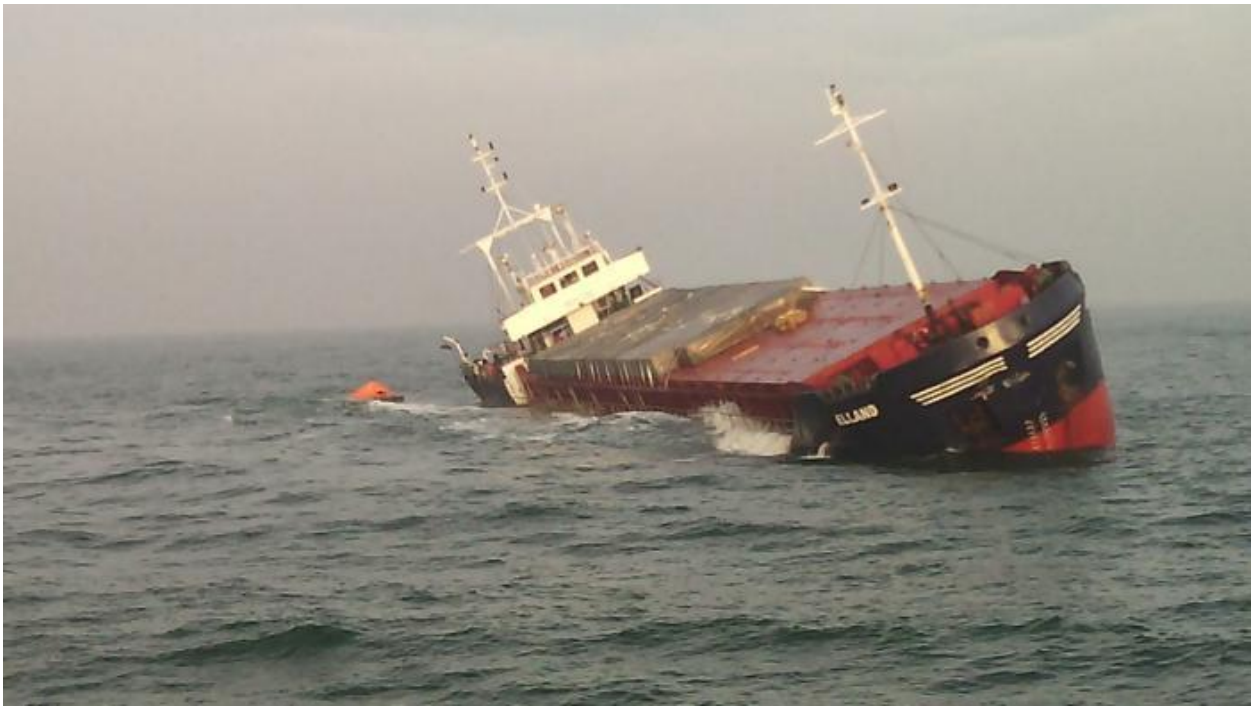
PRECUATIONS WHILE LOADING CONCENTRATE



Cargoes that contain a certain proportion of small particles and a certain amount of moisture may liquefy when the moisture content exceeds the Transportable Moisture Limit (TML). In the resulting viscous fluid state, cargo may flow to one side of the ship with a roll one way but not completely return with a roll the other way, causing the ship progressively to reach a dangerous heel and capsize suddenly.

It is therefore vital to know before loading if the material is safe to transport by ship, and to provide mariners transporting the cargo with an accurate TML and moisture content.

The TML is determined by sampling the cargo correctly and determining the Flow Moisture Point (FMP).

TRANSPORTABLE MOISTURE LIMIT (TML)

This is the maximum moisture content of a cargo that is considered safe for transportation in ships. It is calculated as 90 per cent of the Flow Moisture Point (FMP). Solid bulk cargoes such as metal concentrates may appear to be in a relatively dry granular state when loaded, however they may still contain sufficient moisture to become fluid under the stimulus of the

compaction and vibration that occurs during a voyage. The resulting cargo shift can be sufficient to capsize the vessel.

