with high levels of H₂S, but a stabilisation process usually reduces this level before the crude oil is delivered to the ship. However, the amount of stabilisation may be temporarily reduced at times and a tanker may receive a cargo with an H₂S content higher than usual or expected. In addition, some crude oils are never stabilised and always contain high levels of H₂S. H₂S can also be encountered in refined products such as naphtha, fuel oil, bunker fuels, bitumen's and gas oils.

Cargo and bunker fuels should not be treated as free of H₂S until after they have been loaded and the absence of H₂S has been confirmed by both the results of monitoring and the relevant MSDS information.

(ISGOTT 2.3.6.1)

The use of personal H₂S gas monitoring instruments by personnel engaged in cargo operations is strongly recommended.

(ISGOTT 2.3.6.4)

Notes: Two toxic gas detectors are required on vessels carrying noxious liquids. There should be an adequate supply of chemical indicator tubes (e.g. Draeger tubes), or other electronic equivalents specific to the cargoes being carried and they should be within their expiry date. An up to date inventory of chemical indicator tubes should be maintained. Personnel should be aware that some instrument sensors could be poisoned if exposed to high concentrations of CO₂.

Hot Work Procedures

5.32 Are hot work procedures in accordance with the recommendations of ISGOTT Section 9.4 and OCIMF guidelines?

There have been a number of fires and explosions due to Hot Work in, on, or near cargo tanks or other spaces that contain, or that have previously contained, flammable substances or substances that emit flammable vapours. Hot Work should only be considered if there are no practical alternative means of repair.

(ISGOTT 9.4)

The SMS should include adequate guidance on control of Hot Work and should be robust enough to ensure compliance. (See Fig 9.2) Absence of guidance should be regarded as prohibition rather than approval (IMO MSC/Circ. 1084).

(ISGOTT 9.4.1)

Note: The OCIMF Guidelines on Safety Management Systems for Hot Work and Entry into Enclosed Spaces (1st Ed September 2008) information paper must be taken into account in the development of hot work procedures.

5.33 Is electric welding equipment in good order and are written safety guidelines available on site?

Welding and other equipment used for Hot Work should be carefully inspected before each occasion of use to ensure that it is in good condition. Where required, it must be correctly earthed. Special attention must be paid when using electric arc equipment to ensure that:

- *Electrical supply connections are made in a gas free space.*
- *Existing supply wiring is adequate to carry the electrical current demand without overloading, causing heating.*
- *Insulation of flexible electric cables is in good condition.*
- *The cable route to the work site is the safest possible, only passing over gas free or inerted spaces.*
- *The welding return lead should be connected as near as practicable to the welding arc; metal rails, pipes and frames should not be used as part of the welding circuit unless they are a part of the work piece itself.*

(ISGOTT 9.5)

5.34 Is gas welding and burning equipment in good order?

Note: Piping should be of steel welded construction and bolted flanges are prohibited. Copper, rubber or braided lines should not be used, except that braided lines may be used for the short length from the cylinder heads to the manifolds within the storage space. Pipework and fittings should be free of grease.

Flashback arrestors should be fitted at both the cylinders and workstation as recommended by the USA Operational Safety and Health Admin (OSHA), the UK Health and Safety Executive and other national safety authorities where long lengths of piping between the cylinders and the blowtorch are involved.

5.35 Are spare oxygen and acetylene cylinders stored apart in a dedicated storage and is the storage in a clearly marked, well-ventilated position outside the accommodation and engine room?

Notes: Oxygen will not burn or explode, it only supports combustion; however, a small amount of excess oxygen will allow materials which are not normally combustible to burn with ferocity. Industrial oxygen cylinders are painted blue. Acetylene is 92.3% carbon and 7.7% hydrogen, is lighter than air and is highly flammable with a LEL of 2.5%. Acetylene cylinders are painted maroon.

Oxygen and Acetylene should be kept in separate compartments except in the case of the cylinders that are in use, which may be stored in the same compartment. Cylinders should be stowed away from heat sources and should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Full and empty cylinders should be segregated. Cylinders should be stored with the valve end up. Storage areas should be free of combustible material and not exposed to salt or other corrosive chemicals.

Life Saving Equipment

Before the ship leaves port and at all times during the voyage, all life-saving appliances shall be in working order and ready for immediate use.

(SOLAS III/20.2)

Note: The technical specifications and requirements for life-saving appliances are contained in the Life-Saving Appliances Code.

5.36 Are ship-specific life-saving equipment training manuals available?

A training manual shall be provided in each crew mess room and recreation room, or in each cabin.

(SOLAS III/35.2)

The training manual shall contain instructions and information, in easily understood terms illustrated wherever possible, on the life-saving appliances provided in the ship and on the best methods of survival. Any part of such information may be provided in the form of audio-visual aids in lieu of the manual.

The following shall be explained in detail:

- Donning of lifejackets, immersion suits and anti-exposure suits;*
- Muster at assigned stations;*
- Boarding, launching and clearing the survival craft and rescue boats;*
- Method of launching from within survival craft;*
- Release from launching appliances;*
- Illumination in launching areas;*
- Use of all survival equipment;*
- With the assistance of illustrations, the use of radio life-saving appliances;*
- Use of drogues;*
- Use of engine and accessories;*
- Recovery of survival craft and rescue boats, including stowage and securing;*
- Hazards of exposure and the need for warm clothing;*
- Best use of survival craft facilities in order to survive;*
- Methods of retrieval, including the use of helicopter gear;*
- All other functions contained in the muster list and emergency instructions; and*
- Instructions for repair of the lifesaving appliances.*

(SOLAS III/35.3)

5.37 Are ship-specific life-saving equipment maintenance instructions available and are weekly and monthly inspections being carried out?

The following tests and inspections shall be carried out weekly and a report of the inspection shall be entered in the log-book:

- .1 all survival craft, rescue boats and launching appliances shall be visually inspected to ensure that they are ready for use. The inspection shall include, but is not limited to, the condition of hooks, their attachment to the lifeboat and the on-load release gear being properly and completely reset;*
- .2 all engines in lifeboats and rescue boats shall be run for a total period of not less than 3 minutes, provided the ambient temperature is above the minimum temperature required for starting and running the engine. During this period of time, it should be demonstrated that the gearbox and gearbox train are engaging satisfactorily. If the special characteristics of an outboard motor fitted to a rescue boat would not allow it to be run other than with its propeller submerged for a period of 3 minutes, it should be run for such a period as prescribed in the manufacturer's handbook. In special cases, the Administration may waive this requirement for ships constructed before 1 July 1986;*
- .3 lifeboats, except free-fall lifeboats, on cargo ships shall be moved from their stowed position, without any persons on board, to the extent necessary to demonstrate satisfactory operation of launching appliances, if weather and sea conditions so allow; and*
- .4 the general emergency alarm shall be tested."*

(SOLAS III/20.6)

All lifeboats, except free-fall lifeboats, shall be turned out from their stowed position, without any persons on board if weather and sea conditions so allow.

(SOLAS III/20.7.1)

Monthly inspections. Inspection of the life-saving appliances, including lifeboat equipment, shall be carried out monthly using the checklist required by regulation 36.1 to ensure that they are complete and in good order. A report of the inspection shall be entered in the log-book.

(SOLAS III/20.7.2)

Instructions for on-board maintenance shall be easily understood, illustrated wherever possible and as appropriate, shall include for each appliance:

- 1. A checklist for use when carrying out the monthly inspections required by SOLAS III/20.7.2 and III/36.1;*
- 2. Maintenance and repair instructions;*
- 3. A schedule of periodic maintenance;*
- 4. A diagram of lubrication points with the recommended lubricants;*
- 5. A list of replaceable parts;*
- 6. A list of sources of spare parts; and*
- 7. A log for records of inspections and maintenance.*

(SOLAS III/36)

5.38 Are muster lists and lifejacket donning instructions displayed?

Muster lists and emergency instructions shall be exhibited in conspicuous places throughout the ship including the navigation bridge, engine room and crew accommodation spaces.

(SOLAS III/8.3)

The muster list shall show the duties assigned to the different members of the crew including:

- Closing of the watertight doors, fire doors, valves, scuppers, sidescuttles, portholes and other similar openings in the ship;
- Equipping of the survival craft and other life-saving appliances;
- Preparation and launching of survival craft;
- General preparations of other life-saving appliances;
- Muster of passengers;
- Use of communication equipment;
- Manning of fire parties assigned to deal with fires; and
- Special duties assigned in respect to the use of fire-fighting equipment and installations.

(SOLAS III/37.3)

The muster list shall specify which officers are assigned to ensure that life-saving and fire appliances are maintained in good condition and ready for immediate use. (SOLAS III/37.4)

The muster list shall specify substitutes for key persons who may become disabled, taking into account that different emergencies may call for different actions. (SOLAS III/37.5)

The muster list shall be prepared before the ship proceeds to sea. (SOLAS III/37.7)

5.39 Is there a maintenance and test schedule for lifeboat, Rescue boat on-load release gear, davit launched liferaft automatic release hooks, and free-fall lifeboat release systems, where fitted.

Lifeboat or rescue boat on-load release gear, including free-fall lifeboat release systems shall be:

- maintained in accordance with instructions for on-board maintenance as required by regulation 36;
- subjected to a thorough examination and operational test during the annual surveys required by regulations 1/7 and 1/8 by properly trained personnel familiar with the system; and
- operationally tested under a load of 1.1 times the total mass of the lifeboat when loaded with its full complement of person and equipment whenever the release gear is overhauled. Such over-hauling and test shall be carried out at least once every five years. (SOLAS III/20.11.2)

Davit-launched liferaft automatic release hooks shall be:

- maintained in accordance with instructions for on-board maintenance as required by regulation 36;
- subjected to a thorough examination and operational test during the annual surveys required by regulations 1/7 and 1/8 by properly trained personnel familiar with the system; and
- operationally tested under a load of 1.1 times the total mass of the lifeboat when loaded with its full complement of person and equipment whenever the release gear is overhauled. Such over-hauling and test shall be carried out at least once every five years. (SOLAS III/20.11.3)

Note: Of particular importance in the checking of lifeboats is the on-load release system fitted to enclosed lifeboats and the maintenance routines for them. A high percentage of accidents at sea are attributed to lifeboats and their release systems. (MSC Circ 1206).

5.40 Are lifeboats, including their equipment and launching mechanisms, in good order?

Each survival craft shall be stowed in a state of continuous readiness so that two crew members can carry out preparations for embarkation and launching in less than 5 minutes. (SOLAS III/13.1.3)

Each lifeboat shall be launched with its assigned operating crew aboard and manoeuvred in the water at least once every three months during an abandon ship drill. (SOLAS III/19.3.3.3)

In the case of a lifeboat arranged for free-fall launching, at least once every three months during an abandon ship drill, the crew shall board the lifeboat, properly secure themselves in their seats and commence launch procedures up to, but not including, the actual release of the lifeboat (i.e., the release hook shall not be released). The lifeboat shall then either be free-fall launched with only the required operating crew on board, or lowered into the water by means of the secondary means of launching with or without the operating crew on board. In both cases, the lifeboat shall thereafter be manoeuvred in the water by the operating crew. At intervals of not more than six months, the lifeboat shall either be launched by free fall with only the operating crew on board, or simulated launching shall be carried out in accordance with the guidelines developed by the Organization. (SOLAS III.19.3.3.4)

Emergency lighting for mustering and abandonment shall be tested at each abandon ship drill.

(SOLAS III/19.3.3.9)

Falls used in launching shall be inspected periodically (Refer to Measures to prevent accidents with lifeboats (MSC.1/Circ.1206) with special regard for areas passing through sheaves, and renewed when necessary due to deterioration of the falls or at intervals of not more than 5 years, whichever is the earlier.

(SOLAS III/20.4.1)

Each free-fall lifeboat shall be fitted with a release system which shall be designed to test the release system without launching the lifeboat. (LSA Code IV/4.7.6.4)

Each lifeboat shall be clearly marked with the number of persons for which the lifeboat is approved and the name and port of registry. Means of identifying the ship to which the lifeboat belongs and the number of the lifeboat shall be marked in such a way that they are visible from above. (LSA Code IV/4.4.9)

Notes: It is very important to check the lifting hooks and their associated structure, in particular the connections to the lifeboat keel. These are occasionally found to be severely wasted.

Lifeboat equipment is detailed in the LSA Code IV/4.4.8 and the general requirements for enclosed lifeboats in the LSA Code IV/4.6, although under SOLAS III/32.3.5 the totally enclosed lifeboats carried on ships constructed before 1st July 1986 need not comply with the requirements of the LSA Code IV/4.6.

Amendments to SOLAS III/19 (Emergency training and drills) and 20 (Operational readiness maintenance and inspections) came into force on 1st July 2006. The amendments concern the conditions in which lifeboat emergency training and drills should be conducted and introduce changes to the operational requirements for maintenance, weekly and monthly inspections so as not to require any persons to be on board, and servicing of launching appliances and on-load release gear.

5.41 Are lifeboat and liferaft operating instructions displayed?

Posters or signs shall be provided on or in the vicinity of survival craft and their launching controls shall:

1. Illustrate the purpose of the controls and the procedures for operating the appliance and give relevant instructions or warnings;
2. Be easily seen under emergency lighting conditions; and
3. Use symbols in accordance with resolution A.760, as amended by MSC.82. (SOLAS III/9.2)

5.42 Is the rescue boat, including its equipment and launching arrangement, in good order?

Cargo ships shall carry at least one rescue boat. A lifeboat may be accepted as a rescue boat, provided that it also complies with the requirements for a rescue boat. (SOLAS III/31.2)

Rescue boats shall be stowed in a state of continuous readiness for launching in not more than 5 minutes. (SOLAS III/14.1)

Notes: Rescue boat equipment is detailed in the LSA Code V/5.1.2.2, 3 and 4.

With respect to launching equipment, rescue boats should comply with the requirements of the LSA Code 4.4.7.6 (by LSA Code 5.1.1.1) and either have two release capabilities, one off-load and one on-load, or only one if the rescue boat can only be released when waterborne.

The on-load release shall be:

- Protected against accidental or premature use;
- To prevent a premature on-load release, on-load operation of the release mechanism should require a sustained and deliberate action by the operator;
- To prevent an accidental release the mechanical protection (interlock) should only engage when the release mechanism is properly and completely set;
- The release mechanism shall be so designed that crew members in the lifeboat can clearly observe when the release mechanism is properly and completely reset;
- Clear operating instructions should be provided with a suitable worded warning notice;
- Where a single fall or hook system is used for launching, the above requirements need not apply and a single capability to release the rescue boat only when it is waterborne will be adequate.

5.43 Are liferafts in good order?

Cargo ships shall carry one or more inflatable or rigid liferafts, stowed in a position providing for easy side-to-side transfer at a single open deck level and of such aggregate capacity as will accommodate the total number of persons on board. If not stowed in a position providing for easy side-to-side transfer at a single open deck level, the total capacity available on each side shall be sufficient to accommodate the total number of persons on board. (SOLAS III/31.1.2)

If a free-fall lifeboat is fitted, cargo ships shall have one or more inflatable or rigid liferafts, on each side of the ship, of such aggregate capacity as will accommodate the total number of persons on board. The liferafts on at least one side of the ship shall be served by launching appliances. (SOLAS III/31.1.2.2)

For davit launched liferafts, the launching appliance shall include an automatic release hook arranged so as to prevent premature release during lowering and shall release the liferaft when waterborne. The release hook shall include a capability to release the hook under load. The on-load release control shall:

- Be clearly differentiated from the control which activates the automatic release function;
- Require at least two separate actions to operate;

- Be designed such that crew members on deck can clearly observe when the release mechanism is properly and completely set. (LSA Code VI/6.1.5)

5.44 Are hydrostatic releases, where fitted, correctly attached and in good order?

Every liferaft shall be stowed with its painter permanently attached to the ship. (SOLAS III/13.4.1)

Each liferaft or group of liferafts shall be stowed with a float-free arrangement so that each floats free and if inflatable, inflates automatically when the ship sinks. (SOLAS III/13.4.2)

Liferafts shall be so stowed as to permit manual release of one raft or container at a time from their securing arrangements. (SOLAS III/13.4.3)

Note: Some hydrostatic release manufacturers recommend that each liferaft is fitted with its own individual hydrostatic release unit (HRU), to prevent the possibility, where more than one liferaft is utilising the same release, of one of the liferafts breaking the weak link before the second or subsequent liferafts have inflated. Where more than one liferaft is attached to a single HRU, each of the rafts must be fitted with its own weak link. Liferafts stowed in the forward part of the vessel do not require a HRU.

5.45 Are lifebuoys, lights, buoyant lines, quick release mechanisms and self-activating smoke floats in good order?

Cargo ships shall carry not less than the following numbers of lifebuoys:

- Under 100 metres in length – 8;
- Between 100 metres and under 150 metres – 10;
- Between 150 metres and under 200 metres – 12;
- 200 metres and over – 14. (SOLAS III/32.1.1)

Lifebuoys shall be:

- So distributed as to be readily available on both sides of the ship and as far as practicable on all open decks extending to the ship's side;
- At least one shall be placed in the vicinity of the stern; and
- So stowed as to be capable of being rapidly cast loose and not permanently secured in any way. (SOLAS III/7.1.1)

At least one lifebuoy on each side of the ship shall be fitted with a buoyant line, equal in length to not less than twice the height at which it is stowed above the waterline in the lightest seagoing condition, or 30 metres, whichever is the greater. (SOLAS III/7.1.2)

Not less than one half of the total number of lifebuoys shall be provided with self-igniting lights;

Not less than two of these shall also be provided with lifebuoy self-activating smoke signals capable of quick release from the navigating bridge;

Lifebuoys with lights and those with lights and smoke signals shall be distributed equally on both sides of the ship and shall not be the lifebuoys provided with lifelines. (SOLAS III/7.1.3)

Lifebuoys intended to operate the quick-release arrangement provided for the self-activated smoke signals and self-igniting lights shall have a mass sufficient to operate the quick release arrangement. (LSA Code II/2.1.1.7)

5.46 Are lifejackets in good order?

A lifejacket shall be provided for every person on board and, in addition, a sufficient number of lifejackets shall be carried for persons on watch and for use at remotely located survival craft stations. The lifejackets carried for persons on watch should be stowed on the bridge, in the engine control room and at any other manned watch station. (SOLAS III/7.2.1)

The lifejackets used in totally enclosed lifeboats, except free-fall lifeboats, shall not impede entry into the lifeboat or seating including operation of the seat belts in the lifeboat. (SOLAS III/7.2.3)

Lifejackets selected for free-fall lifeboats and the manner in which they are carried or worn, shall not interfere with entry into the lifeboat, occupant safety or operation of the lifeboat. (SOLAS III/7.2.4)

5.47 Are immersion suits in a good order?

An immersion suit or an anti-exposure suit, of an appropriate size, shall be provided for every person assigned to crew the rescue boat. If the ship is constantly engaged in warm climates where, in the opinion of the Administration thermal protection is unnecessary, this protective clothing need not be carried (SOLAS III/7.3)

An immersion suit complying with the requirements of section 2.3 of the LSA Code shall be provided for every person on board the ship. These immersion suits need not be required if the ship is constantly engaged on voyages in warm climates where, in the opinion of the Administration, immersion suits are unnecessary. (SOLAS III/32.3.2)

If a ship has any watch or work stations which are located remotely from the place or places where immersion suits are normally stowed, additional immersion suits shall be provided at these locations for the number of persons normally on watch or working at those locations at any time. (SOLAS III/32.3.3)

Note: Immersion suits should be subject to periodic testing as set out in MSC Circ 1114.

5.48 Are pyrotechnics, including line throwing apparatus, in date and in good order?

Not less than 12 rocket parachute flares shall be carried and be stowed on or near the navigation bridge. (SOLAS III/6.3)

A line throwing appliance complying with the requirements of section 7.1 of the Code shall be provided. (SOLAS III/18)

An illustrated table describing the life-saving signals shall be readily available to the officer of the watch. (SOLAS V/29)

Note: Line throwing apparatus should be ready for immediate use. The line and the rockets should not be stowed apart.

5.49 Are the locations of life saving appliances marked with IMO symbols?

Containers, brackets, racks and other similar stowage locations for life-saving equipment shall be marked with symbols in accordance with IMO Res. A.760 (18) indicating the devices stowed in that location for that purpose. If more than one device is stowed in that location, the number of devices shall also be indicated. (SOLAS III/20.10)

Fire Fighting Equipment

Fire-fighting systems and appliances shall be kept in good working order and readily available for immediate use. Portable extinguishers which have been discharged shall be immediately recharged or replaced with an equivalent unit. (SOLAS II-2/14.2.1.2)

By the first scheduled dry-docking after 1 January 2010, fixed carbon dioxide fire-extinguishing systems for the protection of machinery spaces and cargo pump-rooms on ships constructed before 1 July 2002 shall comply with the provisions of paragraph 2.2.2 of chapter 5 of the Fire Safety Systems Code.

(SOLAS 2-II/10.4.1.5)

Note: This requires two separate controls within a clearly identified release box to release the CO₂ and activate an audible alarm. One control shall open the piping valve for the gas and the second control discharge the gas from the containers. If the release box is locked, a key shall be located adjacent in a break glass type enclosure.

5.50 Are ship-specific fire training manuals available?

The training manual shall explain the following in detail:

1. General fire safety practice and precautions related to the dangers of smoking, electrical hazards, flammable liquids and similar common shipboard hazards;
2. General instructions on fire-fighting activities and fire-fighting procedures, including procedures for notification of a fire and use of manually operated call points;
3. Meanings of the ship's alarms;
4. Operation and use of fire-fighting systems and appliances;
5. Operation and use of fire doors;
6. Operation and use of fire and smoke dampers; and
7. Escape systems and appliances. (SOLAS II-2/15.2.3.4)

A training manual shall be provided in each crew mess room and recreation room, or in each crew cabin. (SOLAS II-2/15.2.3.1)

The training manual shall be written in the working language of the ship. (SOLAS II-2/15.2.3.2)

5.51 Are ship-specific fire safety operational booklets available?

The fire safety operational booklet shall contain the necessary information and instructions for the safe operation of the ship and cargo handling operations in relation to fire safety. The booklet shall include information concerning the crew's responsibilities for the general fire safety of the ship while loading and discharging cargo and while under way. The booklet shall also provide reference to the pertinent fire-fighting and emergency cargo handling instructions contained in the IBC Code, the IGC Code and the IMDG Code, as appropriate. (SOLAS II-2/16.2.1)

The fire safety operational booklet shall also include provisions for preventing fire spread to the cargo area due to ignition of flammable vapours and include procedures for cargo tank gas-purging and/or gas-freeing. (SOLAS II-2/16.3.1)

The fire safety operational booklet shall be provided in each crew mess room and recreation room, or in each crew cabin. (SOLAS II-2/16.2.2)

The booklet shall be written in the working language of the ship. (SOLAS II-2/16.2.3)

The booklet may be combined with the fire training manual. (SOLAS II-2/16.2.4)

5.52 Are ship-specific firefighting equipment maintenance instructions available and are weekly and monthly inspections being carried out?

Maintenance, testing and inspections shall be carried out based on the guidelines in MSC/Circ.1432

The maintenance plan shall be kept on board the ship and shall be available for inspection.

(SOLAS II-2/14.2.2.2)

The maintenance plan shall include at least the following fire protection systems and firefighting systems and appliances, where installed:

1. Fire mains, fire pumps and hydrants, hoses, nozzles and international shore connections;
2. Fixed fire detection and fire alarm systems;
3. Fixed fire extinguishing systems and other fire extinguishing appliances;
4. Automatic sprinkler, fire detection and fire alarm systems;
5. Ventilation systems, including fire and smoke dampers, fans and their controls;
6. Emergency shutdown of fuel supply;
7. Fire doors, including their controls;
8. General emergency alarm systems;
9. Emergency escape breathing devices;
10. Portable fire extinguishers, including spare charges;
11. Fire fighter's-outfits;
12. Inert gas systems;
13. Deck foam systems;
14. Fire safety arrangements in cargo pump rooms; and
15. Flammable gas detectors.

(SOLAS II-2/14.2.2.3) and 14.4)

The maintenance programme may be computer-based.

(SOLAS II-2/14.2.2.4)

5.53 Are records available to show that samples of foam compound have been tested at regular intervals?

Protein based alcohol foam concentrates should be subject to a stability test with Acetone.

Except for tests above, the first periodical control of foam concentrates should be performed not more than 3 years after being supplied to the ship, and after that, every year. The tests required above should be performed prior to delivery to the ship and annual thereafter. (MSC.1/Circ 1312).

5.54 Is a fire control plan exhibited within the accommodation, is a copy also available externally and is equipment correctly marked on it?

Note: The requirements for fire plans are contained in SOLAS II-2/15.2.4. IMO Resolution A.654 (16) recommends the symbols to be used on fire control plans.

5.55 Are fire mains, pumps, hoses and nozzles in good order and available for immediate use?

5.56 Are isolating valves in fire and foam system lines clearly marked and in good order?

5.57 Is the International shore fire connection readily available externally and is the location clearly marked?

The connection shall be of steel or other suitable material. The connection shall be kept aboard the ship together with a gasket of any material suitable, with four 16 mm bolts, 50 mm in length and eight washers.

(FSS Code 2.2)

If fixed on a ship, the connection should be accessible from both sides of the ship and its location should be clearly marked. The shore connection should be ready for use whenever a ship is in port. (ISGOTT 26.5.3)

5.58 Are fixed fire detection and alarm systems in good order and tested regularly?

Notes: There should be a procedure for whenever a zone of a fire detection system is isolated to ensure that relevant personnel are aware of the isolation and the reason for it and to ensure that the zone is reinstated as soon as possible.

The engine room should not be operated unmanned with any zone in the space isolated.

Spaces not covered by a fire detection system should be covered by regular fire patrols. Such patrols should not utilise the bridge lookout during the hours of darkness.

5.59 Are the main deck, pump room, engine room and other fixed fire extinguishing systems, where fitted, in good order and are clear operating instructions posted?

Paint lockers and flammable liquid lockers shall be protected by an appropriate fire-extinguishing arrangement approved by the Administration. (SOLAS 1974 II-2/18.7 and SOLAS 2004 II-2/10.6.3.2)

For ships constructed after 1st July 2002, paint lockers shall be protected by:

1. A CO₂ system, designed to give a minimum volume of free gas equal to 40% of the gross volume of the protected space; or
2. A dry powder system, designed for at least 0.5 kg powder/m³; or
3. A water spraying system; or
4. A system providing equivalent protection, as determined by the Administration.

(SOLAS 2004/II-2/10.6.3.1)

For lockers of a deck area of less than 4m² which do not give access to accommodation spaces, a portable CO₂ extinguisher sized to provide a minimum volume of free gas equal to 40% of the gross volume of the space may be accepted in lieu of a fixed system. A discharge port shall be arranged in the locker to allow the discharge of the extinguisher without having to enter the protected space. The portable fire extinguisher shall be stowed adjacent to the port. Alternatively a port or hose connection may be provided to facilitate the use of fire main water. (SOLAS 2004 II-2/10.6.3.3)

Note: Evidence of satisfactory testing of the firefighting systems and foam quality should be provided.

5.60 Is the emergency fire pump in full operational condition and are starting instructions clearly displayed?

For ships constructed on or after 1st February 1992, 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 (FSS) 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.

(SOLAS 1974 II-2/4.3.3.2.5 and FSS Code 12.2.2.1.3)

Any service fuel tank shall contain sufficient fuel to enable the pump to run on full load for at least 3 hours and sufficient reserves of fuel shall be available outside the main machinery space of Category A to enable the pump to be run on full load for an additional 15 hours.

(SOLAS 1974 II-2/4.3.3.2.4 and FSS Code 12.2.2.2.2)

Every oil fuel pipe, which, if damaged, would allow oil to escape from a storage, settling or daily service tank situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated. (SOLAS 74 II-2/15.2.5)

Oil fuel pipes, which if damaged would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 litres and above situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such the tanks are situated. (SOLAS 2004 II-2/4.2.2.3.4)

Notes: Consistent with safety and without interfering with the vessel's operations, request to witness the starting and operation of the emergency fire pump.

If a priming system has been fitted to the emergency fire pump, it must be class approved.

5.61 Are portable fire extinguishers in good order with operating instructions clearly marked?

Each extinguisher should be clearly marked with the following minimum information:

1. Name of the manufacturer;
2. Type of fire for which the extinguisher is suitable;
3. Type and quantity of extinguishing medium;
4. Approval details;
5. Instructions for use and recharge (it is recommended that operating instructions be given in pictorial form);
6. Year of manufacture;
7. Temperature range over which the extinguisher will operate satisfactorily; and
8. Test pressure. (FSS Code 4 and Res. A.951)

One of the portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space. (SOLAS 2004 II-2/10.3.2.2)

For vessels constructed after 1st July 2002, spare charges shall be provided for 100% of the first ten extinguishers and 50% of the remaining fire extinguishers capable of being recharged on board. Not more than sixty total spare charges are required. Instructions for recharging shall be carried on board. (SOLAS 2004 II-2/10.3.3.1)

For fire extinguishers which cannot be recharged on board, additional portable fire extinguishers of the same quantity, type, capacity and number shall be provided in lieu of spare charges.

(SOLAS 2004 II-2/10.3.3.2)

For vessels constructed before 1st July 2002, spare charges shall be provided in accordance with requirements specified by the Administration.

(SOLAS 1974 II-2/6.2)

Note: Portable fire extinguishers must be hydrostatically tested every 10 years or lesser period if so required by the Administration. The date of the hydrostatic test must be marked on the cylinder.

5.62 Are firemen's outfits and breathing apparatus in good order, fitted with fully pressurised air cylinders and ready for immediate use?

Tankers shall carry four firemen's outfits, which shall consist of:

- Protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface shall be water-resistant;
- Boots of rubber or other electrically non-conducting material;
- A rigid helmet providing effective protection against impact;
- An electric safety lamp of an approved type with a burning period of 3 hours. Safety lamps on tankers and those intended to be used in hazardous areas shall be of an explosion-proof type;
- An axe with a handle provided with high-voltage insulation;
- A breathing apparatus of an approved type; and
- For each breathing apparatus a fireproof line of at least 30 metres in length, capable of being attached by means of a snap-hook to the harness of the apparatus or to a separate belt in order to prevent the breathing apparatus becoming detached when the lifeline is operated.

(SOLAS 1974 II-2/17, SOLAS 2004 II-2/10.10 and FSS Code 3/2.1.1)

Two spare charges shall be provided for each required breathing apparatus. Cargo ships that are equipped with suitably located means for fully recharging the air cylinders free from contamination need carry only one spare charge for each required apparatus.

(SOLAS 2004 II-2/10.2.5)

For vessels constructed before 1st July 2002, the breathing apparatus may be either a smoke helmet type, or a self-contained compressed air type. A number of spare charges suitable for use with the apparatus provided shall be available on board to the satisfaction of the Administration (SOLAS 1974 II-2/17.1.2)

The outfits shall be kept ready for use in an easily accessible location that is permanently and clearly marked and, they shall be stored in widely separated positions. (SOLAS 1974 II-2/17.4 and SOLAS 2004 II-2/10.3.1)

Notes: Although SOLAS recommends 'widely separated positions', fire-fighting training advocates that breathing apparatus should be used by personnel in pairs.

Self-contained breathing apparatus should be checked for condition and satisfactory operation. With the apparatus charged and the cylinder valve closed, the drop in pressure should not be more than 10 bars in one minute. (Manufacturer's instructions)

Annual inspections should be carried out to ensure that the air quality of breathing apparatus air recharging systems is satisfactory. (MSC/Circ.850)

Breathing apparatus shall be a self-contained compressed air-operated breathing apparatus for which the volume of air contained in the cylinders shall be at least 1,200 l, or other self-contained breathing apparatus which shall be capable of functioning for at least 30 min. All air cylinders for breathing apparatus shall be interchangeable. (FSS Code 3.2.1.2)

Notes: BA air cylinders should be hydrostatically tested every 5 years or lesser period if so recommended by the manufacturer. (4-Year testing intervals are customary for some composite wound cylinders.) The hydrostatic test date must be stamped on the cylinder.

Chemical tankers and Gas tankers are required to have additional breathing apparatus sets as required in the IBC/IGC codes.

5.63 Are emergency escape breathing devices (EEBD's) in the accommodation, pump room and engine room in good order and ready for immediate use?

All ships shall carry at least two emergency escape breathing devices within accommodation spaces.

(SOLAS II-2/13.3.4.2)

On all ships, within the machinery spaces, emergency escape breathing devices shall be situated ready for use at easily visible places, which can be reached quickly and easily at any time in event of fire. The location of EEBD's shall take into account the layout of the machinery space and the number of persons normally working in the spaces.

(SOLAS II-2/13.4.3.1)

Spare emergency escape breathing devices shall be kept on board. (SOLAS II-2/13.3.4.1)

Training in the use of the EEBD should be considered a part of basic safety training. (MSC/Circ.849)

Note: The requirements for EEBD's are contained in Chapter 3/2.2 of the FSS Code and MSC/Circ.849 and among other measures or definitions, stipulate:

An EEBD is a supplied air or oxygen device only used for escape from a compartment that has a hazardous atmosphere and shall be of an approved type.

EEBDs shall not be used for fighting fires, entering oxygen deficient voids or tanks, or worn by firefighters. In these events, a self-contained breathing apparatus, which is specifically suited for such applications, shall be used.

The EEBD shall have a service duration of at least 10 min.

The EEBD shall include a hood or full face piece, as appropriate, to protect the eyes, nose and mouth during escape. Hoods and face pieces shall be constructed of flame-resistant materials and include a clear window for viewing.

An inactivated EEBD shall be capable of being carried hands-free.

An EEBD, when stored, shall be suitably protected from the environment.

Brief instructions or diagrams clearly illustrating their use shall be clearly printed on the EEBD. The donning procedures shall be quick and easy to allow for situations where there is little time to seek safety from a hazardous atmosphere.

Maintenance requirements, manufacturer's trademark and serial number, shelf life with accompanying manufacture date and name of the approving authority shall be printed on each EEBD.

All EEBD training units shall be clearly marked.

5.64 Are accommodation ventilation fan emergency stops clearly marked to indicate the spaces they serve and is there evidence of regular testing and maintenance?

5.65 Are fire flaps clearly marked to indicate the spaces they serve and is there evidence of regular testing and maintenance?

Material Safety Data Sheets (MSDS)

5.66 Are Material Safety Data Sheets (MSDS) on board for all the cargo, bunkers and other products being handled, and are all officers familiar with their use?

MSDS data sheets should be on board for the following:-

- All grades of cargo being carried
- All grades of fuel used on board
- All chemicals used on board
- paints, protective coatings and all other corrosive or toxic materials that are carried on board?

Ships carrying MARPOL Annex I cargoes, as defined in Appendix I to Annex I of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973, and marine fuel oils shall be provided with a material safety data sheet prior to the loading of such cargoes. (SOLAS 2007 Amendments VI 5-1)

On ships carrying MARPOL Annex II cargoes, Prior to loading, the shipper should provide both to the Master and the Company, as defined in the ISM Code, a Material Safety Data Sheet (MSDS), formatted in accordance with resolution MSC.286(86), for cargoes containing benzene. (IBC Appendix 8 Annex).

Note: Boiler treatment chemicals and other chemicals carried in packaged form shall be properly stowed to prevent uncontrolled movement and must be provided with MSDS. Protective equipment including a face shield, apron, gloves and an eye-wash should be provided at the place where chemicals are stored. Personnel who handle the materials in question must be aware as to the purpose of the MSDS and be able to demonstrate familiarity with it.

Paints, protective coatings and all other corrosive or toxic materials that are carried on board shall be properly stowed to prevent uncontrolled movement and must be provided with MSDS. Protective equipment including a face shield, apron, gloves and an eye-wash should be provided at the place where paints, protective coatings and all other corrosive or toxic materials are stored. The MSDS may be printed on the container. If it is not, then the MSDS data must be prominently posted or readily available to the user.

Personnel who handle the materials in question must be aware as to the purpose of the MSDS and be able to demonstrate familiarity with it.

MSDS data sheets for Annex I cargoes and fuel oil are recommended to comply with the format in MSC 286 (86). MSDS for other products carried on board such as Chemicals for use on board, paint thinners etc. should be fit for purpose and should be in a format broadly based on the format laid out in MSC 286(86).

Access

5.67 Is a gangway provided?

A ship's gangway consists of a straight, lightweight bridging structure provided with side stanchions and handrails. The walking surface has a non-slip surface or transverse bars to provide foot grips for when it is inclined. It is rigged perpendicular to the ship's side and spans between the ship's rail and the working deck of the berth. (ISGOTT 16.4.3.2)

5.68 Are accommodation ladders, gangways, pilot ladders where fitted, in good order?

Means of embarkation on and disembarkation from ships.

1. Ships constructed on or after 1 January 2010 shall be provided with means of embarkation on and disembarkation from ships for use in port and in port related operations, such as gangways and accommodation ladders, in accordance with paragraph 2.

2. The means of embarkation and disembarkation required in paragraph 1 shall be constructed and installed based on the guidelines developed by the Organization (MSC.1/Circ 1196) (SOLAS II-1/3-9)

Marking

Each accommodation ladder or gangway should be clearly marked at each end with a plate showing the restrictions on the safe operation and loading, including the maximum and minimum permitted design angles of inclination, design load, maximum load on bottom end plate, etc. Where the maximum operational load is less than the design load, it should also be shown on the marking plate. (MSC.1/Circ.1331/3.5)

5.69 Are all means of access satisfactory, including the provision of a safety net, lifebuoy and line?

Safety nets are not required if the gangway is fixed to the shore and provided with a permanent system of handrails made of structural members. For other types of gangways, and those fitted with rope or chain handrails or removable posts, correctly rigged safety nets should be provided. (ISGOTT 16.4.5)

Notes: Safety nets should be provided wherever there is a possibility of a person falling over or through the side rails of the gangway and should be rigged to prevent anyone falling between the ship and quay. Where the rails provide adequate protection, a safety net might not be necessary.

Regardless of whether the gangway is supplied by ship or shore, it is the ship's responsibility to ensure that a safety net is rigged.

If the means of access are considered to be unsafe, then the inspector must not put him/herself at risk by going on board.

When a gangway is rigged a notice should be posted, preferably at the shore end. The notice should state that:-

- Unauthorised persons are not allowed to board;
- Visitors are required to show identification;
- Mobile phones and other electronic equipment must be switched off;
- Smoking and naked lights are prohibited;

Lighters and matches are prohibited to be carried on board.

5.70 Are pilot boarding and access arrangements satisfactory?

In all ships where the distance from sea level to the point of access to, or egress from, the ship exceeds 9 metres and where it is intended to embark and disembark pilots by means of the accommodation ladder, or by means of mechanical pilot hoists or other equally safe and convenient means in conjunction with a pilot ladder, the ship shall carry such equipment on each side, unless the equipment is capable of being transferred for use on either side. (SOLAS V/23.3.2)

Where the distance from the surface of the water to the point of access to the ship is more than 9m, the accommodation ladder in conjunction with a pilot ladder shall be used. The accommodation ladder shall

lead aft and the lower end shall rest firmly against the ship's side within the parallel body length of the ship and clear of all discharges. (SOLAS V/23.3.3.2)

Means shall be provided to ensure safe, convenient and unobstructed passage for any person embarking on, or disembarking from, the ship between the head of the pilot or accommodation ladder and the deck. (SOLAS V/23.4)

Adequate lighting shall be provided to illuminate the transfer arrangements overside, the position on deck where a person embarks or disembarks and the controls of the mechanical pilot hoist. (SOLAS V/23.8)

5.71 Are safe access to the bow arrangements satisfactory?

Every petroleum, chemical and gas tanker shall be provided with the means to enable the crew to gain safe access to the bow even in severe weather conditions. (SOLAS II-1/3-3)

Note: The requirements for safe access to the bow are contained in MSC.62 (67).

5.72 If a helicopter landing or winching area is provided, does it meet ICS guidelines?

Landing Area: defined as an operating area suitable for landing helicopters. The landing area may consist of a purpose built structure located above the ship's deck (referred to as a "purpose built landing area") or a non-purpose built area located on the ship's deck (referred to as a "non purpose built landing area"). The landing area may also be used for winching operations provided that the winching criteria described below can be satisfied. However, where a landing area with adequate size and obstacle clearance for the helicopter in question is provided, landing is always the preferred option.

Winching Area: defined as an operating area which may only be used for winching operations. The optimum position for a landing or winching area will normally be determined by the availability of a suitable space on the ship. However, where there is more than one area identified and capable of accommodating the type of helicopter(s) expected to be used, the ship's Master, in consultation with the helicopter operator, should assess the merits of each location, taking particular account of the size and position of obstacles and expected aerodynamic and ship motion effects.

(ICS Guide to Helicopter/Ship Operations 4.1.1)

Generally, it is not recommended to locate the winching area near the bow of the ship. In addition, it should not be located on the bridge wing in the absence of a thorough risk assessment acceptable to the ship's Master and the helicopter operator. The winching area should, if possible, be clear of accommodation spaces and provide adequate deck area adjacent to the manoeuvring zone where personnel can muster, and provide for safe access to the area from different directions. In selecting a winching area, the desirability of keeping the winching height to a minimum should also be borne in mind.

