

DECK BARGE STABILITY: REGULATIONS, HAZARDS AND RECOMMENDATIONS

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INTRODUCTION:

Deck barges are the work horses of marine transport. They are in common use all around the world for the carriage of bulk cargo, general cargo and containers in both international and domestic trades. Due to their boxlike hull form, a deck barge's stability margin will generally be adequate even when fully loaded. However, this positive stability characteristic often leads to complacency and errors resulting in barge capsizes, cargo damage, pollution and loss of life. This RB is designed to raise awareness of deck barge stability regulation and the need to ensure compliance through ready access to approved stability data and securing procedures.

BACKGROUND

The fundamentals of vessel stability (regardless of vessel type) and the applicable regulations, operational guidelines and crew competence requirements are discussed in the first six sections of [MM Risk Bulletin No. 30](#). This Risk Bulletin builds on these stability fundamentals to consider their application to deck barges.

The outside perimeter of deck barges is often fitted with steel sideboards (as depicted in the above photo) to facilitate the transport of bulk cargo. This includes coal, iron ore, nickel ore, gravel and other bulk commodities. Such barges may also be used to carry project cargoes, such as steel pipe and heavy equipment. Deck barges without sideboards are usually used for the transport of containers on inter-island feeder trades.

DECK BARGE STABILITY - OPERATIONAL GUIDANCE

Members are referred to the [Barge Stability Guidelines](#) published by Maritime New Zealand. They provide an illustrated and easy to understand introduction to basic deck barge stability together with practical advice. MM recommends that these Guidelines should be downloaded and made available on board all tugs that are engaged in towing deck barges. A copy should also be kept together with the stability booklet for all deck barges as an assistance to its understanding and use.

DECK BARGE STABILITY REGULATIONS - OVERVIEW

The obligation for an international trade deck barge to be measured for freeboard and be provided with a valid Load Line Certificate and adequate stability data is stipulated by the International Load Line Convention ([ILC 1966/1988](#)).

The details of the stability requirements for deck barges are prescribed by the International Stability Code (ISC 2008 [IMO Res. MSC.267\(85\)](#)) which refer to these vessels as 'pontoon'. They are defined as being:

1. Not self-propelled;
2. Unmanned;
3. Carrying only deck cargo;
4. Having a block coefficient of 0.9 or greater;
5. Having a breadth/depth ratio of greater than 3; and
6. No hatchways in the deck except manholes closed with gasketed covers.

With respect to deck barges used in domestic trade, it is generally the case that they will also be defined as 'vessels' under national Non Convention Vessel Standards (NCVS) rules. The important point here is that deck

barges – whether engaged in international or domestic trade – are not exempt from flag state loadline and stability requirements and regulatory compliance is always essential.

DECK BARGES IN INTERNATIONAL TRADE - STABILITY REGULATION

The ISC 2008 provides that the stability criteria for a deck barge/pontoon may be less complex than that for a cargo ship which are set out at Part A. Instead, a deck barge may comply by meeting the ISC 2008 recommendations for design set out at Part B, Chapter 2, Section 2.2, Pontoons.

Section 2.2.2 provides that a deck barge owner should present the following data to their flag state administration for approval and use as a stability booklet.

1. Lines drawing;
2. Hydrostatic curves;
3. Cross curves of stability;
4. Tables of draught and density readings and calculation of lightship displacement and longitudinal centre of gravity;
5. If an inclining test is not performed, a statement of justification of assumed vertical centre of gravity; and
6. Simplified stability guidance such as a loading diagram, so that the pontoon/deck barge may be loaded in compliance with the stability criteria.

Part B, Section 2.2.3 provides the methodology for the performance of the requisite stability calculations which must include the full range of operating drafts. Section 2.2.4 provides the recommended and minimum intact stability criteria. This includes the requirement to maintain a minimum positive GM of 0.15 m. at all times.

The fact that a deck barge complies with the stability requirements of the ILC 1966/1988 and the supporting guideline provided by the ISC 2008 should be stamped and initialled by a flag state administration's RO on the front of the stability booklet. If it is not, then Members should confer with their flag state administration to obtain their formal confirmation of regulatory stability data compliance.

DECK BARGES IN DOMESTIC TRADE - STABILITY REGULATION

For deck barges in domestic trade, the ILC 1966/1988 and the ISC 2008 will not usually apply directly. Instead, these requirements are often replaced by Non-Convention Vessel Standards (NCVS) for loadlines and stability, as enacted into national law by the flag state.

The Indonesian [NCVS, Chapter 6](#), Loadlines, provide a useful example. These rules make it a requirement for all Indonesian domestic trade vessels (inclusive of deck barges), which are not provided with an ILC 1966/1988 Load Line Certificate and are over 24 m. in length, to be subjected to an inclining test. They must also be provided with stability data approved by the Indonesian flag state administration and their appointed RO, Class BKI under Class Rules [Part 8. Domestic](#) and [Part 6. Statutory](#) which refers to [Volume 3, Guidelines on Intact Stability 2014 Edition](#).

The aforementioned BKI Guidelines on Stability are based on the recommendations contained in the IMO's ISC (2008) as amended. They include specific stability requirements for pontoons/deck barges. The result of this is that there appears to be no real difference between the stability requirements for a deck barge whether engaged in the Indonesian international or domestic trades.

