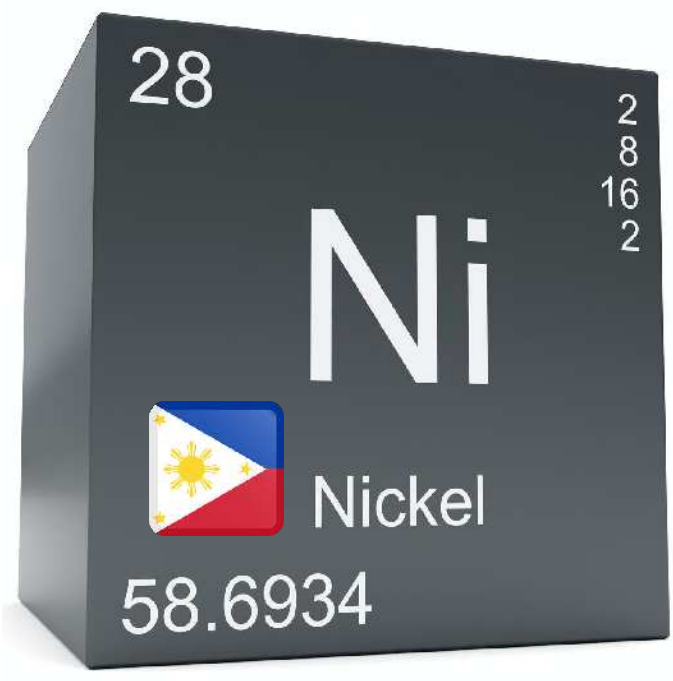
PANDIMAN PHILIPPINES, INC.

P&I Correspondent in the Philippines



Guide to Nickel Ore Cargo - Philippines 2020

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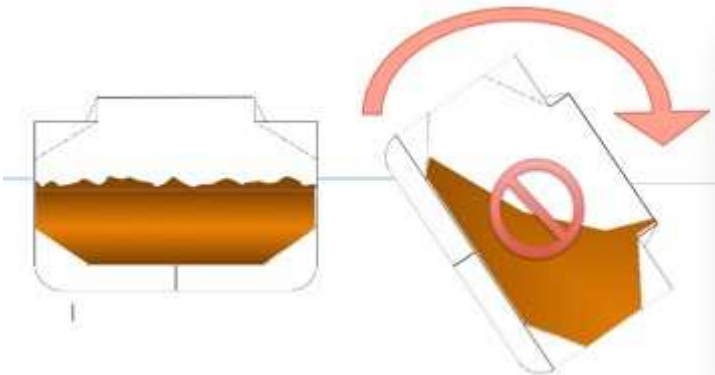
Nickel Ore Cargo from the Philippines.

The potential danger from a cargo of nickel ore liquefying can not be stressed enough, tragically high-lighted by the unnecessary loss of life onboard three vessels which sank in late 2010, two in late 2011, one early 2015 and recently late 2017. Strict adherence to good industry practice for the analysis, monitoring and loading of a cargo of nickel ore in compliance with IMSBC Code is paramount. The nickel ore trade in the Philippines is one of the busiest in the world and there are clear documented concerns as to the veracity of the loading certificates being provided the local mines "in-house" laboratories. This has been based on comparison analysis of cargo undertaken at independent laboratories. That analysis protocol being undertaken for the determination of the moisture content, Flow Moisture Point (FMP) is not in line with the IMSBC Code.

There are additional concerns, mines stock pile nickel ore in open conditions on or near the foreshore, there are no actual piers or port facilities at the locations and the ore is loaded offshore at anchor via barges. The ore is unprocessed and is obtained from open cast mining and therefore exposed to the elements, especially rain during monsoon seasons, however in recent years the clear demarcation between dry and wet seasons has diminished and rain can be experienced any time of the year.

There is an unwillingness by the local mines to allow a joint survey by independent experts on behalf of the ship owner. This has resulted in vessels being withdrawn and sail without loading the cargo of nickel ore. The primary consideration being the safety of the crew and the vessel as the cargo could not be scientifically proved to be safe for carriage under the IMSBC Code.