(ICS Guide to Helicopter/Ship Operations 4.4.1)

Notes: **Landing Area at the Ship's Side:** A non-purpose built landing area located on a ship's side should consist of a "clear zone" and a "manoeuvring zone" A diagram showing the general arrangements is set out in the ICS Guide Figure 4.1, page 22, while the details of the landing area markings are described more fully in Section 4.3.2 of the Guide.

Winching Area at the Ship's Side: Where it is impractical to provide a landing area for helicopters it may be possible to provide an operating area capable of supporting winching operations only. A winching area should consist of a "clear zone" and a "manoeuvring zone". A diagram showing the general arrangements are set out in the ICS Guide Figure 4.4, page 25, while the details of the winching area are described more fully in Section 4.4.3 of the Guide.

5.73 If the bridge wing is used as a winching area, is a thorough risk assessment conducted?

The bridge wing will never be the ideal location for a winching area. However, there may be circumstances where there is no practical alternative to use of the bridge wing, and in such cases a thorough risk assessment of the operation must be conducted. Only if the results are acceptable to, and approved by, both the ship's Master and the helicopter operator should winching to the ship's bridge wing be permitted.

(ICS Guide to Helicopter/Ship Operations 4.2.2)

Note: The ICS Guide, Appendix H contains guidance to the conduct of a bridge wing risk assessment.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 6. Pollution Prevention

Oil Record Books

6.1 Are the Engine Room (Part I) and Cargo (Part II) Oil Record Books (ORBs) correctly completed?

Notes: The IOPP Form B (2.2.2) indicates whether a vessel is fitted with a 15 ppm oily water separator and 15 ppm oil content meter fitted with an alarm and automatic stopping device. Discharge of bilges or transfer from a bilge holding tank to overboard through this equipment should be recorded in section D of the ORB. Section E should be used ONLY in cases where automatic starting systems that are activated by float switches in bilge wells or bilge holding tanks. Such systems are rarely encountered on oil tankers.

Transfer from bilge wells to the bilge holding tank must also be recorded under section D 15.3. Where a voluntary declaration of quantities retained on board in oily bilge water holding tanks is entered in the Oil Record Book, Part I, the entry should be made under Code (I) (Additional operational procedures and general remarks); and the heating of oil residue (sludge) as a method of reducing its volume by evaporation should be recorded in the Oil Record Book, Part I, under Code (C) (Collection, transfer and disposal of oil residues (sludge)), paragraph 12.4. (MEPC 1/Circ.640)

Guidance on the completion of the Oil Record book Part 1 can be found in MEPC.1/Circ736

6.2 Do the sludge and bilge tanks designated in Form A or Form B of the IOPP Certificate and those listed in the Oil Record Book Part I, agree?

Notes: Details of bilge and sludge tanks can be obtained from Form B of the IOPP Certificate, although the recording of bilge tanks (section 3.3) is not a MARPOL requirement and is therefore voluntary. Notwithstanding the foregoing, if an engine room bilge tank is used for the purposes of holding engine room residues, this tank and details of its contents must be recorded in the Oil Record Book Part 1

In Part 1, Section C should be used for the disposal of sludge and other oil residues such as drainage, leakage, exhausted oil etc. and this section should be completed weekly. Section D (Non-Automatic Discharge) should be compiled for the disposal of bilge water as and when it occurs. Masters should obtain from the operator of the reception facilities, which includes barges and tank trucks, a receipt or certificate detailing the quantity of tank washings, dirty ballast, residues or oily mixtures transferred, together with the time and date of the transfer. This receipt or certificate, if attached to the Oil Record Book Part I, may aid the Master of the ship in proving that his ship was not involved in an alleged pollution incident. The receipt or certificate should be kept together with the Oil Record Book Part I.

Where a voluntary declaration of quantities retained on board in oil bilge water holding tanks is entered in the Oil Record Book, Part I, the entry should be made under code (I) (MEPC.1/Circ 640).

6.3 Are the Oil Record Books free of any pollution incidents or violations?

6.4 Have disposals of slops and dirty ballast been adequately recorded and were they in accordance with MARPOL?

6.5 If the disposal of engine room oily water or sludge to a cargo or slop tank has taken place, has the event been recorded in both Oil Record Books, was the receiving tank free of cargo and have the transfer arrangements been approved by Class?

Shipboard Oil and Marine Pollution Emergency Plans

6.6 Is an approved MARPOL Shipboard Oil Pollution Emergency Plan (SOPEP) or Shipboard Marine Pollution Emergency Plan (SMPEP) provided?

Every oil tanker of 150 gt and above and every ship other than an oil tanker of 400 gt and above shall carry on board a shipboard oil pollution emergency plan approved by the Administration.

(MARPOL Annex I/37)

The plan shall be written in the working language of the Master and officers and shall at least consist of:

- The procedure to be followed by the Master or other persons having charge of the ship to report an oil pollution incident;*
- The list of authorities or persons to be contacted in the event of an oil pollution incident;*
- A detailed description of the action to be taken immediately by persons on board to reduce or control the discharge of oil following the incident; and*
- The procedures and point of contact on the ship for co-ordinating shipboard action with national and local authorities in combating the pollution.*

(MARPOL Annex I/37.2)

Every ship of 150 gt and above certified to carry noxious liquid substances in bulk shall carry on board a shipboard marine pollution emergency plan for noxious liquid substances approved by the Administration.
(MARPOL Annex II/17)

The plan shall be written in a working language or languages understood by the Master and officers and shall at least consist of:

- The procedure to be followed by the Master or other persons having charge of the ship to report a noxious liquid substances pollution incident;
- The list of authorities or persons to be contacted in the event of a noxious liquid substance pollution incident;
- A detailed description of the action to be taken immediately by persons on board to reduce or control the discharge of noxious liquid substances following the incident; and
- The procedures and point of contact on the ship for co-ordinating shipboard action with national and local authorities in combating the pollution. (MARPOL Annex II/17.2)

In the case of ships to which regulation 17 of Annex II of the present Convention also applies, such a plan may be combined with the shipboard marine pollution emergency plan for noxious liquid substances required under regulation 17 of Annex II of the present Convention. In this case, the title of such a plan shall be "Shipboard marine pollution emergency plan". (MARPOL Annex I/37.3 and Annex II/17)

Note: The plan is subject to re-approval after a change of management.

6.7 Does the plan include a description of equipment, its location, a plan for deployment and specific crewmember duties for handling small spills?

6.8 Is the IMO Coastal Contact List up to date, is the Master aware of port contact procedures and has a contact list been made for this port?

Notes: The IMO Coastal Contact List is published on 31st December and updated on 31st March, 30th June and 30th September each year. This information is published on the IMO web site at www.imo.org. Inspectors must ensure that the current update to the IMO Coastal Contact List has actually been published and sufficient time allowed for the document to be received on board prior to making an Observation.

A list of specific contact numbers should be prepared for the port and be readily available to the Master and displayed in the cargo control room. The list should at least include the contact numbers for the DPA (or the operator's emergency contact details); the port authorities, the P and I Club, the agent and the national pollution reporting centre from the Coastal Contact List.

6.9 Is there a USCG approved Vessel Response Plan (VRP)?

Note: A VRP must be provided for oil and chemical tankers trading to the USA. SOPEP's, SMPEP's and VRP's can be either in a single combined plan or in separate documents. If the vessel does not trade to the US, answer the question 'NA'.

6.10 Name of the OPA-90 Qualified Individual (QI):

Note: The name of the OPA-90 qualified individual must be recorded in the VRP. If the vessel does not trade to the US, answer the question 'NA'.

VOC Management Plan

6.11 Is the vessel in possession of an approved Volatile Organic Compounds (VOC) Management Plan?

A tanker carrying crude oil shall have on board and implement a VOC management plan approved by the Administration. Such a plan shall be prepared taking into account the guidelines developed by the Organization. The plan shall be specific to each ship and shall at least:

- .1 provide written procedures for minimizing VOC emissions during the loading, sea passage and discharge of cargo;
- .2 give consideration to the additional VOC generated by crude oil washing;
- .3 identify a person responsible for implementing the plan; and
- .4 for ships on international voyages, be written in the working language of the Master and officers and, if the working language of the Master and officers is not English, French or Spanish, include a translation into one of these languages. (MARPOL Annex VI.15.6)

Note: All oil tankers >400gt carrying crude oil are required to have an approved VOC Plan before 1 July 2010. If the vessel is not designated to carry crude oil then it should be answered 'NA'.

Cargo Operations and Deck Area Pollution Prevention

6.12 Are officers aware of the requirements of MARPOL with respect to the disposal of bilge water and cargo slops?

Note: Under MARPOL Annex II the only Special Area applicable to chemical tankers is the Antarctic south of 60° south.

6.13 Is the condition of scupper plugs satisfactory and are scuppers effectively plugged?

Note: Scuppers on gas carriers will only be required to be plugged when bunkering or if carrying a MARPOL Annex 1 cargo.

6.14 Is the ship fitted with a maindeck boundary coaming?

Means shall be provided to keep deck spills away from the accommodation and service areas. This may be accomplished by means of a permanent continuous coaming of a height of at least 300mm, extending from side to side. Special consideration shall be given to the arrangements associated with stern loading. (SOLAS II-2.4.5.1.6)

Continuous coaming of suitable height shall be fitted to keep any spills on deck and away from the accommodation and service areas. (IBC 3.7.7)

Notes: A secondary purpose of this coaming is to provide oil retention at the after end of the maindeck in the event of an oil spill, giving the crew sufficient time to deal with it and avoid oil entering the water. For gas carriers this question should be answered 'NA'.

6.15 Are means readily available for dealing with small oil spills?

Notes: Means should be provided for the prompt removal of any spillage on deck. Spill equipment should be readily available at the manifold and there should be an adequate method (spill pumps or dumping arrangements to a cargo tank or other equally effective means) for the rapid disposal of oil at the aft end of the main deck on both sides of the vessel.

If the use of a cargo tank or slop tank is not a viable option, an alternative enclosed container with a capacity of at least 2 m³ should be available for the disposal of spills and oily water from the deck.

Portable spill pumps should be bonded to the vessel's structure to prevent electrical discharge to earth. Bonding may be made by external means, or by the discharge hose, if this is attached by means of a flanged connection to the vessel's structure. Pumps should also be mounted to prevent movement and subsequent damage during operation.

Where portable spill pumps are provided and the discharge is led to a cargo tank, there should be a suitable fixed connection. Disposal of a spill should not require the insertion of the spill pump discharge hose through a tank opening such as a sighting port.

Where dump valves are installed at the after end of the maindeck, ascertain whether opening the valves will actually result in the disposal of spilled oil to the tank. Excessive cargo tank vapour pressure can result in a release of pressure when the dump valve is opened, thereby aggravating the situation. U bends fitted in the dumping line to the tank may allow spills to be safely disposed of without first having to depressurise the tank, but this depends on the liquid level in the U-bend being adequate to prevent back-flow of vapour. The ullage of the cargo in the tank may also affect the ability to drain spills from the deck, particularly when the tank is full and the vessel is trimmed by the stern.

If effective draining of a spill cannot be achieved or if pressure release is required, an alternative method of immediately disposing of a spill should be provided.

It should be recognised that if the vessel is sagged a spill will accumulate amidships and if trimmed by the head then it will accumulate forward. The positioning of spill equipment and disposal equipment must take these conditions into account.

6.16 Is the vessel free from any visible bulkhead, valve or pipeline leakage liable to cause pollution?

6.17 Are cargo system sea and overboard valves suitably lashed, locked or blanked and are they thoroughly checked to ensure that they are fully closed prior to commencement of cargo transfer?

At the start of loading and at regular intervals throughout loading, discharging, ballasting and tank washing, a watch should be kept to ensure that oil is not escaping through sea valves.

Sea and overboard discharge valves connected to the cargo and ballast systems must be securely closed and lashed and may be sealed when not in use. In line blanks should be inserted where provided. When

lashing is not practical, as with hydraulic valves, some suitable means of marking should be used to indicate clearly that the valves are to remain closed.

For further information on this subject, reference should be made to the ICS/OCIMF publication 'Prevention of Oil Spillages through Cargo Pump Room Sea Valves'. (ISGOTT 24.7.2)

Notes: Records of such checks should be recorded in the Deck or Cargo Log Book. Anti-pollution warning notices should be posted in the vicinity of these valves.

6.18 If cargo sea suction valves are fitted, are adequate pollution prevention measures in place, are valve-testing arrangements provided, are they in good order and regularly monitored for leakage?

It is recommended that a device be installed to monitor pressure build-up and determine liquid make-up in the section of the pipeline which lies between the inboard and outboard sea valves. Such a device would both provide an early indication of leakage through either valve during cargo handling operations and enable the leaking valve to be identified. During cargo operations pressure build-up in this line would be apparent from the gauge reading and would indicate that one of the valves was leaking. (OCIMF Cargo Pump Room Sea Valves 4)

Devices should be positioned so that both readings and samples can be taken from a point far enough above the pump room lower platform level that there is no possibility of human exposure to gas concentrations which may accumulate below the floor plates. (OCIMF Cargo Pump Room Sea Valves 4)

The use of a pressure/vacuum gauge, rather than a pressure-only gauge, is preferable in that it will provide a reliable indication of a vacuum in the line prior to opening the sea valve for ballasting. (OCIMF Cargo Pump Room Sea Valves 4)

(OCIMF Cargo Pump Room Sea Valves 4)

Note: Two valves should be fitted at cargo sea suctions, unless the sea suctions are blanked or a spool piece to the cargo system has been removed. Care should be taken that test pressures do not exceed 3.5.kg/cm2.

6.19 If ballast lines pass through cargo and/or Bunker tanks are they tested regularly and the results recorded?

6.20 Are adequate manifold spill containers and gratings in place under the cargo manifolds, fitted with suitable drainage arrangements and are they empty?

A permanently fitted spill tank, provided with suitable means of draining, should be fitted under all ship and shore manifold connections. If no permanent means are fitted, portable drip trays should be placed under each connection to retain any leakage. The use of plastic should be avoided unless provision for bonding is made. (ISGOTT 24.7.4)

Note: Suitable means of draining the spill container to a cargo tank or spill tank should be provided. On chemical tankers, spill containers should be drained to appropriate tanks with due regard to toxicity and compatibility requirements. Manifold spill containers should be clean and free from cargo residues.

6.21 Are bunker pipelines tested annually?

Note: Bunker pipelines are defined as any pipeline used for taking on, discharging or internally transferring any fuel for consumption on board.

A vessel's 'Bunker Transfer System' should be tested to 100% of their rated working pressure (Sometimes referred to as Maximum Allowable Working Pressure - MAWP) at least annually. 'Oil Transfer Systems' should be tested to 1.5 times their rated working pressure at least twice within any five-year period. Pipelines should be marked with the date of test and the test pressure. A vessel's 'Bunker Transfer System' includes the discharge pump and piping between the pump and the vessel's manifold, excluding any non-metallic hoses. In this case the MAWP can be assumed to be either the pressure at which the transfer piping relief valve is set or, where no relief valve (s) are fitted, the maximum discharge pressure that can be developed by the vessel's pump. For centrifugal pumps this is the pressure developed by the pump at zero flow conditions. Pressure testing should be a hydrostatic test, pressure testing using compressed air or inert gas is not acceptable.

6.22 Are unused cargo and bunker pipeline manifolds fully bolted and are all drains and vents and unused gauge stems, suitably blanked or capped?

All ship's cargo and bunker pipelines not in use must be securely blanked at the manifold. The stern cargo pipelines should be isolated from the tanker's main pipeline system forward of the aft accommodation by blanking or by the removal of a spool piece. (ISGOTT 24.7.5)

Notes: This includes all pipelines and fittings which are in use or which might become pressurised during cargo operations, on both sides of the vessel.

Blanks should be fully bolted. Drains and vents should be fitted with valves and either capped or plugged. Pressure gauge stems should be fitted with valves and capped whenever gauges are not fitted.

6.23 Are suitable spill containers fitted around all fuel, diesel and lubricating oil tank vents?

Notes: The height of any savealls around bunker tank vents should not be greater than the vent heads themselves, because this could lead to the ingress of water in bad weather if the savealls become filled with water. The vent heads should be clearly labelled to indicate the space that they serve.

Containers should be empty of water and free of oil.

Drain plugs should be in place in port.

6.24 Is a suitable containment fitted around hydraulic and other deck machinery?

6.25 Are the arrangements for the disposal of oily water in the foc's'le and other internal spaces adequate?

Note: Where there is a possibility of hydraulic, fuel or other oil accumulating in internal space bilge wells, adequate arrangements should be in place for its disposal. Where hand pumps or ejectors are fitted, pollution prevention notices should be posted and the overboard valves should be secured against accidental opening.

Pump Rooms and Oil Discharge Monitors

6.26 Are pump room bilge high level alarms fitted, regularly tested and the results recorded?

All pump rooms on all tankers constructed on or after 1st July 2002 shall be provided with bilge level monitoring devices together with appropriately located alarms. (SOLAS II-2/4.5.10.1.4)

Notes: The pump room bilge high-level alarm must be sited at a low point in the pump room bilge in order to be effective.

6.27 Are adequate arrangements provided for pipeline draining and the disposal of pump room bilge accumulations?

Notes: On some tankers, no provision is made for effective line draining and, in order to meet the demands of certain product trades, final line contents are drained to the pump room bilge. This is an unsafe practice and it is recommended that cargo procedures be reviewed with the aim of preventing a volatile product being drained to the bilge. Means should be available to have the draining system operated from outside the pumproom, at least from the upper deck.

Where lines that have been used for ballast have to be drained to the pump room bilge on completion of deballasting, care must be taken to ensure that such draining's do not contain petroleum. (ISGOTT 10.11.2)

6.28 If an ODME is fitted, is it in good order and is there evidence of recent testing?

6.29 If the ODME has not been operational, was the fact recorded in the Oil Record Book?

If the ODME is not currently operational, record with the Observation how long it has been out of order and what remedial action is intended.

Note: The date and time when the failure occurred and the date and time when the system was made operational again, together with the reason for the failure should be recorded in the Oil Record Book.

Ballast Water Management

6.30 Does the operator have an approved ballast water and sediments management plan and are records being maintained of all ballast water exchanges?

Notes: The International Convention for the Control and Management of Ships' Ballast Water and Sediments is a new international convention to help prevent the spread of harmful aquatic organisms carried by ships' ballast water, and will require all ships to implement a ballast water and sediments management plan. Some countries are introducing specific requirements for ballast water management and reporting, within their national limits, prior to the Convention coming into force.

The IMO has published '**Guidelines for the Control and Management of Ships Ballast Water to Minimise the Transfer of Harmful Aquatic Organisms and Pathogens**' - (IMO Resolution A.868 (20)).

6.31 Can the vessel check or sample segregated ballast prior to deballasting and are they free from oil.

Notes: A sample of the ballast tanks should be visually checked for oil contamination on each occasion before being discharged. Only ballast tanks adjacent to oil tanks or ballast tanks with oil pipelines running through them need to be checked. Under no circumstances should an oil sheen be detected on the surface of ballast water.

It is not satisfactory if numerous bolts must be removed from manhole covers to check that ballast is free of oil. If this is the only means of checking, an Observation must be made.

In the case of gas carriers there is no possibility of oil contamination of the permanent ballast unless oil pipelines pass through the ballast tanks or the ballast tanks are adjacent to bunker tanks. Except in these cases, sampling of the ballast tanks is not required.

Engine and Steering Compartments

6.32 Are the engine room bilge oily water pumping and disposal arrangements in good order?

A direct connection overboard from a bilge pump used for the regular disposal of accumulations of bilge water, or for any other oil service, must be recorded as an Observation.

At least two power pumps connected to the main bilge system shall be provided, one of which may be driven by the propulsion machinery. If the Administration is satisfied that the safety of the ship is not impaired, bilge pumping arrangements may be dispensed with in particular compartments.

(SOLAS II-1 Reg. 21.3)

Notes: Any system used to transfer bilge or oily water mixtures for retention on board or discharge to deck, must be provided with positive means to ensure that oil or oily mixtures are not discharged into the sea.

Ascertain that a direct overboard discharge is not being used for the disposal of daily machinery space bilge accumulations.

The ship's side valve and associated overboard pipework should be checked for evidence of oil contamination.

6.33 Are emergency bilge pumping arrangements ready for immediate use; is the emergency bilge suction clearly identified and, where fitted, is the emergency overboard discharge valve provided with a notice warning against accidental opening?

Regulations 15 and 34 (Control of the discharge of oil) of this Annex shall not apply to:

.1 the discharge into the sea of oil or oily mixture necessary for the purpose of securing the safety of a ship or saving life at sea; or

.2 the discharge into the sea of oil or oily mixture resulting from damage to a ship or its equipment:

.2.1 provided that all reasonable precautions have been taken after the occurrence of the damage or discovery of the discharge for the purpose of preventing or minimizing the discharge; and

2.2 except if the owner or the Master acted either with intent to cause damage, or recklessly and with knowledge that damage would probably result; or

3 the discharge into the sea of substances containing oil, approved by the Administration, when being used for the purpose of combating specific pollution incidents in order to minimize the damage from pollution. Any such discharge shall be subject to the approval of any Government in whose jurisdiction it is contemplated the discharge will occur. (MARPOL Annex I Reg 4)

Notes: SOLAS states that sanitary, ballast and general service pumps may be accepted as independent power bilge pumps where fitted with the necessary connections to the bilge pumping system. Although not specifically described as such, this SOLAS requirement is to permit bilges to be discharged overboard in an emergency situation and MARPOL Annex I Reg. 4 above, allows for this.

The emergency bilge overboard discharge must not be used for the disposal of daily machinery space bilge accumulations. Inspection of the ship's side valve and associated overboard pipework should be checked for evidence of oil contamination.

In addition to the SOLAS requirement for two means of disposing of bilges, there is a class requirement for an additional emergency bilge disposal system and this will utilise a sea water pump and will discharge directly overboard. This emergency bilge suction valve should be readily accessible and clearly marked as to its purpose.

The means by which operation of the emergency overboard valve is controlled to prevent unauthorised discharge of oil or oily mixtures should be determined. Positive evidence that the overboard discharge valve

has not been opened can be provided by use of a numbered seal, the number of which can be verified in official documents such as the Engine Room Log or the Oil Record Book Part I. Such a method of sealing must be easily breakable to allow the valve to be opened in an emergency.

If the vessel has an ejector as a substitute for one of the bilge pumps then it may be necessary to ensure that the suction valves are similarly sealed.

6.34 Are dedicated sludge pumps free from any connection to a direct overboard discharge?

Piping to and from sludge tanks shall have no direct connection overboard, other than the standard discharge connection referred to in regulation 13. (MARPOL 12/2)

6.35 Is the oily water separator in good order?

1. Except as specified in paragraph 3 of this regulation, any ship of 400 gross tonnage and above but less than 10,000 gross tonnage shall be fitted with oil filtering equipment complying with paragraph 6 of this regulation. Any such ship which may discharge into the sea ballast water retained in oil fuel tanks in accordance with regulation 16.2 shall comply with paragraph 2 of this regulation.

2. Except as specified in paragraph 3 of this regulation, any ship of 10,000 gross tonnage and above shall be fitted with oil filtering equipment complying with paragraph 7 of this regulation.

6. Oil filtering equipment referred to in paragraph 1 of this regulation shall be of a design approved by the Administration and shall be such as will ensure that any oily mixture discharged into the sea after passing through the system has an oil content not exceeding 15 parts per million. In considering the design of such equipment, the Administration shall have regard to the specification recommended by the Organization.

7 Oil filtering equipment referred to in paragraph 2 of this regulation shall comply with paragraph 6 of this regulation. In addition, it shall be provided with alarm arrangements to indicate when this level cannot be maintained. The system shall also be provided with arrangements to ensure that any discharge of oily mixtures is automatically stopped when the oil content of the effluent exceeds 15 parts per million. In considering the design of such equipment and approvals, the Administration shall have regard to the specification recommended by the Organization. (MARPOL Reg 14)

Notes: The oily water separator will normally be supplied with its own supply pump (which may either pump or draw water through the separating unit).

Inspectors should confirm that the oily water separator piping has not been altered, physically by-passed or has been fitted with connections to by-pass the unit and it should be verified that the sensing equipment has not been interfered with. A demonstration should be requested to determine how the oil content alarm is tested to prove satisfactory operation and familiarity of the crew with the equipment. Failure of Oil Filtering Equipment should be recorded in the Oil Record Book, Part I

6.36 Are specific warning notices posted to safeguard against the accidental opening of the overboard discharge valve from the oily water separator?

Note: The overboard valve should be sealed and provided with a warning notice indicating that the valve should not be opened without the authority of the chief engineer or Master.

6.37 If the oily water separator is not fitted with an automatic stopping device, do entries in the Oil Record Book Part 1 indicate that it has not been used in a Special Area?

Notes: Section 2.2.2 of Form B of the IOPP Certificate will indicate whether or not the engine room oily water separator has been fitted with an approved automatic stopping device.

In vessels over 10,000 tons gross tonnage the oily water separator should be fitted with an alarm and an automatic device that will stop the discharge of any mixture above 15 ppm. If the oily water separator has not been fitted with an automatic stopping device, the inspector must ascertain that it has not been used within a Special Area.

6.38 Are the arrangements for the disposal of steering compartment oily bilge water adequate?

Note: Where hydraulic, fuel or other oil may accumulate in steering compartment bilge wells, adequate arrangements should be in place for the disposal of it. Where hand pumps or ejectors are fitted, there should be pollution prevention notices posted and the overboard valves should be secured against accidental opening.

Garbage Management

6.39 Does the vessel have a garbage management plan and garbage record book and is the garbage record book being correctly completed?

Every ship of 100 gross tonnes and above, and every ship which is certified to carry 15 or more persons, and fixed and floating installations shall carry a garbage management plan which the crew shall follow. This plan shall provide written procedures for minimizing, collecting, storing, processing and disposing of garbage, including the use of the equipment on board. It shall also designate the person or persons in charge of carrying out the plan. Such a plan shall be based on the guidelines developed by the organisation and written in the working language of the crew. (MARPOL Annex V Reg 10.2)

Every ship of 400 gross tonnes and above and every ship which is certified to carry 15 or more persons engaged in voyages to ports or offshore terminals under the jurisdiction of another party to the convention and every fixed or floating platform shall be provided a garbage record book. The garbage record book, whether as a part of the ship's official log book or otherwise, shall be in the form specified in the appendix to this annex (MARPOL Annex V Reg 10.3)

The garbage record book shall be kept on board the ship or the fixed or floating platform, and in such a place as to be readily available for inspection at all reasonable times. This document shall be preserved for a period of at least two years from the date of the last entry made in it. (MARPOL Annex V Reg 10.3.3).

6.40 Does the vessel have adequate garbage storage and disposal facilities?

Note: The vessel should have adequate garbage storage facilities and these should allow for segregation of garbage and should be in a tidy and hygienic condition.

Energy Efficiency

6.41 Has the vessel a Ship Energy Efficiency Management Plan (SEEMP)?

Note: All ships are required to have an SEEMP after the next renewal or intermediate survey of the IAPP after 1st January 2013. If the ship has not passed its first renewal/intermediate survey after 1st January 2013 the question should be answered 'NA'.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 7. Structural Condition

7.1 Is the Enhanced Survey Programme file free from any information that raises concerns relating to the vessel's structure?

7.2 Is the hull free from visible structural defects that warrant further investigation?

Notes: Inspection of the hull should include checking for any evidence of structural problems including collision contact or distortion from heavy weather.

Class records should be examined to confirm that class has been involved whenever significant damage has occurred or been repaired.

7.3 Are weather decks free from visible structural defects that warrant further investigation?

Note: Inspection of weather decks should include checking for any evidence of wastage, structural problems including evidence of over-pressurisation, collision contact or distortion from heavy weather.

7.4 Is the superstructure free from visible structural defects that warrant further investigation?

7.5 Are internal spaces free from visible structural defects that warrant further investigation?

7.6 If any cargo and/or ballast tanks were sighted from the deck, were they in good order?

If the internals of a tank, or tanks, were sighted from the deck, record this fact either as an Observation or Comments as applicable and list the findings as appropriate.

Valuable indications as to the condition of compartments such as ballast tanks, access trunks and peak tanks can be made from a visual inspection from the outside.

Indications of problems can be wastage of handrails and ladder rungs, visible corrosion on vertical and horizontal framing, knife-edges on brackets, visible cracking and deformations of bulkheads or frames.

Leakage from adjacent tanks or valve glands may be indicated by the presence of oil or a sheen on the ballast, the presence of gas or the sound of falling liquid.

7.7 Are procedures in place to carry out regular inspections of cargo and ballast tanks, void spaces, trunks and cofferdams by the vessel's personnel and are records maintained?

Note: These requirements apply to every vessel regardless of whether it is subject to enhanced survey. In the case of oil and chemical tankers, inspections of cargo tanks should be made at intervals of 2.5 years, with a 6 month window either side. Intention is that these inspections should align with the Renewal and Intermediate survey regimes. Ballast tanks should be inspected annually. In the case of gas carriers, ballast tanks, and void spaces, cofferdams, and hold spaces should be inspected annually. Records of all inspection results should be maintained. These should include a plan of each compartment with all its boundaries and should at least contain details and the location of:

- Structural deterioration and failure;
- Extent of corrosion, pitting and wastage;
- Extent of deterioration of any coating;
- Any leakages in bulkheads or pipework;
- The condition of cargo handling and monitoring equipment;
- Extent of sediment build-up.

Record dates of last Cargo and Ballast tank inspections.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 8. Cargo and Ballast Systems - Petroleum

Note: The International Safety Guide for Oil Tankers and Terminals (ISGOTT) contains guidance pertaining to the safe carriage and handling of petroleum products. Inspectors should observe cargo operations, interview responsible personnel, review the operator's operating procedures and observe the degree of compliance by officers and crew to appropriate regulations and guidelines. Common causes of incidents are poor planning, improper supervision of transfer operations, inadequate knowledge or disregard of the dangers of static electricity, insufficient personnel on duty and insufficient or incorrect information concerning cargo properties.

Policies, Procedures and Documentation:

8.1 Is the vessel provided with operator's policy statements, guidance and procedures, including information on maximum loading rates and venting capacities with regard to safe cargo operations?

Masters should be provided with information on maximum permissible loading rates for each cargo and ballast tank and, where tanks have a combined venting system, for each group of cargo or ballast tanks. This requirement is aimed at ensuring that tanks are not over or under-pressurised by exceeding the capacity of the venting system, including any installed secondary venting arrangements.

Other considerations will also need to be taken into account when determining maximum loading rates for oil tankers. Precautions against static electricity hazards and pipeline erosion are described in ISGOTT Section 7.3.3.2). (ISGOTT 7.3.3)

Note: This information should be displayed at the cargo control position.

8.2 Are legible and up to date pipeline and/or mimic diagrams of cargo, inert gas and venting systems, as applicable, available in the pumproom(s) and cargo control area?

8.3 Are cargo pump performance curves available, where applicable, for various speeds?

8.4 Is a written procedure provided for the safe handling of heavy weather ballast in cargo tanks on segregated ballast tankers?

Note: Record the last date Heavy weather ballast was taken on board.

Stability and Cargo Loading Limitations:

8.5 If a loading computer or programme is in use, is it class approved?

If a class approved loading computer is not available, record in Comments, how stress and stability calculations are performed.

Notes: Ships of more than 65 metres in length are required by Class to be provided with a loading manual including permissible limits of still water bending moment and shear force; the results of the calculations of still water bending moments; shear forces and where applicable, limitations due to torsional and lateral loads and the allowable local loading for the structure (decks, double bottom, etc.)

Ships of more than 100 metres in length are required by Class to be provided with an approved loading instrument. An operational manual is always to be provided for the loading instrument

The loading instrument should be capable of calculating shear forces and bending moments in any load or ballast condition at specified readout points and should indicate the permissible values. Ships with very limited possibilities for variations in the distribution of cargo and ballast and ships with a regular or fixed trading pattern may be exempt from the requirement.

Class approvals for loading instruments are made under a Type Approvals process. Type-approval certificates are generally valid for periods of not more than five years. MSC Circular 1221 notes that the validity of the Type Approval Certificate itself has no influence on the operational validity of a product accepted and installed on-board ship and that a product manufactured during the period of validity of the relevant Type Approval Certificate need not be renewed or replaced due to the expiry of such Type Approval Certificate.

8.6 Are there records indicating that the operational accuracy of the load computer is tested regularly?

Notes: At each Annual and Special Survey, the loading instrument is to be checked for accuracy and the approved loading guidance information confirmed as being available on board. Class approved data should be used and the tests should be carried out in the presence of the attending surveyor at the annual survey. Regular on-board testing should also take place and records attesting to this should be maintained. The test should involve physically entering the data for each tank into the computer and verifying the result. It is not acceptable to simply retrieve a stored test condition from the computer and compare this against the official conditions.

8.7 Is the stress and stability information included with the cargo plan and are any limitations understood by the cargo watch officers?

Notes: Inspectors should determine that prior to transfer of cargo, calculations have been made for stress and stability conditions for the start, interim and completion of transfer conditions. Regular monitoring of stress and stability should be taking place throughout cargo transfer to ensure that the conditions have been maintained within design limits.

8.8 Is the vessel free of inherent intact stability problems?

Notes: Vessels that have large width tanks will be subject to reductions of intact stability due to free surface. Although such vessels may meet IMO intact stability criteria when in fully loaded or ballasted conditions, they may be unstable when multiple tanks are slack during cargo or ballast transfer operations, or in intermediate states of loading. Trim and stability manuals generally deal only with arrival and departure conditions and operators are not made aware that stability problems may exist at intermediate stages during cargo transfers.

If a vessel has either large width cargo tanks, "U" section ballast tanks, or double bottom tanks without watertight centreline bulkheads, inspectors should ascertain that the vessel meets IMO intact stability criteria by requesting the chief officer to demonstrate, using the class approved loading instrument, the intact stability at the worst case condition. (i.e. All tanks slack and maximum free surface)

If no suitable loading instrument is provided and adequate instructions are not available, the question should be answered 'No', unless there is satisfactory proof that the vessel is free of inherent stability problems.

Inspectors should ascertain whether all officers appear familiar with operational restrictions and that instructions are prominently posted describing action to take if stability concerns are suspected or experienced. Record a "N" response and appropriate Observation if weaknesses or other concerns are revealed.

If specific procedures have been adopted to address potential stability problems, these should be recorded as an Observation.

8.9 Are Damage Stability Verification Guidelines available and can the Master demonstrate that the vessel is normally loaded in accordance with the Stability Information Booklet (SIB)?

Every oil tanker delivered after 31 December 1979, as defined in regulation 1.28.2, of 150 gross tonnage and above, shall comply with the subdivision and damage stability criteria as specified in paragraph 3 of this regulation, after the assumed side or bottom damage as specified in paragraph 2 of this regulation, for any operating draft reflecting actual partial or full load conditions consistent with trim and strength of the ship as well as relative densities of the cargo." (MARPOL Annex I Reg 28(1))

Every oil tanker of 5,000 tonnes deadweight or more shall have prompt access to computerised shore-based damage stability and residual structural strength calculation programs. (MARPOL Annex I Reg 37.4)

Note: The vessel should have an approved stability information book (SIB), written in a language understood by the officers on board, and the SIB should cover damage conditions that include:

- any required and intended loading conditions (including the ones corresponding to multiple freeboards when so assigned to the vessel), i.e. symmetrical/unsymmetrical, homogeneous/alternating or ballast/partial/full
- types (e.g. oil) of liquid cargo allowed including range of densities The vessel may have class approved on-board stability computer programme that includes damage conditions for all loading conditions presented in the SIB except for ballast, light ship and docking conditions. The methods of verifying the damage stability conditions may include pre-programmed damage cases for each loading condition, including capability for calculation of intermediate damage stages with variation of draft due to
 - varying cargo density
 - tank loading patterns
 - extents of tank filling

to ensure that for any possible (alternate) loading condition the most onerous damages have been examined according to relevant stability criteria and these may be recorded in 'comments'.

A sailing condition is deemed to be approved if the filling of each cargo and ballast tank lies within 1% of the weight in the approved condition and GMF lies within 2 cm of the approved condition GMF.

Record an observation if the vessel has ever been loaded to a condition not in accordance with the SIB. However, if the vessel was loaded to a condition according to any of the damage conditions as per the class approved on board stability computer programme and not in accordance with SIB; additional comments need to be inserted with details

8.10 Is the Master aware of the worst damage stability condition in the stability book?

8.11 Do the operator's operating manuals include procedures for restoring stability in case of unstable conditions developing during cargo operations, where applicable?

Note: The procedures listed in the Operating Manual must be identical to those posted and practiced (Q8.8 above, refers). If not, record a "N" response and appropriate Observation.

8.12 Where applicable, are officers aware of the dangers of free surface effects and of the possibility of structural damage caused by sloshing in cargo tanks?

8.13 Are cargo and/or ballast tanks free of sloshing or other restrictions?

Important restrictions other than maximum permitted cargo density should be recorded in Comments.

Cargo Operations and Related Safety Management

8.14 Are all officers familiar with the cargo system, including emergency discharge arrangements?

8.15 Are all officers familiar with the carriage requirements for the cargoes on board?

Note: Officers should be able to demonstrate a basic knowledge of the following:

- Shipboard operations and cargo handling;
- Closed loading, discharging and sampling;
- Requirements for medical treatment following exposure to hazardous cargoes;
- Spill response;
- Communication procedures with shore and emergency stop procedures;

And, as required:

- Effects of high density cargoes;
- Hazards associated with toxic cargoes;
- Hazards of electrostatic generation.

8.16 Has a cargo plan been prepared and does it contain a detailed sequence of cargo and ballast transfer and has it been signed by the watch officers?

All cargo operations should be carefully planned and documented well in advance of their execution. The details of the plans should be discussed with all personnel, both on the ship and at the terminal. Plans may need to be modified following consultation with the terminal and following changing circumstances, either on-board or ashore. Any changes should be formally recorded and brought to the attention of all personnel involved with the operation. ISGOTT Chapter 22 contains details of cargo plans and communications regarding them. (ISGOTT 11.1.1)

Note: The plan should cover all stages of the transfer operations and as a minimum, contain:

- Quantity and grade of each parcel;
- Density, temperature and other relevant properties;
- A plan of the distribution, lines and pumps to be used;
- Transfer rates and maximum allowable pressures;
- Critical stages of the operation;
- Notice of rate change;
- Venting requirements;
- Stability and stress information;
- Drafts and trims;
- Ballast operations;
- Emergency stop procedures;

- Emergency spill procedures and spill containment; and
- Hazards of the particular cargoes.

And also, as required:

- Precautions against static generation;
- Initial start-up rates;
- Control of cargo heating systems;
- Line clearing;
- Crude oil washing procedures;
- Under keel clearance limitations;
- Bunkering; and
- Special precautions required for the particular operation.

The cargo plan should be completed by the responsible officer prior to commencement of operations and verified and approved by the Master. It should be comprehensive, contain full details of the operation and be easy to interpret. Vessel should be able to demonstrate that an independent check of the cargo line up including venting was carried out prior the start of the cargo operation.

8.17 Are cargo operations being carried out and logged in accordance with the plan?

Note: The log must include details of all major events including starting and stopping of main cargo and ballast pumps, tanks being worked and any deviations from the original plan.

8.18 Are all officers aware of the emergency procedures for dealing with leakage, spillage or fire involving the cargo?

8.19 Is the verbal communication between the ship and the shore adequate?

Cargo and Ballast Handling and Monitoring Equipment

8.20 Are the cargo, ballast and stripping pumps, eductors and their associated instrumentation and controls including temperature monitoring, in good order and is there recorded evidence of regular testing?

Notes: The requirement is to provide an alarm. There is no requirement for temperatures to be displayed or for a high temperature trip to operate Cargo pump bearings must not have temporary cooling fitted.

8.21 Are the cargo lines, vapour lines and inert gas lines in good order and is there recorded evidence of regular testing?

The presence of any latent defect in the cargo system will usually reveal itself when the system is pressurised during the discharge operation. It is good practice to pressure test cargo lines on a periodic basis, depending on the trade of the ship. Although these pressure tests may provide an indication of the system's condition at the time of the test, they should not be considered a substitute for regular external inspection of the pipeline system and periodic internal inspections, particularly at known failure points, such as pump discharge bends and stub pipe connections. (ISGOTT 7.3.2)

Pipelines should be visually examined and subjected to routine pressure tests to verify their condition. Other means of non-destructive testing or examination, such as ultrasonic wall thickness measurement, may be considered appropriate, but should always be supplemented by visual examination. (ISGOTT 10.11.3)

Notes: A vessel's 'Oil Transfer System' should be tested to 100% of their rated working pressure (Sometimes referred to as Maximum Allowable Working Pressure - MAWP) at least annually. 'Oil Transfer Systems' should be tested to 1.5 times their rated working pressure at least twice within any five-year period. Pipelines should be marked with the date of test and the test pressure. A vessel's 'Oil Transfer System' includes the discharge pump and piping between the pump and the vessel's manifold, excluding any non-metallic hoses. In this case the MAWP can be assumed to be either the pressure at which the transfer piping relief valve is set or, where no relief valve (s) are fitted, the maximum discharge pressure that can be developed by the vessel's pump. For centrifugal pumps this is the pressure developed by the pump at zero flow conditions. Pressure testing should be a hydrostatic test, pressure testing using compressed air or inert gas is not acceptable. This includes corrosion of bolts and flanges on dresser couplings.

