

# JAPAN P&I NEWS

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## ベネズエラにおける DRIA (HBI) の積載について

ベネズエラのコレスポンデント Venepandi C.A. より、オリノコ川における直接還元鉄 (DRI /Direct Reduced Iron) 積載に関するサーキュラーを入手いたしましたので、ご参考に供し、当該海域を航行する各船舶の安全航行と事故防止を祈念いたします。

以上

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(試訳)

Venepandi's Circular -017-

オリノコ川における DRI A (HBI)の積載に関して

オリノコ川の Palua 及び San felix における HBI (Hot Briquette Iron) プラントの再稼働により、前述の貨物の取り扱いが急激に増加しており、同貨物に関するリスクが高まっています。前述の港に寄港する全船に対するリスク予防対策とアドバイスのために本サーキュラーを用意しました。

我々は度々発生している問題、オリノコ川での座礁 (別途サーキュラーでご案内します) 及び液状化の恐れがある積荷 (Iron ore fine) の水分値上昇や積荷 (DRI 等) の濡損害、若しくは Iron ore fine と申告したが、実際は DRI (Direct Reduced Iron) や DRI A であった、また DRI B や C を DRI や DRI A (HBI)と申告してしまったという、積荷の申告ミスについてまとめご報告します。

現在 Ferrominera は、Iron ore fine の積み込みが出来る唯一のターミナルですが、Orinoco Iron や SIDOR 等の他のターミナルでも HBI や DRI といった鉄貨物を積載することが可能です。しかしながら、これらの貨物は、鉄成分が 10%以下であり、Iron ore fine とは分類されておらず、鉄成分が 60%以上の通常の DRI 貨物と同じ取り扱いが求められないため、dangerous cargo となりうる可能性があります。

Iron ore fines (鉄成分 1%未満の iron ore fine に分類されない貨物) については、我々の経験上、同貨物を積載する船舶は、本船の全ての種類の ventilation を使用する、すなわち本船の ventilation のレベルを適切に保つ、雨水等から貨物を守る、全ホールドの温度を定期的に確認するといった適切な処置をすべきと考えられます。

上記に関し注意するために、船主は事故予防及びトラブルが発生した際に対策をすぐに検討できるよう、また積荷の含水量や IMSBC コードに従い危険な状態ではないか、運送に適している状態であるかを確認するために、積地における Pre-loading 及び loading survey を実施し、ストックパイルの含水量の調査及び荷役作業中の温度を確認することを強くお勧めいたします。

以下に、IMSBC コードの注意警告が盛り込まれている Cargo Handbook からの引用を紹介いたします。

QT :

直接還元鉄貨物 (DRI : Direct Reduced Iron)

Cargo Handbook (世界最大の貨物輸送に関するガイドライン、Website の検索より Direct Reduced Iron (DRI) と検索) より

=以下原文 P. 5 中段より抜粋=

### 3 種類の DRI

IMSBC コードは現在、DRI を 3 種類に分類している。

1. 先ず 1 つ目のタイプが DRI (A)、Hot Briquetted Iron (HBI) や Hot Moulded Briquettes (HMB 2) として知られている、反応性の低い、高密度品種である DRI。
2. 続いては、反応性が高く、低密度であり、lump、pellets、cold moulded briquettes の形状である、DRI (B)。
3. 今般新たに DRI (C) が加わることになり、これらは By-product fines と記載され、DRI (A) や DRI (B) の製造の際に、生産される。
4. 現在 DRI (B) は、inert gas 下のみで運送可能ですが、DRI (C) は、DRI (B) と同じ条件が求められる。コードへの主な変更点は、後に要約されている。

### 警告

IMSBC コードは 3 つの当局 (揚地、積地及び船籍港) の合意により変更されるコードによってカバーされるあらゆる積荷の必要条件を規定している。

このコードは、固体バルク貨物の輸送のための遵守されなければならない条件を規定しており、当局または所管官庁 (揚地、積地及び船籍港) は、少なくともこのコードで要求される効果的で安全である条件を満たした場合に、除外規定を許可することができる。

その当事者ではない所管官庁が許可している免除の承認については、その管轄当局が決定権をもつ対象となる。したがって、免除されている貨物の船積前に、受益者は、当該地の権限ある当局に通知しなければならない。