A major concern for ship owners and their P&I Clubs is the property of the nickel ore, which when carried in bulk, can liquefy through the motion of the ship in a seaway or vibration of the ship through main engine/on board machinery. This ability of the cargo to transform from an apparent solid state to a liquid one when the cargo has a high moisture content can have serious and catastrophic effects to the vessels stability and has resulted in vessels capsizing and sinking within minutes. This property of the cargo should not be mistaken with free surface effect (sloshing), the cargo during liquefaction undergoes a metamorphosis between a solid to a liquid, changing between these states unexpectedly and is a dynamic shift. Once the cargo has shifted it will not come back, this shift resulting in the loss of the vessels stability with resulting list or capsizing.



LOCATIONS OF NICKEL ORE LOADING AREAS IN THE PHILIPPINES

NICKEL ORE MINING (PHILIPPINES)

Santa Cruz Zambales, Philippines
Benguetcorp Nickel Mines, Inc. – Candelaria, Zambales
Eramen Minerals, Inc. – Bolitoc, Sta. Cruz, Zambales
DMCI Mining Corporation – Sta. Cruz, Zambales

Cato, Pangasinan, Philippines
LNL Archipelago Minerals, Inc.

Palawan, Philippines
Rio Tuba Nickel Mining Corporation (Nickel Asia Corporation) – Rio Tuba, Bataraza, Palawan
Narra Citinickel Mines and Development Corporation – Punang, Española, Palawan & Narra, Palawan
Berong Nickel Corporation – Berong, Quezon, Palawan

Homonhon, Canawayon, Eastern Samar, Philippines
Emir Mineral Resources Corporation/Verrum Terra Geosciences Inc.

Davao Oriental, Philippines
Golden Summit Mining Corporation – Sitio Tagdodo, Banay-banay, Davao Oriental

Surigao del Norte, Philippines
Platinum Group Metals, Corporation – Cagdinao, Claver, Surigao del Norte
Taganito Mining Corporation (Nickel Asia Corporation) – Taganito, Claver, Surigao del Norte
Hinatuan Mining Corporation (Nickel Asia Corporation)
Adnama Mining Resources Inc. – Urbiztondo, Claver, Surigao del Norte

Surigao del Sur, Carrascal,Philippines
Marcventures Mining and Development Corporation – Adlay, Carrascal, Surigao del Sur
CTP Construction and Mining Corporation – Adlay, Carrascal, Surigao del Sur
VTP Construction and Development Corporation – Adlay, Carrascal, Surigao del Sur
Carrascal Nickel Corporation – Adlay, Carrascal, Surigao del Sur
Claver Mining Development Corporation – Dahican, Carrascal, Surigao del Sur

Tubay, Agusan del Norte
San Roque Metals, Inc.
Agata Mining Ventures Inc.

Dinagat Islands, Surigao del Norte Philippines
Cagdianao Mining Corporation (Nickel Asia Corporation) – Cagdianao, Dinagat Islands
West Venture Nickel Corporation/Westernshore Nickel Corporation – Libjo, Dinagat Islands
Libjo Mining Corporation – Libjo, Dinagat, Islands
Wellex Mining Corporation – Palhi, Dinagat Islands
Century Peak Corporation – Loreto, Dinagat Islands
AAM-PHIL Natural Resources Exploration and Development Corporation – Loreto Dinagat Islands
Oriental Vision Mining Philippines Corporation – Palhi, Dinagat Islands
Oriental Synergy Mining Corporation – Loreto, Dinagat Islands
Citic – Palhi, Dinagat Island

Tawi-tawi, Philippines
Altawi-tawi Nickel Corporation (ANC) – Tumbagaan, Tawi-tawi, Philippines
Minavida de Mindanao Corporation (Formerly ANC) – Languyan, Tawi-tawi, Philippines
Pax Libera Mining Inc. – Bakung, Languyan, Tawi-tawi, Philippines
SR Languyan Mining Corporation – Basnunuk, Languyan, Tawi-tawi, Philippines

Kupfernickel, **"Old Nick's copper,**

Nickel is the only element named after the *Devil*. Morbidly, centuries after it was discovered in Sweden, the name appears fitting given the number of lives that have been lost due to liquefaction of nickel ore, resulting in the sinking of vessels within seconds.

