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International Federation of Inspection Agencies
Metals and Minerals Committee
Transportable Moisture Limit Code of Practice

**SECOND
EDITION**

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1. DOCUMENT CONTROL

Document title: TRANSPORTABLE MOISTURE LIMIT CODE OF PRACTICE – Second Edition
This document replaces: TRANSPORTABLE MOISTURE LIMIT CODE OF PRACTICE – First Edition

2. INTRODUCTION

The following TML Code of Practice (hereinafter “the Code”), prepared by the Metals & Minerals Committee of the International Federation of Inspection Agencies (IFIA), applies to IFIA Members that offer TML testing services (hereinafter “the Member” or “Members”) and other interested parties that intend to use this Code as guidance for testing the Transportable Moisture Limit (TML) for solid bulk cargoes which may liquefy under the vibration occurring during a voyage at sea.

This Code describes how Members should handle requests for Transportable Moisture Limit (TML) testing, how they should make sure that their executing labs have the required proficiency and how their results should be reported and including an acceptable set of minimum information and possible disclaimers.

The Code refers to the International Maritime Solid Bulk Cargoes Code (IMSBC) 2016 edition and the Guidelines for developing and approving procedures for sampling, testing and controlling moisture content for solid bulk cargoes which may liquefy (MSC.1/Circ.1454/Rev.1). In accordance with the IMSBC (paragraph 4.3.3) the shipper is responsible for preparing procedures for sampling, testing and controlling the moisture content, to be approved and checked by the Competent Authorities and this Code does not intend to shift such a responsibility to Members carrying out TML testing in accordance with such a procedure.

The Code does not distinguish between the four (4) TML methods as per International Maritime Solid Bulk Cargoes Code (IMSBC) 2016 edition, working draft method of ISO/TC 102/SC 3 N 1166 for Iron Ore Fines, Australian method for Coal, or modified Proctor-Fagerberg for bauxite (CCC.1/Circ.2/Rev.1 – Annex 1). When referring to TML testing the aforementioned methods are considered as equivalent.

When performing one or more of the TML methods, Members are expected to have implemented technically robust and easily reproducible procedures following each of the above-mentioned international recognized methods.

This document should not be confused with Standard Operating Procedures for each of the international recognized methods.

TML testing goes beyond normal “commercial testing” that third party inspection agencies perform on behalf of principals, in that the results generated by a Member may become part of a safety related process involving vessel stability predictions.

Liquefaction of a cargo caused by excessive moisture can lead to severe safety consequences. Members are advised to take additional care in performing sampling and testing procedures, so as to produce trustworthy data to be used by the persons or authorities making decisions regarding the pertinent shipments of bulk cargo.

3. PURPOSE

This document is designed to provide Members with a consistent approach for handling TML testing requests, in accordance with procedures for sampling, testing and controlling the moisture content developed by the shipper and approved by the competent Authority.

The shippers are responsible for preparing procedures for sampling, testing and controlling moisture content of solid bulk cargo that may liquefy during a voyage at sea. The Member handling TML testing is not responsible for preparing, implementing and approving such a procedure but just to apply it in a reliable and consistent manner.

The code includes an explanation showing how Members may monitor their proficiency and expertise with TML related sampling and testing.

Members providing TML testing services are reminded that the results of the testing are relied upon by others who make decisions in respect to the safety of cargoes for loading which may be prone to liquefaction.

Members providing TML testing services shall not act on behalf of the Competent Authority of ports of loading, as a body designated or recognized by the competent Authority in accordance with the IMSBC Code unless specifically authorized and approved to do so. Globally the different Competent Authorities are not consistent in their approach to this.

Claims may arise in the form of contractual claims from a Member's customer or in the form of non-contractual claims brought by third parties such as vessel owners. A claim based on error or negligence on the part of the Member shall be substantiated by the claimant, proving that the Member has not fulfilled its duties.

Members are advised to comply with the guidelines in this Code of Practice with special attention given to section 8.2 noting Members shall neither interpret the TML results nor declare a cargo is safe for carriage. It is recommended that Members consider section 11 (Reporting and Disclaimers) carefully for each and every assignment.

4. REFERENCES

The following referenced documents, adopted by the International Maritime Organization (IMO), are to be used within the scope of this Code of Practice.

- ▶ IMSBC 2016 edition.
- ▶ MSC.1/Circ.1454/Rev.1.

5. DEFINITIONS

For the purposes of this document, the terms and definitions given in IMSBC 2016 edition – 1.7 apply.

