

LOADING, OR SAILING AFTER PARTIAL DISCHARGE, OF BULK GRAIN

GRAIN STABILITY CALCULATION

(Cargo and Cargo Handling - Grain)



Australian Government
Australian Maritime Safety Authority

This form must be completed prior to commencing loading or partial discharge and is required to be made available to an AMSA surveyor on request.

GENERAL PARTICULARS

Summer draught	Summer freeboard	Summer displacement
Summer deadweight	Fresh water allowance	Tons per cm

Grain loading booklet
 Approved by: _____ Drawing number: _____ Date of approval: _____

Departure port

Departure conditions

Crew and stores (constant)	Draught	Forward
Bunkers		Aft
Fresh water		Midships
Ballast		Hog / Sag
Cargo		Freeboard
TOTAL DEADWEIGHT		Density

TABLE 1 – SHIP AND CARGO CALCULATION

Compartment number	Type of grain/cargo	S.F.	Grain cubic		Weight	VCG	C or V centres	Moments
			100%	Actual				
Cargo totals								
Light ship								
Crew & stores (constant)								
Ship & cargo totals								

TABLE 2 – FUEL AND WATER CALCULATION

Tank	Liquid type	Departure				Intermediate				Arrival			
		Weight	V.C.G.	Moment	F.S. moment	Weight	V.C.G.	Moment	F.S. moment	Weight	V.C.G.	Moment	F.S. moment
Total Liquids													

The **INTERMEDIATE** section is required to be completed if the **ARRIVAL** section shows ballast, which is not listed in the **DEPARTURE** section. The **INTERMEDIATE** condition is before ballasting so that it includes the free surface effect of the tanks to be ballasted but not the effect of the weight of the ballast which is to be taken onboard.

TABLE 3 – UPSETTING MOMENTS

(1) Comp No	(2) Grain depth or ullage	(3) Volumetric heeling moment		(4) Stowage factor*	(5) Uncorrected Heeling Moments (3) ÷ (4)	(6) Correction factor**	(7) Corrected Heeling Moments (5) X (6)
		Trimmed	Untrimmed				
Totals							

- Notes:
- * **Stowage Factor**: - Where two kinds of grain are stowed in the same compartment, use the stowage factor of the grain at the surface.
 - ** **Correction Factor** :
 - Filled compartments:
 - (i) If Volumetric centres have been used for the VCG in Table 1 no correction is needed.
 - (ii) If Cargo centres have been used for the VCG in Table 1 - the Correction Factor is 1.06
 - (iii) A Correction Factor is not to be applied in the case of ships loading as specially suitable ships (5° criterion, Table 5B)
 - Partly filled compartments: – Correction Factor of 1.12 is to be used except:
 - Where Volumetric centre of full compartment has been used for the VCG in Table 1
 - Where the table or curve of heeling moments has been adjusted for this correction

TABLE 4 – CALCULATION OF KG AND GM

Totals	Departure			Intermediate			Arrival		
	Weight	Moment	F.S. moment	Weight	Moment	F.S. moment	Weight	Moment	F.S. moment
Ship and cargo									
Fuel and water									
Grand Totals DISPLACEMENT									

Departure KG		Intermediate KG		Arrival KG	
Free surface corr. (+)		Free surface corr. (+)		Free surface corr. (+)	
Corrected KG _v		Corrected KG _v		Corrected KG _v	
Departure KM		Intermediate KM		Arrival KM	
DEPARTURE GM (KM – KG_v)		INTERMEDIATE GM		ARRIVAL GM	
Required Minimum GM	0.30m		0.30m		0.30m

$$\text{Uncorrected KG} = \frac{\text{Total Moments}}{\text{Displacement}} \quad \text{Free Surface Correction} = \frac{\text{Total Free Surface Moments}}{\text{Displacement}}$$

TABLE 5 – STABILITY SUMMARY

A. For vessels approved under A7 of the Grain Code

	Departure	Intermediate	Arrival
Displacement			
KG _v			
Total corrected grain heeling moments			
Maximum allowable heeling moments			
Angle of heel* (12° maximum**)			
Residual area* (minimum° .075 Metre-radians)			
Corrected GM* (minimum 0.30m)			

* To be completed if vessel's grain loading booklet does not include a table of allowable heeling moments or where the actual KG and Displacement fall outside the parameters of the table. In such cases, statical stability diagrams demonstrating this information shall be attached hereto.

** The angle of heel due to the shift of grain shall not be greater than 12° or in the case of ships constructed on or after 1 January 1994 the angle at which the deck edge is immersed, whichever is the lesser.

B. For specially suitable ships approved under A8 of the Grain Code

	Departure	Intermediate	Arrival
Total corrected grain heeling moments			
Displacement			
Corrected GM			
Angle of heel (5° maximum)			

$$\text{ANGLE OF HEEL} = \frac{\text{Grain heeling moment X 57.3}}{\text{Displacement X GM}}$$

C. For vessels applying A9 of the Grain Code the Master shall provide to AMSA information demonstrating compliance with that part.

TABLE 6 – SHEAR FORCE AND BENDING MOMENT

	Departure	Intermediate	Arrival
Maximum shear force (% of allowable seagoing)			
Maximum bending moment (% of allowable seagoing)			