8.22 Is the cargo pump emergency shutdown system in good order and is there recorded evidence of regular testing?

Note: Pump alarms and trips, level alarms, etc., where fitted, should be tested regularly to ensure that they are functioning correctly, and the results of these tests should be recorded.

8.23 Are the cargo and ballast system valves in good order and is there recorded evidence of regular testing?

8.24 Are the cargo system ullage gauges, vapour locks and UTI tapes in good order and is there recorded evidence of regular testing?

8.25 Are the remote and local temperature and pressure sensors and gauges in good order and is there recorded evidence of regular testing?

8.26 Are the cargo tank high level and overflow alarms in good order and is there recorded evidence of regular testing?

Note: High level alarms should be in operation during both loading and discharging operations.

Record as an observation if high level alarms are not fitted and also if the overflow alarm system is not independent of the main gauging system.

8.27 Where fitted and in use, is the condition of the cargo tank heating system satisfactory, is it regularly tested and is any observation tank free of oil?

Notes: Where steam cargo heating systems are fitted and when a heated cargo is being carried at the time of the inspection, an indication of the condition of the heating coils can be provided by inspection of the hot well or observation tank.

A very small amount of oil on the surface of hot wells or observation tanks can be considered normal, but a layer of oil over the surface indicates that there is a problem of some significance.

In the case of thermal heating systems, piping should be sound, pumps, joints and glands should be free of leaks and the heater unit should be in good order. Where parts can be isolated, procedures should be in place to identify and record which part is isolated.

Ullaging, Sampling and Closed Operations

8.28 If fixed tank gauges are not fitted, are sufficient portable tapes provided to simultaneously gauge each tank being worked, if used with vapour locks are they calibrated?

Notes: Corrections for datum levels and for list and trim should be checked and approved by the organisation certifying the system if ullages from retrofitted vapour locks are used for cargo calculation. Where vapour locks have been retro-fitted, certificates of calibration must be provided by a recognised Classification society or cargo inspection company.

If a fixed cargo tank gauging system is fitted but is unreliable and portable tapes/vapour locks are being used as the main method of ullaging, this fact should be recorded as an Observation. The number of tapes in use must be recorded.

Portable tapes should be calibrated in accordance with manufacturer's recommendations and certificates of calibration should be provided for each instrument.

8.29 If the vessel is handling volatile or toxic cargoes, is it operating in a closed condition?

All tankers fitted with a fixed inert gas system shall be provided with a closed ullage system.

(SOLAS II-2/4.5.5.3.3)

Notes: A volatile product is petroleum having a flash point below 60°C as determined by the closed cup method of testing. If a cargo is being handled at a temperature within 10°C of its flashpoint, it should be considered volatile. Therefore a cargo with a flashpoint of 80°C should be considered volatile if handled at a temperature of 70°C or above.

8.30 Is the vessel provided with an approved vapour control system?

A tanker to which paragraph 1 of this regulation applies shall be provided with a vapour emission collection system approved by the Administration and shall use this system during the loading of relevant cargoes. A port or terminal that has installed vapour emission control systems in accordance with this regulation may

accept tankers that are not fitted with vapour collection systems for a period of three years after the effective date identified in paragraph 2 of this regulation. (MARPOL Annex VI.15.5)

8.31 Do tank hatches, tank cleaning apertures and sighting ports appear to be liquid and gas tight?

Venting Arrangements

8.32 Is the cargo venting system in good order and being operated correctly?

Note: The condition of p/v valves, mast risers, vent stacks, vapour lines, vacuum valves and flame screens should be assessed.

8.33 Are SOLAS secondary venting requirements being complied with?

A secondary means of full flow relief of vapour, air or inert gas mixtures shall be provided to prevent over-pressure or under-pressure in the event of failure of the primary venting arrangements. Alternatively, pressure sensors may be fitted in each tank protected by the primary venting arrangement with a monitoring system in the cargo control room or the position from which cargo operations are normally carried out. Such monitoring equipment shall also provide an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a tank. (SOLAS II-2/11.6.3.2)

If Cargo loading and ballasting or discharging of a cargo tank or cargo tank group which is isolated from a common venting system is intended, that cargo tank or cargo tank group shall be fitted with a means for over-pressure or under-pressure protection as required in regulation 11.6.3.2. (SOLAS II-2 4.5.3.2.3)

Vessels equipped with vapour collection systems must be fitted with a pressure sensing device that senses the pressure in the main vapour collection line, which:

- (a) Has a pressure indicator located on the vessel where the cargo transfer is controlled; and
- (b) Has a high pressure and a low pressure alarm that:
 - (1) Is audible and visible on the vessel where cargo transfer is controlled;
 - (2) Alarms at a high pressure of not more than 90 percent of the lowest pressure relief valve setting in the cargo tank venting system; and
 - (3) Alarms at a low pressure of not less than four inches water gauge (0.144 psig) for an inerted tankship, or the lowest vacuum relief valve setting in the cargo tank venting system for a non-inerted tankship. (CFR 46 39.20-13)

Notes: Class societies may accept a system that may not comply with the SOLAS requirements for 'Secondary means of full flow relief'.

In such cases the question should be answered 'No'. A full description of the system as fitted should be made as an Observation to allow an assessment of acceptability to be made.

If the vessel is described in the IOPPC Form B 1.11.4 as a Crude oil/Product carrier and carries crude and products simultaneously, the IG/Vent isolation valve will be intentionally closed to prevent vapour carryover. In such cases, both primary and secondary protection must be provided on the cargo tank side of the cargo tank IG/Vent isolation valve.

In the case of inerted vessels, if pressure sensors are provided as the means of secondary protection, the alarm settings for the pressure sensors must be set to actuate when the tank pressure reaches 10% greater than the normal actuation settings of the pressure valves themselves. In the case of the low-pressure settings, the pressure in a tank should never be permitted to fall below zero and the pressure sensors should be set to alarm above zero.

In the case of non-inerted vessels if pressure sensors are provided, the over-pressure setting should be set to alarm at 10% greater than the normal actuation settings of the pressure valves, and at a vacuum 10% greater than the normal actuation settings of the vacuum valves.

In all cases, a description of the secondary venting arrangements should be provided, in particular what vents or pressure/vacuum sensing systems are available on each tank when the main inlet valve to IG/vent main is shut. Where electronic pressure/vacuum sensors are provided, identify and record whether the alarms are set to operate at the correct value or some other value.

8.34 If stop valves are fitted which permit isolation of individual tanks from the common venting system, are they provided with positive locking arrangements and are the keys under the control of the person in overall charge of the cargo transfer?

Where the arrangements are combined with other cargo tanks, either stop valves or other acceptable means shall be provided to isolate each cargo tank. Where stop valves are fitted, they shall be provided with locking arrangements which shall be under the control of the responsible ship's officer. There shall be a clear visual indication of the operational status of the valves or other acceptable means. Where tanks have been isolated, it shall be ensured that relevant isolating valves are opened before cargo loading or

ballasting or discharging of those tanks is commenced. Any isolation must continue to permit the flow caused by thermal variations in a cargo tank in accordance with regulation 11.6.1.1.

(SOLAS II-2/4.5.3.2.2)

8.35 Are the P/V valves in good order, inspected and cleaned as part of a regular planned maintenance routine and are there records to support this?

Notes: High jet cones and flaps should not be jacked open, particularly when loading.

Verify that p/v valves, where fitted, are tight and in good order and that the venting system is designed and operated in accordance with SOLAS.

High velocity vents are not fitted with flame screens and their correct operation relies on a pressure build-up within the compartment, which opens the valve at a predetermined level and which then results in a gas exit velocity of a minimum of 30 metres/sec. This provides protection against the passage of flame, the speed of which is about 7.5 metres/sec.

Consistent with safety and without interfering with operation and if appropriate to the design of the venting equipment, request the manual lifting of p/v valves to demonstrate satisfactory operation.

P/V valves should be checked for free movement prior to the commencement of each cargo operation as required by the Ship to Shore Safety Check List - Question 31.

Inert Gas System

For tankers of 20,000 tonnes deadweight and upwards (For new build tankers of 8,000 tonnes deadweight and upwards built after the 1st January 2016), the protection of the cargo tanks shall be achieved by a fixed inert gas system. If the vessel is not fitted with an Inert Gas system questions 8.36 to 8.49 need not be answered. If the vessel is not fitted with an Inert gas system, then questions 8.36 to 8.49 will be removed within the inspector's programme software.

8.36 Is the vessel fitted with an inert gas system?

For tankers of 20,000 tonnes deadweight and upwards, the protection of the cargo tanks shall be achieved by a fixed inert gas system. (SOLAS II-2.4.5.5.1.1)

8.37 Was the inert gas system in use and operating satisfactorily at the time of the inspection?

8.38 Is a log kept of inert gas operations?

Paperless IG recorder are acceptable, provided the data can be retrieved.

8.39 Are records maintained of equipment maintenance, including the overhaul of the non-return valve?

At least two non-return devices, one of which shall be a water seal, shall be fitted in the inert gas supply main, in order to prevent the return of hydrocarbon vapour to the machinery space uptakes or to any gas-safe spaces under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 2.3.1.3.1 (Ch.15 of the FSS) and the aftermost connection to any cargo tank or cargo pipeline.

The devices referred to in paragraph 2.3.1.4.1 shall be located in the cargo area on deck.

The second device shall be a non-return valve or equivalent capable of preventing the return of vapours or liquids and fitted forward of the deck water seal required in paragraph 2.3.1.4.1. It shall be provided with positive means of closure. As an alternative to positive means of closure, an additional valve having such means of closure may be provided forward of the non-return valve to isolate the deck water seal from the inert gas main to the cargo tanks.

As an additional safeguard against the possible leakage of hydrocarbon liquids or vapours back from the deck main, means shall be provided to permit this section of the line between the valve having positive means of closure referred to in paragraph 2.3.1.4.3 and the valve referred to in paragraph 2.3.1.3 to be vented in a safe manner when the first of these valves is closed. (FSS 15.2.3.1.4)

8.40 Is an operator's policy provided that complies with IMO guidelines in case of failure of the inert gas system and do the master, chief officer and the officers standing cargo watches understand this?

Note: In the event that the inert gas system is unable to meet operational requirements of this regulation and it has been assessed that it is impracticable to effect a repair, then cargo discharge, deballasting and necessary tank cleaning shall only be resumed when the emergency conditions laid down in the 'IMO Guidelines on Inert Gas Systems' are complied with. In brief, these guidelines state that;

1) In the case of tankers engaged in the carriage of crude oil, it is essential that the tanks be maintained in the inerted condition to avoid the danger of pyrophoric iron sulphide ignition. If it is assessed that the tanks

cannot be maintained in an inerted condition before the inert gas system can be repaired, an external supply of inert gas should be connected to the system to avoid air being drawn into the cargo tanks.

(IMO Inert Gas Systems 8.2)

2) In the case of the carriage of products, if it is considered totally impracticable to effect repair of the inert gas system, cargo discharge may only be resumed if an external supply of inert gas is connected, or the following precautions are taken:

- That approved devices, or flame screens, to prevent the passage of flame into cargo tanks are fitted and checked to ensure that they are in good order;
- The valves on the mast risers are opened;
- No free fall of water or slops is permitted; and
- No dipping, ullaging, sampling or other equipment should be introduced into the tank until a period of five hours since injection of inert gas ceased. If essential for the safety of the operation, this should be done only after 30 minutes have elapsed and all metal components should be securely earthed.

(IMO Inert Gas Systems 8.3)

8.41 Is the inert gas system including instrumentation, alarms, trips and pressure and oxygen recorders, in good order?

8.42 Is the Oxygen content of the inert gas delivery at or below 5%?

Record an Observation if the oxygen delivery is more than 5% or if a high oxygen level alarm is not fitted, regardless of the date of delivery.

For tankers constructed after 1st September 1984:

The system shall be capable of maintaining the atmosphere in any part of any cargo tank with an oxygen content not exceeding 8% by volume and at a positive pressure at all times in port and at sea, except when it is necessary for the tank to be gas free.

(FSS Code 15.2.1.3.2)

The system shall be capable of delivering inert gas with an oxygen content of not more than 5% by volume in the inert gas supply main to the cargo tanks.

(FSS Code 15.2.2.1.3)

8.43 Are the vapour spaces in the cargo tanks being maintained at positive pressure?

8.44 Is the oxygen content in the cargo tanks below a maximum of 8%?

Record an observation if the oxygen percentage of the inert gas in the cargo tanks is more than 8%.

8.45 Was the fixed oxygen analyser calibrated immediately prior to use of the inert gas system?

Note: The oxygen analyser must have been calibrated not more than 24 hours prior to starting of the inert gas system.

8.46 Do the readings on the local, bridge and cargo control room oxygen and pressure recorders, where fitted, agree?

Instrumentation shall be fitted for continuously indicating and permanently recording when inert gas is being supplied:

- The pressure of the inert gas supply forward of the non-return devices; and
- The oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.

(FSS Code 15.2.4.2.1)

The devices referred to above shall be placed in the cargo control room. But where no cargo control room is provided, they shall be placed in a position easily accessible to the officer in charge of cargo operations.

(FSS Code 15.2.4.2.2)

In addition, meters shall be fitted:

- In the navigation bridge to indicate at all times the pressure of the inert gas main forward of the non-return devices;
- In the machinery control room or in the machinery space to indicate the oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.

(FSS Code 15.2.4.2.3)

8.47 Is the liquid level in the deck seal correct and clearly visible?

Record in Other comment if a dry-type deck seal is fitted.

Notes: The OCIMF paper on inert gas deck seals recommends that a dry-type deck seal is replaced with one of another type.

Normally with a dry type seal there is a dump valve which should open when the inert gas supply is stopped and which allows the water from the upper tank to drain to the lower, thereby creating a seal. The crew

should be requested to stop the inert gas momentarily (which will not affect cargo operations), to see if this process actually takes place. Upon restoring the supply, the dump valve should close and the upper tank filling and lower tank drain valves open.

8.48 Does the P/V breaker appear to be in good order?

Water filled pressure/vacuum breakers should be filled to the appropriate level with anti-freeze liquid (ISGOTT 7.1.11.3)

8.49 Can double hull spaces be inerted?

Tankers required to be fitted with inert gas systems shall be fitted with suitable connections for the supply of inert gas to double hull spaces. (SOLAS 2001 II-2/59.4.3)

Tankers required to be fitted with inert gas systems shall comply with the following provisions:

- .1 double hull spaces shall be fitted with suitable connections for the supply of inert gas;
- .2 where hull spaces are connected to a permanently fitted inert gas distribution system, means shall be provided to prevent hydrocarbon gases from the cargo tanks entering the double hull spaces through the system; and
- .3 where such spaces are not permanently connected to an inert gas distribution system, appropriate means shall be provided to allow connection to the inert gas main.

(SOLAS 2009 II-2/4.5.5.1.3)

This requirement applies to vessels constructed on or after 1st October 1994. (SOLAS 2001 II-2/59.4.1)

Crude Oil Washing

If the vessel is not fitted with a crude oil washing system questions 8.50 to 8.60 need not be answered, however if the vessel has a crude oil washing system but is not in use at the time of inspection then question 8.50 to 8.60 should still be answered.

8.50 Is the vessel fitted with a crude oil washing system?

Every new crude oil tanker of 20,000 tons deadweight and above shall be fitted with a cargo tank cleaning system using crude oil washing. (MARPOL Annex I/33.1)

8.51 If crude oil washing is being carried out are the tanks being Crude oil washed in accordance with IMO requirements?

With respect to the ballasting of cargo tanks, sufficient cargo tanks shall be crude oil washed prior to each ballast voyage in order that, taking into account the tanker's trading pattern and expected weather conditions, ballast water is put only into cargo tanks which have been crude oil washed.

(MARPOL Annex 1 35.2)

Before departure on a ballast voyage:

- ballast water is put only into cargo tanks which have been crude oil washed. Approximately one quarter of the cargo tanks shall be crude oil washed for sludge control purposes on a rotational basis in accordance with the procedures specified in the Operations and Equipment Manual. However, for these purposes, no tank need be crude oil washed more than once in every four months;
 - If it is considered that additional ballast in a cargo tanks or tanks may be required during the ballast voyage, the tank or tanks which may be used for this ballast shall be crude oil washed in accordance with the procedures in the Operations and Equipment Manual; and
 - Ballast water shall not be put into cargo tanks that have not been crude oil washed.
- (IMO Res. 446(XI) 6.1 and amendments A.496(XII) and A.897(21))

Note: If the crude oil being carried is listed in the Crude Oil Washing Operations and Equipment Manual as being not suitable for crude oil washing then answer the question N/A.

8.52 Is an approved Crude Oil Washing Operations and Equipment Manual provided?

8.53 If the vessel is crude oil washing, has a crude oil washing plan and checklist been completed and is it being followed?

8.54 Is the person in charge of COW operations suitably qualified?

Where a person such as the Master, the chief officer or the cargo control officer assumes overall charge of a crude oil wash he shall:

- (a) Have at least one year's experience on oil tankers where his duties have included the discharge of cargo and associated crude washing. Where his duties have not included crude oil washing

operations, he shall have completed a training programme in crude oil washing in accordance with IMO Resolution A.446 (XI);

- (b) Have participated at least twice in crude oil wash programmes one of which shall be on the particular ship for which he is required to undertake the responsibility of cargo discharge. Alternatively, this latter participation may be acceptable if undertaken on a ship that is similar in all relevant respects; and
- (c) Be fully knowledgeable of the contents of the Operations and Equipment Manual.

(IMO Crude oil washing systems 5.2)

8.55 Do records indicate that the crude oil washing system was pressure tested prior to use?

Before arriving in a port where it is intended to crude oil wash, the tank washing system should be pressure tested to normal working pressure and examined for leaks.

The system should be drained down after testing to avoid the risk of leaks due to thermal expansion. Any leaks found should be made good, after which the system should be re-tested and proved leak free. During crude oil washing, the system must be kept under constant observation so that any leak can be detected immediately and action taken to deal with it. When tanks for crude oil washing are being changed over, the pressure in the COW line should be reduced to a minimum before any valves on the system are opened or closed, thereby minimising the potential for damage due to surge pressure.

(ISGOTT 11.5.5)

8.56 Do records indicate that oxygen readings of the tanks to be crude oil washed have been checked by portable meter and found to be within maximum permissible limits?

8.57 Are crude oil washing line pressure gauges working?

8.58 Is the tank cleaning heater, where fitted, effectively isolated from the crude oil washing line?

8.59 Are any hydrant-type connections on the crude oil washing lines securely sealed?

Note: Either blanks or valves with caps should be fitted.

8.60 Are records maintained of previous COW operations?

Note: A record should be being maintained of all COW operations, including the tanks washed, the number of machines used, the time washing started and was completed, the washing pattern employed, the washing line pressure and the method employed to ensure that the tanks were dry.

Static Electricity Precautions

Notes: ISGOTT Chapter 3 addresses the hazards associated with static electricity. ISGOTT Chapter 11 addresses the precautions that must be taken when handling static accumulator cargoes in more detail. Provided that a tank is maintained in an inert condition when static non-accumulator cargoes are being handled, or when it can be guaranteed that the tank atmosphere is non-flammable, no anti-static precautions are necessary.

Questions 8.61 to 8.68 are applicable to vessels carrying static accumulator cargoes in non-inert tanks. If the cargo is not a static accumulator or if the tanks are properly inerted, these questions will be removed from the inspector's programme software.

Static accumulator cargoes are all those except fuel with anti-static additive, heavy black fuel oils, conductive crude oil, bitumen, alcohols and ketones. (See ISGOTT Table 3.1)

8.61 Are precautions relating to maximum flow rates during initial loading being observed?

The generally accepted method for controlling electrostatic generation in the initial stages of loading is to restrict the velocity of oil entering the tank to 1 metre/second until the tank inlet is well covered and all splashing and surface turbulence in the tank has ceased. The 1 metre/second limit applies in the branch line to each individual cargo tank and should be determined at the smallest cross-sectional area including valves or other piping restrictions in the last section before the tank's loading inlet. (ISGOTT 11.1.7.3)

8.62 Are required settling periods being observed?

There should be a delay of 30 minutes (settling time) after the completion of loading of each tank before commencing these operations. (dipping, ullaging or sampling with metallic equipment) This is to allow the settling of gas bubbles, water or particulate matter in the liquid and the dissipation of any electrical potential. (ISGOTT 11.8.2.3)

Note: If the vessel is fitted with a fixed tank level gauging system, but is not fitted with IG and not fitted with full depth sounding pipes, the Operator's policy relating to actions to be taken in the event of failure of the primary fixed gauging system must be reviewed.

8.63 Where vapour locks are fitted to cargo tanks that are not fitted with full depth sounding pipes, are static electricity precautions taken to ensure that the appropriate relaxation period elapses prior to ullaging or sampling?

Operations carried out through sounding pipes are permissible at any time because it is not possible for any significant charge to accumulate on the surface of the liquid within a correctly designed and installed sounding pipe. A sounding pipe is defined as a conducting pipe which extends the full depth of the tank and which is effectively bonded and earthed to the tank structure at its extremities. The pipe should be slotted in order to prevent any pressure differential between the inside of the pipe and the tank and to ensure that true level indications are obtained. (ISGOTT 11.8.2.3)

8.64 Are metal tapes and other gauging or sampling devices effectively bonded before being introduced into tanks?

Note: UTI tapes must be bonded before being introduced into tanks. UTI tapes which have quick couplings to connect the unit to the vapour lock will possibly not require bonding wires. However, the internal bonding of such units should be checked every six months in accordance with the manufacturer's requirements.

8.65 Are natural fibre ropes, as opposed to synthetic, used for dipping etc.?

(When washing in a non-inert atmosphere) To Control the 'Sources of Ignition' in the Tank. Equipment made entirely of non-metallic materials may, in general, be used, for example a wooden sounding rod may be suspended on a natural fibre rope without earthing. (ISGOTT 11.3.5.2 sub-para (g))

8.66 If portable tank cleaning hoses are used, are continuity tests carried out and the results recorded?

Bonding wires should be incorporated within all portable tank washing hoses to ensure electrical continuity. Couplings should be connected to the hose in such a way that effective bonding is ensured between them. Hoses should be indelibly marked to allow identification. A record should be kept showing the date and the result of electrical continuity testing. (ISGOTT 11.3.6.2)

All hoses supplied for tank washing machines should be tested for electrical continuity in a dry condition prior to use, and in no case should the resistance exceed 6 ohms per metre length. (ISGOTT 11.3.6.3)

8.67 Are personnel aware of the hazards associated with tank cleaning after the carriage of volatile products?

Note: The recommendations contained in ISGOTT Chapter 11.3 must be strictly observed.

8.68 Are personnel aware of the need to avoid the free fall of liquid into tanks?

Loading or ballasting from the top (overall) delivers charged liquid to a tank in such a manner that it can break up into small droplets and splash into the tank. This may produce a charged mist as well as an increase in the petroleum gas concentration in the tank. Restrictions upon loading or ballasting overall are given in ISGOTT Section 11.1.12. (ISGOTT 3.3.3)

Manifold Arrangements

8.69 Are the manifolds in good order?

The following applies to vessels of 16,000 dwt and above:

The distance of the presentation flanges inboard from the ship's side should be 4600 mm.

(Recommendations for Manifolds 2.2)

The height of the centres of the presentation flanges above the deck should not exceed 2100 mm.

(Recommendations for Manifolds 2.3.2)

The working platform (the grating of the saveall) should be fitted to allow 900 mm between the level of the platform and the centres of the presentation flanges.

(Recommendations for Manifolds 2.3.3)

8.70 Are manifold pressure gauges fitted outboard of the manifold valves on both sides of the vessel and are they in good order?

Manifold pressure gauges should be fitted to the spool pieces/reducers on the outboard side of the manifold valves. (ISGOTT 24.6.3)

Note: Manifold pressure gauges should be fitted to the spool pieces/reducers on the outboard side of the manifold valves and be fitted with valves or cocks. Pressure gauges should be fitted to the offshore manifolds and be regularly checked during cargo transfer for manifold valve leakage

8.71 Are manifold blank flanges of an equivalent rating to that of the manifold pipelines?

Notes: It is generally accepted that steel blanks should be of the same thickness as the flanges to which they are attached, but this will not necessarily result in the pressure capability being the same as that of the associated pipework.

It is the pressure rating of the blank which is important and blanks made of materials such as titanium have a superior strength and may therefore be significantly thinner for the same pressure rating as a mild steel blank. If such blanks are fitted, documentation should be on board to prove that the pressure rating is adequate for the service.

8.72 If the vessel is fitted with vapour return manifolds, are they in good order?

To guard against the possible misconnection of the ship's vapour manifold to a terminal liquid loading line, the vapour connection should be clearly identified by painting the outboard 1 metre section with yellow and red bands and by stenciling the word "VAPOUR" in black letters upon it.

In addition, a cylindrical stud should be permanently attached to each presentation flange face at the 12 o'clock position on the flange bolt circle. The stud should project 25.4 mm (1 inch) perpendicular to the flange face, and should be 12.7 mm (1/2 inch) in diameter, in order to prevent the connection of standard liquid transfer hoses. Blank flanges, inboard ends of reducers and hoses for the vapour line will have an extra hole to accommodate the stud on the presentation flange.

Full details of vapour manifold arrangements, materials and fittings are contained in the OCIMF publication 'Recommendations for Oil Tanker Manifolds and Associated Equipment'. (ISGOTT 11.1.13.2)

8.73 If the vapour return manifolds are designed for use at single buoy moorings, do they comply with requirements?

If the vessel is not designed to be utilised at single buoy moorings that are equipped with a vapour emission control system, answer the question "NA".

Note: Vapour return system manifolds (VRSM) which are designed for use at single buoy moorings:

- Should be supported to the same strength as the cargo manifolds;*
- Hose rails at the ship's side should be of the same strength and construction throughout their length, extend beyond the VRSM to permit use at single buoy moorings and be fitted with stopper plates at both the forward and aft ends of the hose rail;*
- A closed chock should be fitted at the ship's side in line with the VRSM;*
- A cruciform bollard should be fitted in line, or nearly in line with the VRSM to allow securing of the VRS hose hang-off chain;*
- Two deck pad-eyes of size sufficient to secure 16" floating hose should be provided, one to either side of the line from the closed chock to the VRSM;*
- Means to thoroughly drain the VRSM should be provided at the lowest point in the VRS line to avoid risk of liquid carry-over into the floating hose.*

8.74 Does the vessel's piping system appear to be free of unauthorised inter-connections between cargo, bunker and ballast systems?**Pump Rooms**

This section applies to all pumprooms if fitted, including Cargo Pumprooms, Ballast pumprooms and Fuel Oil Transfer Pumprooms.

8.75 On vessels with pump rooms, are they free of evidence of significant leaks from machinery, pipework, valve glands and instrumentation?**8.76 Are bulkhead seals gas tight and, if required, well lubricated?**

Where applicable, check whether maintenance of the bulkhead seals as per Manufacturers manuals has been carried out. In case of Automatic unloading system (AUS) installations, if the AUS pump is directly mounted on the pump room bulkhead, check for any visual evidence of seal leaks. If the AUS pump motor is fitted in the vessel's accommodation area, make a mention of the same in the comments section.

8.77 Is the cargo pump room gas monitoring system in good order and regularly checked?

All tankers shall be fitted, by the date of the first scheduled docking after 1st July 2002 but not later than 1st July 2005, with a system for continuous monitoring of the concentration of hydrocarbon gases. Sampling points or detector heads shall be located in suitable positions in order that potentially dangerous leakages are readily detected. When the hydrocarbon gas concentration reaches a pre-set level, which shall not be

higher than 10% of the LEL, a continuous audible and visual alarm signal shall be automatically effected in the in the pump room and cargo control room to alert personnel to the potential hazard.

(SOLAS 2000 II-2/4.5.10.1.3 and 1.6.7)

The alarm shall be automatically effected in the pump room, engine control room, cargo control room and navigation bridge on vessels constructed on or after 1st July 2002. (SOLAS 2000 II-2/4.5.10.1.3)

Note: Existing systems having a pre-set level of not more than 30% LEL may be accepted on vessels constructed before 1st July 2002

8.78 Are pumprooms clean, tidy and free of combustible materials and are the bilges free of Cargo Product?

8.79 Is the level of lighting in the pump room adequate?

Cargo Hoses

8.80 If the vessel uses its own cargo hoses, are they in good order, pressure tested annually to their design working pressure and is a record of all hose tests and inspections maintained on board?

Note: Each hose should be marked with the test date and pressure, maximum working pressure and be individually numbered for identification purposes.

Cargo Lifting Equipment

8.81 Are all cargo cranes and other lifting equipment properly marked and has periodical testing and inspection been carried out?

Notes: Cargo lifting equipment should be load tested every five years and thoroughly examined by a competent person annually. Other lifting equipment is not regulated except as usually required by class, but should be tested and examined under a similar regime. The minimum SWL for which testing is required is one tonne (1,000 kgs).

A Chain Register is not required, but documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/Labelling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

8.82 Are winches associated with lifting equipment in good order?

Note: Cargo derrick topping lifts should have a means of securing them, such as a locking pin or ratchet, to prevent the weight of the derrick being solely taken by the winch brake. Check that this is fitted and that it and any associated winches are in good condition. Documentation supporting testing, examination and maintenance that follow the OCIMF Publication Recommendations for the Tagging/Labelling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

8.83 If the ship has a single centreline mounted crane at the manifold, does it carry a full set of spare hydraulic hoses for the crane?

Note:- In the event of a failure of a hydraulic hose then there must be the capability to replace the defect hose with spare ones. In the event that the cargo hose handling crane has two or more hoses that are identical in all aspects, then only 50% of these identical hoses need to be carried as spares.

Ship to Ship Transfer Operations - Petroleum

Questions 8.84-8.87 ask for basic information to determine if the vessel can be considered for off-shore STS. If the vessel is equipped with specialised equipment for regular ship-to-ship transfer operations such as fenders and hoses, the fact should be recorded in Additional comments. If the vessel is NOT utilised for regular commercial ship-to-ship cargo transfer, Questions 8.84-87 must be answered 'NA'

8.84 Are operator's procedures provided for ship to ship operations?

Any oil tanker involved in STS operations shall carry on board a Plan prescribing how to conduct STS operations (STS Operations Plan) not later than the date of the first annual, intermediate or renewal survey of the ship to be carried out on or after 1st January 2011. Each oil tankers STS operations plan shall be approved by the administration. The STS operations plan shall be written in the working language of the ship. (MARPOL Annex I Reg 41.1)

Notes: STS operations plan are not required for liftings from FPSOs, FSOs and for bunkering operations. (See MARPOL Annex I, Reg 40 for full details) Operations plan shall be developed taking into account the information contained in IMO's "Manual on Oil Pollution, Section 1, Prevention and the

ICS/OCIMF/SIGTTO/CDI "Ship to Ship Transfer Guide, for Petroleum, Chemicals and Liquefied Gases" First Edition 2013.

8.85 Are sufficient closed fairleads and mooring bitts provided?

It is recommended that all fairleads used during STS transfer operations are of an enclosed type. Such fairleads should be strong enough to take the anticipated mooring loads and large enough to allow the mooring line (plus any soft rope and tackle) to pass through comfortably. (STS Guide 9.3)

It has been found that full strength enclosed fairleads and bitts for spring lines need to be positioned no more than 35 metres forward and aft of the cargo manifold. (STS Guide 9.3)

It is recommended that all tankers be fitted with an array of mooring bitts of sufficient strength on each side of the ship. (STS Guide 9.3)

In addition it is recommended that provision be made for securing fender lines. (STS Guide 9.3)

8.86 Are ship-to-ship transfer checklists completed?

The checklists should be used not only at the time of transfer but also when the operation is being planned. Adherence to check list procedures will ensure that the most important aspects of an operation are covered. The checklists are:

- 1 - Pre-fixture information;*
- 2 - Before operations commence;*
- 3 - Before run-in and mooring;*
- 4 - Before cargo transfer; and*
- 5 - Before unmooring.*

(STS Guide 3.3 and Appendix 1)

8.87 If a ship-to-ship transfer was in progress during the inspection, was it conducted in accordance with the recommendations of the OCIMF/ICS STS Transfer Guide?

Combination Carriers

Note: Under normal circumstances, the inspection of combination carriers should be conducted only when the vessel is operating in the 'wet' mode.

8.88 Are operator's procedures provided and are records maintained for changing between the wet and dry modes?

Note: Records should contain details of tank inspections and corrective actions taken, if required, after the carriage of dry cargoes with regard to damage caused by discharging equipment.

8.89 Have the senior deck officers had at least one years' experience operating in wet service?

8.90 Are hatch covers of the dual seal type, are they seated correctly and are they sealed and gas tight?

Notes: Guidance relating to hatch covers on combination carriers is contained in ISGOTT 14.1.8.

It is recommended practice that OBO's arrive at a terminal with a minimum tank vapour space pressure of 500 mm.

Refer to the publication "Testing Requirements for Bulk Carriers."

8.91 Are hatch covers free of visible evidence of damage and are the corners of hatch coamings and adjacent decks free of visible cracks?

8.92 Do records indicate that the pipe tunnel is clean and free of evidence of leakage?

8.93 Are bilge pumping systems for forward spaces in good order?

The means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, shall be capable of being brought into operation from a readily accessible enclosed space, the location of which is accessible from the navigation bridge or propulsion machinery control position without traversing exposed freeboard or superstructure decks. (SOLAS 2002 XII/13.1)

8.94 Is the vessel equipped with bilge alarms in the forward spaces and holds?

Bulk carriers shall be fitted with water level detectors:

- *In each cargo hold giving visual and audible alarms, one when the water level above the inner bottom in any hold reaches a height of 0.5 metres and another at a height of not less than 15% of the depth of the cargo hold;*
- *In any ballast tank forward of the collision bulkhead, giving an audible and visual alarm when the liquid in the tank reaches a level not exceeding 10% of the tank capacity;*
- *In any dry or void space other than a chain cable locker, any part of which extends forward of the foremost cargo hold, giving an audible and visual alarm at a water level of 0.1 metre above the deck. Such alarms need not be provided in enclosed spaces the volume of which does not exceed 0.1% of the ship's maximum displacement volume. (SOLAS 2002 XII/12.1)*

The audible and visual alarms shall be located on the navigation bridge. (SOLAS 2002 XII/12.2)

Bulk carriers constructed before 1st July 2004 shall comply with the requirements not later than the date of the annual, intermediate or renewal survey of the ship to be carried out after 1st July 2004, whichever comes first. (SOLAS 2002 XII/12.3)

8.95 If the vessel uses portable hoses for crude oil washing, are these in good order and do records support that they have been regularly tested.

Note: Portable hoses must be tested for continuity, physical damage and pressure tested periodically

Shuttle Tankers:

Notes: These questions address issues associated with tankers that are provided with specialist equipment for operations at deep water terminals and FPSO's. This section should only be completed when the vessel has such equipment. Unless the inspection is taking place at an offshore installation it may not be possible for the inspector to provide detailed responses relating to these vessels, or to answer some of the questions. Within the inspector's software, the inspector can select two inspection options, "Inspection at an Offshore Loading Oilfield" or "Inspection at a Discharge Terminal". For an "Inspection at an Offshore Loading Terminal" all questions from 8.96 to 8.159 will be addressed. For an "Inspection at a Discharge Terminal" the questions 8.96 to 8.159 will be addressed with the exception of the following 8.117, 8.120, 8.121, 8.122, 8.126, 8.128, 8.131, 8.132, 8.133, 8.134, 8.135, 8.137, 8.139, 8.140, 8.141, 8.143, 8.144, 8.145, 8.147, 8.148, 8.149, 8.150, 8.151, 8.156.

Personnel Management:**8.96 Do all key personnel on board involved in DP operations comply with the IMCA and UKOOA minimum requirements for experience and training?**

Note: Confirm DP certification and experience from log books. Confirm that Engineers and ETOs have appropriate training/guidance on how to operate/maintain plant when in DP mode. (IMCA M 117 Rev 1- The training and Experience of key DP personnel UKOAA Tandem Loading Guidelines).

8.97 Do DP personnel undergo assessed refresher training e.g. DP CAP?**8.98 Record the DP manning arrangements.**

Note: Record the number of qualified DPO's and Masters

8.99 Record the Engine Room manning arrangements during shuttle tanker operations.

Note: Record the engine room manning levels

8.100 Is there an Electronic Technician on-board with approved training on the maintenance of DP system?

Note: IMCA M 117 Rev 1- The training and Experience of key DP personnel

8.101 Have officers and ratings had shore-based training in helicopter handling operations?**Dynamic Positioning and Navigation Equipment:****8.102 Does the vessel have on board a copy of the most recent FME(C)A?**

Note: Record the date of the report and authors. Record the Class Notation of the DP system.

8.103 Do the failure modes meet IMO MSC Circ.645 with 'fail as set, or fail to zero'?*Note: State failure mode(s)***8.104 Is a record of the DP proving trials available on board?****8.105 Have the recommendations (if any) from the DP proving trials been addressed?****8.106 Does the vessel have on board a copy of the most recent annual DP trial report (if required)?***Note: Record the trial data report authors***8.107 Have recommendations from the DP annual trial report been addressed and closed out as required?****8.108 Are all personnel involved in DP operations familiar with the FME(C)A?***Note: Confirm that the FME(C)A is written in a language appropriate for the DPOs, ETOs, engineers and electricians.***8.109 If modifications have been undertaken, has the FME(C)A been up-dated and the modifications proven by testing?***Note: Record modifications to, propulsion, power generation/ supply, DP control system, position references.***Dynamic Positioning (DP) Operations****8.110 Have DP operations been incident-free in the last 12 months?***Note: If 'No' record details of any incidents.***8.111 Does the vessel have a DP Incident reporting system?***Note: This can be either according to the vessel's ISM system or by use of the IMCA M 103 Rev 1, Appendix 1***8.112 Does the vessel review the risk assessments for shuttle tanker operations prior to DP operations?***Note: Reviews reflect changes in operating locations, position reference sensors and Joint Operations Manuals (where appropriate).***8.113 Is the DP control console located so that the DPO can also observe the controls, the external environment and the working operations of the vessel?***Notes: If 'No', state whether CCTV is utilised. IMCA M 103 Rev 1- 1.6.5 Position Control IMCA M 103 Rev 1- 1.2 Scope of Dynamic Positioning.***8.114 Are manual controls and emergency stops located within easy reach?***Notes: They should be protected from inadvertent operation and generate an alarm in the event of a line break. IMCA M 103 Rev 1, 1.6.1 Thrust units State date that emergency stops were last tested. Each thruster should have an independent emergency stop that is well protected against inadvertent operation? Are the emergency stops alarmed against failure?***8.115 What level of power/thrust can be achieved from the main propellers when going astern?***Note: Reverse thrust capacity will be typically reduced, record power/thrust level as percentage of normal ahead thrust.***8.116 Can the controls for position reference systems be accessed within easy reach of the DP control station?****8.117 Does the vessel have a comprehensive DP operating manual on board?***Notes: IMO Resolution 645 Operational Requirement. Confirm that the manual is written in a language appropriate for the DP operators. State whether manual has been reviewed by Class.***8.118 Are all personnel involved in DP operations familiar with the manual and demonstrate an understanding of its contents?**

8.119 Are checklists in place to cover bridge, engine room and electrical systems prior to DP operations?

8.120 Are DP Capability Plots in place to cover the normal and expected operations?

Dynamic Positioning Equipment

8.121 Are all the thrusters in good order?

Note: Routines for calibrating the thrusters should either be a part of the annual dynamic positioning trials or included in the planned maintenance system.

8.122 Is the Dynamic Positioning equipment on board in good order?

Notes: Record the date of the last maintenance visit and review the report. Note any recommendations/deficiencies.

8.123 Are all position reference systems in good order?

8.124 Are the offsets adequately filed?

Note: Check that the file is readily available to DPO's

8.125 Does vessel have a data recorder that records all DP parameters?

Note: IMCA M 103 Rev 1- 1.5 Operation, Training and Documentation Best practice for vessels engaged in sensitive DP operations. If a data recorder is not fitted, confirm that procedures are in place for securing relevant data in the event of a DP incident.

8.126 Is there a procedure for checking of the secure power supply system's prior to DP operations?

8.127 If vessel is DP class 2 (or equivalent), does the DP system have a continuous analysis function checking that in terms of thrust and power the vessel can maintain position after the worst case failure?

Note: IMCA M 103 Rev 1- 1.6 Recommended for all vessels built after 1994

8.128 Do the operational procedures include guidance on number of generators to be running at different power loads and are DPOs and engineers familiar with them?

Note: Guidance should include direction on number of generators to be online and recommended 'spinning reserve'. Is there a policy on standby generators?

8.129 Are consequence analysis alarms used as input to the contingency matrix?

8.130 Is the DP system included within the Planned Maintenance System (PMS)?

Note: Including all position reference systems, UPSs and sensors.

Cargo Operations

8.131 Are the appropriate loading terminal procedures manuals on board for each offshore terminal to which the vessel trades?