Frequently used are:

- ▶ TML - Transportable Moisture Limit
- ▶ IMSBC - International Maritime Solid Bulk Cargoes Code
- ▶ SOLAS - Safety Of Life At Sea

6. RESPONSIBILITY

A Member that offers TML testing services in accordance with the above-mentioned referenced documents shall, by its Board of Directors or equivalent body:

- ▶ Confirm its commitment to this Code.

- ▶ Adopt rules that shall reflect the minimum **Sampling** requirements and procedures (when applicable) as per those listed in the IMSBC Code, or as per customary and approved procedures by the competent authority of the load port.
- ▶ Adopt rules that shall reflect (at least) the minimum **Testing** procedures for Moisture determination and Transportable Moisture Limit as per the IMSBC Code, or as per customary and approved procedures by the competent authority of the load port.
- ▶ Implement an effective TML **training program**.
- ▶ Maintain an up to date **list of facilities and staff** who that are internally approved to conduct and report TML tests.
- ▶ Participate annually in an (IFIA-led) multi-lab round robin test program for each of the TML test methods offered. Reference to 9.2.
- ▶ Report possible life-threatening conditions to the Authorities, including but not limited to the Competent Authorities, port control, any other official body, or ships master.
- ▶ Confirm involvement in TML testing and commitment to abiding this IFIA TML CODE OF PRACTICE.

IFIA members are **NOT** responsible and shall **NOT** attempt to obtain approval by engaging competent authorities in the port of loading for approval of shipper's procedures as per the provisions of paragraph 4.3.3 of the International Maritime Solid Bulk Cargoes (IMSBC) Code and MSC.1/Circ.1454.

A Member cannot act for the shipper or in the name of the shipper to obtain approval to load a cargo, a Member may offer guidance as a service to the shipper to assist the shipper fulfill his duties in this respect.

7. CONDITIONS

This Code does not cover detailed technical guidelines of the different sampling or test methods, rather is it limited to Members following this document for the scope and acceptance of TML requests, commitment to having a proficiency program and providing minimum sets of information and possible disclaimers on reports and/or certificates.

For the execution of sampling and/or testing the rules and guidelines of IMSBC apply, such as ISO, ASTM and those of the Competent Authorities of the port of loading.

Competent Authorities are designated by Contracting & Member Governments of SOLAS.

8. ACCEPTING NOMINATIONS

8.1 General

A member has the obligation to conduct TML related activities proficiently and with an appropriate level of expertise.

Selecting the appropriate test for TML testing is critical. Each different material has different liquefaction properties. The liquefaction properties are a function of particle size distribution, nominal top size, particle shape, material density, pressure (cargo depth), porosity and even chemical composition.

As per the provisions of paragraph 4.3.3 of IMSBC and MSC.1/Circ.1454 the Competent Authority of the load port must approve of shipper's procedures of testing. This makes shippers responsible for advising the IFIA member which TML testing method should be followed.

Shipper's approved procedures should include other details too.

For example:

- ▶ the applied sampling approach
- ▶ the test method for moisture determination
- ▶ controlling the moisture content between testing and loading
- ▶ the validity of a TML certificate in case it is intended for more than one shipment

When a request for TML testing is received from a new potential client or for a new, unknown product, then the IFIA member shall ask – as a minimum – which test method should be followed, i.e. which test method was approved by the Competent Authority at the load port.

When applicable, a Member shall duly inform principals of existing or anticipated limitations of sampling and/or testing.

8.2 Experimental Tests – not intended for cargo shipment declarations

Members may accept experimental test-work to evaluate technical suitability of a material's properties for a certain TML test method, or a modified test method.

A Member shall not accept pressure from the requester to complete such new, experimental TML testing within an unrealistic time-frame.

The Member shall not interpret the TML results. Interpretation of results – and concluding that a certain test or modification is suitable – is the duty of the shipper and possibly Competent Authorities of the port of loading.

If Members are asked to interpret results, shippers shall be referred to section 1.7 of the IMSBC Code, definition of TML and to section 7.3.1.1.

Members shall never declare that a cargo is safe for carriage, even though the TML and moisture content may suggest it is.

8.3 Sample Volume

In their nomination acceptance procedures, a Member shall inform the Principal/Shipper of the volume of sample

material that is required for testing. This is done to ensure that the sample will meet the minimum requirements of the relevant testing method.

The minimum volume that is required is determined by the TML method that is requested by the principal, the particle size of the sample and the number of replicate analyses needed.

