UNIVERSIDADE DA CORUÑA

Escola Politécnica Superior

Trabajo Fin de Grado
CURSO 2019/20

Buque Portacontenedores Postpanamax 11000 TEUS

Grado en Ingeniería Naval y Oceánica

ALUMNA/O

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Resumen

En este trabajo se va a desarrollar el proyecto de un buque portacontenedores postpanamax con capacidad para 11000 TEUS.

Nuestro buque estará propulsado por un motor diésel directamente acoplado y dispondrá de generación eléctrica de gas en zonas portuarias con el fin de reducir la contaminación.

La tripulación estará formada por un total de 30 tripulantes y todos ellos dispondrán de camarotes individuales.

El buque no contará con sistemas de carga y descarga propios, a excepción de una pequeña grúa para el abastecimiento de víveres.

En sus cubiertas se dispondrán dos TEUS en sentido longitudinal, o un FEU si fuera el caso, porque las guías de nuestro buque estarán adaptadas a dicho propósito.

Resumo

Neste traballo irase desenvolvendo o proxecto dun buque portacontenedores postpanamax con capacidade para 11000 TEU´s.

O noso buque estará propulsado por un motor diésel directamente acoplado e disporá de xeración eléctrica de gas en zonas portuarias coa fin de reducir a contaminación.

A tripulación estará formada por un total de 30 tripulantes e todos eles disporán de camarotes individuais.

O buque non contará con sistemas de carga e descarga propios, a excepción dunha pequena grúa para o abastecemento de viveres.

Nas súas cubertas disporanse os TEU´s en sentido lonxitudinal, ou un FEU se fora o caso, porque as guias do noso buque estarán adaptadas a dito propósito.

Summary

In this work, the project of a post-Panamax container ship with capacity for 11000 TEUS will be developed.

Our ship will be powered by a directly coupled diesel engine and will have electric gas generation in port areas in order to reduce pollution.

The crew will be available for a total of 30 crew members and all of them will have individual cabins.

The ship does not have its own loading and unloading systems, with the exception of a small crane for supplying food.

On its decks two TEUS will be arranged longitudinally, or in FEU if applicable, because the guides of our ship are adapted to this purpose.

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Documento

CUADERNO 4: CÁLCULOS DE ARQUITECTURA NAVAL

ESCOLA POLITÉCNICA SUPERIOR

UNIVERSIDADE DA CORUÑA

GRADO EN INGENIERÍA NAVAL Y OCEÁNICA

TRABAJO FIN DE GRADO

CURSO 2.019-2020

PROYECTO NÚMERO 192024

TIPO DE BUQUE: BUQUE PORTACONTENEDORES POSTPANAMAX

CLASIFICACIÓN, COTA Y REGLAMENTOS DE APLICACIÓN: DNV-GL, SOLAS Y MARPOL.

CARACTERÍSTICAS DE LA CARGA: 11000 TEUS

VELOCIDAD Y AUTONOMÍA: Velocidad servicio 20 kn, 85% MCR, 10%MM, 14.000 millas de autonomía.

SISTEMAS Y EQUIPOS DE CARGA / DESCARGA: SIN GRUAS

PROPULSIÓN: Motor diésel directamente acoplado, Generación eléctrica a Gas en zonas portuarias

TRIPULACIÓN Y PASAJE: 30 tripulantes

OTROS EQUIPOS E INSTALACIONES: LOS HABITUALES EN ESTE TIPO DE BUQUE

Ferrol, 12 Setiembre 2020

ALUMNO/A: **Dª MANUEL GARCÍA PENSADO**

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1 INTRODUCCIÓN

En este cuaderno profundizaremos en el estudio de los cálculos correspondientes a la arquitectura naval de nuestro buque, para los cuales deberemos definir los siguientes apartados:

- Tablas de Hidrostáticas
- Tablas de Brazos Adrizantes (curvas KN)
- Definición de la zona estanca del buque y sus puntos de inundación progresiva (PIP)

Además, se realizará una descripción detallada del compartimentado interior definiendo las diferentes zonas del buque, sus tanques y sus bodegas. Al final del documento se adjuntará un anexo con los planos correspondientes y capacidades de los tanques con sus respectivos centros de gravedad.

A continuación, se muestran las dimensiones de nuestro buque necesarias para la realización del cuaderno:

Dimensiones	
L_{oa}	342,62 m
L_{PP}	326 m
B	47 m
D	28 m
T	16 m
C_B	0,671
Δ	172205 t
F_N	0,1817
C_M	0,992
C_P	0,677
C_F	0,827
Velocidad	20 nudos
TEU´s totales	11000
TEU´s cubierta	6168
TEU´s bodega	4840
Tripulación	30

2 TABLAS HIDROSTÁTICAS

Para el cálculo de las hidrostáticas se utilizará el modelo obtenido mediante la transformación paramétrica del cuaderno 3. Introduciendo los datos en el programa "Maxsurf Stability", usaremos la herramienta "Upright Hydrostatics".

El calado mínimo será el del peso en rosca de nuestro buque y el máximo se corresponderá con el calado de 20 m.

En primer lugar obtendremos el calado para el cual nuestro desplazamiento coincide con el peso en rosca. De esta forma obtendremos el calado a partir del cual empezaremos a evaluar las hidrostáticas y curvas KN de nuestro buque.

Draft Amidships m	**5,500**
Displacement t	51251
Heel deg	0,0
Draft at FP m	5,500
Draft at AP m	5,500
Draft at LCF m	5,500
Trim (+ve by stern) m	0,000
WL Length m	326,588
Beam max extents on WL m	46,988
Wetted Area m^2	12102,763
Waterpl. Area m^2	10192,331
Prismatic coeff. (Cp)	0,607
Block coeff. (Cb)	0,592
Max Sect. area coeff. (Cm)	0,977
Waterpl. area coeff. (Cwp)	0,664
LCB from zero pt. (+ve fwd) m	161,214
LCF from zero pt. (+ve fwd) m	161,632
KB m	2,921
KG m	16,000
BMt m	28,181
BML m	1030,248
GMt m	15,10

Draft Amidships m	**5,500**
	3
GML m	1017,170
KMt m	31,103
KML m	1033,170
Immersion (TPc) tonne/cm	104,471
MTc tonne.m	1599,079
RM at 1deg = GMt.Disp.sin(1) tonne.m	13508,894
Max deck inclination deg	0,0000
Trim angle (+ve by stern) deg	0,0000

De este modo comprobamos que el calado inicial será de 5,5 m.

Se han tomado los calados desde 5,5 m hasta 21,25 m con intervalos de 1,75 m, para trimados de -0,5%, 0%, 0,5%, 1% y 1,5% de la eslora entre perpendiculares.

2.1 Hidrostáticas para -1,5% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51271	69531	88123	107100	126725	147278	169062	192246	216832	242480
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	7,945	9,695	11,445	13,195	14,945	16,695	18,445	20,195	21,945	23,695
Draft at AP m	3,055	4,805	6,555	8,305	10,055	11,805	13,555	15,305	17,055	18,805
Draft at LCF m	5,521	7,234	8,940	10,660	12,398	14,130	15,844	17,556	19,286	21,052
Trim (+ve by stern) m	-4,890	-4,890	-4,890	-4,890	-4,890	-4,890	-4,890	-4,890	-4,890	-4,890
WL Length m	325,941	324,903	321,550	318,147	317,194	318,121	324,653	332,527	335,069	336,658
Beam max extents on WL m	46,983	46,997	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12119,390	13359,884	14620,480	15885,162	17194,121	18605,717	20134,701	21752,308	23341,799	24786,787
Waterpl. Area m^2	10066,973	10278,833	10453,870	10730,311	11174,927	11772,937	12525,254	13326,143	14043,340	14518,345
Prismatic coeff. (Cp)	0,588	0,612	0,635	0,654	0,668	0,679	0,681	0,681	0,694	0,709
Block coeff. (Cb)	0,415	0,462	0,501	0,533	0,558	0,578	0,589	0,597	0,614	0,633
Max Sect. area coeff. (Cm)	0,965	0,971	0,975	0,982	0,984	0,985	0,985	0,985	0,985	0,985
Waterpl. area coeff. (Cwp)	0,657	0,673	0,692	0,718	0,750	0,787	0,821	0,853	0,892	0,918
LCB from zero pt. (+ve fwd) m	176,484	172,996	170,345	168,133	166,342	164,862	163,439	161,974	160,517	159,309
LCF from zero pt. (+ve fwd) m	164,436	161,907	159,015	157,036	156,235	155,034	152,636	150,037	148,728	149,793
KB m	3,036	3,915	4,796	5,683	6,589	7,522	8,487	9,479	10,493	11,517
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
BMt m	27,629	21,212	17,409	14,965	13,309	12,182	11,463	11,000	10,669	10,223
BML m	1000,601	762,016	609,313	526,593	495,398	492,272	508,304	527,371	534,844	518,486
GMt m	14,465	8,979	6,096	4,572	3,849	3,677	3,944	4,495	5,200	5,796
GML m	987,437	749,783	598,000	516,200	485,938	483,768	500,785	520,866	529,375	514,059
KMt m	30,662	25,125	22,203	20,646	19,896	19,703	19,948	20,477	21,161	21,739
KML m	1003,525	765,846	614,041	532,216	501,932	499,739	516,734	536,790	545,277	529,944
Immersion (TPc) tonne/cm	103,186	105,358	107,152	109,986	114,543	120,673	128,384	136,593	143,944	148,813
MTc tonne.m	1552,951	1599,153	1616,457	1695,824	1888,934	2185,489	2597,001	3071,552	3520,951	3823,510
RM at 1deg = GMt.Disp.sin(1) tonne.m	12943,058	10895,525	9374,864	8545,673	8511,945	9452,041	11636,031	15079,928	19678,025	24526,256
Max deck inclination deg	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594
Trim angle (+ve by stern) deg	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594	-0,8594

2.2 Hidrostáticas para -1% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51217	69599	88347	107462	127171	147855	169842	193257	217941	243506
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	7,130	8,880	10,630	12,380	14,130	15,880	17,630	19,380	21,130	22,880
Draft at AP m	3,870	5,620	7,370	9,120	10,870	12,620	14,370	16,120	17,870	19,620
Draft at LCF m	5,506	7,236	8,957	10,680	12,412	14,141	15,862	17,587	19,336	21,106
Trim (+ve by stern) m	-3,260	-3,260	-3,260	-3,260	-3,260	-3,260	-3,260	-3,260	-3,260	-3,260
WL Length m	326,619	325,897	323,407	319,363	317,372	320,631	327,829	333,522	334,449	335,834
Beam max extents on WL m	46,985	46,998	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12114,498	13352,200	14615,105	15903,005	17231,075	18668,447	20260,215	21886,703	23397,419	24793,528
Waterpl. Area m^2	10123,132	10357,524	10542,542	10789,301	11222,159	11867,940	12650,785	13445,742	14044,372	14428,227
Prismatic coeff. (Cp)	0,600	0,620	0,639	0,659	0,674	0,680	0,680	0,685	0,701	0,715
Block coeff. (Cb)	0,461	0,503	0,537	0,567	0,591	0,605	0,612	0,623	0,642	0,660
Max Sect. area coeff. (Cm)	0,970	0,976	0,980	0,982	0,987	0,988	0,989	0,989	0,990	0,990
Waterpl. area coeff. (Cwp)	0,660	0,676	0,694	0,719	0,752	0,788	0,821	0,858	0,893	0,914
LCB from zero pt. (+ve fwd) m	171,457	169,135	167,232	165,451	163,831	162,340	160,820	159,248	157,794	156,707
LCF from zero pt. (+ve fwd) m	163,649	161,580	158,714	155,954	154,183	152,078	149,231	146,673	146,561	148,605
KB m	2,971	3,870	4,768	5,667	6,579	7,518	8,489	9,488	10,505	11,525

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	27,848	21,335	17,474	15,004	13,357	12,267	11,583	11,132	10,740	10,108
BML m	1017,413	781,253	627,260	534,219	498,263	500,713	519,497	536,681	530,799	507,690
GMt m	14,735	9,144	6,201	4,647	3,928	3,792	4,093	4,658	5,297	5,697
GML m	1004,300	769,062	615,986	523,862	488,834	492,238	512,008	530,207	525,357	503,279
KMt m	30,817	25,204	22,241	20,670	19,935	19,785	20,071	20,619	21,244	21,633
KML m	1020,333	785,084	631,997	539,859	504,817	508,206	527,960	546,142	541,278	519,190
Immersion (TPc) tonne/cm	103,762	106,165	108,061	110,590	115,027	121,646	129,671	137,819	143,955	147,889
MTc tonne.m	1577,807	1641,863	1669,311	1726,819	1906,879	2232,465	2667,449	3143,064	3512,099	3759,171
RM at 1deg = GMt.Disp.sin(1) tonne.m	13170,721	11107,199	9560,459	8715,652	8717,381	9786,070	12133,504	15709,930	20148,053	24210,665
Max deck inclination deg	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729
Trim angle (+ve by stern) deg	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729	-0,5729

2.3 Hidrostáticas para -0,5% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51208	69689	88590	107883	127744	148626	170856	194483	219191	244610
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	6,315	8,065	9,815	11,565	13,315	15,065	16,815	18,565	20,315	22,065
Draft at AP m	4,685	6,435	8,185	9,935	11,685	13,435	15,185	16,935	18,685	20,435
Draft at LCF m	5,499	7,240	8,977	10,710	12,445	14,179	15,914	17,655	19,409	21,172
Trim (+ve by stern) m	-1,630	-1,630	-1,630	-1,630	-1,630	-1,630	-1,630	-1,630	-1,630	-1,630
WL Length m	326,770	326,510	324,843	321,231	318,512	323,881	331,282	333,237	333,943	335,114
Beam max extents on WL m	46,987	46,998	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12109,394	13350,258	14612,485	15927,218	17292,161	18789,942	20401,914	21984,644	23429,051	24798,435
Waterpl. Area m^2	10163,910	10427,001	10640,243	10880,131	11308,261	12003,488	12790,482	13509,933	14003,592	14329,210
Prismatic coeff. (Cp)	0,608	0,625	0,641	0,660	0,676	0,677	0,677	0,690	0,706	0,720
Block coeff. (Cb)	0,518	0,552	0,579	0,605	0,627	0,634	0,638	0,654	0,672	0,688
Max Sect. area coeff. (Cm)	0,973	0,979	0,984	0,986	0,988	0,990	0,991	0,991	0,992	0,992
Waterpl. area coeff. (Cwp)	0,662	0,679	0,697	0,721	0,755	0,789	0,821	0,863	0,892	0,910
LCB from zero pt. (+ve fwd) m	166,353	165,186	164,030	162,718	161,283	159,751	158,123	156,481	155,099	154,165
LCF from zero pt. (+ve fwd) m	162,724	161,057	158,390	155,027	152,014	148,786	145,758	143,998	144,813	147,475
KB m	2,932	3,845	4,756	5,666	6,586	7,534	8,513	9,519	10,536	11,550

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	28,033	21,455	17,552	15,058	13,425	12,385	11,725	11,271	10,740	9,980
BML m	1026,994	796,584	646,780	547,723	506,497	513,540	531,188	538,123	522,281	495,945
GMt m	14,948	9,290	6,302	4,726	4,020	3,936	4,263	4,822	5,316	5,574
GML m	1013,910	784,418	635,531	537,390	497,092	505,091	523,726	531,674	516,857	491,539
KMt m	30,965	25,300	22,307	20,724	20,011	19,919	20,238	20,789	21,276	21,530
KML m	1029,913	800,419	651,528	553,382	513,077	521,068	539,695	547,635	532,811	507,489
Immersion (TPc) tonne/cm	104,180	106,877	109,062	111,521	115,910	123,036	131,102	138,477	143,537	146,874
MTc tonne.m	1592,608	1676,817	1727,017	1778,342	1947,825	2302,706	2744,784	3171,758	3475,091	3688,132
RM at 1deg = GMt.Disp.sin(1) tonne.m	13359,289	11298,381	9743,954	8898,236	8962,623	10208,815	12710,826	16367,703	20334,325	23795,314
Max deck inclination deg	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865
Trim angle (+ve by stern) deg	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865	-0,2865

2.4 Hidrostáticas para 0% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51251	69814	88859	108353	128457	149608	172110	195880	220540	245789
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Draft at AP m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Draft at LCF m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Trim (+ve by stern) m	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
WL Length m	326,588	326,806	325,817	323,134	322,008	327,572	332,937	333,052	333,552	334,503
Beam max extents on WL m	46,988	46,998	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12102,763	13351,922	14620,109	15953,020	17411,051	18931,456	20552,699	22057,618	23443,117	24803,406
Waterpl. Area m^2	10192,331	10489,174	10738,242	11006,639	11460,707	12152,300	12933,772	13534,509	13924,206	14227,645
Prismatic coeff. (Cp)	0,607	0,623	0,638	0,655	0,669	0,671	0,676	0,693	0,709	0,722
Block coeff. (Cb)	0,592	0,612	0,629	0,647	0,662	0,665	0,671	0,688	0,704	0,718
Max Sect. area coeff. (Cm)	0,977	0,982	0,986	0,988	0,990	0,991	0,992	0,993	0,993	0,994
Waterpl. area coeff. (Cwp)	0,664	0,683	0,701	0,725	0,757	0,789	0,827	0,865	0,888	0,905
LCB from zero pt. (+ve fwd) m	161,214	161,171	160,740	159,905	158,660	157,080	155,347	153,712	152,459	151,687
LCF from zero pt. (+ve fwd) m	161,632	160,334	157,866	154,186	149,618	145,550	142,356	141,814	143,579	146,356
KB m	2,921	3,841	4,760	5,681	6,613	7,571	8,561	9,571	10,584	11,590

