Amendments to the Grain Code – Technical Guidance on Stability Calculations for Bulk Grain Carriers

1. Introduction

The carriage of grain in bulk is inherently hazardous, not because of the weight of the cargo, but because grain particles are, free to move when the ship is in motion. This movement causes a shift of mass toward one side of the ship, which in turn generates a heeling (overturning) moment.

The Grain Code is specifically intended to ensure that this hazard is addressed in a calculable and controllable manner, rather than being left to experience, judgment, or operational discretion.

Instead of waiting for the ship to actually heel due to cargo movement, the Code assumes that the worst credible grain shift has already occurred and then assesses whether the ship remains safe under this conservative assumption.

2. Application

Pursuant to the amendments to the International Code for the Safe Carriage of Grain in Bulk introduced by resolution MSC.552 (108), the revised technical requirements related to grain stability calculations shall apply to all ships, both existing and new, in respect of any grain loading operation carried out on or after 1 January 2026, which is the entry-into-force date of the amendments.

Accordingly, prior to any such grain loading operation, ship-owners shall ensure that the Grain Stability Booklet and associated stability calculations have been reviewed and, where applicable, updated in order to comply with the amended Grain Code. Ship managers and operators shall ensure that only approved and valid grain stability documentation, reflecting the amended requirements, is used during loading operations.

Surveyors, classification societies, and the Flag Administration shall be responsible for the review, verification, and technical approval of the revised stability calculations and related documentation in accordance with the amended Grain Code.

Previously approved documentation remains valid for grain loading operations conducted before 1 January 2026; however, its continued use for grain loading operations carried out on or after that date, without revision in accordance with the amendments, shall constitute a regulatory non-compliance.

For the avoidance of doubt, existing grain loading conditions are not automatically invalidated by the entry into force of resolution MSC.552 (108). However, all grain loading conditions intended to be used for grain loading operations carried out on or after 1 January 2026 shall be reviewed, and those affected by the amendments shall be recalculated and re-approved in accordance with the amended Grain Code.

3. Core Concept of Stability Calculations in MSC.23 (59)

Within the Grain Code, the effect of grain movement is represented by an assumed overturning moment, referred to as the:

Assumed Heeling Moment

The logic behind this concept is straightforward:

- Grain shifts within the compartment
- The center of gravity of the cargo moves
- A heeling lever is created
- This lever, when multiplied by the ship's displacement, produces a heeling moment

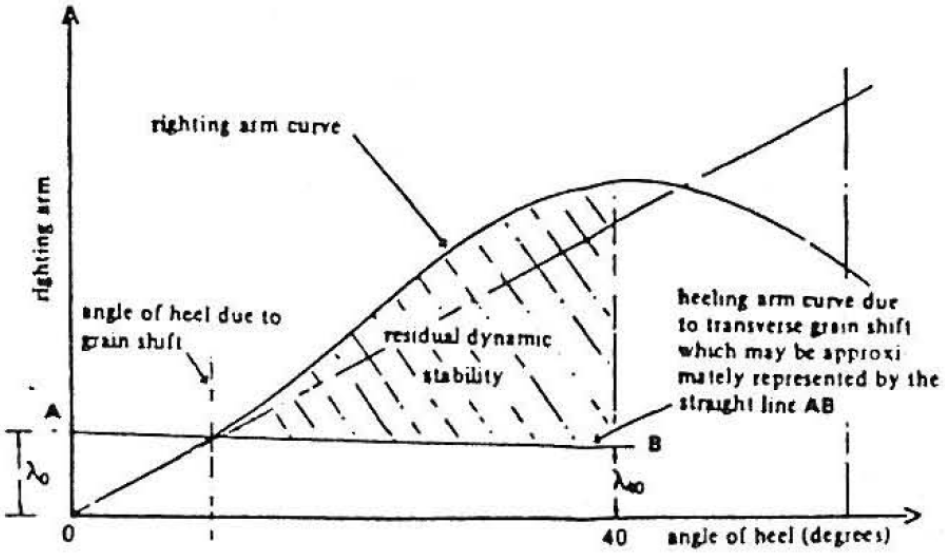
This is expressed in simplified mathematical form as:

$$M_h = \Delta \times GZ_{grain}$$

Where:

- **M_h:** Assumed heeling moment due to grain;
- **Δ:** Ship's displacement;
- **GZ_{grain}:** Effective heeling lever resulting from grain shift;

A ship is permitted to carry grain only if its residual stability is sufficient to counteract this assumed heeling moment.



4. Why the Hold Filling Condition Is So Important

The behavior of grain depends entirely on:

- Whether the hold is completely filled;
- Whether the cargo has been trimmed;
- Whether free surfaces exist at the forward and aft ends of the hold;

For this reason, the Grain Code has, from the outset, defined different loading conditions, including:

- Fully filled and trimmed holds;
- Fully filled but untrimmed holds;
- Partly filled holds;

However, one loading condition became very common in practice but was not clearly addressed in earlier versions of the Code:

- Holds that are “specially suitable” by design;
- Loaded in a partly filled condition;
- With trimming omitted at the forward and aft ends.

