

## CONDITION NAME : A2.GRAIN LOAD CONDITION (TRIMMED) SF=42 ARR.(10% BUNKER)

ITEM	(%)	WEIGHT (MT)	LCG (M)	L.MOMENT (MT-M)	VCG (M)	V.MOMENT (MT-M)	FREE SURFACE MOMENT (MT-M)
LIGHT WEIGHT		12628	8.92	112642	11.14	140676	-
D.W. CONSTANT		343	83.66	28695	13.24	4541	-
PROV. & CONSUM.		*	*	*	*	*	-
FRESH WATER ( S.G. = 1.0000 MT/M <sup>3</sup> )							
F.W.T.	100%	208	107.45	22361	18.02	3750	271
D.W.T.	10%	21	107.48	2257	15.72	330	271
SUB TOTAL		229		24618		4080	541
FUEL OIL ( S.G. = 0.9500 MT/M <sup>3</sup> )							
No.1 F.O.T.		*	*	*	*	*	638
No.2 F.O.T. (P)		*	*	*	*	*	673
No.2 F.O.T. (S)		*	*	*	*	*	633
No.3 F.O.T. (P)		*	*	*	*	*	665
No.3 F.O.T. (S)		*	*	*	*	*	709
No.4 F.O.T. (P)	53%	98	72.53	7108	0.45	44	394
No.4 F.O.T. (S)	54%	99	72.53	7181	0.45	45	394
No.5 FO/DO, MGOT		*	*	*	*	*	395
SUB TOTAL		197		14289		89	4500
DIESEL OIL ( S.G. = 0.8800 MT/M <sup>3</sup> )							
No.1 D.O.T.		*	*	*	*	*	193
No.2 D.O.T.	20%	22	82.99	1826	17.50	385	173
SUB TOTAL		22		1826		385	366
CARGO ( S.G. = 0.8543 MT/M <sup>3</sup> , S.F. = 42.00 CF/LT )							
No.1 CARGO HOLD	100%	12052	-85.26	-1027520	11.24	135463	-
No.2 CARGO HOLD	100%	13154	-57.54	-756931	11.18	147009	-
No.3 CARGO HOLD	59%	6913	-30.61	-211611	7.67	52995	-
No.4 CARGO HOLD	100%	11228	-5.39	-60487	11.28	126644	-
No.5 CARGO HOLD	100%	11738	19.85	233030	11.29	132502	-
No.6 CARGO HOLD	100%	13151	46.79	615353	11.17	146940	-
No.7 CARGO HOLD	100%	10981	73.35	805498	11.69	128373	-
SUB TOTAL		79218		-402667		869926	0
BALLAST WATER ( S.G. = 1.0250 MT/M <sup>3</sup> )							
F.P.T.		*	*	*	*	*	-
No.1 W.B.T. (P)		*	*	*	*	*	-
No.1 W.B.T. (S)		*	*	*	*	*	-
No.2/3 W.B.T. (P)		*	*	*	*	*	-
No.2/3 W.B.T. (S)		*	*	*	*	*	-
No.4 W.B.T. (P)		*	*	*	*	*	-
No.4 W.B.T. (S)		*	*	*	*	*	-
No.5/6 W.B.T. (P)		*	*	*	*	*	-
No.5/6 W.B.T. (S)		*	*	*	*	*	-
No.7 W.B.T. (P)		*	*	*	*	*	-
No.7 W.B.T. (S)		*	*	*	*	*	-
A.P.T.		*	*	*	*	*	-
No.4 HOLD (W.B.)		*	*	*	*	*	-
SUB TOTAL		0		0		0	0
OTHERS ( S.G. = 1.0000 MT/M <sup>3</sup> )							
GRAY W.T. (P)		*	*	*	*	*	-
SUB TOTAL		0		0		0	0
GRAND TOTAL		92638		-220597		1019697	5408

DISPLACEMENT	MT	92638	TKM	M	13.60	
DRAFT AT C.F.	M	14.18	VCG	M	11.01	
DRAFT	FORE	M	13.93	GM	M	2.59
	AFT	M	14.42	GGo	M	0.06
	MEAN	M	14.17	GoM	M	2.54
TRIM	(AFT) M	0.49	TCG	M	-	
T.P.C.	MT	71.05	HEELING ANGLE	DEG	-	
LCG	(FORE) M	-2.38	PROPELLER IMM.	%	155	
LCB	(FORE) M	-2.37	FORE DRAFT / LPP	%	6.20	
H.B.G	M	-0.01	TRIM / LPP	%	0.22	
M.T.C.	MT-M	1233.21	Max. AIR DRAFT	M	36.03	
LCF	(AFT) M	4.39	N.B.VISIBILITY	M	184.13	