従って、当該貨物や、それ以外の貨物の輸送の際に必要な控除を求める方達にとっては有効な機会となる。“High Moisture” DRI Fine はその成分に 12% を上限に水分を、75% を上限に金属鉄が含まれているが、水素が本船の ventilation より取り除かれることを条件に、

inert gas 無しでの運送が認められている。しかしながら、海上の検査では、悪天候の間のように ventilation が一時的に使用できないときには、ホールド内の水素は爆発的に蓄積されることは明らかである。更に、推奨される ventilation 体制では Ythan 号での爆発事故を防ぐことが困難であったと考えられる。それ故に、このような貨物が積み込まれた場合には注意が必要である。これらの内のいくつかは、DRI Fine と un-reduced iron から回収された fine をブレンドしており、それらを非有害な Iron ore fine として取り扱っている場合もある。繰り返しになるが、このような貨物が積み込まれたら注意が必要である。一方で、DRI 炉内での還元によって、Iron ore には沢山のグレードがあり、これらは度々 “direct reduction iron ore pellets”等と呼ばれる。これらは、海上輸送のための特別な規定を必要とせず、それらの化学組成から DRI (B) と区別することが可能である。

コードへの主な変更点

すべてのタイプの DRI

Fine は、現在のサイズで 6.35 ミリまでの粒子として定義されている。

運送人の代表者は、検査のため、ストックパイルと荷役設備への適切なアクセスを確保すること。

荷役中の貨物の温度をモニターし、ログに記録を残すこと。

本船は、oxygen depleted atmosphere 内の水素及び flammable atmosphere を測るために適切な検知器を所持すること。

航海中は積荷温度とホールド内の空気中の水素をモニターすること。

ハッチカバーを開ける前に水素濃度を測定すること。

水素濃度は、ハッチカバーを開く前に保持している中で測定すること。

全ての測定値を 2 年間本船上に保管すること。

DRI (A)、ブリケット、熱間成型されたもの

水分含有量に上限は 1%。この貨物は、完全にブリケットである。

必要に応じて、貨物表面の ventilation を行うこと。Mechanical ventilation が行われる場合には、ファンは防爆性のものを使用し、スパークの発生を防止すること。ワイヤメッシュガードは、通気口の入口と出口の上に取り付けること。

## DRI (B)、ランプ、ペレット、冷間成型のもの

平均粒径は 6.35mm～25mm である。

ローディングコンベアは乾燥している状態にすること。

積み込み前に、ウルトラソニックテストや同様の方法で、ハッチカバーの水密性を確認すること。

水分含有量は 0.3%未満であり、積荷役中にモニターすること。

既にカーゴスペースに積み込まれている貨物が、湿っている、若しくは反応し始めている場合は、早急に揚荷すること。

インサートガスブランケットの下での運送のみ許可されている。

本船は、定期的にホールド内の温度を正確に測定し、カーゴスペースの水素及び酸素濃度を確認すること。

本船は不活性雰囲気をも最小限に抑えながら、確実に船積み内の複数の点の温度を測定し、航海上の貨物スペースの雰囲気中の水素や酸素（5%以下）の濃度を測定すること。本船は CO2 消火システムを設置し、本来の目的以外には使用しないこと。

本船は本船船長と適任者が下記のことを確認するまで出港すべきではない。

1. 積み込まれたすべてのカーゴスペースが正しく密封され、不活性化（イナート）されていること。
2. 貨物の全ての計測地の温度を、安定して保ち、65°C未満であること。
3. フリースペースの水素濃度は、体積の 0.2%未満（L.E.L 最低爆発限界の 5%）であること。

本船は、可燃性の雰囲気中の酸素を測定するために、適した検出器を備ええること。

航海中、酸素濃度は 5%未満に維持すること。

## DRI (C)、生産品、粉状のもの

平均粒径は 6.35 mm 未満であり、12mm を超えないものとする。

「この貨物は、カテゴリーごとの性質によって大きく異なるため、貨物の反応性を決定することは極めて困難である。従って、最悪のシナリオを常に想定すること。」

運送要件は、DRI (B) と同一であり、含水率 3%未満の規定も含んでいる。

確認すべき情報

積荷前：

DRI (C) を含む貨物は、その化学成分によって特定することが可能であり、貨物の詳細を要求すること。化学成分は、全鉄含有量 (Fe) から、金属 (またはフリー) 鉄含有量 (FeO) と水分から成り立っている。

