Base Load Power Hub (BLPH)

HLV Ballast Procedure

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CROSSWIND HKN BASE LOAD POWER HUB PROJECT

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AMENDMENTS AND REVISIONS

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3. REFERENCE CODES
please add DNV-ST.N001 latest rev 2020

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1 BLPH – LIFTING

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BLPH - Lifting

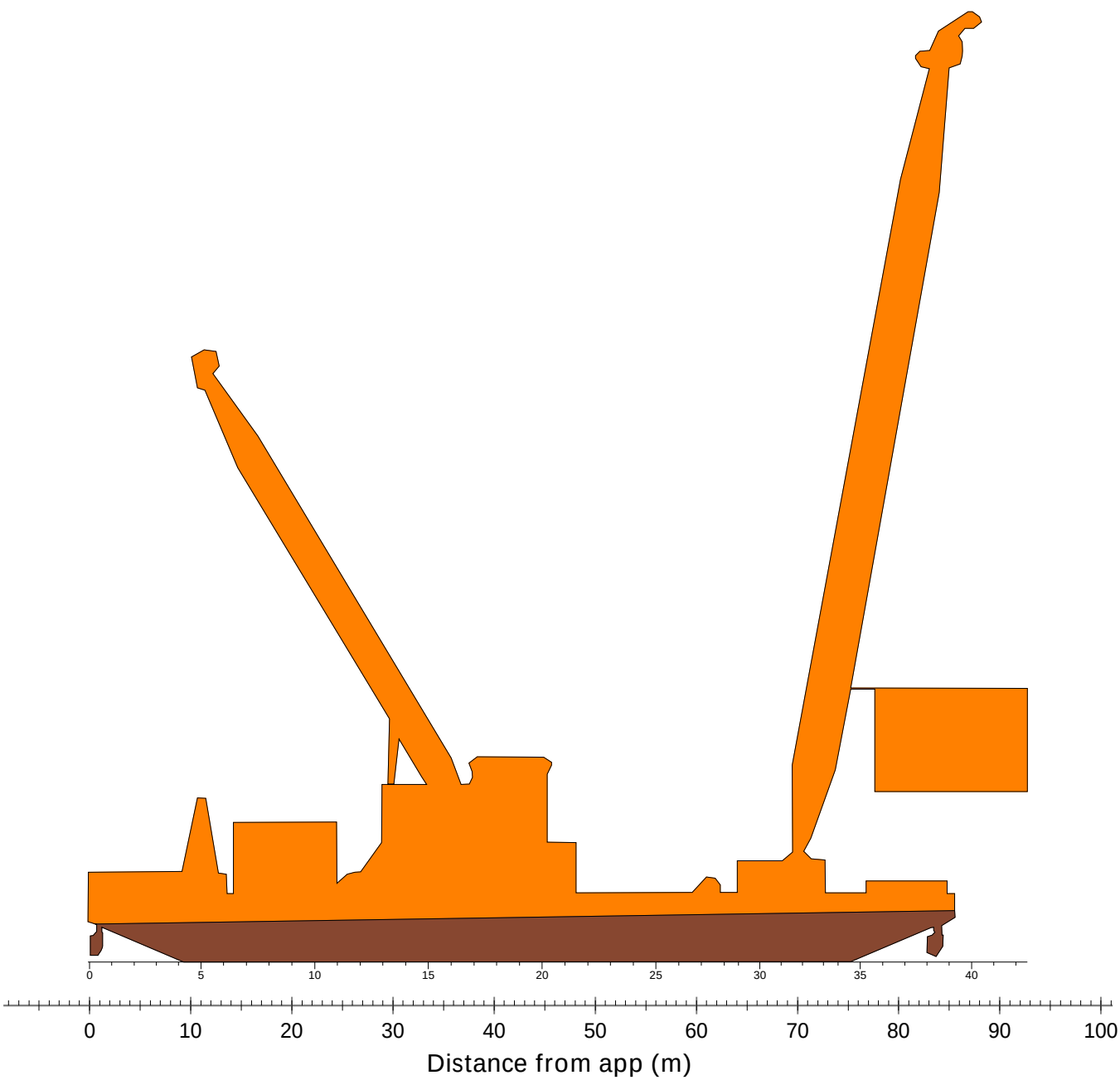
Rambiz

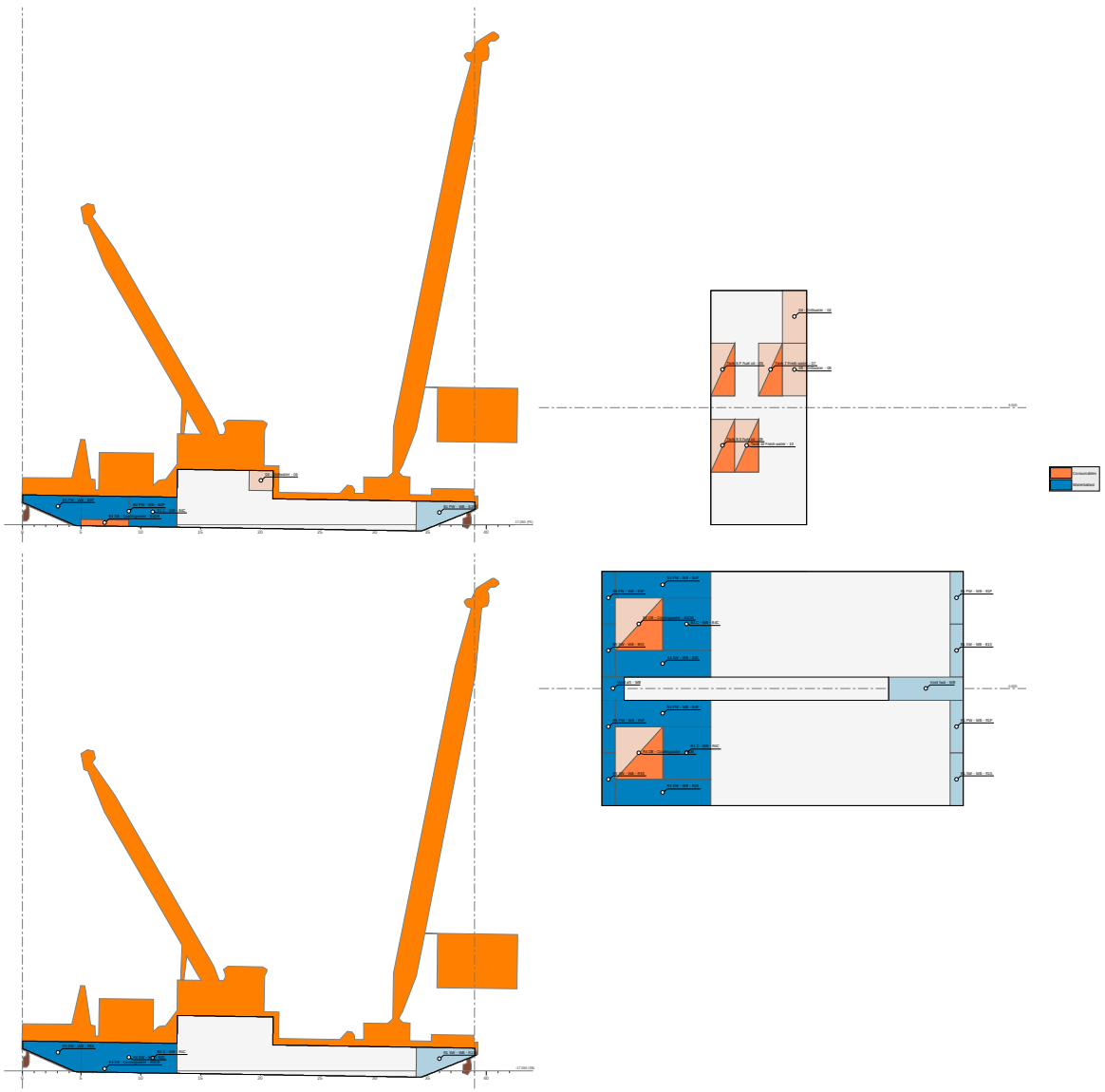
Design length	85,000 (m)	Midship location	42,500 (m)
Length over all	85,000 (m)	Relative water density	1,0250
Design beam	44,000 (m)	Mean shell thickness	0,0000 (m)
Maximum beam	44,000 (m)	Appendage coefficient	1,0000
Design draft	4,610 (m)		

Calculation settings

Center of gravity of tanks containing liquids	:	Use upright COG

Silhouette Working Condition





Hydrostatic particulars

List	-0,5 (SB) (Degr.)	GG'	0,195 (m)
Draft aft pp	3,745 (m)	VCG'	22,865 (m)
Mean moulded draft	4,415 (m)	Roll period	7,4 *(Sec.)*
Draft forward pp	5,084 (m)	GM solid	22,628 (m)
Trim	1,339 (m)	G'M liquid	22,432 (m)
KM	45,297 (m)	Immersion rate	36,207 (t/cm)
VCG	22,670 (m)	MCT	224,4 (t*m/cm)