Notes: Joint Operations manuals should be available, which should include the following information: -

- *Summary field position and field layout and FPSO information including plans of her stern offtake arrangements, and appropriate photographs;*
- *Contact numbers, call signs and communications channels for both Operational and Emergency use;*
- *Description of the offloading equipment and in particular the OCEs on board the FPSO;*
- *Description of standard and occasional joint operations including cargo transfer rates, line flushing etc.;*
- *Data sheets on all tankers approved for regular offtake at that field;*
- *Tendering and accepting Notice of Readiness (NOR), and any special requirements for cargo quality, Bills of Lading and Cargo calculation;*
- *Speed reduction sequence and limits on approaching Facility / FPSO. Speed should normally be reduced to:*

< 12 knots @ 10 nautical miles from the Facility / FPSO

< 5 knots @ 3 nautical miles from the Facility / FPSO

< 0.5 knot @ 1000 meters from the Facility / FPSO

- Operational limits and executive actions on exceeding limits;
- ESD systems and executive actions at each ESD level. (Both for the FPSO ESD system and the joint "Offtake ESD" system);
- Detailed check lists for the FPSO covering each stage of pre offtake checking; approach, Offtake, disconnection and post offtake checking of hardware;
- Detailed check lists for each type of tanker covering field specific actions and requirements not covered by the tankers own detailed checklists;
- Duties and requirements for any towing assist vessel;
- Emergency responsibilities and procedures. Note this section of the joint operations manual should be prepared jointly between the duty holder's management team responsible for running the installation, and the tanker management company to ensure that there are no gaps or overlaps in cover. (Some duty holders prefer to cover this topic by a separate bridging document or emergency response manual for this reason);
- Bearing in mind that many tankers operate on a COA basis visiting many different fields with different procedures each joint operations offtake manual should include:-
 - A short synopsis describing key requirements and where to find more detailed information on each topic within the manual. (I.e. An overview that the Tanker Master can quickly use to get the key facts without having to wade indiscriminately through the full manual).
 - A station-keeping sector limits diagram giving key operational and station keeping limits and key communications channels. (I.e. key information that can be posted on one sheet on the bridge for immediate use).

8.132 Are deck officers familiar the appropriate loading terminal procedures manuals on board for each offshore terminal to which the vessel trades?

8.133 Are weather forecasts received and assessed before commencing offshore operations?

8.134 Are records of regular communications checks with the installation maintained?

8.135 Is there a checklist for bridge or bow control station instrumentation and control systems and has it been correctly completed?

8.136 Is there a checklist for engine room machinery and has it been correctly completed?

8.137 Does the vessel apply the same practices when loading from the offshore terminal as for an onshore terminal?

Note: Specific procedures should be provided for each of the terminals at which the vessel operates

8.138 Are green line interlocks working satisfactorily?

8.139 Is there a service report available for the tension load cells?

Note: The dates should be noted.

8.140 Is the deluge system in good order and is it pressurised during loading?

Note: Record the date of the last test.

8.141 Are the emergency shut-down systems in good order and tested regularly?

Note: Record the date of the last test.

8.142 Is the telemetry system in good order?

Bow Loading Systems (BLS) and Submerged Turret Loading (STL) Operations

8.143 Has the BLS been subject to an FME(C)A process?

8.144 Are the BLS and/or STL systems in good order?

- 8.145** Are checklists for the operation of the BLS and/or STL systems available and is there evidence of their consistent use?
- 8.146** Are seals on the STL buoy hatch and the STL room watertight door in good order?
- 8.147** Is the alarm for the STL room watertight door in good order and tested regularly?
Note: Record the date of the last test.
- 8.148** Are indicators for closing devices in good order?
Note: Record the date of the last test.
- 8.149** Are BLS and/or STL areas fitted with detection/extinguishing systems and are they in good order
Note: Record detection systems fitted, i.e. Fire detection and/or fixed fire extinguishing, gas detection, video monitoring etc.

Safety Management at Offshore Installations

- 8.150** Have communications been established and is there a backup communication system?
Note: If vessel is not being inspected at an offshore location answer this question NA.
- 8.151** Have communications been established with the field standby vessel?
Note: If vessel is not being inspected at an offshore location answer this question NA.
- 8.152** Are written emergency procedures for offshore loading provided?
Note: Sight procedures and records of drills.
- 8.153** Are drills pertaining to these procedures held regularly?
Note: Sight procedures and records of drills
- 8.154** Is there a procedure for emergency towing?
- 8.155** Are emergency towing trials carried out?
Note: Record frequency of trials and date of the last exercise and details of any lessons learned.

Pollution Prevention Specific to Offshore Installations

- 8.156** Does the SOPEP address procedures specific to shuttle tanker operation?
- 8.157** Are BLS and/or STL spaces free of oil?
- 8.158** If an oil discharge monitor is fitted in the STL room, is it in good order?
- 8.159** Is the vessel equipped with an appropriate system for draining the BLS and/or STL spaces?

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 8. Cargo and Ballast Systems – Chemical

Notes: This chapter can only be completed if the vessel is provided with a Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk or International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances (NLS).

If a vessel is certified as a chemical tanker and sometimes carries Annex I cargoes, it shall be inspected as a chemical tanker, irrespective of the cargo on board at the time of the inspection. However, if the on-board records reveal that the vessel is being used for oil cargoes only, the vessel shall be inspected as an oil tanker.

In answering the questions below, note that the IBC Code applies only to those vessels where the keel was laid on or after 1st July 1986.

The BCH code applies to vessels whose keel was laid or which were at a similar stage of construction on or after 12th April 1972. It also applies to vessels constructed before this date, except for the construction provisions of BCH 1.7.3 (a) to (f).

Effective 1 Jan 2007, revisions to MARPOL Annex II re-categorised products into X, Y, Z and Other Substances (OS). The pollution hazards and carriage requirements of all chemicals have been re-evaluated. Categories X, Y and Z carriage requirements are set out in Chapter 17 of the IBC. Category Z cargoes are also set out in Chapter 18 of the IBC along with OS cargoes. P and A Manuals for all vessels carrying Category X, Y or Z cargoes must have been re-approved prior to 1st January 2007.

The MEPC.2 Circular provides a provisional categorisation of liquid substances and is issued in December each year. The current Circular is MEPC.2/ Circ.12. Under normal circumstances chapters 17 and 18 of the IBC Code take precedence over List 1 of the MEPC.2 Circular, in this exceptional case, the entries in Annex 1 List 1: Pure and technically pure products, which apply to "all countries" and no expiry date, supersede those in the IBC Code.

Policies, Procedures and Documentation

8.1 Is the vessel provided with company policy statements, instructions and procedures with regard to safe cargo operations?

8.2 Is information readily available on maximum loading rates and venting capacities?

Note: This information should be displayed at the cargo control position.

8.3 Are legible and up to date pipeline and/or mimic diagrams of cargo, inert gas and venting systems available in the cargo control area?

8.4 Is there a Procedures and Arrangements Manual available?

Note: The list of cargoes which the vessel is allowed to carry is attached to the International Certificate of Fitness. It is not a requirement for the list of cargoes to be attached to the P & A Manual.

8.5 Is the Cargo Record Book correctly completed and up to date?

A Cargo Record Book is required when carrying chemicals under either a Certificate of Fitness or a NLS Certificate. Entries should be recorded as they occur and not at some later point in time.

8.6 Are there guidelines and procedures for tank cleaning after flammable and toxic products, using chemicals and solvents, gas freeing and for steaming cargo tanks?

Notes: Tank cleaning is one of the most hazardous operations in chemical tankers and it is therefore essential that a comprehensive guide is available on board.

Some major chemical tanker operators have developed their own comprehensive tank cleaning guidelines and these should be reviewed. If they have not, a recognised professionally produced industry publication should be available on board.

Annex 10 of MEPC.2/Circ.19 (This MEPC2 Circ is regularly updated) lists the cargo tank cleaning additives evaluated in accordance with MEPC.1/Circ 590 and found to meet the requirements of Regulation 13.5.2 of Annex II of MARPOL 73/78.

Stability and Cargo Loading Limitations:

The Master of the ship shall be supplied with a loading and stability information booklet. This booklet shall contain details of typical service and ballast conditions, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet shall contain sufficient information to enable the Master to load and operate the ship in a safe and seaworthy manner. (IBC 2.2.5)

8.7 Have stability calculations and where applicable stress calculations, been performed for the current cargo operation?

8.8 Is the stress and stability information included with the cargo plan and are any limitations understood by the cargo watch officers?

Notes: Inspectors should determine that prior to transfer of cargo, calculations have been made for stress and stability conditions for the start, interim and completion of transfer conditions. Regular monitoring of stress and stability should be taking place throughout cargo transfer to ensure that the conditions have been maintained within design limits.

8.9 Are damage stability guidelines available?

Notes: Damage assumptions are addressed in Chapter 2.5 of the IBC Code and the stability booklet shall contain information on the ship's survival capabilities. The procedures listed in the Operating Manual must be identical to those posted and practiced (Q8.9 above, refers). If not, record an Observation.

8.10 Is the Master aware of the worst damage stability condition in the stability book?

8.11 Is the vessel free of inherent intact stability problems?

Notes: Vessels that have large width tanks will be subject to reductions of intact stability due to free surface. Although such vessels may meet IMO intact stability criteria when in fully loaded or ballasted conditions, they may be unstable when multiple tanks are slack during cargo or ballast transfer operations, or in intermediate states of loading. Trim and stability manuals generally deal only with arrival and departure conditions and operators are not made aware that stability problems may exist at intermediate stages during cargo transfers.

If a vessel has either large width cargo tanks, "U" section ballast tanks, or double bottom tanks without watertight centreline bulkheads, inspectors should ascertain that the vessel meets IMO intact stability criteria by requesting the chief officer to demonstrate, using the class approved loading instrument, the intact stability at the worst case condition. (i.e. All tanks slack and maximum free surface)

If no suitable loading instrument is provided and adequate instructions are not available, the question should be answered 'No', unless there is satisfactory proof that the vessel is free of inherent stability problems.

Inspectors should ascertain whether all officers appear familiar with operational restrictions and that instructions are prominently posted describing action to take if stability concerns are suspected or experienced. Record a "N" response and appropriate Observation if weaknesses or other concerns are revealed.

If specific procedures have been adopted to address potential stability problems, these should be recorded as an Observation.

8.12 If a loading computer or programme is in use, is it class approved?

If a class approved loading computer is not available, record in Comments how stress and stability calculations are performed.

Notes: Ships of more than 65 metres in length are required by Class to be provided with a loading manual including permissible limits of still water bending moment and shear force; the results of the calculations of still water bending moments; shear forces and where applicable, limitations due to torsional and lateral loads and the allowable local loading for the structure (decks, double bottom, etc.)

Ships of more than 100 metres in length are required by Class to be provided with an approved loading instrument. An operational manual is always to be provided for the loading instrument

The loading instrument should be capable of calculating shear forces and bending moments in any load or ballast condition at specified readout points and should indicate the permissible values. Ships with very limited possibilities for variations in the distribution of cargo and ballast and ships with a regular or fixed trading pattern may be exempt from the requirement.

Class approvals for loading instruments are made under a Type Approvals process. Type-approval certificates are generally valid for periods of not more than five years. MSC Circular 1221 notes that the validity of the Type Approval Certificate itself has no influence on the operational validity of a product accepted and installed on-board ship and that a product manufactured during the period of validity of the relevant Type Approval Certificate need not be renewed or replaced due to the expiry of such Type Approval Certificate.

8.13 Are there records indicating that the operational accuracy of the load computer is tested regularly?

Notes: At each Annual and Special Survey, the loading instrument is to be checked for accuracy and the approved loading guidance information confirmed as being available on board. Class approved data should be used and the tests should be carried out in the presence of the attending surveyor at the annual survey. Regular on-board testing should also take place and records attesting to this should be maintained. The test should involve physically entering the data for each tank into the computer and verifying the result. It is not acceptable to simply retrieve a stored test condition from the computer and compare this against the official conditions.

8.14 Are longitudinal stresses, where applicable, maintained within design limits throughout?**8.15 Are cargo and/or ballast tanks free of sloshing or weight restrictions?**

Important restrictions other than those normally applied such as maximum density should be recorded in Comments.

8.16 Where applicable, are officers aware of the dangers of high free surface effects and of the possibility of structural damage caused by sloshing in cargo tanks?**8.17 Do the operator's operating manuals include procedures for restoring stability in case of unstable conditions developing during cargo operations, where applicable?****Cargo Operations and Related Safety Management****8.18 Are the cargoes being carried listed on the Certificate of Fitness or IPPC for Noxious Liquid Substances in bulk?**

Note: If the cargo being carried is not listed on the Certificate of Fitness there must be authorisation from the Administration or their representative allowing the product to be carried. Reference to the MEPC.2/Circ.12 shall be made in cases where a cargo is not listed in the Certificate of Fitness.

8.19 Are all officers familiar with the cargo system?**8.20 Are all officers familiar with the carriage requirements for the cargoes on board and chemicals in general?**

Note: Officers shall be able to demonstrate a basic knowledge of the following:

- *Shipboard operations and cargo handling;*
- *Closed loading, discharging and sampling;*
- *MARPOL ANNEX II including the meaning of Category X, Y, Z and OS cargoes;*
- *The IBC and BCH Codes, where applicable;*
- *Requirements for medical treatment following exposure to hazardous cargoes; including the use of antidotes when applicable;*
- *Chemical spill response;*
- *Communication procedures with shore and emergency stop procedures.*

And, as required:

- *Drying, padding and inerting;*
- *Precautions for reactive and self-reactive cargoes;*
- *Limitations when loading high density cargoes;*
- *Hazards associated with corrosive cargoes;*
- *Hazards associated with toxic cargoes;*
- *Hazards of electrostatic generation;*
- *Hazards associated with handling nitrogen;*
- *Handling solidifying and high viscosity cargoes;*
- *Pre-wash requirements.*

8.21 When an unfamiliar chemical is to be carried, is there a procedure to review the safety aspects and handling procedures?

Note: For each chemical carried a review of the carriage requirements should have been made in order to ensure that the cargo plan contains all the necessary information for the safe carriage of the product. The review should reference:

- *The IBC Code Chapter 17;*
- *MEPC.2/Circular 12 when applicable*
- *The Certificate of Fitness;*

- The P and A Manual; and
- Material Safety Data Sheets.

8.22 Is a cargo compatibility chart available?

Note: If the USCG compatibility chart is used then reference to Appendix 1 (b) 'dangerously reactive exceptions to the compatibility chart' must be made during preparation of the stowage plan.

8.23 Has a cargo-handling plan been prepared which provides a detailed sequence of cargo and ballast transfer?

Note: The plan should cover all stages of the transfer operations, namely:

- Quantity and grade of each parcel;
- Density, temperature and other relevant properties;
- A plan of the distribution, lines and pumps to be used;
- Transfer rates and maximum allowable pressures;
- Cargo pollution category;
- Flammability and toxicity; (including antidotes if applicable);
- Fire protection including firefighting agent;
- Miscibility;
- Critical stages of the operation;
- Notice of rate change;
- Venting requirements;
- Stability and stress information;
- Drafts and trims;
- Ballast operations;
- Emergency stop procedures;
- Action to be taken in the event of a spill;
- Protective equipment requirements; and
- Hazards of the particular cargoes.

And also, as required or applicable:

- Inhibitor requirements;
- Inerting and padding;
- Cargo viscosity;
- Cargo melting point;
- Cooling;
- Tank coating material compatibility;
- Precautions against static generation;
- Control of cargo heating systems;
- Line clearing;
- Under keel clearance limitations;
- Bunkering; and
- Special precautions required for the particular operation.

8.24 Has the cargo plan been signed by the watch officers to indicate their understanding of it?

Note: The cargo plan should be completed by the responsible officer prior to commencement of operations and verified and approved by the Master. It should be comprehensive, contain full details of the operation and be easy to interpret.

8.25 Are cargo operations being carried out and logged in accordance with the plan?

Note: The log must include details of all major events including starting and stopping of main cargo and ballast pumps and tanks being worked.

8.26 If the cargo is required to be inhibited, is the required information available?

Certain cargoes with a reference in column 'o' of Chapter 17, by the nature of their chemical make-up, tend, under certain conditions of temperature, exposure to air or contact with a catalyst, to undergo polymerisation, decomposition, oxidation or other chemical changes. Mitigation of this tendency is carried out by introducing small amounts of chemical additives into the liquid cargo or controlling the tank environment.
(IBC 15.13.1)

Care shall be taken to ensure that these cargoes are sufficiently protected to prevent deleterious chemical change at all times during the voyage. Ships carrying such cargoes shall be provided with a certificate of protection from the manufacturer and kept during the voyage, specifying:

- The name and amount of additive present;
- Whether the additive is oxygen dependent;

- Date the additive was put in the product and the duration of its effectiveness;
- Any temperature limitations qualifying the additive's effective lifetime; and
- The action to be taken should the length of the voyage exceed the effective lifetime of the additives. (IBC 15.13.3)

8.27 Are the dangers associated with co-mingling non-compatible cargoes considered?

Note: The cargo plan shall identify when care shall be taken to avoid the co-mingling of non-compatible cargoes and which cargoes are involved. All areas where possible comingling should be considered, i.e. slop tanks, common pipelines, drip trays etc.

8.28 Are all officers aware of the emergency procedures for dealing with leakage, spillage or fire involving the cargo?

Officers shall be trained in emergency procedures to deal with conditions of leakage, spillage or fire involving the cargo and a sufficient number of them shall be instructed and trained in essential first aid for cargoes carried. (IBC 16.3.3)

Note: Procedures must include the use of antidotes where applicable.

8.29 Is the verbal communication between the ship and the shore adequate?

8.30 Is a tank cleaning plan established prior to cleaning operations?

Notes: Adequate planning of cleaning operations is crucial to the successful carriage of chemicals and to the avoidance of rejection of tanks, contamination of cargo and incidents. The two most important criteria are the previous and the next cargoes and these two factors will determine the level of cleaning required.

Planning should take into account the method of cleaning required and also ensure that all parts of the cargo system which were in contact with the previous cargo are cleaned, including the tank walls, pumps, cofferdams and exhaust traps, stripping system, cargo and vent lines, cargo valves, p/v valves, sounding pipes, stub pipes, dead ends etc.

The plan should detail, for each of the pre and final cleaning steps:

- The previous and following cargoes;
- The condition of the cargo tank to be cleaned and whether toxic or flammable vapour is present, or whether lack of oxygen should be suspected;
- Any precautions necessary with respect to the condition of the tank;
- The cleaning method, whether butterworth, recirculation, rinsing, steaming, ventilating, or drying;
- The cleaning medium, whether sea, fresh, treated or demineralised water, or a chemical or solvent;
- Which cleaner, if any, to be used, its concentration and whether it is to be injected, recirculated, locally cleaned or hand wiped-;
- The washing temperature required to be maintained;
- The length of cleaning time required;
- Slop disposal requirements;
- Wall wash test requirements, if any;
- Any relevant additional instructions, including protective equipment requirements; and
- The action to be taken in the event of an emergency.

8.31 Are officers aware of the dangers associated with tank cleaning and ventilation operations after the carriage of volatile or toxic products?

Note: Special attention shall be given regarding tank entry permits after tank cleaning of toxic cargoes.

8.32 Have satisfactory column/cofferdam purging routines been established where deep well pumps are fitted?

8.33 Where cargo tanks are of stainless steel are there procedures for passivation and pickling?

Notes: Passivation and pickling are acid treatments applied to the surface of stainless steel tanks to aid the formation of a continuous passive chromium oxide film. The surfaces of stainless steel tanks should be regularly checked, generally using a palladium chloride test, for an intact passive film.

Passivation is removal of contaminants from the surface of stainless steel. The most common treatment is nitric acid solution, although care should be exercised in selecting the treatment to ensure that the contaminant is adequately targeted.

Pickling is the removal of scale and oxide layers on the surface of the tank, generally the result of heating the metal through welding or other heat treatments, by the application of nitric or hydrofluoric acid, although other specialised applications exist. The application restores the chromium oxide film.

It is essential that the passivation or pickling acid is thoroughly removed after the process is completed. Residual hydrofluoric acid will initiate pitting corrosion.

8.34 Are adequate procedures in place for carrying out wall wash tests?

Notes: Wall wash tests are carried out on the bulkheads of cargo tanks. There are many types including chloride, colour, chemical oxygen demand, methanol, non-volatile matter, permanganate time and water miscibility tests. Procedures should include the use of protective equipment where required.

8.35 Is the cargo sample locker situated within the main cargo area and is it in good order?

Samples which have to be kept on board shall be stowed in a designated space situated in the cargo area, or, exceptionally, elsewhere, subject to the approval of the Administration. (IBC 16.5.1)

Note: If the locker contains flammable liquids, the SOLAS fire extinguishing arrangements are required.

8.36 Is the cargo sample locker suitably constructed to prevent breakages?

The stowage space shall be:

- .1 Cell divided in order to avoid shifting of the bottles at sea;*
- .2 Made of material fully resistant to the different liquids intended to be stowed; and*
- .3 Equipped with adequate ventilation arrangements. (IBC 16.5.2)*

Samples which react with each other dangerously shall not be stowed close to each other. (IBC 16.5.3)

Samples shall not be retained on board longer than necessary. (IBC 16.5.4)

8.37 Is the cargo sample locker adequately ventilated?

Note: Mechanical ventilation is not required.

Cargo Handling and Monitoring Equipment

8.38 Are the cargo, ballast and stripping pumps, eductors and their associated instrumentation and controls, in good order and is there recorded evidence of regular testing?

8.39 Are the cargo and ballast pump bearing, casing and shaft gland temperature monitoring sensors in good order and is there evidence of regular testing?

Notes: The requirement is to provide an alarm. There is no requirement for temperatures to be displayed or for a high temperature trip to operate. Cargo pump bearings must not have temporary cooling fitted.

8.40 Are the cargo lines, vapour lines and inert gas lines in good order and is there recorded evidence of regular testing?

Note: Cargo pipelines should be tested to 1.50 times their rated working pressure at least annually and be marked with the date of test and the pressure.

Notes: A vessel's 'Cargo Transfer System' should be tested to 150% of their rated working pressure (Sometimes referred to as Maximum Allowable Working Pressure - MAWP) at least annually. Pipelines should be marked with the date of test and the test pressure. A vessel's 'Cargo Transfer System' includes the discharge pump and piping between the pump and the vessel's manifold, excluding any non-metallic hoses. In this case the MAWP can be assumed to be either the pressure at which the transfer piping relief valve is set or, where no relief valve (s) are fitted, the maximum discharge pressure that can be developed by the vessel's pump. For centrifugal pumps this is the pressure developed by the pump at zero flow conditions. Pressure testing should be a hydrostatic test, pressure testing using compressed air or inert gas is not acceptable.

8.41 Is the cargo pump emergency shutdown system in good order and is there recorded evidence of regular testing?

Note: Pump alarms and trips, level alarms, etc., where fitted, should be tested regularly to ensure that they are functioning correctly, and the results of these tests should be recorded.

8.42 Are the cargo and ballast system valves in good order and is there recorded evidence of regular testing?

8.43 Are the cargo system ullage gauges, vapour locks and UTI tapes in good order and are there recorded evidence of regular testing?

8.44 Are the remote and local temperature and pressure sensors and gauges in good order and is there recorded evidence of regular testing?

8.45 Are the cargo tank high level and overflow alarms in good order and is there recorded evidence of regular testing?

Record as an observation if high level alarms are not fitted and also if the overfill alarm system is not independent of the main gauging system.

Cargo tanks shall be fitted with a visual and audible high-level alarm which indicates when the liquid level in the cargo tank approaches the normal full condition. (IBC 15.19.6)

The high level alarm system shall be independent of the overflow-control system and shall be independent of the gauging devices (These are listed in IBC 13.1). (IBC 15.19.5)

A tank overflow control system shall:

- .1 come into operation when the normal tank loading procedures fail to stop the liquid level exceeding the normal full condition;*
- .2 give a visual and audible tank-overflow alarm to the ship's operator; and*
- .3 provide an agreed signal for sequential shutdown of onshore pumps or valves or both and of the ship's valves. The signal, as well as the pump and valve shutdown, may be dependent on operator's intervention. The use of shipboard automatic closing valves shall be permitted only when specific approval has been obtained from the Administration and the port State authority concerned. (IBC 15.19.7)*

Note: High level alarms should be in operation during both loading and discharging operations.

8.46 Are pipeline drains and stub pieces valved and capped and in good order?

8.47 Are cargo line drains suitably positioned to preclude liquid remaining in the line after draining?

8.48 Is the cargo tank high-level alarm system independent of both the gauging devices and the overflow-control alarm system?

Cargo tanks shall be fitted with a visual and audible high-level alarm which indicates when the liquid level in the cargo tank approaches the normal full condition. (IBC 15.19.6)

The high level alarm system shall be independent of the overflow-control system and shall be independent of the gauging devices (These are Listed in IBC 13.1). (IBC 15.19.5)

A tank overflow control system shall:

- .1 come into operation when the normal tank loading procedures fail to stop the liquid level exceeding the normal full condition;*
- .2 give a visual and audible tank-overflow alarm to the ship's operator; and*
- .3 provide an agreed signal for sequential shutdown of onshore pumps or valves or both and of the ship's valves. The signal, as well as the pump and valve shutdown, may be dependent on operator's intervention. The use of shipboard automatic closing valves shall be permitted only when specific approval has been obtained from the Administration and the port State authority concerned. (IBC 15.19.7)*

Note: High level alarms are required where 15.19.6 is indicated in column 'o' of Chapter 17 and overflow alarms where 15.19.7 is indicated.

8.49 Are there records of the calibration of key cargo instrumentation, including temperature and pressure gauges?

Notes: There should be records of the regular checking and calibration of instrumentation, particularly cargo tank temperature and pressure gauges. Calibration should be carried out preferably at intervals not exceeding 30 months.

Calibration of instrumentation is often difficult whilst the vessel is in service and it is usually carried out during repair periods. However, comparisons between local and remote thermometer readings provide a practical cross-reference.

8.50 Is the inert gas system and/or storage and associated pipework, where fitted, in good order?

8.51 Is the general condition of the cargo tank heating system satisfactory?

Ullaging, Sampling and Closed Operations

8.52 Are vapour locks, where fitted, calibrated and certified by a recognised cargo inspection organisation?

Notes: Corrections for datum levels and for list and trim should be checked and approved by the organisation certifying the system if ullages from retrofitted vapour locks are used for cargo calculation. Where vapour locks have been retro-fitted, certificates of calibration must be provided by a recognised Classification society or cargo inspection company.

8.53 If fixed tank gauges are not fitted, are sufficient portable tapes provided to simultaneously gauge each tank being worked?

If a fixed cargo tank gauging system is fitted but is unreliable and portable tapes/vapour locks are being used as the main method of ullaging, this fact should be recorded as an Observation. The number of tapes in use must be recorded.

Notes: Portable tapes should be calibrated in accordance with manufacturer's recommendations and valid certificates of calibration should be provided for each instrument.

UTI tapes constitute "restricted" gauging and must not be used with cargoes that require "closed" operations as required by IBC chapter 17 column "j".

There should also be two spare tapes on board.

8.54 Is the vessel capable of operating in a closed condition if volatile or toxic products are handled, including ullaging and sampling?

Open and restricted gauging shall be allowed only where:

- .1 open venting is allowed by the Code; or
- .2 means are provided for relieving tank pressure before the gauge is operated. (IBC 13.1.3)

All tankers fitted with a fixed inert gas system shall be provided with a closed ullage system.

(SOLAS 1974 II-2/60.7 and SOLAS 2004 II-2/4.5.5.3.3)

Notes: On a chemical tanker, "closed" loading is required at all times when so specified in IBC chapter 17 column "j". In such cases, use of portable UTI tapes is only permitted when these tapes are certified to be used in cases of complete gas-tight conditions. Use of gauges that are certificated for use in restricted operations is not permitted.

A volatile product is petroleum having a flash point below 60°C as determined by the closed cup method of testing.

If a cargo is being handled at a temperature within 10°C of its flashpoint, it should be considered volatile. Therefore a cargo with a flashpoint of 80°C should be considered volatile if handled at a temperature of 70°C or above.

8.55 If the vessel is handling volatile or toxic cargoes, is it operating in a closed condition at the time of the inspection?

8.56 Do tank hatches, tank cleaning apertures and sighting ports appear to be liquid and gas tight?

Venting Arrangements

8.57 Is the cargo venting system in good order?

Note: The condition of p/v valves, mast risers, vent stacks, vapour lines, vacuum valves and flame screens should be assessed.

8.58 Is the cargo venting system being operated correctly?

8.59 Are SOLAS secondary venting requirements being complied with?

Notes: Class societies may accept a system that may not comply with the SOLAS requirements for 'Secondary means of full flow relief'.

In such cases the question should be answered 'No'. A full description of the system as fitted should be made as an Observation to allow an assessment of acceptability to be made.

Controlled tank venting systems shall consist of a primary and a secondary means of allowing full flow relief of vapour to prevent over-pressure or under-pressure in the event of failure of one means. Alternatively, the secondary means may consist of pressure sensors fitted in each tank with a monitoring system in the ship's

cargo control room or position from which cargo operations are normally carried out. Such monitoring equipment shall also provide an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a tank. (IBC 8.3.3)

Vessels equipped with vapour collection systems must be fitted with a pressure sensing device that senses the pressure in the main vapour collection line, which:

(a) Has a pressure indicator located on the vessel where the cargo transfer is controlled; and

(b) Has a high pressure and a low pressure alarm that:

(1) Is audible and visible on the vessel where cargo transfer is controlled;

(2) Alarms at a high pressure of not more than 90 percent of the lowest pressure relief valve setting in the cargo tank venting system; and

(3) Alarms at a low pressure of not less than four inches water gauge (0.144 psig) for an inerted tankship, or the lowest vacuum relief valve setting in the cargo tank venting system for a non-inerted tankship. (CFR 46 39.20-13)

Notes: In the case of inerted vessels, if pressure sensors are provided as the means of secondary protection, the alarm settings for the pressure sensors must be set to actuate when the tank pressure reaches 10% greater than the normal actuation settings of the pressure valves themselves. In the case of the low-pressure settings, the pressure in a tank should never be permitted to fall below zero and the pressure sensors should be set to alarm above zero.

In the case of non-inerted vessels if pressure sensors are provided, the over-pressure setting should be set to alarm at 10% greater than the normal actuation settings of the pressure valves, and at a vacuum 10% greater than the normal actuation settings of the vacuum valves.

In all cases, a description of the secondary venting arrangements should be provided, in particular what vents or pressure/vacuum sensing systems are available on each tank when the main inlet valve to IG/vent main is shut. Where electronic pressure/vacuum sensors are provided, identify and record whether the alarms are set to operate at the correct value or some other value. Where two full flow PV valves are fitted on a tank it is recommended that each PV valve has its own deck penetration.

8.60 Are the P/V valves in good order, inspected and cleaned as part of a regular planned maintenance routine and are there records to support this?

Notes: High jet cones and flaps should not be jacked open, particularly when loading.

Verify that p/v valves, where fitted, are tight and in good order.

High jet vents are not fitted with flame screens and their correct operation relies on a pressure build-up within the compartment which opens the valve at a predetermined level and results in a gas exit velocity of a minimum of 30 metres/sec. This results in protection against the passage of flame, the speed of which is about 7.5 metres/sec.

Consistent with safety and without interfering with operations and if appropriate to the design of the venting equipment, request the manual lifting of p/v valves to demonstrate satisfactory operation. P/v valves should be checked for free movement prior to the commencement of each cargo operation as required by the Ship to Shore Safety Check List question 31.

8.61 Are flame screens easily accessible and removable, in good order and inspected and cleaned as part of a regular maintenance routine and are there records available?

Note: The vacuum valve of a p/v valve will be fitted with a flame screen.

8.62 If the vessel is operating with a vapour return line connected, are appropriate transfer procedures in place?

Vessels equipped with vapour collection systems must be fitted with a pressure sensing device that senses the pressure in the main vapour collection line, which:

(a) Has a pressure indicator located on the vessel where the cargo transfer is controlled; and

(b) Has a high pressure and a low pressure alarm that:

(1) Is audible and visible on the vessel where cargo transfer is controlled;

(2) Alarms at a high pressure of not more than 90 percent of the lowest pressure relief valve setting in the cargo tank venting system; and

(3) Alarms at a low pressure of not less than four inches water gauge (0.144 psig) for an inerted tankship, or the lowest vacuum relief valve setting in the cargo tank venting system for anon-inerted tankship. (CFR 46 39.20-13)

Note: Particular attention should be paid to monitoring the pressure in the cargo tanks and the associated line system. P/v valves, the ullaging system and the level alarms should have been thoroughly tested prior

to the transfer commencing and there should be awareness of the initial transfer rate and maximum allowable transfer rates.

Static Electricity Precautions

Notes: ISGOTT Chapter 3 addresses the hazards associated with static electricity. ISGOTT Chapter 11 addresses the precautions that must be taken when handling static accumulator cargoes in more detail. Provided that a tank is maintained in an inert condition, when static non-accumulator cargoes are being handled, or when it can be guaranteed that the tank atmosphere is non-flammable, no anti-static precautions are necessary.

Questions 8.63 to 8.71 should only be completed for vessels carrying static accumulator cargoes in non-inert tanks. If the cargo is not a static accumulator or if the tanks are inerted, answer these questions 'NA'.

Static accumulator petroleum cargoes are all those except crude oils, residual fuel oils, black diesel oils and asphalts (bitumens). Some chemicals are known static accumulators and examples are Cumene, Cyclohexane, Diethylether, Heptanes, MTBE, Nonene, Octenes, Styrene, Toluene and Xylene. In case of doubt it should be assumed that a product is a static accumulator and the appropriate precautions should be taken.

8.63 Are precautions relating to maximum flow rates during initial loading being observed?

The generally accepted method for controlling electrostatic generation in the initial stages of loading is to restrict the velocity of oil entering the tank to 1 metre/second until the tank inlet is well covered and all splashing and surface turbulence in the tank has ceased. The 1 metre/second limit applies in the branch line to each individual cargo tank and should be determined at the smallest cross-sectional area including valves or other piping restrictions in the last section before the tank's loading inlet. (ISGOTT 11.1.7.3)

8.64 Are required settling periods being observed?

There should be a delay of 30 minutes (settling time) after the completion of loading of each tank before commencing these operations. (dipping, ullaging or sampling with metallic equipment) This is to allow the settling of gas bubbles, water or particulate matter in the liquid and the dissipation of any electrical potential (ISGOTT 11.8.2.3)

Note: If the vessel is fitted with a fixed tank level gauging system, but is not fitted with IG and not fitted with full depth sounding pipes, the Operator's policy relating to actions to be taken in the event of failure of the primary fixed gauging system must be reviewed.

8.65 Where vapour locks are fitted to cargo tanks that are not fitted with full depth sounding pipes, are static electricity precautions taken to ensure that the appropriate relaxation period elapses prior to ullaging or sampling?

Operations carried out through sounding pipes are permissible at any time because it is not possible for any significant charge to accumulate on the surface of the liquid within a correctly designed and installed sounding pipe. A sounding pipe is defined as a conducting pipe which extends the full depth of the tank and which is effectively bonded and earthed to the tank structure at its extremities. The pipe should be slotted in order to prevent any pressure differential between the inside of the pipe and the tank and to ensure that true level indications are obtained (ISGOTT 11.8.2.3)

8.66 Are metal tapes and other gauging or sampling devices effectively bonded before being introduced into tanks?

Note: UTI tapes must be bonded before being introduced into tanks. UTI tapes which have quick couplings to connect the unit to the vapour lock will possibly not require bonding wires. However, the internal bonding of such units should be checked every six months in accordance with the manufacturer's requirements.

8.67 If portable tank cleaning hoses are used, are continuity tests carried out and the results recorded?

Bonding wires should be incorporated within all portable tank washing hoses to ensure electrical continuity. Couplings should be connected to the hose in such a way that effective bonding is ensured between them. Hoses should be indelibly marked to allow identification. A record should be kept showing the date and the result of electrical continuity testing. (ISGOTT 11.3.6.2)

All hoses supplied for tank washing machines should be tested for electrical continuity in a dry condition prior to use, and in no case should the resistance exceed 6 ohms per metre length. (ISGOTT 11.3.6.3)

8.68 Are personnel aware of the hazards associated with tank cleaning after the carriage of volatile products?

Note: The tank cleaning recommendations contained in ISGOTT Chapter 11.3 must be strictly observed.

8.69 Are personnel aware of the hazards associated with steaming cargo tanks after the carriage of volatile products?

Steam should never be injected into a tank that may contain a flammable cargo. (TSG D.3.11)

8.70 Are personnel aware of the need to avoid the free fall of liquid into tanks?

Loading or ballasting from the top (overall) delivers charged liquid to a tank in such a manner that it can break up into small droplets and splash into the tank. This may produce a charged mist as well as an increase in the petroleum gas concentration in the tank. Restrictions upon loading or ballasting overall are given in ISGOTT Section 11.1.12. (ISGOTT 3.3.3)

8.71 Are cargo pipe joints bonded?

All gasketed cargo-pipe joints and hose connections shall be electrically bonded. (IBC 10.2)

Note: Some gaskets are electrically conductive and bonding is not required.

Manifold Arrangements**8.72 Are cargo manifold arrangements satisfactory?****8.73 Are manifold pressure gauges fitted outboard of the manifold valves and are they in good order?**

Manifold pressure gauges should be fitted to the spool pieces/reducers on the outboard side of the manifold valves. (ISGOTT 24.6.3)

8.74 Are manifold pressure gauges fitted with valves or cocks?**8.75 Are all flange connections fully bolted?**

Note: This includes any line which is being used for, or might become pressurised during, cargo operations on both sides of the vessel.

8.76 Are manifold blank flanges of an equivalent rating to that of the manifold pipelines?

Notes: It is generally accepted that steel blanks should be of the same thickness as the flanges to which they are attached, but this will not necessarily result in the pressure capability being the same as that of the associated pipework.

It is the pressure rating of the blank which is important and blanks made of materials such as titanium have a superior strength and may therefore be significantly thinner for the same pressure rating as a mild steel blank. If such a blank is fitted, there must be documentation on board to prove that the pressure rating is adequate for the service.

8.77 Are the manifold valves and lines marked to identify the tank or tanks they serve?**8.78 Are the manifolds fitted with drain lines and purge points and are they valved and capped?****8.79 Is the vessel free of unauthorised inter-connections between cargo, bunker and ballast systems?****Cargo Pump Room**

This section applies to all pumprooms if fitted, including Cargo Pumprooms, Ballast pumprooms and Fuel Oil Transfer Pumprooms.

8.80 On vessels with pump rooms, are they free of evidence of significant leaks from machinery, pipework, valve glands and instrumentation?**8.81 Are bulkhead seals gas tight and, if required, well lubricated?****8.82 Is the cargo pump room gas monitoring system in good order and regularly checked?**

All tankers shall be fitted, by the date of the first scheduled docking after 1st July 2002 but not later than 1st July 2005, with a system for continuous monitoring of the concentration of hydrocarbon gases. Sampling points or detector heads shall be located in suitable positions in order that potentially dangerous leakages are readily detected. When the hydrocarbon gas concentration reaches a pre-set level, which shall not be higher than 10% of the LEL, a continuous audible and visual alarm signal shall be automatically effected in the in the pump room and cargo control room to alert personnel to the potential hazard.

(SOLAS 2000 II-2/4.5.10.1.3 and 1.6.7)

The alarm shall be automatically affected in the pump room, engine control room, cargo control room and navigation bridge on vessels constructed on or after 1st July 2002. (SOLAS 2000 II-2/4.5.10.1.3)

Note: Existing systems having a pre-set level of not more than 30% LEL may be accepted on vessels constructed before 1st July 2002

8.83 Is the bilge pump in good order and can it be operated from a position outside the pump room?

The bilge system serving the cargo pump room shall be operable from outside the cargo pump-room. (IBC 3.3.5)

8.84 Are discharge pressure gauges provided outside where a cargo pump room is fitted and are they in good order?

Safety Equipment

8.85 Is the vessel provided with the protective equipment required by the IBC or BCH Codes?

For the protection of crew members who are engaged in loading and discharging operations, the ship shall have on board suitable protective equipment consisting of large aprons, special gloves with long sleeves, suitable footwear, coveralls of chemical-resistant material and tight fitting goggles or face shields or both. The protective clothing and equipment shall cover all skin so that no part of the body is unprotected. (IBC 14.1.1)

Work clothes and protective equipment shall be kept in easily accessible places and in special lockers. Such equipment shall not be kept within accommodation spaces, with the exception of new, unused equipment and equipment which has not been used since undergoing a thorough cleaning process. The Administration may, however, approve storage rooms for such equipment within accommodation spaces if adequately segregated from living spaces such as cabins, passageways, dining rooms, bathrooms etc.

(IBC 14.1.2)

Protective equipment shall be used in any operation, which may entail danger to personnel. (IBC 14.1.3)

8.86 Is the vessel provided with the safety equipment required by the IBC or BCH Codes?

Ships carrying toxic cargoes for which 15.12, 15.12.1 or 15.12.3 is listed in column 'o' in the table of chapter 17 shall have on board sufficient but not less than three complete sets of safety equipment, each permitting personnel to enter a gas-filled compartment and work there for at least 20 minutes. (IBC 14.2.1)

One complete set of safety equipment shall consist of:

1. one self-contained air-breathing apparatus (not using stored oxygen);
2. protective clothing, boots, gloves and tight fitting goggles;
3. fireproof line with belt resistant to the cargoes carried; and
4. explosion-proof lamp.

