

SILVER RAY -Full stress and stability report

SHIP NUM- 8152

SHIP YARD: HYUNDAI MIPO DOCKYARD CO. Ltd.

PROGRAM BY: Totem plus Ltd. - Ramat Hasharon 447279 ISRAEL

CONTENT:

- Deadweight items list
- Tanks data
- Cargo Distribution
- Full stability report
- Gz curve
- Shear forces and bending moments
- Full Stress Analysis Curve

* All longitudinal data is measured from A.P.

DEADWEIGHT ITEMS LIST

D.W. Items	Weight [MT]	VCM (B.L.) [m]	LCM [m]	Vert Mom [MT*m]	Long Mom [MT*m]	TCM [m]
Constants	230.4	25.33	85.38	5836	19672	0.00
Ballast Tanks	2928.6	2.48	116.04	7260	339833	2.71
Fuel Oil Tanks	873.7	5.85	117.72	5114	102854	-2.72
Fresh Water Tanks	234.0	11.84	9.90	2772	2317	10.00
Diesel Oil Tanks	323.0	5.59	46.01	1805	14863	-0.15
Lub Oil Tanks	94.2	7.87	23.43	742	2208	3.82
Miscellaneous	47.2	0.63	26.98	30	1275	-0.19
Cargo Hold 1	2627.9	25.36	153.80	66650	404171	-0.01
Cargo Hold 2	2579.6	22.11	103.34	57040	266574	-0.24
Cargo Hold 3	2067.6	23.10	64.41	47763	133184	-0.30
Cargo Hold 4	1497.6	28.10	23.57	42088	35306	-0.10
Light ship	21433.0	18.29	85.89	392010	1840880	-0.27
Displacement	34937.0	18.01	90.54	629110	3163137	0.03

Tanks data

Ballast Tanks

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	Fore Peak C	431.0	0.74	185.00	0	0.000	1.0250	0.1	0.02%
2	Tank BW No. 1	318.2	0.22	167.69	0	3.000	1.0250	3.4	1.04%
3	Tank BW No. 2 PS	358.2	0.33	154.91	-4.152	13.000	1.0250	11.5	3.13%
4	Tank BW No. 2 SB	386.6	3.70	155.12	3.827	126.000	1.0250	379.2	95.69%
5	Tank BW No. 3 PS	787.5	0.34	135.08	-7.144	265.000	1.0250	50.9	6.31%
6	Tank BW No. 3 SB	738.4	3.18	135.96	6.243	192.000	1.0250	724.9	95.78%
7	Tank BW No. 4 C	379.2	1.43	119.69	0	1758.000	1.0250	387.3	99.64%
8	Tank BW No. 4 PS	297.8	0.75	118.97	-11.58	49.000	1.0250	24.9	8.16%
9	Tank BW No. 4 SB	346.1	3.45	119.57	11.694	49.000	1.0250	268.9	75.80%
10	TK D-BW No. 5 C	487.6	0.30	92.70	0	922.000	1.0250	105.2	21.05%
11	TK D-BW No. 5 PS	452.7	0.30	92.67	-7.72	759.000	1.0250	95.0	20.47%
12	TK D-BW No. 5 SB	452.7	0.25	92.67	7.72	759.000	1.0250	80.2	17.28%
13	Tank BW No. 5 PS	569.0	2.92	92.44	-14.864	79.000	1.0250	307.7	52.76%
14	Tank BW No. 5 SB	563.4	2.79	92.28	14.872	72.000	1.0250	288.7	49.99%
15	Tank BW No. 6 C	380.9	0.15	65.70	0	1758.000	1.0250	39.8	10.19%
16	Tank BW No. 6 PS	335.1	0.48	65.43	-12.144	75.000	1.0250	25.9	7.54%
17	Tank BW No. 6 SB	292.9	0.40	65.33	11.77	61.000	1.0250	20.3	6.76%
18	Tank BW No. 7 PS	500.2	0.32	53.44	-6.789	334.000	1.0250	47.2	9.21%
19	Tank BW No. 7 SB	528.7	0.28	53.42	6.426	420.000	1.0250	46.0	8.49%
20	Tank AP C	347.4	9.09	1.76	1.461	879.000	1.0250	14.5	4.07%
21	Tank AP P	469.3	8.38	3.24	-10.175	77.000	1.0250	3.6	0.75%
22	Tank AP S	418.8	8.24	3.33	11.347	60.000	1.0250	3.4	0.79%
	Totals :	9841.7				8710.000		2928.6	