Draft at draft marks

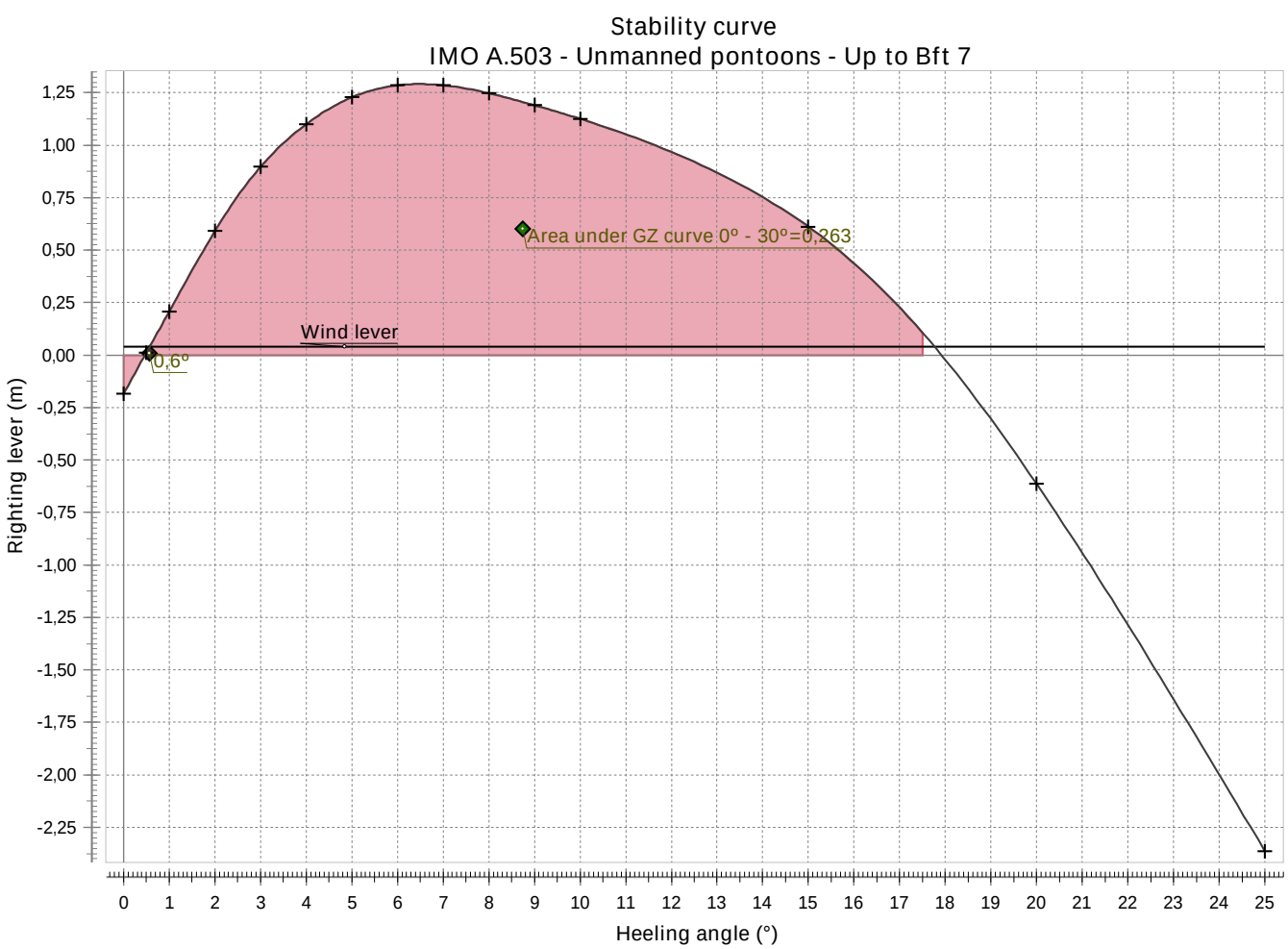
Aft mark	3,777 (m)	Fwd mark	5,116 (m)

Description	Density (t/m³)	Fill%	Weight (tonnes)	LCG (m)	TCG (m)	VCG (m)	FSM (t*m)
Consumables							
B4 DB - Coolingwater - B4DB	1,0000	98,0	102,7	15,500	12,100 (PS)	0,588	713,2
R4 DB - Coolingwater - R4DB	1,0000	98,0	102,7	15,500	-12,100 (SB)	0,588	713,2
Tank 9 S Fuel oil - 09	0,8600	50,1	85,3	31,250	-7,150 (SB)	7,480	309,8
Tank 5 P Fuel oil - 05	0,8600	50,1	85,3	31,250	7,150 (PS)	7,480	309,8
Tank 7 Fresh water - 07	1,0000	50,0	99,2	40,250	7,150 (PS)	7,480	360,2
Tank 10 Fresh water - 10	1,0000	50,1	99,2	35,750	-7,150 (SB)	7,480	360,2
17 Fuel Tank - 17	0,8600	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
08 - Drillwater - 08	1,0000	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
04 - Drillwater - 04	1,0000	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
FO Small tanks 50%			10,7	40,614	-0,159 (SB)	5,498	3,2
Dirty water PS and SB 50%			6,3	12,140	0,000 (CL)	3,225	3,4
Totals for Consumables			591,4	28,013	-0,003 (SB)	5,006	2773,0
Waterballast							
B1 PW - WB - B1P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B1 SW - WB - B1S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R1 PW - WB - R1P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R1 SW - WB - R1S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B4 PW - WB - B4P	1,0250	100,0	505,3	20,000	19,525 (PS)	2,800	0,0
B4 C - WB - B4C	1,0250	100,0	506,3	24,500	12,100 (PS)	2,800	0,0
B4 SW - WB - B4S	1,0250	100,0	505,2	20,000	4,675 (PS)	2,800	0,0
R4 PW - WB - R4P	1,0250	100,0	505,2	20,000	-4,676 (SB)	2,800	0,0
R4 C - WB - R4C	1,0250	100,0	506,3	24,500	-12,100 (SB)	2,800	0,0
R4 SW - WB - R4S	1,0250	100,0	505,3	20,000	-19,525 (SB)	2,800	0,0
B5 PW - WB - B5P	1,0250	100,0	401,1	6,718	17,159 (PS)	3,490	0,0
B5 SW - WB - B5S	1,0250	100,0	407,8	6,669	7,114 (PS)	3,514	0,0
R5 PW - WB - R5P	1,0250	100,0	407,8	6,669	-7,114 (SB)	3,514	0,0
R5 SW - WB - R5S	1,0250	100,0	401,1	6,718	-17,159 (SB)	3,490	0,0
Void aft - WB	1,0250	100,0	331,9	10,363	0,000 (CL)	3,526	0,0
Void fwd - WB	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
Totals for Waterballast			4983,1	15,953	0,000 (CL)	3,076	0,0
Hoisting Equipment							
Topping wire PS - Working condition			25,6	52,030	17,050 (PS)	73,897	0,0
Topping wire SB - Working condition			25,6	52,030	-17,050 (SB)	73,897	0,0
Runner wires PS - Working condition			2,0	79,634	17,050 (PS)	42,017	0,0
Runner wires SB - Working condition			2,0	79,634	-17,050 (SB)	42,017	0,0
Runner block PS A-frame (lower) - Working condition			0,6	89,485	17,050 (PS)	74,101	0,0
Runner block SB A-frame (lower) - Working condition			0,6	89,485	-17,050 (SB)	74,101	0,0
Runner block SB Fly (upper) - Working condition			0,6	96,788	-17,050 (SB)	90,935	0,0
Runner block PS Fly (upper) - Working condition			0,6	96,788	17,050 (PS)	90,935	0,0
Totals for Hoisting Equipment			57,6	55,657	0,000 (CL)	72,044	0,0
Cranes							
Bizon Crane (PS)			215,0	86,051	17,050 (PS)	46,980	
Bizon Crane (PS) - Load			1272,0	104,019	17,050 (PS)	85,060	
Bizon Crane (PS) - hoisting block			55,3	104,019	17,050 (PS)	85,060	
Bizon Crane (PS) - hoisting wires			41,3	104,019	17,050 (PS)	85,060	
Ram Crane (SB)			226,0	86,846	-17,050 (SB)	48,802	