この情報は、可能な限り独立した分析試験場の証明書により証明されるべきで、運送される貨物に関連する分析が必要があり、言い換えれば“一般的な”分析は認められない。分析の証明書には、分析方法とサンプルを分析した際の基準 (好ましくは、BS ISO 10835 : 2006) 及び金属鉄の含有量 (BS ISO 5416 : 2006) に関連する基準を明記すること。サンプリングが行われた日もチェックしておくこと。

鉄鉱石中の鉄成分は、他の要素と化学的に結合されることにより、金属 (若しくはフリー) の鉄が含まれなくなる。貨物に金属鉄 (FeO) が含まれている場合、それは DRI の派生品となる。DRI (C) の金属鉄の含有量は 1%か 2%であるのに対し、DRI (A) 及び (B) は、約 85%の金属鉄を含んでいる。これらのブレンディングされた貨物は、危険な貨物 DRI (C) とみなすべきであり、コードの規定に従って運送する必要がある。もし貨物が疑わしい場合は、専門家に確認を求めること。

DRI (C) を確認すると、IMSBC コードでは本船船長に提供しなければならない情報がまとめられている。DRI (C) では、一般的な要件に加えて、以下のことが明記されている。

“本船に積み込む前に、荷送人は本船船長に対し、積地 National Administration が許可した適任者が、本船積み込み時に貨物が運送に適した状態であること、IMSBC コードの条件が確認されていること、水分値が 0.3%未満であること、温度が 65°Cを超えていないことを示した証明書を提出が必要となる。この証明書は、当該貨物の保管及び温度に関する基準を満たしていることを明記しなければならない。”

“本船に積み込む前に、当該貨物は少なくとも 30 日間保管されなければならない、これを確認する証明書は、積地 National Administration が許可した適任者により発行される。”

“荷送人は、貨物の積み込み前に、本船船長に対し、貨物に関するすべての情報及び緊急時の手順について提供しなければならない”

“積荷役中の貨物温度を確認し、各ロットの温度を細かくログブックに記録し、そのコピーを本船船長に提出する。積荷役完了後、粉状・小粒子も含め引き渡されたこと、貨物の

水分値は 0.3%未満、温度は 65℃未満であることを記載した証明書が積地 National Administration が許可した適任者より発行されなければならない。”

IMSBC コードの除外規定については、同コードの Appendix 1、DRC (C)については Section 1.5 に規定されており、もし貨物に対する別の条件が効果的で安全であれば、当局はこれらを承認できると同 Section 1.5 に規定されている。積地、揚げ地及び船籍国の 3 つの当局がこれらの権限を与えられている。貨物がこれらの除外規定に該当する場合は、事前に関連当局の許可を得ること。

IMSBC コードには除外規定が設けられているが、DRI (C) の運送については同コードに規定されている必要条件を忠実に実行することを強く推奨する。もし運送人がこのアドバイスに従わない場合は、運送人は上述の 3 つの当局に対し通知し、除外規定に対し承認を得る必要があり、flag State Administration のルールに従い、固体バルク貨物を輸送する各船に除外証明書を保管しなければならない。

上述の通り除外規定に従って運送を依頼される貨物については、積込、運送及び安全手順を明確に記載すること。具体的には、本船船長は各カーゴスペースの換気率と接続時間、換気ファンの爆発保護のために必要な標準、詳細な換気ダクトの配置、各カーゴスペース内の水素濃度を監視するための方法及び頻度、各カーゴスペース内の貨物温度を確認する方法及び頻度、緊急を定義する基準、緊急時の手順、荷主の緊急連絡先の電話番号及び揚荷前と揚荷中の手順等を確認すること。

IMSBC コードでは DRI (C) について、運送中の最大許容水分含有量を 0.3%未満と規定している。貨物がこの水分含有量を超過している場合、これは Iron や Nickel ore 貨物と同様に液化化する可能性がある。従って、このような貨物に関連する申告は、Group A や B のように、性質を明記し、付随する分析証明書には、Trans Moisture Limit 及び実際の水分含有量を記載すること。また証明書は、実際に運送される貨物のみ参照されるべきで、以前の積荷から得た包括的な基準や、分析されたサンプルを取得する際に従う基準ではない。

