

Circular № 2-17-24-07

Re: Carriage of coal cargo

After several approaches from the assureds on different issues regarding the carriage of coal Ingosstrakh wishes to inform about some hazards/precautions which Owners and vessels should be aware of during carrying coal cargoes. This circular was prepared with assistance of our partner –Independent Marine Consultants and Surveyors (IMCS-Group).

HAZARDS ASSOCIATED WITH THE CARRIAGE OF COAL

The carriage of coal by sea involves several possible hazards.

The Main Hazards are:

- Emission of methane
- Liquefaction
- Self-heating
- Corrosion
- Asphyxiation

The two main hazards to which the vessel should be alert are **emission of methane** and **self-heating**.

The first hazard is Flammable Atmosphere, namely the emission of methane.

The danger of explosions in coal mines is well known over the world.

Coal cargoes may produce methane (an odorless, flammable gas, presenting a fire and explosion risk) in different amounts, a mixture containing between 5% and 15% methane in air can lead to fire/explosion where a source of ignition is presented.

Methane is lighter than air and will therefore accumulate in the top spaces of the holds. If holds' surrounds are not airtight, methane can leak through into adjacent spaces, thus significantly increasing the prospect of damage to both cargoes and vessel. It is thus important that no "hot" works are carried out near a holds containing coal.

Shippers are required to declare whether or not the coal they are exporting is liable to emit methane. However, some shippers do not declare their cargoes as liable to emit methane.

The second hazard is self-heating / spontaneous heating.

Some types of coal may be liable to self-heating, which can lead to spontaneous combustion in cargo holds where flammable and toxic gases may be present.

In case self-heating of coal cargo occur inside of the bulk of the cargo (for example in center of the hold after cargo has been loaded) there is nothing that can be done to prevent further heating with consequent spontaneous combustion.

Therefore, before loading and during entire process of loading coal's temperature has to be checked to ensure that it is within the acceptable limits for oncoming loading on board and further sea / ocean carriage.

Situation with self-heating of the coal can be aggravated by the presence of oxygen in the cargo and additional moisture. Therefore, it is important that no air is allowed to circulate through the hold, the hatches are closed immediately upon completion of loading and the cargo must be trimmed level after loading to reduce the surface area exposed to oxygen.

Shippers must declare whether or not the coal they are exporting is liable to self-heat. However, some shippers do not declare their cargoes as liable to self-heating.

Monitoring coal cargoes for self-heating and emissions of methane is vital. Careful monitoring allows to prevent serious problems with the cargo and vessel.

The third hazard is corrosion.

Sulphur in the coal causing corrosion to the ship's structure as the moisture could turn to sulphuric acid which affects the mild steel used in shipbuilding.

Water's accumulation in the holds needs to be monitored and pumped out through the bilge well system.

The fourth hazard is Liquefaction and further liquid movement.

If the coal is in the form of fine particles then there is a danger of liquid movement during the voyage. On a ship this could lead to a loss of stability and a possible capsizing.

A cargo which contains a certain proportion of small particles (particles less than 7 mm) and a certain amount of moisture may liquefy during the voyage under the influence of external forces such as vibration, impact or ship's motions.

Prior to loading, the crew should sight the cargo and ensure that the cargo corresponds to the description in cargo declaration.

The crew can perform a 'can test' of the fine particles to check for the possibility of cargo's liquefaction.

Section 8 of the IMSBC code gives details of the can test procedure which should be carried out by the crew. Can tests should be performed with samples from different areas of the cargo bulk during entire process of loading operations.

The crew must be satisfied that the cargo is safe to load. It can be done by physical inspection of the cargo.

The inspection should confirm that the cargo is dry and free of muddy splattering presence of which is indication that the cargo has mentionable quantity of fine particles and high moisture content.

The fifth hazard is Asphyxiation

It is dangerous to enter cargo holds or adjacent spaces when carrying coal. Coal can produce methane, carbon dioxide and carbon monoxide; all of which may lead to a depletion of oxygen in the hold and result in asphyxiation.

Persons should not enter holds or adjacent spaces until they have been properly ventilated and the atmosphere tested.

Additional hazards related to carriage of bulk cargoes

Modern loading and discharging methods can put a considerable stress onto the vessel's structure. The grabs used for discharging bulk cargoes can weigh up to 35 tones and if these are allowed to drop onto the tank tops or other parts of the ship's structure then considerable damage can result.

Allowing cargo to be loaded too fast, particularly into an empty hold where there is nothing to cushion the structure from the shock, can seriously weaken the structure.

There are terminals with high loading rates. Close to the end of loading it is easy for the ship to be overloaded. If the loading is not stopped quickly when the maximum permitted draft is reached, the vessel could be overloaded.

When moisture from coal collects in bilge wells of the holds and is pumped out overboard, the weight of the coal will be reduced. Regular bilge pumping records should be maintained to avoid shortage claims at the discharge port.

The IMSBC Code requirements

The International Maritime Organization (IMO) publishes the International Maritime Solid Bulk Cargoes (IMSBC) Code which specifies the requirements for carriage of solid bulk cargoes including coals.

The IMSBC Code contains a detailed description of the carriage of coal and provides information on the associated hazards. Coal should always be carried in accordance with the requirements of IMSBC Code.