There are, however, some Indonesian NCVS moderating features that Members who operate deck barges should to be aware of. They are noted as below:

- The NCVS requires (at paras. 8.1.2 and 8.1.3) that approved stability data be provided to the Master of a self-propelled vessel. Deck barges are not self-propelled and do not normally carry a riding crew. Despite this, the reasonable inference must be that stability data for a deck barge should still be "readily accessible at all times" (i.e. stored on board the deck barge) for immediate reference by the Master of a towing tug, the persons responsible for the loading and discharge of the barge and flag state or other surveyors.
- The NCVS provides (at para. 8.2.2) that an inclining test for a deck barge may be dispensed with by the flag state administration if reliable stability data, based on an inclining test conducted on board a 'sister ship' built to the same design and specification can be provided. This potential cost saving dispensation may prove helpful to Members who operate barge fleets of similar design.

Members are also reminded that flag state administrations may have imposed load line and stability requirements for deck barges in domestic trade which are under 24 m. in length. Examples include Canada, Australia and Indonesia. It is therefore essential for Members to confer carefully with the appropriate flag state

administration and/or their RO to ensure that all deck barges which they operate – regardless of size or trading area – are in full compliance with all applicable international and/or national loadline and stability regulations.

DECK BARGE STABILITY - OPERATIONAL HAZARDS AND PRECAUTIONS

Deck barges are generally used to transport two main categories of cargo. These two categories present different stability hazards.

BULK CARGO - INCLUSIVE OF COAL, GRAVEL AND SAND, IRON AND NICKEL ORE.

Bulk cargoes are normally loaded using conveyor belt systems which deposit the cargo within the barge perimeter sidewalls. The ultimate height of the cargo and its Centre of Gravity (C of G) and distance above the barge's Keel (KG) will depend on its density (or weight per cubic meter) and what is known as its maximum 'angle of repose'. In turn, the cargo's KG in combination with the barge's KG and Metacentre (M) at the permitted load draft and resulting displacement will determine the transverse stability and righting moment (GZ) of the loaded barge.

For deck barges, the aforesaid stability information is usually provided in a simplified format known as a 'Limiting KG Curve'. This plots the height of the combined barge and cargo KG against the barge's loaded displacement and/or draft. As illustrated at pages 10-11 of the [Barge Stability Guidelines](#), the KG curve provides a ready reference to 'safe' or 'unsafe' loading by personnel with often limited stability training.

By way of illustration, the photo of the coal barge at the top of this Risk Bulletin shows the height of its coal cargo to be approaching the width of the barge. Was its stability within the required safe GZ zone? Based on previous cargo loading experience, it may have been. However, effective risk management requires that the barge's stability data should have been checked by the tug master and the loading supervisor to confirm it was within GZ 'safe zone' tolerance for transporting its bulk cargo of coal at the loaded draft.

BREAK BULK AND CONTAINER CARGOES

Break Bulk or General Cargo and Container transport by deck barge present similar issues in relation to ensuring adequate securing and the ability to calculate accurate cargo KG for stability purposes.

In terms of cargo securing and its potential impact on stability if cargo shifts, Members will be aware that for cargo and container ships over 500 GT in international trade, SOLAS Chaps. V and VII require that all such vessels

be provided with a flag state approved Cargo Securing Manual (CSM). Bearing in mind that deck barges in international trade are defined by IMO conventions as 'vessels', it seems clear that all such deck barges must be provided with and utilise an approved CSM.

With respect to deck barges carrying general cargo and containers in the domestic trades, the requirement for a CSM to be provided and utilised will be subject to the relevant NCVS standards and flag state law. Research suggests that there may be only a few flag state administrations in the Asian region that have enacted national regulation which makes CSMs mandatory in the domestic trades.



Accordingly, if Members operate a deck barge in a domestic trade where the provision and use of a CSM is not mandatory then, if their barge is carrying general cargo and/or containers, MM recommends that it be provided with a CSM which has been prepared by a naval architect and which complies with relevant IMO and SOLAS Guidelines. If this is not done, then the result may well be as depicted in the adjacent photo or much worse.

With reference to stability hazards during loading and throughout the planned transport, it is important that the weights of all general cargo and containers be both readily available and reliable. This data must then be used in conjunction with an approved stability booklet to ensure the adequate stability of a deck barge carrying a cargo which is properly secured.

CONCLUSIONS AND TAKEAWAY

Ensuring adequate deck barge stability and associated cargo securing is essential to ensure full regulatory compliance, deck barge and cargo safety and the optimisation of MM insurance cover. MM would like to recommend three practical steps that Members should take to help accomplish this:

1. A copy of every deck barge's stability data should be always stored in a watertight and clearly labelled container which is placed in a secure position on board the barge e.g. inside the anchor winch motor house. If this is done, then there will always be ready access to stability data by both the towing tug master and persons superintending the loading of the barge.
2. The deck barge deck stability data must be applied diligently and routinely by the towing tug's master and the persons responsible for loading the barge. The 'Limiting KG Curve' is designed to make this a simple process. Its application and confirmation of adequate GZ and stability should be recorded in the towing tug's deck log at the beginning of every deck barge tow.
3. If a deck barge is transporting general cargo or containers – whether in international or domestic trade – that this cargo should be secured in conformance with either a flag state administration or class approved Cargo Securing Manual (CSM) which meets SOLAS standards. Alternatively, if the deck barge is to be loaded with a bulk cargo, then reference should be made to the International Maritime Solid Bulk Carrier (IMSBC) Code and the International Maritime Dangerous Goods(IMDG) Code to establish the properties of the cargoes to be loaded and any safety measures required.