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Certificate of Suitability of Securement of Cargo for Transport by Road and Sea.

5 Pages

Date : 21 February 2022
Customer : Oreplan Commodities, C/O Tradekor, City Deep, Johannesburg
Contact : Michael Cohen

Container : 6m (20') GP Containers

Cargo : Foundry sand in 1 MT woven bulk bags. The bags are unpalletised and are loaded stacked on top of each other as described below.

Gross Cargo Mass : 27 000kg approximate (27 x 1MT bags).

1. PACKING CONFIGURATION

- 1.1 The first row consisted of two sets of 1MT bags stacked one on top of the other as per photo OC1

2. SECURING

Securing forces are calculated to exceed IMO recommendations to secure the total mass of the cargo for each potential direction of movement for a force of at least 1G.

- 2.1 **Friction** – stack of bulk bags is considered to have an inherent co-efficient of friction (CoF) on the container floor of 0.5 (as per IMO CTU Code 2014). Therefore, below calculations of mass to be secured are: Mass of the cargo item multiplied by the CoF = securing force required in daN (Note 1 daN = 1.109kg Force so we normally just use a 1:1 ratio)
- 2.2 **Tipping** – Some of the bulk bags, in particular those stacked three high that are immediately adjacent to stacks that are only two high, are prone to tipping or sliding and steps were taken to prevent movement through the application of direct lashings in a cross configuration to the top D-Rings. The two by three high stacks at the door were secured with the lashing harness as seen in photo OC1 on page 4.

- 2.3 **Dunnage Bags** – Dunnage bags were deployed between each of the 5 rows of bulk bags in the container. The bags not only fill spaces, but also act as a cargo securing item by exerting considerable force to push the bags against the walls of the containers.
- 2.4 **Lashing** – The lashing harness shown in the photos has a total tested system strength of 4 000daN. The Cordstrap CC105 32mm corded lashing deployed has an individual system strength of 2 500daN as can be seen on the attached Germaniche Lloyd certificate.
- 2.5 **Top D-ring Lashing** – some of the top bulk bags are secured to various of the top D-rings via the lifting straps and some woven lashing, as shown in photo OC2 on page 5. Each lashing provides approximately 500daN of securing force.
- 2.6 **Cargo Mass total = 27 000kg x 0.5 CoF = 13 500daN to be secured for each direction.**
- 2.6.1 The stacks of two bags each (first two rows) had a 90x120cm Level 1 AAR dunnage bag between them inflated to approximately 18kPa. Based on the approximated contact surface area between the dunnage bag and the bulk bags of 0.63 m², the force exerted by the dunnage bag onto each stack of two bulk bags is approximately 1 100daN. (Note that the one stack in the second row had three bulk bags, of which the top bag was secured to two separate upper D-Rings with cross straps), each of 500daN for a total of 10 00daN).
- 2.6.2 The stacks of three bags each had a 90x150cm Level 1 AAR dunnage bag between them inflated to approximately 18kPa. Based on the approximated contact surface area between the dunnage bag and the bulk bags of 0.84 m², the force exerted by the dunnage bag onto each stack of three bulk bags is approximately 1 700daN.

Securing force calculation per container against Longitudinal movement;

Dunnage bags (90x120) x 2 bags x 1 100daN =	2 200daN
Dunnage bags (90x150) x 3 bags x 1 700daN =	5 100daN
Lashing harness at door end =	4 000daN
Top lashings 3 x 2 x 500daN =	3 000daN
Total	14 300daN
<u>Therefore, 800daN excess securing force over requirement</u>	

Securing force calculation per container against Lateral movement;

The walls of the container provide securement for lateral forces. The AAR approved dunnage bags between the rows of bulk bags each have a burst pressure rating of 2 x working pressure (20kPa WP x2 = 40kPa) and would therefore only burst if lateral acceleration exceeded 2g, which is twice the expected maximum acceleration in open sea areas.

The lone upper bulk bag in the stack of three adjacent to a stack of two bulk bags is secured with the aforementioned top cross lashings with a total strength of 1 000daN, which covers that bulk bag's mass of 1 000kg.

***Note**

The bulk bags contain foundry sand, which can and does flow. Deformation of the bulk bags due to flow of the foundry sand during the various transport modes can result in the void occupied by the dunnage bags increasing, with a corresponding loss of pressure in the dunnage bag. The strapping harness can also loosen slightly if there is significant further deformation, but overall securing integrity should still be sufficient.

