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INCIDENTS INVOLVING TRANSPORT OF ZINC INGOTS

1 The Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC), at its ninth session (27 September to 1 October 2004), considered an investigation report submitted by Italy on three different ships carrying zinc ingots. Inside the holds of the above ships arsine was accumulated in high concentrations. Four crew members felt ill after entering into cargo holds and one of the crew members died in the local hospital.

Following investigations, the cargo present on board of the above ships was revealed to be Zinc Ingots 98.5% pure or less GOB (good ordinary brand).

2 The Italian Maritime Administration has issued a safety guideline which requires a special atmosphere's test in all cargo holds on board ships loaded with zinc ingots. These tests are carried out before opening cargo hatches, by a competent chemist, in order to guarantee that the atmosphere inside the holds is safe for entry/work during opening and unloading operations, taking into account the presence of toxic or flammable gases or other hazards.

3 The Sub-Committee's attention was drawn to the conclusion of the investigation that:

- .1 the first test on board of the first ship revealed a concentration of arsine of 10 ppm. Such tests had been carried out around a week after the accident and after the holds of the ship had been left open for some time. This supposes that the concentration of arsine in the atmosphere of the closed holds at the time of entry of the crew members was much higher than the 10 ppm stated above;
- .2 afterwards official sanitary reports confirmed that the arsine (arsenic hydride: AsH_3), evidently present in the holds of the first and second ships in higher concentration in comparison to the threshold's limit, was responsible for the death of a sailor and the hospitalization of other crew members;
- .3 the tests on board the third ship revealed a concentration of arsine of 3 ppm in the holds. Precautionary tests of the port chemist avoided an incident on board this ship because the level of concentration of arsine was also in this case, dangerous to the human health;
- .4 the above report shows two common characteristics: the presence of arsine and fresh water;
- .5 the development of arsine was possibly due to the presence of zinc ash not completely removed from the surface of ingots;

- .6 tests carried out on board other ships carrying only zinc ingots of 99.995% purity or more SHG (special high grade) had not revealed any detectable concentration of arsine inside the cargo holds.

4 It is therefore recommended that, in transporting zinc ingots 98.5% pure or less GOB (good ordinary brand), particular attention should be paid to the following:

- .1 wet cargo should not be loaded and weathertightness of hatches should be ensured;
- .2 the cargo should be kept dry and not be handled during precipitation;
- .3 suitable gas detectors for the measurements of hydrogen and arsine and, at least, two sets of self-contained breathing apparatus, additional to those required by regulation II-2/10.10 of the 1974 SOLAS Convention, as amended, should be provided;
- .4 continuous mechanical ventilation is required. Ventilation should be such that any escaping gases cannot reach living quarters on or under deck;
- .5 entry into the holds without wearing the self-contained breathing apparatus must not be permitted until ventilation of the holds has been carried out and after tests reveal no detectable concentration of arsine/flammable gases inside the holds;
- .6 tests must be carried out before opening cargo hatches, by a competent person, in order to guarantee that the atmosphere inside the holds is safe for entry/work during opening and unloading operations, taking into account the presence of toxic or flammable gases or other hazards;
- .7 possible ignition sources as well as hotwork, burning, smoking, electrical sparking should be eliminated during handling and transport.

5 Member Governments are invited to bring the above information to the attention of shipowners, ship operators, companies, shipmasters, shippers and all other parties concerned, requesting that appropriate action be taken when transporting such cargoes.
