

## Transportable Moisture Limit for Coal

### **Disclosure**

The article below has been written in a sincere attempt to inform the US coal export community about the new IMSBC Code regulations for Transportable Moisture Limit (TML). There is a lot of current confusion in the industry about exactly what are the responsibilities of coal shippers and how to comply with the new regulations. To be as clear and correct as possible, this article was reviewed for technical correctness by the Hazardous Materials Division of the United States Coast Guard – which is the “Competent Authority” for the United States and is responsible for interpreting and enforcing the IMSBC Code, including provisions related to the TML.

### **Executive Summary**

The International Maritime Organization (IMO) publishes the International Maritime Solid Bulk Cargoes (IMSBC) Code which specifies the requirements for carriage of solid bulk cargoes other than grain on vessels to which the International Convention for the Safety of Life at Sea (SOLAS) is applicable. This article will address the rules and regulations governing the Transportable Moisture Limit (TML) for coal that became mandatory as of January 1, 2019.

Testing for the TML is driven by the safety requirements for identifying and preventing the conditions that might cause a solid bulk cargo to undergo liquefaction in the hold of a ship and create dangerous conditions due to loss of stability of the vessel.

Liquefaction of a solid bulk cargo can occur for a number of reasons – but in the case of coal it is primarily related to the interaction between the particle size consist of the cargo and its moisture content.

The IMSBC Code states “*Cargoes that may liquefy* means cargoes which contain a certain proportion of fine particles and a certain amount of moisture. They may liquefy if shipped with a moisture content in excess of their TML.”

It is important to note that the recent IMO decision to develop a specific test method for determining the TML of coal cargoes was intended to provide clarity on determining whether or not a given coal is both Group B and Group A. It has long been known that certain coals have the potential to liquefy, as seen by the Group B (and A) classification since the first edition of the IMSBC Code. The decision by the IMO to update many requirements for cargoes that can liquefy was driven by a concern for safety for all bulk carriers after some serious accidents involving other bulk cargoes – most notably, nickel concentrates and iron ore fines. The truth is that there have been no known coal shipments from the United States that have liquefied in transit.

While the risk of liquefaction of most US coals is remote, it does not relieve US coal shippers of their responsibilities as outlined in the IMSBC Code. Recent developments in the Code for coal place certain responsibilities on the shipper with respect to declarations to the master of the vessel regarding the cargo to be loaded – as well as certain testing and supporting documentation for those declarations.

## Cargo Group Classifications for Coal

The IMSBC Code has three Classification Groups – A, B and C – of which only Groups A and B apply to coal.

“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)”

All coal cargoes are classified as Group B due to the potential hazards of the cargo such as self-heating and the release of methane or carbon monoxide. As such, no coal cargoes are classified as Group C.

The key question for US coal shippers is whether or not their cargoes are Group A in addition to being Group B. The IMSBC Code states:

“Coal shall be classified as Group A and B unless classified as Group B only by a test determined by the appropriate authority\* or where it has the following particle size distribution:

1. not more than 10% by weight of particles less than 1 mm ( $D_{10} > 1$  mm); and
2. Not more than 50% by weight of particles less than 10 mm ( $D_{50} > 10$  mm).

Notwithstanding the above, a blend of two or more coals shall be classified at Group A and B unless all original coals in the blend are Group B only.”

Discussion – The above language taken directly from the IMSBC Code states that the first criteria allowing for a Group B only classification is to meet the exact sizing criteria above. Note that both point 1 and point 2 must be met. In the case of blends, all coals loaded onto the vessel would need to meet the sizing exemption criteria to avoid being classified as Group A.

It is also important to understand that the above criteria for exemptions to Group A are new. Previously, the language in the IMSBC Code only indicated that coal cargoes could “liquefy if predominantly fine 75% less than 5 mm coal.” Cargoes that have been declared only Group B in the past may no longer be just Group B based on these new criteria. Simply continuing to declare cargoes as Group B based on past history could be a mistake.

