

NATIONAL CARGO BUREAU, INC.

ADDENDUM # 1 TO THE GRAIN STABILITY CALCULATION FORM

TO BE COMPLETED WHEN A TABLE OF MAXIMUM ALLOWABLE HEELING MOMENTS IS NOT PROVIDED IN THE VESSEL'S APPROVED GRAIN LOADING BOOKLET. IN SUCH A CASE, COMPLIANCE WITH PERTINENT GRAIN REGULATIONS MUST BE DETERMINED FROM A PLOT OF THE STABILITY CURVE. PREPARE ONE ADDENDUM FOR EACH STAGE OF THE VOYAGE AND USE THE RESULTS TO COMPLETE THE **SUMMARY PART** OF THE GRAIN STABILITY CALCULATION FORM.

VESSEL: _____
 PORT: _____ DATE: _____

CHECK ONE:
 DEPARTURE FROM: _____
 INTERMEDIATE
 ARRIVAL AT: _____

IDENTIFICATION OF CROSS CURVES OF STABILITY: _____ (SEE NOTE 1)

BASIC DATA:

DISPLACEMENT (FROM PART II) _____

KG_v (FROM PART II) _____

GM (FROM PART II) _____

GRAIN HEELING MOMENT (FROM PART III)..... _____

ANGLE OF FLOODING (SEE NOTE 2) _____

λ_0 HEELING ARM AT ANGLE 0° (GRAIN HEELING MOMENT ÷ DISPLACEMENT). _____

λ_{40} HEELING ARM AT ANGLE 40° (0.8 x HEELING ARM AT 0°)..... _____

ASSUMED KG OF THE CROSS CURVES _____

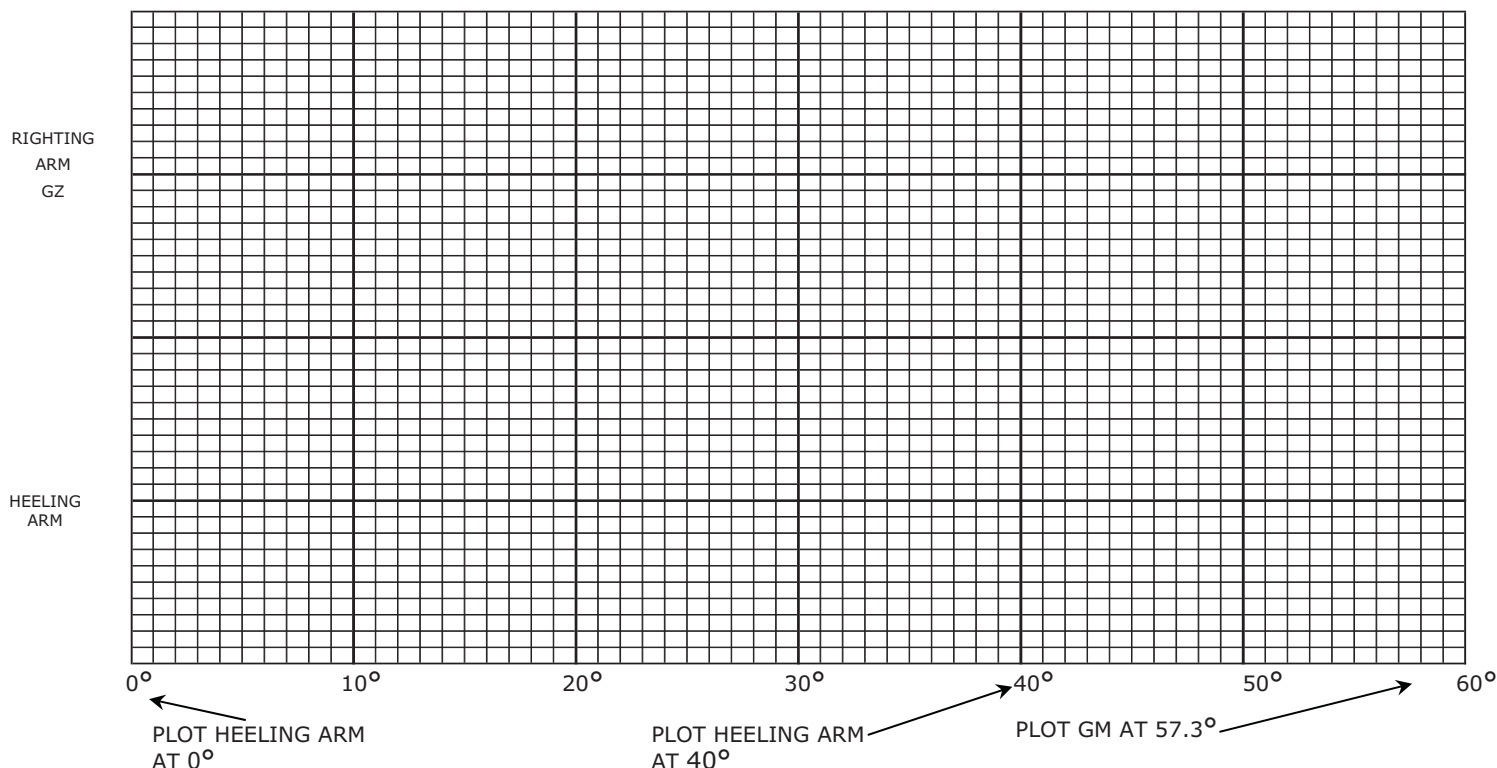
GZ CORRECTION FACTOR (ASSUMED KG - KG_v)..... _____
 (MAY BE "+" OR "-", RETAIN SIGN)

