

Circular From NORTH

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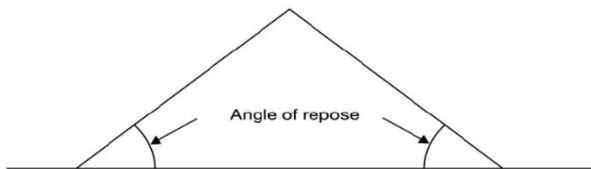
## Looking Straight at the Angle of Repose

Non-cohesive bulk cargoes pose a risk of shifting, so it's important that these cargoes are properly declared. In a recent case, a shipper incorrectly declared an angle of repose for a cargo of granulated pig iron, effectively declaring a cohesive cargo as non-cohesive. **Because of the risk of shifting in transit, non-cohesive cargoes are subject to additional requirements under the IMSBC Code.**

### Cracking the Code

Firstly, it's important to understand the definitions provided in the IMSBC Code.

- **Angle of repose** means the maximum slope angle of non-cohesive (i.e. free-flowing) granular material. It is measured as the angle between a horizontal plane and the cone slope of such material.



- **Cohesive material** means materials other than non-cohesive materials.
- **Non-cohesive material** means dry materials that readily shift due to sliding during transport, as listed in Appendix 3 of the Code.

The cargo in question was declared by the shipper under the Bulk Cargo Shipping Name (BCSN) '**IRON SMELTING BY-PRODUCTS**', the schedule of which states 'not applicable' for the angle of repose.

But the shipper contradicted this by including an angle of repose on the declaration, therefore declaring the cargo to be non-cohesive (free-flowing). However, due to the highly irregular, non-rounded shape of the granules, the cargo was in fact cohesive, and it would not free flow.

### Identifying a non-cohesive cargo

Appendix 3 of the Code lists a number of cargoes which are non-cohesive when dry. Each individual schedule of the cargoes listed in this section will state an angle of repose in the physical properties table and the trimming requirements in the loading section. Cargoes not listed in this section, but exhibit

properties of non-cohesive material are subject to the same trimming requirements as non-cohesive cargoes.

### Safe carriage

**To allow their safe carriage at sea, non-cohesive cargoes are required to be suitably trimmed in accordance with section 5 of the Code.** The level of trimming required is dictated by the cargo's angle of repose. The lower the angle of repose, the more level the stow will be required to be trimmed.

The unevenness of cargoes with an angle of repose greater than 35° is not to exceed 10% of the vessel's beam with a maximum height of 2 metres. For cargoes with an angle of response greater than 30° to 35° this allowance is 10% of the vessel's beam, however the maximum height is reduced to 1.5 metres. An alternative to these trimming requirements is to load the cargo using trimming equipment approved by the country's competent authority.

### Grain regulations

Cargoes with an angle of repose less than or equal to 30° can free flow like a grain cargo. For this reason, the Code requires these cargoes to be carried in accordance with the International Grain Code in addition to the requirements of the IMSBC Code.

Some examples of these cargoes are **AMMONIUM NITRATE, GRAIN SCREENING PELLETS and UREA**. As well as complying with the grain regulations, the **IMSBC Code** requires the bulk density of the cargo to be taken into account when determining the securing arrangements for the cargo and also the influence of free surface effect on the vessel's stability.

### Checking the angle of repose

The angle of repose stated on the shipper's declaration should be determined using a 'tilting box test'. The details of this testing procedure can be found in Appendix 2 of the Code, which also provides an alternative testing method if a tilting box is not available. A check can also be performed by the Master, as the only equipment required is a horizontal table that is free from vibration, a sheet of rough-textured paper, a protractor, and a 3-litre conical flask. This can prove an effective tool to ensure the cargo being loaded matches the angle of repose stated on the shipper's declaration.

Source of Information: The North P&I Club