

## No. 23 2010/2011 - Dangers of carrying Nickel Ore from Indonesia, New Caledonia and the Philippines

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Dear Sirs

### Dangers of carrying Nickel Ore from Indonesia, New Caledonia and the Philippines

Translations: Chinese  Vietnamese 

In the past few weeks two vessels have sunk after loading nickel ore in Indonesia with the loss of many lives. Although investigations are continuing, nickel ore is a cargo which may liquefy if the moisture content of the material exceeds its Transportable Moisture Limit (TML). Cargo liquefaction may lead to a loss of stability, to the extent that the vessel may capsize.

Demand for nickel ore had temporarily declined in 2008/2009 but now that many economies are emerging from recession, shipments of nickel laterite ore from the principal exporters in Indonesia, New Caledonia and the Philippines are expected to rise. This may result in an increase in the number of nickel ore cargoes offered for shipment.

There are many concerns associated with nickel ore cargoes. Most mines are situated in very remote locations, making it hard for surveyors and experts to attend. Moreover, it is not easy to arrange for cargo samples to be tested independently due to the lack of reliable laboratories in such countries.

The nickel ore is simply dug out of the ground and stored in stockpiles susceptible to heavy rainfall prior to shipment or, in some cases, transported directly from the mine to the vessel. Some mines may carry out "solar drying" prior to loading, but the effectiveness of this technique is questionable. No other processing is involved. The ore is typically loaded into barges and transhipped to bulk carriers at anchor, and although the cargo presented for shipment may appear to be dry, this is no guide as to whether the cargo is safe to carry.

The composition and physical properties of nickel ore vary greatly within each mine and the appearance of the material may range from gravel to mud. This also creates problems for laboratories as the non-homogenous nature of nickel ore can cause difficulties when trying to ascertain the TML and moisture content.

Due to the numerous dangers and difficulties associated with this cargo, Members considering the carriage of nickel ore are advised to be mindful of the risks outlined in this Notice and ensure that the recommendations are followed.

#### Shipping

As with many fine particulate minerals including mineral ore concentrates, nickel ore may liquefy and shift if its inherent moisture level is too great. There have been several serious instances of cargo liquefaction involving nickel ore including total losses and near misses. Because of the risk of liquefaction, nickel ore is subject to the provisions of SOLAS and the International Maritime Solid Bulk Cargoes (IMSBC) Code regarding the testing and certification of cargoes that are liable to liquefy ("Group A" hazards).

Members contemplating carriage of nickel ore are advised to study carefully SOLAS Ch.VI, Reg.2 and Sections 4, 7 and 8 of the IMSBC Code. In brief, the shippers of nickel ore are required to certify, prior to commencement of loading:

- The TML of the cargo, namely the maximum permissible moisture content for safe carriage. For nickel ore, the TML needs to be determined by a competent laboratory separately for each cargo. The laboratory determines the moisture content at which the material will start to liquefy. This is called the Flow Moisture Point (FMP). The TML is then calculated as nine tenths of the FMP, thereby providing a safety margin of 10%. Approved test procedures are set out in Appendix 2 of the IMSBC Code.
- The actual moisture content of the cargo offered for shipment. The material may only be shipped if the actual moisture content is less than the TML.

In the case of nickel ore, SOLAS compliant certification is very much more difficult than, say, for metal sulphide concentrates. This is because of the serious lack of homogeneity of nickel ore which may lead to large parts of a cargo being unsafe even if representative test samples are found to be satisfactory. This is complicated by the fact that the FMP/TML test may give ambiguous results for this type of material, and laboratory personnel may lack the training and experience to interpret the results in a manner compatible with the IMSBC Code.