FLOW MOIST POINT

Flow moisture point means the percentage moisture content (wet mass basis) at which a flow state develops under the prescribed method of test in a representative sample of the material (see paragraph 1 of appendix 2/IMSBC CODE).

MOISTURE CONTENT

Moisture content means that portion of a representative sample consisting of water, ice or other liquid expressed as a percentage of the total wet mass of that sample.

Group A consists of cargoes which may liquefy if shipped at a moisture content in excess of their transportable moisture limit.

Group B consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship.

Group C consists of cargoes which are neither liable to liquefy (Group A) nor to possess chemical hazards (Group B).

TRIMMING

Trimming means any levelling of a cargo within a cargo space, either partial or total.

Angle of repose means the maximum slope angle of non-cohesive (i.e., free-flowing) granular material. It is measured as the angle between a horizontal plane and the cone slope of such material.

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Cargo Declaration Forms – Bulk Cargoes That May Liquefy - Dry bulk cargoes that are prone to liquefaction, such as iron ore fines and nickel ore, are continuing to be mis-declared by shippers as Group C cargoes (which neither liquefy nor possess chemical hazards) under the International Maritime Solid Bulk Cargoes (IMSBC) Code. This is a serious and potentially major hazard to the safety of crew and ship. Surveyor sampling bulk cargo The correct classification for cargoes under the IMSBC

Code that are liable to liquefy is found under Group A. There are instances where the cargo with high moisture contents are presented for loading and on the cargo declaration forms are wrongly classified as Group C cargoes. As a result, ships have suffered cargo liquefaction in their holds, with the moisture contents in excess of the transportable moisture limit (TML) and reaching it's flow moisture point (FMP).

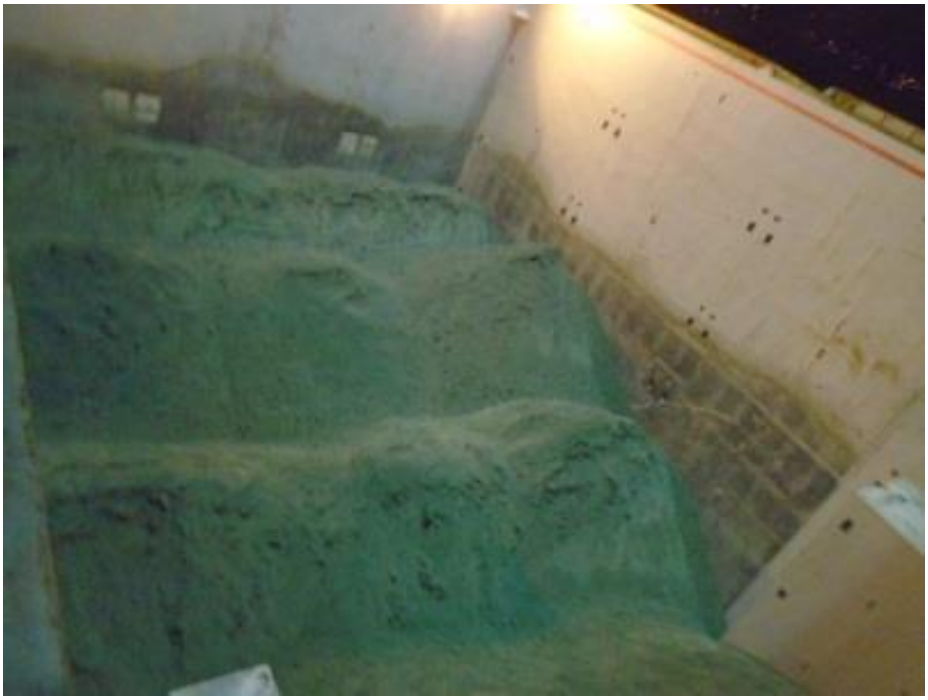
The IMSBC Code must be complied with at all times. Masters must be on their guard to ensure that the cargo to be loaded is correctly classified. Certificates of moisture content must be issued for Group A cargoes, and the interval between sample or testing and loading should not exceed seven days. Certificates of transportable moisture limit must also be issued, with the interval between sample or testing and loading not exceeding six months. However, if it is suspected that the moisture content may have increased since the time of testing or that the flow moisture properties of the cargo may have changed, possibly resulting from heavy rainfall or inefficient stockpiling, additional testing should be carried out to confirm the safety and suitability of the cargo to be loaded. Under the terms of the IMSBC Code, the shipper should provide the master with appropriate information on the cargo far enough in advance of loading to enable precautions to be put into effect for proper stowage and safe carriage of the cargo. If the shipper provides what is suspected to be an inaccurate or falsified cargo declaration form or certificates of moisture content and transportable moisture limit, the cargo should not be loaded until it can be verified that it is safe to load and that the certification is in accordance with the IMSBC Code. The master should contact the company along with the P&I club and local correspondent to assist in providing support and, if necessary, arrange for a cargo surveyor to attend the ship and assist the master. If there are any doubts as to the safety and suitability of the cargo, the shipper should be requested to provide accurate certification, which may involve retesting the cargo for moisture content and transportable moisture limit. The master is reminded that under the provisions of Safety of Life At Sea (SOLAS), cargo should not be loaded if there are any concerns that the ship might be affected by the condition of the cargo. The presence of water on the surface of the cargo could indicate that the moisture content is in excess of its transportable moisture limit. Inform the shipper of the condition of the cargo and that you have observed water. Contact your P&I club and local correspondent for assistance. Arrange for a cargo surveyor to attend and to check the condition of the cargo. Instruct the surveyor to take samples and arrange for