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	28,181	21,570	17,639	15,132	13,524	12,532	11,892	11,383	10,640	9,849
BML m	1030,248	808,644	665,015	568,100	524,874	526,918	541,913	534,420	510,216	483,865
GMt m	15,103	9,411	6,399	4,814	4,137	4,103	4,452	4,954	5,224	5,439
GML m	1017,170	796,485	653,775	557,782	515,486	518,490	534,474	527,990	504,800	479,455
KMt m	31,103	25,411	22,399	20,814	20,137	20,103	20,452	20,954	21,224	21,439
KML m	1033,170	812,485	669,775	573,782	531,486	534,490	550,474	543,990	520,800	495,455
Immersion (TPc) tonne/cm	104,471	107,514	110,067	112,818	117,472	124,561	132,571	138,729	142,723	145,833
MTc tonne.m	1599,079	1705,652	1781,989	1853,862	2031,175	2379,399	2821,674	3172,411	3414,922	3614,804
RM at 1deg = GMt.Disp.sin(1) tonne.m	13508,894	11466,134	9924,178	9102,420	9274,501	10712,851	13373,911	16934,291	20105,339	23332,874
Max deck inclination deg	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Trim angle (+ve by stern) deg	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

2.5 Hidrostáticas para +0,5% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51356	69984	89166	108881	129317	150808	173579	197416	221964	247041
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	4,685	6,435	8,185	9,935	11,685	13,435	15,185	16,935	18,685	20,435
Draft at AP m	6,315	8,065	9,815	11,565	13,315	15,065	16,815	18,565	20,315	22,065
Draft at LCF m	5,513	7,268	9,030	10,799	12,579	14,354	16,117	17,865	19,603	21,339
Trim (+ve by stern) m	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630
WL Length m	326,140	326,827	326,410	324,948	327,148	331,746	333,015	332,957	333,270	334,003
Beam max extents on WL m	46,989	46,999	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12095,580	13357,805	14639,524	15993,057	17495,563	19093,423	20667,497	22109,012	23456,924	24808,800
Waterpl. Area m^2	10210,681	10544,321	10837,104	11160,977	11654,730	12329,829	13024,017	13522,647	13835,910	14125,841
Prismatic coeff. (Cp)	0,584	0,605	0,624	0,642	0,652	0,658	0,672	0,690	0,706	0,719
Block coeff. (Cb)	0,541	0,570	0,594	0,616	0,629	0,638	0,654	0,673	0,690	0,704
Max Sect. area coeff. (Cm)	0,976	0,981	0,985	0,987	0,989	0,990	0,991	0,992	0,993	0,993
Waterpl. area coeff. (Cwp)	0,666	0,686	0,706	0,731	0,758	0,791	0,832	0,864	0,883	0,900
LCB from zero pt. (+ve fwd) m	156,078	157,111	157,369	156,988	155,924	154,313	152,520	150,969	149,889	149,276
LCF from zero pt. (+ve fwd) m	160,376	159,390	157,094	153,142	147,290	142,290	139,682	140,052	142,476	145,237
KB m	2,940	3,860	4,783	5,713	6,660	7,632	8,631	9,641	10,647	11,645

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	28,291	21,675	17,735	15,232	13,665	12,704	12,068	11,429	10,514	9,721
BML m	1028,004	817,265	682,038	592,805	549,442	543,365	544,579	526,710	497,415	471,660
GMt m	15,196	9,505	6,490	4,915	4,290	4,293	4,646	5,010	5,096	5,298
GML m	1014,910	805,096	670,793	582,488	540,066	534,953	537,157	520,291	491,997	467,236
KMt m	31,230	25,534	22,518	20,945	20,325	20,336	20,698	21,070	21,161	21,366
KML m	1030,931	821,115	686,813	598,511	556,095	550,990	553,203	536,345	508,056	483,299
Immersion (TPc) tonne/cm	104,659	108,079	111,080	114,400	119,461	126,381	133,496	138,607	141,818	144,790
MTc tonne.m	1598,792	1728,299	1834,691	1945,419	2142,280	2474,656	2860,041	3150,666	3349,792	3540,620
RM at 1deg = GMt.Disp.sin(1) tonne.m	13619,861	11609,066	10100,102	9340,131	9681,741	11298,870	14075,376	17260,099	19741,259	22840,743
Max deck inclination deg	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865
Trim angle (+ve by stern) deg	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865	0,2865

2.6 Hidrostáticas para +1% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51532	70213	89527	109498	130335	152230	175215	199049	223454	248363
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	3,870	5,620	7,370	9,120	10,870	12,620	14,370	16,120	17,870	19,620
Draft at AP m	7,130	8,880	10,630	12,380	14,130	15,880	17,630	19,380	21,130	22,880
Draft at LCF m	5,541	7,298	9,070	10,865	12,680	14,487	16,254	17,992	19,716	21,438
Trim (+ve by stern) m	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260
WL Length m	325,416	326,597	326,690	327,981	332,791	334,818	333,215	332,950	333,089	333,616
Beam max extents on WL m	46,991	46,999	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12087,839	13366,792	14670,594	16089,716	17636,060	19265,820	20756,504	22133,279	23472,729	24819,633
Waterpl. Area m^2	10220,841	10594,389	10939,704	11351,410	11895,094	12530,231	13076,662	13462,391	13747,252	14027,965
Prismatic coeff. (Cp)	0,561	0,587	0,608	0,624	0,633	0,647	0,668	0,686	0,702	0,716
Block coeff. (Cb)	0,495	0,532	0,561	0,583	0,596	0,613	0,637	0,657	0,675	0,690
Max Sect. area coeff. (Cm)	0,970	0,975	0,979	0,981	0,983	0,985	0,986	0,987	0,988	0,989
Waterpl. area coeff. (Cwp)	0,668	0,690	0,712	0,736	0,760	0,796	0,835	0,860	0,878	0,895
LCB from zero pt. (+ve fwd) m	150,983	153,025	153,927	153,935	153,034	151,436	149,686	148,283	147,390	146,930
LCF from zero pt. (+ve fwd) m	158,941	158,214	155,974	151,532	145,035	139,275	137,570	138,833	141,425	144,181
KB m	2,987	3,901	4,826	5,765	6,728	7,716	8,722	9,729	10,726	11,714

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	28,357	21,768	17,840	15,364	13,847	12,906	12,219	11,345	10,384	9,594
BML m	1020,750	822,799	698,174	622,488	581,769	562,633	542,121	514,295	484,688	459,966
GMt m	15,224	9,571	6,576	5,039	4,476	4,507	4,807	4,926	4,954	5,148
GML m	1007,617	810,601	686,910	612,163	572,398	554,234	534,709	507,877	479,258	455,520
KMt m	31,342	25,669	22,665	21,129	20,574	20,622	20,940	21,073	21,110	21,308
KML m	1023,686	826,659	702,965	628,222	588,468	570,321	550,815	523,998	495,389	471,657
Immersion (TPc) tonne/cm	104,764	108,592	112,132	116,352	121,925	128,435	134,036	137,990	140,909	143,787
MTc tonne.m	1592,753	1745,807	1886,383	2056,110	2288,412	2588,022	2873,838	3100,936	3284,964	3470,309
RM at 1deg = GMt.Disp.sin(1) tonne.m	13691,686	11727,762	10275,092	9629,982	10180,813	11974,396	14700,556	17113,403	19320,431	22313,582
Max deck inclination deg	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729
Trim angle (+ve by stern) deg	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729	0,5729

2.7 Hidrostáticas para +1,5% Lpp

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
Displacement t	51789	70513	89962	110234	131518	153837	176982	200751	225007	249751
Heel deg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Draft at FP m	3,055	4,805	6,555	8,305	10,055	11,805	13,555	15,305	17,055	18,805
Draft at AP m	7,945	9,695	11,445	13,195	14,945	16,695	18,445	20,195	21,945	23,695
Draft at LCF m	5,586	7,343	9,128	10,954	12,805	14,636	16,406	18,128	19,839	21,548
Trim (+ve by stern) m	4,890	4,890	4,890	4,890	4,890	4,890	4,890	4,890	4,890	4,890
WL Length m	324,380	326,121	326,831	331,872	338,254	336,740	333,656	333,032	333,000	333,338
Beam max extents on WL m	46,992	46,999	47,000	47,000	47,000	47,000	47,000	47,000	47,000	47,000
Wetted Area m^2	12078,115	13380,962	14715,418	16176,134	17794,350	19397,815	20827,788	22155,599	23490,054	24833,209
Waterpl. Area m^2	10222,282	10642,340	11052,575	11572,196	12160,574	12692,975	13103,960	13390,072	13659,108	13933,348
Prismatic coeff. (Cp)	0,539	0,568	0,593	0,606	0,615	0,637	0,662	0,681	0,697	0,711
Block coeff. (Cb)	0,457	0,499	0,531	0,552	0,566	0,593	0,620	0,642	0,660	0,676
Max Sect. area coeff. (Cm)	0,971	0,976	0,979	0,982	0,984	0,985	0,986	0,988	0,989	0,989
Waterpl. area coeff. (Cwp)	0,671	0,694	0,720	0,742	0,765	0,802	0,836	0,855	0,873	0,889
LCB from zero pt. (+ve fwd) m	145,964	148,934	150,421	150,733	149,970	148,465	146,874	145,674	144,964	144,649
LCF from zero pt. (+ve fwd) m	157,289	156,800	154,468	149,394	142,695	137,238	135,937	137,803	140,410	143,151
KB m	3,063	3,967	4,891	5,840	6,820	7,823	8,831	9,831	10,818	11,797

Draft Amidships m	5,500	7,250	9,000	10,750	12,500	14,250	16,000	17,750	19,500	21,250
KG m	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
BMt m	28,377	21,850	17,957	15,542	14,066	13,125	12,312	11,220	10,253	9,471
BML m	1007,804	826,007	714,834	655,900	617,385	576,605	536,993	501,006	472,125	448,611
GMt m	15,185	9,608	6,661	5,200	4,691	4,731	4,902	4,791	4,801	4,993
GML m	994,613	813,765	703,538	645,558	608,010	568,211	529,583	494,578	466,672	444,133
KMt m	31,436	25,815	22,846	21,381	20,884	20,946	21,142	21,049	21,070	21,267
KML m	1010,754	829,881	719,645	661,667	624,135	584,363	545,764	510,781	482,889	460,358
Immersion (TPc) tonne/cm	104,778	109,084	113,289	118,615	124,646	130,103	134,316	137,248	140,006	142,817
MTc tonne.m	1580,034	1760,116	1941,420	2182,843	2452,844	2681,300	2874,988	3045,549	3220,936	3402,462
RM at 1deg = GMt.Disp.sin(1) tonne.m	13725,031	11823,615	10457,339	10003,167	10768,105	12700,937	15141,670	16786,192	18852,515	21763,333
Max deck inclination deg	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594
Trim angle (+ve by stern) deg	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594	0,8594

3 CURVAS KN

Para el cálculo de las curvas KN´s emplearemos el programa “Maxsurf Stability”, empleando la opción de “KN values”.

Los trimados serán los mismos que anteriormente: -0,5, 0, 0,5, 1 y 1,1 % de la eslora entre perpendiculares. Los ángulos de escora que hemos utilizado van desde 0º a 50º, en intervalos de 5 grados, y hasta 70º, en intervalos de 10 grados.

A continuación, se muestran los resultados obtenidos para cada trimado:

3.1 Curvas Kn para trimado -1,5% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	**m**	**m**	**m**	**m**	**m**	**0,0 deg.**	**5,0 deg. Starb.**	**10,0 deg. Starb.**	**15,0 deg. Starb.**	**20,0 deg. Starb.**	**25,0 deg. Starb.**	**30,0 deg. Starb.**	**35,0 deg. Starb.**	**40,0 deg. Starb.**	**45,0 deg. Starb.**	**50,0 deg. Starb.**	**60,0 deg. Starb.**	**70,0 deg. Starb.**
51271	5,5	-4,890 (fixed)	176,530	0	0	0	2,674	5,335	7,798	9,766	11,331	12,641	13,776	14,798	15,742	16,641	18,159	18,513
69531	7,25	-4,890 (fixed)	173,055	0	0	0	2,194	4,408	6,629	8,707	10,468	11,98	13,343	14,615	15,815	16,95	18,444	18,617
88123	9	-4,890 (fixed)	170,417	0	0	0	1,94	3,901	5,904	7,933	9,851	11,572	13,135	14,584	15,941	17,061	18,314	18,427
107100	10,75	-4,890 (fixed)	168,219	0	0	0	1,804	3,629	5,498	7,44	9,432	11,323	13,039	14,62	15,953	16,956	18,024	18,093
126725	12,5	-4,890 (fixed)	166,441	0	0	0	1,739	3,499	5,306	7,197	9,181	11,161	13,01	14,592	15,818	16,7	17,65	17,719
147278	14,25	-4,890 (fixed)	164,974	0	0	0	1,723	3,468	5,262	7,125	9,063	11,07	12,94	14,439	15,549	16,351	17,23	17,326
169062	16	-4,890 (fixed)	163,566	0	0	0	1,745	3,509	5,311	7,153	9,057	11,001	12,754	14,134	15,17	15,93	16,791	16,93
192246	17,75	-4,890 (fixed)	162,116	0	0	0	1,79	3,593	5,407	7,246	9,114	10,878	12,421	13,689	14,682	15,432	16,331	16,55
216832	19,5	-4,890 (fixed)	160,675	0	0	0	1,847	3,686	5,526	7,371	9,11	10,645	11,976	13,129	14,09	14,852	15,834	16,179
242480	21,25	-4,890 (fixed)	159,481	0	0	0	1,894	3,777	5,651	7,407	8,954	10,289	11,465	12,508	13,426	14,201	15,293	15,797

3.2 Curvas Kn para trimado -1% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	**m**	**m**	**m**	**m**	**m**	**0,0 deg.**	**5,0 deg. Starb.**	**10,0 deg. Starb.**	**15,0 deg. Starb.**	**20,0 deg. Starb.**	**25,0 deg. Starb.**	**30,0 deg. Starb.**	**35,0 deg. Starb.**	**40,0 deg. Starb.**	**45,0 deg. Starb.**	**50,0 deg. Starb.**	**60,0 deg. Starb.**	**70,0 deg. Starb.**
51217	5,5	-3,260 (fixed)	171,487	0	0	0	2,688	5,366	7,862	9,852	11,431	12,754	13,908	14,964	15,932	16,813	18,266	18,565
69599	7,25	-3,260 (fixed)	169,173	0	0	0	2,201	4,423	6,657	8,758	10,54	12,072	13,466	14,749	15,948	17,093	18,561	18,664
88347	9	-3,260 (fixed)	167,280	0	0	0	1,943	3,909	5,92	7,963	9,912	11,664	13,233	14,672	16,037	17,176	18,408	18,48
107462	10,75	-3,260 (fixed)	165,508	0	0	0	1,806	3,634	5,511	7,471	9,491	11,392	13,103	14,685	16,034	17,025	18,083	18,143
127171	12,5	-3,260 (fixed)	163,897	0	0	0	1,743	3,508	5,327	7,233	9,223	11,2	13,047	14,651	15,868	16,74	17,68	17,75
147855	14,25	-3,260 (fixed)	162,415	0	0	0	1,73	3,486	5,29	7,155	9,085	11,081	12,977	14,473	15,574	16,369	17,241	17,337
169842	16	-3,260 (fixed)	160,905	0	0	0	1,756	3,531	5,335	7,17	9,062	11,017	12,775	14,145	15,175	15,931	16,787	16,925
193257	17,75	-3,260 (fixed)	159,343	0	0	0	1,803	3,609	5,418	7,249	9,121	10,893	12,42	13,682	14,67	15,419	16,317	16,539
217941	19,5	-3,260 (fixed)	157,899	0	0	0	1,85	3,688	5,523	7,372	9,126	10,645	11,963	13,109	14,068	14,83	15,814	16,164
243506	21,25	-3,260 (fixed)	156,822	0	0	0	1,887	3,767	5,644	7,424	8,956	10,28	11,448	12,486	13,4	14,177	15,272	15,782