Some shippers make an erroneous assumption that since their cargo description is “50 mm by zero coal” that they are exempt from Group A. In fact, very few coals meet the exemption criteria based on sizing - in particular metallurgical coals.

While not included in the text of the Coal schedule in the IMSBC Code, there is a second method for determining whether the cargo is a Group A cargo. Appendix 2 of the Code includes the approved Modified Proctor Fagerberg Test for determining the TML of coal. Without going into too much detail on the test procedure, the test requires a coal sample to be saturated to at least 70% moisture content and then compared to a compaction curve.

The second paragraph of section 1.5.3.2 of the Modified Proctor Fagerberg test procedure states “Where moisture freely drains from the sample or the cylindrical mould at moisture content such that the test sample compaction curve does not extend to or beyond 70% saturation, the test is taken to indicate a cargo where water passes through the spaces between particles and there is no increase in pore water pressure. Therefore, the cargo is not able to liquefy.”

In other words, if a coal drains well and the 70% saturation level cannot be reached, then the test result means the coal cargo is not subject to liquefaction. In such a case, this coal is not classified as Group A.

Therefore, all coals are Group A – unless they are proven not to be - based on a) meeting the sizing criteria, or b) draining well enough that a sample of the material cannot reach 70% saturation in the modified Proctor-Fagerberg test. ***These are the only two ways to avoid a coal being classified as Group A.***

In the case that a coal is truly exempt from Group A, it is good practice to present to the ship’s master a copy of the sizing test and/or a statement about the exemption from Group A from an independent laboratory conducting the modified Proctor-Fagerberg test. If a coal is shown to be exempt based on the sizing criteria cited above, it is expected that the supporting sizing test be repeated at least annually – as long as nothing significant has changed in the processing of the coal that would affect the size consist.

### **Group A Cargoes**

Most cargoes leaving US ports should be classified as Group A and B. In the IMSBC Code, there is an example document called “Form for Cargo Information for Solid Bulk Cargoes”. On it there is one section for declaring which Group(s) your cargo falls into. Next to it is a section where the shipper is to declare the “Transportable Moisture Limit” for that cargo and also the “Moisture Content at Shipment”.

We will now discuss both of these terms. The first on Transportable Moisture Limit is fairly straightforward, the second on Moisture Content at Shipment is not at all straightforward.

All Group A cargoes must have a certificate from an independent laboratory – stating what the TML is for the cargo. This certificate must contain the TML test result and test result cannot be more than 6 months old at the time of the cargo loading. Therefore, the regulations say that all shippers of Group A cargoes must have a recent TML certificate to present with their cargo declaration.

Note - if the same coal is shipped under different trade names, a single TML test will suffice for each trade name, as long as the shipper understands that it is responsible for the accuracy of its declaration and that the lab that issues the certificate is indemnified.

The IMSBC Code also states that if there are two or more coals in a blend, then the declared TML for that cargo is to be the lowest of the TML’s for any component of the blend. The USCG will consider the possibility of using the TML test on the loaded blend for determining the TML for future cargoes of the same blend – but will only do so when there is enough data over time (i.e. data from a minimum of three cargoes) to demonstrate that the TML so determined is well supported.

The sample provided to the independent laboratory must be an uncrushed representative sample with a minimum mass of 150 kgs. The test takes approximately 3-5 days to conduct. There are a limited number of laboratories in the USA at this moment that run the Modified Proctor-Fagerberg test, so it is important not to wait until the last minute since there is often a backlog of previous samples to be run.

As noted above, the second declaration on the cargo form is the “Moisture Content at Shipment”

In Section 4 of the IMSBC code, there are some very important individual clauses in Sections 4.3 “Certificates of Test”, 4.4 “Sampling Procedures” and 4.5 “Interval between sampling/testing for TML and moisture content determination”. Upon a review of the language contained in these clauses, it would be easy to conclude that all coal cargoes must be sampled in the stockpile prior to the vessel loading. However, Section 4.6.1 of the Code notes that no single method of sampling is appropriate for all cargoes and that the uniqueness of cargoes will determine which method is utilized. It is important to read and understand all the language in Section 4, but below are some selected important quotes.

