TIMBER STABILITY BOOKLET

Appendix to
STABILITY INFORMATION MANUAL

for

M/V ALI HRZ

"The Code of Safe Practice for Ships Carrying Timber Deck Cargoes"
first circulated by the organization in 1972 and subsequently amended in 1978.

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2 PREFACE

2 Önsöz

- This document was made in compliance with “Regulation 10 of the Chapter II of Annex I of the 1966 ILL Convention&Chapter II-1, Part B, Reg. 22 of SOLAS 1974”
  Bu döküman “1966 ILL Sözleşmesi, Ek I, Bölüm II, Yönetmelik 10” ve “SOLAS 1974, Bölüm II-1, Kısım B, Yönetmelik 22”e uygun olarak hazırlanmıştır.

- This Timber Booklet is approved in according to the International Maritime Organization (I.M.O.) to revise and update “The Code of Safe Practice for Ships Carrying Timber Deck Cargoes”, first circulated by the organization in 1972 and subsequently amended in 1978.
  “Timber Booklet” dökümanı “The Code of Safe Practice for Ships Carrying Timber Deck Cargoes” uygun olarak hazırlanmıştır.

- The calculations included in this work are based on following documents
  Bu dökümandaki hesaplamalar aşağıdaki belgelere göre hazırlanmıştır:
  - Lines-Off-Sets Plan
    Endaze Palanı
  - Capacity Plan
    Kapasite Palanı
  - General Arrangement Plan
    Genel Yerleşim Planı
  - Longitudinal Section Plan
    Boyuna Kesit Planı
  - Midship Section Plan
    Orta Kesit Planı
  - Stability Booklets & Inclining Experiment Test
    Stabilite Kitapcigi & Meyil Deneyi Testi

3 GENERAL PARTICULARS

3 Geminin Genel Özellikleri

3.1 Ship's Name, Owner, Builder, Etc.

3.1 Gemi Adı, Sahibi, İnşaa Eden v.s.

NAME OF SHIP	:	M/V ALI HRZ
YARD NO	:	1467
OWNER NAME	:	AHR SHIPPING CO.

3.2 Date, Class, Etc.

3.2 Tarih, Klas v.s.

YEAR OF BUILT	:	1981/KURUSHIMA DOCKYARD CO.LTD
KIND OF SHIP	:	GENERAL CARGO SHIP
NAVIGATION AREA	:	UNRESTRICTED NAVIGATION
CLASSIFICATION	:	VENEZUELAN REGISTER OF SHIPPING
FLAG	:	TANZANIA
PORT OF REGISTRY	:	ZANZIBAR
SIGNAL LETTERS	:	5IM 608

3.3 Dimension Etc.

3.3 Boyutlar v.s.

LENGTH O.A.	:	84.500	metres
LENGTH B.P.	:	78.000	metres
LENGTH [L]as defined in article 2[8]	:	78.000	metres
BREADTH MLD.	:	15.500	metres
DEPTH MLD.	:	9.500	metres
SUMMER DRAFT(Moulded)	:	7.736	metres
SUMMER DRAFT(Extreme)	:	7.749	metres
DISPLACEMENT-Extreme[Δ]	:	7317.88	tonnes
LIGHTSHIP WEIGHT	:	1442.00	tonnes
SUMMER DEADWEIGHT[TDW]	:	5875.88	tonnes
KEEL THICKNESS	:	13.00	mm
SHEEL THICKNESS	:	11.50	mm

3.4 Tonnage

3.4 Boyutlar v.s.

GROSS TONNAGE INT.	:	3016	G.T.
NET TONNAGE INT.	:		N.T.

3.5 Register Numbers

3.5 Kayıt Numaraları

IMO NUMBER	:	8106599

CAUTION FOR LOADING OPERATION

TPC (at Summer Loadline)	:	11.290	t/cm
Fresh Water Allowance(FWA)	:	162	mm

THE PERMISSIBLE LOCAL LOAD AMOUNTS TO

2.Deck Design Load : 1.80 t/m2

Upper Deck Design Load

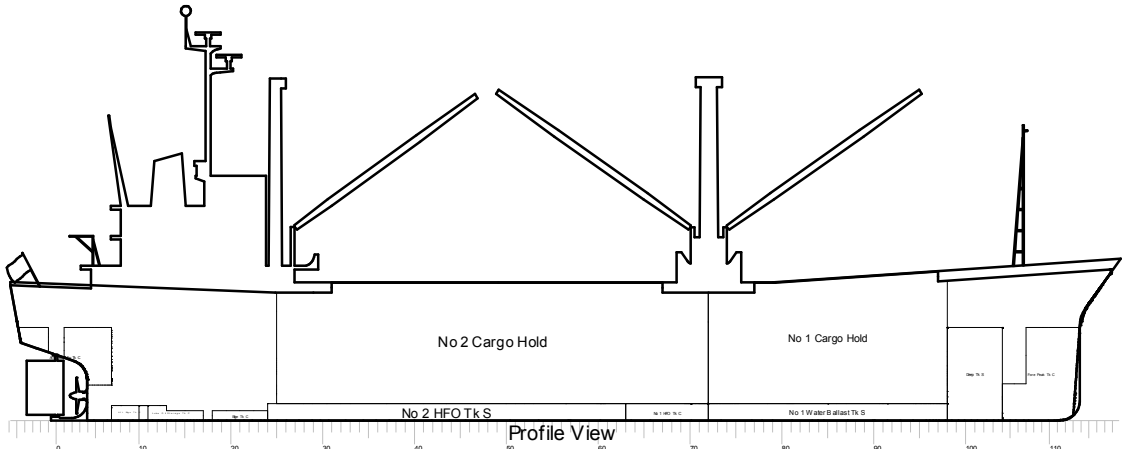
Fr.77-Fr.98	:	2.10 t/m2
Fr.25-Fr.77	:	1.50 t/m2

Pontoon Design Load

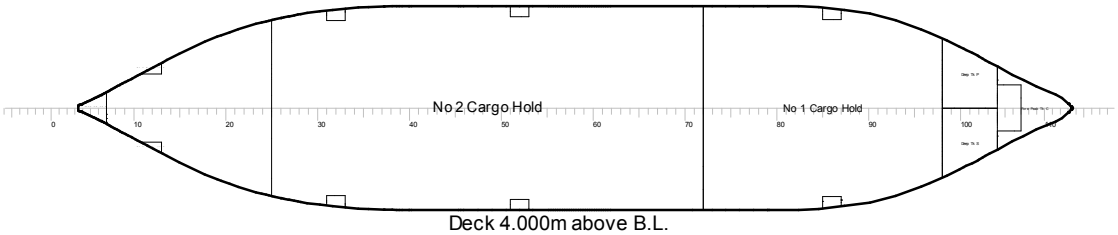
No.1 Hold	:	1.40 t/m2
No.2 Hold	:	0.80 t/m2

4 TANK ARRANGEMENT PLAN

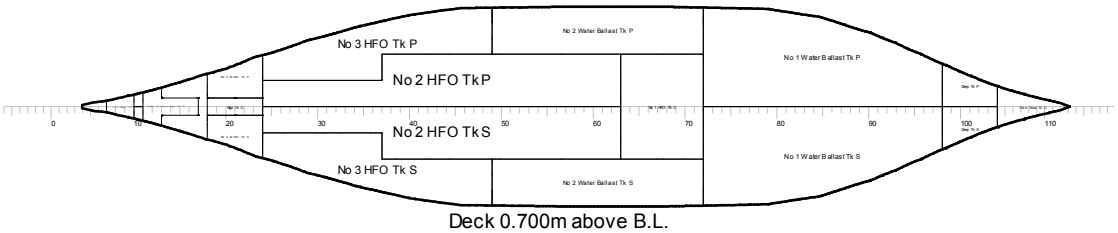
4 Tank Yerleşim Planı



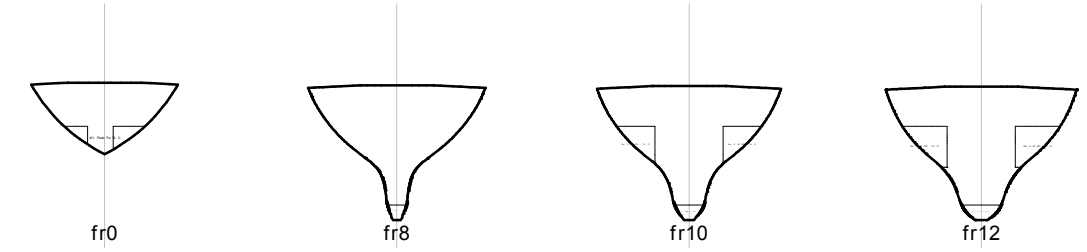
Profile View



Deck 4.000m above B.L.



Deck 0.700m above B.L.



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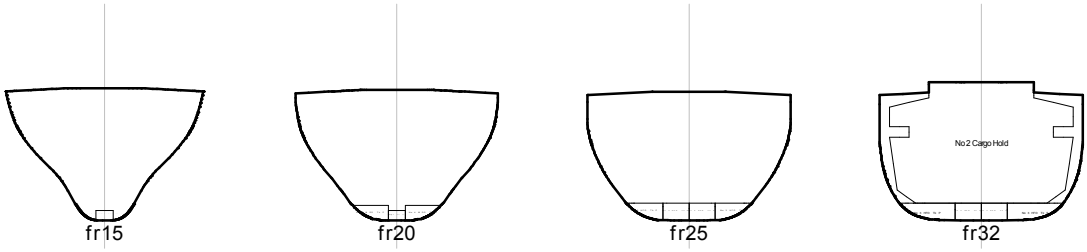

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5 INSTRUCTIONS FOR OPERATION

5 Operasyon Talimatları

5.1 Light Ship Particulars

5.1 Boş Gemi Özellikleri

Light Ship Weight Boş gemi ağırlığı	:	1442.00	tonnes
Vertical Centre Of Gravity (V.C.G.) Ağırlık Merkezinin Yüksekliğine Yeri	:	7.170	metres
Longitudinal Centre Of Gravity (L.C.G.) Ağırlık Merkezinin Boyuna Yeri	:	33.260	metres
Transverse Centre Of Gravity (T.C.G.) Ağırlık Merkezinin Enine Yeri	:	0.000	metres

5.2 Stability

5.2 Stabilite

The Actual GM should meet the stability criteria of IMO Resolution A.749 (18) For all conditions of loading the Master shall asses the stability of the vessel. Stability is satisfactory provided that for every loading condition the vessel's actual GM value decreased by the free surface correction.

GM değeri IMO A.749 (18) kriterlerine uymalıdır.

Tüm yükleme kondisyonlarında gemi stabilite kurallarına uygun olmalıdır. Her yükleme kondisyonu için oluşan GM değeri serbest su yüzeyi etkisi ile düşürülür.

5.3 Propeller Immersion (I/D)

5.3 Pervanenin Batması

In order to avoid propeller cavitations, draft at aft perpendicular should be chosen which is corresponding to the propeller immersion of 105% or more.

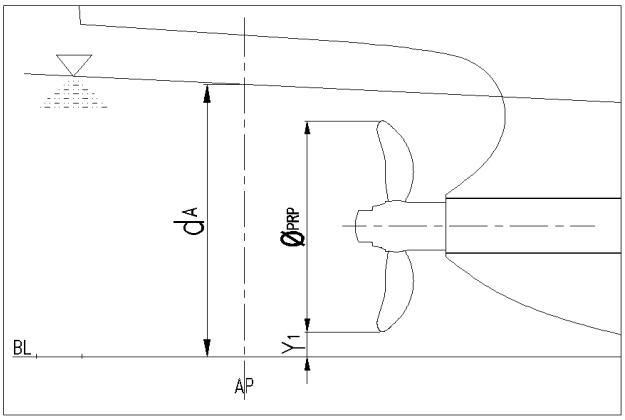
Kavitasyonu önlemek için kıç dikmedeki draft pervaneyi %105 batıracak şekilde olmalıdır.

$$\frac{I}{D} = \frac{d_A - y_1}{\emptyset_{PRP}} * 100$$

dA : Aft draught / Kıç dA : draft

Y_1 : Distance from BL to low edge of propeller / BL'dan pervane alt ucuna olan mesafe

$\emptyset_{PRP}$: Diameter of propeller / Pervane çapı



5.4 Unprotected Openings
5.4 Koruma sız Açıklıklar

Unprotected [Downfloading] Openings

#	x (m)	y (m)	z (m)	Compartment ID	X-ray
1	6.500	3.000	19.300	Engine Room Vent.[Boat Deck] Natural Ventilation	Open
2	6.500	3.000	19.300	Engine Room Vent.[Boat Deck] Natural Ventilation	Open

5.5 Freeboard Tables / Dwt Tables
5.5 Fribord Tablosu / DWT Tablosu

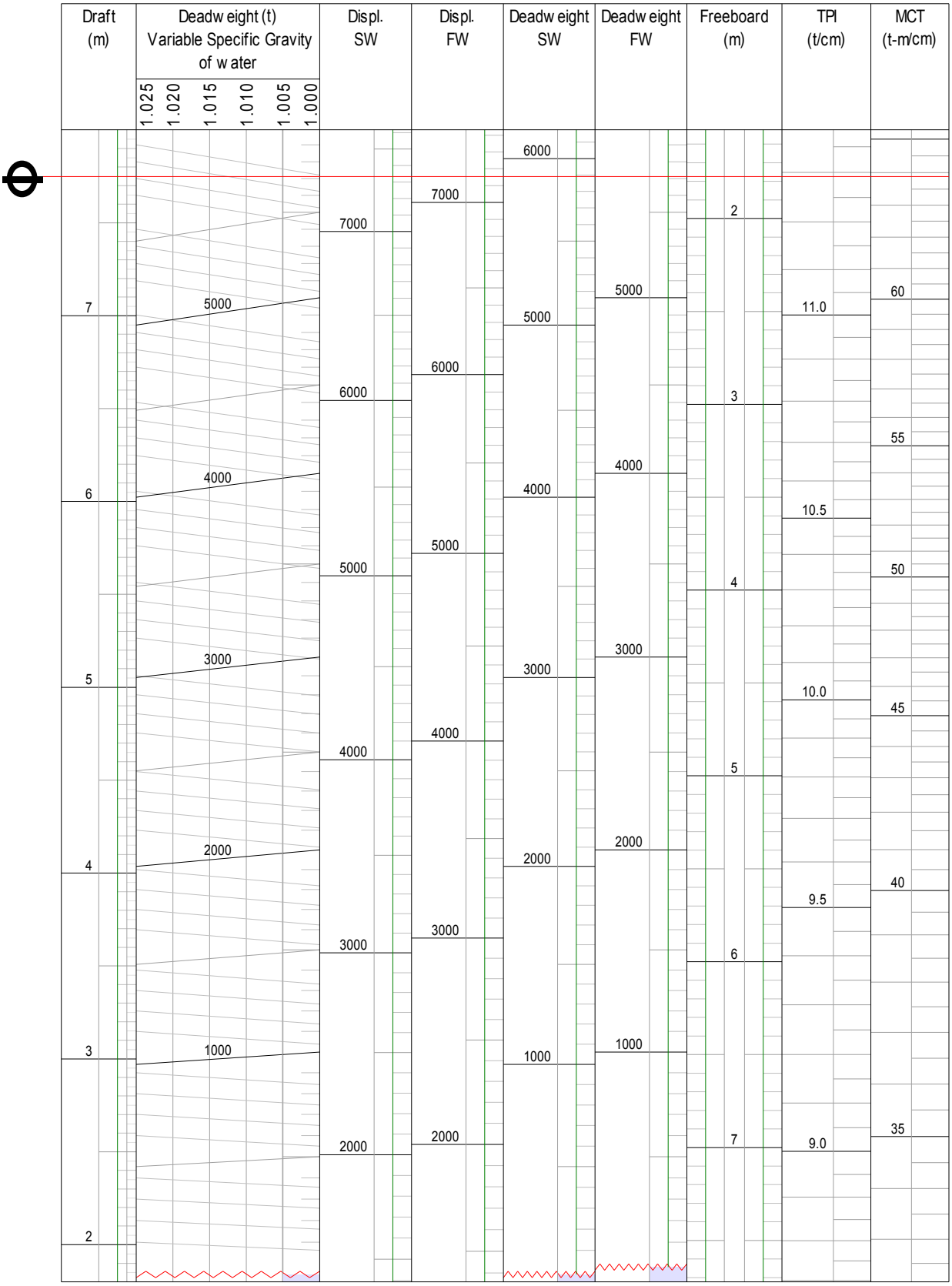
▪	**DEPTH FOR FREEBOARD**		
DEPTH MOULDED	:	9.500	Metres
THICKNESS OF MAIN DECK STRINGER PLATE	:	0.010	Metres
THICKNESS OF FLAT KEEL PLATE	:	0.000	Metres
DECK LINE ABOVE BOTTOM OF KEEL	:	9.510	Metres

[THE UPPER EDGE OF THE DECK LINE FROM WICH THESE FREEBOARDS ARE MESURED IS 0 MM BELOW THE TOP OF THE STEEL UPPER DECK AT SIDE]

▪**LIGHTWEIGHT**	:	1442.00	tonne
▪**DEADWEIGHT**			

LOAD LINE(from top of keel)		FREEBOARD	DRAFT (Mld)	DRAFT (Ext.)	DISPLACEMENT	DEADWEIGHT
		Metres	Metres	Metres	Tonnes	Tonnes
SUMMER FREEBOARD	S	1.774	7.736	7.749	7317.88	5875.88
TROPICAL FREEBOARD	T	1.613	7.897	7.910	7500.21	6058.21
FRESH WATER FRB	F	1.612	7.898	7.911	7501.35	6059.35
WINTER FREEBOARD	W	1.935	7.575	7.588	7136.51	5694.51
NOR. ATLANT.FRB.	WNA	1.985	7.525	7.538	7080.39	5638.39