3.3 Curvas Kn para trimado -0,5% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	**m**	**m**	**m**	**m**	**m**	**0,0 deg.**	**5,0 deg. Starb.**	**10,0 deg. Starb.**	**15,0 deg. Starb.**	**20,0 deg. Starb.**	**25,0 deg. Starb.**	**30,0 deg. Starb.**	**35,0 deg. Starb.**	**40,0 deg. Starb.**	**45,0 deg. Starb.**	**50,0 deg. Starb.**	**60,0 deg. Starb.**	**70,0 deg. Starb.**
51208	5,5	-1,630 (fixed)	166,368	0	0	0	2,701	5,394	7,918	9,932	11,528	12,866	14,047	15,144	16,126	16,986	18,361	18,609
69689	7,25	-1,630 (fixed)	165,205	0	0	0	2,209	4,441	6,688	8,813	10,617	12,184	13,605	14,895	16,091	17,238	18,649	18,698
88590	9	-1,630 (fixed)	164,054	0	0	0	1,949	3,922	5,943	8,007	9,996	11,772	13,344	14,777	16,139	17,276	18,485	18,517
107883	10,75	-1,630 (fixed)	162,746	0	0	0	1,811	3,646	5,536	7,523	9,566	11,474	13,182	14,759	16,107	17,082	18,129	18,181
127744	12,5	-1,630 (fixed)	161,316	0	0	0	1,75	3,526	5,363	7,284	9,275	11,251	13,093	14,707	15,909	16,77	17,7	17,772
148626	14,25	-1,630 (fixed)	159,789	0	0	0	1,743	3,511	5,329	7,192	9,116	11,104	13,012	14,495	15,589	16,379	17,245	17,339
170856	16	-1,630 (fixed)	158,166	0	0	0	1,77	3,559	5,362	7,191	9,074	11,033	12,78	14,142	15,167	15,922	16,778	16,917
194483	17,75	-1,630 (fixed)	156,529	0	0	0	1,815	3,623	5,43	7,256	9,127	10,891	12,404	13,659	14,646	15,395	16,296	16,524
219191	19,5	-1,630 (fixed)	155,152	0	0	0	1,852	3,689	5,522	7,37	9,126	10,629	11,937	13,078	14,036	14,798	15,788	16,145
244610	21,25	-1,630 (fixed)	154,223	0	0	0	1,88	3,757	5,631	7,424	8,943	10,258	11,42	12,454	13,368	14,145	15,246	15,764

3.4 Curvas Kn para trimado 0% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	m	m	m	m	m	0,0 deg.	5,0 deg. Starb.	10,0 deg. Starb.	15,0 deg. Starb.	20,0 deg. Starb.	25,0 deg. Starb.	30,0 deg. Starb.	35,0 deg. Starb.	40,0 deg. Starb.	45,0 deg. Starb.	50,0 deg. Starb.	60,0 deg. Starb.	70,0 deg. Starb.
51251	5,5	0,000 (fixed)	161,214	0	0	0	2,713	5,42	7,966	10,005	11,618	12,979	14,202	15,325	16,311	17,141	18,44	18,648
69814	7,25	0,000 (fixed)	161,171	0	0	0	2,219	4,462	6,723	8,871	10,707	12,318	13,754	15,048	16,242	17,374	18,71	18,721
88859	9	0,000 (fixed)	160,74	0	0	0	1,957	3,94	5,976	8,067	10,099	11,89	13,466	14,896	16,248	17,362	18,54	18,538
108353	10,75	0,000 (fixed)	159,905	0	0	0	1,819	3,666	5,576	7,593	9,652	11,565	13,274	14,843	16,172	17,13	18,16	18,205
128457	12,5	0,000 (fixed)	158,66	0	0	0	1,762	3,555	5,41	7,343	9,335	11,313	13,153	14,754	15,94	16,791	17,711	17,781
149608	14,25	0,000 (fixed)	157,08	0	0	0	1,759	3,545	5,372	7,233	9,153	11,136	13,037	14,505	15,593	16,38	17,242	17,335
172110	16	0,000 (fixed)	155,347	0	0	0	1,789	3,587	5,39	7,217	9,094	11,043	12,769	14,124	15,147	15,901	16,761	16,906
195880	17,75	0,000 (fixed)	153,712	0	0	0	1,825	3,636	5,444	7,267	9,133	10,875	12,373	13,623	14,61	15,361	16,269	16,505
220540	19,5	0,000 (fixed)	152,459	0	0	0	1,85	3,689	5,522	7,367	9,11	10,599	11,899	13,036	13,994	14,759	15,756	16,124
245789	21,25	0,000 (fixed)	151,687	0	0	0	1,872	3,747	5,619	7,405	8,914	10,225	11,383	12,415	13,328	14,107	15,216	15,743

3.5 Curvas Kn para trimado +0,5% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	m	m	m	m	m	0,0 deg.	5,0 deg. Starb.	10,0 deg. Starb.	15,0 deg. Starb.	20,0 deg. Starb.	25,0 deg. Starb.	30,0 deg. Starb.	35,0 deg. Starb.	40,0 deg. Starb.	45,0 deg. Starb.	50,0 deg. Starb.	60,0 deg. Starb.	70,0 deg. Starb.
51356	5,5	1,630 (fixed)	156,063	0	0	0	2,724	5,443	8,006	10,07	11,707	13,098	14,367	15,497	16,472	17,286	18,51	18,676
69984	7,25	1,630 (fixed)	157,091	0	0	0	2,23	4,485	6,762	8,935	10,817	12,464	13,909	15,204	16,394	17,494	18,751	18,735
89166	9	1,630 (fixed)	157,345	0	0	0	1,968	3,964	6,02	8,15	10,215	12,016	13,595	15,025	16,355	17,431	18,572	18,546
108881	10,75	1,630 (fixed)	156,959	0	0	0	1,832	3,695	5,634	7,678	9,745	11,664	13,375	14,934	16,228	17,168	18,178	18,212
129317	12,5	1,630 (fixed)	155,891	0	0	0	1,779	3,592	5,47	7,408	9,402	11,383	13,223	14,791	15,962	16,804	17,713	17,779
150808	14,25	1,630 (fixed)	154,275	0	0	0	1,78	3,587	5,416	7,277	9,196	11,177	13,051	14,505	15,586	16,37	17,231	17,324
173579	16	1,630 (fixed)	152,477	0	0	0	1,809	3,613	5,419	7,245	9,119	11,042	12,744	14,092	15,115	15,871	16,738	16,89
197416	17,75	1,630 (fixed)	150,921	0	0	0	1,832	3,647	5,457	7,28	9,133	10,845	12,329	13,574	14,563	15,317	16,235	16,483
221964	19,5	1,630 (fixed)	149,836	0	0	0	1,847	3,688	5,522	7,363	9,079	10,557	11,85	12,984	13,943	14,713	15,72	16,099
247041	21,25	1,630 (fixed)	149,218	0	0	0	1,866	3,737	5,608	7,369	8,872	10,18	11,337	12,367	13,281	14,063	15,182	15,719

3.6 Curvas Kn para trimado +1% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	m	m	m	m	m	0,0 deg.	5,0 deg. Starb.	10,0 deg. Starb.	15,0 deg. Starb.	20,0 deg. Starb.	25,0 deg. Starb.	30,0 deg. Starb.	35,0 deg. Starb.	40,0 deg. Starb.	45,0 deg. Starb.	50,0 deg. Starb.	60,0 deg. Starb.	70,0 deg. Starb.
51532	5,5	3,260 (fixed)	150,953	0	0	0	2,734	5,462	8,038	10,128	11,794	13,235	14,529	15,65	16,608	17,422	18,566	18,702
70213	7,25	3,260 (fixed)	152,986	0	0	0	2,242	4,51	6,804	9,008	10,946	12,615	14,066	15,36	16,542	17,588	18,776	18,74
89527	9	3,260 (fixed)	153,879	0	0	0	1,981	3,994	6,078	8,251	10,337	12,145	13,73	15,161	16,456	17,488	18,581	18,543
109498	10,75	3,260 (fixed)	153,878	0	0	0	1,849	3,738	5,706	7,771	9,843	11,767	13,483	15,022	16,277	17,197	18,182	18,202
130335	12,5	3,260 (fixed)	152,966	0	0	0	1,802	3,64	5,535	7,477	9,474	11,458	13,29	14,819	15,973	16,807	17,706	17,766
152230	14,25	3,260 (fixed)	151,359	0	0	0	1,805	3,628	5,461	7,324	9,244	11,223	13,054	14,491	15,566	16,349	17,212	17,308
175215	16	3,260 (fixed)	149,599	0	0	0	1,825	3,637	5,446	7,274	9,148	11,032	12,707	14,049	15,072	15,831	16,707	16,871
199049	17,75	3,260 (fixed)	148,186	0	0	0	1,836	3,656	5,471	7,296	9,122	10,803	12,274	13,516	14,507	15,266	16,196	16,459
223454	19,5	3,260 (fixed)	147,283	0	0	0	1,843	3,686	5,523	7,35	9,035	10,504	11,791	12,923	13,885	14,66	15,679	16,073
248363	21,25	3,260 (fixed)	146,813	0	0	0	1,861	3,727	5,59	7,318	8,816	10,123	11,282	12,312	13,226	14,013	15,143	15,694

3.7 Curvas Kn para trimado +1,5% Lpp

Displacement (intact)	Draft Amidships	Trim (+ve by stern)	LCG	TCG	Assumed VCG	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
tonne	m	m	m	m	m	0,0 deg.	5,0 deg. Starb.	10,0 deg. Starb.	15,0 deg. Starb.	20,0 deg. Starb.	25,0 deg. Starb.	30,0 deg. Starb.	35,0 deg. Starb.	40,0 deg. Starb.	45,0 deg. Starb.	50,0 deg. Starb.	60,0 deg. Starb.	70,0 deg. Starb.
51789	5,5	4,890 (fixed)	145,918	0	0	0	2,742	5,478	8,062	10,178	11,886	13,382	14,676	15,781	16,728	17,548	18,625	18,726
70513	7,25	4,890 (fixed)	148,874	0	0	0	2,255	4,538	6,853	9,101	11,084	12,765	14,22	15,512	16,677	17,659	18,783	18,739
89962	9	4,890 (fixed)	150,348	0	0	0	1,998	4,033	6,155	8,365	10,46	12,276	13,867	15,3	16,549	17,528	18,57	18,53
110234	10,75	4,890 (fixed)	150,645	0	0	0	1,873	3,789	5,792	7,866	9,942	11,872	13,596	15,102	16,317	17,217	18,172	18,178
131518	12,5	4,890 (fixed)	149,868	0	0	0	1,83	3,697	5,601	7,548	9,548	11,536	13,348	14,837	15,976	16,801	17,692	17,743
153837	14,25	4,890 (fixed)	148,348	0	0	0	1,832	3,666	5,505	7,373	9,296	11,261	13,047	14,466	15,535	16,317	17,185	17,288
176982	16	4,890 (fixed)	146,742	0	0	0	1,837	3,657	5,473	7,306	9,176	11,013	12,66	13,994	15,018	15,782	16,671	16,849
200751	17,75	4,890 (fixed)	145,526	0	0	0	1,837	3,663	5,484	7,312	9,102	10,752	12,208	13,447	14,442	15,208	16,153	16,434
225007	19,5	4,890 (fixed)	144,802	0	0	0	1,84	3,683	5,525	7,324	8,98	10,44	11,724	12,854	13,819	14,6	15,635	16,044
249751	21,25	4,890 (fixed)	144,472	0	0	0	1,857	3,72	5,559	7,255	8,748	10,057	11,217	12,251	13,166	13,957	15,1	15,666

4 ZONA ESTANCA Y PUNTOS DE INUNDACIÓN PROGRESIVA

En este apartado evaluaremos la zona estanca de nuestro buque, que se define como aquella que no tiene aberturas al exterior o, en caso de tenerla, dichas aberturas disponen de un cierre estanco al agua.

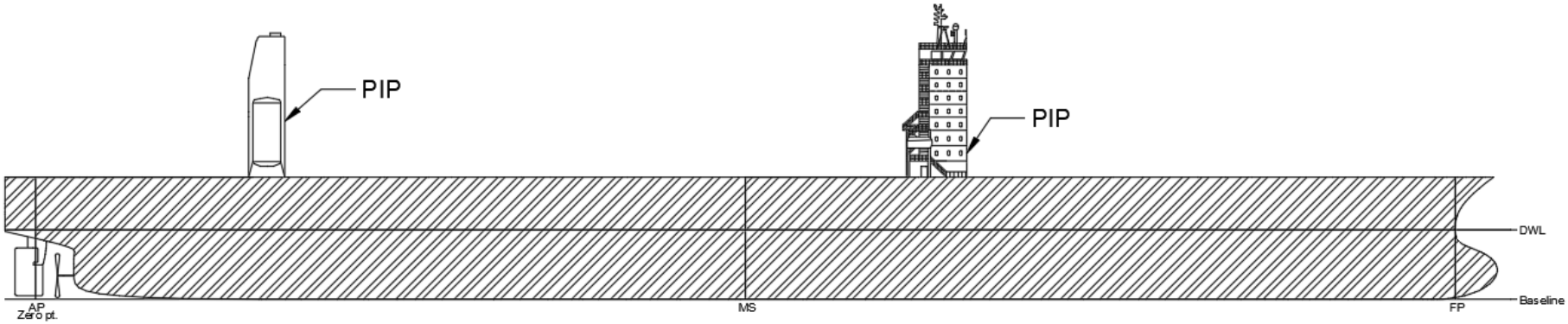
La zona estanca de nuestro buque se extiende desde la línea base hasta la cubierta superior, donde se sitúan las tapas de las escotillas de las bodegas, que serán estancas.

No se considerará estanca la zona de la habilitación ni la chimenea, debido a sus múltiples accesos al exterior para la tripulación.

A continuación, se presenta la disposición general, con los puntos de inundación progresiva indicados sobre el plano.

Punto de inundación progresiva	**Coordenada longitudinal**	**Altura sobre LB**
Chimenea	57 m	40 m
Habilitación	213 m	32,54 m

En la página siguiente se muestran los puntos de inundación progresiva y la zona estanca de nuestro buque.


PIP
PIP
DWL
Baseline
AP
Zero pt.
MS
FP

5 JUSTIFICACIÓN DEL COMPARTIMENTADO

5.1 Compartimentado longitudinal

La separación entre cuadernas en las zonas de popa y proa será menor que en la zona intermedia del buque, siendo respectivamente 600 mm y 700 mm. El espaciado entre bulárcamas será equivalente a 3 cuadernas.

Las bodegas se han dispuesto siguiendo la disposición más frecuente en este tipo de buques, ubicando dos contenedores de 20 ft longitudinalmente, con una separación entre ellos de 0,05 m y 0,180 m en los extremos de proa y popa de cada una.

El espacio entre bodegas estará reservado para albergar los tanques de diésel y agua dulce, reservando el espacio bajo la habilitación para el almacenado del tanque almacén de combustible, que dividiremos en 4 tanques iguales (2 a cada banda).

					Extensión (m)		
Zona	Sep. Cuadernas	Cuadernas		Dif.	Inicio	Final	Longitud
Pique de popa	0,6	-11	13	24	-7	7,4	14,4
Bodega Nº1	0,7	13	31	18	7,4	20	12,6
Cofferdam Nº1	0,7	31	33	2	20	21,4	1,4
Bodega Nº 2	0,7	33	51	18	21,4	34	12,6
Sedim. y UD, Lodos, Aceites	0,7	51	54	3	34	36,1	2,1
Bodega Nº 3	0,7	54	72	18	36,1	48,7	12,6
Sala de Máquinas	0,7	72	109	37	48,7	74,6	25,9
Bodega Nº 4	0,7	109	127	18	60,6	73,2	12,6
Agua Técnica	0,7	127	129	2	73,2	74,6	1,4
Bodega Nº 5	0,7	109	127	18	74,6	87,2	12,6
Bodega Nº 6	0,7	130	148	18	89,3	101,9	12,6
Cofferdam Nº 2	0,7	148	150	2	101,9	103,3	1,4
Bodega Nº 7	0,7	150	168	18	103,3	115,9	12,6
Cofferdam Nº 3	0,7	168	170	2	115,9	117,3	1,4
Bodega Nº 8	0,7	170	188	18	117,3	129,9	12,6
Cofferdam Nº 4	0,7	188	190	2	129,9	131,3	1,4
Bodega Nº 9	0,7	190	208	18	131,3	143,9	12,6
Cofferdam Nº 5	0,7	208	210	2	143,9	145,3	1,4
Bodega Nº 10	0,7	210	228	18	145,3	157,9	12,6
Cofferdam Nº 6	0,7	228	230	2	157,9	159,3	1,4
Bodega Nº 11	0,7	230	248	18	159,3	171,9	12,6
Cofferdam Nº 7	0,7	248	250	2	171,9	173,3	1,4
Bodega Nº 12	0,7	250	268	18	173,3	185,9	12,6

Cofferdam Nº 8	0,7	268	270	2	185,9	187,3	1,4
Bodega Nº 13	0,7	270	288	18	187,3	199,9	12,6
Habilitación/Fuel Almacén	0,7	288	310	22	199,9	215,3	15,4
Bodega Nº 14	0,7	310	328	18	215,3	227,9	12,6
Cofferdam Nº 9	0,7	328	330	2	227,9	229,3	1,4
Bodega Nº 15	0,7	330	348	18	229,3	241,9	12,6
Cofferdam Nº 10	0,7	348	350	2	241,9	243,3	1,4
Bodega Nº 16	0,7	350	368	18	243,3	255,9	12,6
Cofferdam Nº 11	0,7	368	370	2	255,9	257,3	1,4
Bodega Nº 17	0,7	370	388	18	257,3	269,9	12,6
Cofferdam Nº 12	0,7	388	390	2	269,9	271,3	1,4
Bodega Nº 18	0,7	390	408	18	271,3	283,9	12,6
Cofferdam Nº 13	0,7	408	410	2	283,9	285,3	1,4
Bodega Nº 19	0,7	410	428	18	285,3	297,9	12,6
Cofferdam Nº 14	0,7	428	430	2	297,9	299,3	1,4
Bodega Nº 20	0,7	430	448	18	299,3	311,9	12,6
Cofferdam Nº 15	0,7	448	450	2	311,9	313,3	1,4
Pique de proa	0,6	450	471,17	21,17	313,3	326	12,7

5.1.1 Mamparo de colisión

El pique de proa es la zona que se sitúa a proa del mamparo de colisión. La posición de dicho mamparo queda determinada por el reglamento DNV-GL (parte 3, capitulo 1, sección 3, apartado A400) y SOLAS (capitulo II, regla 12). En ambos se especifica lo siguiente:

Regla 12

Mamparos de los piques y de los espacios de máquinas, túneles de ejes, etc.[47]

1 Se instalará un mamparo de colisión que será estanco hasta la cubierta de cierre. Este mamparo estará situado a una distancia de la perpendicular de proa no inferior a 0,05*L* o a 10 m, si esta segunda magnitud es menor, y, salvo cuando la Administración permita otra cosa, dicha distancia no será superior a 0,08*L* o 0,05*L* + 3 m, si esta segunda magnitud es mayor.