“4.2.1 – The shipper shall provide the master or his representative with appropriate information on the cargo sufficiently in advance of loading to enable the precautions which may be necessary for proper stowage and safe carriage of the cargo to be put into effect.”

“4.3.1 – To obtain the information required in 4.2.1 the shipper shall arrange for the cargo to be properly sampled and tested.”

“ 4.4.1 – Physical property tests on the consignment are meaningless unless they are conducted prior to loading on truly representative test samples.”

“4.5.1 – The shipper shall be responsible for ensuring that a test to determine the TML of a solid bulk cargo is conducted within 6 months of the date of loading of the cargo.”

“4.5.2 – The shipper shall be responsible for ensuring that sampling and testing for moisture content is conducted as near as practicable to the date of commencement of loading. The interval between sampling/testing and the date of commencement of loading shall never be more than seven days.”

The wording above seems pretty clear. All shippers of Group A cargoes must have a TML certificate issued within the previous six months to loading AND a declaration of the moisture content of the cargo about to be loaded from samples collected within the seven days prior to loading.

### **The Interpretation of the Competent Authority**

Before the issue of the pre-loading sampling for moisture content can be addressed, it is important to discuss the letter of the law versus the interpretation of the letter of the law by the Competent Authority.

As stated before, the US Coast Guard (USCG) is the Competent Authority of the United States for the IMSBC Code. While the National Cargo Bureau (NCB) is authorized to assist the Coast Guard in administering the provisions of regulations, they are not the Competent Authority for the IMSBC Code. The USCG retains sole authority for approval of test methods and other procedures related to TML as required by the IMSBC Code.

The USCG has provided clarification on this matter: “The NCB is listed in the Supplement of the IMSBC Code as a Competent Authority for the United States; however, this is a not a blanket authority nor is it equivalent to the authority of the USCG. NCB’s authority with respect to solid bulk cargoes is best explained by looking at our domestic regulations in 46 CFR Part 148.12.”

It is important to understand the USCG's interpretation of IMSBC Code requirements. The USCG is very cognizant that US coal cargoes are not at a high risk of liquefaction, and therefore are reasonable in what they will require from US shippers to comply with the IMSBC Code regulations.

The USCG understands that sampling coal cargoes in large stockpiles (or from the tops of barges and railcars) may not provide the most accurate evaluation of moisture content (or particle size). Additionally, the USCG recognizes the significant safety risks that can be presented by these sampling methods, and therefore emphasizes that sampling procedures should be based on what is most appropriate for each producer/shipper. The USCG considers the provisions of Section 4.3.3 to be one of the most important requirements for shipping cargoes that may liquefy. This section states "When a concentrate or other cargo which may liquefy is carried, procedures for sampling, testing and controlling moisture content to ensure that the moisture content is less than the TML when it is on board the ship shall be established by the shipper, taking into account the provisions of this Code".

### **The Key is the Moisture Control Plan**

Section 4.3.3 of the Code is the source of what has been called a Moisture Control Plan or a Moisture Management Plan. The USCG requires all US shippers to develop a Moisture Control Plan (MCP) and submit that MCP to the USCG for their approval. Quote from the USCG - "The USCG is the sole Competent Authority for the approval of procedures required in paragraph 4.3.3 of the IMSBC Code. We review each proposed set of procedures based on the known hazards of Coal cargoes against what we believe are adequate measures to mitigate/manage/control for the liquefaction risks. These procedures can cover everything from transport and storage prior to being loaded onto the vessel, all the way through monitoring conditions during the voyage, as well as offloading the cargo."

The USCG will issue a written approval of the shipper's MCP, called a Moisture Procedures Approval, and that approval is what can be presented to the master of the vessel. The Moisture Procedures Approval will be initially issued for a one year period. After that the Moisture Procedures Approval can be granted for a four year period.