IMSBC CLASSIFICATION

Coal is classed as IMSBC Group A and B, which are defined as follows:

GROUP A: Cargo which may liquefy if shipped at a moisture content in excess of the transportable moisture limit (TML)

GROUP B: Cargo which possesses chemical hazards which could give rise to a dangerous situation on a ship

Coal can be classed as **GROUP B (only)** in one of the following cases:

- By a test determined by the competent authority in the country of origin, or
- When the particle size distribution fulfils specific criteria defined in the IMSBC Code

It should be noted that blended coals should be considered as both Group A and B, unless all the original coals are Group B only.

IMSBC Code lays down a number of requirements for the carriage of different types of coal.

Among the general requirements, there are a number of requirements for all coal cargoes, the more important elements of which are:

- the cargo declaration should contain the information about moisture content (MC) of cargo and Transportable Moisture Limit (TML) of cargo.
- Shipowners should satisfy that the shipper's cargo declaration has been provided in accordance with the requirements of the IMSBC code.
- The declaration shall include an information whether the cargo of coal is liable to emit methane, or self-heating.
- The bilges can only be pumped overboard if the cargo is not classed as Hazardous to the Marine Environment (HME) in accordance with MARPOL regulations. The shipper's declaration should state whether or not the cargo is HME

NOTE: Despite the information stated in cargo declaration it is recommended to consider all coal cargoes as potentially hazardous.

As long as the moisture content of the cargo is below TML it can be carried safely, but should it be above this limit then special precautions as described in

the Code must be carried out.

- The IMSBC code states that if the cargo is declared as liable to self-heating, the temperature of the cargo must be measured before and during loading.

NOTE: it is recommended that the temperature of coal should be measured before loading in all instances.

- Coal cargoes with temperatures above 55°C shall not be accepted for loading.

NOTE: Self-heating can be localized in bulk of the cargo, therefore multiple temperature measurements are recommended to be carried out during loading. Particular caution is recommended where hot coal is presented for loading and the cargo has not been declared as liable to self-heating.

- All coal cargoes require monitoring through regular measurements of temperature, gas concentration and pH value of hold bilge waters.
- The IMSBC code recommends that instruments available on board enable cargo temperature measurements in the range from 0°C to 100°C.

NOTE: The measurements should be carefully recorded. The readings should be taken on daily basis.

Temperature measurements alone may not be a reliable indicator of self-heating. measurements of gas concentrations (CO) are considered a more effective method of monitoring for self-heating.

All vessels engaging in the carriage of coal are required to have gas monitoring equipment for measuring gas concentrations of CH₄, O₂ and CO.

The IMSBC Code provides detailed guidance on sampling and measurement procedures for both unventilated and ventilated holds.

- According to the IMSBC Code the holds should be surface ventilated for the first 24 hours after departure from the loading port.

NOTE: coal cargoes should not be ventilated further following the above 24-hour period as it may lead to self-heating of the cargo.

- Hold bilge pH testing should be carried out during whole voyage.

Main Actions to be taken during carriage of the coal by sea:

1. Cargo spaces and bilge wells should be clean and dry prior to loading, with the latter covered as appropriate to prevent the cargo from entering into the bilge wells.
2. Gas levels in working areas, store rooms, passage ways other areas adjacent to cargo holds should be monitored and the spaces adequately ventilated.
3. Electrical cables and parts within cargo holds and adjacent spaces should be free from defects and safe for use in explosive atmosphere.
4. Coal cargo should not be stowed adjacent to hot areas, i.e. having a temperature higher than 55°C during the carriage of the cargo, This includes the plating of heated fuel oil tanks.
5. The vessel should be provided with calibrated instruments which allow measurement of below parameters without requiring entry in the cargo holds and spaces adjacent to cargo holds:

- methane in the atmosphere;
 - oxygen in the atmosphere;
 - carbon dioxide in the atmosphere;
 - pH value of cargo hold bilge water;
 - remote temperature gauge for the cargo spaces.
6. Smoking and the use of naked flames should be prohibited in the cargo areas and adjacent spaces.
 7. Hot work or sources of ignition (burning, cutting, chipping, welding) in the vicinity of cargo and adjacent spaces should be allowed after proper ventilation and satisfactory methane gas measurements.
 8. The surface of the cargo to be trimmed properly to holds sides and bulkheads to avoid the formation of gas pockets.
 9. The atmosphere in the holds above the cargo should be regularly monitored for the presence of methane, oxygen and carbon monoxide. Records of these readings should be maintained.
 10. All holds should be surface ventilated for the first 24 hours after departure from the loading port. During this period measurements of the methane concentrations should be taken through sampling point of each cargo hold.
 11. Temperature and gas measurements should be continued on a daily basis.
 12. The hatch covers should be closed immediately upon completion of loading. The hatch covers can also be additionally sealed with sealing tape.
 13. As far as possible try to avoid accumulation of gases which may be emitted from the cargo in adjacent enclosed spaces. Adjacent to cargo holds spaces / areas to be regularly monitored for the presence of methane, oxygen and carbon monoxide.
 14. Regular hold bilge testing should be carried out for pH level in order to avoid possible accumulation of acids on tank tops and in the bilge system.
 15. Cargoes with a temperature above 55 C should never be accepted for loading.

As long as the requirements of IMSBC Code and above Main Actions are followed during entire process of loading operations and whole voyage the cargo of coal will be safely carried and delivered to port of destination.

We would like to draw the attention of Shipowners to the importance of immediately informing Ingosstrakh about all incidents for the most professional and effective business management. If you need additional information or assistance, please contact Ingosstrakh with your questions.

Best regards,

P&I Claims Department

Ingosstrakh