5. What Was the Problem and Why Was an Amendment Necessary?

In such holds:

- The grain surface does not form only beneath the hatch opening;
- It also develops a slope in the longitudinal direction of the hold;
- Its behavior is therefore neither that of a fully filled hold nor that of a conventional partly filled hold.

Under the earlier version of the Grain Code:

- The surface slope was not clearly defined;
- The method of calculating the resulting heeling moment lacked precision;
- Different classification societies sometimes applied different interpretations;

Amendment MSC.552 (108) was adopted specifically to resolve this ambiguity.

6. First Major Amendment: Assumed Grain Surface after Loading

The amendment specifies that if a compartment is:

- Specially suitable;
- Partly filled;
- Exempted from end trimming under A 10.4.

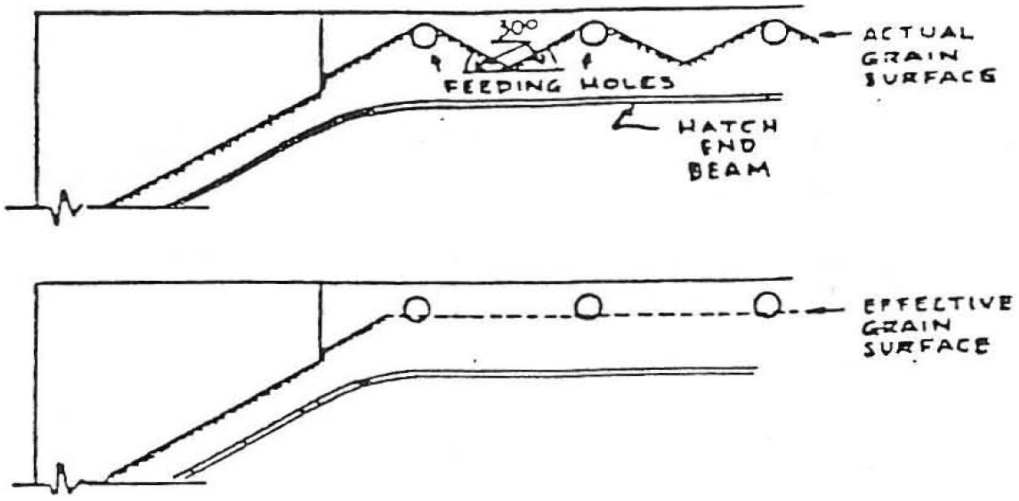
It shall be assumed that, after loading, the grain surface:

- Slopes away from the loading area (beneath the hatch opening);
- In all directions;
- At an angle of 30 degrees.

In simple terms:

$$\theta=30$$

This assumption forms the basis for calculating the volume of grain that may shift as a result of ship motions.



7. Second Major Amendment: Effect of Vertical Movement of Grain Surfaces

Prior to this amendment, the Grain Code focused primarily on **horizontal grain movement**. Subsequent studies demonstrated that vertical movement of the grain surface can also reduce ship stability.

Accordingly, the amendment clearly requires that:
In **partly filled compartments** (both conventional and especially suitable), the adverse effect of vertical grain movement shall be taken into account.

To keep the method practical and simple, the Code defines the following approach:

Total Heeling Moment=1.12×Calculated Transverse Heeling Moment

That is:

- The transverse heeling moment is first calculated in the usual way;
- The result is then multiplied by 1.12;
- This factor accounts for the additional destabilizing effect of vertical grain shift

This requirement represents one of the most significant substantive technical changes introduced by the amendment.

8. Key Regulatory Change: Introduction of a New Section (Section 4)

The amendment introduces a completely new section addressing the following condition:

- Especially suitable compartment, partly filled, with ends untrimmed.

Within this section, the Code states that:

- All rules applicable to fully filled and trimmed compartments remain valid;
- Except where specific differences are explicitly stated.

This means that designers and stability assessors:

- No longer need to rely on assumptions or personal interpretations;
- Are provided with a clear and defined regulatory pathway.

9. Grain Surface Angle after Actual Shifting

After grain has actually shifted (as opposed to the condition immediately after loading), the amendment assumes that the grain surface:

- Under the hatch opening;
- And at the forward and aft ends of the compartment.

Will lie at an angle of 25 degrees to the horizontal:

$$\theta=25$$

This angle is used as the basis for calculating the shifted grain volume and, ultimately, the resulting heeling moment.

10. Practical Effect of the Amendment (in Simple Terms)

In practical application, MSC.552 (108):

- Removes ambiguity from one of the most complex grain loading conditions;
- Introduces a slightly more conservative safety margin;
- Minimizes differing interpretations between the Flag Administration, Class, and designers.

For ships, this means that:

- Some previously accepted loading conditions may no longer be permissible
- Additional ballast or revised loading limitations may be required

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