2 Cuando cualquier parte del buque que quede debajo de la flotación se prolongue por delante de la perpendicular de proa, como por ejemplo ocurre con una proa de bulbo, las distancias estipuladas en el párrafo 1 se medirán desde un punto situado:

.1 a mitad de dicha prolongación;

.2 a una distancia igual a 0,015*L* por delante de la perpendicular de proa; o

.3 a una distancia de 3 m por delante de la perpendicular de proa,

tomándose de esas medidas la menor.

Se define la L_F como el 96% de la eslora total medida en una flotación cuya distancia a la cara superior de la quilla sea igual al 85% del puntal mínimo de trazado, o la eslora medida en esa flotación desde la cara proel de la roda hasta el eje de la mecha del timón, si esta segunda magnitud es mayor:

L (85%D) = 337,21 m

Lf = máx {0,96 x 337,21; 329,7} = 323,72 m

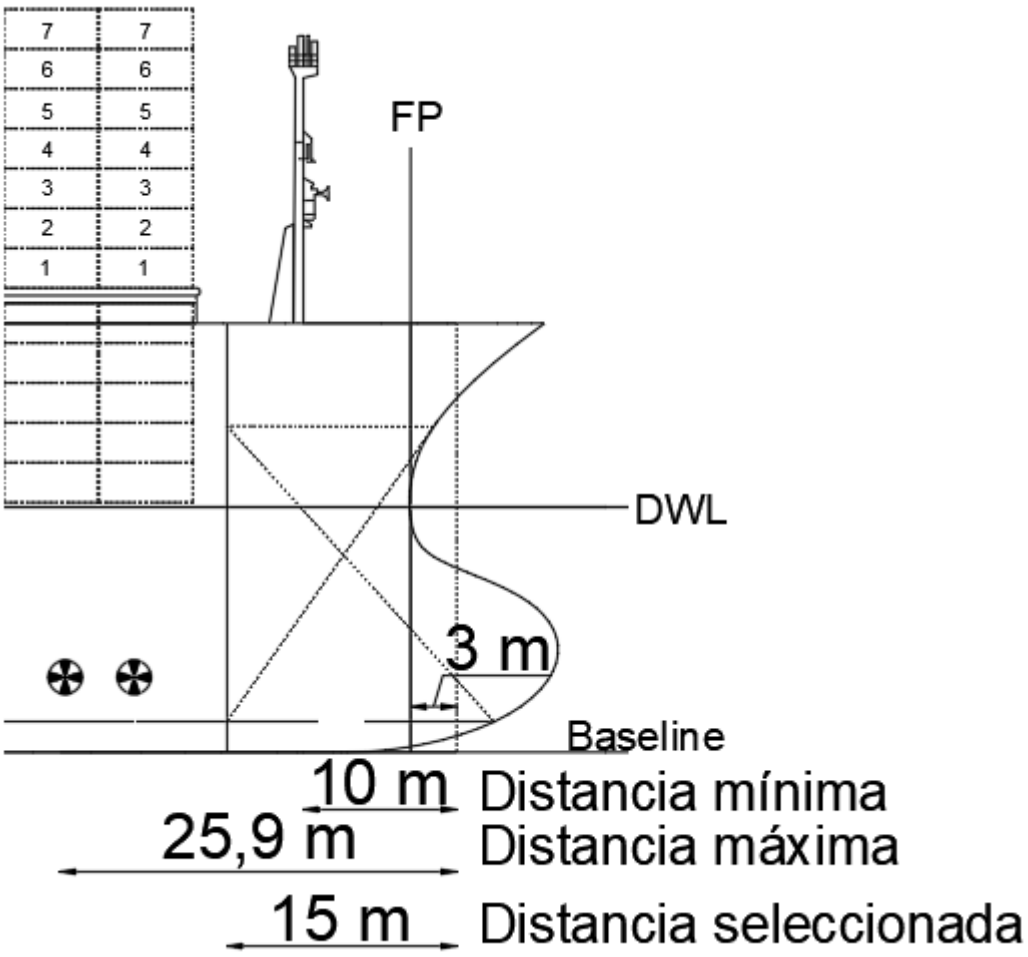
Los valores de las tres distancias expuestas en la norma son los siguientes:

- X= 0,5 x 8,1174 = 4,06 m
- X= 0,015 x 323,72 = 4,855 m
- X= 3 m

Por lo que el punto de referencia será 3 m a proa de la perpendicular de proa. A continuación, calcularemos el intervalo de distancias dentro del cual deberemos situar el mamparo de colisión.

$X_{máx}$ = {0,08 x 323,72 ; 0,05 x 323,72 + 3} = 25,9 m

$X_{mín}$ = {0,05 x 323,72 ; 10} = 10 m



5.2 Compartimentado transversal

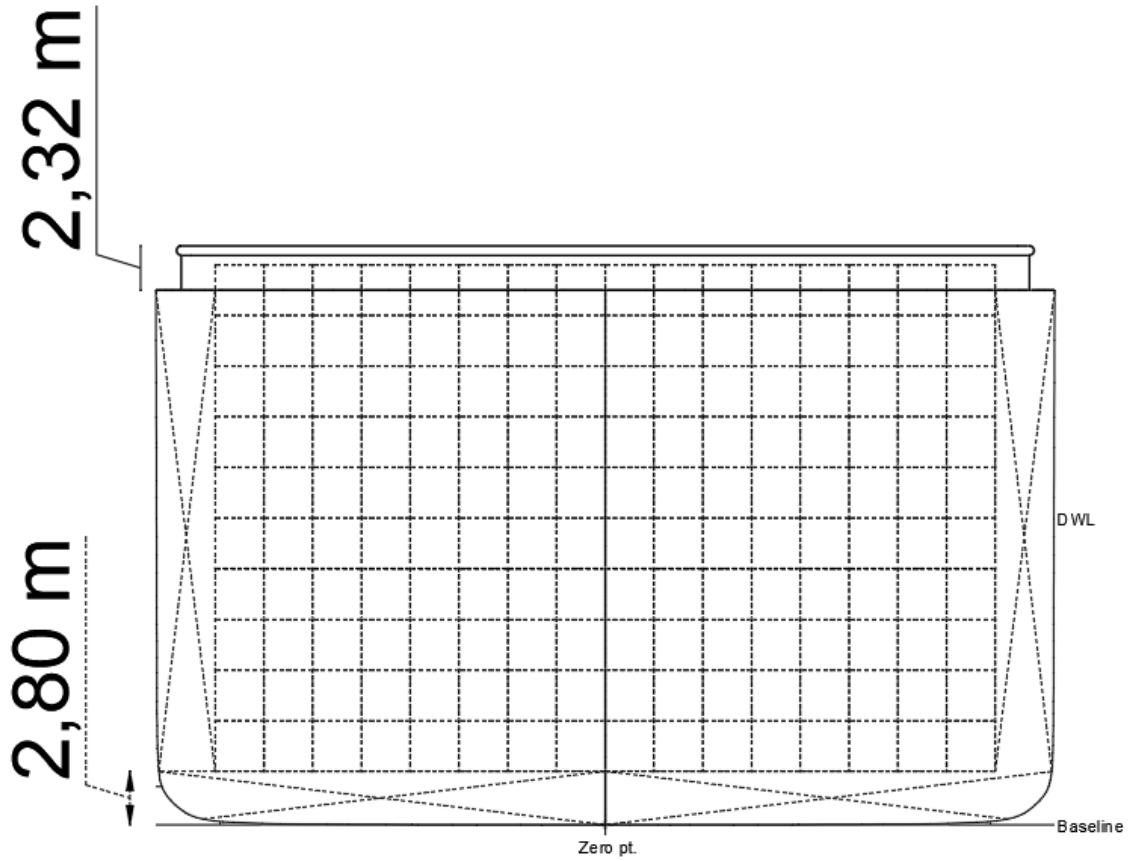
Así mismo fijaremos la altura de las brazolas en 2,32 metros, considerando un margen superior a 0,5 m de margen para la flexión de las escotillas.

Además, la distancia mínima entre un contenedor y el forro exterior no debe superar 1 m.

El espacio restante entre la bodega y el forro lo destinaremos a almenar lastre.

Teniendo en cuenta todas estas disposiciones, obtenemos la siguiente disposición para una sección intermedia (bodega con mayor número de contenedores).

El reglamento establece una altura mínima del doble fondo de H_B = B/20, que en nuestro caso sería de 2,35 m. La altura del doble fondo se ha establecido en 2,80 m, superando dicha altura mínima.



A continuación, se muestra una tabla con las capacidades de cada sección del buque que estibará contenedores, tanto en cubierta como en cubierta.

	Nº TEU´s	
TIER	**Bodega**	**Cubierta**
0	0	324
1	152	324
2	168	324
3	172	324
4	32	324
5	308	324
6	316	324
7	316	324
8	316	324
9	316	324
10	316	324
11	320	324
12	320	324
13	320	324
14	312	256
15	292	256
16	260	256
17	220	256
18	188	224
19	112	196
20	88	196
TOTALES	**BODEGA**	**CUBIERTA**
	4844	**6176**

	Teóricos	**Reales**	**Diferencia**
Teus SC	6160	**6176**	+16
Teus BC	4840	**4844**	+4

Debido a la configuración elegida para los contenedores, observamos una ligera variación al alza en cuanto a la capacidad de carga, con 20 TEU´s más.

En el anexo incluido al final del documento se puede observar la ubicación exacta de todos los TEU´s que llevaremos a bordo.

5.3 Capacidades de los tanques

5.3.1 Tanques de combustible

5.3.1.1 Tanque almacén

El motor seleccionado es el modelo MAN S90ME-C10.5-GI-TII de 8 cilindros que proporciona una potencia de 48800 kW. Para obtener la capacidad de los tanques debemos tener en cuenta la autonomía y velocidad que estipulan las RPA´s de 14000 millas náuticas a 20 nudos. El consumo de nuestro motor es el siguiente:

Fuel Oil

MAN B&W S90ME-C10.5

L_1 SFOC [g/kWh]

Opt. load range	50%	75%	100%
High load	162.5	161.5	166.0
Part load EGB	160.5	160.0	168.5
Low load EGB	158.5	161.0	168.5

Por lo tanto, los datos que tenemos son:

- Consumo del motor (Ce) = 166 g/kWh
- Potencia (BKW) = 48800 kW
- Velocidad = 20 nudos
- Autonomía = 14000 millas

El combustible necesario para conseguir dicha autonomía será:

Fuel Oil Almacén = $\frac{0{,}166 \times 48800 \times 14000}{20 \times 1000}$ = 5670,56 t

La densidad del Diésel es de 0,85 t/m^3.

Por lo tanto, el volumen necesario será de 6671 m^3.

Considerando un margen del 5% y que los tanques van al 98% de su capacidad, tendremos que:

Capacidad de Diésel Almacén = 7147 m^3

5.3.1.2 Tanque de uso diario

Dispondremos de 2 tanques que satisfacen el consumo del buque durante todo un día completo (24 h).

La capacidad necesaria será:

MDO Uso Diario = $\frac{24 \times Ce \times \times BKW}{1000}$ = 194,4 t

Capacidad MDO Uso Diario = 228 m^3

Como los tanques van al 98% de su capacidad, la capacidad de los tanques será:

Capacidad MDO Uso Diario = 233 m^3

5.3.1.3 Tanque de sedimentación

Para los tanques de sedimentación consideraremos una demanda durante 36 h de funcionamiento del motor, estimando un 10% a mayores debido a los lodos que se puedan acumular en el fondo de los tanques de decantación. Dispondremos de 2 tanques con la siguiente capacidad:

MDO Sedimentación = $\frac{36\times Ce\times\times BKW}{1000}$ = 292 t

Considerando el margen del 10% y llenado al 98%, para una densidad de 0,85 t/m^3 tendremos:

Capacidad MDO Sedimentación = 386 m^3

5.3.1.4 Tanques de LNG

En las RPA de nuestro se estipula que para las estancias en puerto usaremos generación eléctrica a gas. Es por ello que instalaremos a bordo 5 motores auxiliares MAN 8L35/44DF GenSet de 7 cilindros que nos proporcionan una potencia total de 21200 kW.

La estancia en puerto estimada para nuestro buque será de 3 días.

El consumo de los motores es el siguiente:

Fuel consumption at 85 % MCR

- SFOC: 175.5 g/kWh (liquid fuel operation)
- SFGC: 7515 kJ/kWh (gas operation)

Por lo tanto, para obtener la cantidad de gas que deberemos disponer a bordo, realizaremos los siguientes cálculos.

Estancia en puerto = 3 días = 72 h

Consumo LNG = 7515 kJ/kWh

Densidad de LNG = 450 Kg/m^3

Potencia total = 21200 kW

PCI (LNG) = 10600 Kcal/Kg = 44350,4 kJ/Kg

1 Kcal = 4,184 kJ

Consumo = $\frac{7515}{44350,4}$ = 0,169 Kg/kWh

Volumen necesario LNG = $\frac{0,169\times 21200\times 72}{450}$ = 573,3 m^3

En el catálogo de MAN, seleccionaremos **2 tanques de 300 m^3** que cubran dicha demanda de gas e irán situados en sentido vertical a ambas bandas de la chimenea.

Examples of MAN Cryo tank sizes (Length, height and diameter can be altered)

Type	Volume	Diameter	Length, incl. coldbox	Weight
Horizontal	30 m³	3.6 m	8.8 m	26 tons
Horizontal	75 m³	3.6 m	14.8 m	40 tons
Horizontal	115 m³	4.2 m	14.5 m	50 tons
Horizontal	125 m³	3.6 m	19.9 m	55 tons
Horizontal	201 m³	5.3 m	15.5 m	80 tons
Horizontal	234 m³	5.5 m	16.9 m	95 tons
Horizontal	300 m³	5.5 m	16.9 m	115 tons
Vertical	86 m³	4.5 m	8.6 m (height)	45 tons
Vertical	230 m³	6.4 m	10.8 m (height)	95 tons
Vertical	300 m³	6.4 m	13.5 m (height)	115 tons
Vertical	400 m³	6.9 m	16.9 m (height)	175 tons

En el reglamento DNV-GL se contemplan una serie de requisito en cuanto a la ubicación de los tanques de gas.

DNV-GL Part 6: Additional class notations, Ch.2 Propulsion, power generation and auxiliary systems

3.3.3 Fuel preparation rooms not containing liquefied gas

3.3.3.1 Structure and supports shall be suitably shielded from leakage from flanges and valves and other possible leakage sources in high pressure gas systems, unless the cool down effect can be shown to be negligible.

3.3.3.2 Fuel preparation rooms for high pressure systems shall be provided with overpressure protection to account for high pressure leakages, unless it can be demonstrated that the integrity of the space can be maintained without such protection.

Los tanques de gas deben ir suficientemente reforzados y sellados de modo que se garantice la estanqueidad total del combustible y su estructura.

Por otra banda, cualquier posible fuga no supondrá, en ningún caso, problema alguno en el correcto funcionamiento del servicio de válvulas de cierre automáticos de seguridad del sistema.

3.3.4 Tank connection spaces

3.3.4.1 Tank connection spaces shall not be located directly adjacent to machinery spaces of category A or other rooms with high fire risk. If cofferdams are used to obtain segregation between tank connection spaces and high fire risk spaces, they shall have a minimum distance of 900 mm between bulkheads or decks. Common boundaries of protective cofferdams with such spaces shall be kept to a minimum.

3.3.4.2 Tank connection spaces shall be able to safely contain leakages of cryogenic liquids, and arranged to prevent the surrounding hull structure from being exposed to unacceptable cooling.