5.6 DWT Scales
5.6 DWT Skalası

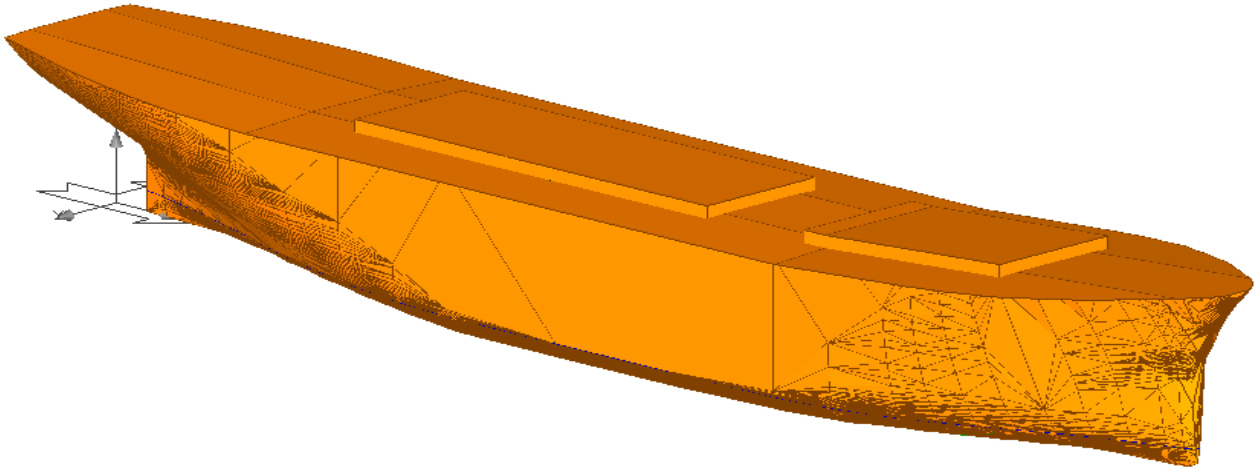


5.7 Hull Summary

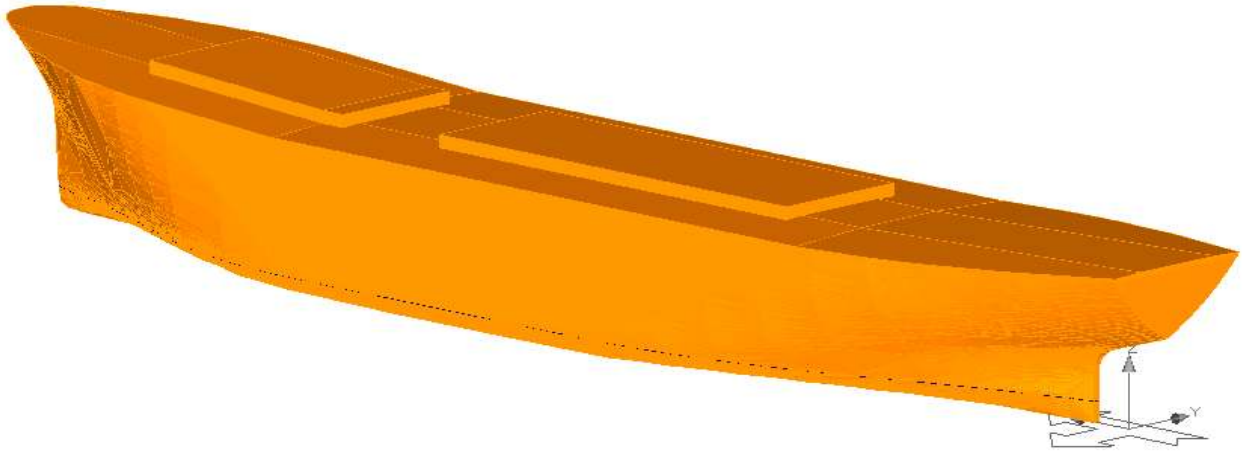
5.7 Model Geometrisi

Mainhull Compartments

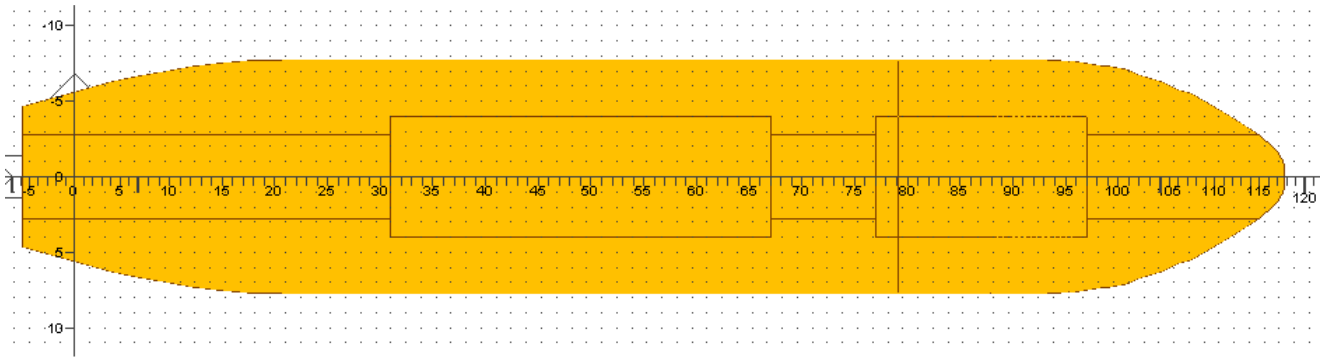
Compartment	Frames	Volume (m^3)	LCG (m)	TCG (m)	VCG (m)
Sections_4 : Envelope	-6-118	9895.276	39.480	0.000	5.509
Total		**9895.276**	**39.480**	**0.000**	**5.509**



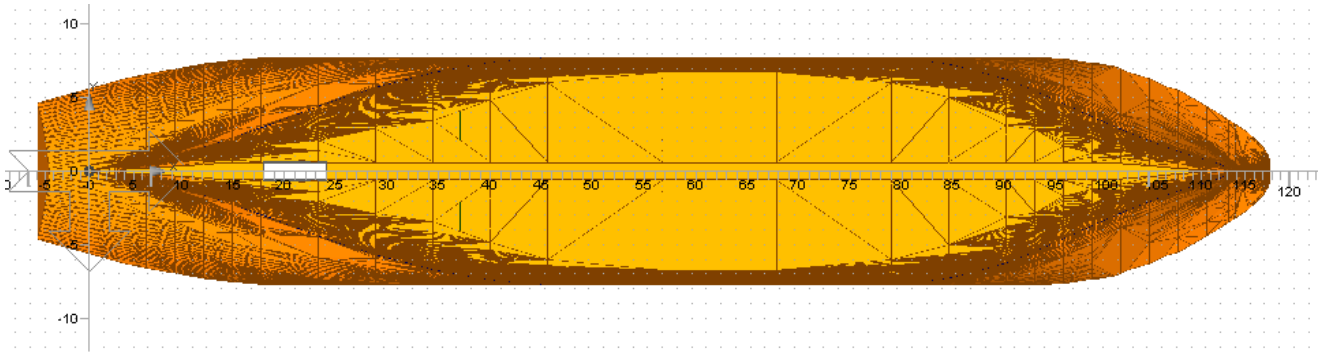
3D View



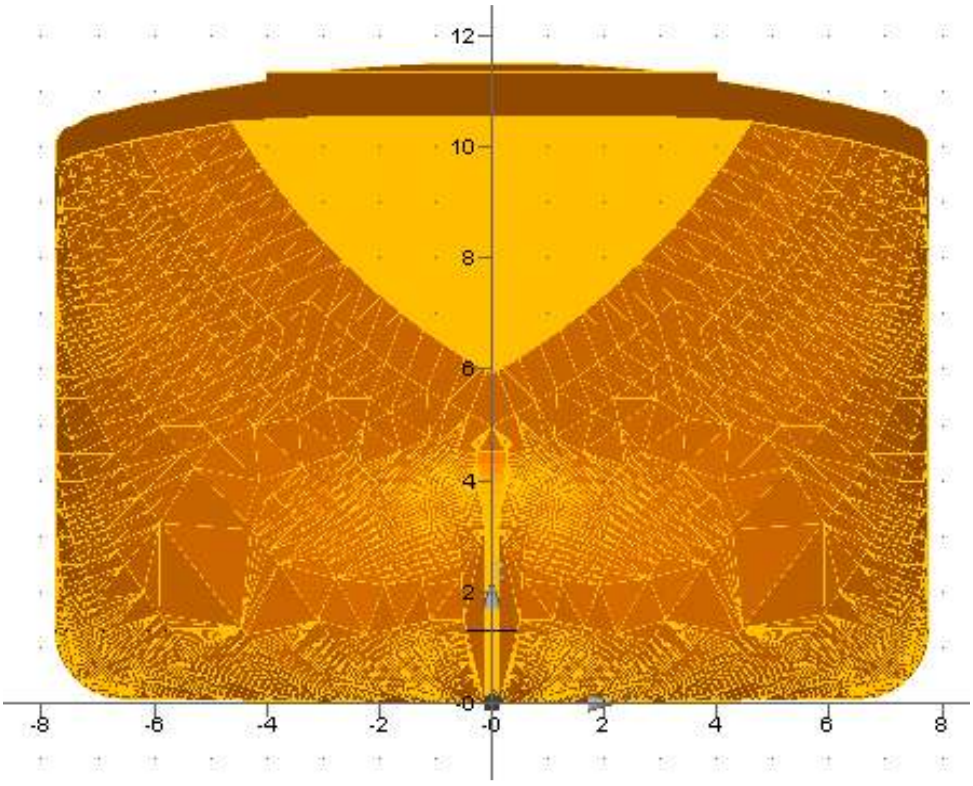
3D View



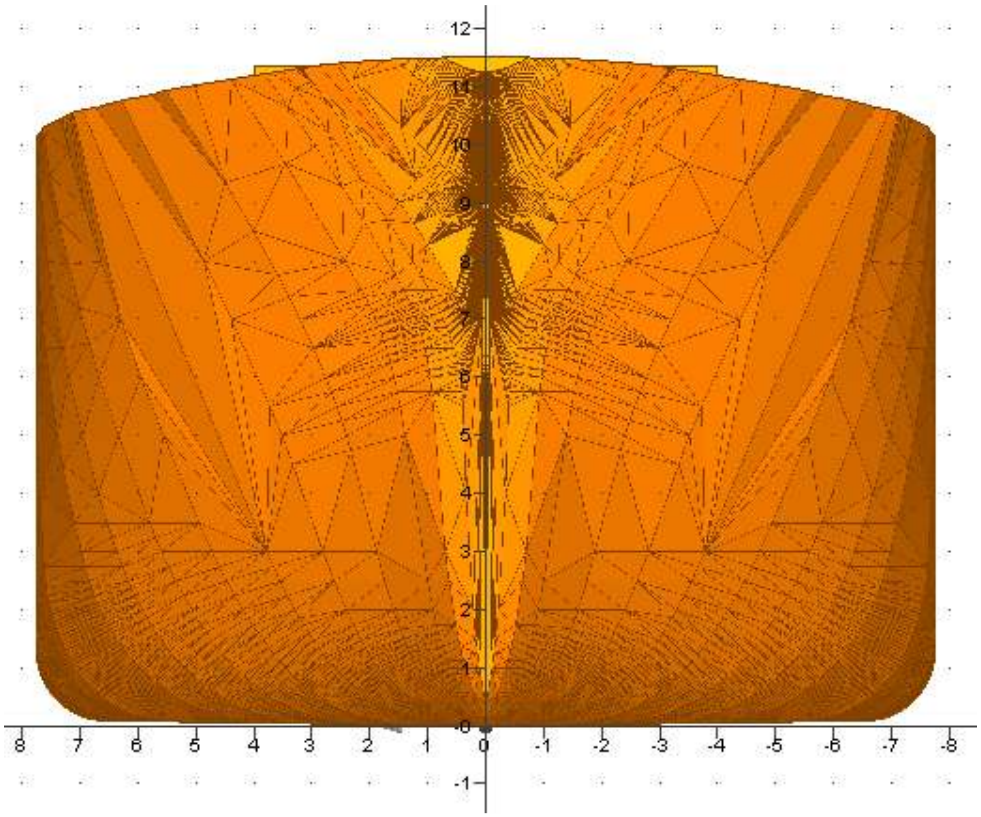
Deck View



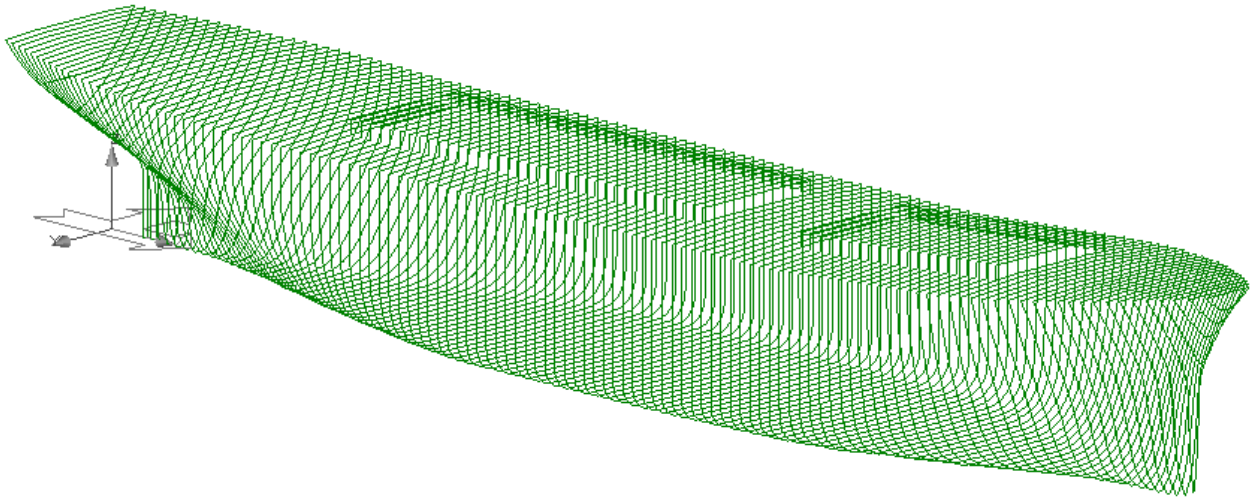
Keel View



3D View



3D View



3D View

5.8 Frame Table
5.8 Posta Tablosu

Frame Table Summary (Distances forward of AP)

From Frame #	Distance (m)	Spacing (m)
-7	-4.200	0.600
7	4.200	0.700
104	72.100	0.600
120	81.700	0.600

Frame Table (Distances forward of A.P.)

Frame #	Distance (m)	Frame #	Distance (m)	Frame #	Distance (m)	Frame #	Distance (m)
-6	-3.600	26	17.500	58	39.900	90	62.300
-5	-3.000	27	18.200	59	40.600	91	63.000
-4	-2.400	28	18.900	60	41.300	92	63.700
-3	-1.800	29	19.600	61	42.000	93	64.400
-2	-1.200	30	20.300	62	42.700	94	65.100
-1	-0.600	31	21.000	63	43.400	95	65.800
0	0.000	32	21.700	64	44.100	96	66.500
1	0.600	33	22.400	65	44.800	97	67.200
2	1.200	34	23.100	66	45.500	98	67.900
3	1.800	35	23.800	67	46.200	99	68.600
4	2.400	36	24.500	68	46.900	100	69.300
5	3.000	37	25.200	69	47.600	101	70.000
6	3.600	38	25.900	70	48.300	102	70.700
7	4.200	39	26.600	71	49.000	103	71.400
8	4.900	40	27.300	72	49.700	104	72.100
9	5.600	41	28.000	73	50.400	105	72.700
10	6.300	42	28.700	74	51.100	106	73.300
11	7.000	43	29.400	75	51.800	107	73.900
12	7.700	44	30.100	76	52.500	108	74.500
13	8.400	45	30.800	77	53.200	109	75.100
14	9.100	46	31.500	78	53.900	110	75.700
15	9.800	47	32.200	79	54.600	111	76.300
16	10.500	48	32.900	80	55.300	112	76.900
17	11.200	49	33.600	81	56.000	113	77.500
18	11.900	50	34.300	82	56.700	114	78.100
19	12.600	51	35.000	83	57.400	115	78.700
20	13.300	52	35.700	84	58.100	116	79.300
21	14.000	53	36.400	85	58.800	117	79.900
22	14.700	54	37.100	86	59.500	118	80.500
23	15.400	55	37.800	87	60.200	119	81.100
24	16.100	56	38.500	88	60.900		
25	16.800	57	39.200	89	61.600		

Stability & Timber Stability Criteria

Intact	A749A	IMO 749 Intact Stability Criteria non - passenger

Axis Convention

Origin from AP	0.000	metres
Positive x-direction	Aft to Forward	
Positive y-direction	Port to Stbd.	

Sea Water Properties

Sea water density	1.02500	tonnes/cu.m
Temperature	15.00	degs. C

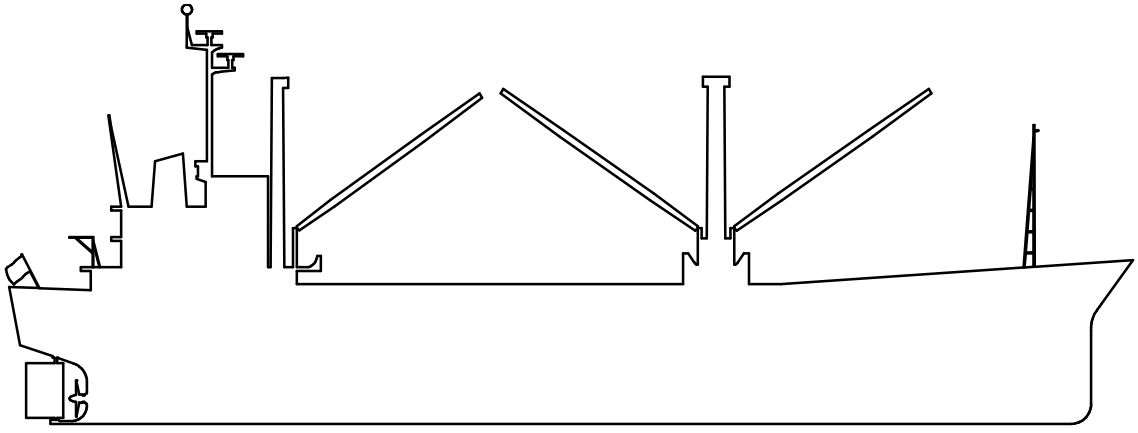
Balancing Tolerances

Draft tolerance	0.001	metres
Trim tolerance	0.010	metres
Heel increment	5.000	degs
Max. no. iterations	20	