Description	Density (t/m³)	Fill%	Weight (tonnes)	LCG (m)	TCG (m)	VCG (m)	FSM (t*m)
Ram Crane (SB) - Load			1308,0	104,019	-17,050 (SB)	85,060	
Ram Crane (SB) - hoisting block			54,0	104,019	-17,050 (SB)	85,060	
Ram Crane (SB) - hoisting wires			41,3	104,019	-17,050 (SB)	85,060	
Totals for Cranes			3212,9	101,609	-0,243 (SB)	79,961	
Project Equipment							
Stores + Crew 150 t			150,0	55,010	-8,470 (SB)	4,550	0,0
Mobile crane			0,0	60,000	0,000 (CL)	10,000	0,0
Manitou			0,0	60,000	0,000 (CL)	10,000	0,0
Totals for Project Equipment			150,0	55,010	-8,470 (SB)	4,550	0,0
Lightship			5209,5	39,322	-0,108 (SB)	8,059	
Deadweight			8995,0	48,246	-0,228 (SB)	31,132	2773,0
Displacement			14204,5	44,973	-0,184 (SB)	22,670	2773,0

Righting levers

Heeling angle (Degr.)	Draft (m)	Trim (m)	Displacement (tonnes)	KN sin(ø) (m)	VCG sin(ø) (m)	GG' sin(ø) (m)	TCG cos(ø) (m)	GZ (m)	Area (mrad)
0,0º (CL)	4,415	1,338	14204,5	0,000	0,000	0,000	0,184	-0,184	0,000
-0,5º (SB)	4,415	1,339	14204,5	0,395	0,198	0,002	0,184	0,012	0,000
-1,0º (SB)	4,414	1,342	14204,5	0,791	0,396	0,003	0,184	0,207	0,001
-2,0º (SB)	4,414	1,363	14204,7	1,573	0,791	0,007	0,184	0,591	0,008
-3,0º (SB)	4,427	1,469	14204,5	2,277	1,186	0,010	0,184	0,897	0,021
-4,0º (SB)	4,464	1,671	14204,6	2,878	1,581	0,014	0,184	1,100	0,039
-5,0º (SB)	4,519	1,933	14204,6	3,404	1,976	0,017	0,183	1,228	0,059
-6,0º (SB)	4,595	2,216	14204,5	3,858	2,370	0,020	0,183	1,285	0,081
-7,0º (SB)	4,689	2,500	14204,6	4,254	2,763	0,024	0,183	1,285	0,104
-8,0º (SB)	4,798	2,789	14204,5	4,612	3,155	0,027	0,182	1,247	0,126
-9,0º (SB)	4,916	3,083	14204,5	4,948	3,546	0,031	0,182	1,190	0,147
-10,0º (SB)	5,040	3,389	14204,5	5,277	3,937	0,034	0,181	1,125	0,167
-15,0º (SB)	5,652	5,457	14204,5	6,707	5,867	0,051	0,178	0,612	0,246
-20,0º (SB)	6,292	8,922	14204,4	7,379	7,754	0,067	0,173	-0,614	0,263
-25,0º (SB)	7,001	14,447	14204,5	7,467	9,581	0,083	0,167	-2,363	0,263



Evaluation of criteria

IMO A.503 - Unmanned pontoons - Up to Bft 7

Unmanned non self-propelled seagoing pontoons

Description	Attained value	Criterion	Required value	Complies
Static angle of heel due to wind and freeboard	0,6 (Degr.)	<	16,0 (Degr.)	YES
Calculated heeling moment	552,1 (t*m)			
Required freeboard	81,6 %	>=	50,0 %	YES
Required freeboard	0,967 (m)	>=	0,593 (m)	YES
Wind silhouette:	Silhouette Working Condition			
Wind pressure	18,3 (kg/m^2)			
Wind area	1215,21 (m^2)			
Area under GZ curve 0º - 30º	0,2626 (mrad)	>=	0,0550 (mrad)	YES
Area under GZ curve to max GZ	0,0920 (mrad)	>=	0,0800 (mrad)	YES