Tanks data

Fuel Oil Tanks

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	TK No.1 HFO P	375.8	5.35	154.53	-2.619	218.000	0.9800	276.6	79.72%
2	TK No.1 HFO S	459.2	5.09	154.50	2.175	320.000	0.9800	307.0	68.23%
3	TK No.2 HFO P	408.9	2.91	141.02	-3.932	162.000	0.9800	6.5	1.62%
4	TK No.2 HFO S	582.6	2.92	139.57	3.705	331.000	0.9800	11.1	1.94%
5	TK No.3 HFO P	240.3	2.90	57.15	-2.55	70.000	0.9800	4.3	1.83%
6	TK No.3 HFO S	278.5	2.93	57.15	2.2	109.000	0.9800	7.5	2.75%
7	TK No.4 HFO P-LS	319.1	4.73	57.46	-8.342	510.000	0.9800	115.3	36.87%
8	TK No.4 HFO S	358.6	3.01	57.42	8.359	90.000	0.9800	14.3	4.07%
9	TK No.1 HFO SERV. P-LS	39.6	10.76	17.33	-11.458	41.000	0.9800	32.3	83.31%
10	TK No.2 HFO SERV. P	47.5	10.80	14.85	-11.458	49.000	0.9800	39.9	85.77%
11	TK No.1 HFO SETT. P-LS	39.6	10.60	19.58	-11.458	40.000	0.9800	27.9	71.89%
12	TK No.2 HFO SETT. P	47.5	10.51	12.15	-11.458	49.000	0.9800	30.7	65.99%
13	TK No.1 FO OVER	10.2	5.56	134.63	-1.05	1.000	0.9800	0.1	1.00%
14	TK No.2 FO OVER	18.6	0.13	44.41	-4.675	1.000	0.9800	0.2	1.10%
	Totals :	3225.8				1991.000		873.7	

Fresh Water Tanks

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	Tank FW No.1	78.2	11.84	9.90	13	12.000	1.0000	78.0	99.76%
2	Tank FW No.2	156.4	11.84	9.90	8.5	97.000	1.0000	156.0	99.74%
	Totals :	234.6				109.000		234.0	

Tanks data

Diesel Oil Tanks

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	TK MDO STOR.P	95.5	6.66	48.57	-8.37	112.000	0.9000	65.6	76.30%
2	TK MDO STOR.S	149.2	4.76	48.70	7.7	139.000	0.9000	62.5	46.54%
3	TK MDO SERV.P	35.5	11.32	8.55	2	24.000	0.9000	3.8	11.89%
4	TK MGO P	146.9	4.26	48.74	-2.836	57.000	0.9000	66.8	50.53%
5	TK MGO S	151.9	5.04	48.60	2.2	60.000	0.9000	106.9	78.19%
6	TK MGO SERV S	35.5	11.75	8.55	-2	24.000	0.9000	17.4	54.46%
Totals :		614.5				416.000		323.0	

Lub Oil Tanks

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	M/E LO STOR. TK	24.5	12.11	8.10	-13.525	12.000	0.9000	20.1	91.35%
2	M/E LO SETT. TK	23.4	12.20	8.10	-10.15	0.000	0.9000	0.0	0.00%
3	G/E LO STOR. TK	11.0	10.35	21.85	13.55	2.000	0.9000	9.9	98.0 %
4	G/E LO SETT. TK	8.2	9.47	19.15	13.55	1.000	0.9000	0.5	7.09%
5	NO.1 CYL.O. TK	16.6	9.85	27.90	12.625	8.000	0.9000	14.9	98.0 %
6	NO.2 CYL.O. TK	24.9	9.57	23.71	13.55	5.000	0.9000	22.3	98.0 %
7	M/E LO SUMP. TK	30.4	1.14	33.02	0.003	27.000	0.9000	26.4	96.66%
Totals :		139.0				55.000		94.2	