5.9 Windage Area And Pressure Arms

5.9 Rüzgar Alanı ve Basınç Kolu

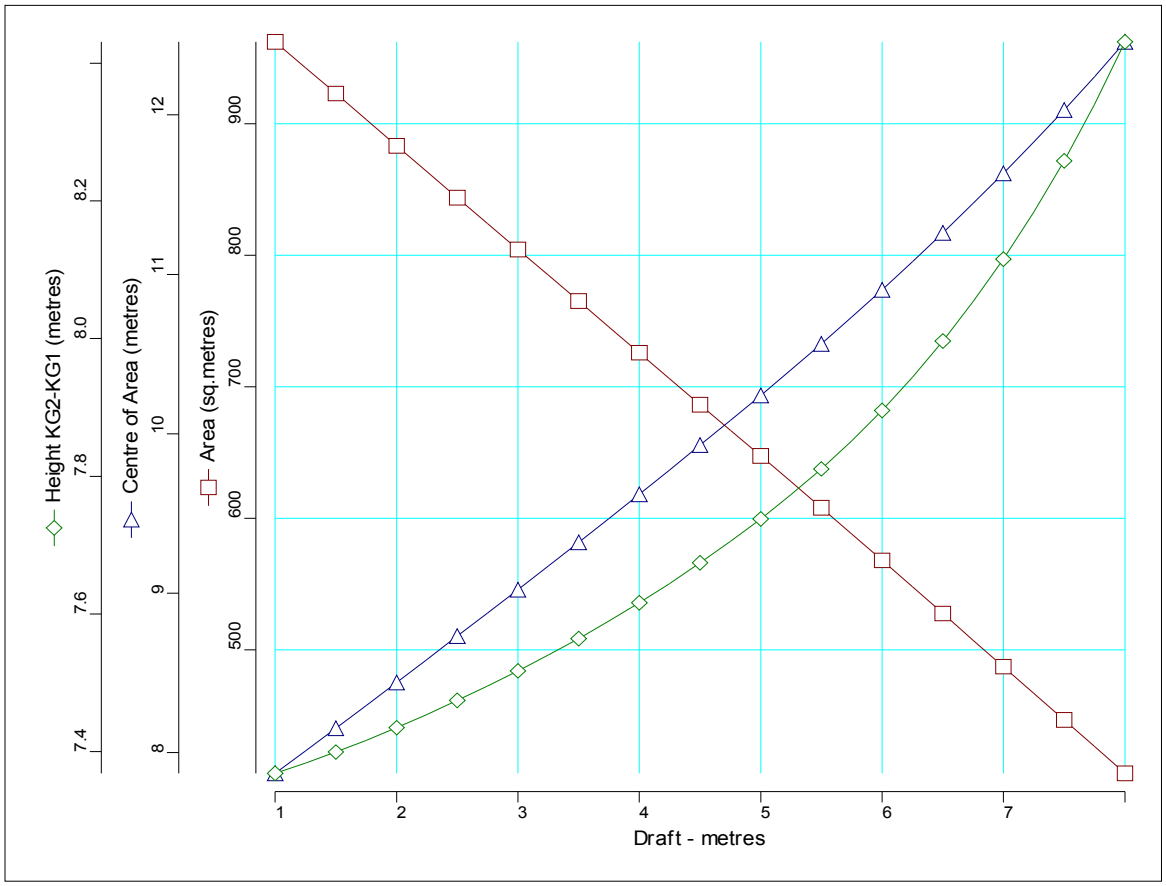
Wind Profile



Windage Areas and Windage Arm Calculations

Draft (m)	Under Waterline Area (m^2)	Under Waterline KG1 (m)	Above Waterline Area (m^2)	Above Waterline KG2 (m)	Height KG2-KG1 (m)	Area Ratio	Waterline Length (m)
1.00	77.700	0.502	962.190	7.871	7.369	12.383	75.207
1.25	97.344	0.628	942.546	8.012	7.383	9.683	75.225
1.50	117.005	0.754	922.885	8.153	7.399	7.888	75.243
1.75	136.794	0.880	903.096	8.296	7.416	6.602	75.261
2.00	156.726	1.006	883.163	8.441	7.435	5.635	75.279
2.25	176.560	1.132	863.330	8.586	7.454	4.890	75.297
2.50	196.227	1.257	843.663	8.731	7.474	4.299	75.316
2.75	215.878	1.381	824.012	8.876	7.495	3.817	75.334
3.00	235.516	1.506	804.374	9.023	7.517	3.415	75.352
3.25	255.143	1.630	784.747	9.170	7.540	3.076	75.378
3.50	274.761	1.755	765.129	9.319	7.564	2.785	75.437
3.75	294.395	1.880	745.495	9.469	7.589	2.532	75.545
4.00	314.058	2.004	725.832	9.621	7.616	2.311	75.712
4.25	333.766	2.130	706.123	9.774	7.644	2.116	75.960
4.50	353.549	2.255	686.341	9.930	7.674	1.941	76.372
4.75	372.983	2.379	666.907	10.084	7.705	1.788	77.095
5.00	392.443	2.503	647.447	10.241	7.738	1.650	77.847
5.25	412.045	2.627	627.845	10.400	7.773	1.524	78.600
5.50	431.820	2.753	608.070	10.564	7.811	1.408	79.352
5.75	451.779	2.880	588.111	10.731	7.851	1.302	80.105
6.00	471.913	3.008	567.977	10.904	7.896	1.204	80.635
6.25	492.097	3.136	547.793	11.080	7.944	1.113	80.699
6.50	512.293	3.263	527.597	11.260	7.996	1.030	80.762
6.75	532.500	3.391	507.390	11.444	8.053	0.953	80.826
7.00	552.719	3.518	487.171	11.634	8.116	0.881	80.890
7.25	572.949	3.646	466.941	11.829	8.184	0.815	80.991
7.50	593.193	3.773	446.697	12.031	8.258	0.753	81.117
7.75	613.456	3.900	426.434	12.241	8.340	0.695	81.243
8.00	633.746	4.028	406.144	12.459	8.431	0.641	81.369

Windage Area/Pressure Arm Curves



5.10 Profile Boundaries

5.10 Profil Sınırları

Profile Points

#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)
0	72.91	11.76	100	14.10	27.84	200	2.64	11.49	300	1.76	1.59
1	54.63	10.52	101	12.20	27.84	201	2.64	10.06	301	1.86	1.59
2	52.21	10.52	102	12.20	27.65	202	-1.23	10.21	302	1.93	1.59
3	52.21	12.82	103	12.91	27.65	203	-2.56	12.76	303	2.01	1.60
4	51.83	12.82	104	12.91	27.36	204	-2.60	12.74	304	2.04	1.60
5	51.34	12.10	105	13.01	27.36	205	-2.55	12.63	305	2.04	1.66
6	51.24	12.00	106	13.01	26.79	206	-2.76	12.50	306	2.15	1.66
7	51.20	11.98	107	11.76	26.79	207	-3.00	12.30	307	2.15	1.60
8	51.12	11.97	108	11.76	27.94	208	-3.12	12.17	308	2.29	1.53
9	51.12	14.73	109	11.94	28.09	209	-3.15	12.14	309	2.33	1.48
10	51.30	14.54	110	12.11	28.19	210	-3.33	11.98	310	2.35	1.39
11	54.70	16.83	111	12.25	28.25	211	-3.63	11.78	311	2.34	1.27
12	61.52	21.61	112	12.30	28.26	212	-3.63	11.78	312	2.33	1.17
13	65.95	24.86	113	12.37	28.28	213	-3.75	11.64	313	2.33	1.17
14	65.76	25.19	114	12.52	28.31	214	-3.75	11.64	314	2.30	1.05
15	61.23	22.11	115	12.52	28.50	215	-3.67	11.22	315	2.25	0.91
16	54.42	17.32	116	11.72	28.50	216	-3.58	11.00	316	2.20	0.82
17	51.11	14.87	117	11.72	29.07	217	-3.58	11.00	317	2.15	0.74
18	51.12	14.73	118	11.81	29.07	218	-3.48	10.84	318	2.07	0.63
19	50.83	14.73	119	11.81	29.36	219	-3.37	10.70	319	2.00	0.55
20	50.83	13.97	120	12.52	29.36	220	-3.37	10.70	320	2.00	0.55
21	50.44	13.97	121	12.52	29.55	221	-3.15	10.49	321	1.89	0.45
22	50.36	25.36	122	10.62	29.55	222	-3.15	10.49	322	1.82	0.41
23	50.74	25.36	123	10.62	29.36	223	-3.15	10.49	323	1.73	0.35
24	50.74	26.13	124	11.34	29.36	224	-2.97	10.68	324	1.69	0.33
25	48.74	26.13	125	11.34	29.07	225	-2.97	10.68	325	1.63	0.30
26	48.74	25.36	126	11.43	29.07	226	-2.74	10.82	326	1.47	0.24
27	49.11	25.36	127	11.43	28.50	227	-2.55	10.98	327	1.39	0.23
28	49.04	13.97	128	10.25	28.50	228	-2.55	10.98	328	1.29	0.21
29	48.65	13.97	129	9.91	29.79	229	-2.44	11.10	329	1.15	0.20
30	48.65	14.73	130	9.91	30.78	230	-2.27	11.26	330	0.30	0.20
31	48.36	14.73	131	9.99	30.81	231	-2.19	11.32	331	0.20	0.30
32	48.36	14.87	132	10.12	30.87	232	-1.94	11.47	332	-0.40	0.30
33	45.06	17.32	133	10.22	30.99	233	-1.28	10.21	333	-0.40	0.00
34	38.24	22.11	134	10.27	31.17	234	-3.50	10.30	334	76.50	0.00
35	33.71	25.19	135	10.26	31.22	235	-2.70	5.92	335	76.77	0.03
36	33.52	24.86	136	10.24	31.31	236	-0.24	5.08	336	76.97	0.08
37	37.96	21.61	137	10.17	31.42	237	-0.24	4.96	337	77.09	0.12
38	44.77	16.83	138	10.07	31.50	238	-0.09	4.96	338	77.16	0.15
39	48.17	14.54	139	10.02	31.53	239	-0.09	4.56	339	77.27	0.21
40	48.31	14.69	140	9.94	31.55	240	-2.25	4.56	340	77.39	0.29
41	48.36	14.73	141	9.89	31.55	241	-2.25	0.45	341	77.49	0.37
42	48.36	11.97	142	9.77	31.53	242	-0.09	0.45	342	77.59	0.47
43	48.27	11.99	143	9.66	31.48	243	-0.09	0.30	343	77.62	0.50

#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)
44	48.20	12.02	144	9.56	31.36	244	0.09	0.30	344	77.68	0.57
45	48.13	12.10	145	9.54	31.33	245	0.09	0.45	345	77.76	0.68
46	48.13	12.10	146	9.52	31.26	246	0.55	0.45	346	77.79	0.73
47	48.08	12.18	147	9.51	31.09	247	0.55	4.56	347	77.83	0.81
48	47.65	12.82	148	9.54	31.01	248	0.09	4.56	348	77.86	0.86
49	47.27	12.82	149	9.58	30.94	249	0.09	4.96	349	77.88	0.90
50	47.27	10.52	150	9.58	30.94	250	0.11	4.96	350	77.93	1.04
51	18.16	10.52	151	9.65	30.87	251	1.33	4.55	351	77.96	1.17
52	18.16	11.49	152	9.65	30.87	252	1.53	4.46	352	77.97	1.23
53	19.98	11.49	153	9.76	30.81	253	1.70	4.37	353	77.98	1.29
54	19.98	12.64	154	9.86	30.78	254	1.77	4.31	354	78.00	1.40
55	19.69	12.64	155	9.86	28.50	255	1.87	4.23	355	78.00	1.50
56	19.66	12.45	156	9.86	28.31	256	1.95	4.15	356	78.00	7.00
57	19.58	12.26	157	11.38	28.13	257	1.99	4.10	357	78.00	7.26
58	19.52	12.15	158	11.38	19.76	258	2.04	4.04	358	78.02	7.53
59	19.45	12.07	159	10.52	19.76	259	2.13	3.91	359	78.05	7.67
60	19.33	11.95	160	10.52	19.38	260	2.18	3.81	360	78.07	7.76
61	19.25	11.89	161	10.71	19.38	261	2.23	3.71	361	78.11	7.92
62	19.17	11.84	162	10.71	18.62	262	2.26	3.63	362	78.25	8.23
63	19.03	11.78	163	10.62	18.62	263	2.28	3.58	363	78.39	8.49
64	18.16	11.78	164	10.62	18.43	264	2.31	3.46	364	78.48	8.60
65	18.16	14.73	165	11.29	18.19	265	2.34	3.29	365	78.62	8.80
66	18.21	14.69	166	11.29	16.34	266	2.35	3.13	366	78.79	9.05
67	18.35	14.55	167	9.86	16.34	267	2.35	2.85	367	81.14	12.32
68	20.98	16.35	168	9.58	20.33	268	2.35	2.44	368	73.74	11.82
69	27.73	21.22	169	7.49	19.76	269	2.34	2.36	369	73.73	21.98
70	32.11	24.52	170	7.20	16.34	270	2.29	2.27	370	74.02	22.04
71	31.92	24.85	171	5.48	16.34	271	2.29	2.27	371	74.02	22.09
72	27.44	21.71	172	4.17	22.32	272	2.23	2.22	372	73.73	22.09
73	20.70	16.84	173	4.04	23.21	273	2.15	2.20	373	73.73	22.48
74	18.16	14.88	174	3.97	23.20	274	2.15	2.13	374	73.66	22.48
75	18.16	14.73	175	4.92	16.34	275	2.04	2.13	375	73.66	11.82
76	17.88	14.73	176	4.16	16.34	276	2.04	2.20	376	72.99	11.77
77	17.88	11.78	177	4.16	16.06	277	1.76	2.21	377	73.07	12.82
78	17.21	11.78	178	4.92	16.06	278	1.56	3.24	378	73.66	12.82
79	17.13	25.27	179	4.92	14.06	279	1.55	3.26	379	73.66	12.90
80	17.51	25.27	180	4.16	14.06	280	1.54	3.26	380	73.07	12.90
81	17.51	26.03	181	4.16	13.78	281	1.54	3.26	381	73.19	14.42
82	17.13	26.03	182	4.92	13.78	282	1.52	3.24	382	73.66	14.42
83	16.27	26.03	183	4.92	11.78	283	1.52	3.19	383	73.66	14.50
84	16.19	11.78	184	3.34	11.78	284	1.52	2.17	384	73.19	14.50
85	15.99	11.78	185	2.83	13.77	285	1.36	2.13	385	73.31	16.02
86	15.99	18.62	186	2.83	14.06	286	1.11	2.03	386	73.66	16.02
87	11.76	18.62	187	1.02	14.06	287	1.04	1.94	387	73.66	16.10
88	11.76	26.27	188	1.02	14.01	288	1.04	1.90	388	73.32	16.10
89	11.92	26.39	189	1.45	14.01	289	1.06	1.82	389	73.44	17.62
90	12.06	26.44	190	2.78	12.82	290	1.11	1.77	390	73.66	17.62

#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)	#	x (m)	z (m)
91	12.22	26.46	191	2.78	12.89	291	1.29	1.69	391	73.66	17.70
92	12.49	26.49	192	1.52	14.01	292	1.45	1.64	392	73.44	17.70
93	13.47	26.60	193	2.78	14.01	293	1.52	1.64	393	73.56	19.22
94	13.47	26.79	194	2.78	11.78	294	1.52	0.56	394	73.66	19.22
95	13.29	26.79	195	2.83	11.78	295	1.54	0.54	395	73.66	19.30
96	13.29	27.36	196	2.83	13.58	296	1.54	0.54	396	73.56	19.30
97	13.39	27.36	197	3.29	11.78	297	1.56	0.56	397	73.66	20.48
98	13.39	27.65	198	1.88	11.78	298	1.56	0.57	398	73.66	21.52
99	14.10	27.65	199	1.88	11.49	299	1.57	0.62	399	72.91	11.76

5.11 Deck Edge

5.11 Güverte Kenar Sınırları

Deck Edge Points

#	x (m)	y (m)	z (m)	#	x (m)	y (m)	z (m)	#	x (m)	y (m)	z (m)
0	8.05	-7.32	9.86	55	68.25	7.33	10.45	110	78.91	-2.57	11.40
1	7.80	-7.29	9.88	56	68.76	7.29	10.48	111	78.58	-2.80	11.38
2	7.50	-7.23	9.89	57	69.00	7.23	10.50	112	78.49	-2.86	11.37
3	5.85	-6.92	9.97	58	69.47	7.17	10.54	113	78.05	-3.16	11.32
4	5.49	-6.87	9.99	59	69.68	7.13	10.55	114	78.00	-3.19	11.32
5	3.90	-6.58	10.07	60	69.80	7.11	10.56	115	77.94	-3.22	11.31
6	3.05	-6.41	10.11	61	70.20	6.95	10.60	116	77.82	-3.30	11.30
7	2.35	-6.25	10.14	62	70.67	6.72	10.64	117	77.51	-3.50	11.27
8	0.46	-5.72	10.25	63	72.15	6.28	10.76	118	77.20	-3.70	11.24
9	0.00	-5.59	10.27	64	73.23	5.74	10.86	119	77.03	-3.81	11.22
10	-1.71	-5.13	10.36	65	74.10	5.51	10.94	120	76.15	-4.33	11.14
11	-3.50	-4.62	10.46	66	75.02	5.01	11.02	121	76.06	-4.39	11.13
12	-3.50	-2.80	10.55	67	76.05	4.39	11.13	122	76.05	-4.39	11.13
13	-3.50	2.80	10.55	68	76.06	4.39	11.13	123	75.02	-5.01	11.02
14	-3.50	4.62	10.46	69	76.15	4.33	11.14	124	74.10	-5.51	10.94
15	-1.71	5.13	10.36	70	77.03	3.81	11.22	125	73.23	-5.74	10.86
16	0.00	5.59	10.27	71	77.20	3.70	11.24	126	72.15	-6.28	10.76
17	0.46	5.72	10.25	72	77.51	3.50	11.27	127	70.67	-6.72	10.64
18	2.35	6.25	10.14	73	77.82	3.30	11.30	128	70.20	-6.95	10.60
19	3.05	6.41	10.11	74	77.94	3.22	11.31	129	69.80	-7.11	10.56
20	3.90	6.58	10.07	75	78.00	3.19	11.32	130	69.68	-7.13	10.55
21	5.49	6.87	9.99	76	78.05	3.16	11.32	131	69.47	-7.17	10.54
22	5.85	6.92	9.97	77	78.49	2.86	11.37	132	69.00	-7.23	10.50
23	7.50	7.23	9.89	78	78.58	2.80	11.38	133	68.76	-7.29	10.48
24	7.80	7.29	9.88	79	78.91	2.57	11.40	134	68.25	-7.33	10.45
25	8.05	7.32	9.86	80	78.97	2.50	11.40	135	66.39	-7.63	10.30
26	9.75	7.52	9.79	81	79.38	2.14	11.43	136	66.30	-7.63	10.30
27	9.97	7.53	9.78	82	79.52	2.00	11.44	137	66.05	-7.64	10.28
28	11.70	7.68	9.70	83	79.80	1.71	11.46	138	65.83	-7.65	10.26
29	12.48	7.68	9.67	84	79.95	1.55	11.47	139	64.35	-7.73	10.16

#	x (m)	y (m)	z (m)	#	x (m)	y (m)	z (m)	#	x (m)	y (m)	z (m)
30	15.60	7.75	9.54	85	80.05	1.38	11.48	140	64.08	-7.74	10.14
31	16.70	7.75	9.50	86	80.07	1.35	11.48	141	63.86	-7.74	10.13
32	17.62	7.75	9.50	87	80.09	1.30	11.48	142	63.27	-7.74	10.09
33	19.50	7.75	9.50	88	80.18	1.15	11.49	143	62.40	-7.74	10.03
34	22.36	7.75	9.50	89	80.22	1.07	11.49	144	60.84	-7.74	9.92
35	23.40	7.75	9.50	90	80.26	0.98	11.49	145	58.50	-7.75	9.76
36	26.42	7.75	9.50	91	80.28	0.94	11.49	146	54.99	-7.75	9.52
37	27.30	7.75	9.50	92	80.33	0.82	11.50	147	54.70	-7.75	9.50
38	30.66	7.75	9.50	93	80.34	0.81	11.50	148	54.60	-7.75	9.50
39	31.20	7.75	9.50	94	80.37	0.74	11.50	149	32.00	-7.75	9.50
40	32.00	7.75	9.50	95	80.37	-0.74	11.50	150	31.20	-7.75	9.50
41	54.60	7.75	9.50	96	80.34	-0.81	11.50	151	30.66	-7.75	9.50
42	54.70	7.75	9.50	97	80.33	-0.82	11.50	152	27.30	-7.75	9.50
43	54.99	7.75	9.52	98	80.28	-0.94	11.49	153	26.42	-7.75	9.50
44	58.50	7.75	9.76	99	80.26	-0.98	11.49	154	23.40	-7.75	9.50
45	60.84	7.74	9.92	100	80.22	-1.07	11.49	155	22.36	-7.75	9.50
46	62.40	7.74	10.03	101	80.18	-1.15	11.49	156	19.50	-7.75	9.50
47	63.27	7.74	10.09	102	80.09	-1.30	11.48	157	17.62	-7.75	9.50
48	63.86	7.74	10.13	103	80.07	-1.35	11.48	158	16.70	-7.75	9.50
49	64.08	7.74	10.14	104	80.05	-1.38	11.48	159	15.60	-7.75	9.54
50	64.35	7.73	10.16	105	79.95	-1.55	11.47	160	12.48	-7.68	9.67
51	65.83	7.65	10.26	106	79.80	-1.71	11.46	161	11.70	-7.68	9.70
52	66.05	7.64	10.28	107	79.52	-2.00	11.44	162	9.97	-7.53	9.78
53	66.30	7.63	10.30	108	79.38	-2.14	11.43	163	9.75	-7.52	9.79
54	66.39	7.63	10.30	109	78.97	-2.50	11.40				

5.12 Metric Conversion Table

5.12 Metrik Çeviri Tablosu

MULTIPLY BY	TO CONVERT FROM	TO OBTAIN	
0.03937	MILLIMETERS	INCHES	25.4
0.3937	CENTIMETERS	INCHES	2.54
3.2808	METERS	FEET	0.3048
2.2046	KILOGRAMMES	POUNDS	0.45359
0.0009842	KILOGRAMMES	TONS(2240 lbs.)	1016.047
0.9842	METRIC TONS (i.e. TONS OF 1000 KILOS)	TONS(2240 lbs.)	1.016
2.4998	METRIC TONS PER CENTIMETER (OF IMMERSION)	TONS PER INCH (OF IMMERSION	0.4
8.2014	MOMENT TO CHANGE TRIM ONE CENTIMETER (MT-METER UNITS)	MOMENT TO CHANGE TRIM ONE INCH (LT-FOOT UNITS	0.122
187.9767	METER RADIANS	FEET DEGREES	0.0053
	TO OBTAIN	**TO CONVERT FROM**	**MULTIPLY BY**