(IBC 14.2.2)

For the safety equipment required in 14.2.1, all ships shall carry either:

1. one set of fully charged spare air bottles for each breathing apparatus;
2. a special air compressor suitable for the supply of high-pressure air of the required purity;
3. a charging manifold capable of dealing with sufficient spare air bottles for the breathing apparatus; or,
4. fully charged spare air bottles with a total free air capacity of at least 6,000 l for each breathing apparatus on board in excess of the requirements of SOLAS regulation II-2/10.10. (IBC 14.2.3)

Note: For vessels carrying toxic cargoes, the safety equipment referred to above should provide full protection. The suits themselves shall be capable of providing adequate protection against the product as indicated in the appropriate resistance table that is provided by the manufacturer, and fitted with integral gloves and boots. The responsible officer should be aware of these limitations as they relate to the cargoes being carried. Such suits are not required if the vessel does not carry toxic cargoes.

8.87 Is the safety equipment correctly located?

At least one set of safety equipment shall be kept in a suitable clearly marked locker in a readily accessible place near the cargo pump room. The other sets of safety equipment shall also be kept in suitable, clearly marked, easily accessible places. (IBC 14.2.5)

8.88 Has the breathing apparatus required by the IBC or BCH Codes examined by an expert agency annually and are records available?

The breathing apparatus shall be inspected at least once a month by a responsible officer, and the inspection recorded in the ship's log book. The equipment shall be inspected and tested by an expert at least once a year. (IBC 14.2.6)

Note: An 'expert' may be a member of the crew provided they have attended relevant courses and have documentation available to prove it.

8.89 Is the safety equipment inspected on board monthly and are records available?

The breathing apparatus shall be inspected at least once a month by a responsible officer, and the inspection recorded in the ship's log-book. (IBC 14.2.6)

8.90 Are emergency escape sets provided for every person on board where required?

Ships carrying cargoes for which 'Yes' is indicated in column 'n' of Chapter 17 shall be provided with suitable respiratory and eye protection sufficient for every person on board for emergency escape purposes, subject to the following:

- .1 filter type respiratory protection is unacceptable;*
- .2 self-contained breathing apparatus shall have at least a duration of service of 15 minutes;*
- .3 emergency escape respiratory protection shall not be used for fire-fighting or cargo handling purposes and shall be marked to that effect. (IBC 14.3.1)*

8.91 Where filter-type respirators have been provided, is there an adequate system of control in place?

Notes: Use of filter type respirators is discouraged. Where filter-type respirators are carried these are not to be considered as part of the safety equipment required by the Codes. Their use must be strictly supervised, they should be stored under the control of the chief officer and there should be clear labelling for which chemicals the canisters are approved. There should be recognition that the lifetime of canisters is affected by the exposure and records should be maintained of use in order that this is not exceeded.

Filter-type respirators should not be used for chemicals identified as toxic by the Codes, nor should they be used in place of breathing apparatus.

8.92 Are decontamination showers and an eye-wash, where required, provided in suitably marked locations?

Suitably marked decontamination showers and an eyewash should be available on deck in convenient locations. The showers and eyewash shall be operable in all ambient conditions. (IBC 14.3.4)

Note: For use in all ambient conditions, a recirculation system, or fully heat-traced line must be provided.

8.93 Is the type of foam compound suitable for the cargoes which the vessel is certified to carry?

Every ship shall be provided with a fixed deck foam system. (IBC 11.3.1)

Only one type of foam concentrate shall be supplied and it shall be effective for the maximum possible number of cargoes intended to be carried. For other cargoes for which foam is not effective or is incompatible, additional arrangements to the satisfaction of the Administration shall be provided. Regular protein foam shall not be used. (IBC 11.3.2)

Note: Ships constructed before 20th May 1981 may comply with the 1977 edition of the Code and therefore might have a dry powder instead of a foam system fitted.

Cargo Hoses**8.94 If the vessel uses its own cargo hoses, are they in good order, pressure tested annually to their design working pressure and is a record of all hose tests and inspections maintained on board?**

The test pressure should be 1.5 times the working pressure.

The hose shall be stencilled or otherwise marked with the date of testing, its specified maximum and minimum service temperature, as applicable. The specified maximum working pressure shall not be less than 1 MPa gauge. (IBC 5.7.3)

Note: Each hose should also be individually numbered for identification purposes.

Cargo Lifting Equipment

8.95 Are all cargo derricks, cranes and other lifting equipment properly marked and has periodical testing and inspection been carried out?

Notes: Cargo lifting equipment should be load tested every five years and thoroughly examined by a competent person annually. Other lifting equipment is not regulated except as usually required by class, but should be tested and examined under a similar regime. The minimum SWL for which testing is required is one tonne (1,000 kgs).

A Chain Register is not required, but documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/ Labelling, Testing and Maintenance, Documentation/ Certification for Ships' Lifting Equipment should be maintained.

8.96 Are winches associated with lifting equipment in good order?

Note: Cargo derrick topping lifts should have a means of securing them, such as a locking pin or ratchet, to prevent the weight of the derrick being solely taken by the winch brake. Check that this is fitted and that it and any associated winches are in good condition. Documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/ Labelling, Testing and Maintenance, Documentation/ Certification for Ships' Lifting Equipment should be maintained.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 8. Cargo and Ballast Systems – LPG

Notes: This chapter can only be completed if the vessel is provided with an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk. The vessel must be carrying gas at the time of the inspection; however a gas carrier which for a brief period is not actually carrying gas at the time of the inspection, may be inspected as a gas carrier provided that an adequate assessment of the procedures on board for the carriage of gas can be made. In such cases, the report must clearly note the circumstances.

In answering the questions below, note that:

- *The mandatory IGC Code applies only to those vessels the keel of which was laid on or after 1st July 1986;*
- *The mandatory GC Code applies to vessels delivered after 30th June 1980; and*
- *The non-mandatory EGC Code applies to those vessels delivered on or before the 31st October 1976.*

Amendments to the IGC and GC Codes introduced after vessels were delivered do not necessarily apply to such vessels.

Gas carriers that carry dual-code cargoes (Diethyl ether, Ethylene oxide/Propylene oxide mixtures with an E-o content of not more than 30%, Isoprene, Isopropylamine, Monoethylamine, Pentanes, Pentene, Propylene oxide, Vinyl ethyl ether and Vinylidene chloride) are additionally required to have a Noxious Liquid Substances Certificate. Gas carriers carrying oil cargoes, which are regulated under Annex 1, are required to hold an IOPP Certificate with a Form B which identifies the ship as a product carrier. The SOLAS Safety Construction and Safety Equipment Certificates should also identify the vessel as 'a tanker engaged in the trade of carrying oil other than crude oil'.

Relevant cargoes are those which do not contain heavy components likely to remain in the tanks after a ventilation procedure and will typically be Light naphtha, Jet fuel (also called Turbo fuel white or White cut gasoline), Mogas, Natural gasoline, Condensate, Pentane and Casing head gasoline.

Gas carriers accepted under this Notice of Equivalency will have:

- *Independent cargo tanks;*
- *An arrangement suitable for tank cleaning by ventilation procedures; tank cleaning with water will be prohibited as a normal procedure;*
- *Deep well pumps, but submerged electrical motors will not be accepted.*

Policies, Procedures and Documentation:

8.1 Is the vessel provided with operator's policy statements, instructions and procedures with regard to safe cargo operations?

8.2 Is information readily available on maximum loading rates?

Note: The information should be displayed in the cargo control area.

8.3 Is information on cargo loading limitations available?

No cargo tanks should be more than 98% liquid full at the reference temperature. (IGC 15.1.1)

The Administration may allow a higher filling limit than the limit of 98% at the reference temperature, taking into account the shape of the tank, arrangements of pressure relief valves, accuracy of level and temperature gauging and the difference between the loading temperature and the temperature corresponding to the vapour pressure of the cargo at the set pressure relief valves. (IGC 15.1.3)

The maximum allowable loading limits for each cargo tank should be indicated for each product which may be carried, for each loading temperature which may be applied and for the applicable maximum reference temperature, on a list to be approved by the Administration. Pressures at which the relief valves, including those valves fitted in accordance with IGC 8.3, have been set should also be stated on the list. A copy of the list should be permanently kept on board by the Master. (IGC 15.2)

Reference temperature means:

- *The temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure relief valves when no cargo vapour pressure/temperature control is provided;*
- *The temperature of the cargo upon termination loading, during transportation, or at unloading, whichever is the greatest, when a cargo vapour pressure/temperature control is provided. If this reference temperature would result in the cargo tank becoming liquid full before the cargo reaches a temperature corresponding to the vapour pressure of the cargo at the set pressure of the relief valves as required by in chapter 8.2, an additional pressure relieving system complying with chapter 8.3 should be fitted.*

(IGC 15.1.4)

Note: Although there are no regulatory requirements governing the maximum pressure below the relief valve setting which the cargo tanks should be allowed to reach, it is prudent to maintain the cargo tank

pressure at or below 80% of the relief valve setting. During loading tanks may occasionally reach 90% of the relief valve setting.

8.4 Are legible and up to date pipeline and/or mimic diagrams of the cargo, inert gas and venting systems as applicable, available in the cargo control area?

8.5 Is there a Procedures and Arrangements Manual available where dual code cargoes are carried?
Notes: A P and A Manual is required only if dual code cargoes are carried and where there is an IOPPC NLS Certificate

8.6 Is the Cargo Record Book correctly completed and up to date?
A Cargo Record Book is required only when carrying dual code cargoes under either a Certificate of Fitness or a NLS Certificate. Entries should be recorded as they occur and not at some later point in time.

Stability and Cargo Loading Limitations

The Master of the ship should be supplied with a loading and stability information booklet. This booklet should contain details of typical service and ballast conditions, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet should contain sufficient information to enable the Master to load and operate the ship in a safe and seaworthy manner. (IGC 2.2.5)

8.7 Have stability calculations and, where applicable, stress calculations, been performed for the current cargo operation?

8.8 Is the stress and stability information included with the cargo plan and are any limitations understood by the cargo watch officers?

8.9 Are damage stability guidelines available?
The Master of the ship should be supplied with a loading and stability information booklet. This booklet should contain details of typical service conditions, loading, unloading and ballasting operations, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet should contain sufficient information to enable the Master to load and operate the ship in a safe and seaworthy manner. (IGC 2.2.5)

8.10 Is the Master aware of the worst damage stability condition in the stability book?

8.11 Is the vessel free of inherent intact stability problems?
Notes: Vessels that have large width tanks will be subject to reductions of intact stability due to free surface. Although such vessels may meet IMO intact stability criteria when in fully loaded or ballasted conditions, they may be unstable when multiple tanks are slack during cargo or ballast transfer operations, or in intermediate states of loading. Trim and stability manuals generally deal only with arrival and departure conditions and operators are not made aware that stability problems may exist at intermediate stages during cargo transfers.

If a vessel has either large width cargo tanks, "U" section ballast tanks, or double bottom tanks without watertight centreline bulkheads, inspectors should ascertain that the vessel meets IMO intact stability criteria by requesting the chief officer to demonstrate, using the class approved loading instrument, the intact stability at the worst case condition. (i.e. All tanks slack and maximum free surface)

If no suitable loading instrument is provided and adequate instructions are not available, the question should be answered 'No', unless there is satisfactory proof that the vessel is free of inherent stability problems.

Inspectors should ascertain whether all officers appear familiar with operational restrictions and that instructions are prominently posted describing action to take if stability concerns are suspected or experienced. Record a "N" response and appropriate Observation if weaknesses or other concerns are revealed.

If cargo tanks are fitted with centre line bulkhead valves, these should normally be kept closed and only used for levelling. No more than 50% of the valves should be open at any one time.

If specific procedures have been adopted to address potential stability problems, these should be recorded as an Observation.

8.12 If a loading computer or programme is in use, is it class approved?

If a class approved loading computer is not available, record in Comments how stress and stability calculations are performed.

Notes: Ships of more than 65 metres in length are required by Class to be provided with a loading manual including permissible limits of still water bending moment and shear force; the results of the calculations of still water bending moments; shear forces and where applicable, limitations due to torsional and lateral loads and the allowable local loading for the structure (decks, double bottom, etc.)

Ships of more than 100 metres in length are required by Class to be provided with an approved loading instrument. An operational manual is always to be provided for the loading instrument

The loading instrument should be capable of calculating shear forces and bending moments in any load or ballast condition at specified readout points and should indicate the permissible values. Ships with very limited possibilities for variations in the distribution of cargo and ballast and ships with a regular or fixed trading pattern may be exempt from the requirement.

Class approvals for loading instruments are made under a Type Approvals process. Type-approval certificates are generally valid for periods of not more than five years. MSC Circular 1221 notes that the validity of the Type Approval Certificate itself has no influence on the operational validity of a product accepted and installed on-board ship and that a product manufactured during the period of validity of the relevant Type Approval Certificate need not be renewed or replaced due to the expiry of such Type Approval Certificate.

8.13 Are there records indicating that the operational accuracy of the load computer is tested regularly?

Notes: At each Annual and Special Survey, the loading instrument is to be checked for accuracy and the approved loading guidance information confirmed as being available on board. Class approved data should be used and the tests should be carried out in the presence of the attending surveyor at the annual survey. Regular on-board testing should also take place and records attesting to this should be maintained. The test should involve physically entering the data for each tank into the computer and verifying the result. It is not acceptable to simply retrieve a stored test condition from the computer and compare this against the official conditions.

8.14 Are longitudinal stresses, where applicable, maintained within design limits throughout?**8.15 Are cargo and/or ballast tanks free of sloshing or weight restrictions?**

Important restrictions other than maximum permitted cargo density should be recorded in Comments.

8.16 Where applicable, are officers aware of the dangers of high free surface effects and of the possibility of structural damage caused by sloshing in cargo tanks?**8.17 Do the operator's operating manuals include procedures for restoring stability in case of unstable conditions developing during cargo operations, where applicable?**

Note: On refrigerated LPG vessels fitted with centre line bulkheads having level gauges fitted close to the bulkhead on either side, the level gauges will indicate substantially differing liquid levels if the vessel is listed, even though both sides of the tank may contain approximately equal quantities. Personnel must be aware of this when taking actions to correct a list.

Cargo Operations and Related Safety Management:**8.18 Are the cargoes being carried included on the Certificate of Fitness?**

Note: If the cargo being carried is not listed on the Certificate of Fitness, there must be authorisation from the Administration allowing the product to be carried.

8.19 Are all officers familiar with the cargo system?**8.20 Are all officers familiar with the carriage requirements for the cargoes on board?**

Note: Officers should be able to demonstrate a basic knowledge of the following:

- *Shipboard operations and cargo handling;*
- *The IGC, GC and EGC Codes, where applicable;*
- *SIGTTO and ICS Guides;*
- *Cargo reliquefaction procedures;*
- *Cargo tank environmental control procedures when gas freeing and gassing up;*

- Hazards associated with thermal loads, particularly when cooling down;
- The minimum cargo temperature;
- Requirements for medical treatment following exposure to hazardous cargoes;
- Spill response;
- Communication procedures with shore;
- Emergency stop procedures, including which systems are affected by ESD activation.

And, as required:

- The meaning of Category X, Y, Z and OS cargoes;
- Precautions for reactive and self-reactive cargoes;
- Limitations when loading high density cargoes;
- Effects of sloshing loads;
- Hazards associated with toxic cargoes.

8.21 Is the chief officer familiar with the term 'reference temperature' and has it been determined for this cargo?

Reference temperature means:

- The temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure relief valves when no cargo vapour pressure/temperature control is provided;
- The temperature of the cargo upon termination loading, during transportation, or at unloading, whichever is the greatest, when a cargo vapour pressure/temperature control is provided. If this reference temperature would result in the cargo tank becoming liquid full before the cargo reaches a temperature corresponding to the vapour pressure of the cargo at the set pressure of the relief valves as required by in chapter 8.2, an additional pressure relieving system complying with chapter 8.3 should be fitted. (IGC 15.1.4)

8.22 When an unfamiliar gas cargo is to be carried, is there a procedure to review the safety aspects and handling procedures?

Note: For each gas carried a review of the carriage requirements should have been made in order to ensure that the cargo plan contains all the necessary information for the safe carriage of the product. The review should reference:

- The IGC Code Chapter 19;
- The Certificate of Fitness;
- The P and A Manual; and
- Material Safety Data Sheets.

8.23 Is a cargo compatibility chart available?

Note: Data sheets and compatibility charts can be found in the SIGTTO and ICS guides. For example, pages 21 to 23 of '**Liquefied Gas Handling Principles**'. Charterer's instructions should be followed.

8.24 Has a cargo handling plan been prepared which provides a detailed sequence of cargo and ballast transfer?

Note: The plan should cover all stages of the transfer operations, namely:

- Quantity and grade of each parcel;
- Density, temperature and other relevant conditions, including the reference temperature which determines the filling limits;
- A plan of the distribution, quantities, innages, lines and pumps to be used;
- Transfer rates and maximum allowable pressures;
- Critical stages of the operation;
- Notice of rate change;
- Stability and stress information;
- Drafts and trims;
- Emergency stop procedures;
- Action to be taken in the event of a spill;
- Flammability and toxicity with references to cargo data sheets;
- Ballast operations;
- Protective equipment requirements;
- Hazards of the particular cargoes.

And, as required, requirements for:

- Cargo pollution category;
- Cooling requirements including rates of cool-down;
- Use of the cargo heater or vapouriser;

- Heel requirements after discharge;
- Under keel clearance limitations;
- Bunkering; and
- Special precautions required for the particular operation.

8.25 Has the cargo plan been signed by the watch officers to indicate their understanding of it?

Note: The cargo plan should be completed by the responsible officer prior to commencement of operations and verified and approved by the Master. It should be comprehensive, contain full details of the operation and be easy to interpret

8.26 Are cargo operations being carried out and logged in accordance with the plan?

Note: The log must include details of all major events including starting and stopping of main cargo and ballast pumps and tanks being worked.

8.27 If the cargo is required to be inhibited, is the required information available?

Care should be taken to ensure that the cargo is sufficiently inhibited to prevent polymerisation at all times during the voyage. Ships should be provided with a certificate from the manufacturer stating:

- Name and amount of inhibitor added;
- Date inhibitor was added and the normally expected duration of its effectiveness;
- Any temperature limitations affecting the inhibitor;
- The action to be taken should the length of the voyage exceed the effective lifetime of the inhibitors. (IGC 17.8)

Vinyl chloride may be inhibited. The control of the oxygen content in the vapour space whether inhibited or not is important. (IGC 17.21)

Note: The products which are required to be inhibited are identified in column 'I' of Chapter 19. They are Butadiene, Isoprene, Vinyl ethyl ether and Vinylidene chloride. Products required to be inhibited should be refused if an inhibitor certificate is not available.

8.28 Are all officers aware of the emergency procedures for dealing with leakage, spillage or fire involving the cargo?

Officers should be trained in emergency procedures to deal with conditions of leakage, spillage or fire involving the cargo and a sufficient number of them should be instructed and trained in essential first aid for the cargoes carried. (IGC 18.3.3)

8.29 Do officers understand the principles involved when cargo and booster pumps and cargo heaters, where fitted, are lined up in series?

Notes: The officers responsible should understand the higher manifold pressures involved when operating deepwell pumps in series with booster pumps. The pumps usually have significantly different capacities and the total flow may have to be regulated on the booster pump outlet to prevent this pump from running dry. The cargo heater, if used, will increase the line pressure even further. The responsible officers should have a good working knowledge of the safety systems installed to protect the heater - for example to prevent freezing and tube failure when sea-water is the heating medium. The total outlet pressure from the deepwell/booster/heater unit may exceed the rating of normal refrigerated lines and a special heater crossover may be required for this purpose.

8.30 Are submerged electrical cargo pumps, where fitted, isolated from their electrical supply during gas-freeing operations?

Notes: Submerged electric pumps should not be used for oil products.

The junction boxes of submerged electric pumps should be visually inspected prior to each discharge and the insulation reading taken and recorded.

8.31 Is the verbal communication between the ship and the shore adequate?

8.32 If refrigerated cargoes are carried, is a means of hydrate control provided and is a supply of freezing depressant maintained on-board?

Notes: LPGs may occasionally contain some small quantities of water, so they are the only cargoes that are sometimes considered for treatment with a freezing depressant such as methanol or ethanol. However, nothing whatsoever may be added to the cargo without clear authorisation from the shipper - because of the sensitivity of LPG (and many other cargoes) to these hydrate control products. There may be alternative ways to deal with freezing other than adding anti-freeze products - for example by using "hot gas".

Methanol/Ethanol must never be used with "chemical gas" cargoes such as Butadiene, Butylene, Propylene or Vinyl Chloride as such anti-freezes will contaminate the cargo and make them commercially valueless as they cannot be used for the intended polymerisation process. Likewise, anti-freezes must not be made in chemical gas cargoes (Diethyl ether, Ethylene oxide/Propylene oxide mixtures with an E-o content of not more than 30%, Isoprene, Isopropylamine, Monoethylamine, Pentanes, Pentene, Propylene oxide, Vinyl ethyl ether and Vinylidene chloride).

Carriage of methanol is prohibited by some Administrations. In the case of ethylene and LNG, in addition to causing contamination, methanol cannot be used as it freezes at -97.8°C

Cargo Handling and Monitoring Equipment

8.33 Are the Cargo, booster, ballast and stripping pumps, eductors and their associated instrumentation and controls, where fitted, in good order and is there evidence of regular testing?

Note: Instrumentation, valves and pipework should be clearly marked to indicate their service and where applicable the compartments to which they relate.

8.34 Are the Cargo heater and/or vaporiser, where fitted, in good order and is there evidence of regular testing

Note: The number of plugged tubes in cargo condensers, heaters or vaporisers should not exceed 25%.

8.35 Are the Cargo, Vapour and Inert Gas lines in good order?

Note: Cargo, Vapour and Inert Gas lines should be inspected where visible and any evidence of damage, corrosion or leakage from glands and flanges recorded as an observation'. Particular attention should be paid to those lines fabricated from low temperature or carbon steels, especially if there is damage to the insulation where water ingress may have occurred. Any damage to insulation should be recorded.

Routine pressure testing of cargo lines, vapour lines and inert gas lines is not required

8.36 Is the Cargo pump emergency shutdown system in good order and is there evidence of regular testing?

8.37 Are the Cargo and ballast system valves in good order and is there evidence of regular testing?

8.38 Are the Cargo system tank pressure, temperature, and level gauges in good order and is there evidence of regular testing?

The vapour space of each cargo tank should be provided with a pressure gauge which should incorporate an indicator in the cargo control position. (IGC 13.4.1)

Each cargo tank should be provided with at least two devices for indicating cargo temperatures, one placed at the bottom of the cargo tank and the second near the top of the tank below the highest allowable liquid level. The temperature indicating devices should be marked to show the lowest temperature for which the cargo tank has been approved by the Administration. (IGC 13.5.1)

Note: Dates of testing and comparisons with secondary tank level gauges should be reviewed and observations recorded in the event of significant discrepancies.

8.39 Are the Remote and local temperature and pressure sensors and gauges, in good order and is there evidence of regular testing?

8.40 Are the Cargo tank high level and overflow alarms in good order and is there evidence of regular testing?

8.41 Are pump and booster pump mechanical seals free of oil leaks?

8.42 Is an emergency discharge method available?

Where cargo transfer is by means of cargo pumps not accessible for repair with the tanks in service, at least two separate means should be provided to transfer cargo from each cargo tank and the design should be such that failure of one cargo pump, or means of transfer, will not prevent the cargo transfer by another pump or pumps, or other cargo transfer means. (IGC 5.8.1)

Gas pressurisation may be accepted as a means of transfer of cargo for those tanks so designed that the design factor of safety is not reduced under the conditions prevailing during the cargo transfer operation.
(IGC 5.8.2)

8.43 Are tank domes and associated fittings in good order and free from corrosion?

8.44 Is the cargo system, including fittings on the tank domes, free of leaks?

8.45 Are sample lines provided for both liquid and vapour and are they valved and capped?

It is recommended that the ship connection is a G½ female parallel threaded connector, with any screwed fittings locked to prevent inadvertent unscrewing during connection / disconnection whilst sampling. Sampling arrangements are recommended to be of the 'closed loop' type, and any venting or purging of sample containers carried out in a safe area. (SIGTTO Liquefied Gas Sampling Procedures)

8.46 Is low temperature pipework adequately insulated from the hull structure?

Low temperature piping should be thermally isolated from the adjacent hull structure, where necessary, to prevent the temperature of the hull from falling below the design temperature of the hull material.

(IGC 5.2.1.3)

8.47 If any cargo or vapour lines are insulated, is the insulation in good order?

Record an Observation if there is any evidence of corrosion.

Notes: Liquid and vapour lines are not required to be insulated. However, if insulation is fitted, a programme to regularly check and record its condition should be in place. Ascertain the condition of the cargo and vapour lines underneath if possible. Evidence of local repairs to the insulation might be an indication of repairs to the cargo or vapour lines underneath having been carried out.

8.48 Where cargo or vapour lines are isolated from the structure, are joints electrically bonded?

Where tanks or piping are separated from the ship's structure by thermal isolation, provision should be made for electrically bonding both the piping and the tanks. All gasketed pipe joints and hose connections should be electrically bonded.

(IGC 5.2.1.4)

Note: Some gaskets are electrically conductive and bonding is not required.

8.49 Are cargo and vapour line expansion arrangements in good order?

Provision should be made by the use of offsets, loops, bends, mechanical expansion joints such as bellows, slip joints and ball joints or similar suitable means to protect the piping system components and cargo tanks from excessive stresses due to thermal movement and from movements of the tank and hull structure. Where mechanical expansion joints are used in piping they should be held to a minimum and, where located outside cargo tanks, should be of the bellows type.

(IGC 5.2.1.2)

Slip joints should not be used except within the cargo tanks.

(IGC 5.4.5.2)

Note: Some bellows pieces may be fitted with covers to protect against the ingress of water. This design feature is acceptable.

8.50 Are liquid and vapour lines free to move inside their clamps?

8.51 Are pipeline drains and stub pieces valved and capped and in good order?

8.52 Are cargo line and system relief valves in good order?

All pipelines or components which may be isolated in a liquid-full condition should be provided with relief valves.

(IGC 5.2.1.6)

Relief valves discharging liquid cargo from the cargo piping system should discharge into the cargo tanks; alternatively they may discharge to the cargo vent mast if means are provided to detect and dispose of liquid cargo which may flow into the vent system. Relief valves on cargo pumps should discharge to the pump suction.

(IGC 5.2.1.7)

Note: Short line section of less than 50 litres volume may be exempt from a "hydrostat" relief valve per IACS agreement.

8.53 Are cargo pipelines free of screwed-in connections?

Screwed couplings acceptable to the Administration should only be used for accessory lines and instrumentation lines with external diameters of 25 mm or less.

(IGC 5.4.2.3)

8.54 Is the cargo tank high level alarm system independent of both the gauging devices and the overflow-control alarm system?

Each tank should be fitted with a high liquid level alarm operating independently of other liquid level indicators and giving an audible and visual warning when the activated. Another sensor operating independently of the high liquid level alarm should automatically actuate a shutoff valve in a manner which both avoids excessive liquid pressure in the loading line and prevents the tank from becoming liquid full. (IGC 13.3.1)

Neither of these devices is required if the cargo tank:

- Is a pressure tank with a volume of not more than 200 m³;
- Is designed to withstand the maximum possible pressure during the loading operation and such pressure is below that of the start-to-discharge pressure of the cargo tank relief valve.

(IGC 13.3.2)

Note: The overflow-control alarm system does not have to be independent of the gauging system.

8.55 Are there records of the calibration of key cargo instrumentation, including temperature and pressure gauges?

Notes: There should be records of the regular checking and calibration of instrumentation, particularly cargo tank temperature and pressure gauges and reliquefaction plant instruments. Calibration should be carried out preferably at intervals not exceeding 30 months.

Calibration of instrumentation is often difficult whilst the vessel is in service and it is usually carried out during repair periods. However, comparisons between local and remote thermometer readings and cross checking with cargo vapour pressure (from tables) provide a practical cross-reference, particularly for high purity cargoes such as Polymer Grade Propylene.

8.56 If slip tubes are fitted, are they for use only in emergencies?

If slip tubes are the only method of gauging, record the fact as an Observation.

Note: Slip tubes are generally used only in cases of emergency. A small amount of cargo vapour or liquid is released during level measurement; therefore they are a restricted type of gauging device and must not be used when toxic cargoes are carried and in the case of flammable cargoes, only if permitted by the terminal and the charterer.

8.57 Is the high level alarm system operated during both loading and discharging operations?**8.58 Are the cargo tank high level alarms independent of the gauging system and in the case of IGC vessels, also independent of the high level shut-down (overflow control) system?**

Except as detailed below, each cargo tank should be fitted with a high liquid level alarm operating independently of other liquid level indicators and giving an audible and visual warning when activated.

Either this sensor (GC vessels) or another sensor operating independently of the high liquid level alarm (IGC vessels) should automatically actuate a shutoff valve (which might be either the ESD or the cargo tank filling valve) in a manner which will both avoid excessive liquid pressure in the loading line and prevent the tank from becoming liquid full. (IGC 13.3.1)

8.59 If the high level and/or shut-down systems can be overridden by a key switch, is there a written procedure detailing under what circumstances and by whom the system may be overridden?

Notes: The system should only be overridden in exceptional circumstances, such as if the tank has been overfilled and it is necessary to by-pass the overflow control system to discharge the tank. Such systems are occasionally over-riden at sea during reliquefaction.

8.60 Is the cargo tank heating system, where fitted, operational?

Note: The date of last use and records of testing should be reviewed to establish correct operation.

Cargo Compressor and Motor Rooms**8.61 Is the cargo conditioning (reliquefaction) plant and associated machinery and instrumentation in good order?**

Note: Records should be available of the pressure testing of cargo condensers and of the calibration of cargo system instrumentation.

8.62 Are the compressor and motor rooms clean and free of combustible material?

8.63 Are the bulkhead seals between the compressor room and the motor room gas tight and well lubricated?

Where pumps and compressors are driven by a shaft passing through a bulkhead or deck, gastight seals with efficient lubrication or other means of ensuring the permanence of the gas seal should be fitted in way of the bulkhead or deck. (IGC 3.3.2)

Note: Lubricator reservoirs, where fitted, should be checked to ensure they contain sufficient oil.

8.64 Is the compressor room free of gas leaks?**8.65 Is the compressor room well-lit and are electrical fittings suitable for use in gas-hazardous areas and in good order?****8.66 Is the compressor room ventilation system maintaining negative pressure?****8.67 Is the motor room ventilation system maintaining positive pressure and operating satisfactorily?****8.68 If the motor room access is located in a gas-hazardous area, is it provided with an air-lock suitably alarmed to warn of both doors being opened at the same time?****8.69 Are airlocks and alarms in good order?**

Access from the open weather deck to gas-safe spaces should be located in a gas-safe zone at least 2.4 metres above the weather deck unless the access is by means of an airlock. (IGC 3.5.4)

8.70 If pressure in the air-lock is lost, will the shutdown system operate correctly?**8.71 Is the gas detection equipment in good order?**

A permanently installed system of gas detection and audible and visual alarms should be provided for:

- Cargo compressor rooms;*
- Motor rooms for cargo handling machinery;*
- Cargo control rooms unless designated gas-safe;*
- Other enclosed spaces in the cargo area where vapour may accumulate including hold spaces and interbarrier spaces for independent tanks other than type C;*
- Ventilation hoods and gas ducts where required by Chapter 16 for LNG carriers; and*
- Airlocks. (IGC 13.6.7)*

The gas detection system should be capable of sampling and analysing for each sampling head sequentially at intervals not exceeding 30 minutes. (IGC 13.6.8)

8.72 Are fixed gas detector sample points fitted at the appropriate level for the cargo being carried?

In every installation the positions of fixed sampling heads should be determined with due regard to the density of the vapours of the products intended to be carried and the dilution from compartment purging or ventilation. (IGC 13.6.2)

Note: Where it is possible to manually choose whether upper or lower level sampling heads should be in use, lower level sampling heads should be in use for all cargoes except Ammonia, Ethylene and LNG.

8.73 Are cargo compressors isolated from the cargo when carrying Propylene Oxide?

Note: There should be approved procedures for the carriage of PO, including the blanking or removal of spool pieces between the cargo compressors and the cargo containment.

Void Spaces and Seals - Type C Cargo Tanks

Note: This section applies to Type C cargo tanks which do not require secondary barriers.

8.74 Are void space seals, where fitted, in good order?**8.75 Is the environmental control of void spaces satisfactory?**

Spaces surrounding Type C refrigerated cargo tanks not having secondary barriers should be filled with suitable inert gas or dry air and be maintained in this condition with makeup inert gas provided by a shipboard inert gas generation system, shipboard storage of inert gas, or dry air provided by suitable drying equipment. (IGC 9.3)

8.76 Is cargo tank insulation, where fitted, reported to be in good condition?

Where a product is carried at a temperature below -10°C suitable insulation should be provided to ensure that the temperature of the hull structure does not fall below the minimum allowable design temperature.

(IGC 4.8.1)

Note: Check hold space inspection records. If perlite insulation is used, establish that it is regularly checked and topped up as required.

8.77 Are relief valves for void spaces, where fitted, in good order?**Void and Interbarrier Spaces and Seals – other cargo tank types**

Note: This section should be completed for all types of cargo containment other than Type C cargo tanks. These include Type A and B cargo tanks.

For cargo containment systems other than Type C:

- Interbarrier and hold spaces associated with cargo containment systems for flammable gas requiring full secondary barriers should be inerted with a suitable dry inert gas and kept inerted with make-up gas provided by a shipboard inert gas generation system, or by shipboard storage which should be sufficient for normal consumption for at least 30 days. (IGC 9.2.1)
- Interbarrier and hold spaces associated with cargo containment systems for flammable gases requiring partial secondary barriers should be inerted with a suitable dry inert gas and kept inerted with make-up gas provided by a shipboard inert gas generation system, or by shipboard storage which should be sufficient for normal consumption for at least 30 days. (IGC 9.2.2.1)

8.78 Is the oxygen and hydrocarbon content of the interbarrier spaces regularly monitored and the results recorded?

In the case of flammable products, where cargo containment systems other than independent tanks are used, hold spaces and interbarrier spaces should be provided with a permanently installed gas detection system capable of measuring gas concentrations of 0% to 100% by volume. The detection equipment, equipped with audible and visual alarms, should be capable of monitoring from each sampling head location sequentially at intervals not exceeding 30 minutes. Alarms should be activated when the vapour concentration reaches the equivalent of 30% of the lower flammable limit in air or such other limit as may be approved by the Administration in the light of particular cargo containment arrangements. Common sampling lines to the detection equipment should not be fitted. (IGC 13.6.11)

Notes: For LPG, 30% LEL is approximately the equivalent of 0.6% by volume. For LNG 30% LEL is the equivalent of 1.5% by volume.

Records should be kept to demonstrate the levels and any apparent trends or changes in level.

8.79 Are the relief valves for the hold spaces and primary and secondary barriers in good order?

Hold spaces and interbarrier spaces which may be subject to pressures beyond their design capabilities should be provided with a pressure relief system. (IGC 8.1)

Interbarrier spaces should be fitted with pressure relief devices to the satisfaction of the Administration.

(IGC 8.2.2)

Note: Hold spaces without open connection to the atmosphere should be provided with suitable pressure gauges.

8.80 Is cargo tank insulation, where fitted, reported to be in good order?

Where a product is carried at a temperature below -10°C suitable insulation should be provided to ensure that the temperature of the hull structure does not fall below the minimum allowable design temperature.

(IGC 4.8.1)

Notes: Check hold space inspection records. If perlite insulation is used, establish that it is regularly checked and topped up as required.

8.81 Is there a means to sample for ingress of water into the interbarrier spaces provided and are checks being recorded?

Note: There should be a means available to drain the interbarrier spaces.

Inert Gas Systems**8.82 Is the inert gas system and/or storage and associated pipework, where fitted, in good order?**

8.83 Are suitable arrangements provided to prevent the backflow of cargo vapour into the inert gas system?

Arrangements suitable for the cargo carried should be provided to prevent the backflow of cargo vapour into the inert gas system. (IGC 9.4.4)

A means acceptable to the Administration, located in the cargo area, of preventing the backflow of cargo gas should be provided. (IGC 9.5.2)

Note: Protection against back-flow of gas is usually made by providing two non-return valves and a spool piece. Check that except when inert gas is being delivered, the spool piece is not in place and that officers clearly understand this important requirement.

Pressure Relief and Venting Systems**8.84 Have the safety relief valves been tested, are the test certificates on-board and are officers aware of their settings?**

Pressure relief valves should be set and sealed by a competent authority acceptable to the Administration and a record of this action, including the values of set pressure, should be retained on board the ship. (IGC 8.2.5)

In the case of cargo tanks permitted to have more than one relief valve setting this may be accomplished by:

- Installing two or more properly set and sealed valves and providing means as necessary for isolating the valves not in use from the cargo tank; or*
- Installing relief valves whose settings may be changed by the insertion of previously approved spacer pieces or alternative springs or by other similar means not requiring pressure testing to verify the new set pressure. All other valve adjustments should be sealed*

(IGC 8.2.6)

Note: Ascertain that the officers responsible clearly understand the procedures to be followed for changing settings.

8.85 Are there adequate procedures for the changing of the relief valve set pressure?

The changing of the set pressure should be carried out under the supervision of the Master in accordance with procedures approved by the Administration and specified in the ship's operating manual. (IGC 8.2.7)

Note: Terminal requirements must also be taken into account when settings are changed. Ascertain that the pressure settings in use are correct for the cargoes on board.

8.86 If the cargo tank safety relief valve settings can be altered, are the appropriate settings being used for the cargo carried and are the current settings prominently displayed in the cargo control position and at the valves?

Changes in set pressures should be recorded in the ship's log and a sign posted in the cargo control room, if provided and at each relief valve, stating the set pressure. (IGC 8.2.7)

8.87 Is the cargo vent system in good order?**8.88 Are vent outlet protective or flame screens fitted as required and are there records of their regular inspection?**

Suitable protection screens should be fitted on vent outlets to prevent the ingress of foreign objects. (IGC 8.2.14)

Cargo tank outlets should be provided with readily renewable and effective flame screens or safety heads of an approved type when carrying a cargo referenced in column 'i' of Chapter 19 - (Diethyl ether, Ethylene oxide-Propylene oxide mixtures with an E-o content of not more than 30%, Isoprene, Isopropylamine, Monoethylamine, Pentanes, Pentene, Propylene oxide, Vinyl ethyl ether and Vinylidene chloride). Due attention should be paid in the design of flame screens and vent heads to the possibility of the blockage of these devices by the freezing of cargo vapour or by icing up in adverse weather conditions. Ordinary protection screens should be fitted after the removal of flame screens. (IGC 17.10)

8.89 Is there a liquid sensor in the liquid pressure relief valve collecting tank or, if not fitted, in the vent mast?

In the vent piping system, means for draining liquid from places where it may accumulate should be provided. The pressure relief valves and piping should be so arranged that liquid can under no circumstances accumulate in or near the pressure relief valves. (IGC 8.2.13)

Relief valves discharging liquid cargo from the cargo piping system should discharge into the cargo tanks. Alternatively they may discharge to the cargo vent mast if means are provided to detect and dispose of any liquid cargo which may flow into the vent system. (IGC 5.2.1.7)

8.90 Are fire extinguishing systems on the vent masts, where fitted, in good order and operational?

Emergency Shutdown System

8.91 Is the emergency shutdown (ESD) system fully operational?

One or more remotely controlled emergency shutdown valves should be provided on the ship for shutting down liquid and vapour cargo transfer between ship and shore. (IGC 5.6.1.1)

One remotely operated emergency shutdown valve should be provided at each cargo hose connection in use. (IGC 5.6.3)

8.92 Are personnel aware of the requirements for the ESD system?

Cargo pumps and compressors should be arranged to shutdown automatically if the emergency shutdown valves required by 5.6.1.1 (above) are closed by the emergency shutdown system. (IGC 5.6.1.3)

8.93 Are there at least two remote positions where the ESD system can be manually activated?

The control system for all required emergency shutdown valves should be so arranged that all such valves may be operated by single controls situated in at least two remote locations on the ship. One of these locations should be in the control position or cargo control room. (IGC 5.6.4)

8.94 Is the ESD system designed to fail-closed?

Emergency shut-down valves should be of the fail-closed (closed on loss of power) type and be capable of local manual closing operation. (IGC 5.6.4)

8.95 Is the ESD system tested prior to cargo transfer and are records maintained?

Notes Correct operation of the ESD activation must be tested prior to every cargo transfer. It is not acceptable that the only activation point is operated from the Cargo Control Room. Each of the ESD positions must be operated at least once every 12 months and a policy must be in place for each of the ESDs to be operated in rotation prior to every cargo transfer.

8.96 Are all manifold valves and tank filling valves, if they form part of the emergency shutdown system, tested and timed to close within 30 seconds?