Laterite nickel ores are a surface formation deposit which is found in hot and wet tropical areas which is enriched in iron and aluminum and develops by intensive and long lasting weathering of the underlying parent rock. Nearly all kinds of rocks can be disintegrated by the action of high rainfall and high temperatures. The dripping rain water causes suspension of primary rock minerals and decreases easily soluble elements as sodium, potassium, calcium, and silicon. This gives rise to a residual concentration of more insoluble elements predominantly iron, aluminum and nickel.

Nickel is a rare element that is usually found with iron and is mined using open-mine pits, when the ore is mined, the nickel has to be taken out of it. One way is smelting where the ore is heated with chemicals until it separates from the ore. Sometimes very high heat will be enough to cause the ore to separate from the nickel without using chemicals. Nickel is found in Russia, Canada, Australia, and New Caledonia, Indonesia and the ***Philippines.***

Nickel is used in stainless steel, glassmaking, magnets, bullet-proof safes, coins, and rechargeable batteries.

Two kinds of lateritic nickel ore have to be distinguished:
limonite types and silicate types.

Limonite type laterites (or oxide type) are highly enriched in iron due to very strong leaching of magnesium and silica. They consist largely of goethite and contain 1-2% nickel incorporated in goethite. Absence of the limonite zone in the ore deposits is due to erosion.

Silicate type (or saprolite type) nickel ore formed beneath the limonite zone. It contains generally 1.5-2.5% nickel

Ni 0.6-0.9% Fe
Ni 0.6-0.9% Fe
Ni 1.5-1.6% Fe
Ni 1.7% above Fe
Ni 1.8% above Fe

SURIGAO – main area for shipment of nickel ore

Open cast mining of nickel ore- photos courtesy of SSI

Surigao and the surrounding islands are the most popular location for loading nickel ore, there are no facilities for loading at the actual port of Surigao which is a small provincial port, but located up to, in the case of Carrascal, Adlay, over 60 kilometers away. This can lead to confusion, especially when masters are expecting a port with a pier and loading facilities. The waters around this area are subject to strong tide rips and a vessel can experience strong set. Several loaded vessels have run aground in Dinagat Sound and masters of loaded vessels should navigate with extreme caution and consider a more prudent departure to open ocean to the East.

We have over the years attended many vessels loading nickel ore (nearly 4,000), by providing surveyors from our sister company Survey Specialists Inc. to attend to monitor the condition of the cargo arriving by barges. There is no infrastructure at the loading areas and vessels charted are all Handy to Super Handy Max size (A handymax ship is typically 150–200 m (492–656 ft) in length, with modern Handymax and Supramax designs are typically 52,000-58,000 DWT in

size, have five cargo holds, and four cranes of around 30 tonnes lifting capacity, therefore versatile being self loading/discharging).

Cargo is loaded by vessels anchoring off a specified location where there is an ongoing mining operation, mining is open cast type. The cargo stockpiled on a beach then pushed onto tank landing craft.

The general practice is to ship cargoes of nickel ore from February to May/June which is traditionally the “dry season” in the Philippines, with the “wet season” starting in late June becoming very heavy by November with associated typhoons. However while twenty years ago the seasons changed like clockwork, the climate has been changing and in recent years it can rain frequently in the “dry season” with typhoons as early as April.

The cargo of nickel ore is being presented for loading overall with higher moisture content than years ago. This has highlighted concerns over the standard of the tests conducted by the local mines “in-house” laboratories, this has become a real issue. The installation and operation of the testing equipment when there has been the opportunity to observe, is not properly installed in line with the IMSBC Code **(The IMSBC now mandatory and forms part of SOLAS, from January 1st 2011).**

Mines have also modified their procedures where by the cone size is tampered with, this was not helped about eight years ago by an “expert” from Australia assisted the mines in Mindanao, however the method taught has raised concerns with scientific experts in this field.