Relation between weight and volume

Ağırlık ve hacim arasındaki ilişki

10 mm cubed	=	1 cubic centimeter
1 cubic centimetre of fresh water (S.G. 1.0)	=	1 gram
1000 cubic centimetre of fresh water (S.G. 1.0)	=	1 kilogram (1000 grams)
1 cubic meter of fresh water (S.G. 1.0)	=	1 MT (1000 kilos)
1 cubic meter of salt water (S.G. 1.025)	=	1.025 MT
1 metric ton of salt water (S.G. 1.025)	=	0.9756 Cubic meters

1 cubic meter	=	35.316 cubic feet
1 cubic foot	=	0.0283 cubic meters

5.13 Stowage Factor Conversion Table

5.13 İstif Faktörü Çeviri Tablosu

STOWAGE FACTOR CONVERSION TABLE

FT^3/LT	M^3/T	T/M^3	FT^3/LT	M^3/T	T/M^3
10	0.2787	3.5880	**45**	1.2542	0.7973
11	0.3066	3.2618	**46**	1.2821	0.7800
12	0.3344	2.9900	**47**	1.3099	0.7634
14	0.3902	2.5629	**48**	1.3378	0.7475
15	0.4181	2.3920	**49**	1.3657	0.7322
16	0.4459	2.2425	**50**	1.3935	0.7176
18	0.5017	1.9933	**52**	1.4493	0.6900
20	0.5574	1.7940	**54**	1.5050	0.6644
22	0.6132	1.6309	**55**	1.5329	0.6524
24	0.6689	1.4950	**56**	1.5608	0.6407
25	0.6968	1.4352	**58**	1.6165	0.6186
26	0.7246	1.3800	**60**	1.6722	0.5980
28	0.7804	1.2814	**62**	1.7280	0.5787
30	0.8361	1.1960	**65**	1.8116	0.5520
32	0.8919	1.1213	**67**	1.8673	0.5355
34	0.9476	1.0553	**70**	1.9509	0.5126
35	0.9755	1.0251	**72**	2.0067	0.4983
36	1.0033	0.9967	**75**	2.0903	0.4784
38	1.0591	0.9442	**77**	2.1460	0.4660
40	1.1148	0.8970	**80**	2.2297	0.4485
41	1.1427	0.8751	**82**	2.2854	0.4376
42	1.1706	0.8543	**85**	2.3690	0.4221
43	1.1984	0.8344	**87**	2.4247	0.4124
44	1.2263	0.8155	**90**	2.5084	0.3987

-RELATION BETWEEN FT^3/LT AND T/M^3

1T……= 0.98421 LT
$1M^3$……= 35.315 FT^3
T/M^3……= 35.88 FT^3/LT

5.14 Draught Marks Location

5.14Draft Markalarının Yerleri

6 NOTES FOR THE MASTER

6 Kaptan İçin Açıklamalar

6.1 General Instructions

6.1 Genel Açıklamalar

The attached stability calculations have been carried out in accordance with the SOLAS 1974 - regulations.

Ekte sunulan stabilite hesapları SOLAS 1974-kurallarına uygun olarak hesaplanmıştır.

6.2 General Precautions Against Capsizing

6.2 Devrilmeye Karşı Genel Uyarılar

1. Compliance with the stability criteria does not ensure immunity against capsizing regardless of the circumstances or absolve the master from his responsibilities. Master should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and navigational zone and should take the appropriate action as to speed and course warranted by the prevailing circumstances.
1. Stabilite kurallarına uygunluk kaptanın geminin devrilmesine karşı sorumluluk almayacağı anlamına gelmez. Bu sebeple kaptan yılın mevsimine, hava durumuna ve sefer bölgesine göre öngörüde bulunmalı, uygun seyir hızı ve rotada hareket etmelidir.
2. Care should be taken the cargo allocated to the ship is capable of being stowed so that compliance with the criteria can be achieved. If necessary, amount should be limited to the extent that ballast weight may be required
2. Gemiye alınan yükün istiflenmesine kriterlerin sağlanabilmesi için dikkat edilmelidir. Eğer gerekliyse, alınan yük miktarı azaltılarak balast ağırlığı arttırılabilir.
3. Before a voyage commences care should be taken to ensure that the cargo and sizable pieces of equipment have been properly stowed so as to minimize the possibility of both longitudinal and lateral shifting while at sea, under the effect of acceleration caused by rolling at pitching.
3. Seyir başlamadan taşınan yükün ve büyük parçaların yalpa ve baş kıç vurmadan kaynaklanan enine ve boyuna kaymasını engellemek için uygun bir şekilde istiflendiğine dikkat edilmelidir.
4. A ship, when engaged in towing operations, should possess an adequate reserve of stability to withstand the anticipated heeling moment arising from the tow line without endangering the towing ship.Deck cargo on board the towing ship should be so positioned as not to endanger the safe working of the crew on deck or impede the proper functioning of the towing equipment and be properly secured. Tow line arrangements should include towing springs and a method of quick release of the tow.
5. The number of partially filled or slack tanks should be kept to a minimum because of their adverse effect on stability. The negative effect on stability of filled pool tanks should be taken into consideration.
6. The stability criteria contained in part A chapter 2 set minimum values, but no maximum values are recommended. It is advisable to avoid excessive values of metacentric height, since these might lead to acceleration forces which could be prejudicial to the ship, its complement, its equipment and to safe carriage of the cargo. Slack tanks may, in exceptional cases, be used as a means of reducing excessive values of metacentric height. In such cases, due consideration should be given to sloshing effects.
7. Regard should be paid to the possible adverse effects on stability where certain bulk cargoes are carried. In this connection, attention should be paid to the IMO Code of Safe Practice for Solid Bulk Cargoes.

6.3 Operational Precautions In Heavy Weather

6.3 Ağır Hava Koşullarında Operasyonel Uyarılar

1. All doorways and other openings, through which water can enter into the hull or deckhouses, forecastle, etc., should be suitably closed in adverse weather conditions and accordingly all appliances for this purpose should be maintained on board and in good condition.

2. Weathertight and watertight hatches, doors, etc., should be kept closed during navigation,except when necessarily opened for the working of the ship and should always be ready for immediate closure and be clearly marked to indicate that these fittings are to be kept closed except for access. Hatch covers and flush deck scuttles in fishing vessels should be kept properly secured when not in use during fishing operations. All portable deadlights should be maintained in good condition and securely closed in bad weather.

3. Any closing devices provided for vent pipes to fuel tanks should be secured in bad weather.

4. Fish should never be carried in bulk without first being sure that the portable divisions in the holds are properly installed.

6.4 Ship Handling In Heavy Weather

6.4 Ağır Hava Koşullarında Gemiyi Taşıma

1. In all conditions of loading necessary care should be taken to maintain a seaworthy freeboard.

2. In severe weather, the speed of the ship should be reduced if propeller emergence, shipping of water on deck or heavy slamming occurs.

3. Special attention should be paid when a ship is sailing in following, quartering or head seas because dangerous phenomena such as parametric resonance, broaching to, reduction of stability on the wave crest, and excessive rolling may occur singularly, in sequence or simultaneously in a multiple combination, creating a threat of capsize. A ship's speed and/or course should be altered appropriately to avoid the above-mentioned phenomena[26].

4. Reliance on automatic steering may be dangerous as this prevents ready changes to course which may be needed in bad weather.

5. Water trapping in deck wells should be avoided. If freeing ports are not sufficient for the drainage of the well, the speed of the ship should be reduced or the course changed, or both.Freeing ports provided with closing appliances should always be capable of functioning and are not to be locked.

6. Masters should be aware that steep or breaking waves may occur in certain areas, or in certain wind and current combinations (river estuaries, shallow water areas, funnel shaped bays, etc.).These waves are particularly dangerous, especially for small ships.

7. In severe weather, the lateral wind pressure may cause a considerable angle of heel.If antiheeling measures (e.g.ballasting, use of anti-heeling devices, etc.) are used to compensate for heeling due to wind, changes of the ship’s course relative to the wind direction may lead to dangerous angles of heel or

capsizing. Therefore, heeling caused by the wind should not be compensated with anti-heeling measures,unless,subject to the approval by the Administration,the vessel has been proven by calculation to have sufficient stability in worst case conditions(i.e. improper or incorrect use, mechanism failure, unintended course change,etc.).Guidance on the use of anti-heeling measures should be provided in the stability booklet.

8. Use of operational guidelines for avoiding dangerous situations in severe weather conditions or an on-board computer based system is recommended. The method should be simple to use.

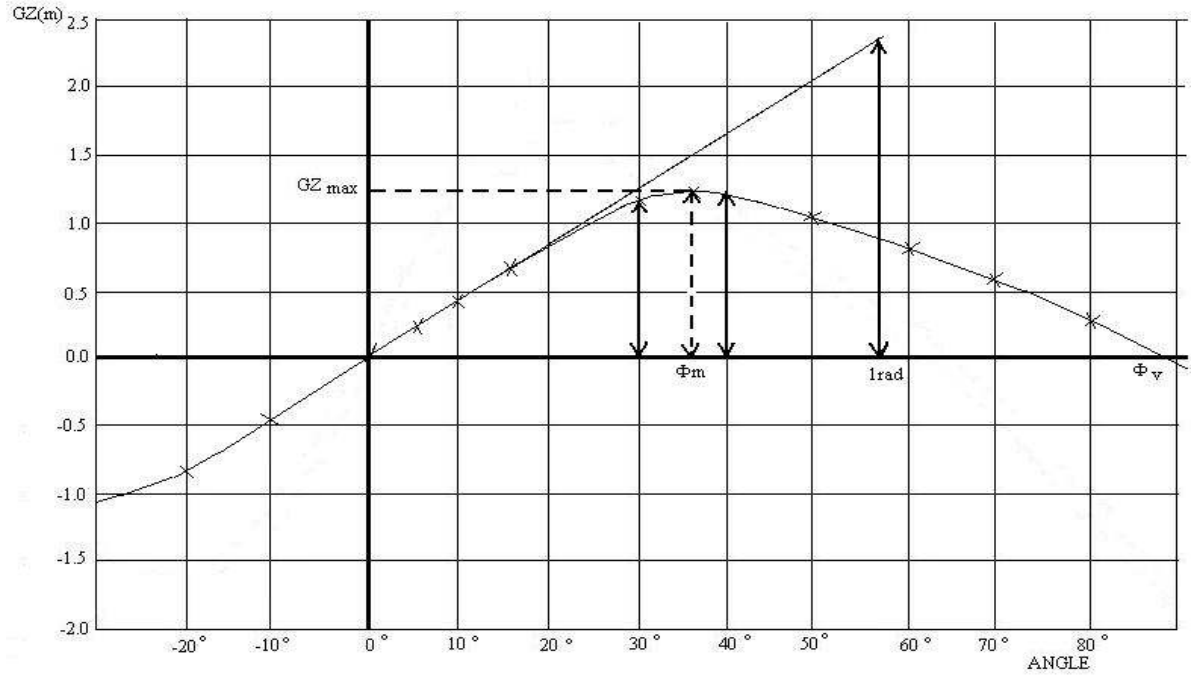
9. High-speed craft should not be intentionally operated outside the worst intended conditions and limitations specified in the relevant certificates, or in documents referred to therein.

6.5 Criteria of Stability

6.5 Stabilite (Denge) Kriterleri

Besides the normal stability criteria of ships, the stability is to satisfy the following special criteria:

Gemilerin normal stabilite koşullarının yanısıra aşağıdaki özel kriterleri de karşılaması gerekmektedir:



1. Area under curve up to 300 to be not less than 0.055 m.rad.

1. 30°'e kadar alan 0.055m.radyan'dan az olamaz

2. Area under curve up to 40° or the angle of flooding (Φf) if this angle is less than 40° to be not less than 0.090 m.rad.

2. 40°'ye veya bayılma açısına kadar (hangisi küçük ise) alan 0.090mradyan'dan az olamaz

3. The area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and Φf, if this angle is less than 40°, should not be less than 0.03 m.rad.

   Φf is an angle of heel at which openings in the hull, superstructures or deckhouses, which cannot be closed weathertight, immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open.

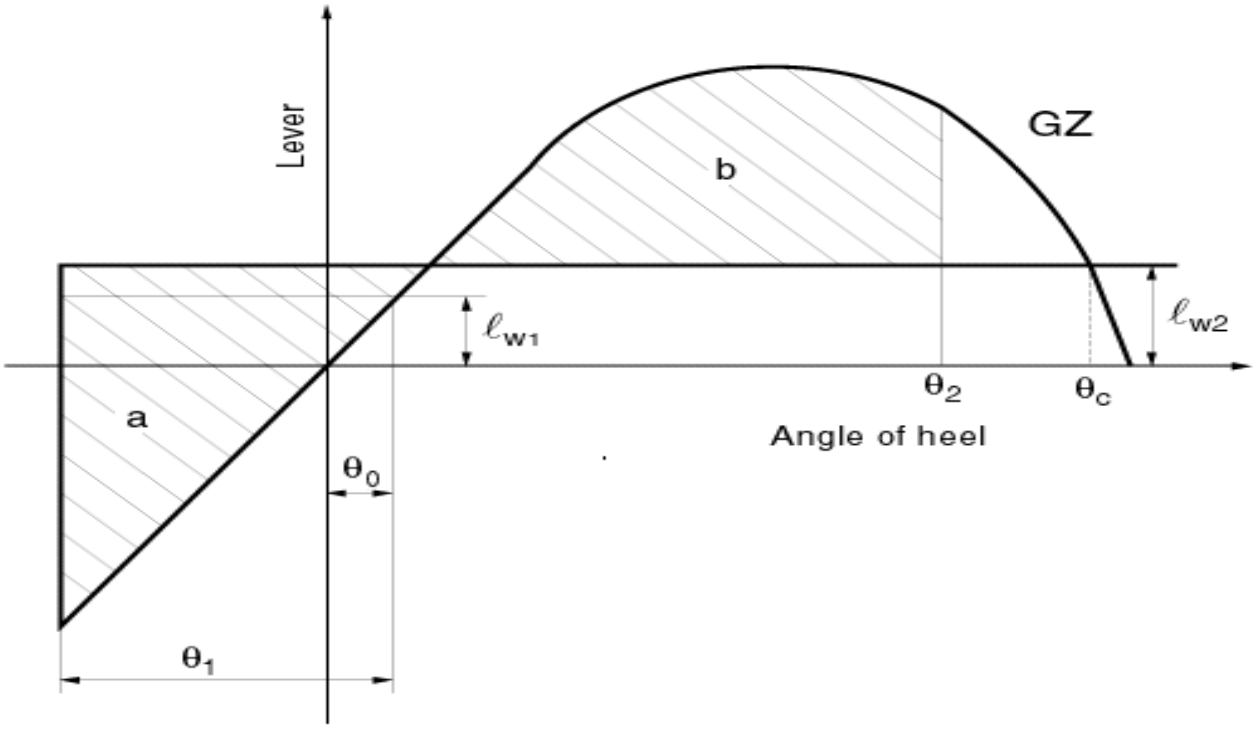
3. 30° ile 40° (veya daha küçükse bayılma açısı ΦF) arasında GZ-Φ eğrisi altında kalan alan 0.03mradyan'dan az olamaz.

ΦF açısı tekne üstünde veya üstyapılar veya güverte evlerinde su geçmez olarak kapatılamayan yerlerdir. Bu kriter uygulanırken küçük açıklıklar dikkate alınmaz.

4. The righting lever GZ should be at least 0.20 m. at an angle of heel equal to or greater than 30°.
4. GZ Doğrultucu moment kolu 30°'de 0.20m veya daha yüksek değerde olmalı
5. The maximum righting arm (GZ_{MAX}) should occur at an angle of heel preferably exceeding 30° but not less than 25°.
5. En büyük doğrultucu moment kolu GZ_{MAX} tercihen 30^0de (25°den az olmamalı) oluşmalıdır.
6. The initial metacentric height GM_0 should not be less than 0.15 m.
7. Başlangıç metasantr yüksekliği GM0 0.15'den az olmamalıdır.

6.6 Weather Criterion

6.6 Hava kriteri



θ_1 : Angle of roll to windward due to wave action.
θ_1 : Dalga hareketiyle oluşun rüzgara meyil açısı
θ_0 : Angle of heel under a steady wind load of 51.4 kg/m^2.
θ_0 : 51.4 kg/m^2 rüzgar yükü altında meyil açısı
θ_{dy} : Angle of dynamic heel assuming a θ_1 degrees roll to windward from θ_0 in association with a gusting wind condition which is 50 percent in excess of the steady wind condition.
θ_{dy} : Düzgün rüzgarın %50 katı sert rüzgarın etkisiyle θ_o dereceden θ_1 dereceye meyil ederken oluştuğu kabul edilen dinamik meyil açısı
l_{W1} : Heeling lever from a steady wind load when the ship is upright.
l_{W1} : Gemi doğrulduğunda düzgün rüzgardan gelen devirici moment kolu
l_{W2} : Heeling lever from a gusting wind = 1.5 x l_{W1}
l W2 : Sert rüzgarın devirici moment kolu = 1.5 x l W1
θ_{de} : Angle of deck Condition coplies with the regulations.
θ_{de} : Güvertenin batma açısı.
θ_2 : Angle of downflooding (θ_f) or 50° or θ_C (whichever is less).
θ_2 : Bayılma açısı veya 50º veya θ_C (hanigisi daha küçük ise)

θ_c : Angle of second intercept between l_{W2} and GZ curves.
θ_c : l_{W2} ve GZ eğrilerinin ikinci kesişim noktası
In any specific loading condition, the following should be complied with:
Herhangibir yükleme durumunda aşağıdaki şartlar sağlanmalıdır.
(i) θ_0 should not be more than 0.80 x θ_{de} or 16° whichever is less.
θ_0 değeri 0.8x θ_{de} 'den veya 16º'den küçük olmamalıdır.
(ii) The area S_2 measured upto θ_f or 50 ° or θ_C (whichever is less) should be greater than or equal to the area S_1 as shown above.
Bayılma açısı veya 50 veya θ_C (hanigisi daha küçük ise) o açıya kadar hesaplanan S_2 alanı yukarıda gösterilen S_1 alanına eşit veya büyük olmalıdır.
Notes:
The angle of down flooding (θ_f) is an angle of heel at which openings in the hull, superstructure or deckhouse, which cannot be made weather tight , immerse. In applying this criteria small openings through which progressive flooding cannot take place need not be considered as open.
Bayılma açısı su geçmez olarak yapılamayan güverte evi kasara ve benzeri tekne üzerindeki yerlerin su aldığı açıdır. Su alabilecek küçük açıklıklar bu kriter için açık kabul edilmesine gerek yoktur.
The wind heeling levers L_{W1} and L_{W2} are constant values at all angle of inclination and should be calculated as follows:
Rüzgar devirici moment kolları L_{W1} ve L_{W2} meyil açılarında sabit değerlerdir, aşağıdaki gibi hesaplanır;

$$LW\ 1 = \frac{P * A * Z}{\Delta} \qquad (m)$$

LW_2 =1.5 LW_1 (m) where;
P = 0.0514 (t/m^2)
A : Projected lateral area of the ship and deck cargo above the waterline (m^2)
A : Gemi gövdesinin ve kargo güvertelerinin su hattı üstünde kalan yanal alanı(m^2)
Z : Vertical distance from the centre of A to the underwater lateral area or approximately to a point one half the draught (m)
Z : A alanının, alan merkezinin su altındaki gemi yanal alanının alan merkezine ya da yaklaşık olarak ortasında bir noktaya olan uzaklığı (m)
Δ : Displacement (t)
Δ : Deplasman (t)
The angle of roll (Q_1) should be calculated as follows:
Yalpa açısı (Q_1) aşağıdaki şekilde hesaplanmalıdır:
Q1 = 109*k*X_1*X_2 *sqrt (r.s) where;
X_1 : factor as shown in table 1
X_1 : çarpanı tablo 1'den seçilecek
X_2 : factor as shown in table 2
X_2 : çarpanı tablo 2'den seçilecek
k : factor as follows:
k = 1.0 for round-bilged ship having no bilge or bar keels;
k= 1.0 dairesel sintine dönümü yalpa omurgasız gemiler için
k = 0.7 for a ship having sharp bilges;
k= 0.7 keskin sintine dönümlü gemiler için
k = as shown in table 3 for a ship having bilge keels, a bar keel or both.
Hem sintine dönümü dairesel olan hem de yalpa omurgalı gemiler için k deeğeri tablo 3'den okunmalıdır
r = 0.73 ± 0.6*OG/d with;
OG : distance between the centre of gravity and the waterline (m) (+ve if centre of gravity is above the waterline, -ve if is below)
OG : değeri su hattı ile ağırlık merkezi arasındaki mesafedir
d : Mean moulded draught of the ship (m)
d : Yüklü su çekimi

s : factor as shown in table 4
s : tablo 4'de belirtilen s faktörü

Table 1 - Values of coefficient X_1	
B/d	X_1
≤2.4	1.00
2.5	0.98
2.6	0.96
2.7	0.95
2.8	0.93
2.9	0.91
3.0	0.90
3.1	0.88
3.2	0.86
3.4	0.82
≤ 3.5	0.80