Miscellaneous

No.	Name.	Full [m ³]	V.C.M [m]	L.C.M [m]	T.C.M [m]	FS [m ⁴]	Dens. [MT/m ³]	Weight [MT]	0.10%
1	LO SLU TK	9.6	6.74	30.23	9.155	0.000	1.0000	0.0	5.22%
2	S/T LO SUMP TK	2.5	1.44	18.92	0.871	1.000	1.0000	0.0	0.94%
3	BILGE HOLD TK	64.7	0.73	20.14	-0.016	1.000	1.0000	31.5	48.64%
4	OILY BILGE TK	48.7	0.21	39.72	-1.659	1.000	1.0000	6.0	12.38%
5	FO SLU TK	16.8	8.20	13.99	0.194	1.000	1.0000	0.0	0.13%

Tanks data

6	SEWAGE HOLD TK	20.5	5.09	39.80	-9.064	0.000	1.0000	0.0	0.00%
7	CLEAN DRAIN TK	18.1	0.72	36.62	3.341	4.000	1.0000	3.7	20.44%
8	C.W. DRAIN TK	26.5	0.23	43.40	4.529	4.000	1.0000	0.6	2.26%
9	F.O. DRAIN TK	12.1	0.51	44.30	-2.491	1.000	1.0000	5.4	44.63%
10	S/T COOLING WATER TK	30.2	3.51	10.35	0	0.000	1.0000	0.0	0.00%
	Totals :	249.7				13.000		47.2	

Cargo Distribution

Hold 1

Cargo Num	Weight [MT]	VCM (B.L.) [m]	LCM AP [m]	Vert Mom [MT*m]	Long Mom [MT*m]	TCM[m]	Tran. Mom [MT*m]
Deck 1	19.3	3.43	129.01	66	2490	0.75	14
Deck 2	24.1	6.12	129.66	147	3123	-0.64	-15
Deck 3	90.0	9.03	142.38	813	12814	0.00	0
Deck 4	132.0	11.82	143.67	1560	18964	0.00	0
Deck 5	177.1	14.89	148.62	2637	26318	-0.21	-37
Deck 6	275.0	18.27	150.13	5024	41286	-0.22	-60
Deck 7	209.2	21.72	148.83	4543	31129	-0.09	-19
Deck 8	317.5	24.41	157.86	7750	50121	0.16	51
Deck 9	320.0	26.94	158.99	8621	50877	0.04	13
Deck 10	232.0	29.48	159.22	6838	36932	-0.04	-9
Deck 11	244.0	32.01	158.65	7810	38711	0.08	20
Deck 12	350.8	34.52	157.73	12109	55328	0.08	28
Deck 13	237.1	36.83	152.18	8731	36078	0.00	0
Ramp 1-3S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-4S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-5S	0.0	0.00	0.00	0	0	0.00	0
Ramp 5-6S	0.0	0.00	0.00	0	0	0.00	0
Ramp 9-10S	0.0	0.00	0.00	0	0	0.00	0
Ramp 11-12P	0.0	0.00	0.00	0	0	0.00	0
Ramp 12-13P	0.0	0.00	0.00	0	0	0.00	0
Total	2627.9	25.36	153.80	66650	404171	-0.01	-16