The current design of the bulk bags is already being replaced with a new design that will not bulge as much as the old design. This will result in improved outturn as the bags should deform significantly less during the voyage.

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The following pages include photos and Germanische Lloyd certification for Cordstrap CC105 and CB10 combination.



Photo OC1

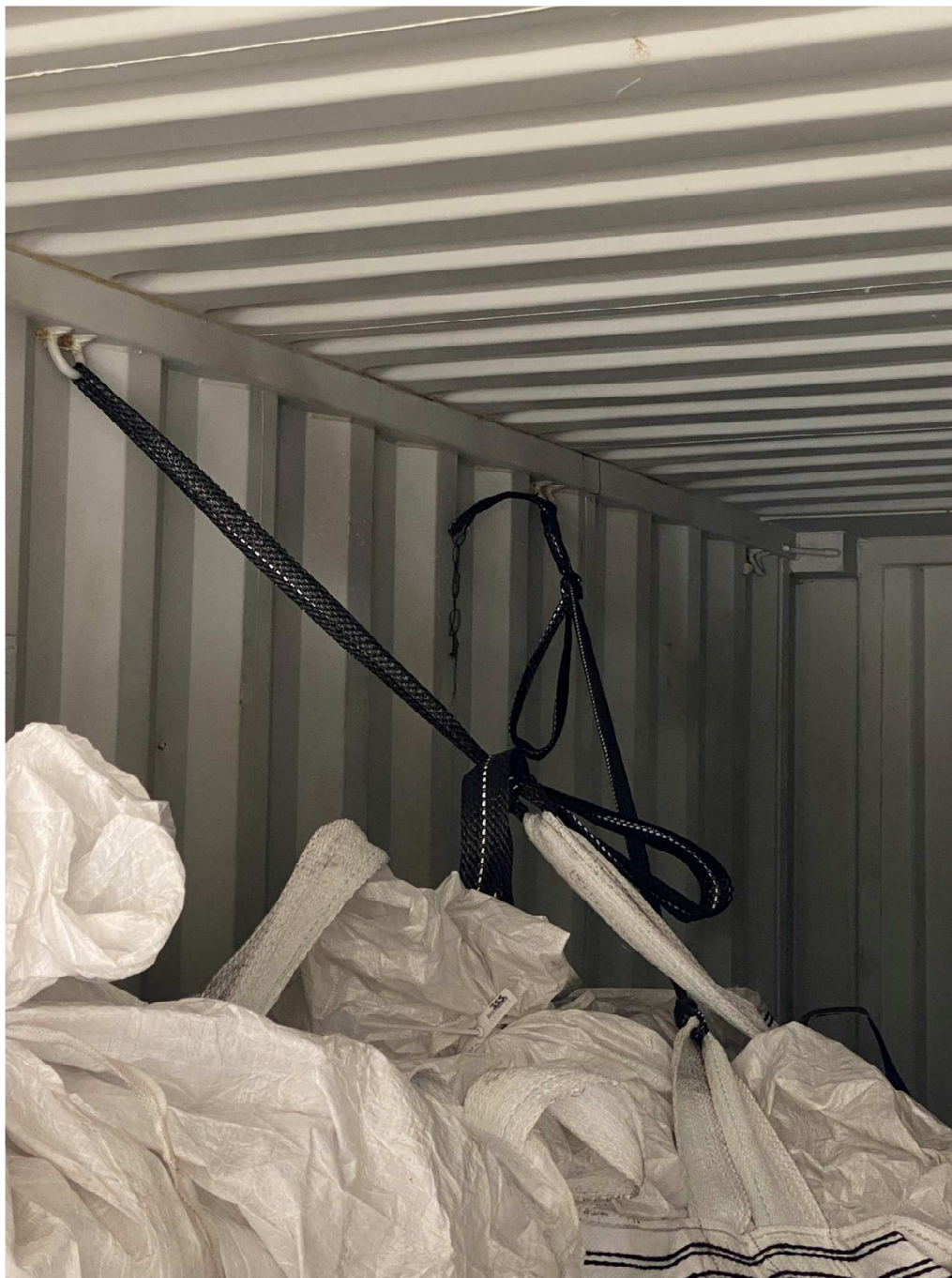


Photo OC2



CC105-CB10 - GL
Certificate [13-09-201