The condition complies with the stability criteria

2 TP - LIFTING

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TP lifting

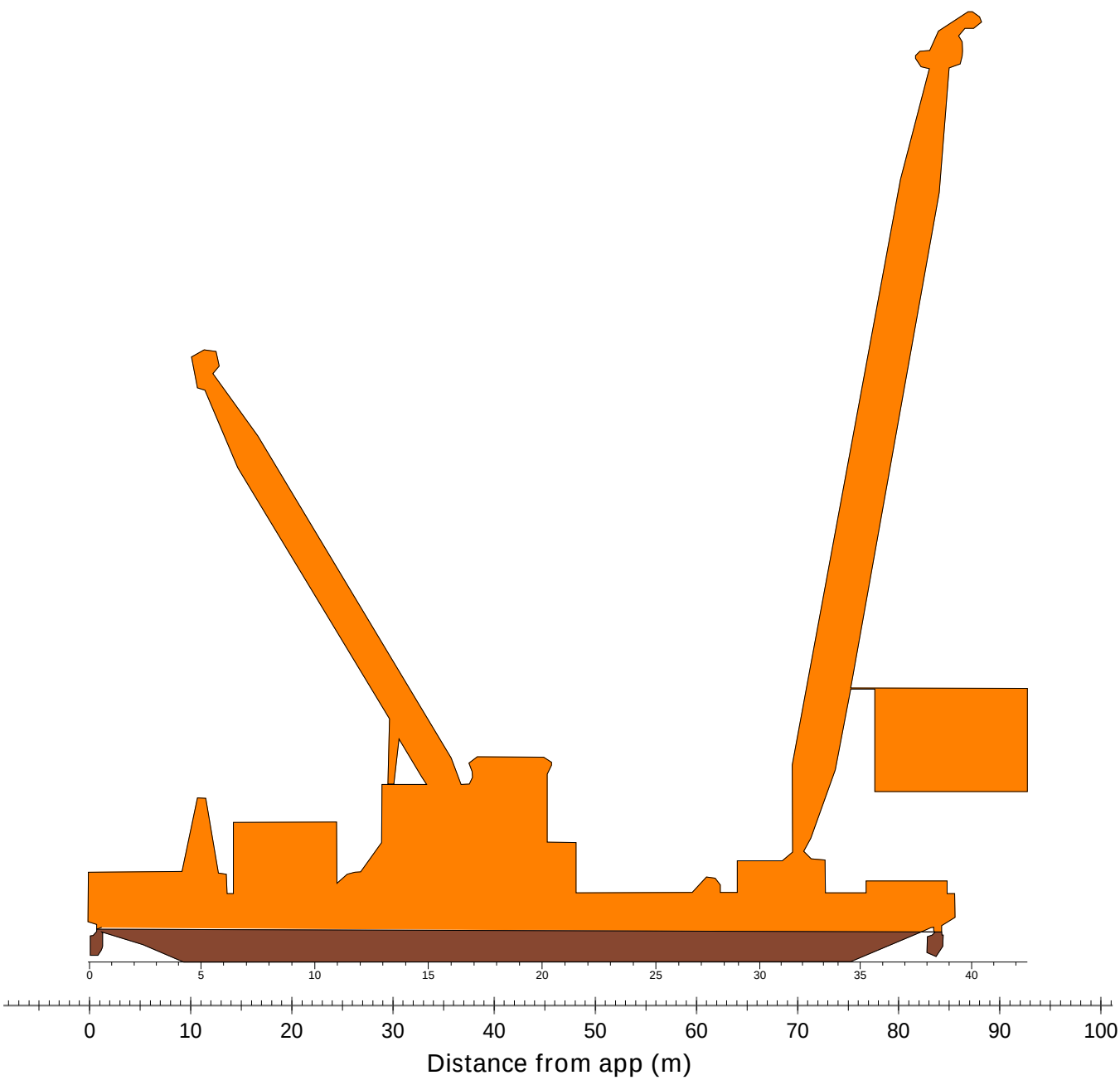
Rambiz

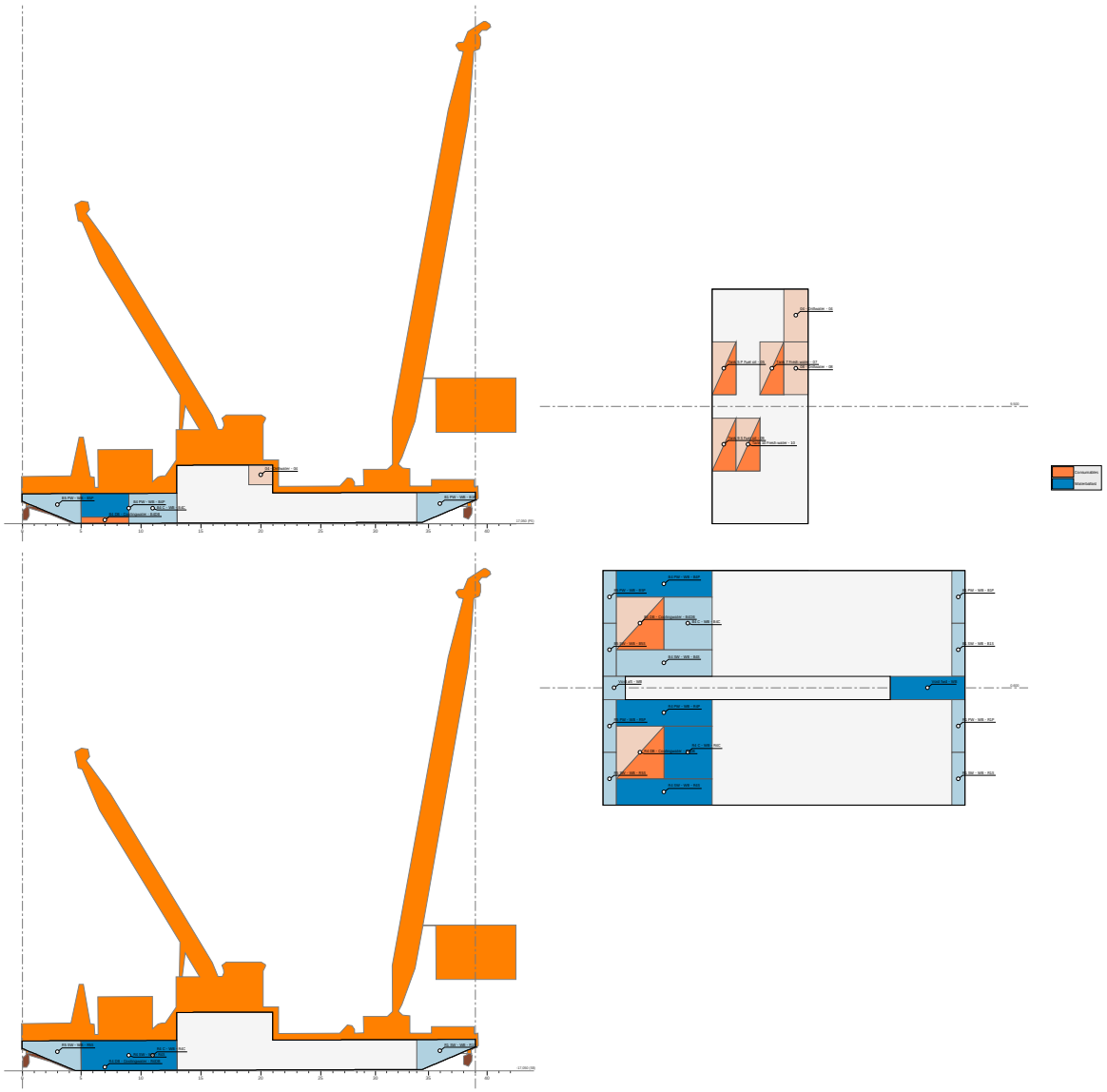
Design length	85,000 (m)	Midship location	42,500 (m)
Length over all	85,000 (m)	Relative water density	1,0250
Design beam	44,000 (m)	Mean shell thickness	0,0000 (m)
Maximum beam	44,000 (m)	Appendage coefficient	1,0000
Design draft	4,610 (m)		

Calculation settings

Center of gravity of tanks containing liquids	:	Use upright COG

Silhouette Working Condition





Hydrostatic particulars

List	-0,6 (SB) (Degr.)	GG'	0,290 (m)
Draft aft pp	3,264 (m)	VCG'	13,278 (m)
Mean moulded draft	3,120 (m)	Roll period	5,0 *(Sec.)*
Draft forward pp	2,977 (m)	GM solid	49,406 (m)
Trim	-0,287 (m)	G'M liquid	49,116 (m)
KM	62,394 (m)	Immersion rate	34,323 (t/cm)
VCG	12,988 (m)	MCT	209,7 (t*m/cm)