3.3.4.3 The material of the bulkheads of the tank connection space shall have a design temperature corresponding with the lowest temperature it can be subject to in a probable maximum leakage scenario.

3.3.4.4 The tank connection space shall be fitted with ventilation arrangements or pressure relief arrangements ensuring that the space can withstand any pressure build up caused by vaporization of the liquefied gas fuel. These pressure relief systems shall be constructed with materials suitable for the lowest temperatures that may arise.

3.3.4.5 Tank connection space boundaries shall be gas tight towards other enclosed spaces in the ship.

3.3.4.6 The tank connection space entrance shall be arranged with a sill height exceeding the liquid level resulting from a calculated maximum leakage, but in no case lower than 300 mm.

3.3.4.7 Unless the access to the tank connection space is independent and direct from open deck, it shall be arranged as a bolted hatch.

3.3.4.8 A cryogenic leakage in the tank connection space shall not render necessary safety functions out of order due to low temperatures.

Según lo establecido en el apartado anterior, los tanques de gas licuado estarán separados una distancia de 900 mm entre ellos, así como de la cubierta principal. En nuestro caso cumpliremos ampliamente esta distancia, dado que cada uno de los tanques estarán situados a cada banda de la chimenea.

En cuanto a los sistemas de seguridad de cierre, cada tanque dispondrá de válvulas de alivio de presión debido a los gases de generados por la vaporización del gas licuado en el interior, cuya presión podría alcanzar valores demasiado altos.

3.3.7 Gas valve unit spaces

3.3.7.1 A gas valve unit space located in the machinery space is considered to be part of the secondary enclosure for gas supply pipes. When such a space is arranged as a room, the access shall be via a bolted hatch.

3.3.7.2 The gas valve unit space shall only be entered after the gas supply system is shut down and gas free. The hatch shall be fitted with a signboard to this effect.

3.3.7.3 Gas valve unit spaces for high pressure systems shall be provided with overpressure protection to account for high pressure leakages, unless it can be demonstrated that the integrity of the space can be maintained without such protection.

5.3.2 Tanques de agua dulce

5.3.2.1 Tanque de agua potable

El volumen de agua potable necesaria se calculará en función del tiempo de travesía y el número de tripulantes. Para ello emplearemos la norma UNE-EN_ISO_15748-2 donde se establece el consumo de agua por persona al día.

ANEXO A (Informativo)

TABLAS Y FIGURAS CON INFORMACIÓN ÚTIL

Tabla A.1
Valores guía para el consumo de agua potable en litros por persona/cama y día

Tipo de buque		Grupo de personas embarcado	Consumo de agua cuando esté equipado con	
			sistema de aseos de gravedad	sistema de aseos de vacío
Buque de alta mar	Carguero	Tripulante/cama	220 l	175 l
	Buque de pasaje	Pasajero/cama	270 l	225 l
	Crucero de lujo	Pasajero/cama	–	275 l
	Trasbordador con cabinas	Pasajero/cama	205 l[a]	160 l[a]
		Pasajero sin cama	100 l	55 l
	Trasbordador sin cabinas	Pasajero sin cama	150 l	105 l
		Tripulante sin cama	100 l	55 l

Por tanto, el volumen que necesitaremos para una travesía de 30 días con 30 tripulantes a bordo, y sobredimensionando un 10%, será:

Agua Potable = 30 x 30 x 175 x 1,1 = 173250 l = 173,25 m^3

5.3.2.2 Agua técnica

El consumo de agua técnica depende directamente del tipo de equipos instalados a bordo y sus características. Una de las funciones principales es la ayudar a refrigerar tanto los equipos propulsores como auxiliares, y garantizar asi su correcto funcionamiento.

La cantidad de agua técnica necesaria se estimarán en función al tipo de buque.

Agua técnica = 250 t

Con lo que la cantidad necesaria con los tanques al 98% será:

Capacidad Agua Técnica = 255,1 m^3

5.3.3 Tanques de aceite

En la Project guide del motor se nos proporciona el dato de aceite necesario en función de los cilindros. Para nuestro motor MAN S90ME-C10_5-GI con 8 cilindros, necesitaremos:

If space is limited, however, other solutions are possible. Minimum lubricating oil bottom tank vol - ume (m^3) is:

5 cyl.	6 cyl.	7 cyl.	8 cyl.	9 cyl.
25.3	30.0	35.4	40.1	45.0

10 cyl.	11 cyl.	12 cyl.	14 cyl.
50.7	55.4	60.2	70.7

Dispondremos de 2 tanques de 20,05 m^3, y el peso total de aceite será:

(Densidad del aceite = 0,92 t/m^3)

Aceite = 0,92 x 40,1 = 37 t

Volumen de Aceite = 40,1 m^3

5.3.4 Otros tanques

5.3.4.1 Tanque de lodos

Según el MARPOL, Anexo I, Capítulo 3, Parte A, Regla 12: “Todo buque de arqueo bruto igual o superior a 400 tendrá un tanque o tanques de capacidad suficiente, habida cuenta del tipo de maquinaria con que esté equipado y la duración de sus viajes, para reducir los residuos de hidrocarburos que no sea posible eliminar de otro modo cumpliendo las prescripciones del presente anexo, tales como los resultantes de la purificación de los combustibles y aceites lubricantes y de las fugas de hidrocarburos que se producen en los espacios de máquinas”.

La interpretación 15.1 establece:

1) “Respecto de los buques que no lleven agua de lastre en los tanques de combustible líquido, la capacidad mínima de tanques de fangos (V1) será calculada conforme a la fórmula (…)
2) “Cuando tales buques estén provistos de homogeneizadores, incineradores de fangos y otros medios reconocidos para la eliminación de fangos a bordo, la capacidad mínima de tanques de fangos (V1) será, en lugar de la antedicha, la siguiente: V1 = 1 m^3 para buques de arqueo bruto o superior a 400, pero inferior a 4000, o 2 m^3 para buques de arqueo bruto igual o superior a 4000.”

Por lo tanto, se dispondrán 2 tanques de lodos de 1 m^3 cada uno, que harán un total de **2 m^3** de capacidad total.

5.3.4.2 Tanque de aguas residuales

Según el convenio MARPOL Anexo IV, Capítulo 3, Regla 9: "Todo buque que, de conformidad con lo dispuesto en la regla 2, esté sujeto a las disposiciones del presente anexo, estará equipado con uno de los siguientes sistemas de tratamiento de aguas sucias:

1) Una instalación de tratamiento de aguas sucias aprobada por la Administración, teniendo en cuenta las normas y los métodos de prueba elaborados por la Organización, o
2) Un sistema para desmenuzar y desinfectar las aguas sucias aprobado por la Administración. Este sistema estará dotado de medios que, a juicio de la Administración, permitan almacenar temporalmente las aguas sucias cuando el buque esté a menos de 3 millas marinas de la tierra mas próxima, o
3) Un tanque de retención que tenga capacidad suficiente, a juicio de la Administración, para retener todas las aguas sucias, habida cuenta del servicio que presta el buque, el número de personas a bordo y otros factores pertinentes. El tanque de retención estará construido del modo que la Administración juzgue satisfactorio y estará dotado de medios para indicar visualmente la cantidad del contenido".

Asimismo, según la norma UNE-EN ISO 15749-1:2004 y la norma UNE-EN ISO 15749-2:2004 se establece:

4.3 Cantidad de agua de desecho

Cuando se diseña una planta, hay que considerar las cantidades mínimas de agua de desecho de acuerdo con la tabla 2.

Tabla 2
Cantidad mínima de agua de desecho

Tipo de buque	Cantidad mínima de agua de desecho por persona y día en litros			
	Planta sin vacío		Planta con vacío	
	Aguas negras	Aguas negras y grises	Aguas negras	Aguas negras y grises
Buques de pasaje	70	230	25	185
Buques de alta mar exceptuando los de pasaje	70	180	25	135
Los buques costeros pueden conservar los valores recomendados por las autoridades responsables.				
NOTA – Estos valores son los recomendados. Hay que considera las posibles variaciones debidas a los reglamentos nacionales o a las recomendaciones de las sociedades de clasificación.				

Capacidad de Aguas Residuales = 30 personas x 30 días x180 l/persona x día = 162 m^3

Considerando los tanques llenos al 98%, obtenemos:

Capacidad de Aguas Residuales = 165,3 m^3

Se dispondrán 2 tanques de 83 m^3 cada uno.

5.3.4.3 Tanque de aceite usado

Se dispondrán dos tanques iguales a los descritos anteriormente para el aceite, con una capacidad de 20,05 m^3.

5.3.4.4 Tanque de lastre

Para calcular la capacidad de lastre necesaria, debemos de considerar el calado mínimo al que podría navegar nuestro buque, que será:

Calado mínimo popa = MI + D + MS

Donde:

MI: distancia desde la línea base a la punta de pala de la hélice. En nuestro caso es de 0,38 m.

D: diámetro del propulsor obtenido en el cuaderno 3. D = 10,37 m

MS: distancia superior mínima medida desde la flotación a la punta de pala. Estimaremos este valor en un 10% del diámetro de la hélice. MS = 0,52 m

Con lo que el calado mínimo de nuestro buque será de **11,3 m**

Consideraremos un trimado del 1% de Lpp, tenemos que t = 3,26 m

Con la ayuda del “Maxsurf Stability” obtendremos las hidrostáticas de nuestro buque para el calado mínimo a un trimado del 1% de Lpp, donde el desplazamiento mínimo de nuestro buque será de 115941 t.

Draft Amidships m	**11,30**
Displacement t	**115941**
Heel deg	0,0
Draft at FP m	9,670
Draft at AP m	12,930
Draft at LCF m	11,434
Trim (+ve by stern) m	3,260
WL Length m	329,531
Beam max extents on WL m	47,000
Wetted Area m^2	16534,804
Waterpl. Area m^2	11508,990
Prismatic coeff. (Cp)	0,627
Block coeff. (Cb)	0,587
Max Sect. area coeff. (Cm)	0,982
Waterpl. area coeff. (Cwp)	0,743
LCB from zero pt. (+ve fwd) m	153,748
LCF from zero pt. (+ve fwd) m	149,619
KB m	6,065
KG m	16,000
BMt m	14,803
BML m	606,7

Draft Amidships m	11,30
	69
GMt m	4,776
GML m	596,743
KMt m	20,868
KML m	612,804
Immersion (TPc) tonne/cm	117,967
MTc tonne.m	2122,264
RM at 1deg = GMt.Disp.sin(1) tonne.m	9664,498
Max deck inclination deg	0,5729
Trim angle (+ve by stern) deg	0,5729

Una vez que tenemos el desplazamiento mínimo, obtendremos el lastre necesario que debe de llevar nuestro buque al dicho calado. Recordemos que el peso en rosca se obtuvo en el cuaderno 2, y era igual 52251 t.

El peso de la tripulación se estimará en 150 Kg por tripulante, por lo que para los 30 marineros a bordo tendremos un peso de 4,5 t.

El peso de pertrechos se estimará el 1% del peso en rosca, que equivale a 522,51 t.

		Peso (ton)
	ROSCA	52251
	Tripulación y pertrechos	527
Combustible	Almacén	595,4
	Sedimentación	29,2
	Uso diario	19,44
GAS	LNG	27
	Peso Tanque	23
Agua dulce	Potable	17,325
	Técnica	25,51
	Aceite	3,7
	Víveres	0,45
Otros tanques	Lodos	1,8
	A. residuales	148,77
	Aceite usado	33,3
	TOTAL	**1614,605**

Por lo tanto, el valor necesario de lastre será:

$$\Delta = \text{Peso en Rosca} + \text{Peso muerto}$$

$$115941 = 52251 + (1614{,}6 + \text{LASTRE})$$

$$\textbf{Lastre = 62075 t = 60561 m}^3$$

Considerando una densidad del agua salada de 1,025 t/m^3.

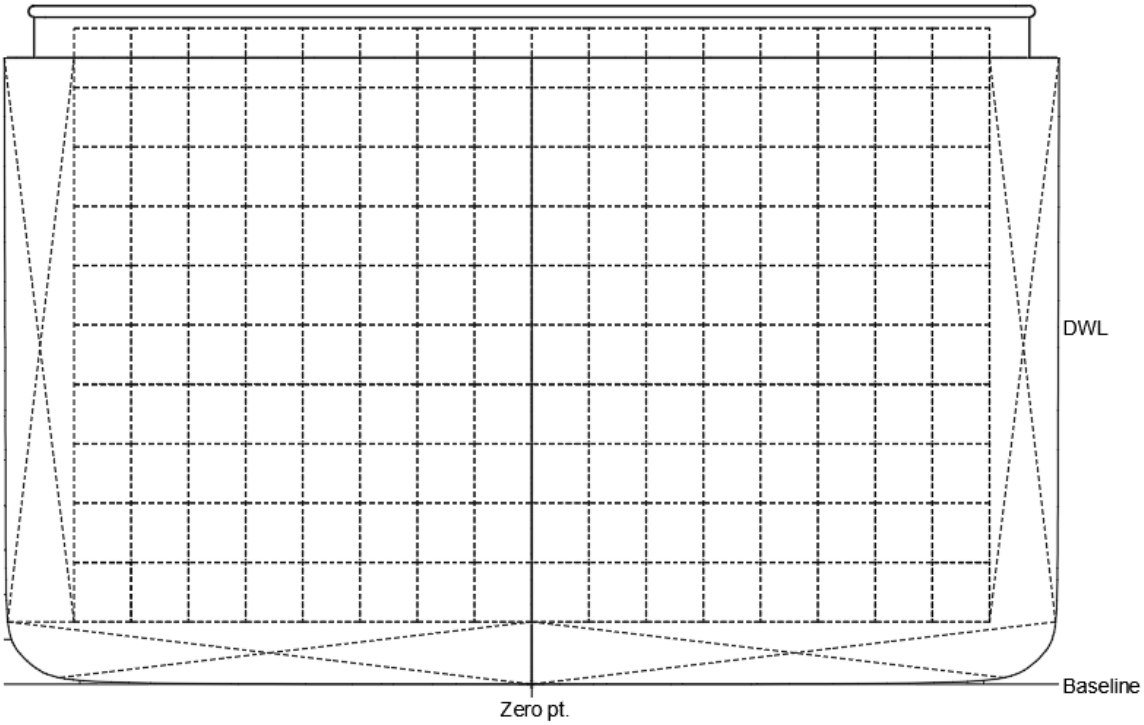
5.4 Comprobación de capacidades

A continuación, compararemos las capacidades anteriormente y las reales empleado la funcionalidad “Tank Calibration” del programa “Maxsurf Stability”.

	Tanque	**Vol. mínimo (m^3)**	**Vol. Real (m^3)**
Combustible	Almacén	7147	**7880**
	Sedimentación	386	**390**
	Uso diario	233	**248**
GAS	LNG	573	**600**
Agua dulce	Potable	173,25	**205**
	Técnica	255,1	**301**
	Aceite	40,1	**41,2**
Otros tanques	Lodos	2	**2,74**
	A. residuales	165,3	**194**
	Aceite usado	40,1	**41,2**

En cuanto al lastre necesario, en la siguiente tabla hemos presentado los tanques destinado a albergar lastre a bordo y poder garantizar la estabilidad del buque.

Recordemos que el lastre mínimo que necesitaremos es de 60561 m^3. Los tanques destinados a albergar lastre los situaremos en el espacio intermedio entre los contenedores y el forro exterior, divididos por el plano de crujía.


DWL
Baseline
Zero pt.

En la siguiente tabla observamos que cumplimos con dicho volumen de lastre:

Tanque	**Volumen (m^3)**	**Peso (t)**
Pique Popa	7202	7382,05
L1 BR	1466	1502,65
L2 ES	1466	1502,65
L1 COF BR	492	504,3
L1 COF ES	492	504,3
L2 BR	1871	1917,775
L2 ES	1871	1917,775
L3 BR	2512	2574,8
L3 ES	2512	2574,8
L6 BR	3631	3721,775
L6 ES	3631	3721,775
L COF 2 BR	603	618,075
L COF 2 ES	603	618,075
L COF 3 BR	865	886,625
L COF 3 ES	865	886,625
L8 BR	3765	3859,125
L8 ES	3765	3859,125
L COF 4 BR	603	618,075
L COF 4 ES	603	618,075
L COF 5 BR	866	887,65
L COF 5 ES	866	887,65
L10 BR	3554	3642,85
L10 ES	3554	3642,85
L COF 6 BR	603	618,075
L COF 6 ES	603	618,075
L COF 7 BR	860	881,5
L COF 7 ES	860	881,5
L12 BR	3305	3387,625
L12 ES	3305	3387,625
L COF 8 BR	677	693,925
L COF 8 ES	677	693,925
L14 BR	1152	1180,8
L14 ES	1152	1180,8
L15 BR	1007	1032,175
L15 ES	1007	1032,175
L16 BR	880	902
L16 ES	880	902
L17 BR	905	927,625
L17 ES	905	927,625
L18 BR	827	847,675

L18 ES	827	847,675
L19 BR	1610	1650,25
L19 ES	1610	1650,25
	TOTAL	**73092,75**

Lastre		
Mínimo	62075,4	t
Real	73092,75	t

Al final del documento se adjuntará un anexo donde se puede comprobar las capacidades de los tanques descritos anteriormente.