As you can imagine, every shipper has its own unique supply chain, blending plan, logistics and loading procedures. As such, the MCP for different shippers can be very different, but the elements in every plan that the USCG is looking for are twofold. First, does the MCP have sufficient sampling and testing protocols in place so that the shipper can detect a TML issue should one ever arise. Secondly, if a potential TML issue is detected by the MCP, does the MCP also include prudent steps to avoid or ameliorate the risk to the vessel.

One key document to consult for developing a Moisture Control Plan is a circular from the International Maritime Organization (IMO) labeled "MSC.1/Circ.1454/Rev1" dated June 15, 2015. This document is titled "Guideline for Developing and Approving Procedures for Sampling, Testing and Controlling the Moisture Content for Solid Bulk Cargoes which may Liquefy". The USCG uses this document to develop their internal process for approving Moisture Control Plans and so it is a very useful document for shippers to consult in the development of the plan they intend to submit to the USCG. An electronic copy of the circular can be requested from the USCG Hazardous Materials Division by emailing [hazmatstandards@uscg.mil](mailto:hazmatstandards@uscg.mil).

It is very important to note that Circ.1454 is a Guideline and its provisions are not mandatory. As such, you will see frequent use of the word “should” which indicates that it is a guideline and not mandatory in all cases. On the other hand, in the IMSBC Code itself you will see frequent use of the word “shall”. All sentences using the word “shall” are mandatory.

While this may all sound onerous, in practical terms it is not. Most US cargos always ship at a moisture content well below their TML, and therefore, a cargo approaching the TML limit is usually quite rare. As such, the MCP just has to contain provisions for detecting when a problem may occur – such as in extreme weather conditions prior to loading. The USCG is well aware that most US shippers control their cargo moisture for commercial reasons and the shippers are already motivated because cargoes whose moisture contents exceed the TML are already commercial disasters. As such, the USCG anticipates the Moisture Control Plans submitted would simply document long standing business practices. Only in instances where the USCG perceives a gap would they discuss the implementation of new processes or procedures.

The most important message to the US coal export industry is that as far as the USCG is concerned, the Moisture Control Plan is the key to complying with the IMSBC Code. As long as a US shipper implements and executes a USCG approved MCP - that addresses all the potential risks for their specific cargoes - then they are considered to be in compliance. Please note that in the opinion of the USCG, all US coal export shippers of coals that are Group A should already have an approved MCP. As such, it is important that shippers should initiate efforts to comply as soon as possible.

Additional guidance from the USCG is that the MCP’s should be written in simple language that a non-technical person can understand. Most important is that if the MCP does not contain a mandatory measure from the IMSBC Code as signified by the use of the word “shall”, the MCP should point that out and provide a rationale for being granted an exception by the USCG. In other words, exceptions can and will be granted – but only when sufficiently justified to the satisfaction of the USCG.

All MCP’s must be submitted to Hazardous Materials Division at [hazmatstandards@uscg.mil](mailto:hazmatstandards@uscg.mil). Dr. Amy Parker is also a good point of contact should you have any questions regarding the development of your request. Dr. Parker is the Lead Chemical Engineer for Bulk Solids and Packaged Hazardous Materials within the Hazardous Materials Division of the US Coast Guard ([amy.m.parker@uscg.mil](mailto:amy.m.parker@uscg.mil)).

### **Practical Application of the Moisture Control Plan**

If one reads the IMSBC Code word for word, you can find many examples of language that can be concerning. There is language about not loading during precipitation or language about covering barges. Some have even interpreted the regulations to require covered storage for Group A cargoes.

The guiding principal in the Moisture Control Plans is that each cargo requires its own plans for ensuring the moisture content does not approach the TML. For most Group A cargoes, the moisture content is well below the TML on a regular basis. For some Group A cargoes, the MCP may require covered storage or other extreme measures due to the cargo being particularly fine and/or wet. For other Group A cargoes, covered storage may only be required if there were anticipated extreme weather events

The goal is safety through common sense. But that common sense requires having a protocol in place to be able to detect a TML problem, should it ever arise.