Draft at draft marks

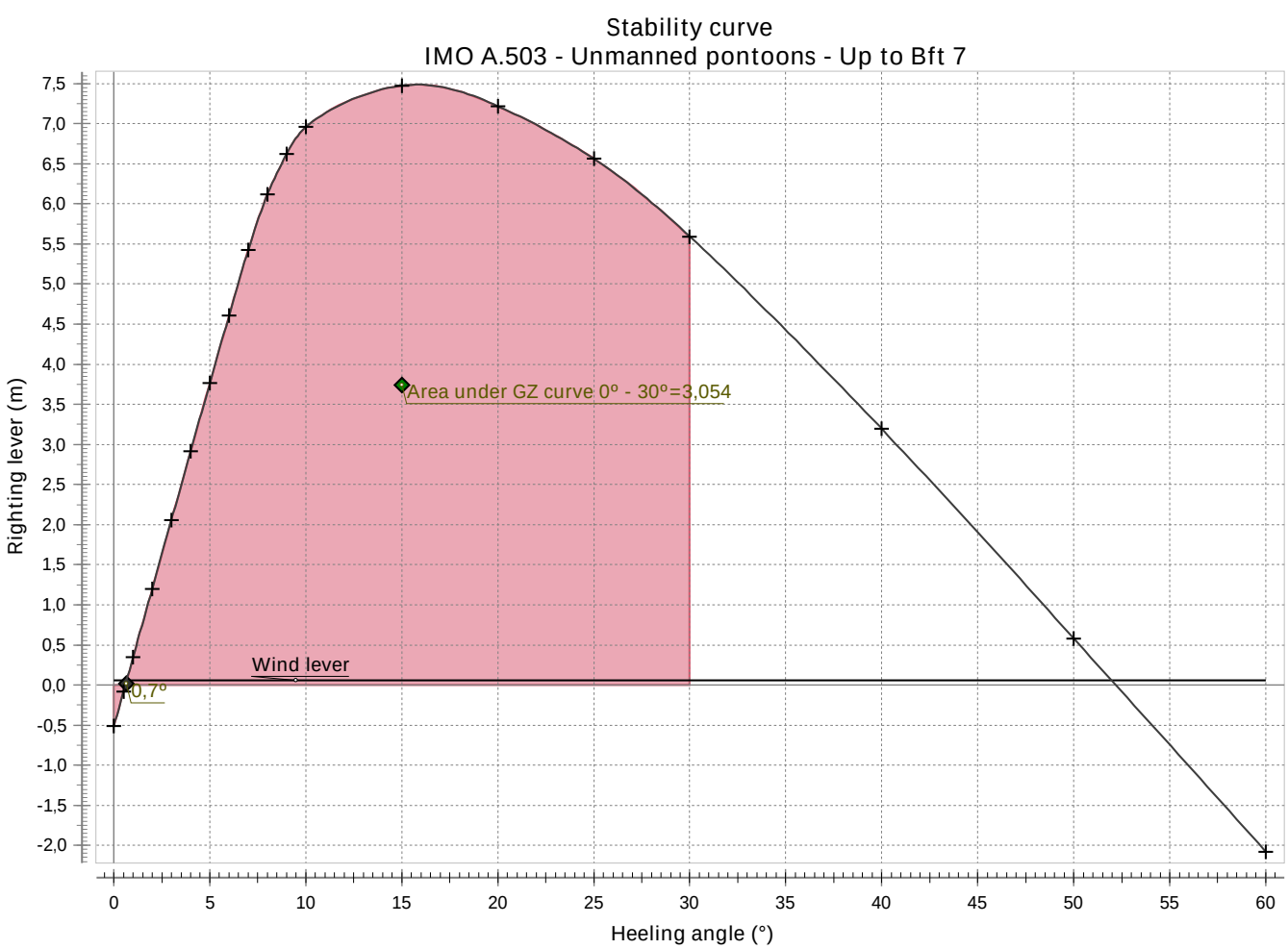
Aft mark	3,296 (m)	Fwd mark	3,009 (m)

Description	Density (t/m³)	Fill%	Weight (tonnes)	LCG (m)	TCG (m)	VCG (m)	FSM (t*m)
Consumables							
B4 DB - Coolingwater - B4DB	1,0000	98,0	102,7	15,500	12,100 (PS)	0,588	713,2
R4 DB - Coolingwater - R4DB	1,0000	98,0	102,7	15,500	-12,100 (SB)	0,588	713,2
Tank 9 S Fuel oil - 09	0,8600	50,1	85,3	31,250	-7,150 (SB)	7,480	309,8
Tank 5 P Fuel oil - 05	0,8600	50,1	85,3	31,250	7,150 (PS)	7,480	309,8
Tank 7 Fresh water - 07	1,0000	50,0	99,2	40,250	7,150 (PS)	7,480	360,2
Tank 10 Fresh water - 10	1,0000	50,1	99,2	35,750	-7,150 (SB)	7,480	360,2
17 Fuel Tank - 17	0,8600	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
08 - Drillwater - 08	1,0000	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
04 - Drillwater - 04	1,0000	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
FO Small tanks 50%			10,7	40,614	-0,159 (SB)	5,498	3,2
Dirty water PS and SB 50%			6,3	12,140	0,000 (CL)	3,225	3,4
Totals for Consumables			591,4	28,013	-0,003 (SB)	5,006	2773,0
Waterballast							
B1 PW - WB - B1P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B1 SW - WB - B1S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R1 PW - WB - R1P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R1 SW - WB - R1S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B4 PW - WB - B4P	1,0250	100,0	505,3	20,000	19,525 (PS)	2,800	0,0
B4 C - WB - B4C	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B4 SW - WB - B4S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R4 PW - WB - R4P	1,0250	100,0	505,2	20,000	-4,676 (SB)	2,800	0,0
R4 C - WB - R4C	1,0250	100,0	506,3	24,500	-12,100 (SB)	2,800	0,0
R4 SW - WB - R4S	1,0250	100,0	505,3	20,000	-19,525 (SB)	2,800	0,0
B5 PW - WB - B5P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
B5 SW - WB - B5S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R5 PW - WB - R5P	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
R5 SW - WB - R5S	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
Void aft - WB	1,0250	0,0	0,0	0,000	0,000 (CL)	0,000	0,0
Void fwd - WB	1,0250	100,0	567,3	69,875	0,000 (CL)	3,201	0,0
Totals for Waterballast			2589,4	31,806	-3,278 (SB)	2,888	0,0
Hoisting Equipment							
Topping wire PS - Working condition			25,6	52,030	17,050 (PS)	73,897	0,0
Topping wire SB - Working condition			25,6	52,030	-17,050 (SB)	73,897	0,0
Runner wires PS - Working condition			2,0	79,634	17,050 (PS)	42,017	0,0
Runner wires SB - Working condition			2,0	79,634	-17,050 (SB)	42,017	0,0
Runner block PS A-frame (lower) - Working condition			0,6	89,485	17,050 (PS)	74,101	0,0
Runner block SB A-frame (lower) - Working condition			0,6	89,485	-17,050 (SB)	74,101	0,0
Runner block SB Fly (upper) - Working condition			0,6	96,788	-17,050 (SB)	90,935	0,0
Runner block PS Fly (upper) - Working condition			0,6	96,788	17,050 (PS)	90,935	0,0
Totals for Hoisting Equipment			57,6	55,657	0,000 (CL)	72,044	0,0
Cranes							
Bizon Crane (PS)			215,0	84,081	17,050 (PS)	47,783	
Bizon Crane (PS) - Load			327,0	100,000	17,050 (PS)	86,764	
Bizon Crane (PS) - hoisting block			55,3	100,000	17,050 (PS)	86,764	
Bizon Crane (PS) - hoisting wires			41,3	100,000	17,050 (PS)	86,764	
Ram Crane (SB)			226,0	82,230	-17,050 (SB)	50,513	