The ore in the area comes in three qualities

Lateritic	nickel content	0.9%
Limonitic	nickel content	1% to 1.5%
Saprolitic	nickel content	1.5% to 2%

The levels of nickel content as can be seen are low, also it should be remembered the cargo is traded per wet metric tonne (wmt) and can contain conservatively 30% water. In a typical nomination of 55,000 wmt then 16,000 tonnes will be water, in the remaining 39,000 tonnes only on average 585 tonnes of nickel will be produced.

Nickel ore cargoes, which consist of a mixture of very fine clay-like particles and rocks up to 1m in diameter (looks like land fill) makes for a cargo whose properties are not fully understood, as no complete study has been made of this cargo and the IMSBC is based on homogenous cargoes.

Stockpiling of nickel ore on the beach- photo courtesy of SSI

There are no ports, loading is done at remote anchorages.

The photo above shows a typical loading area, the vessel in the foreground is anchored approx. 1 nautical mile (1.852 km) off the shore. In the background on the hill side the ongoing open-cast mining can be observed. The Cargo is then stockpiled on the beach, loaded onto a barge and taken out to the ship.

Loading Areas are Remote and Temporary

Below the vessel can be seen loading at anchor, the barges loading at a temporary pier constructed of nickel ore.

The shippers and mines become very protective of the shipments and access to the mine and laborites is not always granted The nickel ore trade is controlled by very powerful organizations locally and brings a revenue of millions of dollars each year.

Our current concerns are the method and quality of the certificates being issued by the mines and that the nickel ore inherently is unsafe to carry and the analysis and results inadequate and not in line with the IMSBC Code.

The mining is open cast and the stock piling open to the weather then the cargo can easily become wet, while the ore is not particularly absorbent, given the nature of tropical rain (heavy) and the fact that the barges very seldom cover the cargo, the moisture content can significantly increase.

However once the rain has stopped then light surface water on well spread or small stockpiles will dry relatively quickly under the tropical sun. Significantly large stockpiles and cargo in the barges do not have the same surface area because of the depth of the ore and evaporation is delayed. In discussing the cargo certain abbreviations are used and need to be understood;

FMP - Flow Moisture Point
TML - Transportable Moisture Limit

The relationship is fairly straight forward; the FMP is determined in a laboratory and is the moisture content at which analysis of representative samples of the cargo will liquefy. The TML is calculated at 0.9 (90%) of the FMP or allows a safety margin of 10%. There is always a danger of having a wrong perception about the cargo in relation to duration of sea passage, some Masters and owners consider a passage to Australia or China 5 to 8 days safer than one of 30 days to places in Europe, we would strongly recommend either the cargo is safe to carry based on laboratory analysis or it is not, duration of voyage should not be a factor, again this cargo can change state very quickly with dramatic effect.

In regards to our surveyors Survey Specialists Inc (SSI), their attendance is to monitor the condition of the cargo coming alongside, this can be done by means of the “can test” as described in the IMSBC Code, however the “can” test is a rudimentary field test and **does not** supersede or replace proper analysis of the cargo for Flow Moisture Point and moisture content under controlled laboratory analysis.

This is a simple test and as the term implies (can test) a metal can is suitable, such as a coffee tin, paint tin (but must be clean). Take about 1 to 2 kg of the ore and place it in the tin, repeatedly slam the can the bulk code says 25 times, if the ore remains the same then it is satisfactory, if it shows any signs of liquefying (very obvious will be where free water appears on top or takes on a shiny flat appearance) then the cargo should be rejected and not loaded.

photos courtesy of SSI

The cargo in a grab being loaded from a barge looked reasonable, however in the photo it has clearly failed a can test.

photos courtesy of SSI

A monitored cargo on completion of loading in which during the load no obvious signs of moisture were detected.