retesting of the cargo by an independent laboratory to determine if the cargo is in excess of its transportable moisture limit and has reached its flow moisture point. If retesting determines that the cargo is in excess of its TML (thus presenting a serious risk of liquefaction) the remaining cargo should not be loaded. On no account should the ship sail with any cargo which has excessive moisture and which exceeds its transportable moisture limit. The surveyor should if possible check the condition of the cargo on shore and determine its suitability for loading, noting any moisture present or contamination and whether it accurately corresponds with the descriptions on the cargo declaration form and bill of lading. Cargo stockpiles for loading need to be clearly identified and related to the cargo documentation. The surveyor should keep in close contact with the master and crew. The cargo plan should be closely monitored to ensure that the shoreside facilities are loading in accordance with the agreed plan.

The surveyor should take owner's samples of the cargo from various stockpiles on shore in accordance with the IMSBC Code procedures, in the event that it is necessary to double check the shipper's certification. If the cargo is wet or unrepresentative of the shipper's cargo declaration, samples taken by the owner's surveyor should be taken to an independent laboratory for retesting and confirmation of suitability to load. The surveyor should pay particular attention to the prospect of rain and how this could affect the cargo to be loaded, including: advising the Master to close the working cargo hatches when it rains for prolonged periods rechecking the cargo stockpile on shore to determine whether the rain has affected the cargo - has this changed the flow moisture properties of the cargo and increased the moisture content? It is essential that the cargo is retested to determine if it is safe for transport advising the master of any wet cargo - the surveyor may assist the master in conducting a 'can test'. This test should only be used to determine whether the condition of a cargo is NOT suitable for loading and should never be regarded as an acceptance test or that the cargo is safe to load.

The cargo declaration forms must be accurate and representative of the cargo to be loaded. This includes:- the correct bulk cargo shipping name (BCSN)- the cargo group (A and B, A, B or C)- IMO class and UN number if applicable- total amount of cargo to be loaded- stowage factor- trimming procedure- toxic or flammable gases which may be generated by cargo- cargo flammability, toxicity, corrosiveness and propensity to oxygen depletion- self-heating properties of the cargo. The IMSBC Code

has been mandatory since 1 January 2011 and must be complied with by both the ship and the shipper. The master has an overriding authority under SOLAS not to load any cargo and to stop loading, if there are any concerns that the ship may be affected by the condition of the cargo.



Condition of Cargo Surface after loading before trimming

A loader engaged in trimming inside the Hold

A loader engaged in trimming inside the Hold

Case Study 1:

A vessel while loading copper concentrate, a small parcel of the cargo was loaded during precipitation as reported by the Sampler employed by the Survey Company. This event created a big issue. The Survey company involved in sampling would certify the moisture content of the material delivered by trucks on the *dock* and *not the moisture content of the material loaded on the ship*. A disclaimer would mention this fact on the speedy moisture certificate. The moisture content determined at dock represents the moisture content from sample delivered from the shed.