Description	Density (t/m³)	Fill%	Weight (tonnes)	LCG (m)	TCG (m)	VCG (m)	FSM (t*m)
Ram Crane (SB) - Load			0,0	95,043	-17,050 (SB)	88,531	
Ram Crane (SB) - hoisting block			54,0	95,043	-17,050 (SB)	88,531	
Ram Crane (SB) - hoisting wires			41,3	95,043	-17,050 (SB)	88,531	
Totals for Cranes			959,9	91,758	5,636 (PS)	69,673	
Project Equipment							
Stores + Crew 150 t			150,0	55,010	-8,470 (SB)	4,550	0,0
Mobile crane			0,0	60,000	0,000 (CL)	10,000	0,0
Manitou			0,0	60,000	0,000 (CL)	10,000	0,0
Totals for Project Equipment			150,0	55,010	-8,470 (SB)	4,550	0,0
Lightship			5209,5	39,322	-0,108 (SB)	8,059	
Deadweight			4348,3	45,641	-1,001 (SB)	18,892	2773,0
Displacement			9557,8	42,197	-0,514 (SB)	12,988	2773,0

Righting levers

Heeling angle (Degr.)	Draft (m)	Trim (m)	Displacement (tonnes)	KN sin(ø) (m)	VCG sin(ø) (m)	GG' sin(ø) (m)	TCG cos(ø) (m)	GZ (m)	Area (mrad)
0,0º (CL)	3,121	-0,287	9557,8	0,000	0,000	0,000	0,514	-0,514	0,000
-0,5º (SB)	3,120	-0,287	9557,8	0,545	0,113	0,003	0,514	-0,085	0,000
-1,0º (SB)	3,119	-0,287	9557,7	1,089	0,227	0,005	0,514	0,343	0,001
-2,0º (SB)	3,114	-0,287	9557,7	2,178	0,453	0,010	0,514	1,201	0,015
-3,0º (SB)	3,107	-0,287	9557,7	3,266	0,680	0,015	0,513	2,058	0,043
-4,0º (SB)	3,097	-0,290	9557,8	4,352	0,906	0,020	0,513	2,913	0,087
-5,0º (SB)	3,084	-0,294	9557,8	5,432	1,132	0,025	0,512	3,763	0,145
-6,0º (SB)	3,070	-0,300	9557,8	6,506	1,358	0,030	0,511	4,607	0,218
-7,0º (SB)	3,056	-0,318	9557,8	7,552	1,583	0,035	0,510	5,424	0,305
-8,0º (SB)	3,057	-0,353	9557,8	8,473	1,808	0,040	0,509	6,116	0,406
-9,0º (SB)	3,062	-0,398	9557,8	9,206	2,032	0,045	0,508	6,621	0,518
-10,0º (SB)	3,060	-0,442	9557,8	9,770	2,255	0,050	0,506	6,958	0,637
-15,0º (SB)	2,959	-0,575	9557,7	11,407	3,361	0,075	0,497	7,474	1,272
-20,0º (SB)	2,710	-0,593	9557,8	12,242	4,442	0,099	0,483	7,218	1,918
-25,0º (SB)	2,335	-0,502	9557,8	12,641	5,489	0,123	0,466	6,563	2,521
-30,0º (SB)	1,883	-0,321	9557,8	12,677	6,494	0,145	0,445	5,593	3,054
-40,0º (SB)	0,652	0,603	9557,8	12,123	8,348	0,186	0,394	3,194	3,825
-50,0º (SB)	-0,960	2,137	9557,8	11,084	9,949	0,222	0,330	0,582	4,157
-60,0º (SB)	-3,272	4,201	9557,8	9,679	11,248	0,251	0,257	-2,077	4,168



Evaluation of criteria

IMO A.503 - Unmanned pontoons - Up to Bft 7

Unmanned non self-propelled seagoing pontoons

Description	Attained value	Criterion	Required value	Complies
Static angle of heel due to wind and freeboard	0,7 (Degr.)	<	16,0 (Degr.)	YES
Calculated heeling moment	572,5 (t*m)			
Required freeboard	89,6 %	>=	50,0 %	YES
Required freeboard	2,223 (m)	>=	1,240 (m)	YES
Wind silhouette:	Silhouette Working Condition			
Wind pressure	18,3 (kg/m^2)			
Wind area	1317,35 (m^2)			
Area under GZ curve 0º - 30º	3,0543 (mrad)	>=	0,0550 (mrad)	YES
Area under GZ curve to max GZ	1,3784 (mrad)	>=	0,0800 (mrad)	YES

The condition complies with the stability criteria