- The role of the attending surveyor is to provide advice and raise concerns to the Master when identifying obviously wet cargo and to reject the cargo from being loaded on board the vessel.
- Cargo that is not rejected and loaded on board, should not under any circumstances, be assumed safe for carriage and in compliance with the IMSBC Code.
- A person can not determine the moisture percentage of a cargo from visual inspection alone.

However obviously wet cargo can be identified, below all cargo was rejected

Pancake

Plasticized

Splatter

In all three photographs shown; the Masters of the vessels involved stated the cargo was acceptable! The cargo shown above if carried can lead to the loss of the vessel

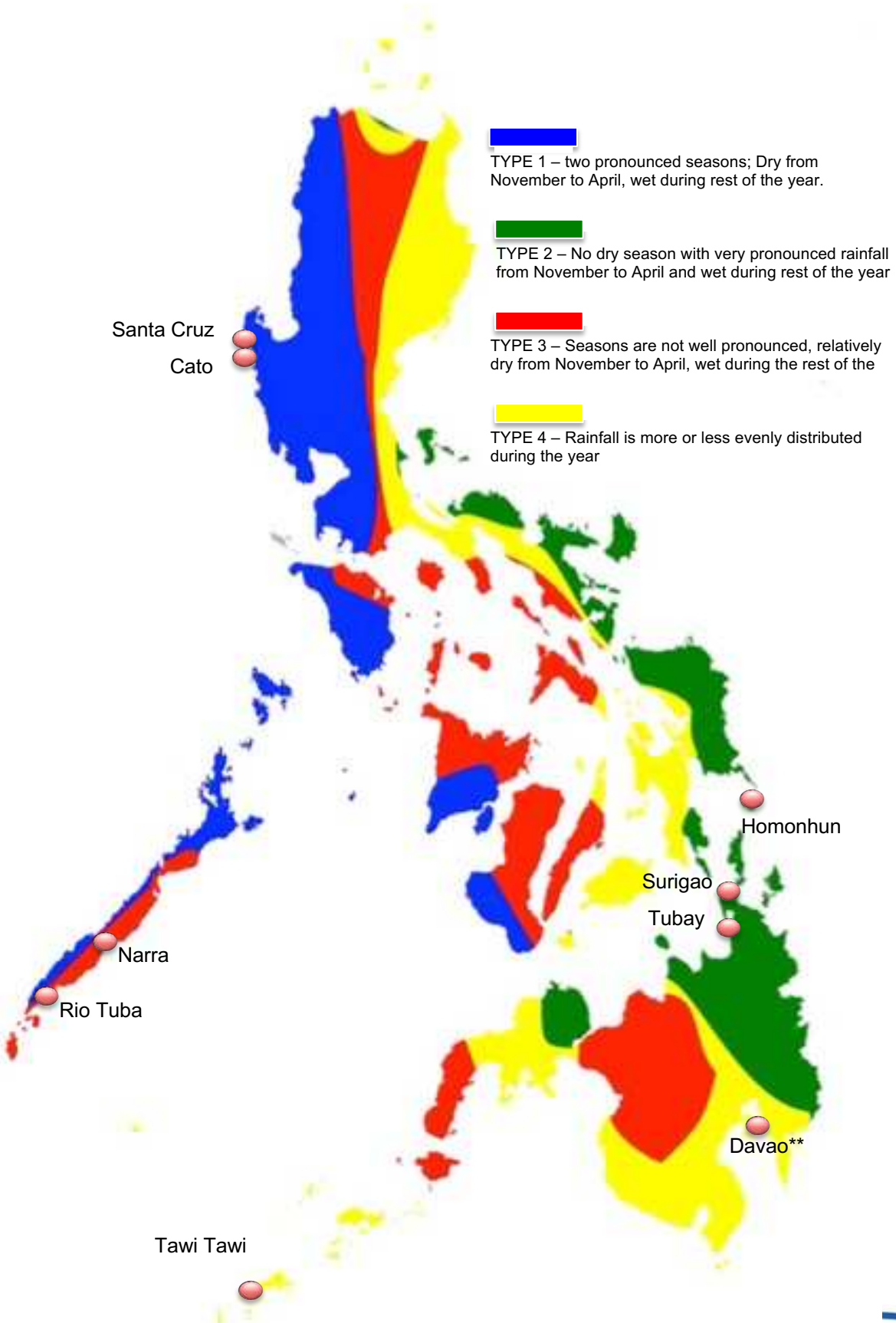
A cargo of nickel ore that has liquefied