Table 2 - Values of coefficient X2	
C_B	X_2
≤ 0.45	0.75
0.5	0.82
0.55	0.89
0.6	0.95
0.65	0.97
≤ 0.70	1.00

Table 3 - Values of coefficient k	
$\frac{A_K \times 100}{L \times B}$	k
0.0	1.00
1.0	0.98
1.5	0.95
2.0	0.88
2.5	0.79
3.0	0.74
3.5	0.72
≤ 4.0	0.70

Table 4 - Values of factor s	
T_R	s
≤ 6	0.100
7	0.098
8	0.093
12	0.065
14	0.053
16	0.044
18	0.038
≤ 20	0.035

(Intermediate values in table 1-4 should be obtained by linear interpolation.)
(1-4 tablolarındaki ara değerler enterpolasyon ile bulunmalıdır)
The rolling period T_R, in s, is calculated as follows (yalpa periyodu T_R aşağıdaki gibi hesaplandı)

$$T_R = \frac{2CB}{\sqrt{GM}}$$

Where;
C = 0.373 + 0.023 (B/d) – 0.043 (L/100)
The symbols in above tables and formula for the rolling period are defined as follows:-
Tablo ve sembollerde gösterinlen sembollerin anlamları aşağıdaki gibidir:
L : Waterline length of the ship (m)
L : Geminin su hattı boyu
B : Moulded breadth of the ship (m)
B : Gemi eni
d : Mean moulded draught of the ship (m)
d : Gemi derinliği
C_B : Block coefficient
C_B : Blok katsayısı
A_K : Total overall area of bilge keel, or area of the lateral projection of the bar keel, or sum of these areas (m^2)
A_K : Toplam alan yalpa omurga veya koruması veya bütün bu alanların toplamı
GM : Metacentric height corrected for free surface effects (m)
GM : Enine metasantr yüksekliği

6.7 Trim Calculation

6.7 Trim Hesabı

This explanation is referred to the page “Trim And Stability”

Bu açıklama, "Trim Ve Stabilite Sayfasına" referans olarak yapılmaktadır.

1. Write all weights in compartments (fuel, fresh water or ballast etc.) in the “Weight” column.

1. Her tanktaki ve depodaki yükün , yakıtın, içme suyunun veya balast suyunun vs. Ağırlığını ton birimleri olarak "Ağırlık" sütununa yazınız.

2. Add all weights explained above and get the total value as displacement in the “Weight” column.

2. Yukarıda belirtilen ağırlıkları ve boş gemiyi, deplasman olarak "Ağırlık" sütununda toplayınız.

3. Multiply the values written in the “Weight" column and the values written in the “LCG” column. Write the result values in “Long’l Mom.” column as a moment value calculated according to the AP.

3. "Ağırlık" sütunundaki değerleri , her tank, yük ambarı vs. ile AP arasındaki boyuna ağırlık merkezi olan "LCG" ile çarpınız. Elde edilen değerleri, her ağırlığın AP 'ye göre momenti olarak "Long’l Mom." sütununa yazınız.

4. Divide the total value of the LONG’L MOM column by displacement.

4. "Long’l Mom." sütunun alt çizgide gösterilen toplamını, deplasmana bölünüz)

5. Trim value according to the “LCG” and the displacement can be calculated by the following formula

5. Deplasman ve “LCG”’ ye göre trim ve draft aşağıdaki formülle hesaplanacaktır.

$$TRIM = \frac{TRIMMom}{MT\ 1} = \frac{\Delta * (LCG - LCB)}{(MT\ 1 * 100)} \text{ (m)}$$

$$dF = dLCF - \frac{TRIM * (LBP - LCF)}{LBP} \text{ (m)}$$

$$dA = dF + TRIM \text{ (m)}$$

$$dM = \frac{(dF + dA)}{2} \text{ (m)}$$

Symbols determines;

Kullanılan kısaltmalar;

LCB : Longitudinal center of buoyancy

LCB : AP’ den itibaren boyuna hacim merkezi

dLCF : The max. draught value at the waterplane area

dLCF : Su alanı merkezindeki en büyük draft

LCF : Longitudinal center of floating

LCF : AP’ den itibaren boyuna su alanı merkezi

dF : Draught at fore peak

dF : FP’ deki draft

dA : Draught at aft peak

dA : AP’ deki draft

dM : Mean of dA and dF

dM : dF ve dA’ nın ortalaması

MT1 : 1cm trim moment

MT1 : Bir santimetre trim değişikliğinin momenti

LCB, dLCF, LCF and MT1 values are harmonized with the displacement value. These values can get from “The Hydrostatic Values” tables. If trim is positive this means ship is on head, if negative on aft.

LCB, dLCF, LCF ve MT1 değerleri deplasmanla uyum halinde olacaktır. Bunlar "Hidrostatik Değerler Tablosu"’ ndan alınabilir.Şayet trim pozitif ise, gemi kıça trimli negatif ise başa trimli demektir.

6.8 Stability Calculation

6.8 Stabilite Hesabı

This explanation is referred to the page “Trim And Stability”.

Bu açıklama "Trim Ve Stabilite Sayfası" na referans olarak yapılmaktadır.

6.8.1 Calculating Metacentric Height (GM)

6.8.1 Metasantr Yüksekliğinin Hesaplanması (GM)

i. Write the vertical center of all weights in VCG column. You can take the compartment weights from capacities and centers tables.

i. Her yükleme ağırlığının, ağırlık merkezi düşey yüksekliğini "VCG" sütununa yazınız. Her bölmenin yükleme ağırlığına uygun olan, düşey ağırlık merkezi "KAPASİTELER VE MERKEZLER" başlıklı tablolardan alınabilir.

ii. Multiply the values written in weights column and VCG column. Write the results in “vertical moment” column.

ii. "Ağırlık sütunundaki değeri "VCG" ile çarpınız ve elde edilen neticeyi, her yükleme ağırlığının dikey momenti olarak "DİKEY MOMENT" sütununa yazınız.

iii. Divide the sum of the values of vertical moment column by displacement. Write the result value to cell placed bottom of the VCG column.

iii. "DİKEY MOMENT" sütununun dip çizgide belirtilen toplamını, deplasmana bölünüz. Elde edilen sonucu, hesap edilen şarta uygun olarak taban çizgisi yukarısındaki dikey ağırlık merkezini gösteren VCG sütununun alt satırına yazınız.

iv. Write the free surface moments of all compartment to the FSM column. You can get these values from “Capacities And Centers” table.

iv. Her tankın serbest yüzey momentini "FSM" sütununa yazınız. Tankların serbest yüzey momenti "Kapasiteler Ve Merkezler" başlıklı çizelgeden alınabilir.

v. Sum all FSM values and write the result values to cell placed bottom of the FSM column.

v. "FSM" sütunu ve belirtilen toplamı, FSM sütununun alt çizgisinde birbiriyle toplayınız.

vi. FSM correction can be calculated by using the following formula.

vi. Serbest yüzey etkisinden kaynaklanan dikey ağırlık merkezinin yükselişi aşağıdaki formülle hesaplanacaktır.

$$FSC = \frac{\sum FSM}{\Delta} \quad (m)$$

FSC : FSM correction (m)

FSC :Dikey ağırlık merkezinde görülen yükseliş (metre)

If the fluid has a different density, free surface moment can be calculated as follows.

Sıvının "KAPASİTELER VE MERKEZLER" başlıklı çizelgede verilen standart değere göre farklı bir özgül ağırlığa sahip olması halinde, serbest yüzey momenti aşağıda gösterildiği gibi hesaplanacaktır.

FSM = Free surface inertia (m^4) x density of the fluid

FSM = Bölme yüzey atalet momenti (m^4) x Bölmedeki sıvının özgül ağırlığı (t/m^3) olacaktır.

Ballast tanks must be fully filled, there is no need to calculate FSM correction and correct the GM value.

Geminin trimi ayarı için kullanılanlar haricinde, balast tanklarının deniz suyu ile, tam olarak doldurulması gerekli olup, böylelikle serbest yüzey etkisinden kaynaklanan GM düzeltilmesine gerek kalmayacaktır.

i. The metacentric height of the ship will be calculated as follows,

i. Geminin metasentrik yüksekliği (GM) aşağıda belirtildiği gibi hesaplanmaktadır.

GM = KM – KG (m)

These symbols determines;

Burada;

KM : Taken from “The Hydrostatic Table” transverse metacentric height from base

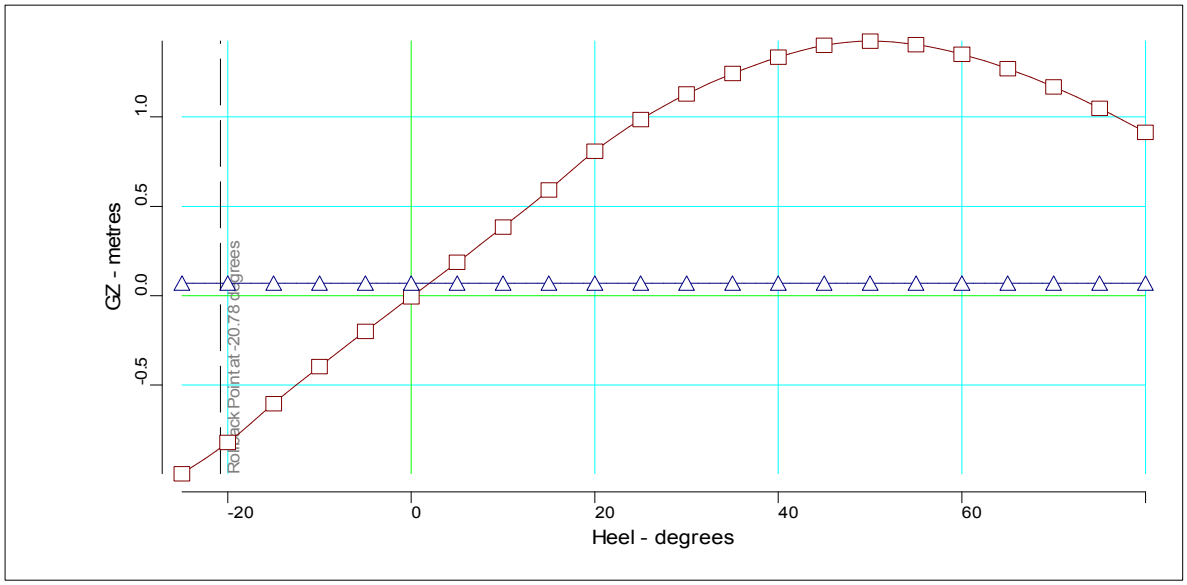
line
KM : "Hidrostatik Değerler Tablosundan" dan okunan kaide hattından itibaren enine metasantr yüksekliğidir.
KG : Vertical center of gravity value corrected by FSM.
KG : Taban çizgisinden başlayarak geminin ağırlık merkezi ile serbest yüzeyler düzeltmesinin toplamı
KG = VCG + FSC
GM : Result of the metecentric height and free surface effect.
GM : Metasentrik yükseklik ve serbest yüzey etkileri toplamıdır.
GM = KM – KG

6.8.2 To get the static stability Curve
6.8.2 Statik Stabilite Eğrisinin Elde Edilmesi
The rigthing lever curve can be plotted as follows,
Statik stabilite eğrisi (doğrultma moment kolu) aşağıdaki yöntemle elde edilir.
i. First calculate the vertical center of gravity
i. Önce gemi ağırlık merkezi KG 'nin düşey yerini hesaplayınız.
KG = VCG + FSC
ii. Get the KN or KZ values from the Cross curves table
ii. Bu deplasmanda her meyil açısı için KZ veya KN değerlerini metre olarak "CROSS CURVERS"'den (Stabilite Çapraz Değerleri Tablosundan veya Grafiğinden) okuyunuz.
iii. Calculate the righting lever (GZ) for each inclining angle
iii. Her meyil açısı için doğrultma kolunu (GZ) hesaplayınız. Şöyle ki;
GZ = KN - KG*sinΦ (m)
iv. Combine the values GZ (as ordinate) and the angles (absis) as a curve.
GZ değerlerini ordinat ve Φ değerlerini absis olarak belirleyiniz ve bu noktaları düzgün bir eğri ile birleştiriniz.

6.8.3 An Example For Usage Of The Cross Curves
6.8.3Çapraz Eğrilerin Kullanılışına Ait Bir Örnek
The ship is considered in a condition => displacement equals 1410.70 tonnes.
Gemi için herhangi bir seyir koşulu altındaki deplasmanı biliyor kabul edelim. Deplasman (Δ) = 1410.70 ton olsun.
The vertical center of the gravitity of the ship KGf = 2.538 and in this condition KM = 4.724. In the condition lets get the GZ-angle values and GM.
Geminin bu deplasmandaki ağırlık merkezi ile serbest yüzey etkileri toplamının (KGf) 2.538 metre, kaide hattından itibaren enine metasantr yüksekliğinin (KM) 4.724 metre olduğuna göre GZ-Φ değerlerini ve GMf'i hesaplayalım

Meyil Açısı -θ (derece) / **Inclining angle**	**5º**	**10º**	**20º**	**30º**	**40º**	**50º**	**60º**	**70º**	**80º**
KZ (KN) (metre)	0.407	0.825	1.676	2.396	2.965	3.368	3.548	3.553	3.413
KG (metre)	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538
KG*SINθ	0.221	0.441	0.868	1.269	1.631	1.944	2.198	2.385	2.499
GZ=KN-KG*SINθ (m)	0.186	0.384	0.808	1.127	1.334	1.424	1.350	1.168	0.914

GMf = KM - KGf
= 4.724-2.538
= 2.186m olarak bulunur.



6.8.4 Notes on Use of Free Surface Correction

6.8.4 Serbest Su Yüzeyi Düzeltmesi

If tank is completely filled with liquid, are movements of this liquid impossible, and the effect on the ships stability is identical to the effect of a tank containing solid material. Immediately a quantity of liquid is withdrawn from the tank, the situation changes completely and the stability of the ship is adversely affected by what is known as the 'free surface affects'. Due the ship's list a part of the liquid will shift to the lower sides of the tank, which provides an additional heeling moment. This adverse effect on the stability is identical to a 'loss in GM ' or as a virtual rise in the virtual center of gravity.

This is calculated as fallows:

Eğer tank tamamen sıvı ile doldurulmuş ise, sıvının hareket etmesi mümkün değildir ve tankın gemi stabilitesine etkisi tankın katı bir malzeme taşıyormuş gibi etki etmesi anlamına gelir. Tanktan bir miktar sıvı alınır ise, durum tamamen değişir ve gemi stabilitesi "serbest su yüzeyi etkisi" adı verilen bir etki ile ters yönde etkilenir. Geminin yalpa durumunda bir miktar sıvı tankın düşük tarafına doğru kayacaktır, ve bu ek bir devirici moment doğuracaktır. Bu ters etki, stabilitede GM azalmasına ve sanal ağırlık merkezinin artmasına sebep olacaktır. Bu etki aşağıdaki şekilde hesaplanır.

$$FSC = \frac{I\,momxS.G.}{\Delta}\ (m)$$

FSC : FSM correction (m)

FSC :Serbest su yüzeyi etkisi nedeniyle dikey ağırlık merkezinde görülen yükseliş (m)

Imom : Moment of inertia (m^4)

Imom :Atalet momenti (m^4)

S.G. : Specific Weight of Liquid in Tank (t/m^3)

S.G. :Tanktaki sıvının özgül ağırlığı (t/m^3)

Δ Displacement (t)

Δ Deplasman (t)

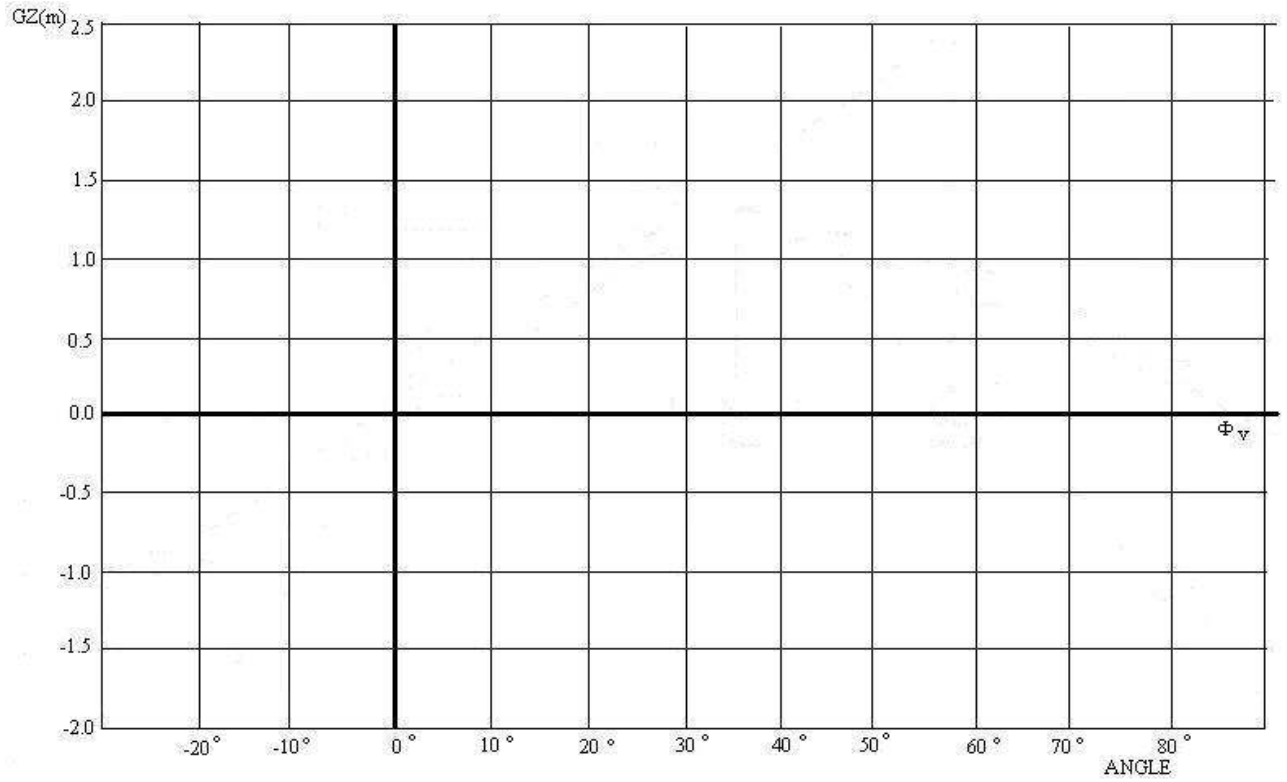
The free surface effects of all tanks have to be taken into account in both the Arrival and Departure Conditions. The free surface effects can be taken from the sheet "Departure Conditions" and "Arrival Conditons".

