SUMMARY

Executive summary: This document provides the report of the Correspondence Group on Transport of Iron Ore Fines in Bulk, containing the comments in the final round of the correspondence group.

Strategic direction: 5.2

High-level action: 5.2.3

Planned output: 5.2.3.3

Action to be taken: Paragraph 3

Related documents: DSC 17/4/34, DSC 17/INF.9, DSC 17/17; MSC 91/22; DSC 18/6/13 and DSC 18/INF.9 to INF.13

General

1 The Sub-Committee, at its seventeenth session, re-established the Correspondence Group on Transport of Iron Ore Fines in Bulk, hereafter simply expressed as "CG", under the coordination of Japan (DSC 17/17, paragraph 4.34). The terms of reference for the CG and the participants to the CG are provided in document DSC 18/6/13 (CG report, part 1).

Comments in the final round of the CG

2 To facilitate the discussion by the Sub-Committee, the comments in the final round of the CG are set out in the annex to this document.

Action requested of the Sub-Committee

3 The Sub-Committee is invited to note the information set out in the annex to this document.

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ANNEX

COMMENTS IN THE FINAL ROUND OF THE CORRESPONDENCE GROUP
(INCLUDING THE COORDINATOR’S REMARKS IN THE FINAL ROUND)

Note: The comment by each CG participant is expressed with the name of the member government or the organization in bold font and the text followed by the name in green.

2013 June 11

CG on Transport of Iron Ore Fines in Bulk – 3rd round
Coordinator’s remarks

When the CG participants have comments on the coordinator’s remarks, please send them by 21st of June. Please DO NOT make comments directly on the comments/opinions of other CG participants, in order to prevent confusion.

Note: After the aforementioned deadline of the comments, I will prepare the draft report and submit it to the Japanese government, for the procedure for submitting document to the IMO, and invite the CG participants to check the draft report.

To facilitate the preparation of the document with consolidated comments, please DO NOT use "comment insertion" or "track change" function of the M.S. Word when you insert comments in this document for coordinator's remark. Please insert full sentences AFTER THE RELEVANT PARAGRAPH, but not after a sentence/word in a paragraph, and indicate the relevant sentences/words in your comments as necessary.

Here, I would like to recall that I have invited the "Technical Research (Working) Group" (TWG) to join the CG as the observer and the contact person of the TWG is Mr. Michael von Herff, as mentioned in E-mail dated on December 17. So, if you have questions or comments on the research by the TWG, please contact Mr. Michael von Herff. Sending CC to the CG participants is appreciated.

1 Outline of the previous discussions

Though the results of previous discussions in the CG will be reviewed in this document, based on the results of the research by the TWG, I would like to summarize the results of discussions in the first round, because there was no substantial discussion in the second round.

- The CG agreed to use "IRON ORE FINES" as the BCSN.

- The CG agreed the inclusion of new mandatory provisions for application in the individual schedules for Iron Ore Fines and for IRON ORE, in principle.

- The majority of the CG supported the following text for the section for DESCRIPTION:
  "Iron ore varies in colour from dark grey to rusty red and varies in iron content from haematite (high grade ore) to ironstone of the lower commercial ranges."

- The CG postponed the discussion on SIZE.
- The CG agreed to use "not applicable" for the column for ANGLE OF REPOSE.

- Regarding bulk density, it was pointed out that 1250 kg/m³ was not realistic. The United Kingdom proposed 1,850 to 3,850 kg/m³. Australia and Brazil proposed 1,500 to 3,500 kg/m³. Thus, the coordinator tentatively proposed to use 1,500 to 3,850 kg/m³ as BULK DENSITY and 0.26 to 0.67 m³/ton as STOWAGE FACTOR.

- Regarding the chemical properties of Iron Ore Fines, the CG agreed to develop the individual schedule for non-MHB (Group A) cargoes. The CG further agreed that if MHB Iron Ore Fines will be found in future, a separate individual schedule should be developed for such cargo.

- The CG postponed the discussion on HAZARD, while the following text proposed by the co-ordinator was generally supported:

  "This cargo may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). See section 7 of this Code. This cargo may affect magnetic compasses. This cargo is non-combustible or has low fire-risks."

- The CG agreed to use "no special requirements" in the section for HOLD CLEANLINESS.

- The majority of the CG agreed to separate the sampling issues from the individual schedule, while some participants were of the view that it was premature to conclude so. The CG postponed the discussion on this issue.

- The CG postponed the discussions on PRECAUTIONS and CARRIAGE.

- The CG postponed the discussion on WEATHER PRECAUTIONS. The standard text for Group A cargoes was proposed.

- The CG postponed the discussion on LOADING. The standard text for high-density cargo was proposed.

As mentioned in the first round, the texts in the following sections have already been agreed by the CG before DSC 17 (the previous CG):

- STOWAGE & SEGREGATION (No special requirements)
- VENTILATION (No special requirements)
- DISCHARGE (No special requirements)
- CLEAN-UP (No special requirements)

**United Kingdom**

Regarding the sentence "Iron ore varies in colour from dark grey to rusty red and varies in iron content from haematite (high grade ore) to ironstone of the lower commercial ranges."

The TWG research raises many questions which have been addressed to the TWG and have as yet to be answered. Now there is essentially no time for CG members to respond to the last four reports from the TWG. For this reason several of the points above have to be revisited. The description of Iron ore has now added to it a further constituents, goethites, hematites and magnetites and mixtures of each. In
the Australian ores the goethite fraction varies from 35% to 88% by weight and significantly modifies the behavioural response as compared with the Brazilian ores with goethite content of 9% to 15% by weight. This makes it necessary to either change the DESCRIPTION or perhaps to simplify by saying:

"Iron ore varies in colour from dark grey to rusty red and varies in iron content."

Regarding the text "This cargo may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). See section 7 of this Code. This cargo may affect magnetic compasses. This cargo is non-combustible or has low fire-risks."

The independent review of TGW research has the following statement:

Each of the tests - Flow Table Test (FTT), Penetration Test (PT) and Proctor-Fagerberg Test (PFT) – are not a direct measurement of the liquefaction potential of solid bulk cargoes. The tests do not take into account key material properties of a cargo (e.g., dilatancy, degree of saturation) or system variables (e.g., pore water pressure, vessel motion) that can influence liquefaction potential.

If the tests do not measure liquefaction potential what is the point in using them as a measure of TML? This opens the door to defining liquefaction potential, and safe transport of iron ore cargo, in a different way.

2 Results of the research by the TWG

The CG participants are invited to check the following WEB SITE for download of the reports of the research by the TWG.


The CG participants are further invited to consider the TWG report part 5 sent on 7th of June in the UTC.

The following texts are the recommendations by the TWG (see part 5 of the report):

.1 Modification of Appendix 2 of the IMSBC Code with a Proctor/Fagerberg Test (PFT) as a discrete test procedure (see Annex B) for Iron Ore Fines (IOF). Other IMSBC Code Appendix 2 amendments will need to be undertaken to integrate that change;

United Kingdom

Please see the comment from the independent review of TGW research. There has been little time to review TGW Reports 2 to 5, let alone to elicit responses from the TWG that some comment have to be referred to reviews yet to be read by other CG members. In the review of TGW 1 and 3 it was pointed out that the limiting conditions for vessel movement and forces was open to discussion; to move the saturation limit from 70% to 80% could permit wetter cargoes to be loaded and increase the potential for drainage that cannot be controlled. The PF test itself is open to question and to change the acceptability to allow wetter cargoes should be discussed.
.2 Modification of Appendix 2 of IMSBC Code with an IOF PFT with specific requirement to a recognised international standard to undertake density determination.

**United Kingdom**

The laser scans gave very high voids ratios low loaded densities and these were not replicated in the laboratory tests on Brazilian ores in either the UK or Japanese laboratories. The PFT test densities were also higher than the as loaded measurements by laser scans. The measured as loaded density is an average and the actual variation within the cargo is unknown so what is it that the TWG want to measure?

.3 Before applying this method, in keeping with the existing code requirement "an extensive investigation for adoption and improvement of the method" is required to be conducted to determine if the Optimum Moisture Content (OMC) is equal to, or greater than, 90%;

.4 Goethite content should be determined using an internationally recognised procedure.

*Note:* Imperial’s position on differentiating IOF cargoes between Group A and Group C based on Goethite content is neutral and this is also the position of the NGOs for the time being.

**ICHCA**

ICHCA does not see sufficient benefit to the IMSBC Code amendments by further research of the behavior of IOF cargoes with various Goethite contents as this parameter does not apply to all IOF cargoes, nor does it define a cargo as Group C or Group A.