Emergency shutdown valves in liquid piping should fully close under all service conditions within 30 seconds of actuation. Information about the closing time of the valves and their operating characteristics should be available onboard and the closing time should be verifiable and reproducible. Such valves should close smoothly. (IGC 5.6.4)

Cargo pumps and compressors should be arranged to shutdown automatically if the emergency shutdown valves are closed by the emergency shutdown system. (IGC 5.6.1.3)

Notes: The emergency shutdown valve at the manifold may be located either inboard or outboard of the hand operated manifold valve.

If cargo tank valves are not part of the ESD their closing times are not controlled by the requirements of the ESD.

8.97 Are fusible plugs fitted on the liquid domes and in the vicinity of the manifolds and are they in good order?

The control system should also be provided with fusible elements designed to melt at temperatures between 98° and 104°C which will cause the emergency shutdown valves to close. Locations for such fusible elements should include the tank domes and loading stations. (IGC 5.6.4)

Note: Fusible elements should not be painted over as this might affect the temperature at which they will operate.

Manifold Arrangements

8.98 Are cargo and vapour manifold arrangements satisfactory?

Note: Refer to "Manifold Recommendations for Liquefied Gas Carriers. 1st Ed (2011)"

- 8.99 Is the manifold area clear of obstructions which could interfere with the automatic release of a hard arm?**
- 8.100 Does the manifold arrangement provide for safe access for connection and disconnection of cargo lines?**
- 8.101 Are manifold pressure gauges fitted outboard of the manifold valves and are they in good order?**
- 8.102 Are pressure gauges also fitted to the offshore manifolds and regularly checked during the discharge for manifold valve leakage?**
Note: The offshore manifolds on LPG carriers are often pressurised with nitrogen and it is normal that the space between the manifold valves and the flanges are under pressure. Indications of leakage are indicated by frosting, not pressure.
- 8.103 Are manifold pressure gauges fitted with valves or cocks and do the connections provide protection against inadvertent unscrewing?**
Note: The SIGTTO Liquefied Gas Sampling Procedures recommend that the ship connection is a G $\frac{1}{2}$ female parallel threaded connector, with any screwed fittings locked to prevent inadvertent unscrewing during connection/disconnection whilst sampling.
- 8.104 Are all flange connections fully bolted?**
Note: This includes any line which is being used for, or might become pressurised during, cargo operations on both sides of the vessel.
- 8.105 Are manifold blank flanges of an equivalent rating to that of the manifold pipelines?**
Notes: It is generally accepted that steel blanks should be of the same thickness as the flanges to which they are attached, but this will not necessarily result in the pressure capability being the same as that of the associated pipework.
It is the pressure rating of the blank which is important and blanks made of materials such as titanium have a superior strength and may therefore be significantly thinner for the same pressure rating as a mild steel blank. If such a blank is fitted, there must be documentation on board to prove that the pressure rating is adequate for the service.
- 8.106 Are the manifold valves and lines clearly marked as to whether they are liquid or vapour?**
- 8.107 Are the manifolds fitted with drain lines and purge points and are they valved and capped?**
- 8.108 Are manifold strainers, where fitted, not being by-passed?**
- 8.109 Are liquid spill arrangements adequate, taking into account the lowest temperature cargoes which the vessel is certified to carry?**
Where leakage may be anticipated, such as at shore connections and at pump seals, protection for the hull beneath should be provided. (IGC 5.2.1.3)
- Note:-Where leakage may be anticipated, such as at shore connections and at pump seals, protection for the hull beneath should be provided. The spillage containment area should be provided with a drain line capable of leading a spill overboard. Such a line should include a valve that is closed during normal operation and operable from a safe location. The discharge from the line should point vertically downwards so as not to deluge the jetty and associated equipment with liquid. Provisions should be made to drain off any accumulated water. During operations the drip trays should as far as practical be dry, except for Ammonia transfers the bottom of the drip tray should be covered with water. (Manifold Recommendations for Liquefied gas carriers 1st Ed 2011).*

Safety Equipment

- 8.110 Is suitable protective equipment available for all crew members engaged in cargo operations?**
Suitable protective equipment including eye protection should be provided for protection of crew members engaged in loading and discharging operations, taking into account the character of the products. (IGC 14.1)

8.111 Are there at least two complete sets of safety equipment on board and are they in good order?

Sufficient, but not less than two complete sets of safety equipment in addition to the firemen's outfits, each permitting personnel to enter and work in a gas-filled space, should be provided.

One complete set of safety equipment should consist of:

- One self-contained air-breathing apparatus having a capacity of at least 1,200 litres of free air;
- Protective clothing, boots, gloves and tight-fitting goggles;
- Steel-cored rescue line with belt; and
- Explosion proof lamp. (IGC 14.2.2)

An adequate supply of compressed air should be provided and should consist either of:

- One set of fully charged spare air cylinders for each breathing apparatus;
- A special air compressor suitable for the supply of high-pressure air of the required purity; and
- A charging manifold capable of dealing with sufficient spare breathing apparatus air cylinders for the breathing apparatus; or
- Fully charged spare air cylinders with a total free air capacity of at least 6,000 litres for each breathing apparatus. (IGC 14.2.3)

Note: For vessels carrying Ammonia and other toxic cargoes, the safety equipment referred to above should provide full protection. The suits themselves should be capable of providing adequate protection against the product and they should be fitted with integral gloves and boots. Such suits are not required if the vessel does not carry toxic cargoes.

8.112 If the vessel has a cargo capacity greater than 5,000 m³, is the additional firemen's outfit carried?

Every ship carrying flammable products should carry firemen's outfits complying with SOLAS as follows:

- 5,000 m³ and below: 4 outfits;
- Above 5,000 m³: 5 outfits. (IGC 11.6.1)

8.113 Is the safety equipment correctly located?

The protective equipment and safety equipment should be kept in suitable, clearly marked lockers located in readily accessible places. (IGC 14.2.5)

8.114 Where required in vessels of a cargo capacity of 2,000 m³ and over, are the two additional sets of safety equipment on board?

Where required by the note 14.4.4 in column 'h' of Chapter 19, (Acetaldehyde, Ammonia, Chlorine, Dimethylamine, Ethylene oxide, Methyl bromide, Monoethylamine, Pentanes, Pentene and Sulphur dioxide), two complete sets of safety equipment should be provided in addition to the equipment required above. At least three spare charged air cylinders should be provided for each self-contained air breathing apparatus. (IGC 14.4.4)

8.115 Where required are emergency escape sets provided for all personnel, plus two sets in the wheelhouse?

Where required by the note 14.4.2 in column 'h' of Chapter 19, (Ammonia, Chlorine, Diethyl ether, Dimethylamine, Ethylene oxide, Isopropylamine, Methyl bromide, Monoethylamine, Sulphur dioxide, Vinyl chloride, Vinyl ethyl ether and Vinylidene chloride), respiratory and eye protection suitable for emergency escape purposes should be provided for every person on board subject to the following:

- Filter-type respiratory protection is unacceptable;
- Self-contained breathing apparatus should normally have a duration of service of at least 15 minutes;
- Emergency escape respiratory protection equipment should not be used for fire-fighting or cargo handling purposes and should be marked to that effect;
- Two additional sets of the above respiratory and eye protection should be permanently located in the navigating bridge. (IGC 14.4.2)

8.116 Is the safety equipment required by the IGC Code examined by an expert annually and are records available?

The compressed air equipment should be inspected at least once a month by a responsible officer and the inspection recorded in the ship's log book and inspected and tested by an expert at least once a year. (IGC 14.2.6)

Note: An 'expert' may be a member of the crew provided they have attended relevant courses and have documentation available to prove it. Such courses must be comprehensive, hands-on and cover all aspects of inspection and testing of the equipment.

8.117 Is the safety equipment inspected on board monthly and are records available?

The compressed air equipment should be inspected at least once a month by a responsible officer and the inspection recorded in the ship's log book. (IGC 14.2.6)

8.118 Are decontamination showers and an eye-wash, where required, provided in suitably marked locations?

Suitably marked decontamination showers and eyewash should be available on deck in convenient locations. The showers and eyewash should be operable in all ambient conditions. (IGC 14.4.3)

Notes: This requirement is only for vessels certified for the carriage of cargoes listed in column 'i' of the table in Chapter 19. These cargoes are Acetaldehyde, Ammonia, Chlorine, Diethyl ether, Dimethylamine, Ethylene oxide, Ethylene oxide/Propylene oxide mixtures with an E-o content of not more than 30%, Isoprene, Isopropylamine, Methyl bromide, Monoethylamine, Propylene oxide, Vinyl chloride, Vinyl ethyl ether and Vinylidene chloride.

8.119 Is the chemical dry powder system in good order?

Ships in which the carriage of flammable products is intended should be fitted with fixed dry chemical powder type extinguishing systems for the purpose of fighting fire on the deck in the cargo area and bow or stern cargo handling areas if applicable. (IGC 11.4.1)

Notes: Records should be maintained of the dates when the powder in the system cylinders was last agitated and of powder discharge. Powder should be agitated, or fluffed, regularly to prevent compaction.

8.120 Is the water spray system in good order?

On ships carrying flammable or toxic products or both, a water-spray system for cooling, fire prevention and crew protection should be installed to cover:

- Exposed cargo tank domes and any exposed parts of cargo tanks;*
- Exposed on-deck storage vessels for flammable or toxic products;*
- Cargo liquid and vapour discharge and loading manifolds and the area of their control valves and any other areas where essential control valves are situated and which should be at least equal to the area of the drip trays; and*
- Boundaries of superstructures and deckhouses normally manned, cargo compressor rooms, cargo pump rooms, store rooms containing high fire risk items and cargo control rooms, all facing the cargo area. Boundaries of unmanned forecastle structures not containing high fire risk items or equipment do not require water spray protection. (IGC 11.3.1)*

Notes: The piping system may be constructed from stainless steel or of mild steel and may be lined with PVC. If mild steel is used, then the system should be drained and dried to avoid the formation of rust particles inside mild steel pipe that may block the nozzles. The system should be tested periodically to ensure proper operation and such tests should be part of the planned maintenance system with records maintained to verify satisfactory operation.

8.121 Are the cargo space smothering systems in good order?

An appropriate firefighting system approved by the Administration should protect these spaces in ships dedicated to the carriage of a restricted number of cargoes. (IGC 11.5)

Notes: The IGC Code requires cargo compressor rooms to be provided with a carbon dioxide extinguishing system. Under the GC Code, the spaces should be provided with a fixed installation which is capable of extinguishing a fire within the space.

Cargo Hoses**8.122 If the vessel uses its own cargo hoses, are they in good order, pressure tested annually to their design working pressure and is a record of all hose tests and inspections maintained on board?**

Each new length of cargo hose produced should be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure nor more than two fifths its bursting pressure. The hose should be stencilled or otherwise marked with its specified maximum working pressure and, if used in other than ambient temperature services, its maximum or minimum service temperature or both. The specified maximum working pressure should not be less than 10 bar gauge. (IGC 5.7.3)

Notes: This requirement applies to cargo hoses delivered after 1st July 2002. Each hose should also be marked with the test date and be individually numbered for identification purposes.

Cargo Lifting Equipment:

8.123 Are all cargo derricks, cranes and other lifting equipment properly marked and has periodical testing and inspection been carried out?

Notes: Cargo lifting equipment should be load tested every five years and thoroughly examined by a competent person annually. Other lifting equipment is not regulated except as usually required by class, but should be tested and examined under a similar regime. The minimum SWL for which testing is required is one tonne (1,000 kgs).

A Chain Register is not required, but documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/Labeling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

8.124 Are winches associated with lifting equipment in good order?

Note: If fitted, derrick topping lifts should have a means of securing them, such as a locking pin or ratchet, to prevent the weight of the derrick being solely taken by the winch brake. Check that this is fitted and that it and any associated winches are in good condition. Documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/Labeling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

Ship to Ship Transfer Operations

If the vessel is equipped with specialised equipment for regular ship-to-ship transfer operations such as fenders and hoses, the fact should be recorded in Additional comments. If the vessel is NOT utilised for regular commercial ship-to-ship cargo transfer, Questions 8.125-128 must be answered 'NA'

8.125 Are operator's procedures provided for ship-to-ship operations?

Note: Procedures should follow the recommendations of the OCIMF/ICS STS Transfer Guide (Liquefied Gases).

8.126 Are sufficient closed fairleads and mooring bitts provided?

It is recommended that all fairleads used during STS transfer operations are of an enclosed type. Such fairleads should be strong enough to take the anticipated mooring loads and large enough to allow the mooring line (plus any soft rope and tackle) to pass through comfortably. (STS Guide 10.3.4)

It has been found that enclosed fairleads and bitts for spring lines need to be positioned no more than 35 metres forward and aft of the cargo manifold. (STS Guide 10.3.4)

It is recommended that all tankers be fitted with an array of mooring bitts of sufficient strength on each side of the ship. (STS Guide 10.3.5)

8.127 Are ship-to-ship transfer checklists completed?

The checklists should be used not only at the time of transfer but also when organisers are planning an operation. Adherence to check list procedures will ensure that the most essential aspects of an operation are covered. The checklists are:

- 1 - Pre-fixture information;*
- 2 - Before operations commence;*
- 3 - Before run-in and mooring;*
- 4 - Before cargo transfer; and*
- 5 - Before unmooring.*

(STS Guide 3.2 and Appendix 1)

8.128 If a ship-to-ship transfer was in progress during the inspection, was it conducted in accordance with the recommendations of the OCIMF/ICS/SIGTTO/CDI STS Transfer Guide?

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 8. Cargo and Ballast Systems – LNG

Notes: This chapter can only be completed if the vessel is provided with an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk.

In answering the questions below, note that:

- *The mandatory IGC Code applies only to those vessels the keel of which was laid on or after 1st July 1986;*
- *The mandatory GC Code applies to vessels delivered after 30th June 1980; and*
- *The non-mandatory EGC Code applies to those vessels delivered on or before the 31st October 1976.*

Amendments to the IGC and GC Codes introduced after vessels were delivered do not necessarily apply to such vessels.

Policies, Procedures and Documentation

8.1 Is the vessel provided with operator's policy statements, instructions and procedures with regard to safe cargo operations?

8.2 Is information readily available on maximum loading rates?

Note: The information should be displayed in the cargo control area and should show the loading rate for each manifold line and if necessary, the maximum loading rate for each tank. The characteristics of manifold strainer should be taken into account.

8.3 Is information on cargo loading limitations available?

No cargo tanks should be more than 98% liquid full at the reference temperature. (IGC 15.1.1)

The Administration may allow a higher filling limit than the limit of 98% at the reference temperature, taking into account the shape of the tank, arrangements of pressure relief valves, accuracy of level and temperature gauging and the difference between the loading temperature and the temperature corresponding to the vapour pressure of the cargo at the set pressure relief valves. (IGC 15.1.3)

Reference temperature means:

- *The temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure relief valves when no cargo vapour pressure/temperature control is provided;*
- *The temperature of the cargo upon termination loading, during transportation, or at unloading, whichever is the greatest, when a cargo vapour pressure/temperature control is provided. If this reference temperature would result in the cargo tank becoming liquid full before the cargo reaches a temperature corresponding to the vapour pressure of the cargo at the set pressure of the relief valves as required by in chapter 8.2, an additional pressure relieving system complying with chapter 8.3 should be fitted.*

(IGC 15.1.4)

The maximum allowable loading limits for each cargo tank should be indicated.

(IGC 15.2)

8.4 Are legible and up to date pipeline and/or mimic diagrams of the cargo, inert gas and venting systems as applicable, available in the cargo control area?

Stability and Cargo Loading Limitations

The Master of the ship should be supplied with a loading and stability information booklet. This booklet should contain details of typical service and ballast conditions, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet should contain sufficient information to enable the Master to load and operate the ship in a safe and seaworthy manner. (IGC 2.2.5)

8.5 Have stability calculations and, where applicable, stress calculations, been performed for the current cargo operation?

8.6 Is the stress and stability information included with the cargo plan and are any limitations understood by the cargo watch officers?

8.7 Are damage stability guidelines available?

The Master of the ship should be supplied with a loading and stability information booklet. This booklet should contain details of typical service conditions, loading, unloading and ballasting operations, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the

booklet should contain sufficient information to enable the Master to load and operate the ship in a safe and seaworthy manner. (IGC 2.2.5)

8.8 Is the Master aware of the worst damage stability condition in the stability book?

8.9 Is the vessel free of inherent intact stability problems?

Notes: Vessels that have large width tanks will be subject to reductions of intact stability due to free surface. Although such vessels may meet IMO intact stability criteria when in fully loaded or ballasted conditions, they may be unstable when multiple tanks are slack during cargo or ballast transfer operations, or in intermediate states of loading. Trim and stability manuals generally deal only with arrival and departure conditions and operators are not made aware that stability problems may exist at intermediate stages during cargo transfers.

If a vessel has either large width cargo tanks, "U" section ballast tanks, or double bottom tanks without watertight centreline bulkheads, inspectors should ascertain that the vessel meets IMO intact stability criteria by requesting the chief officer to demonstrate, using the class approved loading instrument, the intact stability at the worst case condition. (i.e. All tanks slack and maximum free surface)

If no suitable loading instrument is provided and adequate instructions are not available, the question should be answered 'No', unless there is satisfactory proof that the vessel is free of inherent stability problems.

Inspectors should ascertain whether all officers appear familiar with operational restrictions and that instructions are prominently posted describing action to take if stability concerns are suspected or experienced. Record a "N" response and appropriate Observation if weaknesses or other concerns are revealed.

If cargo tanks are fitted with centre line bulkhead valves, these should normally be kept closed and only used for levelling. No more than 50% of the valves should be open at any one time.

If specific procedures have been adopted to address potential stability problems, these should be recorded as an Observation.

8.10 If a loading computer or programme is in use, is it class approved?

If a class approved loading computer is not available, record in Comments how stress and stability calculations are performed.

Notes: Ships of more than 65 metres in length are required by Class to be provided with a loading manual including permissible limits of still water bending moment and shear force; the results of the calculations of still water bending moments; shear forces and where applicable, limitations due to torsional and lateral loads and the allowable local loading for the structure (decks, double bottom, etc.)

Ships of more than 100 metres in length are required by Class to be provided with an approved loading instrument. An operational manual is always to be provided for the loading instrument

The loading instrument should be capable of calculating shear forces and bending moments in any load or ballast condition at specified readout points and should indicate the permissible values. Ships with very limited possibilities for variations in the distribution of cargo and ballast and ships with a regular or fixed trading pattern may be exempt from the requirement.

Class approvals for loading instruments are made under a Type Approvals process. Type-approval certificates are generally valid for periods of not more than five years. MSC Circular 1221 notes that the validity of the Type Approval Certificate itself has no influence on the operational validity of a product accepted and installed on-board ship and that a product manufactured during the period of validity of the relevant Type Approval Certificate need not be renewed or replaced due to the expiry of such Type Approval Certificate.

8.11 Are there records indicating that the operational accuracy of the load computer is tested regularly?

Notes: At each Annual and Special Survey, the loading instrument is to be checked for accuracy and the approved loading guidance information confirmed as being available on board. Class approved data should be used and the tests should be carried out in the presence of the attending surveyor at the annual survey. Regular on-board testing should also take place and records attesting to this should be maintained. The test should involve physically entering the data for each tank into the computer and verifying the result. It is not acceptable to simply retrieve a stored test condition from the computer and compare this against the official conditions.

8.12 Are longitudinal stresses, where applicable, maintained within design limits throughout?

8.13 Are cargo and/or ballast tanks free of sloshing restrictions?

Note: If the inspected vessel is a membrane carrier, filling and loading limits and restrictions will be posted. In such cases do not record a 'No' observation.

8.14 Where applicable, are officers aware of the dangers of high free surface effects and of the possibility of structural damage caused by sloshing in cargo tanks?

Note: If the inspected vessel is a membrane LNG carrier, filling and loading limits and restrictions will be posted. In such cases do not record a 'No' observation.

8.15 Do the operator's operating manuals include procedures for restoring stability in case of unstable conditions developing during cargo operations, where applicable?**Cargo Operations and Related Safety Management****8.16 Are all officers familiar with the cargo system?****8.17 Is a Cargo Operations Manual available that covers all routine cargo operations?**

Note: Operations should include gas-up, cool-down, cargo loading, loaded passage, cargo discharge, ballasting, ballast passage cargo tank management, cold arrival, gas freeing, purging and hold space management operations.

8.18 Are all officers familiar with the carriage requirements for LNG?

Note: Officers should be able to demonstrate a basic knowledge of the following:

- *Shipboard operations and cargo handling;*
- *Gas combustion systems;*
- *The IGC, GC and EGC Codes, where applicable;*
- *SIGTTO and ICS Guides;*
- *Cargo reliquefaction procedures, if applicable;*
- *Cargo tank environmental control procedures when gas freeing and gassing up;*
- *Hazards associated with thermal loads, particularly when cooling down;*
- *The minimum cargo temperature;*
- *Requirements for medical treatment following exposure to LNG;*
- *Spill response;*
- *Communication procedures with shore;*
- *Emergency stop procedures, including which systems are affected by ESD activation; and*
- *Effects of sloshing loads.*

8.19 Has a cargo handling plan been prepared which provides a detailed sequence of cargo and ballast transfer?

Note: The plan should cover all stages of the transfer operations, namely:

- *Cargo temperature and other relevant conditions, including the filling limits;*
- *A plan of the distribution, quantities, innages, lines and pumps to be used;*
- *Transfer rates and maximum allowable pressures;*
- *Critical stages of the operation;*
- *Notice of rate change;*
- *Stability and stress information;*
- *Drafts and trims;*
- *Emergency stop procedures;*
- *Action to be taken in the event of a spill;*
- *Flammability and toxicity with references to cargo data sheets;*
- *Ballast operations;*
- *Protective equipment requirements;*
- *Hazards of the cargo.*
- *Cooling requirements including rates of cool-down;*
- *Use of the cargo heater or vapouriser;*
- *Heel requirements after discharge;*
- *Under keel clearance limitations;*
- *Bunkering; and*
- *Special precautions required for the particular operation.*

8.20 Has the cargo plan been signed by the watch officers to indicate their understanding of it?

Note: The cargo plan should be completed by the responsible officer prior to commencement of operations and verified and approved by the Master. It should be comprehensive, contain full details of the operation and be easy to interpret.

8.21 Are cargo operations being carried out and logged in accordance with the plan?

Note: The log must include details of all major events including starting and stopping of main cargo and ballast pumps and tanks being worked.

8.22 Are all officers aware of the emergency procedures for dealing with leakage, spillage or fire involving the cargo?

Officers should be trained in emergency procedures to deal with conditions of leakage, spillage or fire involving the cargo and a sufficient number of them should be instructed and trained in essential first aid for the cargoes carried. (IGC 18.3.3)

8.23 Are submerged electrical cargo pumps, where fitted, isolated from their electrical supply during gas-freeing operations?

Note: The junction boxes of submerged electric pumps should be visually inspected prior to each discharge.

8.24 Is the verbal communication between the ship and the shore adequate?**Cargo Handling and Monitoring Equipment****8.25 Are the cargo and ballast pumps and their associated instrumentation and controls, in good order and is there evidence of regular testing?**

Note: Instrumentation, valves and pipework should be clearly marked to indicate their service and where applicable the compartments to which they relate.

8.26 Are the Cargo, Vapour and Inert Gas lines in good order?

Note: Cargo, Vapour and Inert Gas lines should be inspected where visible and any evidence of damage, corrosion or leakage from glands and flanges recorded as an observation'. Any damage to insulation should be recorded. Routine pressure testing of cargo lines, vapour lines and inert gas lines is not required

8.27 Is the cargo pump emergency shutdown system in good order and is there evidence of regular testing?**8.28 Are the cargo and ballast system valves in good order and is there evidence of regular testing?****8.29 Are the cargo system tank pressure, temperature, and level gauges in good order and is there evidence of regular testing?**

The vapour space of each cargo tank should be provided with a pressure gauge which should incorporate an indicator in the cargo control position. (IGC 13.4.1)

Each cargo tank should be provided with at least two devices for indicating cargo temperatures, one placed at the bottom of the cargo tank and the second near the top of the tank below the highest allowable liquid level. The temperature indicating devices should be marked to show the lowest temperature for which the cargo tank has been approved by the Administration. (IGC 13.5.1)

Note: Dates of testing and comparisons with secondary tank level gauges should be reviewed and observations recorded in the event of significant discrepancies.

8.30 Are the remote and local temperature and pressure sensors and gauges, in good order and is there evidence of regular testing?**8.31 Is an emergency discharge method available?**

Where cargo transfer is by means of cargo pumps not accessible for repair with the tanks in service, at least two separate means should be provided to transfer cargo from each cargo tank and the design should be such that failure of one cargo pump, or means of transfer, will not prevent the cargo transfer by another pump or pumps, or other cargo transfer means. (IGC 5.8.1)

Gas pressurisation may be accepted as a means of transfer of cargo for those tanks so designed that the design factor of safety is not reduced under the conditions prevailing during the cargo transfer operation.

Note: With very few exceptions, LNG vessels are fitted with two main cargo pumps and another method of emergency discharge. For Moss vessels it is pressurization. For membrane vessels it is another pump that can be fitted in the tank.

8.32 Are tank domes and associated fittings in good order and free from corrosion?

8.33 Is the cargo system, including fittings on the tank domes, free of leaks?

8.34 Is low temperature pipework adequately insulated from the hull structure?

Low temperature piping should be thermally isolated from the adjacent hull structure, where necessary, to prevent the temperature of the hull from falling below the design temperature of the hull material.

(IGC 5.2.1.3)

8.35 If any cargo or vapour lines are insulated, is the insulation in good order?

Record an Observation if there is any evidence of corrosion.

Notes: Liquid and vapour lines are not required to be insulated. However, if insulation is fitted, a programme to regularly check and record its condition should be in place. Ascertain the condition of the cargo and vapour lines underneath if possible. Evidence of local repairs to the insulation might be an indication of repairs to the cargo or vapour lines underneath having been carried out.

8.36 Where cargo or vapour lines are isolated from the structure, are joints electrically bonded?

Where tanks or piping are separated from the ship's structure by thermal isolation, provision should be made for electrically bonding both the piping and the tanks. All gasketed pipe joints and hose connections should be electrically bonded.

(IGC 5.2.1.4)

Notes: Some gaskets are electrically conductive and bonding is not required. Bonding may not be required on older vessels that are governed by the GC or EGC.

8.37 Are cargo and vapour line expansion arrangements in good order?

Provision should be made by the use of offsets, loops, bends, mechanical expansion joints such as bellows, slip joints and ball joints or similar suitable means to protect the piping system components and cargo tanks from excessive stresses due to thermal movement and from movements of the tank and hull structure. Where mechanical expansion joints are used in piping they should be held to a minimum and, where located outside cargo tanks, should be of the bellows type.

(IGC 5.2.1.2)

Slip joints should not be used except within the cargo tanks.

(IGC 5.4.5.2)

Note: Some bellows pieces may be fitted with covers to protect against the ingress of water. This design feature is acceptable.

8.38 Are liquid and vapour lines free to move inside their clamps?

8.39 Are cargo line and system relief valves in good order?

All pipelines or components which may be isolated in a liquid-full condition should be provided with relief valves.

(IGC 5.2.1.6)

Relief valves discharging liquid cargo from the cargo piping system should discharge into the cargo tanks; alternatively they may discharge to the cargo vent mast if means are provided to detect and dispose of liquid cargo which may flow into the vent system. Relief valves on cargo pumps should discharge to the pump suction.

(IGC 5.2.1.7)

8.40 Are cargo pipelines free of screwed-in connections?

Screwed couplings acceptable to the Administration should only be used for accessory lines and instrumentation lines with external diameters of 25 mm or less.

(IGC 5.4.2.3)

8.41 Is the cargo tank high level alarm system independent of both the gauging devices and the overflow-control alarm system?

Each tank should be fitted with a high liquid level alarm operating independently of other liquid level indicators and giving an audible and visual warning when the activated. Another sensor operating independently of the high liquid level alarm should automatically actuate a shutoff valve in a manner which both avoids excessive liquid pressure in the loading line and prevents the tank from becoming liquid full.

(IGC 13.3.1)

Note: The overflow-control alarm system does not have to be independent of the gauging system.

8.42 Are there records of the calibration of key cargo instrumentation, including temperature and pressure gauges?

Notes: There should be records of the regular checking and calibration of instrumentation, particularly cargo tank temperature and pressure gauges and reliquefaction plant instruments. Calibration should be carried out preferably at intervals not exceeding 30 months.

Calibration of instrumentation is often difficult whilst the vessel is in service and it is usually carried out during repair periods.

8.43 Is the high level alarm system operated during both loading and discharging operations?

8.44 Are the cargo tank high level alarms independent of the gauging system and in the case of IGC vessels, also independent of the high level shut-down (overflow control) system?

Except as detailed below, each cargo tank should be fitted with a high liquid level alarm operating independently of other liquid level indicators and giving an audible and visual warning when activated.

Either this sensor (GC vessels) or another sensor operating independently of the high liquid level alarm (IGC vessels) should automatically actuate a shutoff valve (which might be either the ESD or the cargo tank filling valve) in a manner which will both avoid excessive liquid pressure in the loading line and prevent the tank from becoming liquid full. (IGC 13.3.1)

8.45 If the high level and/or shut-down systems can be overridden by a key switch, is there a written procedure detailing under what circumstances and by whom the system may be overridden?

Note: Written procedures must be in place to clearly state who holds this responsibility and under what circumstances the high level alarms or shut down systems may be overridden.

LNG Cargo Machinery Rooms

8.46 Are compressor rooms, motor rooms and if applicable, the reliquefaction plant, clean and free of combustible materials?

8.47 Are the bulkhead seals between the, compressor room and the motor room, gas tight and operating effectively?

Where pumps and compressors are driven by a shaft passing through a bulkhead or deck, gastight seals with efficient lubrication or other means of ensuring the permanence of the gas seal should be fitted in way of the bulkhead or deck. (IGC 3.3.2)

Note: Bulkhead shaft seals on LNG vessels are normally provided by means of pressurised nitrogen.

8.48 Are the cargo machinery rooms well-lit and are electrical fittings suitable for use in gas-hazardous areas and in good order?

8.49 Are the Cargo compressor rooms ventilation system maintaining negative pressure?

Note: In cargo compressor and pump rooms and in cargo control rooms if considered gas-dangerous, the ventilation should be of the negative pressure type. (IGC 12.1.5.)

Note: Only applies to ships constructed on or after 1st July 1986.

8.50 If the motor room access is located in a gas-hazardous area, is it provided with an air-lock suitably alarmed to warn of both doors being opened at the same time?

The doors should be self-closing and without any holding back arrangements.

The airlock space should be mechanically ventilated from a gas-safe space and maintained at an overpressure to the gas-dangerous zone on the open weather deck.

(IGC Code 3.6.1.)

Note: An airlock should only be permitted between a gas-dangerous zone on the open weather deck and a gas-safe space and should consist of two steel doors substantially gastight spaced at least 1.5 m but not more than 2.5 m apart.

8.51 Are airlocks and alarms in good order?

Access from the open weather deck to gas-safe spaces should be located in a gas-safe zone at least 2.4 metres above the weather deck unless the access is by means of an airlock.

The airlock space should be monitored for cargo vapour. An audible and visual alarm system to give a warning on both sides of the airlock should be provided to indicate if more than one door is moved from the closed position. (IGC 3.5.4)

8.52 Is the compressor room free of gas leaks?

8.53 Is the gas detection equipment in good order?

A permanently installed system of gas detection and audible and visual alarms should be provided for:

- Cargo compressor rooms;
- Motor rooms for cargo handling machinery;
- Cargo control rooms unless designated gas-safe;
- Other enclosed spaces in the cargo area where vapour may accumulate including hold spaces and interbarrier spaces for independent tanks other than type C;
- Ventilation hoods and gas ducts where required by Chapter 16 for LNG carriers;
- Airlocks. (IGC 13.6.7)

The gas detection system should be capable of sampling and analysing for each sampling head sequentially at intervals not exceeding 30 minutes. (IGC 13.6.8)

8.54 Are fixed gas detector sample points fitted at the upper level of the machinery spaces?

Note: LNG vapours are lighter than air and will accumulate in the upper areas of a space.

Cargo Reliquefaction Systems

8.55 If applicable, are all the cargo reliquefaction plant and associated machinery and instrumentation in good order?

Note: Records should be available of the pressure testing of alarms and trips and of the calibration of cargo system instrumentation. Such testing should be included under the PMS system. If the equipment is undergoing routine maintenance at the time of the inspection, record the fact in Comments.

Reliquefaction equipment should include, but not be limited to, compressors, cold box or gas cooler.

8.56 Is the flow of N2 to the system sufficient?

8.57 Is the Gas supply to the Engine Room unaffected by ESD Shutdown?

8.58 Is the reliquefaction plant fitted with an independent emergency shutdown control independent of the cargo ESD system.

Gas Combustion Systems

This sub-section is applicable to vessels fitted with a reliquefaction system or other cargo system that requires that a Gas Combustion Unit (GCU) to be fitted.

8.59 Is the GCU unit in fully operational condition?

8.60 Are the alarms associated with the GCU tested in accordance with the Planned Maintenance System?

8.61 Is the GCU ready for immediate use?

Note: The GCU should be operated in automatic mode to allow for failure of the reliquefaction unit or the loss of gas combustion in the machinery. If not in automatic mode are there sufficient procedures in place to permit manual operation when required.

8.62 Is the gas detection system for the machinery space in good working order?

Note: Records of testing the results of such testing should be recorded and reviewed.

8.63 Is the gas fuel piping protection in good order?

Gas fuel piping should not pass through accommodation spaces, service spaces, or control stations. Gas fuel piping may pass through or extend into other spaces provided they fulfil one of the following:

- The gas fuel piping should be a double-wall piping system with the gas fuel contained in the inner pipe. The space between the concentric pipes should be pressurised with inert gas at a pressure

greater than the gas fuel pressure. Suitable alarms should be provided to indicate a loss of inert gas pressure between the pipes; or

- The gas fuel piping should be installed within a ventilated pipe or duct. The air space between the gas fuel piping and inner wall of this pipe or duct should be equipped with mechanical exhaust ventilation having a capacity of 30 changes per hour. The ventilation system should be arranged to maintain a pressure less than the atmospheric pressure. Continuous gas detection should be provided to indicate leaks and to shut down the gas fuel supply to the machinery space.

(IGC 16.3.1)

8.64 Is the automatic gas shut-off system in good order and regularly tested?

Each gas utilisation unit should be provided with a set of three automatic valves. Two of these valves should be in series in the gas fuel pipe to the consuming equipment. The third valve should be in a pipe that vents, to a safe location in the open air, that portion of the gas fuel piping that is between the two valves in series. These valves should be arranged so that failure of the necessary forced draft, loss of flame on boiler burners, abnormal pressure in the gas fuel supply line, or failure of the valve control actuating medium will cause the two gas fuel valves which are in series to close automatically and the vent valve to open automatically.

(IGC 16.3.6)

Void and Interbarrier Spaces and Seals

Note: This section should be completed for all types of cargo containment. These include integral, membrane, semi-membrane and independent Type A and B cargo tanks.

For cargo containment systems other than Type C:

- Interbarrier and hold spaces associated with cargo containment systems for flammable gas requiring full secondary barriers should be inerted with a suitable dry inert gas and kept inerted with make-up gas provided by a shipboard inert gas generation system, or by shipboard storage which should be sufficient for normal consumption for at least 30 days. (IGC 9.2.1)
- Interbarrier and hold spaces associated with cargo containment systems for flammable gases requiring partial secondary barriers should be inerted with a suitable dry inert gas and kept inerted with make-up gas provided by a shipboard inert gas generation system, or by shipboard storage which should be sufficient for normal consumption for at least 30 days. (IGC 9.2.2.1)
- Alternatively, the administration may allow Interbarrier and Hold spaces to be filled with Dry air provided the ship maintains a stored charge of inert gas or is fitted with an inert gas generator sufficient to inert the largest of these spaces; and provided that the configuration of the spaces and the relevant vapour detection systems, together with the capability of the inerting arrangements, ensure that any leakage from the cargo tanks will be rapidly detected and inerting effected before a dangerous condition can develop. Equipment for the provision of sufficient dry air of suitable quality to satisfy the expected demand should be provided. (IGC 9.2.2.2)

8.65 No question assigned

8.66 Is the oxygen and hydrocarbon content of the interbarrier spaces regularly monitored and the results recorded?

In the case of flammable products, where cargo containment systems other than independent tanks are used, hold spaces and interbarrier spaces should be provided with a permanently installed gas detection system capable of measuring gas concentrations of 0% to 100% by volume. The detection equipment, equipped with audible and visual alarms, should be capable of monitoring from each sampling head location sequentially at intervals not exceeding 30 minutes. Alarms should be activated when the vapour concentration reaches the equivalent of 30% of the lower flammable limit in air or such other limit as may be approved by the Administration in the light of particular cargo containment arrangements. Common sampling lines to the detection equipment should not be fitted. (IGC 13.6.11)

Notes: 30% LEL is the equivalent of 1.5% by volume.

Records should be kept to demonstrate the levels and any apparent trends or changes in level.

8.67 Is the interbarrier space nitrogen purging system in good order?

Note: Review records of nitrogen consumption and running hours of nitrogen generator to confirm the efficiency of the interbarrier space. Frequent sweeping or purging with nitrogen, with resultant use of nitrogen, is used to reduce the explosive gas levels.

8.68 Is the pressure in the interbarrier spaces being maintained at a sufficient level to prevent ingress from the atmosphere?

The secondary barrier should be capable of being periodically checked for its effectiveness, by means of a pressure/vacuum test, a visual inspection, or another suitable method acceptable to the Administration.

Note: The interbarrier spaces should be being maintained at positive pressure and records of the pressure should be being maintained.

- 8.69 Are the relief valves for the hold spaces and primary and secondary barriers in good order?**
Hold spaces and interbarrier spaces which may be subject to pressures beyond their design capabilities should be provided with a pressure relief system. (IGC 8.1)
Interbarrier spaces should be fitted with pressure relief devices to the satisfaction of the Administration. (IGC 8.2.2)
Note: Hold spaces without open connection to the atmosphere should be provided with suitable pressure gauges.
- 8.70 Is there a means to sample for ingress of water into the insulation spaces provided and are checks being recorded?**
Note: There should be a means available to drain the insulation spaces. Records of testing the water detectors (typically conductivity cell types) should be maintained.
- 8.71 Is the glycol heating system in the void spaces between cargo tanks, where fitted, in good order?**

Inert Gas Systems

- 8.72 Is the inert gas system and/or storage and associated pipework, where fitted, in good order?**
- 8.73 Are suitable arrangements provided to prevent the backflow of cargo vapour into the inert gas system?**
Arrangements suitable for the cargo carried should be provided to prevent the backflow of cargo vapour into the inert gas system. (IGC 9.4.4)
A means acceptable to the Administration, located in the cargo area, of preventing the backflow of cargo gas should be provided. (IGC 9.5.2)
Note: Protection against back-flow of gas is usually made by providing two non-return valves and a spool piece. Check that except when inert gas is being delivered, the spool piece is not in place and that officers clearly understand this important requirement.

Pressure Relief and Venting Systems

- 8.74 Have the safety relief valves been tested, are the test certificates on-board and are officers aware of their settings?**
Pressure relief valves should be set and sealed by a competent authority acceptable to the Administration and a record of this action, including the values of set pressure, should be retained on board the ship. (IGC 8.2.5)
In the case of cargo tanks permitted to have more than one relief valve setting this may be accomplished by:
- *Installing two or more properly set and sealed valves and providing means as necessary for isolating the valves not in use from the cargo tank; or*
 - *Installing relief valves whose settings may be changed by the insertion of previously approved spacer pieces or alternative springs or other similar means not requiring pressure testing to verify the new set pressure. All other valve adjustments should be sealed. (IGC 8.2.6)*
- Note: The only circumstances where relief valve settings may be changed are in the case of Moss vessels where, in cases of emergency, a pressurised discharge may be undertaken.*
- 8.75 Is the cargo vent system in good order?**
- 8.76 Are vent outlet protective or flame screens fitted as required and are there records of their regular inspection?**
Suitable protection screens should be fitted on vent outlets to prevent the ingress of foreign objects. (IGC 8.2.14)
- 8.77 Where the pressure relief line vents directly through a mast riser, does this system have a liquid sensor??**

In the vent piping system, means for draining liquid from places where it may accumulate should be provided. The pressure relief valves and piping should be so arranged that liquid can under no circumstances accumulate in or near the pressure relief valves. (IGC 8.2.13)

Relief valves discharging liquid cargo from the cargo piping system should discharge into the cargo tanks. Alternatively they may discharge to the cargo vent mast if means are provided to detect and dispose of any liquid cargo which may flow into the vent system. (IGC 5.2.1.7)

8.78 Are fire extinguishing systems on the vent masts, where fitted, in good order and operational?

8.79 Is the forward mast vent always operated in automatic mode?

Note: the forward mast riser should be operated in the automatic mode. If it is not, record an observation and state the reason.

8.80 Are there clear procedures and authorisation for changing settings and inhibiting alarms?

8.81 Are the ship's crew aware of the various pressure alarm points and of the required actions in the event of alarms being activated?