COMPARTMENT	GRAIN HEELING MOMENT			FACTOR	MOMENT (MT-M)
	WEIGHT (MT)	VOLUME (M <sup>3</sup> )	(%)		
No.1 CARGO HOLD	12052	14107	100.00%	1.00	1162
No.2 CARGO HOLD	13154	15397	100.00%	1.00	1100
No.3 CARGO HOLD	6913	8092	58.89%	1.12	27083
No.4 CARGO HOLD	11228	13143	100.00%	1.00	788
No.5 CARGO HOLD	11738	13740	100.00%	1.00	842
No.6 CARGO HOLD	13151	15394	100.00%	1.00	1045
No.7 CARGO HOLD	10981	12854	100.00%	1.00	901
TOTAL	79218	92727			32921

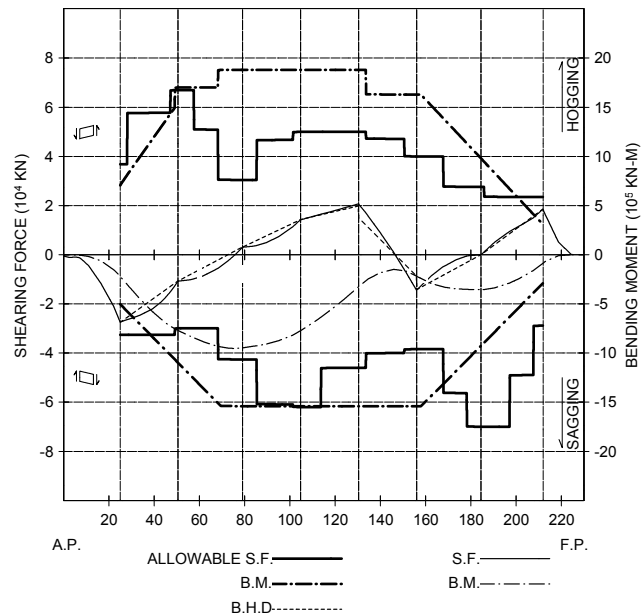
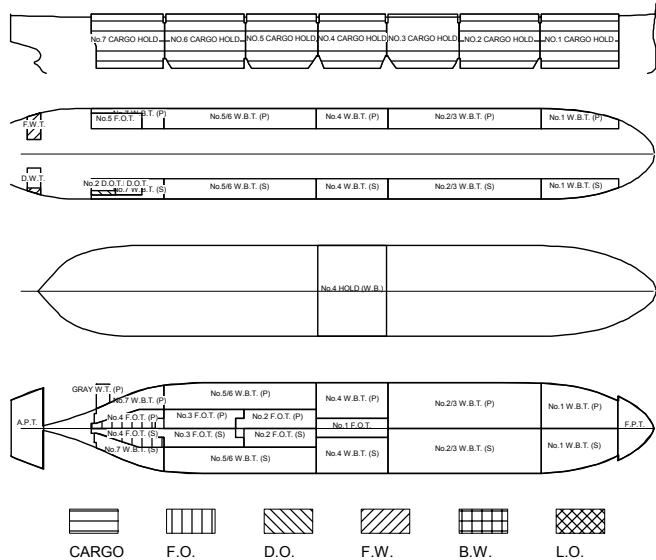
ALLOWABLE GRAIN HEELING MOMENT (MT-M) ----- 54409

CONDITION NAME : A2.GRAIN LOAD CONDITION (TRIMMED) SF=42 ARR.(10% BUNKER)

LONGITUDINAL STRENGTH			ACTUAL / ALLOW.	
Max. Bending Moment	( Fr. No. : 238.97 )	KN-M	91	0.0%
Min. Bending Moment	( Fr. No. : 82.44 )	KN-M	-953251	-61.8%
Max. Shearing Force *)	( Fr. No. : 140.00 )	KN	19896	39.8%
Min. Shearing Force *)	( Fr. No. : 29.00 )	KN	-27474	-84.3%

\*) : VALUE AFTER BHD CORRECTION.

POSITION FRAME NO.	FROM A.P. (M)	SHEARING FORCE (SF) (KN)	BHD CORR. (SF) (KN)	BENDING MOMENT (BM) (KN-M)
240.15	225.49	-0		-18
240.15	225.49	-1		-23
239.11	224.50	-41		17
227.29	213.27	15738		-66429
226.00	212.05	18667	18667	-87478
221.47	207.85	15208		-158101
215.37	202.05	12039		-236832
210.42	197.35	9580		-287723
203.55	190.82	5419		-337346
198.47	186.00	1307		-354001
197.00	184.60	-97	-97	-354848
191.74	179.60	-368		-354098
190.37	178.30	-600		-353469
179.92	168.38	-4599		-330844
179.53	168.00	-4823		-329062
168.11	157.15	-13530		-233418
167.00	156.10	-14601	-14513	-218641
161.39	150.77	-6198		-163523
156.29	145.93	975		-151045
144.47	134.70	15821		-247596
143.47	133.75	16965		-263174
140.00	130.45	20803	19896	-325547
132.66	123.47	18933		-464086
127.47	118.5	17661		-554183
122.60	113.5	1104		-325
120.84	112.5	1095		-10474
113.00	104.60	14288	14288	-773079
109.47	101.45	11497		-816736
109.03	101.03	11175		-821550
97.21	89.80	4977		-908051
92.68	85.50	3778		-926640
86.00	79.15	3177	3177	-947997
85.39	78.57	2607		-949659
83.00	76.30	472		-953126
74.63	68.35	-5485		-931657
73.58	67.35	-6069		-925878
63.47	57.75	-9880		-846751
61.76	56.13	-10216		-830412
56.00	50.65	-10762	-10762	-772589
54.53	49.25	-12641		-756189
53.00	47.80	-14439		-736539
52.47	47.30	-15023		-729173
49.95	44.90	-17574		-689974
48.00	43.05	-19266		-655861
38.13	33.68	-24740		-445961
38.00	33.55	-24785		-442866
35.00	30.70	-25741		-370809
32.42	28.25	-26407		-306905
29.26	25.25	-27379		-226383
29.00	25.00	-27474	-27474	-219526
26.17	22.45	-21470		-157338
13.69	11.22	-4666		-19239
10.00	7.90	-1866		-8741
9.00	7.11	-1302		-7494
3.00	2.37	-1106		-2481
0.00	0.00	-490		-699
-4.42	-3.49	-2		-0
-4.43	-3.50	-0		-0