Members shall not accept pressure from the Principal/Shipper to conduct TML testing on a sample that is too small in volume or mass.

8.4 Sampling

When a Member is asked to perform sampling that will ultimately result in a TML sample, then this Member should have full access for sampling throughout building of the stockpile. The shipper should arrange for the sampling to start as soon as the stockpile is being formed, when the first material arrives in the port of loading.

Alternatively, the IMSBC code permits sampling of stockpiles that have already been formed; this provision is conditional and depends on the material type and storage conditions (e.g. height of the pile). Shippers should be aware that static stockpile sampling will likely limit the accessibility of the cargo for sampling.

IMSBC provides guidelines for sampling so called "static stockpiles" of mineral concentrates and mentions minimum number of increments to be taken in a systematic grid pattern over the stockpile.

Sampling of static stockpiles of unprocessed mineral ores – such as Iron Ore Fines – is permitted, provided that the stockpile height is maximum 3 meters and a full vertical column can be accessed by the sampling tool.

Regardless of the material: For all "static" stockpile sampling interventions it remains the sole responsibility of the shipper to ensure that the product that is accessible is representative for the entire shipment.

8.5 Submitted Samples

When submitting a sample to a Member the shipper is responsible for the representativeness of such a submitted sample.

The characteristics to be determined and tested on a submitted sample, e.g. moisture content and TML, should be representative for the actual cargo that is allocated to be shipped.

A sample that is submitted should be provided at a minimum with information of the bulk cargo shipping name (BCSN), the date and location of sampling and the quantity of cargo that the sample represents. The Member, and in turn recipients of TML reports and/or certificates such as ships masters, must rely on such bona fide information.

8.6 Composite or Blended Samples

When a cargo consists of several grades of material then the IFIA member may be requested to sample and compose one average composite – or blended sample – intended to represent the entire shipment quantity.

It is not permitted to calculate a weighted average value using TML results of individual grades. When different grades of material are sampled separately – prior to loading and actual blending – then the Member shall create a physical sample for actual TML testing.

The physical sample shall be composed on the basis of the mass percentage of each individual grade. Such physical sample should then be mixed in accordance with sampling standards prior to obtaining test portions for TML determination.

A Member shall never calculate a mathematical average of TML test results. TML results are non-additive and a physical test sample shall always be used for producing a TML value.

It is the sole responsibility of the shipper to ensure that individual grades are properly mixed in order to create a homogeneous cargo throughout each cargo space that is loaded.

8.7 Validity of TML Certificates

In the event that a shipper intends to use a TML value of a material for more than one shipment – for example during a period wherein product, production methods and specifications of the material are guaranteed to be constant (by the shipper) – it is the sole responsibility of such shipper to ensure that the tested sample has the same characteristics and properties of the cargo that was sampled and tested for TML.

Members shall not state a validity period on TML certificates, but will report their results based upon the sampling and testing dates of the pertinent sample.

8.8 Validity of Actual Moisture Certificates

Sampling and testing for actual 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 sampling and loading, check tests shall be conducted to ensure that the Actual Moisture content of the cargo is still less than its TML. The interval between sampling/testing and loading shall never be more than seven (7) days.

Members shall not state a validity period on Actual Moisture certificates, but will report their results based upon the sampling and testing dates of the pertinent sample.

9. PROFICIENCY

Members should conduct TML related activities proficiently and with an appropriate level of expertise.

9.1 Sampling Proficiency

Sampling proficiency exercises involving TML parameters – by round robin inter-laboratory testing – are very scarce and difficult to organize.

Members shall sample a cargo as per most appropriate methods and industry standard, such as those referred in the IMSBC code.

Members will do their utmost to follow the basic sampling principle: any particle in the cargo shall have equal probability of being selected and included in the sample that is used for testing.

Members shall provide suitably trained personnel and correct equipment for sampling. Each member will have training programs and maintenance schedules to make sure the sample that is drawn will be representative for the cargo. Records will be kept of training and maintenance.