Any additional precipitation is added after the sample is *taken "the certificate is null and void. Any change in condition to the sample taken nullifies the results".*

As per the Instruction received by the Survey Company from the Authority "no loading would take place during any precipitation". This incident could have cause the cargo to surpass the TML.

Under these circumstances, the Inspector refused to issue certificate because he suspected that moisture content would exceed the TML value. The Inspector insisted to have a new Lab Analysis. The sampler refused to take sample from the Hold as the procedure from his company restricts him to do so. As a result the stevedore took the sample from the Hold. The "Moisture Content" rose from 6.5% to 8.15%. There following were the report from the "Survey Company".

SPEEDY MOISTURE REPORT

Report Date: XXXX
Location:
Cargo: Approx 10,000 WMT of Copper Concentrate
Date of intervention XXXX
Vessel: XXXX

We hereby certify on behalf of our principals, XXXX that we sampled the cargo said to be copper concentrate throughout the loading operations to undertake speedy moisture testing.

A) The average moisture result from samples obtained by XXX during loading is: 6.5 %

B) Average from samples taken by Stevedore from hold No 2 based on Survey's instructions is: 8.15 %

The above moisture content was determined from samples taken during the cargo delivery at quay side. In view loading was authorized during periods of rain precipitations Sampling Company cannot ascertain the above results(A) as being the total moisture on board. Consequently Sampling does not take any responsibility as to whether the cargo is seaworthy or not in accordance with IMSBC Code Ed 2013 requirement.

Based on the Inspector's instructions samples were drawn from the surface of Hold No 2 and submitted to us for moisture analysis. The sample (s) to which the findings recorded here ("the findings") results B related were drawn and /or provided by the customer or by a third party acting at the customer's direction. The Findings constitute no warranty of the sample's representation of any goods and strictly relate to the sample(s) are said to be extracted. Sampling Company accepts no liability with regards to the origin or source from which the samples are said to be extracted.

A loader engaged in trimming inside the Hold

Condition of Cargo Surface after trimming

Condition of Cargo Surface after trimming

Condition of Cargo Surface after trimming

The following "Certificates" must be provided to the Master by the Shipper be before loading.

1. **Certificate of Analysis** 2. **Cargo Information for Solid Bulk Cargo**

Certificate of Analysis

Date: October 22, 2014

We hereby Certify that we have sampled and analyzed the cargo describe and report as follows:

Cargo: Copper Concentrate

For Loading on M.V. Dhaka

Stockpiles Located at: Chittagong, Shed No. 4

We drew samples from various points of the stockpile describe above for loading to designate vessel, as of August 22, 2014 for TML and Flow Moisture determination.

We drew samples from various points of the stockpile described above, for loading to designate vessel, as of, October 19, 2014 for determination purposes.

An average composite sample was prepared and dried to constant weight for moisture purposes.

TOTAL MOISTURE (%):	**7.45**
TRANSPORTABLE MOISTURE LIMIT (%):	**9.02**
FLOW MOISTURE POINT (%):	**10.03**

The transportable moisture limit was determined in accordance with the method described in the IMSBC, Edition 2013, on: July 22, 2014.

The samples used to determine these results were obtained by sampling methods at least equal to those recommended by the "Government of XXXX".