Cargo Distribution

Hold 2

Cargo Num	Weight [MT]	VCM (B.L.) [m]	LCM AP [m]	Vert Mom [MT*m]	Long Mom [MT*m]	TCM[m]	Tran. Mom [MT*m]
Deck 1	110.9	3.43	101.61	380	11269	0.04	4
Deck 2	97.5	6.12	103.07	597	10049	-1.11	-108
Deck 3	250.0	9.03	103.80	2258	25950	-1.46	-365
Deck 4	225.0	11.82	103.40	2660	23265	-0.86	-194
Deck 5	153.9	14.89	103.58	2292	15942	-0.60	-92
Deck 6	225.0	18.27	103.70	4111	23333	0.41	92
Deck 7	146.3	21.72	103.38	3177	15123	-0.13	-19
Deck 8	250.0	24.41	103.38	6102	25845	-0.12	-30
Deck 9	227.6	26.94	103.37	6133	23532	-0.13	-30
Deck 10	277.8	29.48	103.38	8191	28724	-0.17	-47
Deck 11	247.5	32.01	103.10	7922	25517	0.20	50
Deck 12	145.6	34.52	103.02	5028	15004	0.80	117
Deck 13	222.4	36.83	103.53	8190	23021	-0.02	-4
Ramp 1-3S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-4S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-5S	0.0	0.00	0.00	0	0	0.00	0
Ramp 5-6S	0.0	0.00	0.00	0	0	0.00	0
Ramp 9-10S	0.0	0.00	0.00	0	0	0.00	0
Ramp 11-12P	0.0	0.00	0.00	0	0	0.00	0
Ramp 12-13P	0.0	0.00	0.00	0	0	0.00	0
Total	2579.6	22.11	260.02	57040	670744	-0.24	-627

Cargo Distribution

Hold 3

Cargo Num	Weight [MT]	VCM (B.L.) [m]	LCM AP [m]	Vert Mom [MT*m]	Long Mom [MT*m]	TCM[m]	Tran. Mom [MT*m]
Deck 1	64.9	3.43	72.91	223	4732	1.38	90
Deck 2	52.8	6.12	71.56	323	3776	-1.13	-60
Deck 3	175.0	9.03	64.20	1580	11235	-1.61	-282
Deck 4	200.0	11.82	64.63	2364	12926	-2.37	-474
Deck 5	133.2	14.89	64.27	1983	8558	-0.96	-128
Deck 6	101.6	18.27	63.82	1857	6486	0.09	9
Deck 7	128.5	21.72	63.90	2791	8212	0.00	0
Deck 8	177.5	24.41	63.91	4333	11344	0.00	0
Deck 9	266.4	26.94	63.91	7177	17026	0.00	0
Deck 10	247.6	29.48	63.92	7301	15830	0.00	0
Deck 11	210.0	32.01	63.91	6722	13421	0.01	2
Deck 12	134.5	34.52	63.39	4643	8527	0.54	73
Deck 13	175.6	36.83	63.28	6467	11111	0.87	153
Ramp 1-3S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-4S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-5S	0.0	0.00	0.00	0	0	0.00	0
Ramp 5-6S	0.0	0.00	0.00	0	0	0.00	0
Ramp 9-10S	0.0	0.00	0.00	0	0	0.00	0
Ramp 11-12P	0.0	0.00	0.00	0	0	0.00	0
Ramp 12-13P	0.0	0.00	0.00	0	0	0.00	0
Total	2067.6	23.10	388.82	47763	803928	-0.30	-617

Cargo Distribution

Hold 4

Cargo Num	Weight [MT]	VCM (B.L.) [m]	LCM AP [m]	Vert Mom [MT*m]	Long Mom [MT*m]	TCM[m]	Tran. Mom [MT*m]
Deck 1	0.0	0.00	0.00	0	0	0.00	0
Deck 2	0.0	0.00	0.00	0	0	0.00	0
Deck 3	0.0	0.00	0.00	0	0	0.00	0
Deck 4	0.0	0.00	0.00	0	0	0.00	0
Deck 5	55.1	14.89	21.26	821	1172	0.26	14
Deck 6	64.7	18.27	21.91	1182	1417	-0.40	-26
Deck 7	136.2	21.72	28.99	2959	3950	0.49	67
Deck 8	250.0	24.41	22.14	6102	5535	-0.39	-97
Deck 9	205.9	26.94	22.37	5548	4607	-0.39	-80
Deck 10	252.5	29.48	22.71	7445	5735	-0.27	-68
Deck 11	250.0	32.01	22.89	8002	5723	-0.30	-75
Deck 12	172.5	34.52	23.24	5955	4009	-0.08	-14
Deck 13	110.6	36.83	28.56	4073	3158	1.13	125
Ramp 1-3S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-4S	0.0	0.00	0.00	0	0	0.00	0
Ramp 3-5S	0.0	0.00	0.00	0	0	0.00	0
Ramp 5-6S	0.0	0.00	0.00	0	0	0.00	0
Ramp 9-10S	0.0	0.00	0.00	0	0	0.00	0
Ramp 11-12P	0.0	0.00	0.00	0	0	0.00	0
Ramp 12-13P	0.0	0.00	0.00	0	0	0.00	0
Total	1497.6	28.10	560.37	42088	839234	-0.10	-155