ACTUAL / ALLOWABLE [At Sea]

Fr. No.	29	56	86	113	140	167	197	226
S.F. (%)	-84.3	-35.9	10.4	28.6	39.8	-37.8	-0.1	79.4
B.M. (%)	-43.6	-70.3	-61.5	-50.2	-21.1	-14.2	-38.3	-30.2

IMO GRAIN STABILITY

CONDITION NAME : A2.GRAIN LOAD CONDITION (TRIMMED) SF=42 ARR.(10% BUNKER)

(1) STABILITY CURVE

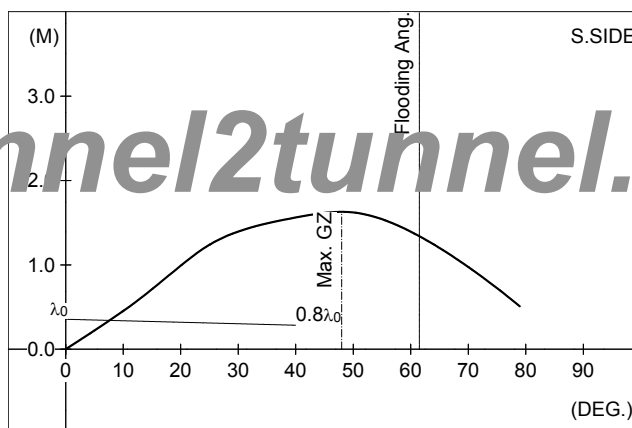
$$GZ = GZa - (VCGo - VCGa)SIN\theta$$

GZa : GZ FROM CROSS CURVE

VCGa ( VCG Assumed in Cross Curve ) = 0.00 M

VCGo - VCGa = 11.06 M

$\theta$ (deg)	0	5	10	12	20	25	30	40	50	60	70	80
SIN $\theta$	0.000	0.087	0.174	0.208	0.342	0.423	0.500	0.643	0.766	0.866	0.940	0.985
GZa	0.000	1.187	2.376	2.853	4.775	5.916	6.927	8.674	10.098	10.976	11.372	11.348
( VCGo - VCGa )SIN $\theta$	0.000	0.964	1.921	2.300	3.784	4.676	5.532	7.112	8.476	9.582	10.397	10.897
GZ	0.000	0.223	0.454	0.552	0.991	1.240	1.395	1.562	1.622	1.394	0.975	0.452



(2) APPLIED RULE INTERNATIONAL GRAIN CODE (IMO RES. MSC.23(59))

CRITERIA	UNIT	REQUIRED		ATTAINED	JUDGE
GoM	M	0.30	≤	2.54	GOOD
Heeling Angle Due to Grain Shift	DEG	12.00	≥	7.61	GOOD
Residual Dynamic Stability	M-RAD	0.075	≤	0.437	GOOD
$\theta_m$ : Deck Edge Immersion Angle	DEG	-		19.80	
$\theta_f$ : Flooding Angle	DEG	-		61.50	
$\lambda_0$ = Heeling Moment / Displacement	M	-		0.36	

(3) APPLIED RULE 2008 IS Code Part A Chapter 2.2

CRITERIA	UNIT	REQUIRED		ATTAINED	JUDGE
Area ( 0° - 30° )	M-RAD	0.055	≤	0.377	GOOD
Area ( 30° - 40° or $\theta_f$ )	M-RAD	0.030	≤	0.260	GOOD
Area ( 0° - 40° or $\theta_f$ )	M-RAD	0.090	≤	0.637	GOOD
Max. GZ	M	0.20	≤	1.63	GOOD
$\theta$ at Max. GZ	DEG	25.00	≤	47.96	GOOD
GoM	M	0.15	≤	2.54	GOOD
GZ at 30°	M	-		1.40	

(4) APPLIED RULE 2008 IS Code Part A Chapter 2.3

CRITERIA	UNIT	REQUIRED		ATTAINED	JUDGE
Inclining Angle by Wind	DEG	15.84	>	0.36	GOOD
Area "B" / Area "A"	-	1.00	≤	5.41	GOOD