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STRESS AND STABILITY[1]

1. GENERAL

Stability criteria at all times during the voyage is to comply with the Class approved loading manual and IMO & local requirements. The stability criteria include GM, GZ, intact stability criteria, trim, list, heeling moment, shearing force, bending moment etc.[2]

It is the responsibility of the Master to ensure the ship is loaded in accordance with the applicable stability criteria during all operational cargo conditions.

Stress and stability will be calculated for at least the following conditions:

- Arrival Condition
- At different crucial stages of the cargo operation
- Before shifting berth
- Departure Condition
- At different crucial stages of ballast exchange operations
- Should ice form on deck or on the rigging
- At any time, the Master may deem necessary

Prior any cargo operations, CNO shall ensure that calculations have been made for stress and stability conditions for the start, interim and completion of cargo conditions.

Any proposed deviation from these conditions should first be brought to the Company's attention who will then seek clarification as to whether the proposed loading condition is acceptable or not.

Under no circumstances should any stowage plan be confirmed for loading until all stability cases have checked and accepted by the Master.

During cargo operations, the duty officer is to regularly monitor the vessels stress and stability as per cargo plan to ensure that the conditions have been maintained within the design limits. If a significant deviation from the agreed loading/unloading plan is detected, all cargo and ballast operations must STOP.[3]

The officer in charge should ensure that:

- The cargo operation and intended ballast/de-ballast procedure are synchronized

[1] W 09 / 2018 (Entire Section)
[2] W 21 / 2022
[3] W 21 / 2022

- Draught surveys are conducted at appropriate steps of the loading/discharge plan to verify the ship's condition
- The draught readings, usually taken at amidships and the fore and aft perpendiculars, should be in good agreement with values calculated in the loading/discharging plan
- Ballast tanks are sounded to verify their contents and rate of ballasting/de-ballasting
- The cargo load is in agreement with the figures provided by the terminal
- The SF, BM and, where appropriate, hold cargo weight versus draught calculations are performed at intermediate stages of the cargo operation. These results should be logged.
- Any revised loading/unloading plan should be signed by a terminal representative and by the master or chief officer.[4]

There are three main problems associated with high loading rates which may result in over-stressing the ship's structure, namely:

- The SF and BM may exceed the allowable limit
- Overloading the local structure.
- Synchronisation of the ballasting operations.5

High cargo loading rates may create problems with the ballasting operation as the pumping capacity of the ship may be relatively low compared to the cargo loading rate. In such cases the cargo operation must be stopped to ensure synchronisation with the ballasting operation is maintained.[6]

When necessary, the loading rate must be adjusted to synchronise with the ship's pumping capacity.[7]

The Master should not sail until verification of compliance with stability requirements is completed. The stability instrument printouts used to verify compliance are to be retained on board, so that this information can be readily available to third parties. Printouts are to be electronically filed in ONEDRIVE[8] prior departure each port.

Company recommends that the loading instrument is to be checked for accuracy every 6 Months (Refer Mespas[9] for the 6 monthly testing requirements)[10] and the approved loading guidance information confirmed as being available on board. The test should involve physically entering the data for each tank/hold into the computer and verifying the result against class approved standard

[4] W 21 / 2022
[5] W 21 / 2022
[6] W 21 / 2022
[7] W 21 / 2022
[8] W 21 / 2022
[9] W 03 / 2024
[10] W 21 / 2022

conditions provided in loading manual/stability booklet. It is not acceptable to simply retrieve a stored test condition from the computer and compare this against the official conditions.

The accuracy of the loading computer shall be checked at each annual survey by applying at least one approved test loading condition (other than light ship) and endorsed by the class surveyor. At each renewal survey this checking for all approved loading conditions is to be done in the presence of the class surveyor.[11]

2. SHEAR FORCE AND BENDING MOMENT[12]

Shearing force and bending moments must be within acceptable limits at all stages of the voyage, taking in to account any ballast exchanges which may be conducted during the voyage.

All efforts shall be made to keep stresses to the minimum possible. It may require a number of revisions of the stowage plan to achieve the minimum stresses.

The CNO shall carefully plan the distribution of cargo and ballast and ensure that SF and BM does not exceed 95% at sea going conditions.

If the SF/BM exceeds 95%, the Master shall inform the Company and send the loadicator reports for Company's review.

The Company will review the loadicator report and provide necessary guidance to the Master to reduce the SF/BM. This may involve modifying the stowage plan, adjusting ballast, reducing cargo, changing port rotation by liaising with the operators etc.

The Company may permit SF/BM to 98% on a case-by-case basis after a detailed review of the stowage plan.

3. REFERENCE

Reference: Chapter 11 of Watchkeeping safety and cargo management in port, Chapter 8 of **"BULK CARRIER PRACTICE", Loading Manual and vessels Stability Booklet**

[11] W 21 / 2022
[12] W 21 / 2022