Full stability report

Displacement	34937.0 MT
Light Weight	21433.0 MT
Deadweight	13504.0 MT

Draft (LCF)	9.320 m
Draft Fwd	9.237 m
Draft Aft	9.379 m
Draft Mid.	9.308 m
Trim	- 0.143 m
Fwd Trim Limit	1.86 m
Aft Trim Limit	-1.94 m
Density	1.025 MT/m ³

Ballast	2928.6 MT
Fuel Oil	873.7 MT
Fresh Water	234.0 MT
Diesel Oil	323.0 MT
Lub Oil	94.2 MT
Misc.	47.2 MT

Int. and Dam. Max. VCM	17.524 mtr
Actual V.C.M (KG)	18.007
Corrected Actual VCM	18.334 m NOT OK
GM Solid	2.138 mtr
Free Surface Corr.	0.327 m
Corrected GM	1.811 mtr
Max. GZ Angle	60.0 Deg
Max. GZ Value	0.664 mtr
Area below 30 deg.	0.07 m-R
Area Difference	-0.02 m-R
Flooding Angle (VD)	48.529 Deg.

Cargo Weight	8772.8 MT
Liquids in Tanks	4500.8 MT
Stores, Const. Etc.	230.4 MT
Total Deadweight	13504.0 MT
Vertical Moment	629110 MT*m
Longitudinal Moment	3163137 MT*m
Total Free Surface	11425 MT*m

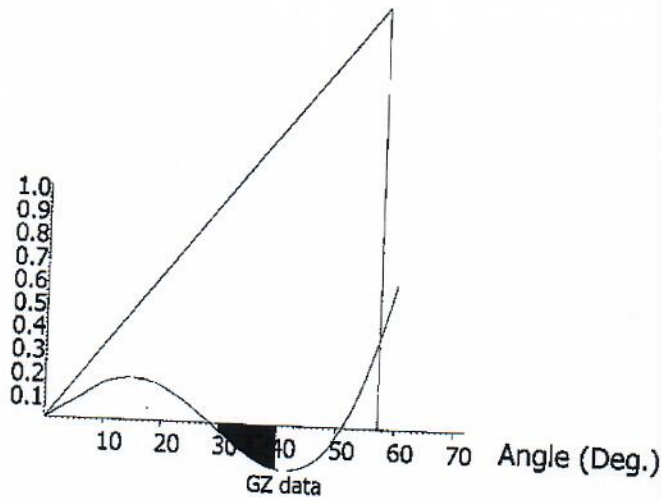
Hydrostatic Values

Transv.KM	20.145 m
L.C.F	78.646 m
L.C.B	90.800 m
M.T.C	64086.4 T-m
Draft	9.320 m
Disp	34937.0 T

GZ CURVE

G'Z (m)

RESULTS MIGHT BE INACCURATE
FOR TRIM GREATER THAN 1% Lpp



Angle	G.Z.[m]
5°	0.16
10°	0.16
15°	0.18
20°	0.15
25°	0.07
30°	-0.03
35°	-0.13
40°	-0.19
45°	-0.17
50°	-0.05
55°	0.21
60°	0.62