Members that offer sampling activities for TML related determinations shall complete a sampling checklist that includes, as a minimum, the following information:

- ▶ Name and contact details of the client (must be same as shipper)
- ▶ Name and contact details of the port, terminal or warehouse
- ▶ Name and contact details of the trained sampler(s)
- ▶ Name and contact details of the Technical supervisor

- ▶ Stated identification of the consignment to be sampled
- ▶ Stated identification of the material – including:
 - Commodity type
 - Particle size distribution or nominal top size

- ▶ Sampling details:
 - International Sampling Standard
 - Sampling implement
 - Manual or Mechanical sampling
 - Dynamic (during handling) or Static Stockpile sampling
 - Number of increments and/or sub samples
 - Location of primary increment sampling
 - Time of sampling
 - Mass of an increment and minimum sample mass for testing
 - Method of combining increments, respectively sample division, to obtain a test sample
 - Method of sample protection (integrity of moisture content between sampling and testing)
 - Method of sample identification (traceability to the consignment that is sampled).

A sampling checklist shall conform to MSC.1/Circ.1454 – Section 2.3.

Records of training and maintenance shall conform to MSC.1/Circ.1454 – Section 2.4.

Submitted samples are not taken by Members. The responsibility for all aspects of proficiency of sampling lies with the shippers in case of submitting samples to a Member. When submitting a sample to a Member the shipper/client is responsible for all sampling proficiency, descriptions and information regarding such a submitted sample, upon which, by necessity, the Member must rely.

9.2 Testing proficiency

IFIA is considering options for an independent round robin inter-laboratory testing exercise for each individual TML determination method.

Until such time that an independent TML round robin program has been identified – and set as mandatory by the IFIA Metals & Minerals Committee – each Member that offers TML testing shall implement its own inter-laboratory testing program.

A Member shall develop training procedures, maintain records of training, perform internal audits and keep maintenance and calibration logs of the equipment and instruments that are used.

For smaller organizations, or those with centralized TML testing, the internal round robin cannot be applicable and a multi-day, multi-technician repeatability exercise should be conducted instead.

In addition to the tests for TML determination purposes the Member shall have procedures, training programs and calibration codes for other related tests such as: moisture determination, particle size analysis, bulk density determination, and density of solids determination; if applicable using the referenced methods of IMSBC.

Members that offer TML related tests shall complete a testing checklist that includes, as a minimum, the following information:

- ▶ Name and contact details of the client (must be same as shipper)
- ▶ Name and contact details of the port, terminal or warehouse from where samples originated
- ▶ Name and contact details of the trained TML test technician(s)
- ▶ Name and contact details of the Technical supervisor

- ▶ Stated identification of the consignment to be tested
- ▶ Stated identification of the sample material – including:
 - Commodity type
 - Particle size distribution or nominal top size

- ▶ Sample mass (in kilogram) as received by the laboratory for testing

- ▶ Testing details:
 - IMSBC Test Method, Exemption Test Method or Approved Test Method by Competent Authorities
 - TML Testing equipment to be used, e.g. Flow Table, Penetration or Proctor Fagerberg
 - Moisture determination method, e.g. ISO 589.
 - Bulk density determination method, e.g. ASTM D-698 without compaction
 - Density of solids determination method, e.g. ASTM D-5550

A testing checklist shall conform to MSC.1/Circ.1454/Rev.1 – Section 3.2.

Members shall not subcontract TML testing outside their own organization as proficiency of testing would be outside their own control.

10. SAMPLE AND TEST SUITABILITY

Members have the obligation to conduct TML related activities proficiently and with an appropriate level of expertise.

10.1 Untestable Samples

It is recognized in IMSBC and IMO publications that in some instances the scope of each of the recognized methods may not be suitable for the cargo that was sampled.

Members shall not issue a TML certificate when there is no approved alternative or modified method that can accommodate testing of the sample of the cargo to be shipped. In these circumstances the Member should consult with the shipper for further clarification from the competent authorities.

10.2 Modified Methods

It is recognized in IMSBC and IMO publications that in some instances the scope of each of the recognized methods may not be suitable for the cargo that was sampled.

In some instances, only a part of the sample can be used for a specific test. This is mostly done by screening a sample and excluding a part thereof to accommodate the test specifications.

For example: on Iron Ore Fines with nominal top size 31.5 mm, only the fraction minus 25 mm is used in a Penetration Test. This procedure is also called "scalping".

When only a part of the sample is used and scalping is applied, then this shall be specified on the TML certificate

accordingly.

Notwithstanding the mandatory specification of a method modification such as "scalping", the Competent Authorities of the port of loading must approve of any such modification.

It is the responsibility of the shipper to obtain such approval for a method modification; Members shall not proceed with modified testing unless specifically instructed in writing by the shipper, the principal.

10.3 Unsuitable Methods

It is recognized in IMSBC and IMO publications that in some instances the scope of each of the recognized methods may not be suitable for the cargo that was sampled.