Tüm tanklar için "serbest su yüzeyi etkisi" değerleri Kalkış ve Varış durumları sayfalarından alınabilir.

6.9 Trim and Stability Calculation Form

6.9 Trim ve Stabilite Hesap Formu

Item Name	Weight tonne	Long. Arm m	Mom.x Tonne.m	Vertical Arm m	Mom.z Tonne.m	Trans. Arm m	Mom.y Tonne.m	FS Mom Tonne.m



Heel to Port degrees	-30.0	-25.0	-20.0	-15.0	-10.0	-5.0	0.0	5.0	10.0	15.0	20.0
GZ m											

Heel to Port degrees	30.0	40.0	50.0	60.0	70.0	80.0	90.0
GZ m							

Criteria	Value	Units	Actual	Status
3.1.2.1: Area 0 to 30				
shall not be less than (>=)	0.055	m.rad		
3.1.2.1: Area 0 to 40				
shall not be less than (>=)	0.090	m.rad		
3.1.2.1: Area 30 to 40				
shall not be less than (>=)	0.030	m.rad		
3.1.2.2: Max GZ at 30 or greater				
shall not be less than (>=)	0.200	m		
3.1.2.3: Angle of maximum GZ				
shall not be less than (>=)	25.0	deg		
3.1.2.4: Initial GMt				
shall not be less than (>=)	0.150	m		
3.2.2: Severe wind and rolling				
Angle of steady heel shall not be greater than (<=)	16.0	deg		
Area1 / Area2 shall not be less than (>=)	100.000	%		

7 CAPACITIES & CENTERS

7 Kapasiteler ve Merkezleri

Category WB - Water Ballast (SG = 1.025 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
Deep Tk P	98-104	114.750	117.619	69.824	-2.156	4.098	61
Deep Tk S	98-104	114.750	117.619	69.824	2.156	4.098	61
Fore Peak Tk C	104-114	100.990	103.515	74.464	0.000	4.106	98
No 1 Water Ballast Tk P	72-98	136.060	139.462	57.733	-3.161	0.695	509
No 1 Water Ballast Tk S	72-98	136.060	139.462	57.733	3.161	0.695	509
No 2 Water Ballast Tk P	49-72	67.670	69.362	41.653	-5.739	0.714	69
No 2 Water Ballast Tk S	49-72	67.670	69.362	41.653	5.739	0.714	69
Total		**737.950**	**756.399**	**60.834**	**0.000**	**2.224**	

Category HFO - Fuel Oil (SG = 0.940 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
No 1 HFO Tk C	63-72	63.210	59.417	46.551	0.000	0.661	263
No 2 HFO Tk P	24-63	114.150	107.301	31.553	-1.786	0.659	115
No 2 HFO Tk S	24-63	114.150	107.301	31.553	1.786	0.659	115
No 3 HFO Tk P	24-49	66.460	62.473	25.226	-4.573	0.735	132
No 3 HFO Tk S	24-49	66.460	62.473	25.226	4.573	0.735	132
Total		**424.430**	**398.964**	**31.805**	**0.000**	**0.683**	

Category MDO - Diesel Oil (SG = 0.870 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
No 4 MDO Tk P	18-24	10.779	9.378	14.221	-1.886	0.658	10
No 4 MDO Tk S	18-24	10.779	9.378	14.221	1.886	0.658	10
No 5 MDO Tk P	8-13	17.350	15.095	6.911	-3.716	6.040	8
No 5 MDO Tk S	8-13	17.350	15.095	6.911	3.716	6.040	8
Total		**56.260**	**48.945**	**9.713**	**0.000**	**3.978**	

Category LO - Lube Oil (SG = 0.920 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
Lube Oil Storage Tk C	10-17	6.830	6.284	8.435	0.047	0.553	3
Total		**6.830**	**6.284**	**8.435**	**0.047**	**0.553**	

Category FW - Fresh Water (SG = 1.000 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
Aft Peak Fw Tk C	-5-7	61.630	61.630	1.942	0.018	6.026	198
Total		**61.630**	**61.630**	**1.942**	**0.018**	**6.026**	

Category OTH - Other (SG = 1.000 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	IT (m^4)
Aft Bilge Tk C	7-11	3.500	3.500	5.616	0.091	0.661	1
Bilge Tk C	18-24	3.950	3.950	14.000	0.000	0.375	0
Total		**7.450**	**7.450**	**10.061**	**0.043**	**0.509**	

Category CARGO - Hold (SG = 0.812 tonnes/cu.m 100 % full)

Compartment	Frames	Volume (m^3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)
No 1 Cargo Hold	72-98	2337.820	1897.409	58.710	0.000	5.900
No 2 Cargo Hold	25-72	4256.460	3454.605	33.484	0.000	5.673
Total		**6594.280**	**5352.013**	**42.427**	**0.000**	**5.754**

Mainhull Compartments

Compartment	Frames	Volume (m^3)	LCG (m)	TCG (m)	VCG (m)
Envelope	-6-118	9895.276	39.480	0.000	5.509
Total		**9895.280**	**39.480**	**0.000**	**5.509**

Content Types

Name	Type	Density (t/m3)	Grain Angle degrees	Colour	Permeability %
WB	Liquid	1.0250	NA		100.00
HFO	Liquid	0.9400	NA		100.00
MDO	Liquid	0.8700	NA		100.00
LO	Liquid	0.9200	NA		100.00
FW	Liquid	1.0000	NA		100.00
OTH	Liquid	1.0000	NA		100.00
CARGO	Solid	0.8116	NA		100.00

8 PERMISSIBLE SHEAR FORCE-BENDING MOMENTS

8 Izinverilebilir Kesme kuvveti-Egilme Momenti

SF-BM Values/Harbour Cond

X position (m)	+ve S.F. (kN)	-ve S.F. (kN)	Sag B.M. (kNm)	Hog B.M. (kNm)	Torsion M. (kNm)	Bulkhead Factor	Description
15.600	7169	8843	137464	111427	0.0	0.0000	0.20L
23.400	7169	8843	206197	167141	0.0	0.0000	0.30L
31.200	6728	6728	274930	222856	0.0	0.0000	0.40L
46.800	6728	6728	274930	222856	0.0	0.0000	0.60L
50.700	8170	6950	274930	222856	0.0	0.0000	0.65L
54.600	9614	7169	235654	191020	0.0	0.0000	0.70L
66.300	9614	7169	117828	95510	0.0	0.0000	0.85L

SF-BM Values/Still Water

X position (m)	+ve S.F. (kN)	-ve S.F. (kN)	Sag B.M. (kNm)	Hog B.M. (kNm)	Torsion M. (kNm)	Bulkhead Factor	Description
15.600	3983	4913	76369	61904	0.0	0.0000	0.20L
23.400	3983	4913	114554	92856	0.0	0.0000	0.30L
31.200	3738	3738	152739	123809	0.0	0.0000	0.40L
46.800	3738	3738	152739	123809	0.0	0.0000	0.60L
50.700	4539	3861	152739	123809	0.0	0.0000	0.65L
54.600	5341	3983	130919	106122	0.0	0.0000	0.70L
66.300	5341	3983	65460	53061	0.0	0.0000	0.85L

9 LIGHTSHIP DISTRIBUTION

9 Bos Tekne Agirlik Dagilimi

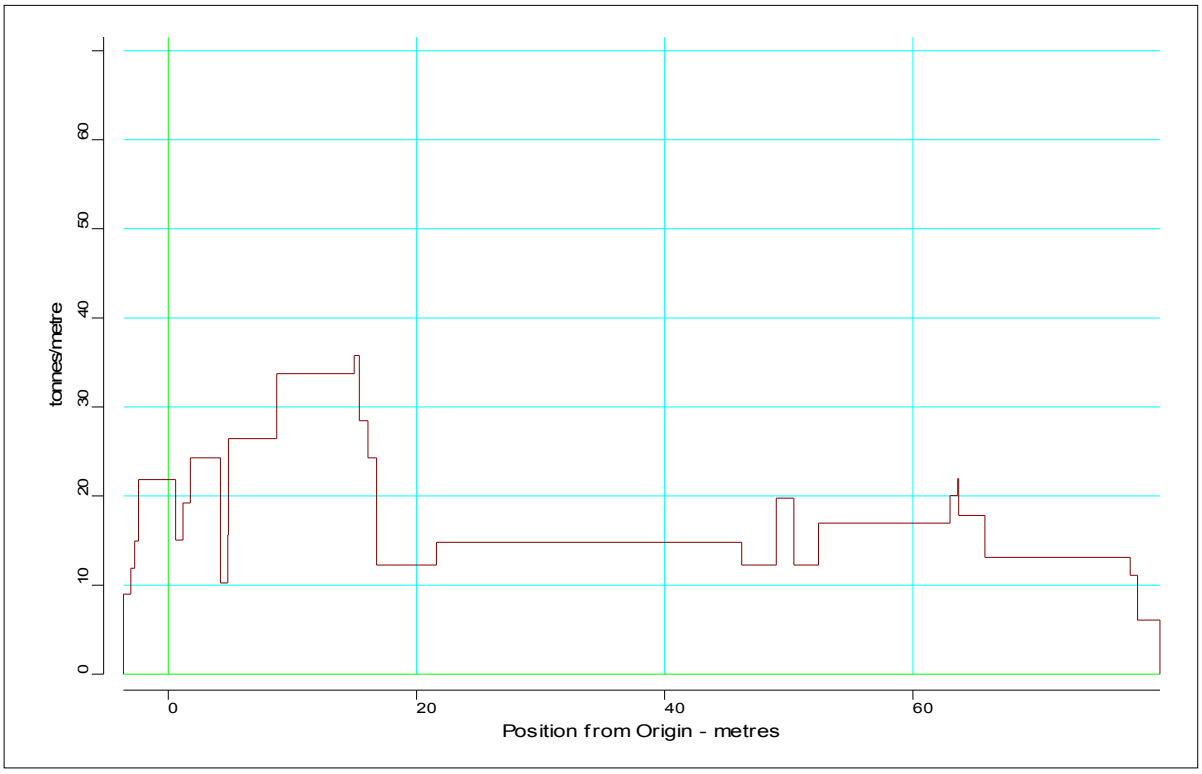
Lightweight Summary

Item	Weight (t)	LCG (m)	TCG (m)	VCG (m)	FSM (t-m)	Aft ext. (m)	Fwd ext. (m)
MAIN ENGINE	48.48	12.075	0.000	7.170	0.00	8.750	15.400
ENGINE ROOM	129.24	10.825	0.000	7.170	0.00	4.850	16.800
AFT PEAK	70.00	0.300	0.000	7.170	0.00	-3.600	4.200
DOUBLE BOTTOM	194.54	40.250	0.000	7.170	0.00	16.800	63.700
FORE PEAK	23.41	70.550	0.000	7.170	0.00	63.000	78.100
FORECASTLE&CHAIN LOCKER	23.31	70.550	0.000	7.170	0.00	63.000	78.100
POOP DECK EQUIPMENT	10.53	-1.200	0.000	7.170	0.00	-3.000	0.600
DECKHOUSE	48.51	8.650	0.000	7.170	0.00	1.200	16.100
SHELL PLATING	250.60	38.750	0.000	7.170	0.00	-2.400	79.900
FURNITURES	13.68	8.650	0.000	7.170	0.00	1.200	16.100
RUDDER&STEERING GEAR	11.60	-0.900	0.000	7.170	0.00	-2.400	0.600
PROPULSION	12.11	3.000	0.000	7.170	0.00	1.800	4.200
MACHINERY EQUIPMENTS	64.62	10.800	0.000	7.170	0.00	4.800	16.800
PIPING	126.20	46.250	0.000	7.170	0.00	15.000	77.500
COAMING & COVER 1	63.06	59.100	0.000	7.170	0.00	52.400	65.800
CHAIN & ANCHOR	9.45	70.850	0.000	7.170	0.00	63.600	78.100
FORECASTLE EQUIPMENTS	18.31	70.850	0.000	7.170	0.00	63.600	78.100
TRANSVERSE BULKHEAD	10.53	49.700	0.000	7.170	0.00	49.000	50.400
MAIN DECK PLATE	250.77	38.600	0.000	7.170	0.00	-2.700	79.900
COAMING & COVER 2	63.06	33.900	0.000	7.170	0.00	21.600	46.200
Total	**1442.00**	**33.260**	**0.000**	**7.170**	**0.00**		

Lightweight Distribution

X Position (m)	Wt.aft (t/m)	Wt.fwd (t/m)
-3.60	0.000	8.975
-3.00	8.975	11.899
-2.70	11.899	14.935
-2.40	14.935	21.848
0.60	21.848	15.055
1.20	15.055	19.229
1.80	19.229	24.273
4.20	24.273	10.254
4.80	10.254	15.639
4.85	15.639	26.454
8.75	26.454	33.745
15.00	33.745	35.764
15.40	35.764	28.473
16.10	28.473	24.299
16.80	24.299	12.248
21.60	12.248	14.811
46.20	14.811	12.248
49.00	12.248	19.769
50.40	19.769	12.248
52.40	12.248	16.954
63.00	16.954	20.048
63.60	20.048	21.963
63.70	21.963	17.815
65.80	17.815	13.109
77.50	13.109	11.090
78.10	11.090	6.081
79.90	6.081	0.000

Lightweight Distribution



Loading Conditions

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Heavy Timber Arrival[SG=2.50 cubm/t]	98
Light Timber Departure[SG=5.00 cubm/t]	108
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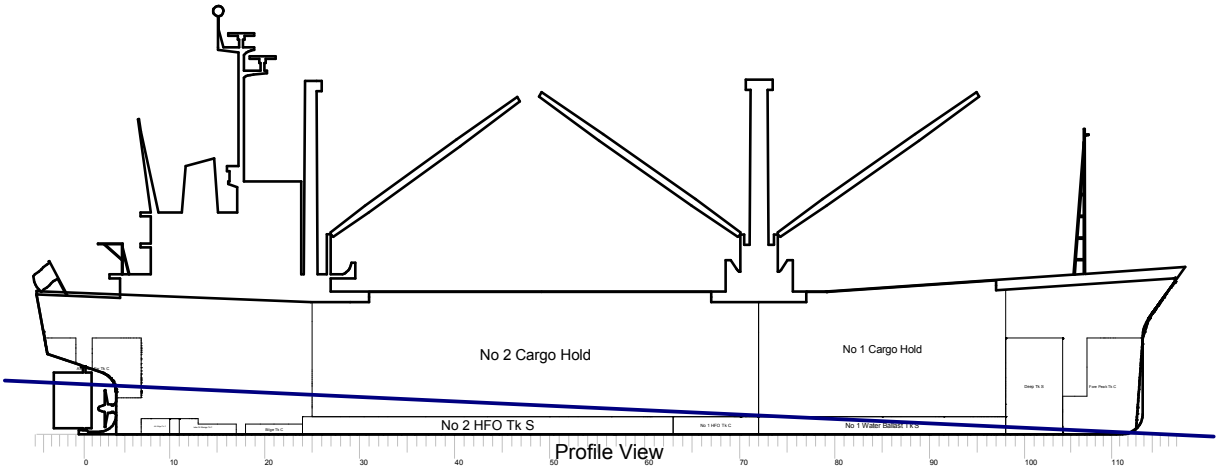
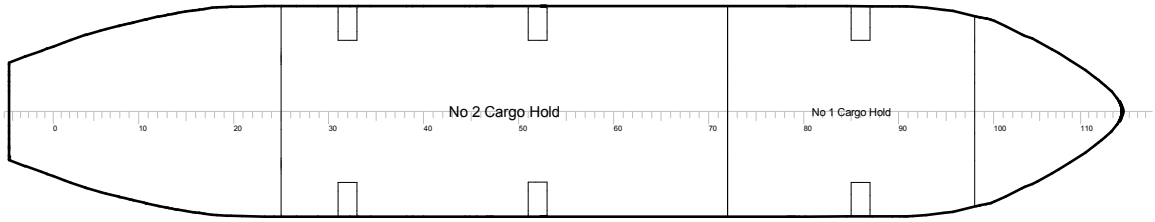
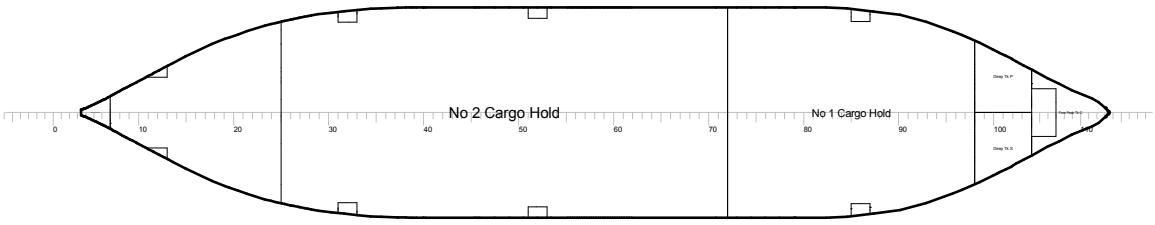
Intact State



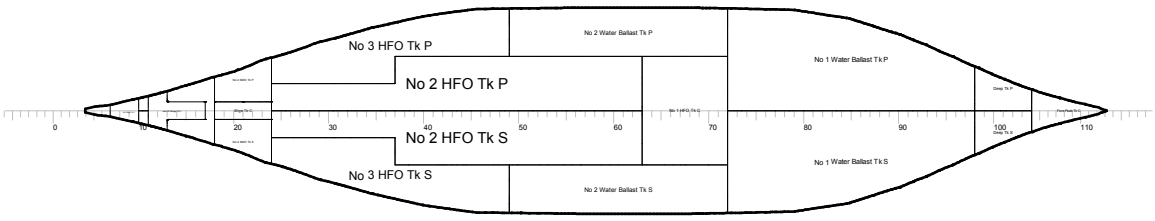
Profile View



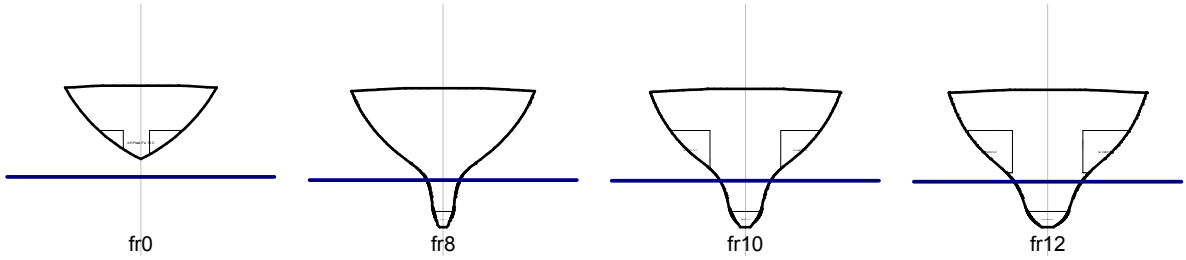
Deck 9.000m above B.L.