IMSBC コードは、Appendix 1 に記載のない貨物についても規定があり、積地、揚地及び船籍港の当局による三者間の合意によって許可、定義される条件下で当該の貨物を運送可能と定めている。しかしながら、もし積荷が Iron ore fine や、本稿の背景に含まれる説明に該当する貨物、また金属鉄 (FeO) を含んでいる貨物の場合には、三者間の合意に基づいて許可するのは Appendix 1 に記載の無い貨物の場合であるため、当該の貨物は DRI(C)と見做し、IMSBC コードに従い運送すること。

危険因子、特にハザード、積み付け&分離、ホールドの清掃、天候、換気、運送、揚荷等についてはIMSBCコードをご参照。

## **UNQT**

最後に、エキスパートやサーベイヤーの起用を検討する際に、明らかに利害関係がある荷送人の関係者の起用は避けるべきです。追加情報等が必要であれば私達にご連絡下さい。

本件やその他の案件についてご不明なことがあれば、お問い合わせ下さい。

Carlos Carrasco  
Operations Manager  
Venepandi C. A.



## Venepandi's Circular - 017 – General advice for ship's loading DRI A (HBI) at Orinoco River

**Since the reactivation of Palua's and San Felix's (Orinoco river) HBI plants that has increased significantly the shipments of the mentioned cargo, risks have increased for which we've prepared this circular including some precautionary measures and advice for all vessels calling locally to take into consideration.**

Please note that we could summarize the most frequent issues that have taken place at the Orinoco River in groundings (that will be treated in a further circular) and cargo misdeclarations that could lead to hazardous situations due high moisture on cargo (iron ore fines) with potential liquefaction or wet cargo (DRI, etc) or cargoes declared as Iron ore fines but resulting to be DRI or DRI A (HBI) resulting to be DRI B or C.

Indeed Ferrominera is currently the only one terminal where the Iron ore fines can be loaded at, but in others terminal's like Orinoco Iron or SIDOR, vessels can load some iron cargoes like HBI or DRI by products that despite are not classified as iron ore fines, have low percentages of iron, less than 10% that does not require the same cares than a regular DRI shipment with an percentage higher than 60% than can be potentially a dangerous cargo.

For these cargoes that are not iron ore fines (reminding that a cargo is classified under this category when the iron percentage does not exceed 1%), we've found by our experience that any carrier vessel should take the proper measures like use all kind of ventilations available, i.e. maintain a proper level of ventilation (naturally and from the vessel), keeping the cargo away from any kind of liquid (rain, etc) and monitoring constantly all the temperatures in every hold, to check the situation.

Taking note of the above, it is highly recommended to owners to appoint surveyor a as a precautionary measure in order to carry out a preloading and loading survey in order to check the moisture content of the cargo stockpiles as well as to monitor the temperatures throught the loading in order to determine timely any strategy to take to avoid further issues due the moisture content of the cargo or any other hazardous situation and who could confirm that the cargo complies with the IMSBC code and is suitable for carriage.

The following represents an extract from the cargo handbook on the warnings on the IMSBC code:

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Quote:

Direct Reduced Iron (DRI) From Cargo Handbook - the world's largest cargo transport guidelines website Jump to: navigation, search Infobox on Direct Reduced Iron (DRI) Example of Direct Reduced Iron (DRI) Facts Origin World wide Stowage factor (in m<sup>3</sup>/t) Briquettes: 0,3-0,4 m<sup>3</sup>/t Lumps, pellets: 0,5-0,6 m<sup>3</sup>/t Fines, byproducts: 0,3-0,55 m<sup>3</sup>/t

Humidity / moisture Briquettes: <1% (IMO) Lumps, pellets: <0,3% (IMO) Fines, byproducts: <0,3% (IMO)

Ventilation Briquettes: surface ventilation Lumps, pellets: No (inert) Fines, byproducts: No (inert)

Risk factors Self-heating / auto ignition Oxygen depletion Highly reactive with air and (sea) water Formation of hydrogen (explosion hazard)

Contents

- 1 Description / Application / Shipment - Storage / Risk factors
- 2 Risk factors

Description / Application / Shipment - Storage / Risk factors

Direct-reduced iron (DRI), also called sponge iron, is produced from direct reduction of iron ore (in the form of lumps, pellets or fines) by a reducing gas produced from natural gas or coal. The reducing gas is a mixture majority of hydrogen (H<sub>2</sub>) and carbon monoxide (CO) which acts as reducing agent. This process of directly reducing the iron ore in solid form by reducing gases is called direct reduction.