Emergency Shut Down (ESD) System

8.82 Is the emergency shutdown (ESD) system fully operational?

One or more remotely controlled emergency shutdown valves should be provided on the ship for shutting down liquid and vapour cargo transfer between ship and shore. (IGC 5.6.1.1)

One remotely operated emergency shutdown valve should be provided at each cargo hose connection in use. (IGC 5.6.3)

8.83 Are personnel aware of the requirements for the ESD system?

Cargo pumps and compressors should be arranged to shutdown automatically if the emergency shutdown valves required by 5.6.1.1 (above) are closed by the emergency shutdown system. (IGC 5.6.1.3)

Note: Documentation must list the equipment that will be effected by the activation of an ESD.

8.84 Are there at least two remote positions where the ESD system can be manually activated?

The control system for all required emergency shutdown valves should be so arranged that all such valves may be operated by single controls situated in at least two remote locations on the ship. One of these locations should be in the control position or cargo control room. (IGC 5.6.4)

8.85 Is the ESD system designed to fail to safe when activated?

In the event of a loss of power or communication, the emergency shut-down system should be of the fail-closed (closed on loss of power) type and be capable of local manual closing operation. (IGC 5.6.4)

8.86 Is the ESD system tested prior to cargo transfer and are records maintained?

Notes: Correct operation of the ESD activation must be tested prior to every cargo transfer. It is not acceptable that the only activation point is operated from the Cargo Control Room. Each of the ESD positions must be operated at least once every 12 months and a policy must be in place for each of the ESDs to be operated in rotation prior to every cargo transfer.

8.87 Are all manifold valves and tank filling valves, if they form part of the emergency shutdown system, tested and timed to close within 30 seconds?

Emergency shutdown valves in liquid piping should fully close under all service conditions within 30 seconds of actuation. Information about the closing time of the valves and their operating characteristics should be available onboard and the closing time should be verifiable and reproducible. Such valves should close smoothly. (IGC 5.6.4)

Cargo pumps and compressors should be arranged to shutdown automatically if the emergency shutdown valves are closed by the emergency shutdown system. (IGC 5.6.1.3)

Notes: The emergency shutdown valve at the manifold may be located either inside or outside the hand operated manifold valve.

On older vessels, the cargo tank valves may be part of the ESD. On modern vessels they are not. They will, however close in the event of actuation of a high level alarm.

8.88 Are fusible plugs fitted on the liquid domes and in the vicinity of the manifolds and are they in good order?

The control system should also be provided with fusible elements designed to melt at temperatures between 98° and 104°C which will cause the emergency shutdown valves to close. Locations for such fusible elements should include the tank domes and loading stations. (IGC 5.6.4)

Note: Fusible elements should not be painted over as this might affect the temperature at which they will operate.

8.89 If the vessel is fitted with a reliquefaction plant, will this be tripped in the event of activation of the ESD?**8.90 Whilst running at sea, is the secondary tank pressure management system sufficient to handle the gas volume in the event of a shutdown of the reliquefaction system?**

Note: It is assumed in port that the vessel will be able to handle the gas generated by boil off by returning to shore. Whilst at sea the use of the gas combustion unit or other similar methods will be necessary to avoid venting.

8.91 Is clear guidance posted as to the authority to override alarms and ESD trips?**Manifold Arrangements****8.92 Are cargo and vapour manifold arrangements satisfactory?**

Note: Refer to "Manifold Recommendations for Liquefied Gas Carriers 1st Ed (2011)"

8.93 Is the manifold area clear of obstructions which could interfere with the automatic release of a hard arm?**8.94 Does the manifold arrangement provide for safe access for connection and disconnection of cargo lines?****8.95 Are visible means provided to restrict access to the manifold area during cargo operations?**

Note: Non-essential personnel should be kept clear of the manifold area during cargo operations.

8.96 Are manifold pressure gauges fitted outboard of the manifold valves and are they in good order?**8.97 Are the offshore manifolds regularly checked during cargo transfer for manifold valve leakage?**

Note: The offshore manifolds on LNG carriers are often pressurised with nitrogen and it is normal that the space between the manifold valves and the flanges are under pressure. Indications of leakage are indicated by frosting, not pressure.

8.98 Are all flange connections fully bolted?

Note: This includes any line which is being used for, or might become pressurised during, cargo operations on both sides of the vessel.

8.99 Are manifold blank flanges of an equivalent rating to that of the manifold pipelines?

Notes: It is generally accepted that steel blanks should be of the same thickness as the flanges to which they are attached, but this will not necessarily result in the pressure capability being the same as that of the associated pipework.

It is the pressure rating of the blank which is important and blanks made of materials such as titanium have a superior strength and may therefore be significantly thinner for the same pressure rating as a mild steel blank. If such a blank is fitted, there must be documentation on board to prove that the pressure rating is adequate for the service.

8.100 Are the manifold valves and lines clearly marked as to whether they are liquid or vapour?**8.101 Are the manifolds fitted with drain lines and purge points and are they valved and capped?**

8.102 Are the manifold strainers not being by-passed?

Note: Manifold strainers may be fitted at the option of the terminal or the vessel. The provision of the strainers may be by the terminal or by the vessel.

8.103 Are LNG spill arrangements adequate?

Where leakage may be anticipated, such as at shore connections protection for the hull beneath should be provided. (IGC 5.2.1.3)

8.104 Is the overboard water spray curtain in use?

Note: the curtain should produce adequate water coverage of the area beneath the manifold area, without generating excess spray. The water curtain should be used whenever the transfer lines contain LNG.

8.105 Is the manifold drip tray area designed to be load bearing?

Note: The manifold gratings must be of sufficient strength that in the event of a loading arm dry break coupling releasing, the resulting load will not distort or damage the gratings.

8.106 Are Liquid Spill and Manifold Drip tray arrangements adequate?

The spillage containment area should be provided with a drain line capable of leading a spill overboard. Such a line should include a valve that is closed during normal operation and operable from a safe location. The discharge from the line should point vertically downwards so as not to deluge the jetty and associated equipment with liquid. Provisions should be made to drain off any accumulated water. During operations the drip trays should as far as practical be dry. (Manifold Recommendations for Liquefied gas carriers 1st Ed 2011).

8.107 During the disconnection of the loading arms are the crew aware of the hazards related to the purging of liquid from the arms via the drain cocks?**Safety Equipment****8.108 Is suitable protective equipment available for all crew members engaged in cargo operations?**

Suitable protective equipment including eye protection should be provided for protection of crew members engaged in loading and discharging operations, (IGC 14.1)

8.109 Are there at least two complete sets of safety equipment on board and are they in good order?

Sufficient, but not less than two complete sets of safety equipment in addition to the firemen's outfits, each permitting personnel to enter and work in a gas-filled space, should be provided.

One complete set of safety equipment should consist of:

- *One self-contained air-breathing apparatus having a capacity of at least 1,200 litres of free air;*
- *Protective clothing, boots, gloves and tight-fitting goggles;*
- *Steel-cored rescue line with belt; and*
- *Explosion proof lamp. (IGC 14.2.2)*

An adequate supply of compressed air should be provided and should consist either of:

- *One set of fully charged spare air cylinders for each breathing apparatus;*
- *A special air compressor suitable for the supply of high-pressure air of the required purity; and*
- *A charging manifold capable of dealing with sufficient spare breathing apparatus air cylinders for the breathing apparatus; or*
- *Fully charged spare air cylinders with a total free air capacity of at least 6,000 litres for each breathing apparatus. (IGC 14.2.3)*

8.110 If the vessel has a cargo capacity greater than 5,000m³, is the additional firemen's outfit carried?

Every ship carrying flammable products should carry firemen's outfits complying with SOLAS as follows:

- *5,000 m³ and below: 4 outfits;*
- *Above 5,000 m³: 5 outfits. (IGC 11.6.1)*

8.111 Is the safety equipment correctly located?

The protective equipment and safety equipment should be kept in suitable, clearly marked lockers located in readily accessible places. (IGC 14.2.5)

8.112 Is the safety equipment required by the IGC Code examined by an expert annually and are records available?

The compressed air equipment should be inspected at least once a month by a responsible officer and the inspection recorded in the ship's log book and inspected and tested by an expert at least once a year. (IGC 14.2.6)

Note: An 'expert' may be a member of the crew provided they have attended relevant courses and have documentation available to prove it. Such courses must be comprehensive, hands-on and cover all aspects of inspection and testing of the equipment.

8.113 Is the safety equipment inspected on board monthly and are records available?

The compressed air equipment should be inspected at least once a month by a responsible officer and the inspection recorded in the ship's log book. (IGC 14.2.6)

8.114 Is the fixed chemical dry powder system ready for use and in good order?

Ships in which the carriage of flammable products is intended should be fitted with fixed dry chemical powder type extinguishing systems for the purpose of fighting fire on the deck in the cargo area and bow or stern cargo handling areas if applicable. (IGC 11.4.1)

Notes: Records should be maintained of the dates when the powder in the system cylinders was last agitated and of powder discharge. Powder should be agitated, or fluffed, regularly to prevent compaction.

8.115 Is the water spray system in good order?

On ships carrying flammable or toxic products or both, a water-spray system for cooling, fire prevention and crew protection should be installed to cover:

- Exposed cargo tank domes and any exposed parts of cargo tanks;
- Exposed on-deck storage vessels for flammable or toxic products;
- Cargo liquid and vapour discharge and loading manifolds and the area of their control valves and any other areas where essential control valves are situated and which should be at least equal to the area of the drip trays; and
- Boundaries of superstructures and deckhouses normally manned, cargo compressor rooms, cargo pump rooms, store rooms containing high fire risk items and cargo control rooms, all facing the cargo area. Boundaries of unmanned forecastle structures not containing high fire risk items or equipment do not require water spray protection. (IGC 11.3.1)

Notes: The piping system may be constructed from stainless steel or of mild steel and may be lined with PVC. If mild steel is used, then the system should be drained and dried to avoid the formation of rust particles inside mild steel pipe that may block the nozzles. The system should be tested periodically to ensure proper operation and such tests should be part of the planned maintenance system with records maintained to verify satisfactory operation.

8.116 Are the cargo space smothering systems in good order?

An appropriate firefighting system approved by the Administration should protect these spaces in ships dedicated to the carriage of a restricted number of cargoes. (IGC 11.5)

Cargo Hoses**8.117 If the vessel uses its own cargo hoses are they in good order?**

Notes: Hoses must be protected from sunlight and weather and kept covered except when in use. Flanges must be fitted to each end each and the hoses charged internally with nitrogen. Hoses must be free of visual damage, abrasion, crimps or crushed areas and the flange sealing surface free of damage.

8.118 Are the hoses pressure tested in accordance with the requirement of the IGC?

Each new length of cargo hose produced should be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure nor more than two fifths its bursting pressure. The hose should be stencilled or otherwise marked with its specified maximum working pressure and, if used in other than ambient temperature services, its maximum or minimum service temperature or both. The specified maximum working pressure should not be less than 10 bar gauge. (IGC 5.7.3)

8.119 Is a record of all hose tests and inspections maintained on board?

Note: Cargo hoses on LNG carriers must be pressure tested prior to each use. Each hose should be marked with the test date and be individually numbered for identification purposes. For vessels that are conducting transfers using hoses on a regular basis, should have in place a documented procedure in place to ensure the integrity of the transfer hoses.

Cargo Lifting Equipment:

8.120 Are all cargo derricks, cranes and other lifting equipment properly marked and have periodical testing and inspection been carried out?

Notes: Cargo lifting equipment should be load tested every five years and thoroughly examined by a competent person annually. Other lifting equipment is not regulated except as usually required by class, but should be tested and examined under a similar regime. The minimum SWL for which testing is required is one tonne (1,000 kgs).

A Chain Register is not required, but documentation supporting testing, examination and maintenance that follows the OCIMF Publication Recommendations for the Tagging/Labelling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

8.121 Are winches associated with lifting equipment in good order?

Note: If fitted, derrick topping lifts should have a means of securing them, such as a locking pin or ratchet, to prevent the weight of the derrick being solely taken by the winch brake. Check that this is fitted and that it and any associated winches are in good condition. Documentation supporting testing, examination and maintenance that follow the OCIMF Publication Recommendations for the Tagging/Labelling, Testing and Maintenance, Documentation/Certification for Ships' Lifting Equipment should be maintained.

Ship to Ship Transfer Operations

If the vessel is equipped with specialised equipment for regular ship-to-ship transfer operations such as fenders and cargo hoses, the fact should be recorded in Additional comments. If the vessel is NOT utilised for regular commercial ship-to-ship cargo transfer, Questions 8.122- 126 must be answered 'NA'.

8.122 Is the equipment used for ship-to-ship transfer of LNG type-approved?

8.123 Are operator's procedures provided for ship-to-ship operations?

Note: Procedures should follow the recommendations of the OCIMF/ICS STS Transfer Guide (Liquefied Gases).

8.124 Are sufficient closed fairleads and mooring bitts provided?

It is recommended that all fairleads used during STS transfer operations are of an enclosed type. Such fairleads should be strong enough to take the anticipated mooring loads and large enough to allow the mooring line (plus any soft rope and tackle) to pass through comfortably. (STS Guide 10.3.4)

It has been found that enclosed fairleads and bitts for spring lines need to be positioned no more than 35 metres forward and aft of the cargo manifold. (STS Guide 10.3.4)

It is recommended that all tankers be fitted with an array of mooring bitts of sufficient strength on each side of the ship. (STS Guide 10.3.5)

8.125 Are ship-to-ship transfer checklists completed?

The checklists should be used not only at the time of transfer but also when organisers are planning an operation. Adherence to check list procedures will ensure that the most essential aspects of an operation are covered. The checklists are:

- 1 - pre-fixture information;*
- 2 - before operations commence;*
- 3 - before run-in and mooring;*
- 4 - before cargo transfer; and*
- 5 - before unmooring.*

(STS Guide 3.2 and Appendix 1)

8.126 If a ship-to-ship transfer was in progress during the inspection, was it conducted in accordance with the recommendations of the OCIMF/ICS STS Transfer Guide (Liquefied Gases)?

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 9. Mooring

Notes: The OCIMF publications '**Effective Mooring**', '**Mooring Equipment Guidelines, Anchoring Systems and Procedures**' and '**Guidelines on the Use of High Modulus Synthetic Fibre Ropes as Mooring Lines on Large Tankers**' provide information on all aspects of mooring equipment and operations.

Common causes of accidents are an inadequate understanding of good mooring practices, unattended mooring lines, a mixture of wire and non-wire moorings, unbalanced mooring arrangements, poor quality of mooring lines, poor maintenance of mooring equipment, insufficient knowledge of local conditions, inattention to weather and tidal conditions and passing traffic.

Mooring equipment documentation

9.1 Are certificates available for all mooring ropes and wires?

Note: A file showing the locations of the winches should be maintained. Test certificates for mooring lines, Mandel/Tonsberg shackles and synthetic tails should be kept in a file clearly showing to which winch each particular component has been fitted.

9.2 Do all mooring ropes and where fitted, mooring wire tails, meet OCIMF guidelines?

Mooring lines should preferably all be of the same material and construction. Ropes with low elastic elongation properties are recommended for larger tankers as they limit the tanker's movement at the berth. High modulus synthetic fibre ropes are a viable replacement for winch-stowed steel wire ropes for the mooring of large tankers at terminals, other than single point moorings. Recommendations on their use are contained in the OCIMF publication '**Guidelines on the Use of High Modulus Synthetic Fibre Ropes as Mooring Lines on Large Tankers**'. (ISGOTT 23.4.1)

Where dynamic (shock) loading on moorings can be caused by swell conditions or the close passing of ships, fibre tails on the ends of mooring wires and high modulus synthetic fibre mooring ropes can provide sufficient elasticity to prevent failure of the mooring and other components in the mooring system. The tanker or the terminal may provide the tails, whose length should not exceed one third of the distance between the ship's fairlead and the shore mooring bollard. (ISGOTT 23.4.1)

Any material having moderate to high elasticity is suitable for the manufacture of tails. Common materials include polyester, polyester/polyolefin composites and polyamide. To increase fatigue life and strength, it is recommended that tails are torque matched to the main line. Synthetic tails should have an MBL at least 25% higher than that of the mooring line to which they are attached. Polyamide tails should have a 37% higher MBL than the mooring line to take account of loss of strength when wet. (MEG 6.5.1)

Polyamide is previously referred to as Nylon and it loses 10-15% of its strength when wet. It has the highest elasticity of regularly used materials with good temperature and abrasion resistance (MEG 6.3.1.2)

The traditional tail length of 11 metres is adequate for sheltered pierside moorings where little or no wave induced vessel motion occur. At exposed pierside moorings where significant ship motions occur, the tail length of 11 metres may be inadequate. This could lead to immediate tensile failure or, in the longer term, lead to the fatigue failure of main winch ropes and/or mooring equipment on-board or ashore. Longer tail lengths may be required for exposed berths where waves up to 2 metres significant wave height and having periods in excess of 10 seconds may be encountered. Increased tail length will typically only be required for breast lines and may not be necessary for spring lines. (MEG 6.5.2)

Tails should be replaced at least every 18 months unless experience and hours in use coupled with inspection indicates a longer or shorter period is warranted. A record of service should be maintained that includes time in use and inspection results. Tails should be replaced prior to their residual strength falling to 60% of their original MBL. (MEG 6.5.3)

Notes: The 18 month period mentioned above is based upon the actual time in use on an average ship in average trade. The important factor is that an inspection/assessment programme is in place (with records).

The use of primarily polyester blends as opposed to nylon should be acceptable, based on existing OCIMF guidance on the fibre properties.

9.3 If one or more bow stoppers are fitted is a certificate attesting to the safe working load provided?

The ship should hold a copy of the manufacturer's type-approval certificate for the bow chain stopper(s) confirming that the bow chain stopper(s) are constructed in strict compliance with a recognised standard that specifies SWL, yield strength and safety factors.

The ships should also hold a certificate attesting to the strength of the bow chain stopper(s) foundations and associated ship supporting structure substantiated by detailed engineering analysis or calculation.

Bow chain stoppers, associated foundation and supporting structure should be subject to periodic survey, at least once every 5 years, and maintained in good order. Bow chain stoppers should be permanently marked with their SWL and appropriate serial number so that certificates can be easily cross referenced.

(MEG Appendix E2)

9.4 Are there records of the inspection and maintenance of mooring ropes, wires and equipment?

All mooring ropes, wires and tails should be received with either individual certificates or, if part of a batch a certificate of conformity.

It is recommended that on receipt, all ropes, wires and tails be permanently marked so that positive identification with their corresponding certificate can be made. Records should be kept of date placed in use, inspections, and any maintenance. (MEG 6.1.4)

9.5 Is there a policy in place for the testing of winch brakes and are the results recorded?

The primary brake should be set to hold 60% of the mooring line's minimum breaking load. Since brakes may deteriorate in service, it is recommended that new equipment be designed to hold 80% of the line's minimum breaking load, but have the capability to be adjusted down to 60%. (MEG 7.4.6)

Regardless of the brake type, periodic testing is essential to ensure safe mooring (MEG 7.4.5)

The main purpose of brake testing is to verify that the brake will render at a load less than the design rope's MBL. New ships are normally supplied with a brake test kit of the simplified type. Each winch manufacturer will have their own test equipment and procedures which should be followed by the operator. (MEG 7.4.5.1)

Each winch should be tested individually and test should be carried out prior to the ship's delivery and then every year thereafter following recommendations in ISGOTT. In addition, individual winches should be tested after completion of any modification or repair involving the winch brakes, or upon any evidence of premature brake slippage or related malfunctions. Brakes should be tested to prove they render at a load that is equivalent to 60% of the line's MBL (MEG 7.4.5.2)

It is recommended that a complete set of test equipment is placed on board each ship properly stowed in an appropriate location. Alternatively the owner may elect to procure one or two sets of testing equipment for each type and size of winch and retain this equipment in a convenient central location for shipment to repair facilities (MEG 7.4.5.5)

Ideally, a brake should hold and render within a very small range and once it renders, should shed only enough load to bring the line tension back to a safe level. Unfortunately, the widely used band brake with screw is only marginally satisfactory in fulfilling these requirements and its operation requires special care.

(MEG 7.4)

Specifications should be available on the winch drum to show the design holding capacity and the torque required on the hand wheel or lever to achieve this. (MEG 1.8)

Note: If mooring lines are utilised that have a minimum breaking load in excess of that for which the winch was originally designed, the brakes should be set to render at 60% of the minimum breaking load of the mooring line for which the winch was designed. A further consideration in such cases is that if the over-strength line is of a greater diameter than the mooring line for which the winch was designed, full stowage on the drum must be made and in the case of split-drum winches, must not result in excess layers on the tension part of the drum when in use.

Mooring procedures**9.6 Are moorings satisfactorily deployed and tended?**

Generally mooring lines of the same size and type (material) should be used for all leads. Mooring lines should be arranged so that all lines in the same service are about the same length between the ship and the shore bollard. (MEG 1.5)

Note: The mooring arrangement in use for the port and its effectiveness should be reviewed. Breastlines provide the bulk of transverse restraint, backsprings the longitudinal. Headlines and sternlines contribute much less to the mooring strength than is commonly supposed.

Mooring operations are potentially a hazardous operation and all involved should be aware of the hazards, particularly 'snap-back' areas. The recommendations in the OCIMF information paper "The hazards of Snap-back" should be taken into account.

9.7 Are mooring lines secured to bitts and turned up correctly?

The recommended method of turning up a rope on bitts is to take one or two full turns around the leading post before figure of eighting. The reason for this is to reduce the tendency to pull the two posts together. However when turning up unjacketed high modulus lines around bitts, for example when a tug's line fast, two turns should be taken around the leading post prior to turning the line up in a figure of eight fashion (MEG 8.2)

Note: Mooring lines must not be secured to winch warping drums.

9.8 Are all powered mooring lines correctly reeled on drums, secured on brakes and winches out of gear.

A band brake is designed to work in one direction only, so the line must always be reeled correctly onto the drum. Each arrangement should be assessed on a case-by-case basis with reference to the manufacturer's guidance. With lines correctly reeled, tension on the line should be in a direction that causes the free end of the band to be forced towards the fixed end, thereby forcing the two halves of the band together. (MEG 7.4.2.6)

Winches should never be left in gear with the mooring winch band brake on. Hydraulic or electric drives can suffer severe damage should the brake render. Mooring drums should always be left disconnected from the winch drive whenever the mooring line is tensioned and the band brake is fully applied. (MEG 7.4.2.3)

9.9 On split drum winches are all the lines made fast with no more than one layer on each tension side of the drum?

The rated holding capacity is only achieved with one layer of line on the tension section of the drum. Operation with additional layers will decrease the brake holding capacity (MEG 7.4.1)

9.10 If mooring tails are fitted to wires, do they have proper connecting links and are they correctly fitted?

Tails should be connected to a wire mooring line using appropriate shackles, for example, those manufactured by Mandal, Tonsberg and Boss. The SWL of the joining shackle should be equal to or greater than, the SWL of the mooring line to which it is attached. It is critical that the connecting links are rigged in accordance with the manufacturer's instructions. The eye of the tails should be protected with a suitable sheath, the use of leather sheathing is not recommended. If the manufacturer recommends that it is appropriate, a synthetic tail can be attached to a high modulus rope by using a cow hitch. The hitch provides a suitable method of joining ropes without the use of thimbles or other hardware. The cow hitch will reduce the strength of the arrangement by approximately 15%. The use of cow hitches is not recommended for connecting mooring pendants to Aramid lines on account of compression damage. (MEG 6.5.4)

Notes: Tonsberg have a straight pin and the tail should be connected to it; Mandal has a curved roller and the wire should be connected to it; Boss links can be connected in either direction. In all cases, it is critical that the connecting links are rigged in accordance with the manufacturer's instructions.

9.11 Are all mooring lines stowed neatly to minimise tripping hazards and are mooring areas clear and unobstructed?**Mooring equipment****9.12 Are mooring winches, including winch foundations in good order?****9.13 Do brake linings, drums and pins appear to be in good order?**

Notes: Defective brake gear is often evident, particularly on older vessels. Check the condition of cheek plates for wastage and distortion, the hinge pins and their retaining devices and the condition of the brake drum below the lining.

If there is significant wear on the brake linings, the brake adjustment screw may be at the limit of its travel and further tightening not possible.

9.14 If mooring winches in a gas hazardous area are electrically powered, are motors Ex 'd' rated and have insulation tests carried out and results recorded.

Notes: Most mooring winches will be outside gas hazardous areas and therefore will not require an 'Ex' rating. If not, there must be evidence available, either by a manufacturer's plate on the motor, or by

documentation, that the motor is rated for use in a gas-hazardous area. An Ex 'd' rating means that the equipment can withstand an internal explosion without igniting the outside atmosphere. Ex 'e' is an increased safety rating. Glands at the point of entry of electric cables into junction boxes should be checked. Records should be available of the testing of the insulation resistance, from the phases to earth, of motors. The resistance should be above 1 Megohm. Falling insulation resistance indicates deterioration.

9.15 Are mooring wires, ropes and synthetic tails in good order?

Notes: Splicing of ropes is acceptable, but reduces the strength of the rope by about 10%. Splices in eyes and for repairs should have a minimum of 5 tucks.

Particular attention should be paid to the eyes of mooring wires. If there are more than three broken wires in any strand, or five in any adjacent strands in a length of wire 10 times the diameter, the damaged part requires removal and the wire re-splicing.

There should be a routine for the maintenance of wires and the lubrication of them using a preservative which will effectively penetrate the strands and wires.

9.16 Are pedestal fairleads, roller fairleads and other rollers well-greased and free to turn and are bits and chocks free of grooving?

9.17 Is mooring equipment marked with its SWL?

Each fitting should be clearly marked by bead weld outline with its SWL, in addition to any markings required by other applicable standards. The SWL should be expressed in tonnes (letter 't') and be located so that it is not obscured during the operation of the fitting. For safety, the marked SWL should correspond to the load in the associated line or chain. Therefore, the marked SWL will normally be the mooring lines MBL. It will not be the resultant load on the fitting which may be higher. (MEG 4.6)

Note: Some vessels have the mooring equipment marked in 'Kn', which is an acceptable alternative.

Anchoring equipment

9.18 Are windlasses, anchors, locking bars and cables in good order and operating effectively?

Note: The condition of the locking bars should be checked to ascertain that they function correctly by locking the chain when the vessel is at anchor to prevent the brake having to take the full load of the cable.

9.19 Except whilst alongside, when locking bars should be in place, were the anchors cleared and ready for immediate use during port entry?

Whilst moored alongside, anchors not in use should be properly secured by brake and guillotine, but otherwise be available for immediate use. Where specifically otherwise required by the terminal the response should be NA, (ISGOTT 23.4.2.5)

9.20 Are bitter end securing arrangements unobstructed and outside the chain locker?

9.21 Are the chain locker doors securely battened down?

Single Point Moorings

9.22 Is single point mooring (SPM) and associated equipment fitted to OCIMF recommendations?

Existing ships delivered before 2009 likely to trade to SPM's should be equipped with bow chain stoppers designed to accept 76 mm chafe chain:

<i>Up to 150,000 tdw:</i>	<i>1 stopper</i>	<i>200 tonnes swl</i>
<i>150 to 350,000 tdw:</i>	<i>2 stoppers</i>	<i>200 tonnes swl</i>
<i>Over 350,000 tdw:</i>	<i>2 stoppers</i>	<i>250 tonnes swl</i>

New ships delivered during or after 2009 likely to visit SPMs should be equipped with bow chain stoppers designed to accept 76mm chafe chain in accordance with the following table. Owners of ships under construction before 2009 are encouraged to consider fitting bow chain stoppers in accordance with the recommendations for new ships.

<i>Up to 100,000 tdw:</i>	<i>1 stopper</i>	<i>200 tonnes swl</i>
<i>100 to 150,000 tdw:</i>	<i>1 stoppers</i>	<i>250 tonnes swl</i>
<i>Over 150,000 tdw:</i>	<i>2 stoppers</i>	<i>350 tonnes swl</i>

Stoppers should be located between 2.7 and 3.7 metres inboard from the bow fairlead (regardless of the size of vessel) and due consideration should be given to the correct alignment of stoppers relative to the lead between bow fairlead, stopper, pedestal fairlead and winch drum or the warping drum of the winch.

A bow fairlead should measure at least 600 by 450 mm and be placed on the centre line. If two fairleads are recommended these should be spaced 2 metres centre to centre apart, but in no case more than 3 metres. (MEG Appendix E.2)

9.23 If the vessel is equipped for mooring at single point moorings, does it meet the recommendations as applicable, contained in Mooring Equipment Guidelines (3rd Edition)?

Existing ships delivered before 2009

Existing ships delivered before 2009, likely to visit SPMs, should be equipped to safely handle pick-up ropes taking into consideration safety and protection from risk of whiplash injury to mooring personnel. It is recognised that existing ship mooring arrangements will normally require the use of pedestal rollers to achieve the desired lead through the bow fairlead and bow chain stopper to the winch storage drum. It is essential that pedestal rollers(s) are correctly positioned, relative to the winch storage drum and the centre of the bow chain stopper, to enable a direct lead from the centre of the bow fairlead to the centre of the bow chain stopper while allowing the pick-up rope to be stowed evenly on the storage drum. There should be at least 3.0 metres distance between the bow chain stopper and the closest pedestal roller to allow for the pick-up rope eye, connecting shackle, shipboard-end oblong plate and a number of chafe chain links. Owners of existing ships and ships under construction before 2009 are encouraged to consider the practicality of adopting the recommendations for new ships.

New ships delivered during or after 2009

New ships delivered during or after 2009 likely to visit SPM's. Wherever possible, it is recommended that winch storage drums used to recover the pick-up ropes are positioned in a direct straight lead with the bow fairlead and bow chain stopper and without the use of pedestal rollers. This relative positioning of the tanker SPM mooring equipment in a direct straight lead is considered the safest and most efficient arrangement for handling the pick-up ropes. However, recognising that not all new mooring arrangement designs will permit direct straight leads to a winch storage drum, consideration of safety and protection from risk of whiplash injury to mooring personnel should take priority in determining the number and positioning of pedestal rollers. In addition to the pedestal roller arrangement recommendations for existing ships, the number of pedestal rollers used for each bow chain stopper should not exceed two and the angle of change of direction of the pick-up rope lead should be minimal.

Remote operated winch storage drums may afford some additional protection whiplash protection for the winch operator.

Winch storage drum used to stow the pick-up rope for **existing and new ships** should be capable of lifting at least 15 tonnes and be of sufficient size to accommodate 150 metres of 80 mm diameter rope. Use of winch drum ends (warping ends) to handle pick-up ropes is considered unsafe and should be avoided. (MEG Appendix E.4)

9.24 If the vessel is fitted with a hydraulically operated bow stopper, are safeguards provided to prevent its accidental release?

Emergency towing arrangements

9.25 Are emergency towing arrangements readily available for deployment at both ends of the vessel?

The requirement for emergency towing arrangements applies to oil, chemical and gas tankers over 20,000 tdw.

For tankers constructed before 1 July 2002:

- The design and construction of emergency towing arrangements shall be approved by the Administration, based on the guidelines developed by the Organisation (MSC.35);
- The aft emergency towing arrangement should be pre-rigged and capable of being deployed in a controlled manner in harbour conditions by one person within 15 minutes;
- The pick-up gear for the aft towing pennant should be designed at least for manual operation by one person taking into account the absence of power and the potential for adverse environmental conditions that may prevail during such emergency towing operations. The pick-up gear should be protected against the weather and other adverse conditions that may prevail;

- The forward emergency towing arrangement should be capable of being deployed in harbour conditions in not more than one hour. (It is unlikely that a length of chain could be retrieved within the time limit if it is stored in the foc's'le space);
- Forward emergency towing arrangements which comply with the requirements for aft emergency towing arrangements may be accepted;
- All emergency towing arrangements should be clearly marked to facilitate safe and effective use even in darkness and poor visibility;
- All emergency towing components should be inspected by ship personnel at regular intervals and maintained in good working order. (MSC.35)

For tankers constructed on or after 1st July 2002:

- The arrangements shall, at all times, be capable of rapid deployment in the absence of main power on the ship to be towed and easy connection to the towing ship. At least one of the emergency towing arrangements shall be pre-rigged ready for rapid deployment; and,
- Emergency towing arrangements at both ends shall be of adequate strength taking into account the size and deadweight of the ship and the expected forces during bad weather conditions. (SOLAS II-1/3-4,1.2)

Once the system has been deployed the watertight integrity of adjacent spaces should be maintained. The prime emergency towing arrangement may be fitted either forward or aft.

9.26 Does the vessel have on board Emergency Towing Procedures?

For ships constructed after 1 Jan 2010 and existing ships not later than 1st January 2012

- Ships shall be provided with a ship-specific emergency towing procedure. Such a procedure shall be carried aboard the ship for use in emergency situations and shall be based on existing arrangements and equipment available on board the ship.

The procedure shall include:

- drawings of fore and aft deck showing possible emergency towing arrangements;
- inventory of equipment on board that can be used for emergency towing;
- means and methods of communication; and
- sample procedures to facilitate the preparation for and conducting of emergency towing operations."

(SOLAS II-1/3-4,2.2-3)

Note: Ships should have on board three copies of a ship specific of an 'Emergency Towing Booklets' (ETB). Copies of the ETB should be located on the Bridge, Foc's'le space and Ship's office or Cargo Control room. The ETB should contain procedures, diagrams etc. as set out in MSC.1/ Circ 1255.

Once the system has been deployed the watertight integrity of adjacent spaces should be maintained. The prime emergency towing arrangement may be fitted either forward or aft

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 10. Communications

Satellite communications equipment normally operates at 1.6 GHz and the power levels generated are not sufficient to present an ignition hazard. Satellite communications equipment may therefore be used to transmit and receive messages whilst the ship is in port.

Communications procedures

10.1 Are instructions for operating the digital selective calling (DSC) and satellite communications equipment in an emergency clearly displayed?

10.2 Are the vessel's call sign and Inmarsat ship station identity clearly marked on the radio installation?

10.3 Can officers demonstrate a satisfactory understanding of how to operate the equipment in an emergency?

**10.4 Are officers aware of the function of the ship security alert system and how it operates?
*Under no circumstances should enquiries be made as to the system details.***

All ships constructed after 1st July 2004 shall be fitted with a ship security alert system. (SOLAS XI-2/6.1.1)

The ship security alert system shall, when activated, initiate and transmit a ship-to-shore security alert to a competent authority, which in these circumstances may include the Company, identifying the ship, its location and indicating that the security of the ship is under threat or it has been compromised.

(SOLAS XI-2/6.2.1)

It shall not send the security alert to other ships or raise the alarm on board and it shall continue until deactivated or reset.

(SOLAS XI-2/6.2.2,3 and 4)

The ship security alert system shall be capable of being activated from the navigation bridge and in at least one other location.

(SOLAS XI-2/6.3.1)

Note: SIRE defines Company as the vessel Operator)

10.5 Has a qualified person been designated to handle distress communications?

Every ship shall carry personnel qualified for distress and safety radio communication purposes to the satisfaction of the Administration. (SOLAS IV/16.1)

Note: That person should not be the Master.

10.6 Are the periodical tests of communications equipment being carried out as required?

The following tests should be carried out:

Daily:

- *The proper functioning of the DSC facilities without radiation of signals;*
- *Battery voltage checks;*
- *Printers.*

Weekly:

- *The proper function of the DSC facilities by means of a test call when within communication range of a coast station;*
- *Where the reserve source of energy is not batteries, the reserve source to be tested.*

Monthly:

- *Each Emergency Position Indicating Radio Beacon (EPIRB) to be tested to determine its capability to operate properly using the means provided on the device and without using the satellite system;*
- *Each marine search and rescue transponder (SART) using the in-built test facility and checked for security and signs of damage;*
- *The security and condition of all batteries providing a source of energy for any part of the radio installation;*
- *The condition of all aerials and insulators;*
- *Each survival craft two-way VHF equipment, on a frequency other than channel 16.*

(Radio Log)

Note: Amendments to Res. MSC.256(84), Res.MSC.259(84), Res.MSC.260(84), Res.MSC.246(83) permit the use of either GMDSS-SART or AIS-SART and apply to ships constructed after 1 Jan 2010 or ships where equipment is being replaced.

10.7 Is the Radio Log being maintained correctly?

The following should be being recorded:

- A summary of distress, urgency and safety communications;
- Important incidents relating to the radio service;
- Where appropriate, the position of the ship at least once per day;
- A summary of the condition of the radio equipment, including its sources of energy;
- Personnel assigned responsibility for sending a distress alert instructed to operate properly all radio equipment on the ship;
- Necessary instruction and information on the use of the radio equipment to relevant crew members;
- Pre-sailing checks to ensure that all equipment is in an efficient working condition;
- The results of the testing of the DSC distress and safety radio equipment by means of a test call at least once a week;
- The results of the testing of the distress and safety radio equipment by means of a test at least once each day but without radiating any signal;
- The on-load and off-load daily test of the batteries;
- The results of the weekly hydrometer or load test of the batteries;
- The results of the monthly security check of each battery and its connections. (MSA Radio Log)

10.8 If applicable, is the emergency radio battery log up to date?

Where a reserve source of energy consists of rechargeable accumulator batteries, their capacity shall be checked, using an appropriate method, at intervals not exceeding 12 months, when the ship is not at sea.

(SOLAS IV/13.6)

10.9 Is there a maintenance programme in place to ensure availability of the radio equipment?

On ships engaged on voyages in sea areas A1 and A2, the radio availability shall be ensured by using such methods as:

- Duplication of equipment; or
- Shore based maintenance (the requirement on GMDSS vessels to have shore based maintenance does not infer there should necessarily be a contract but that maintenance should be carried out annually by a shore-based i.e. 'expert' organisation); or
- At-sea electronic maintenance capability; or
- A combination of these as may be approved by the Administration. (SOLAS IV/15.6)

On ships engaged on voyages in sea areas A3 and A4, the radio availability shall be ensured by using a combination of at least two of the methods detailed above. (SOLAS IV/15.7)

Communications equipment

10.10 Is the communications equipment in good order?

Notes: The minimum requirements for radio equipment for the vessel should be taken from the Radio Certificate and its attachment Form R or in Form C if the Safety Radio Certificate is combined in the Harmonised Certificate. If the vessel uses EX rated mobile phones within the gas-hazardous area confirm that proper certification is provided.

10.11 Is the satellite EPIRB fitted, armed and labelled correctly and inspected in accordance with the manufacturer's requirements?

The EPIRB shall be:

- capable of transmitting a distress alert through the polar orbiting satellite service operating in the 406 MHz band;"
- Installed in an easily accessible position;
- Ready to be manually released and capable of being carried by one person into a survival craft;
- Capable of floating free if the ship sinks and of being automatically activated when afloat; and
- Capable of being activated manually. (SOLAS IV/7.1.6)

Satellite EPIRBs shall be annually tested within 3 months before the expiry date, or 3 months before or after the anniversary date, of the Cargo Ship Safety Radio Certificate. The test may be conducted on board the ship or at an approved testing station; and subject to maintenance at intervals not exceeding five years, (SOLAS IV/15.9)

Notes: The vessel's name, the serial number and the maritime mobile services identity (MMSI or 15 Hex ID) should be clearly indicated on the EPIRB.

The inspection of EPIRB's should include:

- Inspection of the housing to ensure it is undamaged;

- Inspection of the hydrostatic release unit to ensure it is in good order and in date. Releases should be renewed after two years;
- Inspection of the lanyard, which should be neatly stowed and not attached to the ship;
- Ensuring that the markings remain clearly decipherable;
- Checking the battery to ensure it is in good order and in date. The battery life for most EPIRB's is 5 years;
- Carrying out a self-test. Most EPIRB's have a self-test facility which is usually a spring-loaded switch. When activated a light will indicate that the test circuits are operating correctly and sometimes this will also activate the strobe light. It is recommended that the self-test switch be held for no more than 2 flashes of the strobe light, or no longer than 1 minute after the first self-test mode burst transmission.

When the self-test is activated on a 406 MHz EPIRB, the EPIRB is allowed to radiate a single burst which is specially coded so that it is ignored by the COSPAS-SARSAT system. The EPIRB must never be tested by actual operation.

The annual testing of 406 MHz satellite EPIRB's required by SOLAS IV/15.9 requires test equipment capable of performing all the relevant measurements detailed in MSC/Circ 1040.

10.12 Are radio emergency batteries in good order and fully charged?

10.13 Are Lists of Radio Signals the latest edition and corrected up to date?

10.14 Is the vessel equipped with sufficient intrinsically safe portable radios for use on deck?

Note: Sufficient portable radios should be available to allow communications between the cargo control, the deck officer, the deck watch and the Master, as well as the pumpman if required.