A Member shall verify with the shipper, the principal, in case the instructed method to be applied is unsuitable for the cargo.

For example: on a sample with high clay content a Flow Table Test is requested.

When a method may be unsuitable, then this shall be specified on the TML certificate accordingly.

Notwithstanding the mandatory specification of possible unsuitable method, it is the responsibility of the shipper to obtain approval for any applied method from the Competent Authorities for their cargo. IFIA members shall not proceed with a possible unsuitable method unless specifically instructed in writing by the shipper, the principal.

11. REPORTING AND DISCLAIMERS

Members have the obligation to conduct TML related activities proficiently and with an appropriate level of expertise.

11.1 Minimum information on Reports and Certificates

Members shall specify as a minimum the below information on their reports and/or certificates:

- ▶ The applied TML method for testing, e.g. Flow Table Test, Penetration, Proctor Fagerberg
- ▶ Identification and Provenance of the sample including:
 - Description of the material, e.g. type and trade-name
 - Cargo quantity in metric tons that the sample represented at time of sampling
 - Date of sampling
 - Place of sampling
 - Who took the sample, the IFIA member or the shipper
 - Advised cargo height when on the ship (used for calculation of compaction energy)
 - Bulk density of the compacted sample (using Proctor C hammer of 350 g and drop height of 200 mm; 5 layers of 25 blows each)
- ▶ Where applicable: A remark that the TML sample was over FPM (or OMC) and had to be dried prior to testing.
- ▶ Any modification of the recognized test method as published in IMSBC
- ▶ Any limitation or indication that the TML test method may not be suitable for the cargo that was sampled

- ▶ Transportable Moisture Limit of the sample expressed as mass percentage of the undried sample material (called gross water content for Proctor Fagerberg Testing)

Note that a TML certificate shall not advise the Actual Moisture content of a sample. Actual Moisture content – when required – shall be reported on a separate document.

11.2 Disclaimers

IFIA members have the obligation to operate conduct TML related work proficiently and with an appropriate level of expertise.

With TML this goes beyond the normal "commercial testing" obligation towards principals, it extends to any other party that may place "safety" reliance on a TML certificate that is issued by an IFIA member.

IFIA Members may apply endorsements and disclaimers on the certificate in order to explain any limitation of sampling, testing and/or the scope of work that the IFIA member conducted.

Disclaimers and/or caveats may also be used to draw attention to the necessity of comparing a TML result with the actual moisture result of a cargo.

Examples of disclaimers used by Members:

- ▶ Sampling is conducted in total reliance of the assurance of the shipper that the product presented was (in terms of condition, quality, storage and all other aspects) representative of the entire bulk of the product shipped.
- ▶ Testing method as specified by the shipper may not be best available method; the shipper should consult with the appropriate authorities for approval.
- ▶ Testing was conducted on a part of the sample: particles retained on a 7 mm sieve were excluded from the test portions.
- ▶ A TML certificate is based upon a sample taken on a specific date, place and in specific circumstances. Should a Shipper, in possession of a TML certificate, chose to use said certificate to represent subsequent shipments it shall be solely under the Shippers responsibility and the Shipper shall supply stakeholders and lawful authorities with a full, complete and bona fide cargo declaration in all respects of the cargo in question.
- ▶ Shippers have the sole responsibility to provide the Actual Moisture content of the cargo and ensure it is less than the TML.

12. LIFE-THREATENING CONDITIONS

Members have the obligation to conduct TML related activities proficiently and with an appropriate level of expertise.

When a Member becomes aware of inappropriate use of TML or Actual Moisture certificates (e.g. changing production methods, moisture ingress after sampling), or when a Member becomes aware that the Actual Moisture content is higher than TML, it shall be considered a potentially life-threatening condition that must by law be reported immediately to the Competent Authorities.

When IFIA members are aware of life-threatening conditions that are not immediately relayed to the authorities by their principals, then the IFIA member shall act and inform authorities directly.

13. MANAGEMENT COMMITMENT

IFIA members that offer TML testing services shall annually issue a statement to IFIA's secretariat to confirm that the Member has been actively involved in employing Transportable Moisture Limit testing procedures and that the Member has conducted or participated in at least one multi-lab round robin test program per method as well as having an effective training program and maintaining an updated lists of its facilities and staff who are trained and internally approved to conduct and report the findings of TML tests.

IFIA members that offer TML testing services are committed to the IFIA TML CODE OF PRACTICE.