The conventional route for making steel consists of sintering or pelletization plants, coke ovens, blast furnaces, and basic oxygen furnaces. Such plants require high capital expenses and raw materials of stringent specifications. Coking coal is needed to make a coke strong enough to support the burden in the blast furnace. Integrated steel plants of less than one million tons annual capacity are generally not economically viable. The coke ovens and sintering plants in an integrated steel plant are polluting and expensive units.

Direct reduction, an alternative route of iron making, has been developed to overcome some of these difficulties of conventional blast furnaces. DRI is successfully manufactured in various parts of the world through either natural gas or coal-based technology. Iron ore is reduced in solid state at 800 to 1,050 °C

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either by reducing gas (H<sub>2</sub>+CO) or coal. The specific investment and operating costs of direct reduction plants are low compared to integrated steel plants and are more suitable for many developing countries where supplies of coking coal are limited.

The direct reduction process is intrinsically more energy efficient than the blast furnace because it operates at a lower temperature, and there are several other factors which make it economical:

Direct-reduced iron has about the same iron content as Pig Iron, typically 90–94% total iron (depending on the quality of the raw ore) as opposed to about 93% for molten pig iron, so it is an excellent feedstock for the electric furnaces used by mini mills, allowing them to use lower grades of scrap for the rest of the charge or to produce higher grades of steel.

Hot-briquetted iron (HBI) is a compacted form of DRI designed for ease of shipping, handling, and storage.

Hot Direct Reduced Iron (HDRI) is iron not cooled before discharge from the reduction furnace, immediately transported to a waiting electric arc furnace and charged thereby saving energy.

The direct reduction process uses pelletized iron ore or natural "lump" ore. One exception is the fluidized bed process which uses (requires) sized iron ore particles. Select few ores are suitable for direct reduction.

The direct reduction process can use natural gas contaminated with inert gases, avoiding the need to remove these gases for other use. However, any inert gas contamination of the reducing gas lowers the effect (quality) of that gas stream and the thermal efficiency of the process.

Supplies of powdered ore and raw natural gas are both available in areas such as Northern Australia, avoiding transport costs for the gas. In most cases the DRI plant is located near natural gas source as it is more cost effective to ship the ore rather than the gas.

India is the world's largest producer of direct-reduced iron, a vital constituent of the steel industry. Many other countries use variants of the process, so providing iron for local engineering industries.

#### Problems

Directly reduced iron is highly susceptible to oxidation and rusting if left unprotected, and is normally quickly processed further to steel. The bulk iron can also catch fire since it is pyrophoric.

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Sponge iron is not useful by itself, but can be processed to create wrought iron. The sponge is removed from the furnace, called a bloomery, and repeatedly beaten with heavy hammers and folded over to remove the slag, oxidise any carbon or carbide and weld the iron together. This treatment usually creates wrought iron with about three percent slag and a fraction of a percent of other impurities. Further treatment may add controlled amounts of carbon, allowing various kinds of heat treatment (e.g. "steeling").

Today, sponge iron is created by reducing iron ore without melting it. This makes for an energy-efficient feedstock for specialty steel manufacturers which used to rely upon scrap metal.

#### More information on DRI

Direct Reduced Iron may be in the form of pellets, lumps or briquettes, and is used as a feed for blast furnaces. The material, if wetted, may oxidize rapidly and generate heat over a period of time. In addition, hydrogen may be generated, which could possibly form an explosive atmosphere.

Moulded briquettes minimise certain risks; other products, such as cold moulded briquettes and specially processed material, appear to act similarly. However, as a general precaution, every effort should be made to prevent the ingress of water into cargo compartments. Flammable gases should be prevented from entering adjacent enclosed spaces. Prior to shipment, Direct Reduced Iron should be aged for at least 72 hours or treated with some passivation technique to reduce its activity to at least the same level of the aged product. Holds should be maintained under inert atmosphere (less than 5% oxygen and less than 1% hydrogen) throughout the voyage. Direct Reduced Iron, which has been manufactured or treated in a manner approved by the competent authority to provide protection against corrosion and oxidation by water and air, may be shipped without inerting. If wetting to the top level of a bulk stow occurs then this will not necessarily create a problem. However, a problem may arise if the stow is then moved for loading on to carrying vehicles or into a vessel, at which time the wet material is relocated into the centre of the stow. This commodity has, in some cases, been incorrectly described as Sponge Iron, Iron Pellets or Iron Ore Pellets.