As stated before, there is language requiring sampling of the cargo within seven days prior to the commencement of loading. As a good example of the USCG balancing the requirements of the IMSBC Code with real world considerations for coal cargoes, their position is that sampling frequency shall be established in the shipper's Moisture Control Plan. They will ensure that the procedures outlined in the MCP can accurately and adequately predict the moisture content prior to loading of the cargo (i.e. the frequency of testing provides a true evaluation of the moisture content of the cargo).

So, what would normally be an alarming regulation that would be difficult to comply with becomes a minor concern based the interpretation of the competent authority. Sampling the stockpile could be a part of your sampling protocol in certain cases, but it may not be appropriate for all cargoes.

Some of the components of MCP's we have seen have been a) sampling of barges or railcars upon loading; b) sampling of barges or railcars when dumped to ground storage; c) monitoring rainfall at the port or in transit; and d) when a TML issue is detected, conducting rapid moistures on the first sublots of the ship to ensure the cargo is loaded below the TML.

It seems prudent for the shipper to also keep records of all their previous cargoes of the same type and show that history versus the TML. It is not a requirement of the IMSBC Code, but it certainly could be useful to demonstrate to a nervous master that this particular cargo has a history of safe loading.

Special Note: For those shippers that export coal from other countries besides the USA, it is important to understand that the interpretation of the IMSBC Code by the USCG may be different from the Competent Authority in other countries. A good case in point is that the competent authority in Canada is Transport Canada - and they make a much stricter interpretation of the IMSBC Code – because their country ships a lot of fine and wet metallurgical coals off their west coast where there can be significant rainfall throughout the year. The USCG is not currently performing audits on the procedures specified in Moisture Control Plans prior to approving the plans, nor are they employing third party organizations to perform audits on their behalf; however, the USCG retains the rights and authority to conduct audits at a later date. Therefore, a main secondary point of this article is that shippers must understand the interpretations of the Competent Authority(ies) in the country(ies) they ship from and those they ship to.

## **Summary**

Most coal cargoes leaving the US are perfectly safe. This is not a newly discovered danger. However, there are newly implemented rules that put the responsibility squarely on the shipper to make accurate declarations and to have a Moisture Control Plan in place to ensure that their cargoes are not subject to liquefaction from exceeding the TML.

There are some circumstances in which cargo moistures could approach the TML. Without a Moisture Control Plan, the shipper would not have the wherewithal to detect when a dangerous situation occurred.

In addition, without a Moisture Control Plan, of which the required documents are a part, there is always a risk that a nervous or uninformed master may delay the vessel loading unnecessarily. This is especially the case as the word of the new regulations spread in the shipping industry but lag behind a full understanding of what is required to comply.

## Key Takeaways

- The new test for TML for coal is the Modified Proctor Fagerberg Test found in Appendix 2 of the IMSBC Code.
- US coals are Group A and Group B – with a few rare exceptions. Two new criteria that can be used to not classify coal as Group A were included in the amendments to the IMSBC Code that became mandatory on 1 January 2019. The two new criteria are:
  - Specific size criteria, or
  - A draining capability whereby the Modified Proctor Fagerberg test result is that the coal is not subject to liquefaction.
- The key to knowing what language in the IMSBC Code is applicable to coal is understanding what the interpretation of the regulations is by the Competent Authority.
- The USCG is the Competent Authority for the United States for the IMSBC Code.
- The USCG expects all US coal shippers to develop, and submit for approval, their Moisture Control Plan for Cargoes that are Group A. That approval will come from the Hazardous Materials Division of the USCG and is called a Moisture Procedures Approval.
- That MCP must contain protocols for detecting when cargo moisture approaches the TML, as well as for measures to be taken to prevent a cargo from being loaded in excess of its TML – whenever a dangerous condition is detected.
- Guidance on development of Moisture Control Plans can be found in IMO Circular SC1/Circ.1454/Rev1” dated June 15, 2015.
- Implementing and executing a USCG approved Moisture Control Plan will suffice to be compliant with the IMSBC Code for TML of coal.