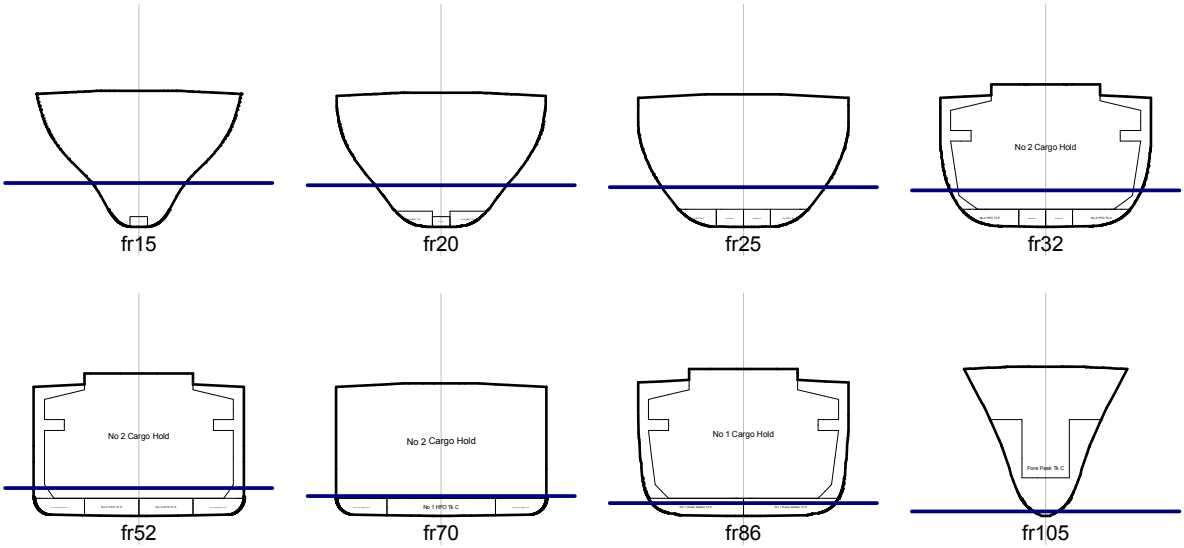
Deck 4.000m above B.L.



Deck 0.700m above B.L.



fr0 fr8 fr10 fr12


fr15
fr20
fr25
No 2 Cargo Hold
fr32
No 2 Cargo Hold
fr52
No 2 Cargo Hold
No 1 HFO Tk C
fr70
No 1 Cargo Hold
fr86
Fore Peak Tk C
fr105

Intact State

Intact State

Title	Frames	Cargo	% full	SG (t/m3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	FSM (t-m)	S M
Lightweight					**1442.0**	**33.26**	**0.00**	**7.17**	**0.0**	
Deadweight					**0.0**	**0.00**	**0.00**	**0.00**	**0.0**	
Total					**1442.0**	**33.26**	**0.00**	**7.17**	**0.0**	
Buoyancy					**1442.0**	**32.98**	**0.00**	**1.17**	**14014.8**	
Total Buoyancy					**1442.0**	**32.98**	**0.00**	**1.17**	**14014.8**	

Intact State

Drafts at equilibrium angle

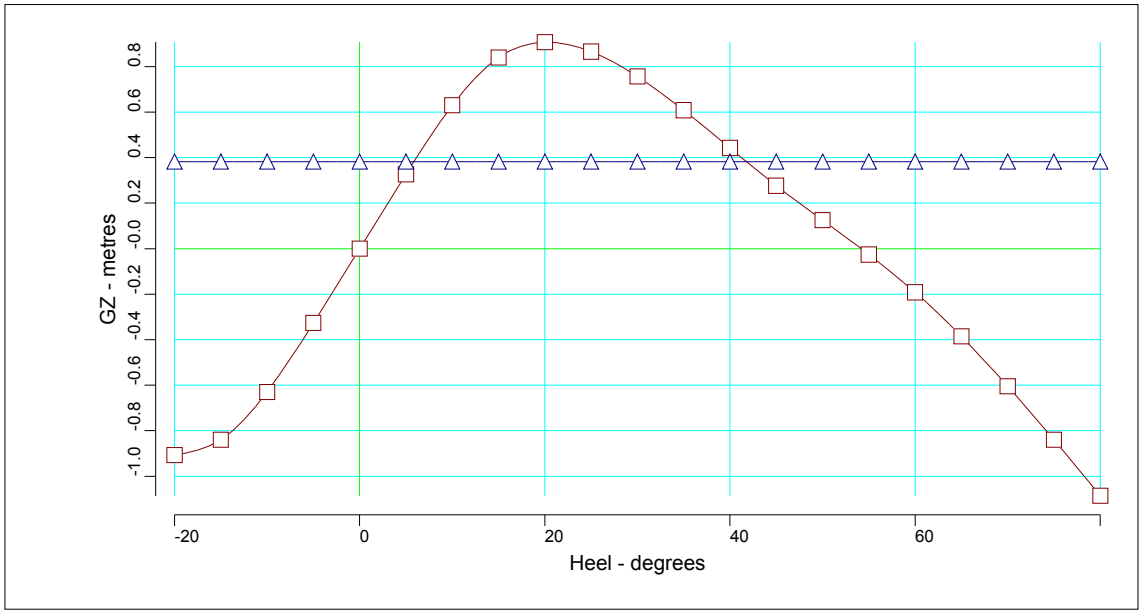
	Moulded	Extreme	
Draft at LCF	1.898	1.911	metres
Draft aft at marks	3.549	3.562	metres
Draft fwd at marks	0.115	0.128	metres
Draft at AP	3.687	3.700	metres
Draft at FP	0.092	0.105	metres
Mean draft at midships	1.889	1.902	metres

Hydrostatics at equilibrium angle

Density of water	1.0250	tonnes/cu.m
Heel	No heel	
Trim by the stern	3.595	metres
KG	7.170	metres
FSC	0.000	metres
KGf	7.170	metres
GMt	3.715	metres
BMt	9.719	metres
BMl	168.789	metres
Waterplane area	844.54	sq.metres
LCG	33.261	metres
LCB	32.985	metres
TCB	0.000	metres
LCF	38.696	metres
TCF	0.000	metres
TPC	8.657	tonnes/cm
MTC	31.203	tonnes-m/cm
Shell thickness	11.500	mm

Intact State

Lightship [Not a Seagoing]: Intact State



Righting Lever (GZ) Curve

Heel to Stbd (deg)	GZ (m)	Slope (m/rad)	Trim (m)	WLrad (m)	Freeboard (m)	Unprotected (m)	Wind (m)
-20.00	-0.9071	0.0790	-3.763	2.965	3.63[161]	13.99[1]	0.3823
-15.00	-0.8395	1.5879	-3.648	3.102	4.38[161]	14.61[1]	0.3823
-10.00	-0.6295	3.0798	-3.590	3.186	5.13[161]	15.15[1]	0.3823
-5.00	-0.3267	3.6254	-3.590	3.237	5.86[161]	15.58[1]	0.3823
0.00	0.0000	3.7152	-3.595	3.255	6.54[0]	15.90[0]	0.3823
5.00	0.3267	3.6254	-3.590	3.237	5.86[28]	15.58[0]	0.3823
10.00	0.6295	3.0798	-3.590	3.186	5.13[28]	15.15[0]	0.3823
15.00	0.8395	1.5879	-3.648	3.102	4.38[28]	14.61[0]	0.3823
20.00	0.9071	0.0790	-3.763	2.965	3.63[28]	13.99[0]	0.3823
25.00	0.8655	-0.9042	-3.893	2.763	2.89[28]	13.30[0]	0.3823
30.00	0.7564	-1.5079	-4.011	2.496	2.18[28]	12.55[0]	0.3823
35.00	0.6084	-1.8396	-4.102	2.167	1.49[28]	11.76[0]	0.3823
40.00	0.4423	-1.9499	-4.158	1.779	0.84[28]	10.91[0]	0.3823
45.00	0.2766	-1.8471	-4.169	1.332	0.22[28]	10.03[0]	0.3823
50.00	0.1256	-1.7087	-4.129	0.828	-0.35[28]	9.12[0]	0.3823
55.00	-0.0261	-1.8109	-4.082	0.292	-0.90[28]	8.16[0]	0.3823
60.00	-0.1917	-2.0421	-4.052	-0.256	-1.42[28]	7.15[0]	0.3823
65.00	-0.3852	-2.3980	-4.013	-0.820	-1.92[28]	6.11[0]	0.3823
70.00	-0.6043	-2.6192	-3.959	-1.392	-2.38[28]	5.03[0]	0.3823
75.00	-0.8391	-2.7658	-3.897	-1.962	-2.82[28]	3.92[0]	0.3823
80.00	-1.0857	-2.8650	-3.822	-2.521	-3.24[28]	2.78[0]	0.3823

IMO Wind heeling

Property	Value	Units
Length WL	80.340	metres
Profile area above WL	890.075	sq.metres
Area to leeward (Area b)	0.20688	m-radians
Area to windward (Area a)	0.35153	m-radians
GZc	0.382	metres
Gust angle	5.877	degrees

Property	Value	Units
Rollback angle	24.549	degrees
Steady state angle	3.881	degrees
Max. angle to leeward	41.779	degrees
B/d'	4.762	
X1	0.800	
Cb	0.356	
Ar	0.000	
K	1.000	
Og	3.915	metres
r	1.452	
T	7.205	seconds

Intact State

IMO 749 Intact Stabilty Criteria non - passenger

#	Criterion	Actual Value	Critical Value	Int.cr. KGf	Int.cr. GMf	
1	Area under GZ curve up to 30 degrees > 0.055	0.348	0.055	9.576	1.309	
2	Area under GZ curve from 30 to 40 deg. or downflood > 0.03	0.106	0.030	7.931	2.954	
3	Area under GZ curve up to 40 deg. or downflood > 0.09	0.453	0.090	9.162	1.723	
4	Initial GM to be at least 0.15 metres	3.715	0.150	10.735	0.150	
5	GZ to be at least 0.20m at an angle > 30 degrees	0.907	0.200	9.715	1.170	
6	Max GZ to be at an angle > 25 degrees	20.294	25.000	6.172	4.713	Fail
7	IMO Weather Criterion (Maximum Initial Angle Of Heel)	3.881	16.000	Indeterm.	Indeterm.	
8	IMO Weather Criterion (Areas)	0.588	1.000	6.619	4.266	Fail
	Critical			**6.172**	**4.713**	
	Actual			**7.170**	**3.715**	

**** Condition does not comply ****

Note

Term	Meaning
Indeterm.	The value cannot be determined, although the ship passes the test. The reason may be that the value has some very large value. Another reason may be that no profile has been defined, and thus the wind moment cannot be calculated.

Intact State

Immersion Particulars

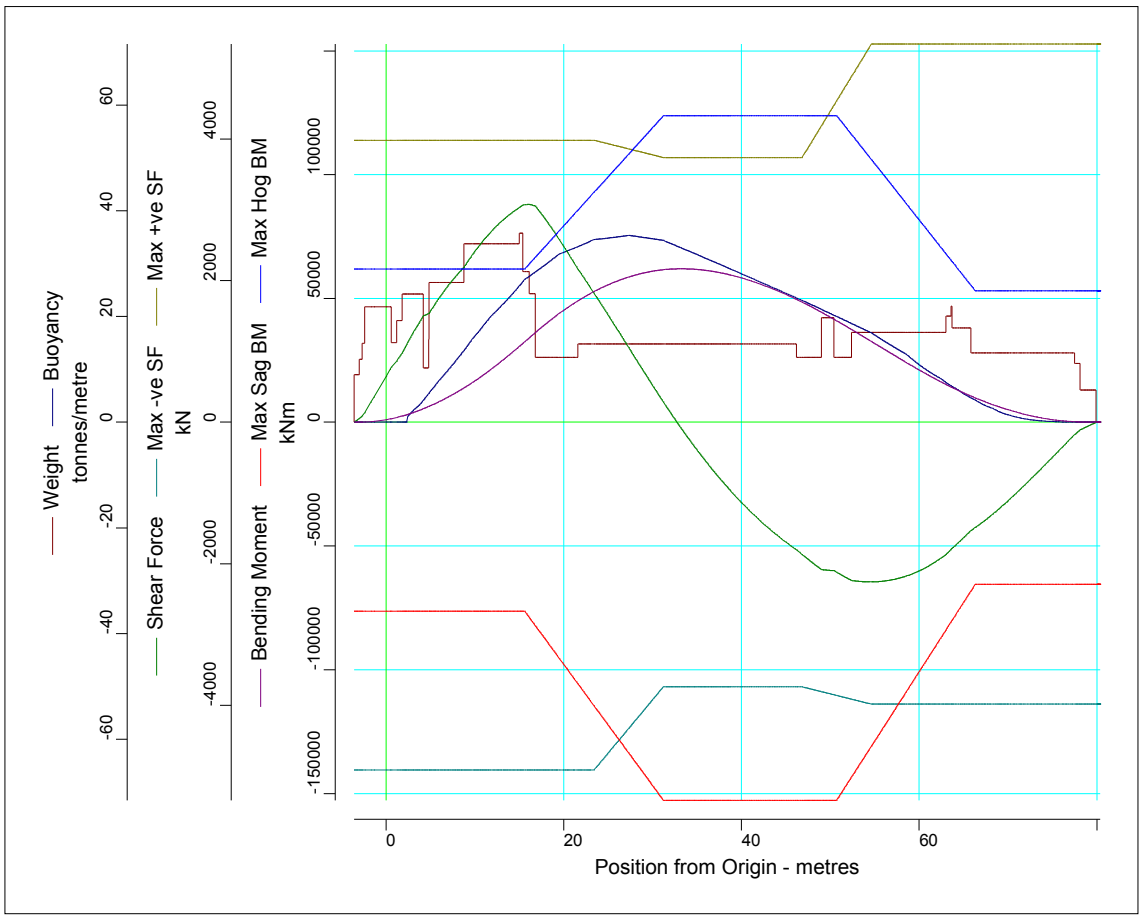
State of Openings = X-ray: Normal condition

Intact

Type	Point #	X position (m)	Y position (m)	Z position (m)	Ht. above WL (m)	Flood Angle (deg)	Downflood Compartment
Unprotected							No opening immersed
Deck Edge	28	11.700	7.684	9.701	6.546	46.931	

Intact State

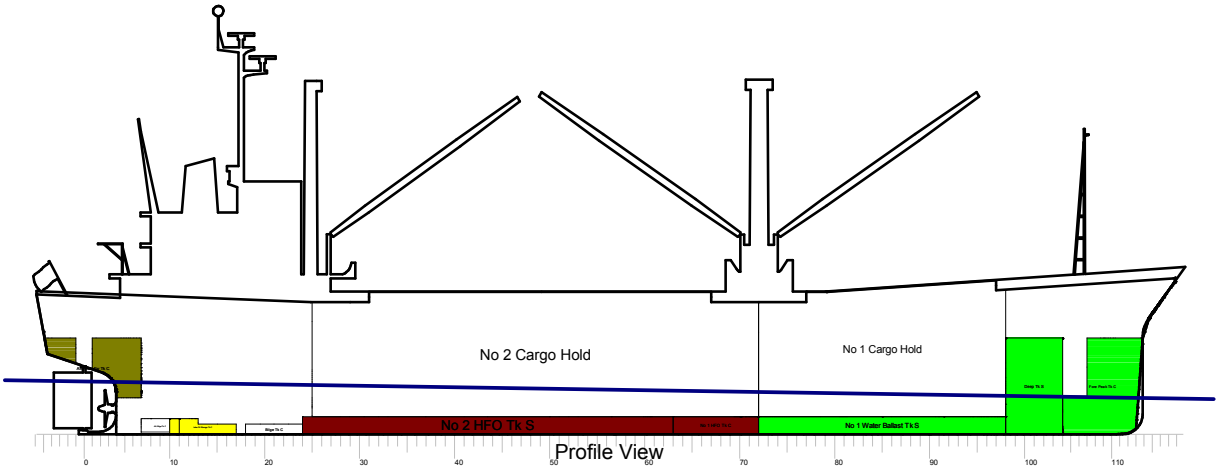
Longitudinal Strength



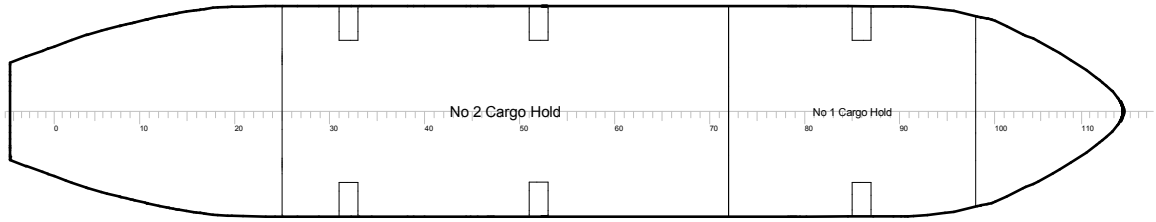
Shearing Force and Bending Moments

Distance from Origin (m)		Shearing Force (kN)	% of Max allowed	Bending Moment (kNm)	% of Max allowed
15.60	0.20L	3072.3	77.1	32502.4	52.5
23.40	0.30L	1823.5	45.8	52771.1	56.8
31.20	0.40L	285.2	7.6	61598.9	49.8
46.80	0.60L	-1867.6	50.0	48522.9	39.2
50.70	0.65L	-2119.6	54.9	40946.7	33.1
54.60	0.70L	-2255.5	56.6	32600.6	30.7
66.30	0.85L	-1487.1	37.3	9801.0	18.5
Maximum BM and Maximum Percentage of Limit					
33.23				**61971.9**	**50.1**
21.44				**48714.4**	**57.3**
Maximum SF and Maximum Percentage of Limit					
16.10		**3077.9**	**77.3**		
16.10		**3077.9**	**77.3**		

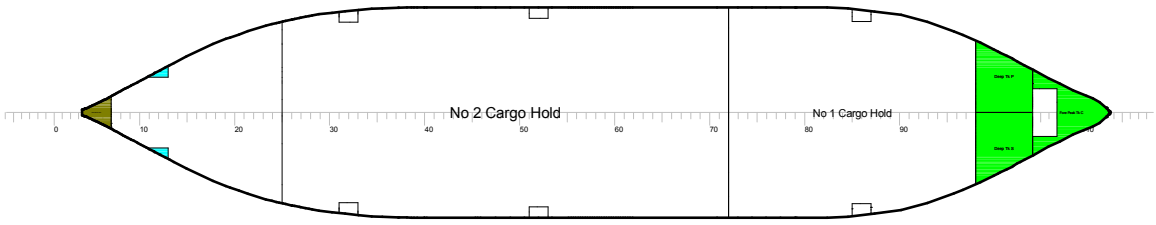
Intact State



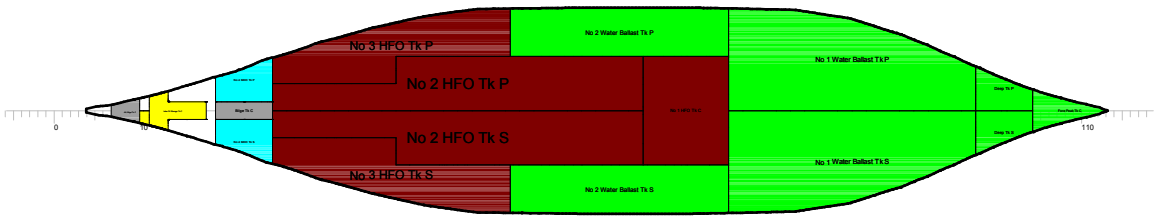
Profile View



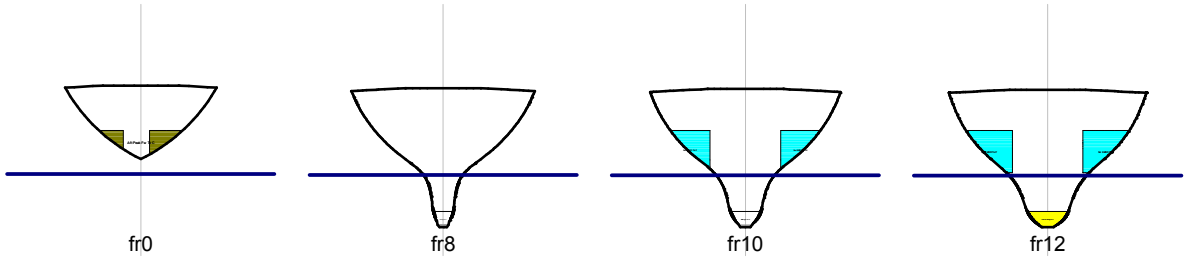
Deck 9.000m above B.L.