.5 A new IRON ORE FINES schedule (Group A) contained in the IMSBC Code contain a specific exemption for IOF cargoes with a minimum goethite content with a critical value within the range of $25% < x < 35\%$ (where $x$ is to be finalized), AND are being transported in vessels that have a gross tonnage (GT) rating greater than XX,000. Cargoes that meet these criteria should be categorized as Group C;

*Note:* Imperial do not believe that a specific range where the critical Goethite content should lie should be specified and that the actual value should await further testing, which is therefore also the position of the NGOs for the time being. It is understood that further testing is being undertaken by the TWG to define the region between 25% and 35% Goethite. On ship size, the NGOs also maintain a reservation on the basis that if the science really does show that iron ore fines with Goethite content less than a defined limit can liquefy, then ship size does not come into the equation as a defining factor in determining whether a cargo can liquefy.

**United Kingdom**

This needs much more clarity and it is correct to allow more research and discussion.
ICHCA Please see above (.4) for ICHCA’s position.

.6 The goethite content of the material be declared as part of the cargo information supplied in writing in appropriate shipping documents prior to loading; and

**Note:** See above for IC and NGO position.

**United Kingdom**

This will depend on the choice made for the description of Iron Ore Fines. Please see comment in the “outline of previous discussion”.

ICHCA Please see above (.4) for ICHCA’s position.

.7 A new IRON ORE FINES schedule (Group A) contained in the IMSBC Code contains specific wording that deals with the situation where a cargo, previously categorised as Group C (based on the mineralogy and vessel size criteria detailed above), is subsequently transshipped in a vessel with a GT equal to or less than XX,000, then the cargo shall revert to an IRON ORE FINES (Group A) category.

**Note:** See above for IC and NGO position on Goethite content and ship size differentiation. Hence the NGOs reserve their position on the proposed Schedule for the time being. The NGOs have also reserved their position on the particle size characteristics of IOF as contained in the draft Schedule.

**United Kingdom**

As in .5 above.

ICHCA Please see above (.4) for ICHCA’s position on Goethite content.

3 Adequacy of current methods for determining TML (TOR 1)

The CG is instructed to consider the adequacy of current methods for determining TML for iron ore fines and consider new and/or amended existing methods to be included in appendix 2 of the IMSBC Code (TOR. No.1).

3.1 Substantial discussion

With regard to the test procedure for determining TML, I propose to accept the results of the research by the TWG. The recommendations .1 to .3 in paragraph 2 are relevant to the test procedure for determining TML. I propose to agree with these recommendations.

*The CG participants are invited to make comments on the proposal above.*

**Australia**

Recommendations .1 to .3 of paragraph 2 are verified outcomes of the research and Australia would therefore agree with these recommendations.

**Brazil**

We agree with the test procedure for determining TML of iron ore fines, which is an outcome from evaluated and verified research.
Japan

We welcome to adopt the reasonable new test procedure for determining TML. In addition, we think that the adoption of the test procedure has no bad influence, because that Appendix 2 is not mandatory and the judgment is remitted to the respective Authority.

United Kingdom

The results of the TWG research show that the PFT does not measure safety against liquefaction. If the tests do not measure liquefaction potential what is the point in using this test as a measure of TML? This opens the door to defining liquefaction potential, and safe transport of iron ore cargo, in a different way.

To remind the CG, the independent review of TGW research has the following statement:

"Each of the tests – Flow Table Test (FTT), Penetration Test (PT) and Proctor-Fagerberg Test (PFT) – are not a direct measurement of the liquefaction potential of solid bulk cargoes. The tests do not take into account key material properties of a cargo (e.g. dilatancy, degree of saturation) or system variables (e.g. pore water pressure, vessel motion) that can influence liquefaction potential."

Why throw away the results of the research? The research shows that there is more than one variable involved. A graphic illustration is given in the hypothetical chart below.

For a maximum anticipated sea state giving a maximum wave height of Hmax the smaller vessel could carry the ore below some moisture content (indicated as 8% to 9% in the diagram) whereas the larger vessel can tolerate the sea state better and could carry the cargo at a higher moisture content (indicated as 10% to 11% in the diagram).

Fixing the moisture content at a certain level just does not use the results of the research work presented; it means that safety of carriage has to be set for the smallest vessel in the roughest sea state.

The shape of the "Permissible" surface in the diagram can be built up with the available recorded experience of all voyages to date.
United States

Support the coordinator's proposal.

The NGOs

INTERNATIONAL GROUP OF P & I CLUBS
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERCARGO
BIMCO
INTERNATIONAL FOUNDATION FOR AIDS TO NAVIGATION (IFAN)

The NGOs support the recommendations proposed.

If the CG agrees with the recommendations by the TWG, I would like to conclude them in the CG report as follows:

"The CG accepted the results of the research by the TWG and agreed the following recommendations by the TWG, in principle:

.1 Modification of Appendix 2 to the IMSBC Code with a Proctor/Fagerberg Test (PFT) as a discrete test procedure for Iron Ore Fines (IOF);

.2 Modification of Appendix 2 to the IMSBC Code with an IOF PFT with specific requirement to a recognised international standard to undertake density determination; and

.3 Before applying this method, in keeping with the existing code requirement "an extensive investigation for adoption and improvement of the method" is required to be conducted to determine whether the degree of saturation corresponding to Optimum Moisture Content (OMC) is equal to or greater than 90%."

United Kingdom

Please note that slight modifications of the expression were made, to prevent confusion on degree of saturation and moisture content (see paragraph 3.2 and Annex 1 to this document).

If the results of the TWG research results are to be accepted this proposal is not supportable.

Other factors have been introduced by the research in that it appears that iron ore with a significant portion of goethite is a possibility. The PFT requires the sample to be dried prior to test and drying changes the response characteristics of the goethite. [Perhaps the following parts may answer this]

3.2 Editorial issues

Pending the decision on the substantial proposal in the above paragraph, I prepared the draft amendment to appendix 2 to the IMSBC Code as set out in Annex 1 to this document, based on the draft test procedure prepared by the TWG, i.e., Annex B to part 5 of the report.

3.2.1 I propose to use "Modified Proctor/Fagerberg test procedure for Iron Ore Fines [which may liquefy]" as the title of new test procedure. Paragraph 4 of this document refers to the text in the square bracket.
3.2.2 I consider it appropriate to include just the difference between the new test procedure and the original Proctor/Fagerberg test procedure in the existing Code, rather than to incorporate the full text and figures for new test procedure.

3.2.3 The draft provision proposed by the TWG "the optimum moisture content (OMC) of IOF should occur above 90% saturation" may not be sufficient expression as a test procedure. I propose to clarify that the test procedure is not applicable to the cargo if the degree of saturation corresponding to the OMC is less than 90%. I further propose to require that the degree of saturation corresponding to the OMC should be checked and that the shipper should consult with an appropriate authority if the degree of saturation is less than 90%.

The CG participants are invited to make comments on Annex 1 to this document, under the assumption that the substantial proposal in paragraph 3.1 is agreed.

Australia

Australia agrees with the coordinator's remarks and proposals EXCEPT we would prefer to retain the full text of the modified test in Appendix 2 rather than only including differences. This preference is purely form a user clarity point of view, however Australia would accept only the differences being added if that is the majority view. Importantly Australia agrees to the substantial proposal in paragraph 3.1.

Brazil

In principle, we support 3.2.1 and 3.2.3 above, but not 3.2.2. We understand further discussion on wording is still necessary for 3.2.1 and 3.2.3.

We prefer the incorporation of a full test procedure to Appendix 2, rather than incorporate a new section emphasizing the differences between the new test procedure and the existing Proctor/Fagerberg. We respectfully suggest Appendix 2 should contain an exact procedure for the modified test which will reduce any possible procedural breach. To facilitate, the comments above are repeated on Annex 1 reply attached.

Japan

We agree to the coordinator's proposals in 3.2.1 & 3.2.2, because the proposed expression is easy to understand. In addition, we agree to his proposal in 3.2.3 because the clarification of the scope of the application of the new test procedure is very important. Measurements by respective supplier and verified by relevant authorities is needed for OMC in Iron Ore Fines. In this regards, we think that further discussion is necessary on determination procedures for TML of Iron Ore Fines having less than 90% of OMC (Ex. TML may be determined as the moisture content corresponding to 70% of degree of saturation under the compaction condition of the new test procedure.)

United Kingdom Not supportable.

United States

United States – Generally support the coordinator's proposal; however, we would prefer to include the full text of the new test procedure rather than just the differences between the new procedure and the existing procedure in the Code.
The NGOs
- International Group of P & I Clubs
- International Chamber of Shipping (ICS)
- INTERCARGO
- BIMCO
- International Foundation for Aids to Navigation (IFAN)

The NGOs support the recommendations proposed.

4  Consideration on the research into iron ore fines (TOR 2)

The CG is instructed to consider the evaluated and verified research into iron ore fines (TOR. No.2).

United Kingdom

There are a huge number of questions, posed to the TWG, on the research, the evaluations and analyses and there have been no substantive answers. There have been virtually no comment made by CG members on the queries raised and there must be a period allowed for the full discussion of all the research and its implications.