10.15 Are survival craft portable VHF radios and Search and Rescue Locating Devices in good order and charged?

At least 3 two-way VHF radiotelephone apparatus shall be provided on every cargo ship of 500 gross tonnage and upwards. (SOLAS III/6.2.1.1)

The two-way radiotelephone should be capable of operation on the frequency 156.800 MHz (VHF channel 16) and on at least one additional channel. (Res. A.890/3.1)

The source of energy should be integrated in the equipment and may be replaceable by the user. In addition, provision may be made to operate the equipment using an external source of electrical energy. (Res. A.890/12.1)

Equipment for which the source of energy is intended to be user-replaceable should be provided with a dedicated primary battery for use in the event of a distress situation. This battery should be equipped with a non-replaceable seal to indicate that it has not been used. (Res. A.890/12.2)

Equipment for which the source of energy is intended to be non-user-replaceable should be provided with a primary battery. The portable two-way radiotelephone equipment should be fitted with a non-replaceable seal to indicate that it has not been used. (Res. A.890/12.3)

At least one radar transponder shall be carried on each side of every cargo ship of 500 gross tonnage and upwards. The radar transponders shall be stowed in such locations that they can be rapidly placed in any survival craft (other than the forward liferaft). On ships equipped with free-fall lifeboats, one of the transponders shall be stowed in the free-fall lifeboat and the other located in the immediate vicinity of the navigation bridge so that it can be utilised on board and ready to transfer to any other survival craft. (SOLAS III/6.2.2)

Note: The requirements for survival craft two-way VHF radios are contained in IMO Res. A.809(19).

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 11. Engine and Steering Compartments

Policies, Procedures and Documentation

11.1 Is the vessel provided with adequate operator's instructions and procedures?

Note: Engineering procedures should include at least the following:

- *Engine room organisation and operation;*
- *Unmanned machinery space (UMS) operation, when applicable;*
- *Reporting equipment deficiencies;*
- *Engine room emergency preparedness and actions in the event of an emergency;*
- *Ensuring that all essential engine room equipment is available and fully operational;*
- *Planned maintenance;*
- *The control of spare parts.*

11.2 Are the duties of the watch-standing officers and ratings clearly defined?

11.3 If the machinery space is certified for unmanned operation is it being operated in that mode?

If the machinery space is certified for unmanned operation but is not being operated in that mode because of unreliability of the UMS plant, record an Observation and describe the reason why. Do not record an observation if a UMS certified vessel is being operated in manned mode for operational purposes and where the manning level permits.

11.4 If the machinery space is being operated manned, are there sufficient engineers on board?

Note: If the machinery space is certified for unmanned operation, it will be likely that the Safe Manning Certificate will allow a reduced number of engineers to be carried. Ensure that the manning level, if operating manned, is not at that reduced level.

11.5 Has the Chief Engineer written his own standing orders and have the watch engineers countersigned the standing and night orders as read and understood?

Notes: Standing order and night order books should be checked to ascertain that all officers are instructed as to their responsibilities. Standing orders should be written by the chief engineer to reflect the specific operator's requirements, as well as his own, particular to the vessel, the trade and the experience of the engineering officers aboard at the time. It should be updated and signed by each chief engineer as they join the vessel.

Night orders should be written as and when they are required to supplement the standing orders.

11.6 Are there documented procedures that address engine room entry requirements when operating in the UMS mode, and are the personnel on-board aware of these requirements?

Notes: Procedures should be in place to ensure that no-one enters the engine compartment alone, for example to carry out final evening checks during unattended periods, without first informing the bridge. Contact should be maintained at predetermined periods.

Ratings should not be required to attend the engine room alone during unattended periods.

On vessels where a single engineer maintains a watch, there should be procedures as detailed above to regularly and frequently maintain contact with the bridge or cargo control room, unless a dead man alarm system is fitted.

11.7 Is the dead man alarm system, where fitted, in good order and used as required?

The personnel alarm should automatically give an alarm on the navigating bridge or in the officers' quarters as appropriate, if it is not reset from the machinery spaces in a period satisfactory to the Administration, but not exceeding 30 minutes. (IMO International Codes on Alarms and Indicators, 1995. 7.1.1)

11.8 Is the engine room log book adequately maintained?

Note: The vessel's SMS system should indicate which fields are required to be completed. When a vessel is operating in the UMS mode, the times when the vessel is UMS should be recorded. Details of bunkering operations and major internal oil transfers should also be recorded. The Chief engineer should sign the log book on a daily basis.

11.9 Are there procedures to restart essential equipment?

Note: A written procedure should be readily available within the engine room which should be specific to the particular ship in order to identify relevant controls. The procedure should include the following guidance, where applicable, on how to:

- Regain power from the emergency to the main switchboard;
- Charge the air receivers for the main diesel generators in order to provide electrical power to all auxiliaries (fuel and lubricating oil pumps and the boiler supply);
- Restart all auxiliaries;
- Restart the main engine and boiler.

11.10 Does the operator subscribe to a fuel, lubricating and hydraulic oil testing programme, and is there a procedure in place to take into account the results?

Note: Report which groups of oils are subject to testing programme and frequency of testing (i.e. Fuel oils, main engine lub oils, hydraulic oils, thermal oils etc. Verify the latest lube oil sample analysis is free from deficiencies. Record any deficiencies found.

11.11 Are detailed bunker transfer instructions available?

Notes: All bunkering operations should be carefully planned and executed. Pollution caused when heavy fuel oil is spilt is particularly damaging and difficult to clean up.

Personnel involved in the bunkering operation onboard should have no other tasks and should remain at their workstations during topping off. This is particularly important when bunkers are being loaded concurrent with cargo operations, so that conflicts of interest for operational personnel are avoided.

Planning of bunkering operations should include the following:

- Determining that there is adequate space for the volume of bunkers to be loaded;
- Specific procedures for storage and separation of different grades/Sulphur content of bunkers.
- The maximum filling volume;
- Controls for the setting of bunker system valves;
- Determining loading rates for the start of loading, bulk loading and topping off;
- Arrangements of bunker tank ventilation;
- Internal tank overflow arrangements;
- Verification of gauging system operation and accuracy;
- Alarm settings on overfill alarm units;
- Communication with the terminal to establish when bunkering can be undertaken;
- Methods of managing the handling of bunkers which have or may have a H₂S or benzene content and testing procedures for determining the presence of hydrocarbon or H₂S or benzene vapours;
- Method of determining the temperature of the bunkers during loading;
- Communications procedure for the operation, including emergency stop;
- Changing over tanks during loading;
- Containment arrangements and cleanup equipment to be available;
- Manning requirement to execute the operation safely.

Ship's personnel should always be alert to the possible presence of H₂S or benzene in bunker fuel.

It is preferable that a diagram of the fuel oil transfer piping be attached to the plan.

11.12 Is the vessel able to safely comply with SECA/ECA legislation or other local requirements regarding use of low sulphur fuels in boilers?

Notes: Use of low Sulphur distillate fuels presents a safety risk in boilers that have not been specifically designed or modified for such use and inspectors must establish that the boilers are certificated to be able to safely burn these bunkers or that an alternative method of heating is utilised that does not require operation of the boiler in port. The OCIMF/INTERTANKO information paper "Recommendations on the Hazard Assessment of Fuel Changeover Processes" provides further guidance. If the vessel is not trading in areas where low Sulphur is required, the question is to be answered 'NA'.

11.13 Are written instructions provided to control the change from residual to low-sulphur fuels?

Notes: Instructions should demonstrate that all aspects of the process have been considered and set out the steps to be followed when changing main boiler(s) and auxiliary machinery fuel supply from residual to low Sulphur fuel oil and vice versa to ensure an uninterrupted fuel supply. The OCIMF/INTERTANKO information paper "Recommendations on the Hazard Assessment of Fuel Changeover Processes" provides further guidance. If the vessel does not trade in SECA areas, question to be answered 'NA'.

Planned Maintenance

11.14 Is a planned maintenance system being followed and is it up to date?

Notes: Although there is no specific requirement for any particular computer or paper-based planned maintenance system (PMS) to be provided, the Company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant Regulations and with any additional requirements which may be established by the Company and specified in the ISM Code Section 10.1. Inspectors must ascertain that a PMS is in place and that it is accurate, up to date, effective and maintained in accordance with the requirements of the ISM Code, the Operator's procedures and of the best practices set out in Tanker Management Self-Assessment (TMSA) Element 4. Responsible personnel should be able to demonstrate familiarity with the system.

The planned maintenance programme should include:

- *Details of maintenance schedules whether carried out according to running hours or calendar period, or if condition monitoring is used as a substitute;*
- *Details, referenced to equipment manufacturer's instructions or experience, of what maintenance is required;*
- *Historical data on maintenance and repair work which has been carried out;*
- *Spare parts inventory;*
- *Any proposed major repairs or overhauls should have a completion schedule, with spare parts verified as being on board or on order.*

Inspectors must take into account the Class Machinery Survey notation under which the vessel is operated and of the planned maintenance system associated with the notation. Planned maintenance may be conducted under various different Class survey schemes; however, not all of these require Class approval. These schemes are:

Machinery Renewal or Engine Survey (ES) *Class approval of the PMS is not required.*

Planned Maintenance Scheme (PMS) *A "Certificate of Approval for Planned Maintenance Scheme" is required.*

Continuous Survey Machinery (CSM) *Vessel is approved for Continuous Survey of machinery, the procedure depends whether the PMS is approved or not:*

Approved Machinery Planned Maintenance Scheme (MPMS) *Class Approval required for specific items of machinery to be examined by the Chief Engineer without the presence of Class surveyor.*

Non – Approved Machinery Planned Maintenance Scheme. *Does not require class approval. Where possible Class should perform surveys, Where Class attendance is not possible the Chief Engineer can perform inspection which must then be credited by Class.*

Planned Maintenance System (Condition Monitoring) PMS(CM). *Under either the PMS or PMS(CM) "alternative" survey systems vessels will carry the appropriate Class notations but in either case, a specific Class approval certificate for the PMS will not be issued.*

Where PMS notation is included in the Certificate of Class, then the latest version of the PMS installed on board and the Type Approval certificate for the specific PMS version should be available on board.

11.15 Is a comprehensive and up to date inventory of spare parts being maintained?

Note: Inventory of spare parts should include critical spares

Safety Management

11.16 Is an engineer's call alarm fitted and is it in good order and tested regularly and the results recorded?

Note: Inspectors should consider testing this critical alarm. To do so if permitted alongside, request that a suitable test alarm be initiated which should sound on the bridge, in the duty engineer's quarters and in public rooms. If not answered within the specified period a back-up alarm system should be activated.

11.17 Are emergency escape routes effectively marked, unobstructed and adequately lit?

11.18 Is the level of lighting in all areas of the engine room satisfactory?

11.19 Do records indicate the regular testing of emergency equipment?

Notes: Emergency equipment will include, where fitted, the emergency fire pump, main fire and foam pumps, emergency air compressor, emergency generator, emergency generator switchboard, emergency steering,, emergency stops, engineers alarms and bilge ejectors.

Testing of the emergency generator should be carried out under load, but to do this may require the vessel to be blacked out. This testing is not to be conducted during a SIRE inspection. Inspectors must establish that the operator has a requirement for this test and determine from records that it is carried out at least annually.

Where fitted, the emergency air compressor should be regularly tested to the starting pressure of the diesel generator. The emergency air reservoir should be permanently maintained at the required pressure.

11.20 Is the fuel system fitted with valves that are capable of being closed from outside the machinery space and are they regularly tested and in good order?

Oil fuel pipes, which, if damaged, would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 l and above situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated. (SOLAS II-2/4.2.2.3.4)

Notes: The method of valve closure should be able to operate in the absence of power from the vessels normal or emergency generators sets and may utilise pneumatic/ hydraulic stored power or the use of valves wheels located outside of the machinery space and fitted with reach-rods to the shut-off valves. In either case, it is important that the remote means of closure are tested regularly from the remote position and proven to operate correctly. In the case of power operated valves that are operated using a hydraulic hand pump, sufficient hydraulic oil must be available to ensure that all valves served by the system can be fully closed. The position and identification of each of the closing devices must be clearly marked. Records should be checked to verify that testing has taken place. Personnel must be questioned to ensure that the use of these devices is fully understood.

11.21 Are engine room emergency stops for ventilation fans clearly marked and do records indicate that they have been regularly tested?

11.22 Are diesel engine high and low pressure fuel delivery pipes adequately jacketed or screened?

External high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors shall be protected with a jacketed piping system capable of containing fuel from a high pressure line failure. A jacketed pipe incorporates an outer pipe into which the high pressure fuel pipe is placed, forming a permanent assembly. The jacketed piping system shall include a means for collection of leakages and arrangements shall be provided for an alarm to be given of a fuel line failure. (SOLAS II-2/4.2.2.5.2)

11.23 Are diesel engine exhausts and other hot surfaces in the vicinity of fuel, diesel, lubricating and hydraulic oil pipes protected against spray?

Surfaces with temperatures above 220°C which may be impinged as a result of a leak from an oil system failure shall be properly insulated. (SOLAS II-2/4.2.2.6.1)

Precautions shall be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces. (SOLAS II-2/4.2.2.6.2)

11.24 Are hot surfaces, particularly diesel engines, free of any evidence of fuel, diesel and lubricating oil?

Note: Lagging and insulation should be in good condition and free from oil.

If there is evidence of oil leakage or oil soaked lagging this must be recorded as an Observation.

11.25 Are purifier rooms and fuel and lubricating oil handling areas ventilated and clean?

Note: A significant number of major incidents occur as a result of engine room fires. It is of particular importance that purifier rooms and oil handling areas are maintained in a clean condition.

11.26 If the vessel class notation allows UMS operation, are main engine bearing temperature monitors, or the crankcase oil mist detector, in good order?

Internal combustion engines of 2,250 KW and above or having cylinders of more than 300 mm bore shall be provided with crankcase oil mist detectors, or engine bearing temperature monitors, or equivalent devices. (SOLAS II-1/47.2)

Note: Testing of the detector alarm can be carried out either electronically or by removing a cover and blocking the sensor path.

If the vessel does not have a class notation to operate UMS and does not have a crankcase oil mist detector or main engine bearing monitoring then answer the question 'NA'. However if the vessel does have the

crankcase oil mist detector or main engine bearing monitoring equipment then the question should be answered as if operating UMS.

11.27 Where hydraulic aggregate pumps are located within the main engine compartment, is an oil mist detector fitted?

Note: In vessels fitted with deep-well pumps driven by hydraulic pressure packs, pressure in the transmission pipes can be very high. If the aggregate pumps are located within the engine compartment it is advisable that an oil mist detector be fitted. Where the aggregate pumps are located within a dedicated, fully segregated compartment within the main engine compartment, the question should be answered N/A.

11.28 Are the main switchboard, alternators and other electrical equipment satisfactorily protected from water spray?

If the main switchboard is not located in the engine control room or other protected location, record in Comments, the measures that have been taken to protect it from water spray.

Note: Risk due to water spray in the event of failure of sea water pipes, including fire mains and hydrants, should be assessed.

11.29 Is deck insulation provided to the front and rear of medium power (i.e. 220V and above) electrical switchboards and is it in good order?

Where necessary non-conducting mats or gratings shall be provided at the front and rear of the switchboard. (SOLAS II-1/45. 2)

Non-conducting deck coverings, such as non-conducting mats or gratings, suitable for the specific switchboard voltage should be installed for personnel protection at the front and rear of the switchboard and should extend the entire length of and be of sufficient width to suit, the operating space.

(USCG 46 CFR 111.30-11)

Notes: The USCG requirements apply to switchboards exceeding 250 volts. Some decks are made from insulating composite material and will not need extra insulation. Insulating matting is only required at the front and rear of switchboards. Individual machinery starter boxes throughout the Machinery space are NOT considered switchboards and do not require insulating matting in front or behind them

11.30 Are gauge glass closing devices on oil tanks of a self-closing, fail-safe type and not inhibited?

11.31 Are self-closing sounding devices to double bottom tanks in good order and closed?

11.32 Is all moving machinery provided with effective guards where this presents a hazard?

Note: Guards should be fitted wherever the equipment presents a hazard to personnel.

11.33 Do engine room machine tools have adequate eye protection available?

11.34 Are records maintained for the regular inspection and testing of lifting devices?

Note: Lifting devices includes cranes, portable and beam chain blocks, pad eyes, lifting beams etc.

11.35 Is an inspection and maintenance programme in place for other lifting equipment such as wire slings?

11.36 Is all loose gear in the machinery spaces, stores and steering compartment properly secured?

11.37 Are machinery spaces and steering compartments clean and free from obvious leaks and is the overall standard of housekeeping and fabric maintenance satisfactory?

Note: Workshops, compressor rooms, chemical stores, spare gear stores, electrician's store/workshop, IG rooms, and boiler rooms should be checked. Safety notices and signs appropriate to the specific compartments should be posted.'

11.38 Are bilges free of oil, rubbish and sediment?

Note: Oily areas indicate a lack of adequate maintenance and cleanliness. However, a small amount of oil in savealls should not be considered unsatisfactory.

11.39 Is the bilge high level alarm system regularly tested and are records maintained?

Note: Inspectors should consider requesting that this critical alarm be tested in their presence. It should be borne in mind that most bilge alarms are fitted with time delays.

11.40 Are seawater pumps, sea chests and associated pipework in good order and free of hard rust and temporary repairs, particularly outboard of the ship-side valves?

Note: The condition of sea chests, sea water lines, storm valves and hull penetrations should be carefully checked to ensure that they are in good condition.

Evidence of hard rust or deterioration should be recorded as an Observation.

Machinery status

11.41 Are the following, where applicable, all in good order and do they appear to be well maintained?

The main engine;	
Auxiliary engines and generators, including shaft g and emergency generators where fitted.	<i>Notes: Consider examining log book entries to determine that any idle generators have been run recently. Check that the automatic switch over arrangements and protection devices such as reverse power relays are in good order and that engineers are familiar with procedures for changing over generators.</i>
Boilers, including waste heat and domestic boilers;	<i>Notes: Where automated boilers are fitted, they should be being operated in automatic mode. Boiler controls should not be overridden or by-passed.</i>
Compressors including main, instrument and emergency air compressors;	
Purifiers and fuel oil handling equipment;	
Inert gas plant, including the fans, scrubber, analyser and valves;	<i>Note: Records should confirm that tests of trips have been carried out.</i>
Sewage plant;	
Bilge pumping arrangements and the oily water separator;	
Pipework, including steam, fuel, lubricating oil, seawater, sewage, drain and air pipes, etc.	
Refrigeration and air conditioning machinery;	
Hydraulic aggregate pumps;	
Ventilation fans and trunking;	
Stern tube sealing arrangements;	
Any other items of machinery, including stand-by machinery.	
Burners, tubes, uptakes, exhaust manifolds and spark arrestors (if fitted)	<i>As a precaution against funnel fires and sparks, burners, tubes, uptakes, exhaust manifolds and spark arrestors should be maintained in good working condition. (ISGOTT 4.2.4.1) Boiler tubes should be soot blown prior to arrival and after departure from a port. Boiler tubes should not be soot blown when the ship is in port. (ISGOTT 4.2.4.2) Notes: An Operator's policy should specify the maintenance and cleaning procedures to avoid spark emissions. Log book entries should confirm that these have been conducted.</i>

11.42 Are engineers familiar with the procedure for taking over the controls for manoeuvring the vessel from the bridge in an emergency?

Note: Procedures should be available for this method of operation. Emergency control can be from the engine side for direct drive engines or at a local position to control the pitch of the propeller if the vessel is fitted with a CPP. In all cases instructions should be posted and communication systems should be in place. If vessel is fitted with a CPP, the engineers should be aware of the CPP failure mode. It is recommended that a notice indicating the failure mode is in place.

11.43 Are concise starting instructions for the emergency generator clearly displayed?

Each emergency generating set arranged to be automatically started shall be equipped with starting devices approved by the Administration with a stored energy capability of at least three consecutive starts. A second source of energy shall be provided for an additional three starts within 30 minutes unless manual starting can be demonstrated to be effective. (SOLAS II-1/44.2)

Notes: These instructions are not for the use of the qualified engineering personnel, but for others who might be required to start the generator in an emergency and ensure there is instruction on how to put power on the emergency switchboard if not an automatic system.

Where the emergency generator starting source relies on a single starter motor, then a spare starter motor should be available.

11.44 Is the emergency generator reserve fuel tank provided with sufficient fuel?

The generator should be capable of providing full load requirements for at least 18 hours. (SOLAS II-1/43.2)

Notes: This may not necessarily mean a full tank. A minimum quantity to provide sufficient fuel for this requirement should have been established.

If necessary, the emergency generator fuel tank should be charged with fuel designed for use in sub-zero temperatures.

Every oil fuel pipe, which, if damaged, would allow oil to escape from a storage, settling or daily service tank situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated. (SOLAS 74 II-2/15.2.5)

Oil fuel pipes, which if damaged would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 litres and above situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such the tanks are situated. (SOLAS 2004 II-2/4.2.2.3.4)

The controls for remote operation of the valve for the emergency generator fuel tank shall be in a separate location from the controls for remote operation of other valves for tanks located in machinery spaces. (SOLAS 2004 II-2/4.2.2.3.4)

11.45 Where an emergency generator is not fitted, are engine room emergency batteries in good order and fully charged?

Note: The emergency batteries must supply the designed power load for up to 18 hours.

11.46 Is all electrical equipment including junction boxes and cable runs in good order?**11.47 Are switchboards free of significant earth faults?**

Note: Class rules require a minimum insulation resistance of 1 megohm (1 million ohms). Good practice suggests that a much higher standard, as near to infinity as possible, but not less than 5 megohms, should be aimed for. This should be achievable on a 440 volt system, but on a 220 volt system 2 megohms is acceptable due to the large number of parallel circuits.

Steering Compartment**11.48 Has the emergency steering gear been tested within the past three months and are the results recorded?**

Emergency steering drills shall take place at least once every three months in order to practise emergency steering procedures. These drills shall include direct control within the steering gear compartment, the communications procedure with the navigation bridge and, where applicable, the operation of alternative power supplies. (SOLAS V/26.4)

11.49 Are emergency steering gear changeover procedures clearly displayed in the steering compartment and in the wheelhouse?

Simple operating instructions with a block diagram showing the change-over procedures for remote control systems and steering gear power units shall be permanently displayed on the navigation bridge and in the steering gear compartment. (SOLAS V/26.3.1)

11.50 Are officers familiar with operation of the steering gear in the emergency mode?

All ship's officers concerned with the operation and/or the maintenance of steering gear shall be familiar with the operation of the steering systems and with the procedures for changing from one system to another. (SOLAS V/26.3.2)

Note: The opportunity should be taken if possible to request that an officer demonstrates the operation of the emergency steering gear.

11.51 Is the steering gear emergency reserve tank fully charged?

A fixed storage tank shall be provided having sufficient capacity to recharge at least one power actuating system including the reservoir. (SOLAS II-1/29.12.3)

Note: This may not necessarily mean a full tank. A minimum level to comply with these requirements should have been established.

11.52 Are the arrangements for the provision of heading information adequate?

Ships with emergency steering positions shall at least be provided with a telephone or other means of communication for relaying heading information to such positions.

(SOLAS 1974 V/12(f) and SOLAS 2004 V/19.2.1.9)

In addition, ships of 500 gt and upwards constructed after 1st February 1992 shall be provided with arrangements for supplying visual compass readings to the emergency steering position.

(SOLAS 74 V/12(f) and SOLAS 2004 V/19.2.5.2)

11.53 Are communications with the bridge satisfactory?

11.54 Is the rudder angle indicator clearly visible at the emergency steering position?

11.55 Is access to steering gear unobstructed?

11.56 Is the steering compartment fitted with suitable handrails, gratings or other non-slip surfaces?

The steering gear compartment shall be provided with suitable arrangements to ensure working access to steering gear machinery and controls. These arrangements shall include handrails and gratings or other non-slip surfaces to ensure suitable working conditions in the event of hydraulic fluid leakage. (This regulation applies to all vessels (petroleum, chemical and gas tankers) except those of less than 10,000 gt built before 1st July 1986). (SOLAS II-1/29.13.2)

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Chapter 12. General Appearance and Condition

Remarks should be recorded in Additional comments relating to the superficial condition of the coating and appearance of the hull, weather decks, superstructure and on the condition and cleanliness of the accommodation and living quarters including hygiene and sanitation.

Note: Check that each area, including structure, pipework, fittings, ladders, catwalks, rails, etc., are in good order and that they are clean, painted and properly maintained.

Hull, superstructure and external weather decks

12.1 Is the general condition, visual appearance and cleanliness of the hull satisfactory?

In the event of accidental or other exceptional discharge of oil, a statement shall be made in the Oil Record Book Part II of the circumstances of, and the reasons for, the discharge. (Oil Record Books Introduction Parts I and II).

Note: The hull should be free from oil staining, extensive coating breakdown or excessive marine growth. Record in comments approximate percentage coating breakdown or areas of marine growth. The hull may be oil stained by passing through an area of oil and not be recorded in the Oil record book. If the hull is stained in this way, record of passing through oil areas should be recorded in the deck log book if such transit occurred during daylight hours.

12.2 Are hull markings clearly indicated and correctly placed?

The ship's identification number shall be permanently marked:

- In a visible place either on the stern of the ship or on either side of the hull, amidships port and starboard, above the deepest assigned load line or either side of the superstructure, port and starboard or on the front of the superstructure; and,
- In an easily accessible place either on one end of the transverse bulkheads of the machinery spaces, or on one of the hatchways or, in the case of tankers, in the pump room. (SOLAS XI-1/3.4)

The permanent marking shall be plainly visible, clear of any other markings on the hull and shall be painted in a contrasting colour. (SOLAS XI-1/3.5.1)

The permanent marking referred to in paragraph 1 shall be not less than 200 mm in height. The permanent marking referred to in paragraph 2 shall be not less than 100 mm in height. The width of the marks shall be proportionate to the height. (SOLAS XI-1/3.5.2)

The requirement for the ship's identification number shall be complied with not later than the first scheduled dry-docking after 1st July 2004 for ships constructed before that date. (SOLAS XI-1/3)

Note: The following should also be clearly indicated, where applicable:

- The vessel's name;
- Loadlines;
- Draft marks;
- Thruster warnings;
- Tug push points.

12.3 Is the general condition, visual appearance and cleanliness of the weather decks satisfactory?

12.4 Do decks in working areas have clearly identified non-slip surfaces?

12.5 Is the general condition of service pipework satisfactory and is it free from significant corrosion and pitting and soft patches or other temporary repairs?

Notes: The following deck pipework should be examined, particularly on the underside, for external indications of corrosion and for patching or accelerated wear caused by rope abrasion:

- Hydraulic and pneumatic pipework;
- Fire mains and associated fittings;
- Deck steam lines;
- Compressed air lines;
- Tank cleaning lines.

Pipe securing arrangements should be intact and permit free movement of the pipes as necessary.

12.6 Are pipe stands, clamps, supports and expansion arrangements satisfactory?

- 12.7 Are all deck openings, including watertight doors and portholes, in good order and capable of being properly secured?**
- 12.8 Are fuel, ballast and other space vents and air pipes in good order and does visual evidence indicate regular maintenance?**
Note: Vent heads should be regularly dismantled to prove that flame screens, where fitted are clean and in good order and that the closing device which prevents the ingress of water is also in good condition and operating correctly.
- 12.9 Are all vents and air pipes clearly marked to indicate the spaces they serve?**
- 12.10 Is the general condition, visual appearance and cleanliness of the superstructure satisfactory?**

Electrical Equipment

- 12.11 Is deck lighting adequate?**

Notes: The level of deck lighting should be adequate to allow:

- *Sufficient visibility to permit safe access to all areas of the deck*
- *The safe use of mooring equipment;*
- *The monitoring of the deck area for spills and leakages;*
- *The monitoring of all deck areas and the adjacent surrounding areas to prevent unauthorised access.*

- 12.12 Is the general condition of electrical equipment, including conduits and wiring, satisfactory?**

- 12.13 Are light fittings in gas-hazardous areas Ex 'd' rated and in good order?**

Notes: Lights will be either explosion-proof or pressurised. The flame paths of explosion-proof lights should not be painted over. Fluorescent fittings will generally have flame paths at each end.

The manufacturer's or Administration's certificate approving the fitting for use in gas-hazardous areas will be invalidated if the correct bolts for securing the cover, or the correct light bulb size, are not used.

Particular attention should be paid to the following:

- *Cracks in metal, cracked or broken glasses or failure of cement around cemented glasses in flameproof or explosion proof enclosures;*
- *Covers of flameproof enclosures to ensure that they are tight, that no bolts are missing, and that no gaskets are present between mating metal surfaces;*
- *Each connection to ensure that it is properly connected;*
- *Possible slackness of joints in conduit runs and fittings;*

Vent fan, cargo pump and cargo winch motors and lighting are likely to be found within gas-hazardous areas. An Ex'd' rating means that the equipment can withstand an internal explosion without igniting the outside atmosphere. Ex 'e' is an increased safety rating.

Internal Spaces

- 12.14 Are internal spaces and storerooms clean, free from debris and tidy?**

- 12.15 Is the forecastle space free of water?**

Accommodation Areas

- 12.16 Are alleyways free of obstructions and exits clearly marked?**

- 12.17 Are accommodation, public spaces, including smoke rooms, mess rooms, sanitary areas, food storerooms, food handling spaces, refrigerated spaces, galleys and pantries clean, tidy and in a hygienic condition?**

Notes: Unburned fuel or fatty deposits in galley ranges, within flue pipes and in the filter cowls of galley vents can cause fire and must be maintained in a clean condition.

Oil and deep fat fryers should be fitted with thermostats to cut off the electrical power and prevent overheating.

12.18 Are laundries free of accumulations of clothing that could constitute a fire hazard?

12.19 If fitted, is the Ship's Hospital clean and tidy and ready for use?

Note: The Ship's hospital should be ready for immediate use. The Ship's hospital should not be used as an additional cabin or used as a store room. If the vessel is not equipped with a Ship's hospital answer the question 'NA'

12.20 Is the level of accommodation lighting satisfactory?

12.21 Is the condition of electrical equipment in the accommodation satisfactory?

12.22 Are personnel alarms in refrigerated spaces in good order and operational?

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

Remarks should be recorded in Additional comments relating to the superficial condition of the coating and appearance of the hull, weather decks, superstructure and on the condition and cleanliness of the accommodation and living quarters including hygiene and sanitation.

Chapter 13. Ice Operations

This section is to be completed if the vessel has an Ice Class Notation or has a valid winterisation certificate. The OCIMF publication 'The Use of Large Tankers in Seasonal First Year Ice and Severe Sub-Zero conditions' provides guidance on the safe operation of tankers in areas affected by seasonal first year ice. The IMO Guidelines for Ships Operating In polar Waters sets out recommendations that address ship structure, lifesaving and fire-fighting equipment, operational issues and environmental considerations. These voluntary guidelines are intended for ships constructed after 1 Jan 2011. Existing ships are encouraged to comply with the Code as far as reasonable and practical. The OCIMF Briefing Paper for chartering and Vetting Groups titled "The Use of Large Tankers in Seasonal First-Year Ice or Severe Sub-Zero Conditions" contains comprehensive guidance relating to the use of tankers >50,000dwt with no, or low ice class that are likely to encounter first-year ice.

For the purpose of this chapter, 'Severe sub-Zero' conditions are defined as forecast daily mean ambient temperatures below -25°C. (The Use of Large Tankers in Seasonal First-Year Ice and Severe Sub-Zero Conditions - Oct 2009)

13.1 Are procedures available for operations in ice?

Verify that procedures for operating in ice are available that will typically include the following information:

- Risk management and risk mitigation measures when preparing for and operating in ice
- Principal particulars of the vessel
- Operating limitations of the vessel, if applicable, based on the ice classification
- Loading procedures and limitations including any applicable restrictions on carrying pollutants in tanks and compartments against the hull
- Maximum load condition and distribution and stability criteria
- Contingency Plans and evacuation procedures
- Spill response procedures
- Procedures for checking hull integrity
- Procedures for passage assisted by an ice breaker or in ice convoy
- Procedures for towing operations in ice
- Guidance on passage planning
- Guidance on operating machinery and systems
- Guidance on manning e.g. bridge watchkeeping requirements

13.2 Are means in place to detect ice?

Such means may include searchlights, thermal imaging, ice radar or a visual lookout forward. Searchlights should be of a narrow beam type and mounted on each bridge wing or at the bow. It is recommended that search lights mounted on bridge wings are below conning position eye level to reduce disturbance during heavy snow fall. Minimum 2kW halogen or 1kW xenon. The searchlights should be fitted with an adequate means of de-icing to ensure proper directional movement. The ice radar will normally comprise of a 12 bit processor and dedicated display. The 12 bit processor provides enhanced detection and resolution in ice. **The means of ice detection in place to be recorded as a Comment.**

13.3 Are systems in place for the routine receipt of navigational, meteorological and environmental data including ice data, ice charts and satellite images?

Verify that systems are in place to enable the regular receipt of up-to-date ice information.

13.4 Has training specifically addressing navigation in ice been provided to members of the vessel's complement?

Training includes formal courses, in-house or on-board training and the regulated use of videos and Computer Based Training (CBT).

Record details of the training in Comments – e.g. course name, method of delivery, provider, who trained and date of training.

13.5 Are means in place on at least one main engine sea water chest to prevent its freezing or clogging?

Methods employed to prevent freezing or clogging include heating, use of hot water or steam and a system designed to blow out any ice blockage. **Means employed should be recorded as a Comment.**

13.6 Are procedures available for operations in sub-zero temperatures?

Verify that procedures for operating in sub-zero temperatures are available that will typically include the following information:

- Means to protect personnel from the effects of sub-zero temperatures, e.g. cold weather clothing, management of watch routines and duty periods.
- Arrangements for accommodation heating.
- Measures to maintain safe access and movement around the vessel.
- Arrangements to ensure operability of wheelhouse equipment and systems and the maintenance of an effective lookout.
- Procedures to ensure the operability of critical equipment and systems including fire-fighting systems and lifesaving appliances.
- The management of cargo and ballast systems.

13.7 Are means and/or procedures in place to protect personnel from exposure to sub-zero temperatures?

Procedures should include the provision of protective clothing suitable for anticipated cold weather conditions. Particular attention should be given to ensuring that personnel having duties in exposed locations are suitably protected through the provision of cold weather PPE and the management of work routines. Examples of such duties include bow lookout, gangway watch and bridge wing lookout. For guidance on PPE and working in exposed locations, refer to OGP Report 398.

Record as a comment whether bridge wings are open or enclosed.

13.8 Are means provided to maintain accommodation spaces at a temperature suitable for habitation?

Accommodation heating systems should have adequate redundancy. External bulkheads within the accommodation should be insulated to prevent the formation of condensation when in sub-zero temperatures.

The following is extracted from MLC Guideline B3.1.3 – Heating:

1. The system of heating the seafarer accommodation should be in operation at all times when seafarers are living or working on board and conditions require its use.
2. In all ships in which a heating system is required, the heating should be by means of hot water, warm air, electricity, steam or equivalent. However, within the accommodation area, steam should not be used as a medium for heat transmission. The heating system should be capable of maintaining the temperature in seafarer accommodation at a satisfactory level under normal conditions of weather and climate likely to be met within the trade in which the ship is engaged. The competent authority should prescribe the standard to be provided.
3. Radiators and other heating apparatus should be placed and, where necessary, shielded so as to avoid risk of fire or danger or discomfort to the occupants.

13.9 Are means and procedures in place to ensure safe access and movement about the vessel in sub-zero conditions?

Procedures should address the need to ensure that walkways and access ladders are maintained in a safe condition. Vessels should be equipped with materials and/or equipment to enable clearance of snow and ice from critical areas e.g. wooden mallets, heated stairs and handrails.

13.10 Are means in place to prevent the icing of wheelhouse windows?

Wheelhouse windows should be heated to prevent them from icing up. Heat may be provided by blowers or by heating elements within the glass. Unless they are heated and used in conjunction with heated windows, window wipers are not effective in sub-zero temperatures as the wipers may freeze to the windows or blur any ice that may be present. 'Clear view screens' consisting of a glass disc rotating at high speed may be effective if the screens are provided with heating.

13.11 Are radars fitted that are of a type classed as being suitable for operation in sub-zero temperatures?

The radar antennae working temperature range can normally be obtained by consulting the specifications section of the radar manufacturers manual. Occasionally the specifications quote standards rather than actual temperature values; any reference to IEC 60945 includes suitability for working temperature limits -25C to +55C. It should be verified that the working temperature range of the scanner and scanner motor is suitable for use in sub-zero temperatures. The working temperature range should be recorded. Lubricants used in the scanner drive should be suitable for sub-zero temperatures.

13.12 Are means and/or procedures in place to ensure that air driven whistles and fog horns are operable at sub-zero temperatures?

Note: Record means employed, e.g. heater.

13.13 Are means and/or procedures in place to ensure the operability of critical equipment and systems in sub-zero air temperatures?

Procedures should address the need to prepare critical equipment prior to entering the cold weather area. Particular attention should be given to ensuring the suitability of fuels used in systems such as those serving the emergency generator and lifeboat engine.

13.14 Are means and/or procedures in place aimed at ensuring the ready availability of life saving appliances?

Procedures should include actions to ensure the ready availability of life saving appliances that include the following:

- The need for Thermal Protective Aids and immersion suits should be addressed and equipment suitable for anticipated temperatures should be provided prior to the vessel entering cold areas.
- Ensuring that fuel and engine oils used in lifeboats and rescue boats should be of a type suitable for operation in sub-zero temperatures. Where fitted, heating systems should be checked to be operational.
- The need to move lifeboat water containers to an adjacent heated space.
- The requirement to keep lifeboats and launching equipment free of ice accretion. An ice removal mallet should be available in the vicinity of lifeboats and liferafts or electrical trace heating provided to protect critical items such as door seals.

13.15 Are means and/or procedures in place aimed at ensuring the operability of fire-fighting systems?

Fire pumps, including the emergency fire pump, should be in heated spaces or protected from freezing. Arrangements for the emergency fire pump should take into account the prevention of clogging of sea inlets with ice. The procedure should include actions to ensure the ready availability of systems.

When in sub-zero temperatures, the fire main should be drained from the lowest point and the drain valve closed in order to keep the system ready for operation. The procedure should address the need to regularly check the drained condition of the line by operating the drain valve. The procedure should also consider the method of re-pressurising the fire main in sub-zero temperatures with the aim of avoiding freezing of hydrants and monitors.

Fire-extinguishing systems should be designed or located to ensure their continued operability in conditions of ice or snow accumulation and sub-zero temperatures.

Water or foam extinguishers should not be located in any position exposed to freezing temperatures.

Fire main isolating valves should be located so that they are accessible. Any isolating valves in exposed locations should be protected from exposure to freezing spray. Hydrants should be positioned or designed to remain operable under all anticipated conditions, taking into account ice accumulation. Hydrant valves should be of a design that ensures ease of operation by personnel wearing heavy gloves

Note: The location of the drain point for the deck fire main should be recorded.

13.16 Are means and/or procedures in place to ensure the proper functioning of air intakes and fire flaps?

Note: Record means used, e.g. regular checks, protected location, trace heating.

13.17 Are means and/or procedures in place to protect piping systems on deck from the risk of freezing?

Procedures should require the integrity of deck lines to be checked prior to use. All cargo, ballast, tank cleaning and COW lines on deck should be thoroughly drained after their pressure testing or use. Lines should be drained from the lowest point in the system. Means should be available to protect valves such as those on tank gauging/dipping points and pressure gauges from freezing and this may be through the use of suitable grease and canvas covers.

Cargo manifold drip trays should be drained of any water.

The deck air line should be isolated and drained. If air is required on deck, it should be supplied through an air drier.

Hydraulic systems serving mooring and other equipment on deck should be circulated to maintain even heating of the oil. This may be achieved by taking mooring winches out of gear and slowly rotating them or by use of a heating bypass system designed to keep the oil warm.

13.18 Are means and/or procedures in place to ensure the operability of ballast systems and any drenching systems at sea temperatures of -2°C and sub-zero air temperatures?

Note: Means and procedures include for e.g. heating arrangements, air bubbling and ballast water exchange. The procedures should include guidance on ballast handling when loading cargoes at a sub-zero temperature.

Record means used.

13.19 Are means or procedures in place to prevent the icing up of cargo tank primary and secondary venting arrangements?

If P/V valves are not provided with a heating system, a procedure should require that the valves are regularly checked by manual opening during cargo operations. The frequency of manual opening should be established to ensure continued operation of the valve and prevent restricted movement through ice formation.

The IG deck water seal should be provided with an operational heating system. Procedures should require that it is regularly checked during operations to ensure a positive water flow and that inlet and outlet lines remain clear.

The P/V breaker should be filled with anti-freeze (glycol-based as opposed to methanol-based) in accordance with manufacturer's guidance prior to entering the cold area. It is important that the correct concentration of ethylene glycol and water is used - excessive concentrations may reduce effectiveness.

Essential valves on IG and venting systems should be protected with suitable grease and a canvas cover.

Flame arrestors should be confirmed to be free of snow or ice before the start of cargo operations.

13.20 Are means and/or procedures in place to prevent the icing up of air pipes to settling and service tanks required for the operation of the main propulsion plant and essential auxiliaries?

If no heating arrangement is provided, verify that there is a procedure in place aimed at ensuring that the air pipes remain clear.

Note: Means employed should be recorded as a Comment.

13.21 Has training specifically addressing operations in sub-zero temperatures been provided to the vessel's complement?

Training includes formal courses, in-house or on-board training and the regulated use of videos and Computer Based Training (CBT).

Note: Record details of the training in Comments – e.g. course name, method of delivery, provider, who trained and date of training.

Additional comments:

If the Inspector has comments in respect of the subject matter covered by the Chapter additional to those which the Inspector may make in response to the specific questions in the Chapter, the Inspector should include such additional comments in this section.

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