James Bond

Manager

The following are the "Cargo Declaration form by the Shipper"

FORM FOR CARGO INFORMATION

for Solid Bulk Cargoes

<table>
<tr><td>Shipper
ABS Dhaka Inc.</td><td>Document Number
123456</td></tr>
<tr><td>Consignee Carrier
Barrah Export Inc.</td><td>Consignee Carrier
Nawabgonj Transport Inc.</td></tr>
<tr><td>Name/means of transport
Ocean Transport
M.V. Rostand</td><td rowspan="2">Instructions or other matters:
Cargo is not harmful to the Marine Environment. Cargo residues classified as not harmful to the marine environment, may be discharged not less than 12 NM from the nearest land.</td></tr>
<tr><td>Port/place of destination</td></tr>
<tr><td>General description of the cargo
Material: Copper Concentrate
Particle size: 80% passing size expected to be 30 mm based on pilot plant results (ranging from 15 to 50 mm)</td><td>Gross mass (kg/tonnes)</td></tr>
<tr><td colspan="2">Specifications of bulk cargo
Stowage factor: 0.32 MT/Cubic Metre
Angle of repose, if applicable:
Trimming procedures: Grab/Conveyor belt trimming
Chemical properties : Chalcopyrite (CuFeS2), Pentlandite $(Ni,Fe)_9S_8$, Pyrrhotite $(Fe_{n-1}S_n)$</td></tr>
<tr><td>Group of the cargo

Group A & B*</td><td>Additional certificate(s)*
Certificate of moisture content and transportable moisture limit, Attached
Weathering certificate
Exemption certificate
Other (specify)
* If required</td></tr>
<tr><td>DECLARATION
I hereby declare that the consignment is fully and accurately described and that the given test results and other specifications are
correct to the best of my knowledge and belief and can be considered as representative for the cargo to be loaded.</td><td>Name/status, company/organization of Signatory
James Bond, M5 Inc.
Place and date March 8, 2013
Signature on behalf of shipper</td></tr>
</table>

Sampling procedures

Sampling shall be conducted only by persons who have been suitably trained in sampling procedures and who are under the supervision of someone who is fully aware of the properties of the consignment and also the applicable principles and practices of sampling.

Prior to taking samples, and within the limits of practicability, a visual inspection of the consignment which is to form the ship's cargo shall be carried out. Any substantial portions of material which appear to be contaminated or significantly different in characteristics or moisture content from the bulk of the consignment shall be sampled and analyzed separately. Depending upon the results obtained in these tests, it may be necessary to reject those particular portions as unfit for shipment.

Representative samples shall be obtained by employing techniques which take the following factors into account:

.1 the type of material;

.2 the particle size distribution;

.3 composition of the material and its variability;

.4 the manner in which the material is stored, in stockpiles, rail wagons or other containers, and transferred or loaded by material-handling systems such as conveyors, loading chutes, crane grabs, etc.;

.5 the chemical hazards (toxicity, corrosivity, etc.);

.6 the characteristics which have to be determined: moisture content, TML, bulk density/stowage factor, angle of repose, etc.;

.7 variations in moisture distribution throughout the consignment which may occur due to weather conditions, natural drainage, e.g., to lower levels of stockpiles or containers, or other forms of moisture migration; and

.8 variations which may occur following freezing of the material.

Throughout the sampling procedures, utmost care shall be taken to prevent changes in quality and characteristics. Samples shall be immediately placed in suitable sealed containers which are properly marked.

Unless expressly provided otherwise, sampling for the test required by this Code shall follow an internationally or nationally accepted standard procedure.

Interval between sampling/testing and loading for TML and moisture content determination

A test to determine the TML of a solid bulk cargo shall be conducted within six months to the date of loading the cargo. Notwithstanding this provision, where the composition or characteristics of the cargo are variable for any reason, a test to determine the TML shall be conducted again after it is reasonably assumed that such variation has taken place.

Sampling and testing for moisture content shall be conducted as near as practicable to the time of loading. 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.

Samples of frozen cargo shall be tested for the TML or the moisture content after the free moisture has completely thawed.

The following items to be considered:

1. **Master must obtain "Certificate of Analysis" indicating "Moisture Content (MC)", Transportable Moisture Limit (TML) & Flow Moisture Point (FMP);**
2. **Before loading, to check the cargo hold bilge suction is functional.**
3. **Before Sailing the surface of the cargo in cargo holds has to be trimmed. (Section 5 of the IMSBC Code)**
4. **The vessel must not load during precipitation.**
5. **Master must maintain "Precipitation Log" & the timings to be the same as "Deck Log Book".**

Reference

The Standard P&I Club

IMSBC Code, Edition 2013

Capt. Kamal Ahmed

15th Batch