The following problems may arise during sampling and testing:

- *Moisture content determination:* For non-homogeneous cargoes such as nickel ore, the IMSBC Code requires the moisture content of the cargo destined for each hold to be determined and certified separately. This must take place prior to the commencement of loading. Because of the variability of the material, and because of the way nickel ore is mined and shipped, it is often difficult and laborious to take suitable representative samples in advance of shipment. However, shippers almost invariably declare a single moisture content for the entire cargo rather than on a hold-by-hold basis and often use non-representative sampling methods. Even if the average moisture content of the cargo intended for each hold is indeed below the TML, some parts of the source material may be much wetter. If the variability of moisture contents is greater than the difference between the TML and the FMP (i.e. greater than one tenth of the FMP), the safety margin provided for in the IMSBC Code will be exceeded and some of the cargo may be unsafe. Under these circumstances the IMSBC Code recommends that any substantially wetter parts of the cargo are rejected, after separate sampling and testing, as being unfit for shipment. In addition, in many mines the cargo stockpiles are exposed to tropical rainfall after sampling and before loading. This may increase the moisture content significantly compared with the values certified by shippers. The IMSBC Code sets out that if there has been significant rain or snow between the time of testing and loading, check tests shall be conducted to ensure that the moisture content of the cargo is still less than its TML. The interval between sampling/testing and loading shall never be more than seven days. The IMSBC Code also requires shippers to have the entire cargo ready in stockpiles and available for sampling and inspection before any loading takes place. Some shippers do not have a sufficiently large stockpiling area for an entire ship's cargo and instead excavate and deliver material directly from the mine over the course of loading. This practice contravenes the provisions of the IMSBC Code and the FMP/TML/moisture figures shown on shippers' test certificates are unlikely to be accurate in such circumstances.
- *Sampling for FMP/TML testing:* The IMSBC Code certification process is based on the implicit assumption that all of the material to be loaded will have the same TML and will vary only in its moisture content. This is not the case for nickel ore where the physical properties and the TML of the cargo may vary depending on where it has been dug out of the ground. Therefore the TML of nickel ore cargoes should be determined using representative samples taken systematically. It is preferable to test multiple samples representing different cargo holds, stockpiles and/or pits in order to assess the variability of the TML across the material offered for shipment. However, there is no explicit IMSBC Code requirement to do so.
- *The flow table test to determine FMP/TML:* Although Appendix 2 of the IMSBC Code lists three alternative methods for FMP determination, the only method that is in current use for the certification of nickel ore is the flow table method. This process was developed for testing metal sulphide concentrates and its use for testing nickel ore is problematic. The IMSBC Code specifies that the method is generally suitable for fine material with a maximum particle size of 1mm. However, although the same method may also be used to test materials with a maximum

particle size up to 7mm, it is not suitable for materials coarser than this and may not give satisfactory results for those with a high clay content. Nickel ore has a high clay content and generally contains a substantial proportion of material coarser than 7mm. A common workaround to test nickel ore samples is to remove all particles greater than 7mm from the sample prior to testing. The flow table test itself depends critically on the ability of the operator to identify a flow state from the appearance and behaviour of the sample on the flow table. While this is usually straightforward for metal sulphide concentrates, a range of subjective interpretations may arise in the case of nickel ore samples which may lead to significantly different reported values for the FMP/TML. To date, no systematic inter-laboratory comparisons have been carried out to validate the applicability of the flow table method to nickel ore.

- *Compatibility of moisture and TML results:* As mentioned above, it is not uncommon to modify the flow table test method by removing all particles greater than 7mm from the sample prior to FMP/TML testing. If the method is adapted in this way, it is imperative that the samples used to determine the actual moisture content of the cargo undergo the same removal of particles so that the actual moisture content and TML may be compared on a like-for-like basis. Since the coarse proportion of the cargo will have a much lower moisture content than the fine proportion, failure to do so will result in a misleadingly low moisture content being reported, making the cargo appear to be safer than it actually is.

## Advice to Members

It is common practice for the shippers of nickel ore to provide certificates issued by the in-house laboratories of the mines producing the material based on their own sampling and testing. Unfortunately, audits of the sampling and testing methods used by such mines have revealed serious deficiencies which have rendered the values certified by many shippers effectively meaningless.

This presents shipowners with a dilemma. They are faced with a choice of either accepting the figures certified by shippers at face value in spite of a high probability that the certificates are flawed, or becoming actively involved in a time-consuming and possibly acrimonious investigation regarding the safety of the cargo being offered for shipment.

