

SUB-COMMITTEE ON CARRIAGE OF  
CARGOES AND CONTAINERS  
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Agenda item 5

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## AMENDMENTS TO THE IMSBC CODE AND SUPPLEMENTS

### Amendment to the individual schedules for DIRECT REDUCED IRON (A) and DIRECT REDUCED IRON (B)

Submitted by Japan, IIMA

#### SUMMARY

*Executive summary:* This document contains a proposal for the amendment to individual schedules for DIRECT REDUCED IRON (A) and DIRECT REDUCED IRON (B)

*Strategic direction, if applicable:* 7

*Output:* 7.13

*Action to be taken:* Paragraph 13

*Related documents:* CCC 9/5/15, CCC 9/14, E&T 40/3/3, E&T 40/INF.2, CCC 10/5 and CCC 10/INF.xx

#### Background

1 Hot briquetted direct reduced iron, so called "HBI" (Hot Briquetted Iron) has been being carried in bulk under the individual schedule for "DIRECT REDUCED IRON (A) Briquettes, hot-moulded", hereafter expressed as "DRI (A)". This cargo is a key strategic component for decarbonization of iron and steel production and the volume of carriage is anticipated to increase.

2 The Sub-Committee, at the last session, considered document CCC 9/5/15 containing a proposal for amendments to the individual schedule for DRI (A), to make the density criterion mandatory and to clarify and strengthen the provisions of the Loading section of the schedule in order to emphasise the importance of briquette integrity and strength. The Sub-Committee agreed to refer the document to E&T 40 for further consideration with a view to providing advice to CCC 10. (CCC 9/14, paragraphs 5.36 to 5.38).

3 In document E&T 40/3/3, Japan and IIMA expressed their belief that it is crucial to communicate the importance and relevance of apparent density to safe shipment of DRI (A) and the risks associated with inadequately-pressed, low-strength briquettes to concerned

stakeholders. In this context they proposed to issue an MSC Circular for disseminating the information and recommendation.

4 E&T 40, having considered document E&T 40/3/3, proposing to issue an MSC circular on safe carriage of DRI (A), and document E&T 40/INF.2, providing background to the proposals made in documents CCC 9/5/15 and E&T 40/3/3, agreed, in principle, to:

- .1 include the term "apparent density" in the schedules for DRI (A) and "DIRECT REDUCED IRON (B), Lumps, pellets, cold-moulded briquettes", hereafter expressed as "DRI (B)", along with a footnote concerning explanation of the term and the method for measurement according to ISO 15968:2016;
- .2 make apparent density a mandatory requirement; and
- .3 invite interested Member States and international organizations to submit further proposals to CCC 10 in this regard. (CCC 10/5, paragraph 3.37 to 3.41)

## Discussion

5 Apparent density is the mass in air per volume, including both the solid and void spaces within particles, but excluding the void spaces between particles. Apparent density of DRI (A) is determined in accordance with the ISO 15968:2016 "Direct reduced iron -- Determination of apparent density and water absorption of hot briquetted iron (HBI)".

6 Apparent density is a good indicator of the effectiveness of the briquetting process, being a proxy for the reactivity of the material. Apparent density can be negatively impacted by too low briquetting temperature and/or pressure, as well as by problems with the briquetting press itself. At an apparent density of greater than 5,000 kg/m<sup>3</sup>, the reactivity of DRI (A) is considered to be sufficiently reduced for safe shipment. Inadequate briquetting may lead to briquettes with poor physical strength, in turn leading to briquette breakage, the generation of excessive small particles and exposure and release of uncompacted pellets.

7 As mentioned in paragraph 7 of E&T 40/3/3, lower grade HBI, produced using a proportion of lower grade iron ore, is also transported. The proportion of low grade iron ore in the production of HBI currently being shipped is such that the HBI, whilst of somewhat lower grade than HBI produced exclusively from high grade iron ore (which has a total iron (Fe) content of at least 88% by weight), still satisfies the requirement for an apparent density greater than 5,000 kg/m<sup>3</sup>.

8 However, in the medium to long term future, due to limitations in the supply of high grade iron ore, an increasing volume of HBI for maritime transport will necessarily be produced with a high proportion of lower grade iron ore which, depending on the process and technology employed, may not achieve an apparent density of 5,000 kg/m<sup>3</sup>.

9 As it now stands, HBI that does not have apparent density of 5,000 kg/m<sup>3</sup> should be shipped in accordance with the DRI (B) schedule. However, this may not necessarily be appropriate for all types of lower grade HBI which, whilst not satisfying the apparent density criterion, may nevertheless have been briquetted at sufficiently high temperature and pressure to achieve a low level of reactivity such as to enable safe shipment.