4.1  Substantial discussion

4.1.1  Judgment on application of requirements for Group A cargoes depending on goethite content and ships size

It is necessary to discuss on the recommendations .4 to .7 in paragraph 2, in particular, recommendations .5 and .7 which are related to the application of the requirements for Group A cargoes. If these recommendations are agreed, recommendations .4 and .6 should consequentially be accepted.

Prior to discussion on the concrete criteria on goethite content and ship size, I would like to ask the opinion of the CG participants on the principle that the requirements for Group A cargoes may be exempted depending on goethite content and ship size.

The CG participants are invited to make comments on the aforementioned principle, taking into account the results of the research by the TWG.

The NGOs also invited to make comments, again, on the aforementioned principle, because I separated the discussion points into two, i.e., the principle and the criteria.

Australia

Australia agrees to the principles of goethite content and ship size being taken into account, based on the extensive and verified research data that has been provided. The TWG was invited to provide such research outcomes and Australia believes the principles are fully supported by those verified outcomes.

With respect to a ship size threshold, TWG Reports 2 and 4 show increased stability occurs for larger vessels and this would be expected and is supported by general stability knowledge.
Australia therefore believes that the combination of Goethite content and vessels size would be positive for safe shipping.

Nonetheless, Australia believes the two principles are not inextricably linked. The threshold of 35% goethite is sufficiently conservative to stand on its own regardless of ship size.

Brazil

We support proceeding with the discussion separating the points as recommended by the Coordinator, i.e., the principle and the criteria.

The goethite and ship size principles are supported by evaluated and verified research.

Regarding their incorporation into the amendments proposed by the CG, we believe that the combination would be positive for safe shipping.

Nonetheless, Brazil believes the two principles are not inextricably linked. The threshold of 35% goethite is sufficiently conservative to stand on its own regardless of ship size.

With respect to a ship size threshold, TWG Reports 2 and 4 show increased stability occurs for larger vessels. The intention is to allow this knowledge to be used to improve the behavior or hazard awareness for the vessel of concern.

Japan

For the ground that goethite content is relevant to liquefaction as the result of study by TWG, we think that “the assumption that the principle on the exemption is agreed” is rational. However, we concerned that though stability has already been considered by the TWG, ship structural strength has not been evaluated taking into account that the coefficient of earth pressure of the cargo increases to 1.0 in case of liquefaction. So, we consider that this issue should be discussed at DSC 18. In addition, we hope that Panamax Size vessels are also studied and examined based on the technical background.

United Kingdom

The principal - Not supported.

Goethite is a mineral that modifies the response and has different permeability characteristics and treatment requirements. High water content behaviour has not been explored and it is possible that the pore water response becomes similar to that of Nickel Ore which consist largely of goethite and contain 1-2% nickel - See the paper on The carriage of ‘Nickel Ore’ Background and introductory comments by A.E.S. - Circulated to the CG in November 2012 by Captain Nosrati. The Nickel ores at high water contents are prone to liquefy because of the properties of the matrix which is often mainly goethite and the goethite changes its form and properties during shear.
United States

Agree that goethite content should be taken into account based on the research data provided. More discussion/consideration should be given to inclusion of ship size.

The NGOs

INTERNATIONAL GROUP OF P & I CLUBS
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERCARGO
BIMCO
INTERNATIONAL FOUNDATION FOR AIDS TO NAVIGATION (IFAN)

The NGOs' position on differentiating between Group A and Group C cargoes based on Goethite content and ship size remains unchanged from the position outlined in the accompanying submission with TWG report 5 circulated to the CG on 7 June.

On Goethite content, the review of the TWG research undertaken by Imperial College did not provide the NGOs with sufficient evidence to suggest that differentiating on this basis is appropriate or justified, since the position of Imperial College remains neutral in this regard. It should be noted that Imperial College also commented that:

.i There may be other effects, such as hematite, that may influence the stability;

.ii That an actual value, if such a differentiation is to be included, should await further testing (which we understand is being undertaken), especially if hematite is also acting to stabilise the cargo and thus obscuring to some extent the effect of the goethite alone, and that the value of this critical goethite content should not be constrained to a range as the single experiment at 35%, being the lowest point, might subsequently be found to be an outlier (i.e. repeats are needed to establish confidence in the value), and

.iii If one wants to differentiate between A & C cargoes based on goethite content, then a safety margin could be added to the minimum goethite content that has not liquefied as the base case. With the current data that has been provided by the TWG, this would give a boundary of around 40%.

Separately, the NGOs had already requested the TWG to consider the impact of introducing a boundary of around 45%, if the introduction of differentiation based on goethite content is agreed. This was not taken on board by the TWG and, disappointingly, the TWG members did not provide any impact analysis on their Members in the event of the introduction of a Goethite content boundary set at 40% or 45%.

Nonetheless, the primary position of the NGOs remains as contained in the submission circulated to the CG on 7 June, which is not supportive at this stage of differentiating based on Goethite content.
On ship size, the NGOs also continue to have misgivings. This would set an unhelpful precedent for the IMSBC Code and go beyond the boundaries of this work, which should be concerned with the behaviour of the cargo and not matters relating to vessel stability or post loading mitigation factors based on ship type. If a cargo can liquefy, then it should be classified accordingly irrespective of the size of vessel that will carry the cargo.

ICHCA

Please see above (2.4) for ICHCA's position on goethite content.

ICHCA does see the merit of further research, in principle, into the effects of ship size on the failure criteria.

4.1.2 Criteria on goethite content and ship size

I would like to discuss on the criteria in parallel with the discussion on the aforementioned principle, pending the agreement on the principle, due to constraint in time. Please consider the following issues under the ASSUMPTION that the principle on the exemption is agreed.

With regard to the criterion on goethite content, I consider that 35% should be selected, at present, because part 4 and part 5 of the report said as follows:

"CTT data show IOF products with goethite content at 35% and above passing. The experiments thus suggest that there is a critical goethite content above which the cargo will not liquefy under shipping conditions."

"The TWG's research also indicated that the combination of conditions required for liquefaction is not attained in IOF with goethite content that is above a minimum threshold – even when this material is tested in fully saturated conditions. The research showed that material with 35% goethite content survived CTT, but material with 25% goethite content failed."

In other words, "within the range of $25\% < x < 35\%$ (where $x$ is to be finalized)", the critical value should be determined at 35%, which is the most conservative value in the range, unless another research indicates the other values.

With regard to the criterion on ship size, the conclusion in part 2 of the report is as follows:

"Research and scientific testing by the TWG to date offer support to the empirical evidence that problems related to the safe carriage of IOF may be restricted to a certain size and class of vessel. The stability of Cape-size vessels – in which over 90% of global iron ore tonnage is shipped – is not compromised unless there is a more-than-50% cargo shift. In the case of IOF, cargo observation data indicates the cargo mass does not move significantly in these ships and, therefore, its carriage would not constitute an undue risk."

The results of the research implied the safety of carriage of Iron Ore Fines on "Cape-size vessels". Therefore, the criterion on ship size should identify "Cape-size vessels" or larger. Thus, I propose to use 150,000 tonnes of Dead Weight Tonnage (DWT), rather than use Gross Tonnage.
Briefly speaking, I propose to use 35% (goethite content) and 150,000 DWT (ship size) as the criteria for the application of the requirements for Group A cargoes.

*The CG participants, including NGOs, are invited to make comments on these values.*

**Australia**

Noting the data indicates a verified "safe" and a verified "unsafe" Goethite content Australia believes the verified safe figure should be used as proposed above. Regarding vessel size Australia believes in principle the figure should be Gross Tonnage (GT) to align with the majority of IMO instruments, however it is acknowledged Deadweight (DWT) may provide a more recognizable figure for Shippers and Charters to understand. Using DWT however will need a little care since it is not the best indication of cargo capacity but it is a good estimate whereby a figure could be developed using an agreed factor of safety added to the research data. Noting the research indicates more than 80,000 DWT provides a sufficient safety margin, Australia would propose adding a further factor of safety to take into account the use of DWT and propose 100,000 DWT is the figure used.

**Brazil**

We agree to the exemption for 35% goethite and, if ship size is to be considered, we suggest the adoption of 100,000 DWT to provide an extra safety margin.

**Japan**

We agree to the coordinator’s proposal based on the prerequisite condition, full-loaded (over 90%) of "Cape-size vessels". However, in the case that the prerequisite condition is different from the above, the concrete criteria of goethite content, ship size and loading condition should be examined separately considering the comment of relevant party for the following reasons:

(Reasons) We wonder that the criteria are suitable or not for the semi or half-loaded "Cape-size vessels" or other size vessels such as panama-size vessels, taking into account that the ship motion depends on cargo loading condition.

**United Kingdom**

Not supported – This needs much more research.

Regarding "cargo shift", the models for cargo in the 'shift' analyses in TWG report 3 are not correct. TWG research needs discussion.

**United States**

Support coordinator’s proposals.