A liquefied cargo of nickel ore is the result of a combination of poor decisions / choices

Recently charters have claimed that the charter party prohibits the independent taking of samples or analysis or even inspecting the stockpile.

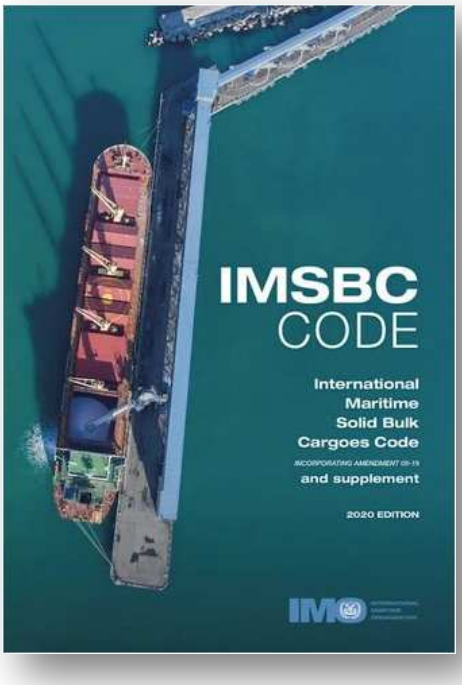
The issue of wet cargo will only become a greater problem

Climate types in regards top rain fall in the Philippines



The ability of a cargo of nickel ore to transform from an apparent solid state to a liquid one can have serious and catastrophic effects to the vessels stability and has resulted in vessels capsizing and sinking within minutes.

Therefore best practices have been adopted worldwide through the International Maritime Organization (IMO) in the publication "International Maritime Solid Bulk Cargoes Code " (IMSBC Code) and adopted by "Safety Of Life At Sea" (SOLAS).



The IMSBC Code itself provides guidance to Administrations, ship owners, shippers and masters on the standards to be applied in the safe stowage and shipment of solid bulk cargoes The BC Code is recommended to Governments for adoption or for use as the basis for national regulations in pursuance of their obligations under chapters VI and VII of the 1974 SOLAS Convention.

The IMSBC Code is very clear on sampling and certification of cargoes:

Section 4.4.1 – 'Sampling Procedure' – "*Physical property tests on the consignment will be meaningless unless they are conducted prior to loading on truly representative test samples*"

Section 4.3.1 – "Certificates of test' – " *To obtain the information required in 4.2.1 the shipper shall arrange for the cargo to be properly sampled and tested. The shipper shall provide the ship's master or his representative with the appropriate certificates of test, if required in this code*".

(The IMSBC Code uses the word shall)

Given the geography of the Philippines and intensity of tropical rain showers, coupled with the open stockpiling of the cargo exposed to the elements then very important (however we do not see it being enforced) is Section 4.5;

Section 4.5.2 – "Interval between sampling/testing and loading for TML and moisture content determinations") *"Sampling and testing for moisture content shall be conducted as near as practicable to the time of loading. If there has been a 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.*

There are issues with a Shippers Declaration, general observations in conjunction with international experts;

1. No supporting documentation as to how the FMP was obtained to demonstrate it is in accordance with the IMSBC Code.

2. No evidence to show that the declared moisture content was based on the analysis of representative samples taken from the whole cargo to be loaded.

We would require proof from the shipper/mine that the following has been undertaken to ensure that the cargo complied with IMSBC Code / SOLAS and is therefore safe to load.