TABLE OF RIGHTING ARMS (GZ): INCLUDE DATA FROM 0° TO 60° (MINIMUM)

ANGLE OF INCLINATION θ						
SINE θ						
GZ (FROM CROSS CURVES)						
SINE θ x CORRECTION FACTOR (OBSERVE SIGN)						
CORRECTED GZ						

- NOTES:**
- THIS INFORMATION IS REQUIRED ONLY IF CROSS CURVES OF STABILITY (OR TABULAR DATA) ARE **NOT** FURNISHED IN THE VESSEL'S APPROVED GRAIN LOADING BOOKLET.
 - THE ANGLE OF FLOODING MEANS AN ANGLE OF HEEL AT WHICH OPENINGS IN THE HULL, SUPERSTRUCTURES OR DECK HOUSES, THAT CANNOT BE CLOSED WEATHER-TIGHT, IMMERSE. SMALL OPENINGS THROUGH WHICH PROGRESSIVE FLOODING CANNOT TAKE PLACE NEED NOT BE CONSIDERED.
 - THIS METHOD APPLIES IN THE USUAL CASE WHERE THREE POINTS DESCRIBE THE RIGHTING ARM CURVE BETWEEN THE ANGLE OF HEEL AND THE LIMITING ANGLE; IF NOT, APPLY SIMPSON'S RULE USING FIVE STATIONS INSTEAD OF THREE AS SHOWN.
 - METER DEGREES DIVIDED BY 57.3 = METER RADIANS; FOOT DEGREES DIVIDED BY 188 = METER RADIANS.

PLOT OF STABILITY CURVE:



DETERMINE FROM THE ABOVE PLOT: **ANGLE OF HEEL** (THE FIRST INTERSECTION OF THE RIGHTING ARM CURVE WITH THE HEELING ARM CURVE)

= _____ **DEGREES**

LIMITING ANGLE

(40 DEGREES, OR THE ANGLE OF FLOODING, OR THE ANGLE AT WHICH THERE IS MAXIMUM DIFFERENCE BETWEEN THE RIGHTING ARM CURVE AND THE HEELING ARM CURVE)

} WHICHEVER IS **LEAST**

= _____ **DEGREES**

RESIDUAL AREA CALCULATION: STATION SPACING (S) = $\frac{(\text{LIMITING ANGLE} - \text{ANGLE OF HEEL})}{2} = \frac{0^\circ - 40^\circ}{2} = 20^\circ$ (SEE NOTE 3)

ANGLE OF INCLINATION	RIGHTING ARM	HEELING ARM	DIFFERENCE		PRODUCT
ANGLE OF HEEL			0	1	0
ANGLE OF HEEL + S°				4	
ANGLE OF HEEL + 2S° (LIMITING ANGLE)				1	
SUM					

$\frac{\text{SUM} \times S}{3} = \text{RESIDUAL AREA} = \frac{\quad}{3} = \quad \frac{\text{m}^\circ}{\text{Ft}^\circ} = \quad \text{mr}$ (SEE NOTE 4)

MASTER EXAMINED: _____
N.C.B. SURVEYOR