6 ANEXO I: TANK CALIBRATION

6.1.1 Tank Calibrations - diseño - copia

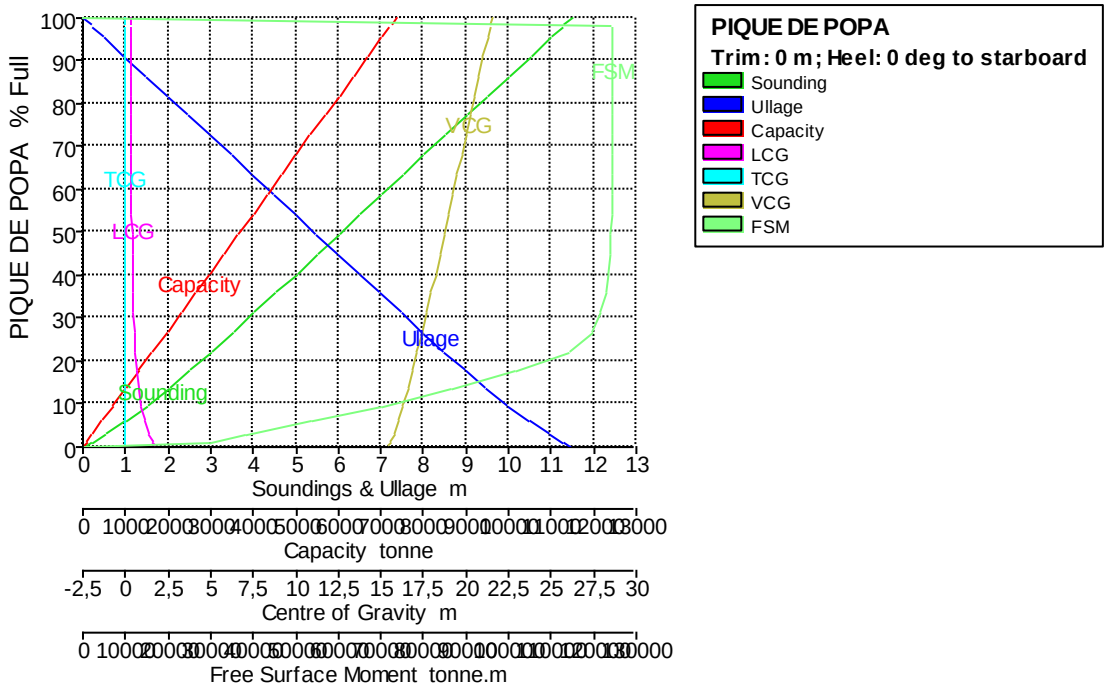
Stability 22.01.00.131, build: 131

6.1.1.1 **Tank Calibrations - PIQUE DE POPA**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
PIQUE DE POPA	11,500	0,000	100,000	7352,392	7352,392	0,288	0,000	21,524	0,000
	11,283	0,217	98,000	7205,344	7205,344	0,290	0,000	21,414	124576,153
	11,272	0,228	97,900	7197,992	7197,992	0,290	0,000	21,409	124576,089
	11,000	0,500	95,398	7014,010	7014,010	0,292	0,000	21,271	124574,494

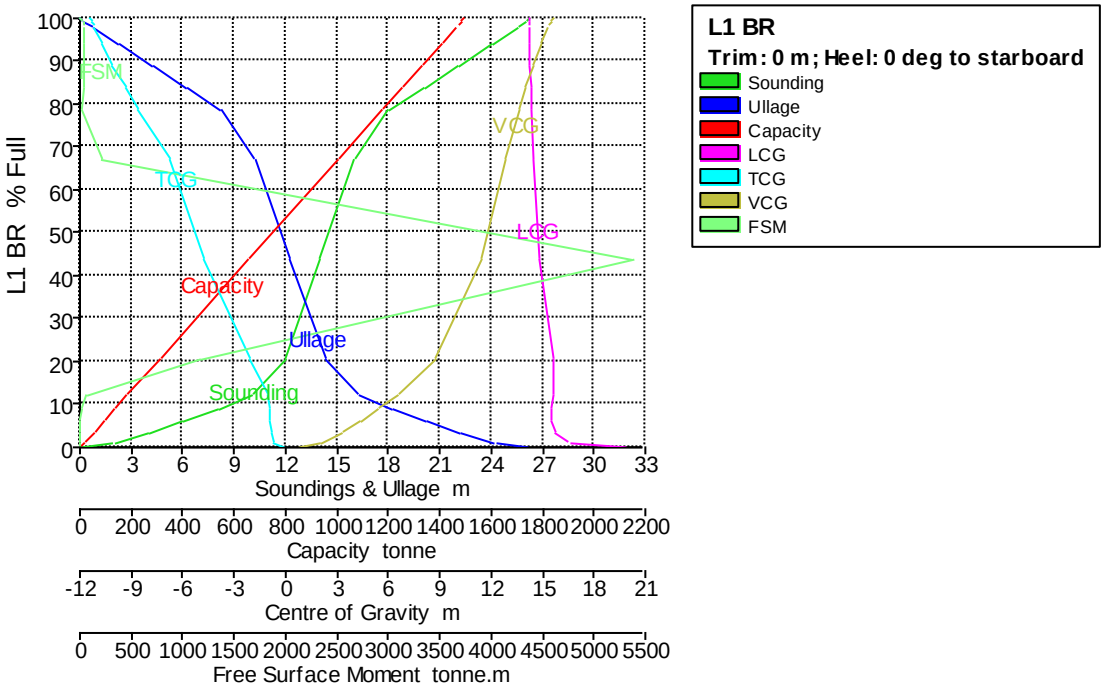
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	10,500	1,000	90,795	6675,631	6675,631	0,297	0,000	21,019	124571,559
	10,000	1,500	86,193	6337,255	6337,255	0,302	0,000	20,766	124568,625
	9,500	2,000	81,591	5998,890	5998,890	0,308	0,000	20,514	124545,192
	9,000	2,500	76,989	5660,547	5660,547	0,314	0,000	20,260	124519,880
	8,500	3,000	72,388	5322,228	5322,228	0,321	0,000	20,007	124493,721
	8,000	3,500	67,787	4983,933	4983,933	0,330	0,000	19,753	124467,158
	7,500	4,000	63,186	4645,689	4645,689	0,339	0,000	19,498	124379,620
	7,000	4,500	58,587	4307,525	4307,525	0,350	0,000	19,243	124289,849
	6,500	5,000	53,988	3969,444	3969,444	0,363	0,000	18,987	124200,120
	6,000	5,500	49,392	3631,498	3631,498	0,378	0,000	18,729	123983,496
	5,500	6,000	44,798	3293,758	3293,758	0,396	0,000	18,471	123752,458
	5,000	6,500	40,209	2956,290	2956,290	0,418	0,000	18,211	123331,269
	4,500	7,000	35,625	2619,269	2619,269	0,446	0,000	17,948	122793,918
	4,000	7,500	31,051	2282,973	2282,973	0,482	0,000	17,683	121781,617
	3,500	8,000	26,494	1947,975	1947,975	0,530	0,000	17,413	119760,254
	3,000	8,500	21,981	1616,103	1616,103	0,596	0,000	17,139	114253,925
	2,500	9,000	17,590	1293,299	1293,299	0,680	0,000	16,861	101488,568
	2,000	9,500	13,406	985,698	985,698	0,788	0,000	16,583	86268,187
	1,500	10,000	9,481	697,111	697,111	0,930	0,000	16,305	70127,492
	1,000	10,500	5,877	432,124	432,124	1,125	0,000	16,030	53690,005
	0,500	11,000	2,678	196,899	196,899	1,404	0,000	15,759	38050,899
	0,200	11,300	1,000	73,523	73,523	1,637	0,000	15,602	29687,670
	0,000	11,500	0,000	0,000	0,000	1,829	0,000	15,500	0,000

6.1.1.2 **Tank Calibrations - L1 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L1 BR	26,289	0,000	100,000	1496,385	1496,385	14,219	-11,420	15,580	0,000
	26,000	0,289	99,245	1485,083	1485,083	14,223	-11,339	15,494	31,268
	25,523	0,766	98,000	1466,458	1466,458	14,229	-11,205	15,355	31,263
	25,485	0,805	97,900	1464,961	1464,961	14,230	-11,194	15,344	31,263
	24,000	2,289	94,026	1406,992	1406,992	14,252	-10,751	14,927	31,188
	22,000	4,289	88,818	1329,056	1329,056	14,284	-10,094	14,412	30,822
	20,000	6,289	83,652	1251,752	1251,752	14,320	-9,363	13,961	29,479
	18,000	8,289	78,693	1177,543	1177,543	14,359	-8,574	13,598	21,878
	16,000	10,289	66,933	1001,570	1001,570	14,464	-6,771	12,868	209,603
	14,0	12	43,	651,	651,	14	-	11	5379

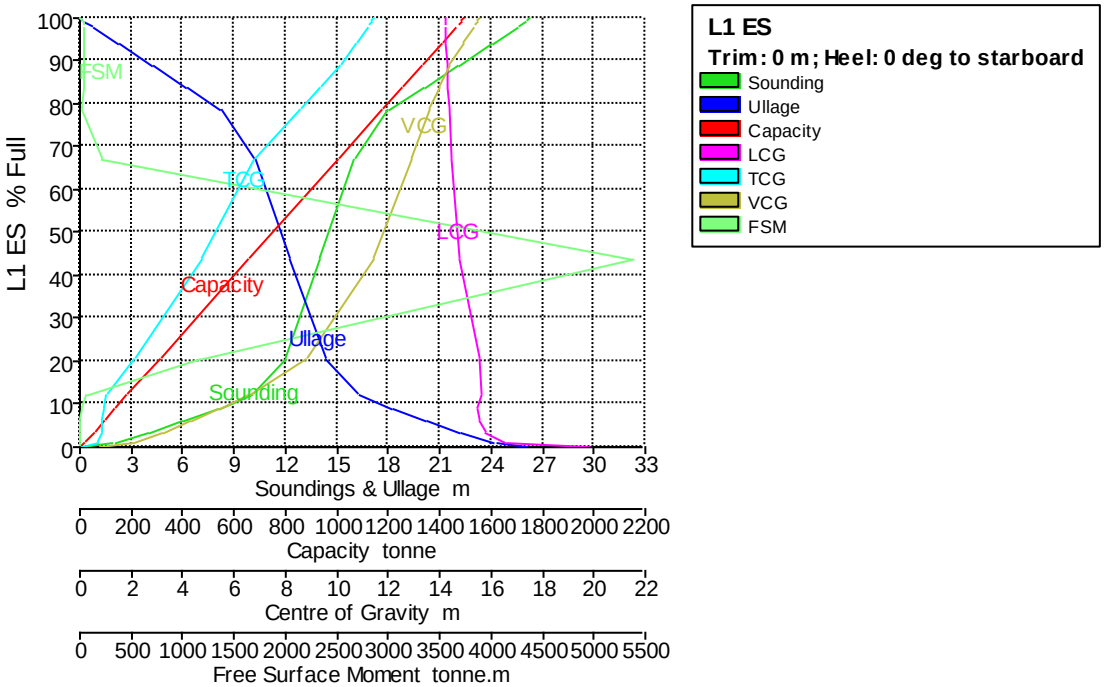
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	00	,289	507	036	036	,805	4,752	,448	,133
	12,000	14,289	20,532	307,239	307,239	15,582	-2,102	8,807	1157,328
	10,000	16,289	11,983	179,309	179,309	15,609	-1,029	6,556	62,354
	8,000	18,289	8,705	130,253	130,253	15,482	-0,895	5,346	10,470
	6,000	20,289	6,046	90,468	90,468	15,536	-0,865	4,305	6,960
	4,000	22,289	3,427	51,281	51,281	15,804	-0,818	3,221	6,411
	2,000	24,289	1,082	16,189	16,189	16,604	-0,687	2,045	3,950
	1,917	24,373	1,000	14,964	14,964	16,668	-0,679	1,991	3,777
	0,000	26,289	0,000	0,000	0,000	19,928	0,000	0,711	0,000

6.1.1.3 **Tank Calibrations - L1 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



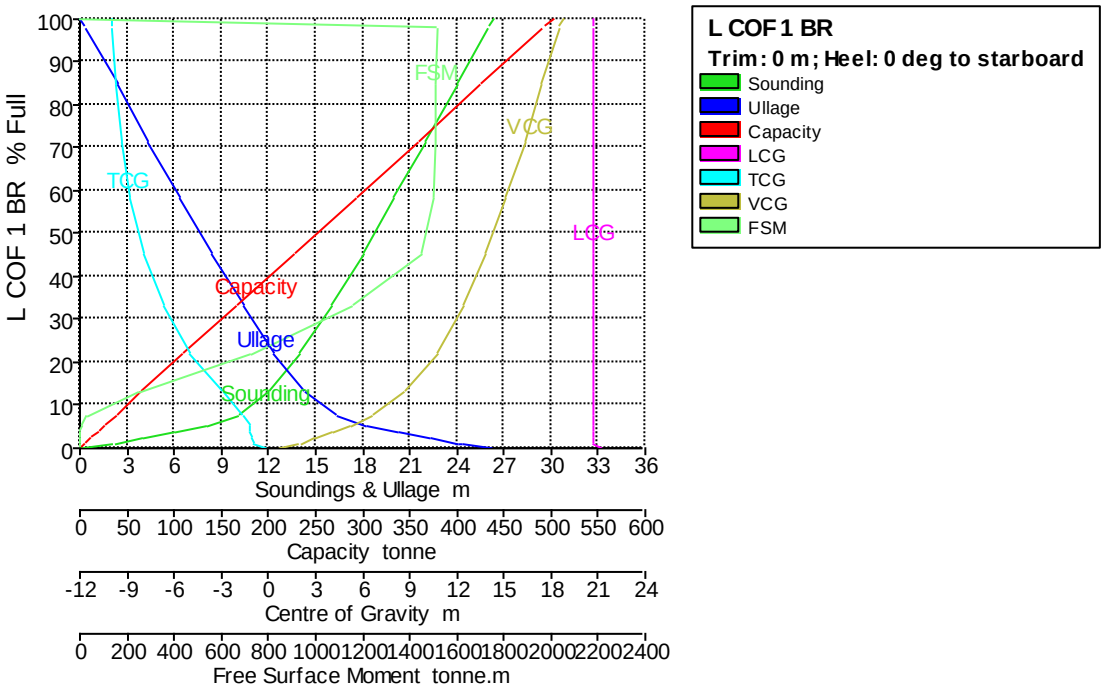
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L1 ES	26,289	0,000	100,000	1496,385	1496,385	14,219	11,420	15,580	0,000
	26,000	0,289	99,245	1485,083	1485,083	14,223	11,339	15,494	31,268
	25,523	0,766	98,000	1466,458	1466,458	14,229	11,205	15,355	31,263
	25,485	0,805	97,900	1464,961	1464,961	14,230	11,194	15,344	31,263
	24,000	2,289	94,026	1406,992	1406,992	14,252	10,751	14,927	31,188
	22,000	4,289	88,818	1329,056	1329,056	14,284	10,094	14,412	30,822
	20,000	6,289	83,652	1251,752	1251,752	14,320	9,363	13,961	29,479
	18,000	8,289	78,693	1177,543	1177,543	14,359	8,574	13,598	21,878
	16,000	10,289	66,933	1001,570	1001,570	14,464	6,771	12,868	209,603
	14,000	12,289	43,507	651,036	651,036	14,805	4,752	11,448	5379,133
	12,000	14,289	20,532	307,239	307,239	15,582	2,102	8,807	1157,328
	10,000	16,289	11,983	179,309	179,309	15,609	1,029	6,556	62,354
	8,000	18,289	8,705	130,253	130,253	15,482	0,895	5,346	10,470
	6,000	20,289	6,046	90,468	90,468	15,536	0,865	4,305	6,960
	4,000	22,289	3,427	51,281	51,281	15,804	0,818	3,221	6,411
	2,000	24,289	1,082	16,189	16,189	16,604	0,687	2,045	3,950
	1,917	24,373	1,000	14,964	14,964	16,668	0,679	1,991	3,777
	0,000	26,289	0,000	0,000	0,000	19,928	0,000	0,711	0,000

6.1.1.4 **Tank Calibrations - L COF 1 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 1 BR	26,380	0,000	100,000	502,948	502,948	20,702	-10,017	18,749	0,000
	26,074	0,306	98,000	492,889	492,889	20,702	-9,981	18,583	1513,998
	26,059	0,321	97,900	492,386	492,386	20,702	-9,979	18,575	1513,997
	26,000	0,380	97,517	490,459	490,459	20,702	-9,973	18,543	1513,993
	24,000	2,380	84,435	424,662	424,662	20,702	-9,697	17,447	1513,427
	22,000	4,380	71,356	358,884	358,884	20,703	-9,322	16,315	1511,033
	20,000	6,380	58,292	293,178	293,178	20,703	-8,781	15,126	1501,862
	18,000	8,380	45,297	227,818	227,818	20,704	-7,952	13,837	1448,412
	16,000	10,380	32,803	164,980	164,980	20,706	-6,705	12,391	1152,203
	14,000	12,380	21,642	108,849	108,849	20,708	-4,983	10,712	723,012
	12,000	14,380	12,802	64,390	64,390	20,711	-2,887	8,664	248,070
	10,000	16,380	7,653	38,492	38,492	20,713	-1,567	6,590	25,985
	8,000	18,380	5,217	26,239	26,239	20,711	-1,243	5,127	4,273