DRI is produced by passing hot reducing gases such as hydrogen, methane and carbon monoxide over iron ore (oxide), which is usually in the form of pellets or lumps. Although the process is conducted at high temperatures, these are still substantially below the melting point of iron. This means that the lumps and pellets retain their original shape, but are considerably lighter owing to the removal of oxygen from the ore. Therefore, the pellets and lumps have a hugely porous structure, which makes the material extremely reactive and prone to re-oxidation

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on contact with air and/or moisture. These oxidation reactions cause self-heating in the stow, which can lead to auto-oxidation in which cargo temperatures in excess of 900°C can be generated. Moreover, contact with moisture evolves hydrogen, an extremely flammable and sensitive gas that has caused explosions in the holds of several ships following its ignition.

#### The Adamandas and the Ythan

In 2003 the Adamandas was deliberately sunk by the French Authorities following overheating of her cargo of 21.000 MT of DRI pellets. On 28 February 2004, hydrogen explosions in four of her cargo holds caused the total loss of the Ythan off Colombia, together with the deaths of six of her crew including the Master. The hydrogen had been produced from a cargo of damp DRI fines.

#### Mandatory 2011

In the wake of this incident, a paper was submitted to the IMO Maritime Safety Committee (MSC) by the Marshall Islands, and the topic has been discussed at subsequent meetings of the Sub-committee on Dangerous Goods, Solid Cargoes and Containers (DSC). Eventually, new schedules were agreed in September 2008 and were adopted by MSC Resolution in December 2008 as part of the new IMSBC Code, which was published in 2009. The Code has been recommendatory from 1 January 2009, but became mandatory on 1 January 2011.

#### Three types of DRI

The IMSBC Code now categorise three types of DRI.

1. The first, type DRI (A), is the less reactive, high-density variety of DRI that is known as Hot Briquetted Iron HBI, or Hot Moulded Briquettes HMB 2. The second type, DRI (B), is highly reactive, low density DRI in the form of lumps and pellets and cold moulded briquettes.
3. The schedule now included a new entry DRI ©, which is described as By-product fines and is intended to include all the materials generated as by-products in the manufacture and handling process of DRI (A) and/or DRI (B).
4. DRI (B) may now only be carried under an inert gas atmosphere, and DRI (C) is subjected to the same requirements as DRI (B). The main changes to the Code are summarized later on.

#### Caveat

The IMSBC Code provides for the requirements of carriage of any cargo covered by the Code to be varied by consent of three competent authorities: Where this Code requires that a particular provision for the transport of solid bulk cargoes shall be complied with, a competent authority or competent authorities (port State of departure, port State of arrival or flag State) may authorise any other provision by

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Caracas, 18<sup>th</sup> June 2015

exemption if satisfied that such provision is at least as effective and safe as that required by this Code. Acceptance of an exemption authorized under this section by a competent authority not party to it is subject to the discretion of that competent authority. Accordingly, prior to any shipment covered by the exemption, the recipient of the exemptions shall notify other competent authorities concerned.

The door is therefore open for parties to seek exemption from any or all of the requirements for the carriage of this or any other cargo. 'High Moisture' DRI Fines containing up to 12% moisture and 75% metallic iron are being offered for carriage without inert gas on the basis that the hydrogen will be removed using the ship's mechanical ventilation. However, sea trials showed that hydrogen accumulated in the holds in explosive concentrations when the ventilation was suspended for a short period of time, as would be expected during bad weather. Moreover, the recommended ventilation regime would not have prevented the explosions that caused the loss of Ythan. Therefore one should be very cautious when such a cargo is offered. Some manufacturers are blending quantities of DRI fines with fines recovered from the un-reduced iron ore, and offering them as (non hazardous) iron ore fines. Again, caution is to be exercised upon offering such a cargo for shipment. On the other hand, many grades of iron ore are prepared specifically for reduction in DRI furnaces, and are often referred to as 'direct reduction iron ore pellets', or similar. These do not require any special provisions for transport by sea, and can be differentiated from DRI (B) by their chemical composition.