**The NGOs**

INTERNATIONAL GROUP OF P & I CLUBS
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
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The NGOs’ position on differentiating between Group A and Group C cargoes based on Goethite content and ship size remains unchanged from the position outlined in the accompanying submission with TWG report 5 circulated to the CG on 7 June.

On Goethite content, the review of the TWG research undertaken by Imperial College did not provide the NGOs with sufficient evidence to suggest that differentiating on this basis is appropriate or justified, since the position of Imperial College remains neutral in this regard. It should be noted that Imperial College also commented that:

.i There may be other effects, such as hematite, that may influence the stability;

.ii That an actual value, if such a differentiation is to be included, should await further testing (which we understand is being undertaken), especially if hematite is also acting to stabilize the cargo and thus obscuring to some extent the effect of the goethite alone, and that the value of this critical goethite content should not be constrained to a range as the single experiment at 35%, being the lowest point, might subsequently be found to be an outlier (i.e. repeats are needed to establish confidence in the value), and

.iii If one wants to differentiate between A & C cargoes based on goethite content, then a safety margin could be added to the minimum goethite content that has not liquefied as the base case. With the current data that has been provided by the TWG, this would give a boundary of around 40%.

Separately, the NGOs had already requested the TWG to consider the impact of introducing a boundary of around 45%, if the introduction of differentiation based on goethite content is agreed. This was not taken on board by the TWG and, disappointingly, the TWG members did not provide any impact analysis on their Members in the event of the introduction of a Goethite content boundary set at 40% or 45%.

Nonetheless, the primary position of the NGOs remains as contained in the submission circulated to the CG on 7 June, which is not supportive at this stage of differentiating based on Goethite content.

On ship size, the NGOs also continue to have misgivings. This would set an unhelpful precedent for the IMSBC Code and go beyond the boundaries of this work, which should be concerned with the behaviour of the cargo and not matters relating to vessel stability or post loading mitigation factors based on ship type. If a cargo can liquefy, then it should be classified accordingly irrespective of the size of vessel that will carry the cargo.

ICHCA

Laboratory analysis that confirms the hypotheses regarding the liquefaction potential of iron ore based on the particle sizes and ship sizes are yet to be proved, but ICHCA welcomes these results. With respect to the goethite content, refer to comment in 2.4 above.
4.1.3 Requirement for goethite content declaration

With regard to recommendations 4 and 6 in paragraph 2, if the requirements for Group A cargoes are exempted based on goethite content (recommendations 5 and 7), declaration of goethite content is essential. Thus, I propose to include the requirement for declaration of goethite content, in the case that the exemption based on goethite content is included.

For the purpose of declaration, an appropriate method for determining goethite content should be employed. Thus, I propose to include a provision on appropriate standards for determining goethite content, if declaration of goethite content is required.

*The CG participants are invited to make comments on these proposals, in principle.*

The expressions of these provisions are discussed in paragraph 4.2.4.

**Australia**

Australia agrees that the Goethite content must be declared and, just as importantly, that the declaration is based on a standard method of determining the Goethite content.

**Brazil**

We agree on goethite content being declared on shipper’s declaration for those occasions when the goethite exemption is applicable.

**Japan**

We agree to the coordinator’s proposal with our understanding that the determination of goethite content will be discussed separately.

**United Kingdom** Not supported – This needs much more research.

**United States** Support coordinator’s proposals.

**ICHCA** Please see above (2.4) for ICHCA’s position on Goethite content.

### 4.2 Editorial issues

In this paragraph, I would like to discuss on the editorial issues, pending the decisions on the substantial issues discussed in paragraph 4.1, under the assumption that the exemption of requirements related to liquefaction discussed in paragraph 4.1 is agreed in principle.

*The CG participants are invited to make comments on the following Options, i.e., Option 1 and Option 2 in paragraphs 4.2.1 to 4.2.3, as the matter of expression of individual schedules and exemption provisions.*

Note: If the exemption of requirements for Group A cargoes is not agreed, the texts below are unnecessary.
Australia

Australia supports the principles as already indicated and would support 35% Goethite content as being verified but would consider the outcomes of further research as it is made available in the future. Australia also supports ship size as being a verified mitigation of risk in conjunction with the Goethite content. Option 1 or option 2 would be acceptable subject to further discussions to ensure there are no unintentional consequences whichever option is agreed.

However option 2 appears to Australia to be the preferred way forward as it provides a Group A schedule that will be more completely recognizable as a "standard" schedule without additional complications in sections that are traditionally easy to understand. We prefer that the mandatory text proposed in option 2 is in one easy to understand place in the schedule and also see no issues in principle with that text excluding Code provisions despite the schedules traditionally pointing to provisions in the Code that do apply. However if there was to be only schedule for iron ore fines that defines what that material is, and the IRON ORE Group C schedule is amended to define what that schedule does, or does not, apply in terms of particle size and distribution, there is a danger that iron ore fines as defined in the single new schedule with Code text exclusions as proposed will have to be carried in accordance with other sections of the schedule (weather precautions etc.) rather than carrying the cargo in accordance with the IRON ORE Group C schedule. For only one new schedule it must be confirmed what exactly applies in every schedule section to iron ore fines that are defined by particle size in the new Group A schedule, and not just include selected Code text exclusions that do not amend or delete mandatory text in the new schedule sections. Otherwise it is preferable for the Group A schedule to state iron ore fines that meet the criteria may be carried in accordance with the IRON ORE Group C schedule and amend the Group C schedule to include such material as being able to be carried under the schedule.

If discussions result in the Goethite content and DWT figures in option 2 being agreed then Australia would not object – however we suggest they may be changed to an agreed figure as necessary.

Brazil

We prefer single schedule option however a two schedule option is acceptable provided those schedules are reflective of scientific outcomes.

Japan

We think that the Option 2 is suitable.

United Kingdom

The exemption is not supported and as such the texts below are unnecessary.

United States

Prefer Option 2 over Option 1.

4.2.1 Draft individual schedule prepared by the TWG

In the draft individual schedule prepared by the TWG, i.e., Annex A to part 5 report, the following text is included in the mandatory part (before the section for DESCRIPTION):
“This schedule shall not apply to IRON ORE FINES when:

i. The total goethite content exceeds [x% – in the range of 25% to 35%, to be defined], and

ii. the cargo is to be carried in bulk carriers of [XX,000] gross tonnage or greater where the deadweight is [XX,000] tonnes or greater.

The shipper shall provide the master with a declaration detailing the goethite content of the material to be shipped. Cargoes that meet both the above criteria together with the shipper's declaration shall be shipped under the IRON ORE (Group C) schedule. If the carriage of this cargo is to be shipped in a bulk carrier equal to, or less than [XX,000] gross tonnage where the deadweight is equal to, or less than [XX,000] tonnes, the provisions of this schedule shall apply.”

I consider that the aforementioned text is not sufficient to cover Iron Ore Fines with high goethite content and carried on a big ship, even though the criteria are fixed. If the above mentioned text is used, "Iron Ore Fines with high goethite content and carried on a big ship" will be "a cargo not listed in appendix 1 to this Code", unless the individual schedule for IRON ORE is amended further.

Furthermore, the requirement for goethite content declaration should be added in the individual schedule for IRON ORE in order to apply the individual schedule to Iron Ore Fines, to keep consistency of the individual schedules for IRON ORE and for Iron Ore Fines. Thus, I would like to propose to use other texts as discussed in paragraphs 4.2.2 and 4.2.3. It is rational to require declaration of goethite content and I propose to include such requirement (see paragraph 4.2.4).

4.2.2 Option 1: Two individual schedules for Iron Ore Fines

Taking into account the above mentioned issues, I suggest preparing two individual schedules for Iron Ore Fines of Group A and Group C. “Option 1” is this way forward.

In Option 1, I tentatively used two BCSNs, i.e., "IRON ORE FINES which may liquefy" and "IRON ORE FINES which is not liable to liquefy". These BCSNs will be reviewed, at DSC 18, if the substantial proposals (see paragraph 4.1) and this Option are agreed.

Iron Ore Fines and IRON ORE will be identified based on grain size. The identification of Iron Ore Fines and IRON ORE is referred to in paragraph 5.2 in this document.

The individual schedule for "IRON ORE FINES which is not liable to liquefy" (Group C) applies to Iron Ore Fines meeting the following conditions:

.1 the total goethite content of the cargo exceeds 35%; and

.2 the cargo is to be carried on a bulk carrier of 150,000 tonnes deadweight or upward.

The individual schedule for "IRON ORE FINES which may liquefy" (Group A) need not apply for cargoes meeting the above conditions.
4.2.3 Option 2: Single individual schedule for Iron Ore Fines with exemption provisions

It may be irrational to change the Group of a cargo depending on goethite content and ship size, in particular, ship size. Thus, I prepared one individual schedule for Iron Ore Fines with exemption provisions. “Option 2” is this way forward.