(i) FMP to be determined in strict accordance with the BC Code, including the identification of the flow point. A number of indicators should be used in identifying the flow point, all of which are given in the BC Code. The moisture contents of the flow test samples need to be measured by drying at a constant weight, and not worked out on a theoretical basis.

(ii) Sufficient samples should be taken from the cargo designated for loading onboard the vessel in order to accurately determine the moisture content of all the cargo to be loaded. We would comment further on this matter as follows:

(iii)

a. Preparing a single composite sample for determination of the moisture content of the whole cargo is unacceptable on two counts. Firstly, preparing a representative composite sample of nickel ore is extremely difficult as it will not readily mix unless it is dried. The process of preparing the composite sample will result in moisture loss to the extent that it may no longer represent the cargo from which it was taken. Secondly, knowing the average moisture content of the whole cargo is not sufficient as this still allows for 'wet' cargo to be loaded into the cargo holds. Section 4.3.3 of the IMSBC Code actually states "*when a concentrate or other cargo which may liquefy is to be loaded into more than one cargo one cargo space of a ship, the certificate or the declaration of moisture content shall certify the moisture content of each type of finely grained material loaded into each cargo space*". In other words, to ensure the safety of the vessel you need to know the average moisture content of the cargo in each hold, and not simply the overall average moisture content.

b. Using the IMSBC Code for guidance (Section 4.6.4), we would require a minimum 200 samples (for a normal nominated cargo of 50,000 wmt) to be taken from all of the cargo in a systematic manner. Each sample should be individually sealed and analyzed so that the variation in moisture content can be assessed.

Our surveyors are experienced , but to follow the IMSBC then it has to be understood there will be delays if samples are to be taken, there is one laboratory in Manila , Inspectorate, samples can be sent to Singapore/UK (Mintons, Brookes Bell) or Alfred Knights in Hong Kong.

FLOW MOISTURE TEST OF CARGO

VESSEL NAME :
LOADING PORT : SURIGAO , PHILIPPINES
DATE OF LOADING : 2009
CARGO GRADES : LATERITIC NICKEL ORE
LOADING QUANTITY :
DATE OF TEST : 2009

We hereby certify that we have carried out test on representative sample of the cargo to be loaded into M.V. The following results have been determined as set out hereunder:

NO.	DATE	DATA	RESULT	REMARKS
1	July 2009	Moisture Content	32.32 %	
2		Transportable Moisture Limit	33.18%	
3		Flow Moisture Point	37.09%	

We further certify that all test procedures are adopted from the International Maritime Organization's Code of Safe Practice for Solid Bulk Cargoes.

Chemist

Signed by :
Title : CHEMIST
Company :
Date : JULY 2009

When an owner or club is only presented with a shippers declaration which alleges to confirm to the requirements under the IMSBC Code and SOLAS but has no supporting documentation, is the owner /club willing to accept the cargo at face value given the known concerns with cargoes of nickel ore in this area.

If we are requested to appoint a surveyor, our surveying company, Survey Specialists, Inc (SSI) will attend. We would recommend that before arrival owners request from the shipper's, certification for the cargo with supporting documents that demonstrate the cargo has been analyzed and certified in accordance with the IMSBC Code. Our surveyors when allowed, will then visit the mine and identify the stockpiles and inspect the laboratory.

We recommend that scientific advice be sought by providing details to one of two organizations that are recognized as experts in the analysis of nickel ore cargo and have written articles on the subject for the International Group of P&I Clubs, Brookes Bell (UK) and Minton, Treharne & Davies Group (Singapore).

Again a can test is a field test and whether to load a vessel, should not be based on the "can test" alone, but the proper certification in line with the IMSBC Code.

Can tests are not fully reliable and completely subjective. Nickel ore is essentially one third water and should only be accurately determined through proper laboratory testing.