Ideally, expert attendance on site is necessary in order to carry out an in-depth audit of the sampling and certification procedures to determine either the reliability, or the lack thereof, of the certification offered by shippers. This is beyond the capacity of a Master or a non-specialised marine surveyor. However, mine operators are often reluctant to provide independent experts with access to conduct such audits. In view of the typically remote locations of the mines, expert attendance is often difficult or impossible without the full co-operation of shippers.

Section 8.4 of the IMSBC Code describes a shipboard method (the “can” test) for checking whether a cargo is unacceptable for shipment. This involves filling a small can with the material and banging it repeatedly on a hard surface to see whether or not it liquefies or becomes moist. If “can” tests carried out on a cargo presented for loading suggest a propensity for liquefaction, this is a major indication that the cargo as a whole is unsafe for carriage. However, a “can” test is no substitute for proper laboratory testing using an approved method.

In some recent instances, owners or their surveyors have accepted or rejected individual barge loads presented for loading solely on the basis of “can” tests. The “can” test was not designed for this purpose and cannot ensure the safety of a cargo on its own. It can only indicate whether the material is above the FMP leaving no safety margin whatsoever. If shippers present significant amounts of nickel ore that fail “can” tests after being barged to a vessel, this is a warning that the cargo as a whole is unsafe and that any certification to the contrary is unreliable. Consequently the acceptance of an entire cargo for shipment based purely on the result of “can” tests of barges as they arrive at the vessel is imprudent.

## Important

Members who plan to fix or charter a vessel to load nickel ore from ports in Indonesia, New Caledonia or the Philippines must contact the Managers at the earliest opportunity so that a local surveyor can be appointed to establish the location of the cargo prior to arrival and provide assistance to the Master during loading by monitoring the moisture content of the cargo and carrying out “can” tests. The Managers also recommend that an expert is appointed, not

necessarily to attend in person but to liaise with and supervise the local surveyor throughout. However, it may be the case that the third party expert is unable or unwilling to give explicit recommendations based on the advice provided by the local surveyor, due to difficulties in obtaining objective information at the mine and load port.

A copy of the shipper's test certificate(s) should be forwarded to the expert and the local surveyor as soon as received. In the event of any concerns regarding the reliability of the FMP/TML figures, the nature or source of the cargo or the way in which the samples were taken or tested, the expert will instruct the local surveyor to draw cargo samples from the stockpiles or barges and arrange for them to be sent to a known and trusted laboratory where the FMP/TML figures may be determined with accuracy. It should also be borne in mind that due to the remote locations of many nickel ore mines; this may take a number of days. Depending on the circumstances it may be possible to start the process prior to the vessel's arrival provided the Managers are notified well in advance. However, significant delay cannot be ruled out, particularly if the cargo is still being mined. Loading should not commence until the test results have been received and the expert is satisfied that the cargo is safe for shipment. The IMSBC Code requires that the interval between sampling/testing for moisture content and loading shall never exceed 7 days. When samples are sent to a trusted laboratory in another country for testing it must be ensured that this interval is not exceeded. Due to the difficult nature of this cargo, even after testing at an accepted laboratory significant doubts as to the safety of the cargo may remain. In the event that complications are encountered with a particular cargo, it may not be possible for an expert to attend on site due to difficulties, hostility and a lack of co-operation as experienced at certain locations in the past. Such a situation may result in further, possibly considerable, delays.

Members who plan to fix or charter a vessel to load nickel ore from ports in Indonesia, New Caledonia or the Philippines must take care to ensure that express terms are included within the charter party, contract of affreightment or other contract (as applicable) so as to safeguard their position, and should contact the Club's Claims and Loss Prevention departments for further advice before entering into such a fixture or charter. Failure to do so could result in cover being prejudiced.

The Club would like to thank Brookes Bell for their assistance with the preparation of this Notice to Members.

Yours faithfully

For: **West of England Insurance Services (Luxembourg) S.A.**  
(As Managers)

**M W H Williams**  
Director

This Notice to Members is also available in Chinese and Vietnamese.