In Option 2, I propose to include the following text in the mandatory part:

"Notwithstanding of the provisions in section 1.4 of the Code, the requirements in sections 4.2.2.9, 4.2.2.10, 4.3.2 to 4.3.5, 4.5, 4.6, 7.3 and 8 of the Code and the requirements in the appendix to this schedule need not apply to this cargo in the case that:

.1 the total goethite content of the cargo exceeds 35%; and

.2 the cargo is to be carried on a bulk carrier of 150,000 tonnes deadweight or upward."

Here, the requirements related to liquefaction are contained in the appendix.

See the action requested of the CG participants in paragraph 4 (before paragraph 4.2.1).

4.2.4 Requirement for goethite content declaration

In the draft individual schedule prepared by the TWG, the following text was included:

"The shipper shall provide the master with a declaration detailing the goethite content of the material to be shipped."

Taking into account the aforementioned text, the recommendations by the TWG and the existing requirements on measurements in the Code, I prepared the following text, for both options, as set out in Annex 2 to this document:

"The shipper shall provide the master with a declaration indicating the goethite content of the cargo. The goethite content of the cargo shall be determined according to internationally or nationally accepted standard procedures."

The CG participants are invited to make comments on the proposed text.

Brazil We support the text proposed.
Japan We agree to the coordinator’s proposal.
United Kingdom

The form of the goethite in the different ores is marked [See the SEM's in TWG report 4 Figs 3 to 6] The different particle size distribution, porosity and surface area will lead to differences in the constitutive relationships and hence response. So a measure of goethite content will not pin down the different responses.
5 Draft individual schedule for iron ore fines (TOR 3)

The CG is instructed to prepare draft individual schedule(s) for iron ore fines and any required amendments to appendix 2 and review the existing iron ore schedule, as necessary (TOR. No.3).

5.1 Draft amendments to appendix 2 of the Code

The draft amendments to appendix 2 are discussed in paragraph 3 of this document.

I consider that no more amendments to appendix 2 are necessary, taking into account section 8 of the Code. Section 8 of the Code, requiring that the TML of Group A cargo shall be determined in accordance with a procedure determined by the appropriate authority. Section 8 further clarifies that appendix 2 provides "recommended methods for determining TML".

The CG participants are invited to make comments, if further amendment to appendix 2 to the Code seems necessary.

Australia Australia agrees no further amendments are necessary.

Brazil

We prefer to have a stand-alone method included. Other changes are acceptable as per output of the research undertaken by the TWG (Report 5).

Japan

We agree to the coordinator’s proposal. Further amendment to Appendix 2 is not necessary.

United Kingdom

The question whether TML is a valid concept is still to be discussed and answered.

5.2 Identification of Iron Ore Fines and IRON ORE

5.2.1 Substantial discussion

In the previous CG, identification of Iron Ore Fines and IRON ORE could not reach to the agreement. I would like to draw the attention of the CG on the following discussion in the previous CG (see paragraph 9 in document DSC 17/4/3):

The coordinator proposed the following criteria based on grain size distribution:

Group C cargo: $D_{10}$ is not less than 1 mm and $D_{50}$ is not less than 10 mm; and
Group A cargo: $D_{10}$ is less than 1 mm or $D_{50}$ is less than 10 mm.

The following criteria were also proposed:

Group C cargo: $D_{10}$ is not less than 1 mm or $D_{50}$ is not less than 10 mm; and
Group A cargo: $D_{10}$ is less than 1 mm and $D_{50}$ is less than 10 mm.
Noting that the latter criteria was widely employed for soil in the field of soil mechanics, I, the coordinator invited the previous CG to consider the former criteria, taking into account safety margin against un-ordinary grain size distribution of Iron Ore Fines.

In the present CG after DSC 17, Australia and Brazil proposed the latter. In the draft individual schedule prepared by the TWG, the latter criteria is used in the section for SIZE (see Annex A to part 5 of the report). Then, I asked the TWG on the criteria and the answer by the TWG was that the description of Iron Ore Fines (in the draft individual schedule prepared by the TWG) was considered the industry standard used to describe the product (rather than a specific output of the research).

Taking into account these discussions, I propose to use the latter criteria for identification of Iron Ore Fines and IRON ORE. Namely, I propose the following criteria:

IRON ORE: \( D_{10} \) is not less than 1 mm or \( D_{50} \) is not less than 10 mm; and

Iron Ore Fines: \( D_{10} \) is less than 1 mm and \( D_{50} \) is less than 10 mm.

*The CG participants are invited to make comments on the above proposal.*

**Australia**

Australia supports these proposed criteria. However please refer to the comments above regarding iron ore fines that meet the criteria in the new IRON ORE FINES schedule since they cannot be carried under the iron ore Group C schedule with that schedule having the size criteria specified at all. Possibly state the schedule applies to iron ore that does not meet the criteria for IRON ORE FINES? It may be possible to add criteria to the Group C schedule along the lines of “typically material nominally greater than 6.3 mm” however Australia believes this would re-open discussions as to what qualifiers such as “typically” and “nominally” mean and would re-complicate something now clearly achieved – the answer to what is iron ore fines. IRON ORE is logically iron ore that does not meet the criteria for being iron ore fines.

**Brazil**

Brazil agrees with the Iron Ore Fines Particle Size Distribution (PSD) definition.

Brazil believes, however, that consideration should be given to simplifying the definition for Iron Ore to reflect the fact that it would be described as material nominally greater than 6.3 mm, i. e., described as coarser than one key-size in the coarse size range of the particles present in the cargo. We understand that 6.3 mm is a figure commonly adopted by the producers and shippers when referring to Iron Ore.

**Japan**

We agree to the coordinator’s proposal because the clear criteria for identification of Group A or C is helpful for us.

**United States**

Generally support the coordinator’s proposal.
The NGOs
INTERNATIONAL GROUP OF P & I CLUBS
INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERCARGO
BIMCO
INTERNATIONAL FOUNDATION FOR AIDS TO NAVIGATION (IFAN)

The current issue with particle size is whether the test method being proposed is suitable for all iron ore fines (i.e. as defined by particle size proposed), and in particular those that have a lot of coarser material, but still fall within the proposed definition. The current upper limit for the Proctor/Fagerberg test as set out in 1.3.1 of Appendix 2 of the IMSBC Code is only 5 mm, but it has been proposed by the TWG that this should be increased to above 10 mm.

The NGOs believe that applying the test to > 10 mm may lead to inaccuracies and do not at present believe that enough work has been done to substantiate this position. In addition, the potential dependence of specific gravity on the method of analysis (e.g. water or helium pycnometry) may mean the method will give a variation in TML that contradicts the accuracy being proposed.

Reference by the TWG that the description of Iron Ore Fines was considered the industry standard used to describe the product would seem to miss the point.

5.2.2 Editorial issues

Pending the decision on the proposed criteria for Iron Ore Fines and IRON ORE, I propose to incorporate appropriate provisions on the application of the individual schedules in the mandatory parts of the individual schedules. As mentioned in paragraph 1 (2nd bullet point), this proposal was agreed in principle.

In case of Option 2, the texts for individual schedules for Iron Ore Fines and IRON ORE (draft amendment to the existing schedule) are as follows:

(Iron Ore Fines)

"The provisions of this schedule need not apply to iron ore cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or
.2 less than 50% of particles less than 10 mm."

(IRON ORE)

"The provisions of this schedule shall apply only to cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or
.2 less than 50% of particles less than 10 mm."

In case of Option 1, the texts for Iron Ore Fines schedules are a little bit complex but the meaning of the provision should be the same.
The CG participants are invited to make comments on the proposed text, as the matter of expression, under the ASSUMPTION that the identification criteria in paragraph 5.2.1 are agreed in principle.

Australia

As noted in comments for 5.2.1 this depends on what schedule section are to be applied to iron ore fines that can be considered to be carried safely as a Group C cargo. Also Australia would prefer each schedule to reflect what the criteria are that the cargo meets – not what is should not meet. "Need not apply" in the iron ore fines schedule seems "optional"?

Brazil

We understand the provisions proposed above describe well the size distribution criteria which distinguish Iron Ore Fines and Iron Ore (this is aligned with industry standards), although we agree that the Iron Ore Fines criteria are a bit complex as written.

We believe the wording below reduces the complexity of the Iron Ore Fines criteria.

(Iron Ore Fines)

"The provisions of this schedule shall only apply to cargoes containing both:

.1 10% or more of fine particles less than 1 mm; and

.2 50% or more of particles less than 10 mm."

Japan

We agree to the coordinator's proposal.

United States

Generally support the coordinator's proposals; however, we would prefer more definitive language in both individual schedules with respect to the applicable criteria. The proposed "need not apply" could be revised to "do not apply".

ICHCA

Based on the assumptions and results of research to date, ICHCA suggests:

(IRON ORE FINES)

"The provisions of this schedule apply to iron ore cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or

.2 less than 50% of particles less than 10 mm; or

.3 both."
5.3 Draft individual schedule(s) for Iron Ore Fines

5.3.1 General

Based on the draft individual schedule prepared by the TWG, I prepared the draft individual schedules for Iron Ore Fines, for both Option 1 and Option 2.