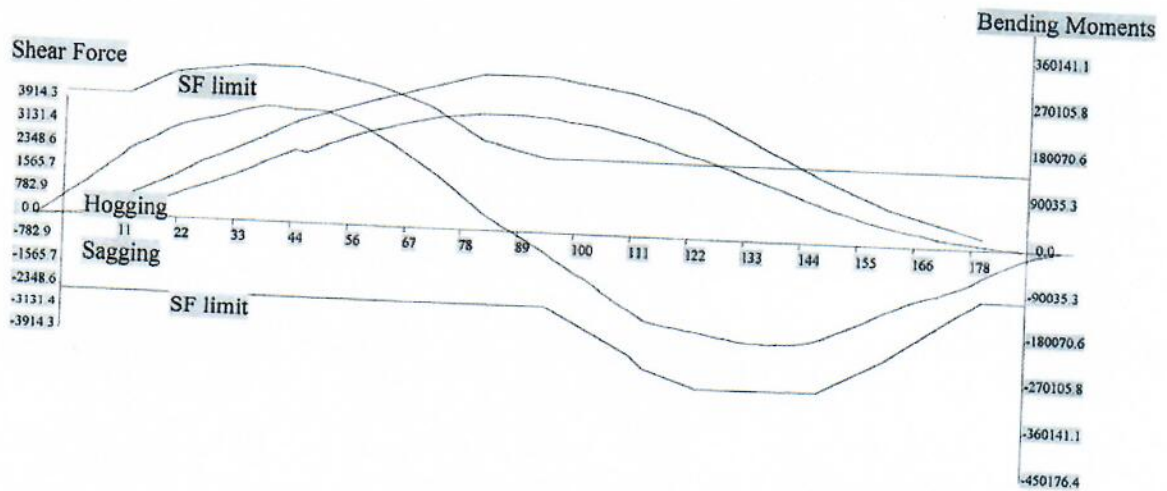
	Value	Min	Status
Initial corr. GM [m]:	1.81m	0.15	OK
Max corr. GZ [m]:	0.62m	0.20	OK
Max GZ [Deg.]:	60 Deg	30°	OK
Steady Wind Heel:	5.8°	16° (Max)	OK

	Value	Min	Status
Area Till 30 [m-R]:	0.068m-R	0.055	OK
Area Till 40 [m-R]:	0.046m-R	0.09	Not OK _i
Area 30 - 40 [m-R]:	-0.022m-R	0.03	Not OK _t
Weather criteria(B-A)m-r	-0.25	Positive	Not OK _r

Shear forces and Bending moments

Location	Frame No.	SF Tons	BM Ton-m	%SF	%BM
12.6 mtrs	14	2235.8	19484.6	53.7%	48.7%
21.6 mtrs	24	3060.3	44956.7	62.1%	56.2%
27.0 mtrs	30	3349.5	63942.9	66.3%	56.6%
36.0 mtrs	40	3776.0	100553.5	71.9%	67.0%
45.9 mtrs	51	3796.1	140240.2	72.6%	71.0%
60.3 mtrs	67	3109.1	184303.7	65.5%	75.8%
71.1 mtrs	79	1980.7	210711.0	48.3%	77.3%
81.9 mtrs	91	556.5	224159.9	18.5%	74.6%
94.5 mtrs	105	-693.1	221838.3	27.7%	73.8%
111.6 mtrs	124	-2592.8	192816.0	62.9%	70.1%
114.3 mtrs	127	-2891.1	185518.3	63.8%	69.5%
125.1 mtrs	139	-3230.8	152521.6	62.4%	63.7%
148.5 mtrs	165	-3311.6	72042.4	64.6%	57.8%
161.1 mtrs	179	-2298.8	36434.2	57.6%	50.2%
180.0 mtrs	200	-931.3	5768.5	52.3%	28.8%

Full Stress Analysis Curve-



Max. SWBM (207432 TM): 77.3%, 69.5m From AP

Max. SWSF (3761 T): 74.4%, 51.1m From AP

Horizontal-axis is from A.P to F.P in meters