Up until October 2016 we were at the mercy of shippers/mines who insisted that we required their participation for an Ore Transport Permit (OTP) to send samples to Manila and Internationally. Without an OTP they had advised airlines and ferries to refuse to accept samples for carriage. The end result was that it was extremely hard to get samples to Manila as shippers/mines were not cooperative.

We made a significant break through as one area that we had consistently argued was the actual requirements for an OTP (Ore Transport Permit) for samples. Our understanding was that none is needed for transporting small quantities required for testing purposes. However the shipper and mines are so powerful that they sent circulars to the airports, ship terminals and others that no samples are to be allowed without the OTP from the MGB and DENR.

We spoke again to the authorities in Manila and after speaking to eight different departments of the MGB they eventually agreed that no OTP is required. Our argument was based on the

Philippine Mining Bill,

CHAPTER IX TRANSPORT, SALE AND PROCESSING OF MINERALS Section 53. Ore Transport Permit. - A permit specifying the origin and quantity of non-processed mineral ores or minerals shall be required for their transport. Transport permits shall be issued by the mines regional director who has jurisdiction over the area where the ores were extracted. In the case of mineral ores or minerals being transported from the small-scale mining areas to the custom mills or processing plants, the Provincial Mining Regulatory Board (PMRB) concerned shall formulate their own policies to govern such transport of ores produced by small-scale miners. The absence of a permit shall be considered as prima facie evidence of illegal mining and shall be sufficient cause for the Government to confiscate the ores or minerals being transported, the tools and equipment utilized, and the vehicle containing the same. Ore samples not exceeding two metric tons (2 m.t.) to be used exclusively for assay or pilot test purposes shall be exempted from such requirement.

The 2010 amendment to the Mining Bill states;

An OTP is not necessary for ore samples not exceeding two (2) metric tons to be used exclusively for assay and pilot test purposes. Instead, a certification regarding the same shall be issued by the Regional Director concerned.

For ore samples exceeding two (2) metric tons to be transported exclusively for assay and pilot tests purposes, an OTP shall be issued by the Regional Director concerned for a limited amount based on the type of ore, metallurgical tests to be undertaken and other justifiable reasons as determined by the Regional Office concerned.

It is the latter I believe where shippers are causing confusion to the air lines, courier companies and ferries, as only samples over 2mt need an OTP, and we require only a Certificate from the MGB, however the mines need to allow the samples to be landed as the MGB need to sight, photograph and document the samples in order to issue the certificate to us. Shippers and mines need to comply with allowing us to land samples without the harassment and not interfere with us going to the MGB.

As correspondent (Pandiman) and though our P&I Surveyors Survey Specialists Inc (SSI) we strongly recommend appointments based on full compliance with the IMSBC code.

- **Notified in advance of the intended vessels arrival.**
- **Inspection of the mine site and visual confirmation of the stockpiles assigned to be loaded.**
- **Samples taken in co-ordination with the mine and bureau of mines (Surigao obtained locally), in Palawan (obtained through Manila under DENR "Department of Environment & Natural Resources").**
- **samples sent to independent laboratory (currently abroad)**
- **That the vessel does not commence loading until results have been obtained from the independent laboratory. *(note*)**

- **Loading will be monitored throughout that the cargo is from the allocated stock piles, weather conditions are observed, especially periods of heavy rain and that suitable measures are being taken to protect the stockpiles or cargo on board barges.**

- **Monitoring of cargo through the "can test" for signs of obvious moisture.**

- *Note: we have observed several owners who have allowed loading of the vessel concurrent with analysis abroad, that loading has commenced prior to results. The risk here is that the cargo may have to be offloaded if the results show that the cargo does meet the requirements for TML.*

In such situations the attending surveyor will carry out his task diligently recognizing the limitations of field tests, to stop obviously wet cargo from being loaded.

The international Group of P&I Clubs have issued clear guidelines to members and as correspondent for majority of the clubs we will strictly observe these recommendations.

We strongly recommend that in all cases owners insist on full documentation being provided by shippers/mine before the vessel arrives.

Captain Andrew Malpass – President & GM
Pandiman Philippines Inc.

Manila 2020