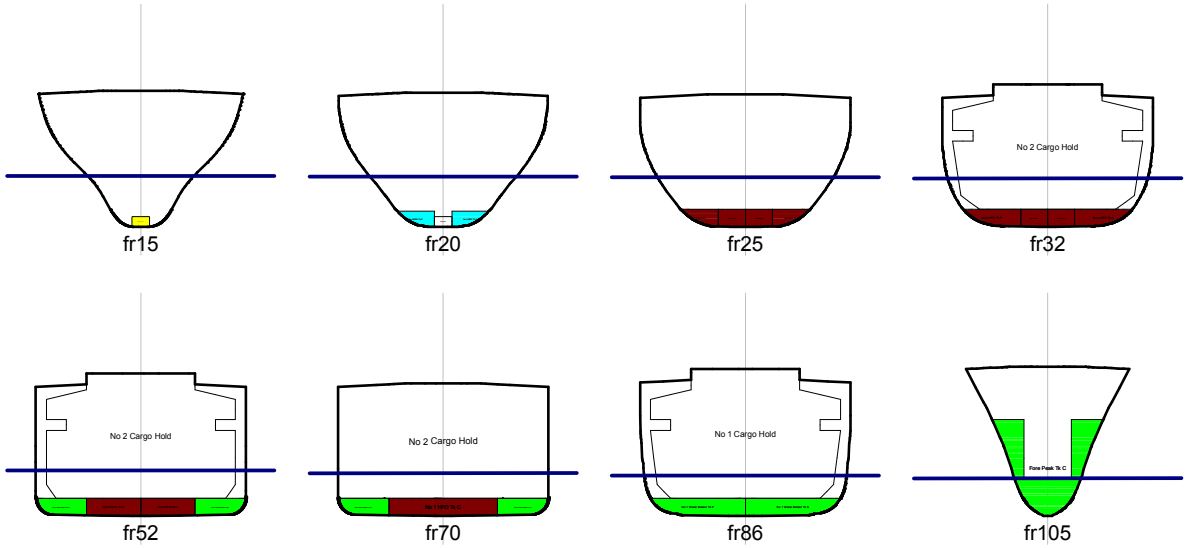
Deck 4.000m above B.L.



Deck 0.700m above B.L.



fr0 fr8 fr10 fr12



Key

Key	Name	Density (t/m3)
	WB	1.0250
	HFO	0.9400
	MDO	0.8700
	LO	0.9200
	FW	1.0000
	OTH	1.0000

Intact State

Intact State

Title	Frames	Cargo	% full	SG (t/m3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	FSM (t-m)	S M
Water Ballast										
Deep Tk P	98-104	WB	100.0	1.025	117.6	69.82	-2.16	4.10	0.0	
Deep Tk S	98-104	WB	100.0	1.025	117.6	69.82	2.16	4.10	0.0	
Fore Peak Tk C	104-114	WB	100.0	1.025	103.5	74.46	0.00	4.11	0.0	
No 1 Water Ballast Tk P	72-98	WB	100.0	1.025	139.5	57.73	-3.16	0.70	0.0	
No 1 Water Ballast Tk S	72-98	WB	100.0	1.025	139.5	57.73	3.16	0.70	0.0	
No 2 Water Ballast Tk P	49-72	WB	100.0	1.025	69.4	41.65	-5.74	0.71	0.0	
No 2 Water Ballast Tk S	49-72	WB	100.0	1.025	69.4	41.65	5.74	0.71	0.0	
Total Water Ballast					**756.5**	**60.83**	**0.00**	**2.22**	**0.0**	
Fuel Oil										
No 1 HFO Tk C	63-72	HFO	98.0	0.940	58.2	46.55	0.00	0.65	248.0	
No 2 HFO Tk P	24-63	HFO	98.0	0.940	105.2	31.55	-1.79	0.65	108.4	
No 2 HFO Tk S	24-63	HFO	98.0	0.940	105.2	31.55	1.79	0.65	108.4	
No 3 HFO Tk P	24-49	HFO	98.0	0.940	61.2	25.23	-4.57	0.72	124.8	
No 3 HFO Tk S	24-49	HFO	98.0	0.940	61.2	25.23	4.57	0.72	124.8	
Total Fuel Oil					**391.0**	**31.81**	**0.00**	**0.67**	**714.4**	
Diesel Oil										
No 4 MDO Tk P	18-24	MDO	98.0	0.870	9.2	14.22	-1.88	0.65	9.3	
No 4 MDO Tk S	18-24	MDO	98.0	0.870	9.2	14.22	1.88	0.65	9.3	
No 5 MDO Tk P	8-13	MDO	98.0	0.870	14.8	6.91	-3.71	6.02	7.6	
No 5 MDO Tk S	8-13	MDO	98.0	0.870	14.8	6.91	3.71	6.02	7.6	
Total Diesel Oil					**48.0**	**9.71**	**0.00**	**3.96**	**33.8**	
Lube Oil										
Lube Oil Storage Tk C	10-17	LO	98.0	0.920	6.2	8.45	0.05	0.54	3.4	
Total Lube Oil					**6.2**	**8.45**	**0.05**	**0.54**	**3.4**	
Fresh Water										
Aft Peak Fw Tk C	-5-7	FW	98.0	1.000	60.4	1.96	0.02	6.00	198.8	
Total Fresh Water					**60.4**	**1.96**	**0.02**	**6.00**	**198.8**	
Other										
Aft Bilge Tk C	7-11	OTH	10.0	1.000	0.4	5.56	0.04	0.10	1.2	
Bilge Tk C	18-24	OTH	10.0	1.000	0.4	14.00	0.00	0.04	0.7	
Total Other					**0.8**	**10.04**	**0.02**	**0.07**	**1.9**	
Departure at E/R Tanks										
W.&Oil in ER					22.5	11.06	0.00	7.50	0.0	
Total Departure at E/R Tanks					**22.5**	**11.06**	**0.00**	**7.50**	**0.0**	
Crews and Effects										
Crew and Effect					2.3	13.83	0.00	12.71	0.0	
Total Crews and Effects					**2.3**	**13.83**	**0.00**	**12.71**	**0.0**	
Consumables Stores Departure										
Store&Spare					6.1	25.25	0.00	9.36	0.0	
Provision					1.4	3.30	0.00	9.37	0.0	
Total Consumables Stores Departure					**7.5**	**21.07**	**0.00**	**9.36**	**0.0**	
Lightweight					**1442.0**	**33.26**	**0.00**	**7.17**	**0.0**	
Deadweight					**1295.0**	**45.97**	**0.00**	**2.14**	**952.3**	

Title	Frames	Cargo	% full	SG (t/m3)	Weight (t)	LCG (m)	TCG (m)	VCG (m)	FSM (t-m)	S M
Total Displacement					**2737.0**	**39.28**	**0.00**	**4.79**	**952.3**	
Buoyancy					**2736.9**	**39.22**	**0.00**	**1.75**	**15651.5**	
Total Buoyancy					**2736.9**	**39.22**	**0.00**	**1.75**	**15651.5**	

Intact State

Drafts at equilibrium angle

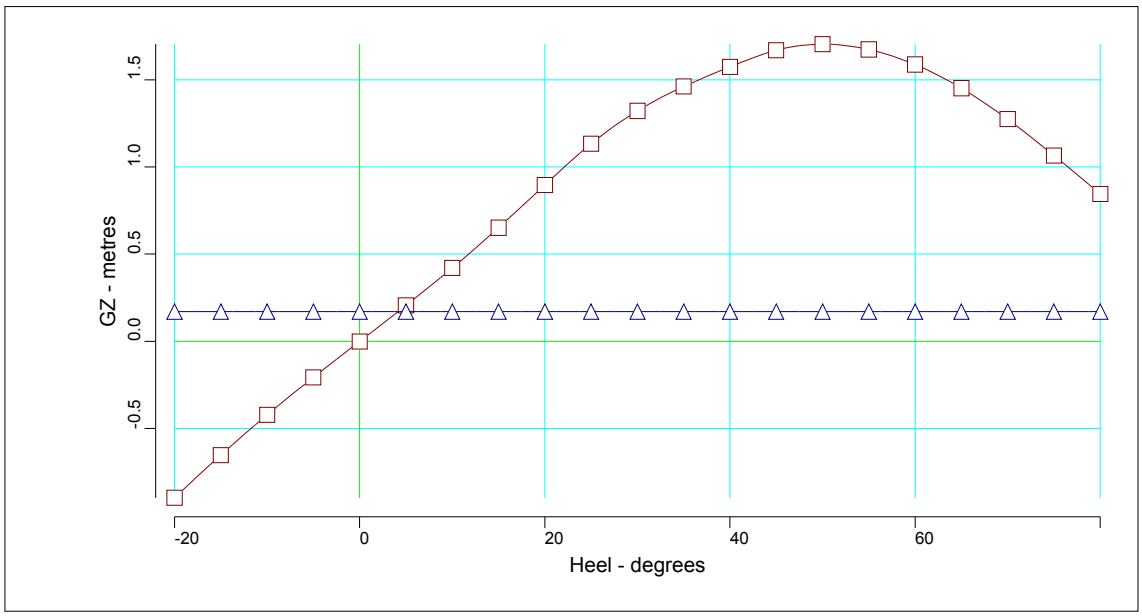
	Moulded	Extreme	
Draft at LCF	3.280	3.293	metres
Draft aft at marks	3.858	3.871	metres
Draft fwd at marks	2.695	2.708	metres
Draft at AP	3.905	3.918	metres
Draft at FP	2.688	2.701	metres
Mean draft at midships	3.296	3.309	metres

Hydrostatics at equilibrium angle

Density of water	1.0250	tonnes/cu.m
Heel to starboard	0.01	degrees
Trim by the stern	1.217	metres
KG	4.789	metres
FSC	0.348	metres
KGf	5.137	metres
GMt	2.329	metres
BMt	5.719	metres
BMl	109.289	metres
Waterplane area	914.35	sq.metres
LCG	39.276	metres
LCB	39.223	metres
TCB	0.001	metres
LCF	39.949	metres
TCF	0.001	metres
TPC	9.372	tonnes/cm
MTC	38.348	tonnes-m/cm
Shell thickness	11.500	mm

Intact State

Full Ballast Departure: Intact State



Righting Lever (GZ) Curve

Heel to Stbd (deg)	GZ (m)	Slope (m/rad)	Trim (m)	WLrad (m)	Freeboard (m)	Unprotected (m)	Wind (m)
-20.00	-0.8977	2.8239	-1.004	3.402	2.97[158]	13.67[1]	0.1702
-15.00	-0.6523	2.7401	-1.092	3.559	3.71[158]	14.27[1]	0.1702
-10.00	-0.4216	2.5202	-1.160	3.670	4.45[158]	14.77[1]	0.1702
-5.00	-0.2070	2.3749	-1.203	3.737	5.16[158]	15.18[1]	0.1702
0.00	-0.0005	2.3289	-1.217	3.759	5.86[31]	15.49[0]	0.1702
5.00	0.2060	2.3750	-1.203	3.737	5.16[31]	15.18[0]	0.1702
10.00	0.4206	2.5204	-1.160	3.670	4.45[31]	14.77[0]	0.1702
15.00	0.6513	2.7404	-1.092	3.559	3.71[31]	14.27[0]	0.1702
20.00	0.8967	2.8242	-1.004	3.402	2.97[31]	13.67[0]	0.1702
25.00	1.1339	2.5030	-0.907	3.190	2.23[31]	13.00[0]	0.1702
30.00	1.3214	1.8380	-0.813	2.914	1.52[31]	12.27[0]	0.1702
35.00	1.4613	1.4125	-0.721	2.568	0.84[31]	11.49[0]	0.1702
40.00	1.5739	1.2092	-0.628	2.158	0.20[31]	10.68[0]	0.1702
45.00	1.6692	0.7985	-0.543	1.691	-0.40[31]	9.81[0]	0.1702
50.00	1.7043	-0.0044	-0.488	1.207	-0.99[31]	8.88[0]	0.1702
55.00	1.6740	-0.6969	-0.443	0.711	-1.57[31]	7.89[0]	0.1702
60.00	1.5875	-1.2907	-0.406	0.209	-2.13[31]	6.83[0]	0.1702
65.00	1.4517	-1.8257	-0.377	-0.301	-2.67[31]	5.72[0]	0.1702
70.00	1.2742	-2.2320	-0.336	-0.821	-3.18[31]	4.59[0]	0.1702
75.00	1.0658	-2.5384	-0.288	-1.347	-3.65[31]	3.43[0]	0.1702
80.00	0.8450	-2.4943	-0.236	-1.877	-4.08[31]	2.27[0]	0.1702

IMO Wind heeling

Property	Value	Units
Length WL	80.340	metres
Profile area above WL	780.721	sq.metres
Area to leeward (Area b)	0.74807	m-radians
Area to windward (Area a)	0.21624	m-radians
GZc	0.170	metres
Gust angle	4.137	degrees

Property	Value	Units
Rollback angle	23.437	degrees
Steady state angle	2.770	degrees
Max. angle to leeward	50.000	degrees
B/d'	4.123	
X1	0.800	
Cb	0.585	
Ar	0.000	
K	1.000	
Og	1.378	metres
r	0.950	
T	8.802	seconds

Intact State

IMO 749 Intact Stabilty Criteria non - passenger

#	Criterion	Actual Value	Critical Value	Int.cr. KGf	Int.cr. GMf	
1	Area under GZ curve up to 30 degrees > 0.055	0.347	0.055	7.314	0.152	
2	Area under GZ curve from 30 to 40 deg. or downflood > 0.03	0.254	0.030	7.380	0.086	
3	Area under GZ curve up to 40 deg. or downflood > 0.09	0.601	0.090	7.321	0.145	
4	Initial GM to be at least 0.15 metres	2.329	0.150	7.321	0.145	
5	GZ to be at least 0.20m at an angle > 30 degrees	1.704	0.200	7.382	0.084	
6	Max GZ to be at an angle > 25 degrees	49.974	25.000	7.778	-0.312	
7	IMO Weather Criterion (Maximum Initial Angle Of Heel)	2.770	16.000	7.263	0.203	
8	IMO Weather Criterion (Areas)	3.460	1.000	7.193	0.273	
	Critical			**7.193**	**0.273**	
	Actual			**5.137**	**2.329**	

Condition complies with the regulations

Intact State

Immersion Particulars

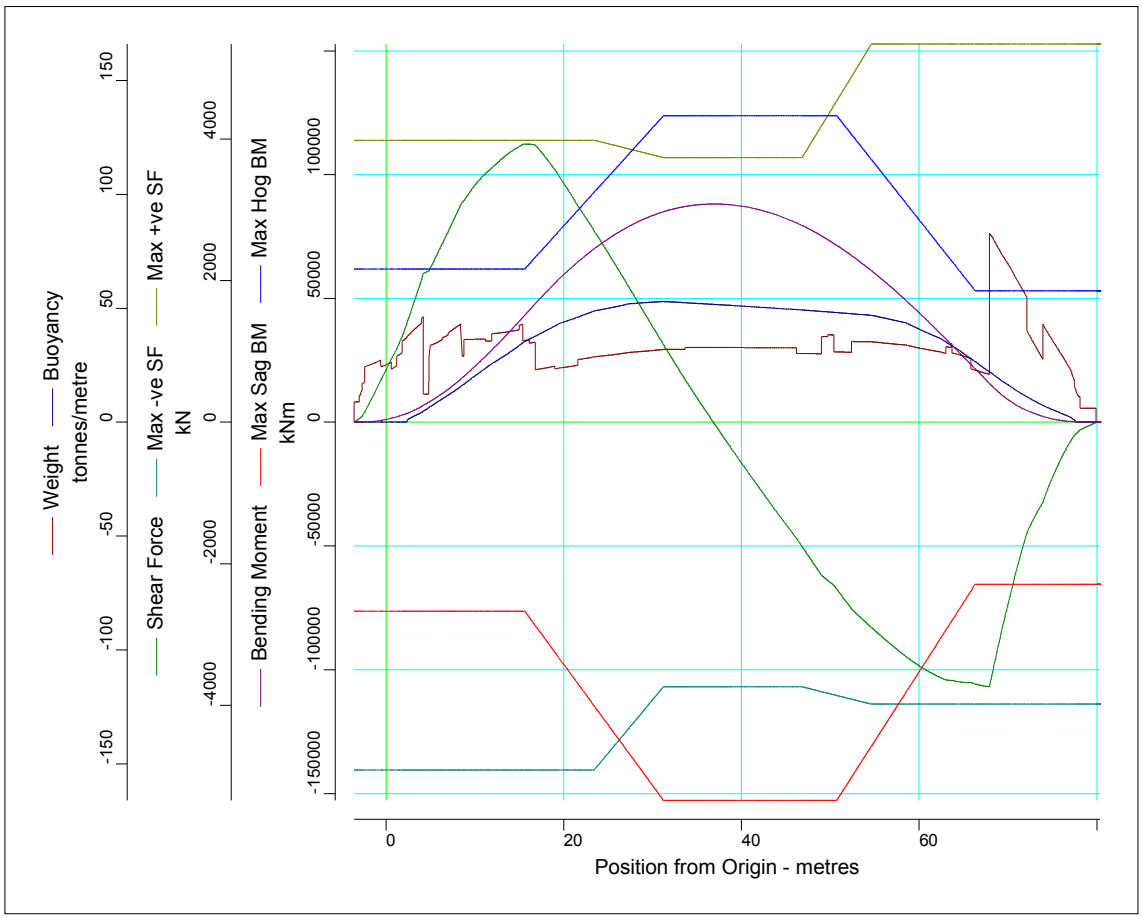
State of Openings = X-ray: Normal condition

Intact

Type	Point #	X position (m)	Y position (m)	Z position (m)	Ht. above WL (m)	Flood Angle (deg)	Downflood Compartment
Unprotected							No opening immersed
Deck Edge	31	16.700	7.750	9.500	5.853	41.661	

Intact State

Longitudinal Strength



Shearing Force and Bending Moments

Distance from Origin (m)		Shearing Force (kN)	% of Max allowed	Bending Moment (kNm)	% of Max allowed
15.60	0.20L	3929.3	98.7	43210.3	69.8
23.40	0.30L	2706.5	68.0	70020.5	75.4
31.20	0.40L	1098.0	29.4	85021.3	68.7
46.80	0.60L	-1755.4	47.0	79480.0	64.2
50.70	0.65L	-2357.5	61.1	71432.8	57.7
54.60	0.70L	-2899.6	72.8	61183.6	57.7
66.30	0.85L	-3699.8	92.9	21511.3	40.5
Maximum BM and Maximum Percentage of Limit					
36.92				**88140.1**	**71.2**
21.91				**65762.2**	**75.6**
Maximum SF and Maximum Percentage of Limit					
15.85		**3929.7**	**98.7**		
15.85		**3929.7**	**98.7**		