To facilitate the discussion, hereafter, I only refer to the text in the draft individual schedule for "IRON ORE FINES which may liquefy" (Option 1), while the same discussion should be applied to the draft individual schedule for Iron Ore Fines (Option 2).

The CG participants are invited to make comments on the text in the draft individual schedule for "IRON ORE FINES which may liquefy" set out in Annex 2 to this document. I will apply the same comments to the other draft individual schedules, as appropriate.

I understand that the texts for the following sections have already been agreed (see paragraph 1 of this document):

- ANGLE OF REPOSE and CLASS (CHARACTERISTICS): Not applicable
- STOWAGE & SEGREGATION: No special requirements
- HOLD CLEANLINESS: No special requirements
- VENTILATION: No special requirements
- DISCHARGE: No special requirements
- CLEAN-UP: No special requirements

Brazil See Annex 2 amendments proposed.

5.3.2 DESCRIPTION

I propose to use the text prepared by the TWG, instead of the text prepared in the previous discussion.

The CG participants are invited to make comments on the proposed text in the section for DESCRIPTION.

Australia

As per previous comments we prefer not to use "optional" text such as "need not apply" and believe the footnotes will cause unnecessary and undesirable confusion. This Group A schedule needs to state the determined and agreed criteria so maybe:

"The provisions of this schedule apply to cargoes containing both:

.1 10% or more of fine particles less than 1 mm; and
.2 50% or more of particles less than 10 mm."
And

The provisions of this schedule do not apply to iron ore fines meeting the following both conditions:

.1 the total goethite content of the cargo exceeds 35%; and
.2 the cargo is to be carried on a bulk carrier of 150,000 tonnes of deadweight tonnage or upward.

Such cargoes may be carried in accordance with the IRON ORE Group C schedule.

Japan We agree to the coordinator's proposal.

United Kingdom

Regarding the text "Iron ore fines vary in colour from dark grey, rusty red to yellow and comprise of hematite, goethite and magnetite with varying iron content."

"comprise" - make up or constitute (a whole) - It would be more appropriate to say contains.

United States

Would prefer more definitive language with respect to criteria. The proposed "need not apply" could be revised to "do not apply".

ICHCA As stated above.

5.3.3 CHARACTERISTICS

The CG participants are invited to make comments on the proposed text in the sections for BULK DENSITY and STOWAGE FACTOR.

Australia No comments.

Japan

We agree on the BULK DENSITY (1,500 – 3,850) and STOWAGE FACTOR (0.26 – 0.67) described in Annex 2 Option 1.

United States Support the coordinator's proposal.

ICHCA ICHCA suggests the bulk density range of 1,500 to 3,850 kg/m³.

5.3.4 HAZARD

The CG participants are invited to make comments on the proposed text in the section for HAZARD.
Australia

Could we just be reminded why we do not reference "section 7 and 8" and only section 7?

Japan

We agree with the text described on Annex 2 Option 1.

United States

Support the coordinator’s proposal.

ICHCA

For Group A Iron Ore Fines, ICHCA suggests:

“This cargo is a hazard to safety at sea due to its potential to cause loss of vessel stability when the moisture content exceeds its TML. Due consideration is required to maintain a moisture content lower than the TML at all times from the time of sampling cargo for laboratory testing, during loading, until the end of the voyage.”

Iron ore with a proportion of fines tested as possessing Group A properties should be transported only in accordance with this schedule.

5.3.5 WEATHER PRECAUTIONS

The CG participants are invited to make comments on the proposed text in the section for WEATHER PRECAUTIONS, noting that the proposed text is the standard text for Group A cargo.

Australia

No comments.

Japan

We basically agree with the text described on Annex 2 Option 1.

United Kingdom

Regarding the text "the moisture content of the cargo shall be kept less than its TML during loading operations and the voyage"

It is not possible to comply with this if the cargo drains to a ‘wet bottom’.

United States

Support the coordinator’s proposal.

5.3.6 LOADING

The CG participants are invited to make comments on the proposed text in the section for LOADING.

Please note that the following text is specific for this cargo, while other two sentences are standard texts for trimming and high density cargo:

"When the shipper’s cargo declaration states that the cargo is likely to exude free water on passage, the cargo shall not be trimmed to level."

The text above may be deleted taking into account that the declaration of trimming procedure is required by sub-section 4.2.2.7 of the Code.
Australia

The text should be deleted. In our opinion it is doubtful by what tests the Shipper will be able to make this statement on a declaration in any case.

Japan

We agree to the coordinator's proposal.

United States

Support the coordinator's proposal to delete the text.

The NGOs

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BIMCO
INTERNATIONAL FOUNDATION FOR AIDS TO NAVIGATION (IFAN)

The NGOs fully support the proposal to delete this text.

5.3.7 PRECAUTIONS

The CG participants are invited to make comments on the proposed text in the section for PRECAUTIONS, noting that the proposed text is the same text in the individual schedule for IRON ORE.

Note: In this provision, the referenced regulation number in SOLAS Convention should be VI/7.3, while the individual schedule for IRON ORE refers to SOLAS regulation VI/9.3. The referenced regulation number in the individual schedule for IRON ORE might be an editorial error and the IMO secretariats are considering this issue.

Australia

No comments.

Japan

We agree with the text described on Annex 2 Option 1.

United States

Support the coordinator's proposal.

5.3.8 CARRIAGE

The CG participants are invited to make comments on the proposed text in the section for CARRIAGE.

Please note that the following text is specific for this cargo, while other texts are ordinary texts for Group A cargoes:

"When the shipper's cargo declaration states that the cargo is likely to exude free water on passage and free water is collected at the corners of the cargo spaces, reinforcement of bilge water pumping shall be considered."

Australia

Again it is unclear how this statement would appear on a declaration.
Japan

Free water accumulated on the surface of cargo cannot be pumped out by the bilge system because it does not penetrate though the cargo. Therefore, this text should be removed because it is impracticable manner. In addition, the following text is duplicated: "Cargo hold bilges shall be sounded at regular intervals and pumped out, as necessary."

United Kingdom

TWG research on pore water [PWP] measurements shows that bilge pumping has no effect on the PWP under the main cargo stow.

United States

Support deletion of the text.

The NGOs

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INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERCARGO
BIMCO
INTERNATIONAL FOUNDATION FOR AIDS TO NAVIGATION (IFAN)

The NGOs also support the deletion of the text that states that "When the shipper’s cargo declaration states that the cargo is likely to exude free water on passage and free water is collected at the corners of the cargo spaces, bilge water pumping needs to be reinforced". The reference to reinforcement is unclear and the reference to cargo holds being pumped is already included in the first paragraph.

ICHCA

Based on suggestions made in the previous Correspondence Group 3rd round (2012) ICHCA recommend:

"Cargo hold bilges shall be sounded at regular intervals and pumped out as necessary. Due consideration shall be given to prevent clogging of bilge line. If free water above the cargo or fluid state of the cargo is observed during voyage, the master shall take appropriate actions to prevent cargo shifting and potential capsize of the ship, and give consideration to seeking emergency entry into a place of refuge."

5.3.9 CARRIAGE - IRON ORE FINES which is not liable to liquefy

I propose to include the requirement for bilge check in the individual schedule for "IRON ORE FINES which is not liable to liquefy" in Option 1 and in the section for CARRIAGE outside the appendix in Option 2, which is applicable for cargoes not liable to liquefy, as set out in Annex 2 to this document.

The CG participants are invited to make comments on this proposal.

Australia

Australia prefers standard application of bilge checking for Group A cargoes. In either option the cargo is not liable to liquefy so can be considered Group C and Group A requirements need not be applied. Again this is why Australia believes
clarity is required in what does or does not apply to iron ore fines that is not liable to liquefy whichever option is agreed. Our preference is to have one new Group A schedule and if the agreed criteria is met to be carried as a cargo that is not liable to liquefy then the existing IRON ORE Group C schedule may be used. Careful and logical (minor) amendments would be required to ensure the Group C schedule includes the cargo not liable to liquefy.

Brazil

Brazil prefers a standardized approach for bilge checking that applies universally to all Group A cargoes.

Japan

We have no objection to the proposed text because it is routine work.

United Kingdom

It depends on the permeability of the cargo. If the permeability is low the same conclusion as above is applicable.

United States

Support the coordinator's proposal.

6 Sampling issues

This CG is not instructed to discuss sampling issues.

The CG participants are invited to submit proposals directly to DSC 18, if you have opinions/information on sampling issues.

Japan

We agree to the coordinator's comment.

7 Consequential amendments to the Code

I would like to point out the necessity of consequential amendments to Appendix 4 to the Code (Index of solid bulk cargoes) in the report of the CG. Such work will be done by the E&T Group.

The CG participants are invited to identify other relevant works, if exists.