The main changes to the Code

All types of DRI

Fines are now defined as particles up to 6,35 mm in size.

The carrier's representative is to have reasonable access to stockpiles and loading installations for inspection.

The cargo temperatures are to be monitored during loading and recorded in a log.

The ship shall be provided with a detector suitable for measuring hydrogen in an oxygen depleted atmosphere and for use in a flammable atmosphere.

Cargo temperatures and hydrogen concentrations in hold atmospheres are to be monitored on voyage.

The hydrogen concentration is to be measured in holds prior to opening hatch covers.

All records of measurements are to be retained on board for two years

DRI (A), Briquettes, hot-moulded

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The maximum limit on the moisture content is 1% The cargo is to comprise essentially whole briquettes.

Surface ventilation only shall be conducted as necessary. When mechanical ventilation is used, the fans shall be certified as explosion-proof and shall prevent spark generation. Wire mesh guards shall be fitted over inlet and outlet ventilation openings.

DRI (B), Lumps, pellets, cold-moulded briquettes

The average particle size is from 6,35 mm to 25 mm.

Loading conveyors are to be dry

Prior to loading, an ultrasonic test or another equivalent method with a suitable instrument shall be conducted to ensure weather tightness of the hatch covers and closing arrangements.

The moisture content must be less than 0,3% and must be monitored during loading.

Any cargo that has already been loaded into a cargo space and which subsequently becomes wetted, or in which reactions have started, shall be discharged without delay.

Carriage is only permitted under an inert gas blanket.

The ship shall be provided with the means of reliably measuring the temperature at several points within the stow, and determining the concentrations of hydrogen and oxygen in the cargo space atmosphere on voyage whilst minimising the loss of the inert atmosphere.

The ship shall be provided with the means to ensure that the requirements to maintain the oxygen concentration below 5% can be achieved throughout the voyage. The ship's fixed CO<sub>2</sub> fire-fighting system shall not be used for this purpose.

The ship shall not sail until the master and a competent person are satisfied that:

1. All loaded cargo spaces are correctly sealed and inerted.
2. The cargo temperatures have stabilised at all measuring points and are less than 65°C.
3. The concentration of hydrogen in the free space has stabilised and is less than 0,2% by volume (i.e. 5% of the lower explosive limit, L.E.L.).

The ship shall be provided with a detector suitable for measuring oxygen in a flammable atmosphere.

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The oxygen concentration shall be maintained at less than 5% throughout the duration of voyage.

DRI ©, By-products, Fines

The average particle size is less than 6,35 mm, and there are to be no particles greater than 12 mm in size.

'The reactivity of this cargo is extremely difficult to assess due to the nature of the material that can be included in the category. A worst-case scenario should therefore be assumed at all times.'

The carriage requirements are identical to those for DRI (B), including the 0,3% limit on moisture.

Information to be obtained

Before Loading:

Cargo blends containing DRI (C) can be identified by their chemical composition, details of which must be requested. The chemical composition must include the total iron content (Fe), the metallic (or free) iron content (Feo) and the moisture content. This information should preferably be supported by a certificate from an independent testing laboratory and must relate to the cargo that is being offered for shipment: in other words, a "generic" analysis is not acceptable. The certificate should state the method and standards that have been followed when obtaining the samples that have been tested (preferably ISO 10835: 2000) and the standards that have been followed to determine the metallic iron content (preferably BS ISO 5416: 2006). The date on which the sampling took place should also be checked to ensure relevance.

The iron in a cargo of iron ore is chemically bound with other elements and therefore it contains no metallic (or free) iron. If the cargo contains any metallic iron (Feo), then it must be a DRI derivative: DRI (A) and (B) cargoes typically contain about 85% metallic iron, whereas in blends containing DRI (C) it can be as low as 1% or 2%. Such blended cargoes should be regarded as the hazardous commodity DRI (C) and be carried in accordance with the provisions of the Code. If in doubt, expert advice should be sought.

