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CARRIAGE OF COAL[1]

1. PROPERTIES AND CHARACTERISTICS (HAZARDS OF COAL)

Certain coals may liquefy in the right conditions, leading to shifting of cargo.

Coals may emit methane, a flammable gas. A methane/air mixture containing between 5% and 16% methane constitutes an explosive atmosphere which can be ignited by sparks or naked flame, e.g. electrical or frictional sparks, a match or lighted cigarette. Methane is lighter than air and may, therefore, accumulate in the upper region of the cargo space or other enclosed spaces. If the cargo space boundaries are not tight, methane can seep through into spaces adjacent to the cargo space.

Coals may be subject to oxidation, leading to depletion of oxygen and an increase in carbon dioxide or carbon monoxide concentrations in the cargo space. Carbon monoxide is an odourless gas, slightly lighter than air and has flammable limits in air of 12% to 75% by volume. It is toxic by inhalation, with an affinity for blood haemoglobin over 200 times that of oxygen. Carbon Monoxide is extremely dangerous which can cause breathlessness and ultimately death by asphyxia.

Some coals may heat spontaneously, the spontaneous heating may lead to spontaneous combustion in the cargo space. Flammable and toxic gases, including carbon monoxide, may be produced.

Some coals may be liable to react with water and produce acids which may cause corrosion. Flammable and toxic gases, including hydrogen, may be produced. Hydrogen is an odourless gas, much lighter than air and has flammable limits in air of 4% to 75% by volume.

Smoking and the use of naked flames shall not be permitted in the cargo areas and adjacent spaces and appropriate warning notices shall be posted in conspicuous places. Burning, cutting, chipping, welding or other sources of ignition shall not be permitted in the vicinity of cargo spaces or in other adjacent spaces, except for emergency purpose where the Company's permission is obtained and the space has been properly ventilated and the methane gas measurements indicate it is safe to do so.

2. PRIOR LOADING

All cargo spaces and bilge wells shall be clean and dry. Any residue of waste material or previous cargo shall be removed.

All sources of ignition must be removed from the area.

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All electrical cables and components situated in cargo spaces and adjacent enclosed spaces shall be free from defects. Such cables and electrical components should be safe for use in an explosive atmosphere or positively isolated.

Ventilation must be adequate and surface ventilators must be kept unobstructed.

Hatch cover drains must be clear of obstruction, non-return capability maintained and tested prior loading.

Prior completion of loading, the Master shall be satisfied that the surface of the material has been trimmed reasonably level to the boundaries of the cargo space to promote ventilation above the surface of the cargo, to avoid the formation of gas pockets or to prevent air from permeating the body of the coal and to prevent shifting of cargo in rough weather.

Coal stockpiles on the shore should be watched by the deck to see if any smoke/vapour or heat shimmer is visible. Any abnormalities should be reported to the Master immediately.

Loading in rain or the water presence should be noted. This may affect accuracy of tonnages at the load and discharge ports, resulting in claims against the ship.

3. ATMOSPHERE MONITORING

The atmosphere in the space above the cargo in each hold shall be regularly monitored for the concentration of methane, oxygen and carbon monoxide and recorded in **Company Form 2.3.0** and filed in SharePoint. The frequency of the monitoring shall be determined based upon the information provided by the shipper and the information obtained through the analysis of the atmosphere in the cargo space.

Testing shall be done through the gas sampling point which shall be tightly closed after observation.

Unless expressly provided otherwise, surface ventilation shall be conducted in all cargo spaces carrying this cargo for the first 24 hours after departure from the loading port. During this period, the atmosphere in the cargo spaces shall be monitored once from one sample point per cargo space and, for the purpose of the gas monitoring, the ventilation shall be stopped for an appropriate period (for about 4 hours) prior to the gas monitoring.

When the methane concentrations monitored within 24 hours after departure are at an acceptably low level, the ventilation openings shall be closed and the atmosphere in the cargo spaces shall be monitored. When the methane concentrations monitored within 24 hours after departure are not at an acceptably low level (more than 20% LEL), adequate surface ventilation shall be maintained, except for an appropriate period for gas monitoring, and the atmosphere in the cargo spaces shall be monitored. This procedure shall be followed until the methane concentrations become acceptably low level. In any event, the atmosphere in the cargo spaces shall be monitored on a daily basis.

Care shall be taken to remove any accumulated gases prior to operation of the hatch covers or other openings for any reason, including discharging. Care shall be taken to operate hatch covers of the cargo spaces and other openings to avoid creating sparks.

The Master shall ensure, as far as practicable, that any gases which may be emitted from this cargo do not accumulate in adjacent enclosed spaces. The Master shall ensure that enclosed working spaces such as storerooms, forecastle store, passageways, tunnels, etc., are regularly monitored for the presence of methane, oxygen and carbon monoxide. Such spaces shall be adequately ventilated. Particular care must be taken on vessels that have a hatchway to number 1 hatch, that opens into a store or access in the forecastle.

Personnel shall not be permitted to enter the cargo space or enclosed adjacent spaces unless the space has been ventilated and the atmosphere tested and found to be gas-free and to have sufficient oxygen to support life.

4. SELF HEATING COALS

A steady rise in the level of carbon monoxide detected within a cargo space is a conclusive indication that self-heating is taking place.

When the shipper has informed that the cargo is likely to self-heat or analysis of the atmosphere in the cargo space indicates an increasing concentration of carbon monoxide, then the following additional precautions shall be taken:

- Prior to loading, temperature of this cargo shall be monitored. This cargo shall only be accepted for loading when the temperature of the cargo is not higher than 55°C.
- The cargo spaces shall be closed immediately after completion of loading in each cargo space. The hatch covers may also be additionally sealed with a suitable sealing tape. Only natural surface ventilation shall be permitted and ventilation shall be limited to the absolute minimum time necessary to remove methane which may have accumulated.
- Under normal conditions, one gas measurement per day is sufficient as a precautionary measure. However, if carbon monoxide levels are higher than 30 ppm then the frequency shall be increased to at least twice a day at suitably spaced intervals.
- When the carbon monoxide level is increasing steadily i.e. reaches 50 ppm or exhibits a steady rise over three consecutive days, a potential self-heating may be developing. In such a case, the cargo space shall be completely closed and all ventilation ceased, and the master shall seek expert advice immediately. Water shall not be used for cooling material or fighting coal cargo fires at sea, but may be used for cooling the boundaries of the cargo space.

5. GREEN OR SOFT COAL

Some coals may have a high oil content, which can cause staining of the upper reaches of the coal stow. Barrier or slip coat product should be considered for these cargoes, to prevent staining of the bulkheads.

6. BILGE SOUNDINGS

Many coals contain sulphur. If the sulphur is in a soluble form it may react with moisture in the coal to form sulphurous and sulphuric acids. These acids will attack steel, corroding bilge systems, tank top areas and in some cases bulkheads.

Regular hold bilge testing shall be systematically carried out during voyage carrying this cargo. If the pH monitoring indicates that a corrosion risk exists, bilges shall be frequently pumped out during the voyage in order to avoid possible accumulation of acids on tank tops and in the bilge system. A record of the amount pumped out must be kept on board to avoid shortage claims (**Form 2.3.24**).