Japan

We agree to the coordinator's comment and we see no further work.
Annex 1 (to the coordinator’s remarks in the final round)

Proposed amendment to Appendix 2 to the IMSBC Code

Add the following text as new section 1.4:

**Brazil**

We prefer the incorporation of a full test procedure to Appendix 2, rather than incorporate a new section emphasizing the differences between the new test procedure and the existing Proctor/Fagerberg. We respectfully suggest Appendix 2 should contain an exact procedure for the modified test which will reduce any possible procedural breach. To facilitate, the comments above are repeated on Annex 1 reply attached.

"1.4 Modified Proctor/Fagerberg test procedure for Iron Ore Fines [which may liquefy]"

**United Kingdom**

The use of the Proctor/Fagerberg test is under question as it is not able to capture the known variables involved in safe transport of Iron Ore Fines.

**1.4.1 Scope**

The test procedure specified in this section (this test) should only be used for determining Transportable Moisture Limit of IRON ORE FINES [which may liquefy].

For the purpose of this test, unless expressly specified in this section, the test procedure specified in section 1.3 (ordinary Proctor/Fagerberg test) should be followed.

**United Kingdom**

If variables of sea state and ship size are to be considered TML has to be set in a different way.

**1.4.2 Difference between this test and ordinary Proctor/Fagerberg test**

**United Kingdom** See comment under 1.4 above.

**1.4.2.1 Sample preparation**

For the purpose of this test, a part of the representative sample is dried at a temperature of approximately 60°C or lower to reduce moisture of the sample, as necessary, while drying temperature is 100°C for ordinary Proctor/Fagerberg test (See the first sentence in sub-section 1.3.4.1.). The representative sample for this test should not be fully dried, except in case of moisture content measurement.
United Kingdom

In TWG_Report_5_Research_Synopsis_Master_V11 the section is as below:

1.4.4 Procedure

.1 Establishment of a complete compaction curve. A representative sample according to a relevant standard (see section 4.7 of the IMSBC Code) of the test material is partially dried at a temperature of approximately 60°C or less to reduce the samples moisture to a suitable starting moisture, if needed. Note: no full drying for IOF samples are to be carried out.

It is not only drying that induces change in response, the mixing procedure does so as well. If this test is adopted will the details of the mixing procedure be standardized?

1.4.2.2 Density of solids

For the purpose of this test, density of solids should be measured using a gas or water pycnometry equipment according to internationally or nationally accepted standard, e.g., ASTM D5550 and AS 1289 (See sub-section 1.3.2.5).

1.4.2.3 Compaction procedure

The following table specifies the compaction condition for this test, comparing the compaction condition for ordinary Proctor/Fagerberg test:

<table>
<thead>
<tr>
<th>Weight of hammer</th>
<th>This test</th>
<th>Ordinary Proctor/Fagerberg test</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 g</td>
<td>350 g</td>
<td></td>
</tr>
<tr>
<td>Height of dropping hammer</td>
<td>0.15 m</td>
<td>0.2 m</td>
</tr>
<tr>
<td>Number of dropping for each layer</td>
<td>25 times</td>
<td></td>
</tr>
<tr>
<td>Number of layers</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

An appropriate compaction hammer should be prepared for the aforementioned compaction.

1.4.2.4 Moisture content

For the purpose of this test, the cylinder is emptied when the weight of the cylinder with the tamped sample has been determined, the sample is dried at 105°C and the weight is determined (See the last sentence in sub-section 1.3.4.1.). Reference is made to ISO 3087:2011 "Iron ores -- Determination of the moisture content of a lot".

United Kingdom

In TWG_Report_5_Research_Synopsis_Master_V11 the sub-section is 1.4.4.1.

1.4.2.5 Compaction curve

For the purpose of this test, the critical moisture content is indicated by the intersection of the compaction curve and the line corresponding to "degree of saturation equals to 80% (S = 80%)", while the the critical moisture content for
ordinary Proctor/Fagerberg test corresponds to "degree of saturation equals to 70% (S = 70%)" (See sub-section 1.3.4.5). The transportable moisture limit (TML) is the critical moisture content.

**United Kingdom**

Argument against the increase has been advanced - Answers to the queries raised should be given before this proposal goes forward.

### 1.4.3 Optimum moisture content

Optimum Moisture Content (OMC) is the moisture content corresponding to the maximum compaction (maximum dry density) under the specified compaction condition.

To check the applicability of this test, the relation between moisture content and dry density should be evaluated, during this test. Then the OMC and the corresponding degree of saturation should be determined.

This test procedure was developed with the finding that the degree of saturation corresponding to OMC of iron ore fines was 90 % to 95 %, while such degree of saturation of the Scandinavian ores and concentrates studied by Fagerberg were 70 % to 75 %.

In the case that the degree of saturation corresponding to OMC is less than 90 %, the shipper should consult with an appropriate authority, for the reason that this test is not applicable for the material and the TML determined in accordance with section 1.4.2.5 may be too high."

**United Kingdom**

Please do remember that the sample preparation also affects the TML determination as does the particle size distribution. The effect of soaking time is shown.

![Figure 6: Variation in soaking time from 5 minutes to 30 hours - Sample of Australian Iron Ore Fines: Australia - A](image)

Differences were also found in repeat tests. So how many repeat tests are to be specified?
Annex 2 (to the coordinator’s remarks in the final round)

Draft amendments to Appendix 1
Individual schedules for Iron Ore Fines and IRON ORE

Brazil

Our comments are inserted below as instructed by the CG Coordinator, i.e., only on the Iron Ore Fines [which may liquefy] proposed schedule. As per CG Coordinator guidance, the comments below will be extended to the other draft individual schedules, as appropriate.

Part 1

New individual schedule(s) for Iron Ore Fines

Option 1

The following two individual schedules are added:

"IRON ORE FINES which is not liable to liquefy"

The provisions of this schedule shall only apply to iron ore cargoes meeting all the following conditions:

.1 the cargo contains both:
  .1.1 10% or more of fine particles less than 1 mm; and
  .1.2 50% or more of particles less than 10 mm*;

.2 the total goethite content of the cargo exceeds 35%; and

.3 the cargo is to be carried on a bulk carrier of 150,000 tonnes of deadweight tonnage or upward**.

Footnote*: "See individual schedule for "IRON ORE"."

Footnote**: "See individual schedule for “IRON ORE FINES which may liquefy”.”

The shipper shall provide the master with a declaration indicating the goethite content of the cargo. The goethite content of the cargo shall be determined according to internationally or nationally accepted standard procedures.

United Kingdom

Goethite is a substitution pseudomorph, in which one mineral [or other material] is replaced by another and has different forms, crystalline, pisolithitic, vitreous as well as earthy and often has cores of other material.

Just specifying goethite content does not give any indication of what form it is in or what its properties are. The Schedule would have to say exactly where the ore is from and what form the goethite is in. The schedule should be written to cover Iron Ore Fines from any part of the world.
Goethite from Minas Gerais, Brazil.

Goethite coating/replacing rusted pyrite cubes.

Goethite--Leadville mining district, Colorado


Description

Iron ore fines vary in colour from dark grey, rusty red to yellow and comprise of hematite, goethite and magnetite with varying iron content.

IRON CONCENTRATE is a different cargo (See individual schedule for "MINERAL CONCENTRATES")

Characteristics

<table>
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</table>

Hazard

This cargo may affect magnetic compasses. This cargo is non-combustible or has low fire-risks.

Stowage & Segregation

No special requirements

Hold Cleanliness

No special requirements

Weather Precautions

No special requirements

Loading

Trim in accordance with the relevant provisions required under sections 4 and 5 of the Code.
As the density of the cargo is high, due consideration shall be given to ensure that tanktop is not overstressed during voyage and during loading by a pile of the cargo.

**Precautions**

Loading rates of this cargo are normally very high. Due consideration shall be given to the ballasting operation in developing the loading plan required by SOLAS regulation VI/7.3. Bilge wells shall be clean, dry and covered as appropriate to prevent ingress of the cargo.

**Ventilation**

No special requirements

**Carriage**

Cargo hold bilges shall be sounded at regular intervals and pumped out, as necessary.

**Discharge**

No special requirements

**Clean-Up**

No special requirements" and

"**IRON ORE FINES which may liquefy**

The provisions of this schedule need not apply to iron ore cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or

.2 less than 50% of particles less than 10 mm*.

**Brazil**

Brazil suggests the following wording:

The provisions of this schedule apply to cargoes containing both:

.1 10% or more of fine particles less than 1 mm; and

.2 50% or more of particles less than 10 mm.

The provisions of this schedule need not apply to iron ore fines meeting the following both conditions:

.1 the total goethite content of the cargo exceeds 35%; and

.2 the cargo is to be carried on a bulk carrier of 150,000 tonnes of deadweight tonnage or upward**.

Footnote*: "See individual schedule for "IRON ORE"."