10 As mentioned in E&T 40/INF.2, an ongoing scientific research project, designated HBI C-Flex, which is partially financed by a grant from an EU fund and sponsored by participants

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along the iron ore to steel value chain, aims to investigate, inter alia, the impact of the use of lower grade iron ore on the safe shipment of HBI and thus how to adapt future maritime regulations accordingly.

11 The primary purpose of the proposed amendments to the DRI (A) schedule is to better ensure the safe shipment of this cargo. However, in proposing these amendments, the co-sponsors do not wish to preclude the possibility that lower grade HBI with a total Fe content less than 88% by weight and apparent density of 5,000 kg/m<sup>3</sup> or lower could, in the meantime, be carried in bulk as necessary as a cargo not listed in the IMSBC Code under the provision in 1.3 of the Code. In this regard, the co-sponsors propose to include texts for differentiating high grade and low grade HBI based on total Fe content in the sections for Description in the schedules for DRI (A) and DRI (B).

### **Proposal**

12 The co-sponsors propose the amendments to the individual schedules for DRI (A) and DRI (B) as set out in the annex to this document.

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

13 The Sub-committee is invited to consider the proposed amendments and take action as appropriate.

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## Proposed draft amendment to individual schedule for DRI (A)

Note 1: Tracked changes are created using "strikeout" for deleted text and "grey shading" to highlight all modifications and new insertions, including deleted text.

1 Amend the text in the section for Description as follows:

"Direct reduced iron (DRI) (A) is a metallic grey material, ~~moulded in a briquette form,~~ emanating from a densification process, whereby the DRI feed material is hot-moulded into a briquette form with total Fe content of at least 88% by weight at a temperature greater than 650°C ~~and has a density greater than 5,000 kg/m<sup>3</sup>. Fines and small particles (under 6.35 mm) shall not exceed 5% by weight.~~"

2 Amend the first to the third paragraphs in the section for Loading with the associated footnote as follows:

"Prior to loading this cargo, the shipper shall provide the master with a certificate issued by a competent person recognized by the competent authority of the port of loading stating that the cargo, at the time of loading, is suitable for shipment and that it conforms with the requirements of this Code; that the apparent density\* is greater than 5,000 kg/m<sup>3</sup>; the quantity of fines and small particles (under 6.35 mm in size) does not exceed more than 5% by weight; the moisture content does not exceed 1.0% and the temperature does not exceed 65°C.

This cargo shall not be loaded and shipped under the provisions of this schedule when the temperature is in excess of 65°C, if its moisture content is in excess of 1.0%, or if the quantity of fines and small particles (under 6.35 mm in size) exceeds 5% by weight or if the apparent density\* is equal to or less than 5,000 kg/m<sup>3</sup>.

Appropriate precautions<sup>†</sup> shall be taken prior to and during loading in order to have a that the cargo be substantially composed of essentially whole intact briquettes with minimal presence of exposed or loose uncompact pellets. The cargo shall be loaded in such a way so as to minimize breakage of briquettes and the additional generation of fines and small particles (under 6.35 mm in size) and concentration of fines in any area of the cargo and to minimize the presence of exposed or loose uncompact pellets and concentration thereof in any area of the cargo. The addition of fines and small particles (under 6.35 mm in size) or dust or loose pellets in homogeneous cargoes of DRI (A) shall be prohibited.

\* Apparent density is the mass in air per volume, including both the solid and void spaces within particles, but excluding the void spaces between particles. Apparent density of hot briquetted direct reduced iron is determined according to ISO 15968:2016 "Direct reduced iron -- Determination of apparent density and water absorption of hot briquetted iron (HBI)".

† One example of an appropriate precaution is screening of the material to be loaded."

### Proposed draft amendment to individual schedule for DRI (B)

- 1 Amend the text in the section for Description with the associated footnote as follows:

"Direct reduced iron (DRI) (B) is a highly porous, black/grey metallic material formed by the reduction (removal of oxygen) of iron oxide at temperatures below the fusion point of iron. ~~Cold-moulded briquettes~~ Cargoes in briquette form are defined as those with total Fe content of at least 88% by weight which have been moulded at a temperature ~~less~~ not greater than 650°C or which have a an apparent density\* of ~~less~~ not greater than 5,000 kg/m<sup>3</sup>. ~~Fines and small particles under 6.35 mm in size shall not exceed 5% by weight.~~

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\* Apparent density is the mass in air per volume, including both the solid and void spaces within particles, but excluding the void spaces between particles."

Note 2: The sentences "Fines and small particles (under 6.35 mm) in size shall not exceed 5% by weight" and "Fines and small particles under 6.35 mm in size shall not exceed 5% by weight" in the sections for Description in the individual schedules for DRI (A) and DRI (B) are proposed to be deleted, for the reason that there are relevant mandatory requirements in the sections for Loading and these sentences are superfluous.

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