Having identified the cargo as DRI (C), the IMSBC Code sets out the information that must be provided to the Master. In addition to the general requirements, the entry for DRI (C) specifies the following:

"Prior to loading the cargo, the shipper shall provide the master with a certificate issued by a competent person recognised by the National Administration of the port of loading stating that the cargo, at the time of loading, is suitable for

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Caracas, 18<sup>th</sup> June 2015

shipment; that it conforms with the requirements of this Code; that the moisture content is less than 0.3%; and the temperature does not exceed 65°C. The certificate shall state that the cargo meets the loading criteria in regards to ageing and material temperature.”

“Prior to shipment, the cargo shall be aged for at least 30 days and a certificate confirming this shall be issued by a competent person recognised by the National Administration of the port of loading.”

“Shippers shall provide to the master, prior to loading, comprehensive information on the cargo and safety procedures to be followed in the event of emergency.”

“The cargo temperature shall be monitored during loading and recorded in a log detailing the temperature for each lot of cargo loaded, a copy of which shall be provided to the master. After loading, a certificate shall be issued by a competent person recognised by the National Administration of the port of loading confirming that throughout the whole consignment of fines and small particles the moisture content has not exceeded 0.3% and the temperature does not exceed 65°C.

Exemptions from the requirements of the IMSBC Code For cargoes that are listed in Appendix 1 of the IMSBC Code, such as DRI (C), Section 1.5 allows a competent authority to authorize any other provision or exemption if satisfied that such alternative provision is at least as effective and safe as that required by the Code. Three competent authorities are recognised: the port State of departure, port State of arrival and the flag State. Prior to any shipment covered by such an exemption, the recipient of the exemption must notify the other competent authorities concerned, who may or may not accept that exemption.

Although the IMSBC Code permits an exemption, it is strongly advised to adhere to the carriage requirements as detailed in the IMSBC entry for DRI (C). If carriers choose not to follow this advice, they should satisfy themselves that all of the three competent authorities named above have been notified and have accepted the exemption, that the rules of the flag State Administration are not breached and that the exemption certificate is maintained on board each ship transporting the solid bulk cargoes in accordance with the exemption.

For cargoes that are offered for transport in accordance with an exemption as described above, the loading, carriage and safety procedures must be clearly stated. In particular, the master must be advised of the ventilation rates and durations for each cargo space; the required standard of explosion protection of the ventilation fans; details of the arrangement of ventilation ducts into the holds; the method and frequency of monitoring the hydrogen concentrations in each cargo space; the method and frequency of monitoring the cargo temperatures in each cargo space; the criteria defining an emergency; the procedures to follow in

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the event of emergency; shipper's contact numbers in the event of emergency; and the procedures to follow before and during discharge.

The IMSBC Code schedule for DRI (C) sets maximum allowable moisture content as 0.3% for carriage. When cargoes are offered with moisture content in excess of this then they are not compliant, and at higher moisture contents they may additionally pose a realistic risk that they may liquefy in a similar manner to certain iron and nickel ore cargoes. Therefore, any Declaration relating to such cargoes must classify the material as Group A and B and the accompanying test certificate(s) must state the Transportable Moisture Limit and actual moisture content of the shipment. The certificate(s) should also refer only to the cargo that is being offered for shipment, i.e. not a generic measure obtained from previous shipments, and the standards that have been followed when obtaining the samples that have been tested.

The IMSBC Code also addresses cargoes that are not listed in Appendix 1 of the IMSBC Code and provides that such cargoes can be carried under conditions which are defined by and subject to a tripartite agreement between the competent authorities of the ports of loading and unloading and the flag State. However, if a cargo is described as iron ore fines, or one of the other descriptions contained in the background section of this circular, and is found to contain any metallic iron content (Feo), then it should be regarded as DRI (C) and be carried in accordance with the provisions of the Code as the tripartite agreement procedure is for cargoes not listed in Appendix 1 of the Code.

Risk factors Always consult the IMSBC Code for particulars on aspects like Hazard, Stowage & Segregation, Hold cleanliness, Weather precautions, Ventilation, Carriage, Discharge, etc.

Unquote.

Finally, we strongly recommend to avoid the appointment of any company related to the shippers given the evident conflict of interests for which in case the appointment of an expert/surveyor is under consideration, we would recommend to approach us on a free of charge basis to receive more information.

Should you have any question about this or any other matter, please don't hesitate on contacting us.

**Carlos Carrasco**  
**Operations Manager**

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