Footnote**: "See individual schedule for "IRON ORE FINES which is not liable to liquefy"."
The shipper shall provide the master with a declaration indicating the goethite content of the cargo. The goethite content of the cargo shall be determined according to internationally or nationally accepted standard procedures.

**United Kingdom**

Regarding "goethite content", see the problems outlined above.

**Description**

Iron ore fines vary in colour from dark grey, rusty red to yellow and comprise of hematite, goethite and magnetite with varying iron content.

IRON CONCENTRATE is a different cargo (See individual schedule for "MINERAL CONCENTRATES")

**Brazil:** We agree.

**Characteristics**

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**Brazil** Brazil agrees with Characteristics – Bulk Density and Stowage Factor included.

**Hazard**

This cargo may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). See section 7 of this Code.

This cargo may affect magnetic compasses.

This cargo is non-combustible or has low fire-risks.

**Brazil:** We agree.

**Stowage & Segregation**

No special requirements.

**Brazil:** We agree.

**Hold Cleanliness**

No special requirements.

**Brazil:** We agree.
Weather Precautions

When a cargo is carried in a ship other than a specially constructed or fitted cargo ship complying with the requirements in subsection 7.3.2 of this Code, during loading and unloading operations, the following provisions shall be complied with:

.1 the moisture content of the cargo shall be kept less than its TML during loading operations and the voyage;

.2 unless expressly provided otherwise in this individual schedule, the cargo shall not be handled during precipitation;

.3 unless expressly provided otherwise in this individual schedule, during handling of the cargo, all non-working hatches of the cargo spaces into which the cargo is loaded or to be loaded shall be closed;

.4 the cargo may be handled during precipitation under the conditions stated in the procedures required in subsection 4.3.3 of this Code; and

.5 the cargo in a cargo space may be discharged during precipitation provided that the total amount of the cargo in the cargo space is to be discharged in the port.

Brazil: We agree.

Loading

Trim in accordance with the relevant provisions required under sections 4 and 5 of the Code.

As the density of the cargo is high, due consideration shall be given to ensure that tanktop is not overstressed during voyage and during loading by a pile of the cargo.

When the shipper's cargo declaration states that the cargo is likely to exude free water on passage, the cargo shall not be trimmed to level.

Brazil: We agree.

Precautions

Loading rates of this cargo are normally very high. Due consideration shall be given to the ballasting operation in developing the loading plan required by SOLAS regulation VI/7.3. Bilge wells shall be clean, dry and covered as appropriate to prevent ingress of the cargo.

Brazil: We agree.

Ventilation

No special requirements.

Brazil: We agree.

Carriage

Cargo hold bilges shall be sounded at regular intervals and pumped out, as necessary.
When the shipper’s cargo declaration states that the cargo is likely to exude free water on passage and free water is collected at the corners of the cargo spaces, reinforcement of bilge water pumping shall be considered.

The appearance of the surface of this cargo shall be checked regularly during voyage, as far as practicable. Cargo hold bilges shall be sounded at regular intervals and pumped out, as necessary.

**United Kingdom**

Bilge pumping has no effect on the water pressures in the main part of a wet base as demonstrated by the TWG research.

If free water above the cargo or fluid state of the cargo is observed during voyage, the master shall take appropriate actions to prevent cargo shifting and potential capsize of the ship, and give consideration to seeking emergency entry into a place of refuge.

**Brazil**

“Free water above the cargo” is potentially misleading and it is not supported by the research outputs. Although differing from the IMO standard provision/language, we understand the wording below is more appropriate to replace the previous paragraph:

If a fluid state of the cargo bulk is observed or free water is observed above the cargo bulk during voyage, the master shall take appropriate actions to prevent cargo shifting and give consideration to seeking emergency entry into a place of refuge.

**United Kingdom**

Regarding the words "to prevent cargo shifting ", the cargo would have already shifted!

**Discharge**

No special requirements.

**Brazil:** We agree.

**Clean-Up**

No special requirements*

**Brazil:** We agree.

**Option 2**

The following individual schedule is added:

"**IRON ORE FINES**

The provisions of this schedule need not apply to iron ore cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or

.2 less than 50% of particles less than 10 mm*.

Footnote: "See individual schedule for "IRON ORE"."
Notwithstanding of the provisions in section 1.4 of the Code, the requirements in sections 4.2.2.9, 4.2.2.10, 4.3.2 to 4.3.5, 4.5, 4.6, 7.3 and 8 of the Code and the requirements in the appendix to this schedule need not apply to this cargo in the case that:

.1 the total goethite content of the cargo exceeds 35%; and

.2 the cargo is to be carried on a bulk carrier of 150,000 tonnes of deadweight tonnage or upward.

The shipper shall provide the master with a declaration indicating the goethite content of the cargo. The goethite content of the cargo shall be determined according to internationally or nationally accepted standard procedures.

**United Kingdom**

Regarding "goethite content", see comments on goethite above.

**Description**

Iron ore fines vary in colour from dark grey, rusty red to yellow and comprise of hematite, goethite and magnetite with varying iron content.

IRON CONCENTRATE is a different cargo (See individual schedule for "MINERAL CONCENTRATES")

**Characteristics**

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**Hazard**

This cargo may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). See section 7 of this Code.

This cargo may affect magnetic compasses.

This cargo is non-combustible or has low fire-risks.

**Stowage & Segregation**

No special requirements

**Hold Cleanliness**

No special requirements

**Weather Precautions**

See appendix to this schedule.
Loading

Trim in accordance with the relevant provisions required under sections 4 and 5 of the Code.

As the density of the cargo is high, due consideration shall be given to ensure that tanktop is not overstressed during voyage and during loading by a pile of the cargo.

See appendix to this schedule.

Precautions

Loading rates of this cargo are normally very high. Due consideration shall be given to the ballasting operation in developing the loading plan required by SOLAS regulation VI/7.3. Bilge wells shall be clean, dry and covered as appropriate to prevent ingress of the cargo.

Ventilation

No special requirements

Carriage

Cargo hold bilges shall be sounded at regular intervals and pumped out, as necessary.

See appendix to this schedule.

Discharge

No special requirements

Clean-Up

No special requirements

APPENDIX

WEATHER PRECAUTIONS

When a cargo is carried in a ship other than a specially constructed or fitted cargo ship complying with the requirements in subsection 7.3.2 of this Code, during loading and unloading operations, the following provisions shall be complied with:

.1 the moisture content of the cargo shall be kept less than its TML during loading operations and the voyage;

United Kingdom

This statement can only apply to the whole cargo. The TML will be exceeded in portions of the cargo if water drainage occurs.

.2 unless expressly provided otherwise in this individual schedule, the cargo shall not be handled during precipitation;

.3 unless expressly provided otherwise in this individual schedule, during handling of the cargo, all non-working hatches of the cargo
spaces into which the cargo is loaded or to be loaded shall be closed;

.4 the cargo may be handled during precipitation under the conditions stated in the procedures required in subsection 4.3.3 of this Code; and

.5 the cargo in a cargo space may be discharged during precipitation provided that the total amount of the cargo in the cargo space is to be discharged in the port.

Loading

When the shipper's cargo declaration states that the cargo is likely to exude free water on passage, the cargo shall not be trimmed to level.

United Kingdom

No research evaluation by the TWG supports this requirement.

Carriage

When the shipper's cargo declaration states that the cargo is likely to exude free water on passage and free water is collected at the corners of the cargo spaces, reinforcement of bilge water pumping shall be considered.

United Kingdom

Bilge water pumping will have virtually no effect on cargo safety.

The appearance of the surface of this cargo shall be checked regularly during voyage, as far as practicable.

If free water above the cargo or fluid state of the cargo is observed during voyage, the master shall take appropriate actions to prevent cargo shifting and potential capsize of the ship, and give consideration to seeking emergency entry into a place of refuge.

United Kingdom

Why not include the requirement of video recording so that the cargo state during the voyage can be recorded in any sea state without endangering the crew?
Part 2

Proposes amendment to individual schedule for IRON ORE (Group C)

The following text with the footnote is inserted under the Bulk Cargo Shipping Name:

"The provisions of this schedule shall apply only to cargoes containing either:

.1 less than 10% of fine particles less than 1 mm; or

.2 less than 50% of particles less than 10 mm*."

Footnote:

Option 1 "See individual schedules for "IRON ORE FINES which may liquefy" and "IRON ORE FINES which is not liable to liquefy."

Option 2 "See individual schedule for IRON ORE FINES."

Brazil

We agree with the text proposed by the CG Coordinator to amend the Iron Ore (Group C) individual schedule, in principle.

Brazil believes, however, that consideration should be given to simplifying the definition for Iron Ore to reflect the fact that it would be described as material nominally greater than 6.3 mm, i.e., described as coarser than one key-size in the coarse size range of the particles present in the cargo. We understand that 6.3 mm is a figure commonly adopted by the producers and shippers when referring to Iron Ore.

United Kingdom

This proposal cannot be supported.