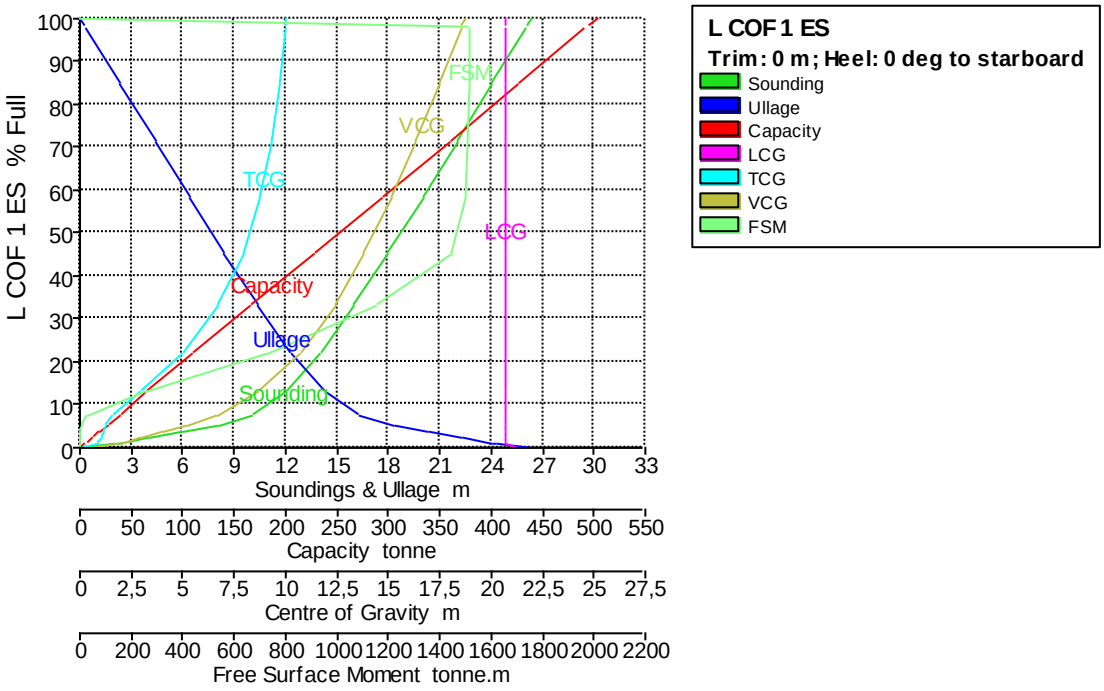
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	20,380	3,598	18,098	18,098	20,710	-1,145	3,990	2,203
	4,000	22,380	2,174	10,933	10,933	20,711	-1,057	2,914	1,780
	2,224	24,156	1,000	5,030	5,030	20,713	-0,902	1,935	1,280
	2,000	24,380	0,863	4,342	4,342	20,714	-0,871	1,808	1,185
	0,000	26,380	0,000	0,000	0,000	21,392	-0,001	0,620	0,000

6.1.1.5 **Tank Calibrations - L COF 1 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 1 ES	26,380	0,000	100,000	502,948	502,948	20,702	10,017	18,749	0,000

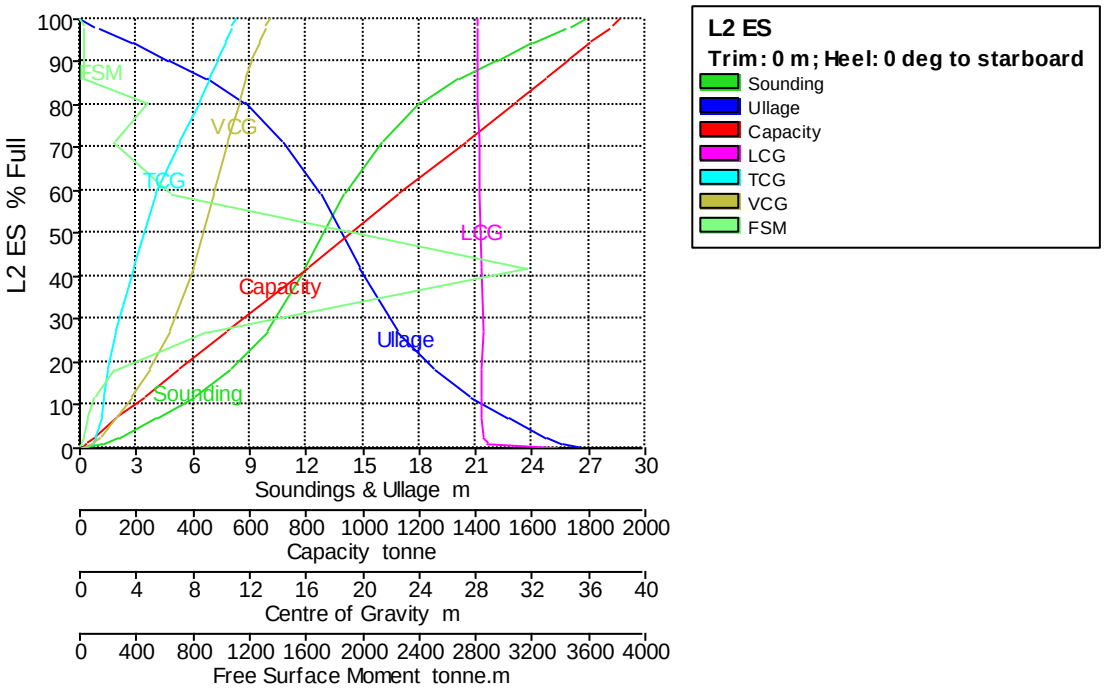
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,074	0,306	98,000	492,889	492,889	20,702	9,981	18,583	1513,998
	26,059	0,321	97,900	492,386	492,386	20,702	9,979	18,575	1513,997
	26,000	0,380	97,517	490,459	490,459	20,702	9,973	18,543	1513,993
	24,000	2,380	84,435	424,662	424,662	20,702	9,697	17,447	1513,427
	22,000	4,380	71,356	358,884	358,884	20,703	9,322	16,315	1511,033
	20,000	6,380	58,292	293,178	293,178	20,703	8,781	15,126	1501,862
	18,000	8,380	45,297	227,818	227,818	20,704	7,952	13,837	1448,412
	16,000	10,380	32,803	164,980	164,980	20,706	6,705	12,391	1152,203
	14,000	12,380	21,642	108,849	108,849	20,708	4,983	10,712	723,012
	12,000	14,380	12,802	64,390	64,390	20,711	2,887	8,664	248,070
	10,000	16,380	7,653	38,492	38,492	20,713	1,567	6,590	25,985
	8,000	18,380	5,217	26,239	26,239	20,711	1,243	5,127	4,273
	6,000	20,380	3,598	18,098	18,098	20,710	1,145	3,990	2,203
	4,000	22,380	2,174	10,933	10,933	20,711	1,057	2,914	1,780
	2,224	24,156	1,000	5,030	5,030	20,713	0,902	1,935	1,280
	2,000	24,380	0,863	4,342	4,342	20,714	0,871	1,808	1,185
	0,000	26,380	0,000	0,000	0,000	21,392	0,001	0,620	0,000

6.1.1.6 **Tank Calibrations - L2 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L2 ES	26,818	0,000	100,000	1910,058	1910,058	28,071	10,992	13,420	0,000
	26,000	0,818	98,328	1878,128	1878,128	28,077	10,805	13,196	31,262
	25,839	0,978	98,000	1871,857	1871,857	28,078	10,768	13,153	31,260
	25,791	1,027	97,900	1869,947	1869,947	28,079	10,756	13,140	31,260
	24,000	2,818	94,241	1800,059	1800,059	28,093	10,322	12,677	31,141
	22,000	4,818	90,165	1722,204	1722,204	28,111	9,797	12,202	30,686
	20,000	6,818	86,133	1645,195	1645,195	28,130	9,229	11,781	28,815
	18,000	8,818	80,579	1539,105	1539,105	28,159	8,445	11,286	486,181
	16,000	10,818	71,343	1362,700	1362,700	28,210	7,102	10,517	237,921
	14,000	12,818	58,870	1124,450	1124,450	28,286	5,361	9,528	651,361
	12,000	14,818	42,050	803,184	803,184	28,413	3,763	8,118	3160,458
	10,000	16,818	27,042	516,516	516,516	28,501	2,558	6,372	893,967
	8,000	18,818	17,955	342,960	342,960	28,460	1,974	4,910	239,558

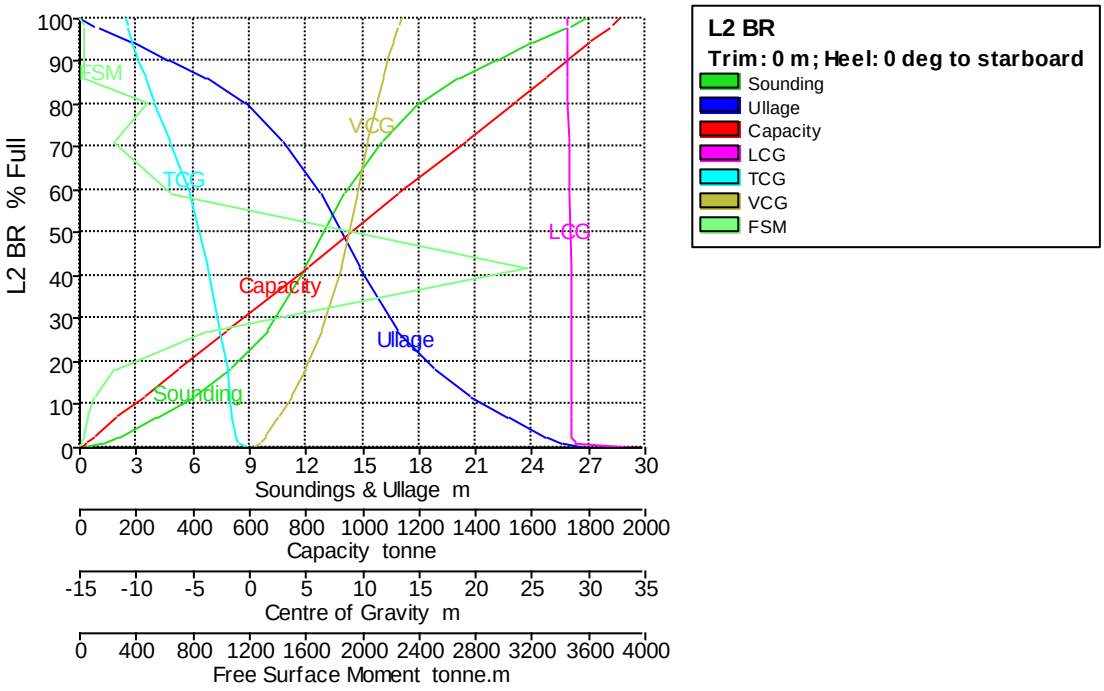
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	20,818	11,759	224,610	224,610	28,403	1,696	3,688	95,572
	4,000	22,818	6,745	128,824	128,824	28,391	1,485	2,557	55,281
	2,000	24,818	2,478	47,335	47,335	28,519	1,169	1,424	28,616
	1,134	25,684	1,000	19,101	19,101	28,810	0,919	0,917	14,531
	0,000	26,818	0,000	0,000	0,000	33,928	0,001	0,182	0,000

6.1.1.7 **Tank Calibrations - L2 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L2 BR	26,818	0,000	100,000	1910,058	1910,058	28,071	-10,992	13,420	0,000

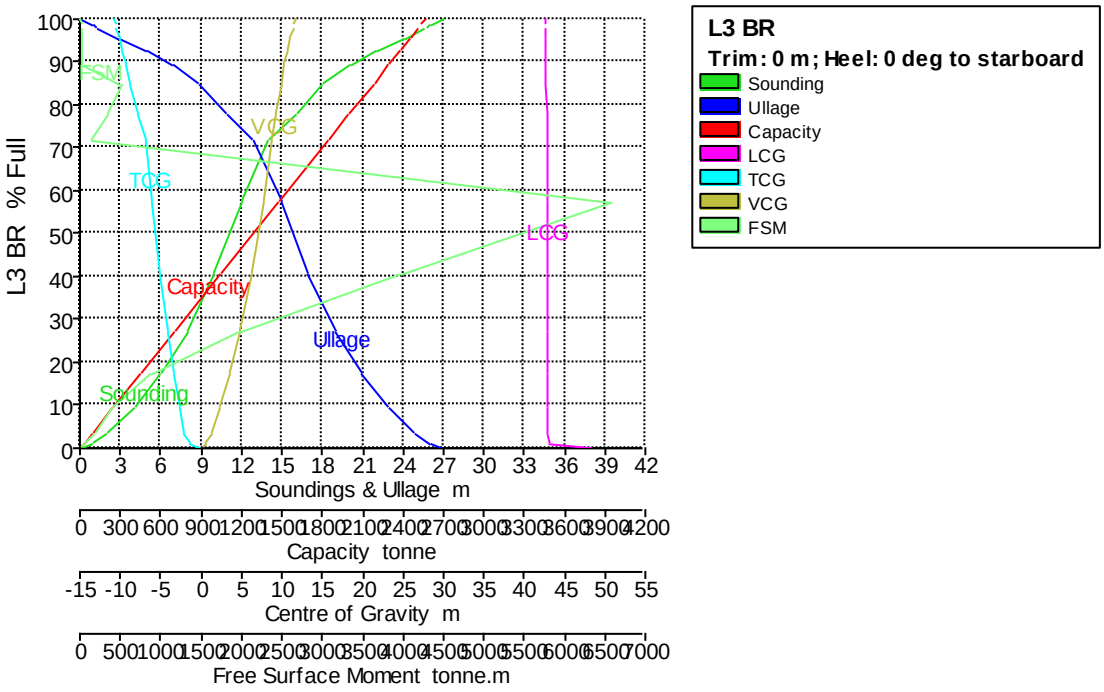
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,000	0,818	98,328	1878,128	1878,128	28,077	-10,805	13,196	31,262
	25,839	0,978	98,000	1871,857	1871,857	28,078	-10,768	13,153	31,260
	25,791	1,027	97,900	1869,947	1869,947	28,079	-10,756	13,140	31,260
	24,000	2,818	94,241	1800,059	1800,059	28,093	-10,322	12,677	31,141
	22,000	4,818	90,165	1722,204	1722,204	28,111	-9,797	12,202	30,686
	20,000	6,818	86,133	1645,195	1645,195	28,130	-9,229	11,781	28,815
	18,000	8,818	80,579	1539,105	1539,105	28,159	-8,445	11,286	486,181
	16,000	10,818	71,343	1362,700	1362,700	28,210	-7,102	10,517	237,921
	14,000	12,818	58,870	1124,450	1124,450	28,286	-5,361	9,528	651,361
	12,000	14,818	42,050	803,184	803,184	28,413	-3,763	8,118	3160,457
	10,000	16,818	27,042	516,516	516,516	28,501	-2,558	6,372	893,967
	8,000	18,818	17,955	342,960	342,960	28,460	-1,974	4,910	239,558
	6,000	20,818	11,759	224,610	224,610	28,403	-1,696	3,688	95,572
	4,000	22,818	6,745	128,824	128,824	28,391	-1,485	2,557	55,281
	2,000	24,818	2,478	47,335	47,335	28,519	-1,169	1,424	28,616
	1,134	25,684	1,000	19,101	19,101	28,810	-0,919	0,917	14,531
	0,000	26,818	0,000	0,000	0,000	33,928	-0,001	0,182	0,000

6.1.1.8 **Tank Calibrations - L3 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L3 BR	26,976	0,000	100,000	2563,810	2563,810	42,700	-10,687	11,718	0,000
	26,000	0,976	98,513	2525,690	2525,690	42,705	-10,517	11,494	31,262
	25,663	1,313	98,000	2512,534	2512,534	42,706	-10,457	11,419	31,259
	25,597	1,379	97,900	2509,970	2509,970	42,707	-10,445	11,405	31,258
	24,000	2,976	95,468	2447,624	2447,624	42,714	-10,152	11,063	31,140
	22,000	4,976	92,432	2369,772	2369,772	42,725	-9,765	10,670	30,701
	20,000	6,976	89,426	2292,718	2292,718	42,736	-9,356	10,322	28,981
	18,000	8,976	84,857	2175,566	2175,566	42,753	-8,762	9,866	508,582
	16,000	10,976	77,573	1988,837	1988,837	42,781	-7,800	9,192	338,116
	14,000	12,976	71,581	1835,191	1835,191	42,796	-6,915	8,700	160,657
	12,000	14,976	57,083	1463,505	1463,505	42,855	-6,011	7,652	6581,675
	10,000	16,976	40,486	1037,990	1037,990	42,938	-4,987	6,256	3954,284
	8,000	18,976	27,191	697,137	697,137	42,984	-4,050	4,882	1947,876

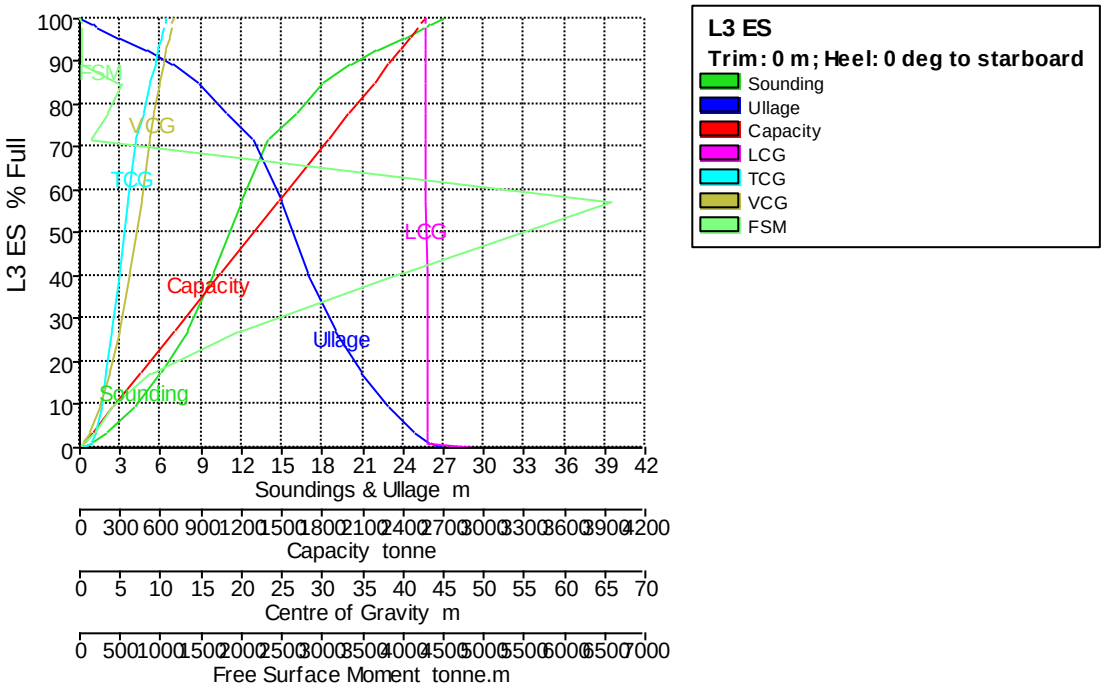
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	20,976	17,117	438,843	438,843	42,982	-3,318	3,593	861,085
	4,000	22,976	9,436	241,931	241,931	42,965	-2,734	2,394	397,717
	2,000	24,976	3,464	88,820	88,820	42,982	-2,053	1,230	166,510
	0,882	26,094	1,000	25,638	25,638	43,087	-1,410	0,571	56,615
	0,000	26,976	0,000	0,000	0,000	48,628	-0,001	0,024	0,000

6.1.1.9 **Tank Calibrations - L3 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L3 ES	26,976	0,000	100,000	2563,810	2563,810	42,700	10,687	11,718	0,000

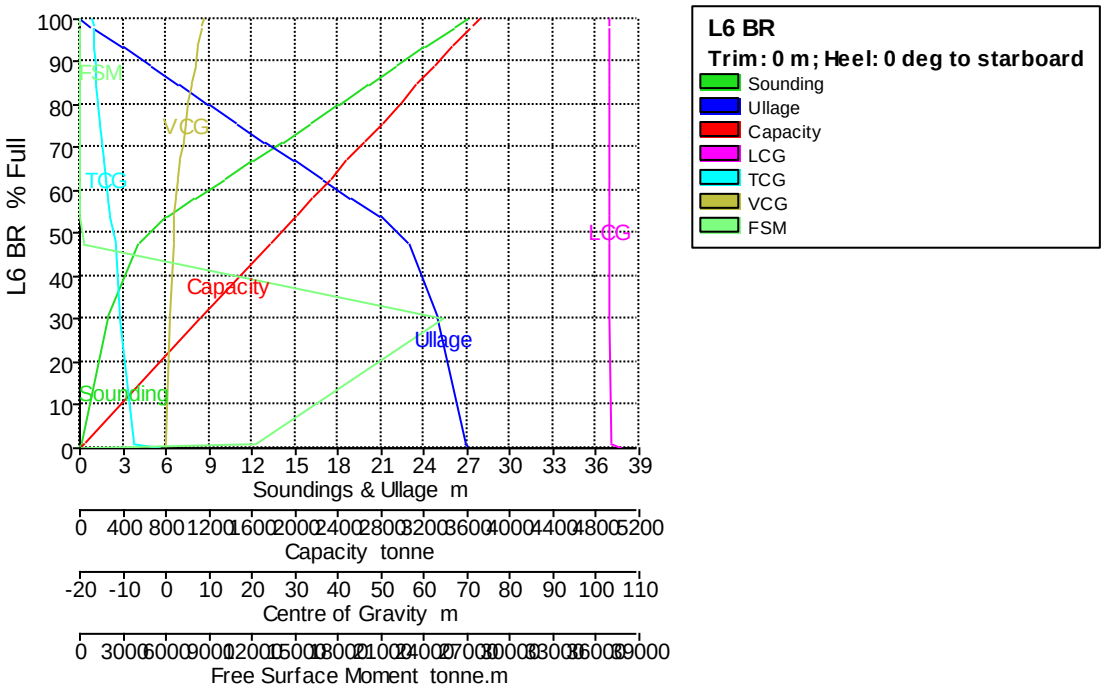
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,000	0,976	98,513	2525,690	2525,690	42,705	10,517	11,494	31,262
	25,663	1,313	98,000	2512,534	2512,534	42,706	10,457	11,419	31,259
	25,597	1,379	97,900	2509,970	2509,970	42,707	10,445	11,405	31,258
	24,000	2,976	95,468	2447,624	2447,624	42,714	10,152	11,063	31,140
	22,000	4,976	92,432	2369,772	2369,772	42,725	9,765	10,670	30,701
	20,000	6,976	89,426	2292,718	2292,718	42,736	9,356	10,322	28,981
	18,000	8,976	84,857	2175,566	2175,566	42,753	8,762	9,866	508,582
	16,000	10,976	77,573	1988,837	1988,837	42,781	7,800	9,192	338,116
	14,000	12,976	71,581	1835,191	1835,191	42,796	6,915	8,700	160,657
	12,000	14,976	57,083	1463,505	1463,505	42,855	6,011	7,652	6581,675
	10,000	16,976	40,486	1037,990	1037,990	42,938	4,987	6,256	3954,284
	8,000	18,976	27,191	697,137	697,137	42,984	4,050	4,882	1947,876
	6,000	20,976	17,117	438,843	438,843	42,982	3,318	3,593	861,085
	4,000	22,976	9,436	241,931	241,931	42,965	2,734	2,394	397,717
	2,000	24,976	3,464	88,820	88,820	42,982	2,053	1,230	166,510
	0,882	26,094	1,000	25,638	25,638	43,087	1,410	0,571	56,615
	0,000	26,976	0,000	0,000	0,000	48,628	0,001	0,024	0,000

6.1.1.10 **Tank Calibrations - L6 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L6 BR	27,000	0,000	100,000	3705,812	3705,812	102,833	-16,994	8,730	0,000
	26,101	0,899	98,000	3631,696	3631,696	102,838	-16,892	8,367	66,034
	26,056	0,944	97,900	3627,990	3627,990	102,838	-16,887	8,349	66,034
	26,000	1,000	97,775	3623,353	3623,353	102,838	-16,881	8,326	66,034
	24,000	3,000	93,325	3458,440	3458,440	102,849	-16,639	7,531	66,017
	22,000	5,000	88,875	3293,554	3293,554	102,862	-16,373	6,757	65,964
	20,000	7,000	84,428	3128,744	3128,744	102,875	-16,079	6,006	65,828
	18,000	9,000	79,986	2964,126	2964,126	102,890	-15,754	5,285	65,475
	16,000	11,000	75,556	2799,951	2799,951	102,906	-15,391	4,598	64,735
	14,000	13,000	71,149	2636,665	2636,665	102,921	-14,985	3,953	63,405
	12,000	15,000	66,783	2474,843	2474,843	102,934	-14,532	3,362	61,495
	10,000	17,000	62,471	2315,051	2315,051	102,943	-14,023	2,834	59,136
	8,000	19,000	58,231	2157,916	2157,916	102,945	-13,451	2,385	56,272

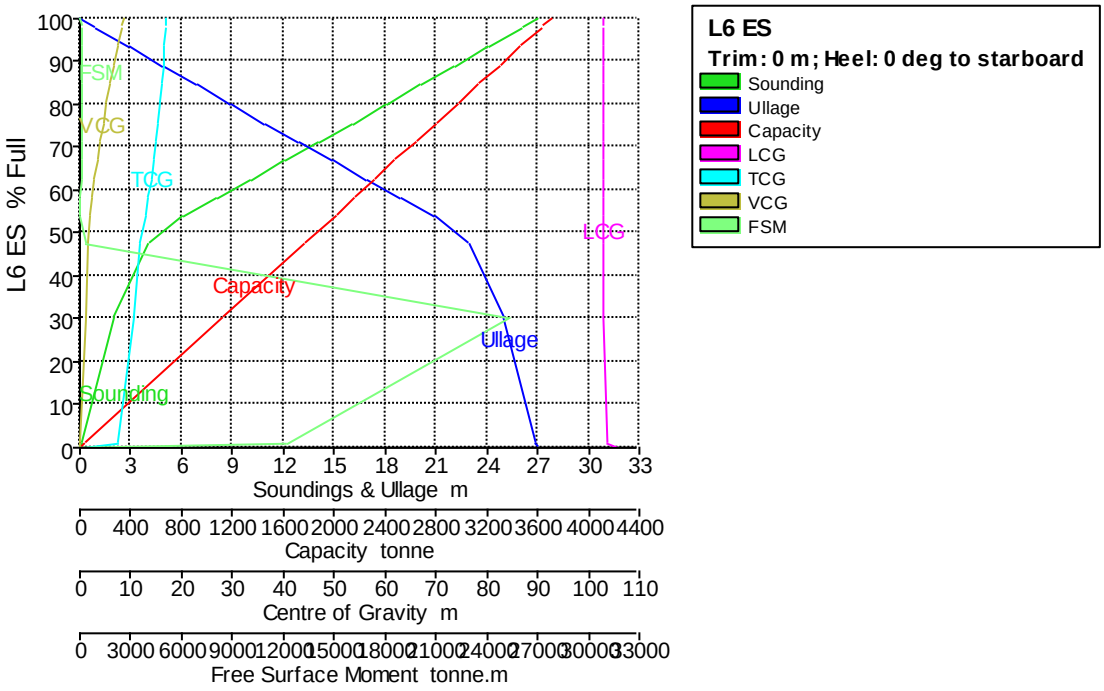
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	54,090	2004,477	2004,477	102,936	-12,808	2,031	52,522
	4,000	23,000	47,481	1759,571	1759,571	102,921	-11,705	1,633	324,199
	2,000	25,000	30,053	1113,700	1113,700	102,938	-10,582	1,040	25284,528
	0,098	26,902	1,000	37,058	37,058	103,553	-7,551	0,054	12097,774
	0,000	27,000	0,000	0,000	0,000	106,094	-0,919	0,000	0,000

6.1.1.11 **Tank Calibrations - L6 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L6 ES	27,000	0,000	100,000	3705,812	3705,812	102,833	16,994	8,730	0,000

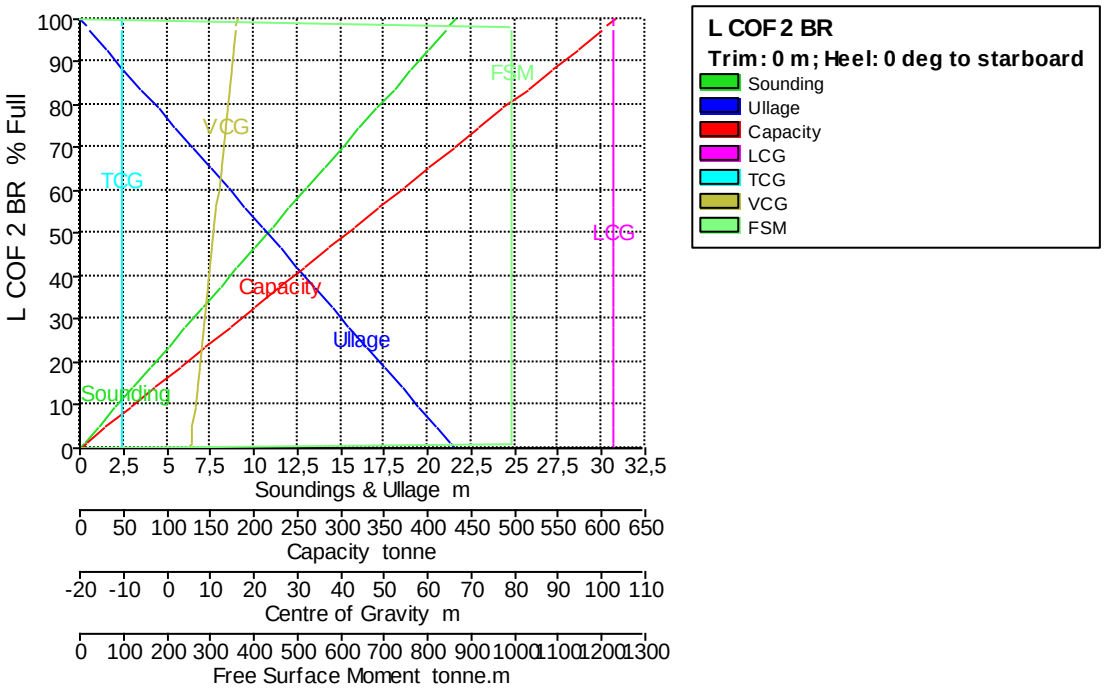
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,101	0,899	98,000	3631,696	3631,696	102,838	16,892	8,367	66,034
	26,056	0,944	97,900	3627,990	3627,990	102,838	16,887	8,349	66,034
	26,000	1,000	97,775	3623,353	3623,353	102,838	16,881	8,326	66,034
	24,000	3,000	93,325	3458,440	3458,440	102,849	16,639	7,531	66,017
	22,000	5,000	88,875	3293,554	3293,554	102,862	16,373	6,757	65,964
	20,000	7,000	84,428	3128,744	3128,744	102,875	16,079	6,006	65,828
	18,000	9,000	79,986	2964,126	2964,126	102,890	15,754	5,285	65,475
	16,000	11,000	75,556	2799,951	2799,951	102,906	15,391	4,598	64,735
	14,000	13,000	71,149	2636,665	2636,665	102,921	14,985	3,953	63,405
	12,000	15,000	66,783	2474,843	2474,843	102,934	14,532	3,362	61,495
	10,000	17,000	62,471	2315,051	2315,051	102,943	14,023	2,834	59,136
	8,000	19,000	58,231	2157,916	2157,916	102,945	13,451	2,385	56,272
	6,000	21,000	54,090	2004,477	2004,477	102,936	12,808	2,031	52,522
	4,000	23,000	47,481	1759,571	1759,571	102,921	11,705	1,633	324,199
	2,000	25,000	30,053	1113,700	1113,700	102,938	10,582	1,040	25284,528
	0,098	26,902	1,000	37,058	37,058	103,553	7,551	0,054	12097,774
	0,000	27,000	0,000	0,000	0,000	106,094	0,919	0,000	0,000

6.1.1.12 **Tank Calibrations - L COF 2 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 2 BR	21,560	0,000	100,000	615,753	615,753	102,600	-10,200	16,220	0,000
	21,129	0,431	98,000	603,438	603,438	102,600	-10,200	16,004	990,459
	21,107	0,453	97,900	602,822	602,822	102,600	-10,200	15,994	990,459
	21,000	0,560	97,403	599,759	599,759	102,600	-10,200	15,940	990,459
	20,000	1,560	92,764	571,199	571,199	102,600	-10,200	15,440	990,459
	19,000	2,560	88,126	542,639	542,639	102,600	-10,200	14,940	990,459
	18,000	3,560	83,488	514,079	514,079	102,600	-10,200	14,440	990,459
	17,000	4,560	78,850	485,519	485,519	102,600	-10,200	13,940	990,459
	16,000	5,560	74,212	456,959	456,959	102,600	-10,200	13,440	990,459
	15,000	6,560	69,573	428,399	428,399	102,600	-10,200	12,940	990,459
	14,000	7,560	64,935	399,839	399,839	102,600	-10,200	12,440	990,459
	13,000	8,560	60,297	371,279	371,279	102,600	-10,200	11,940	990,459
	12,000	9,560	55,659	342,719	342,719	102,600	-10,200	11,440	990,459

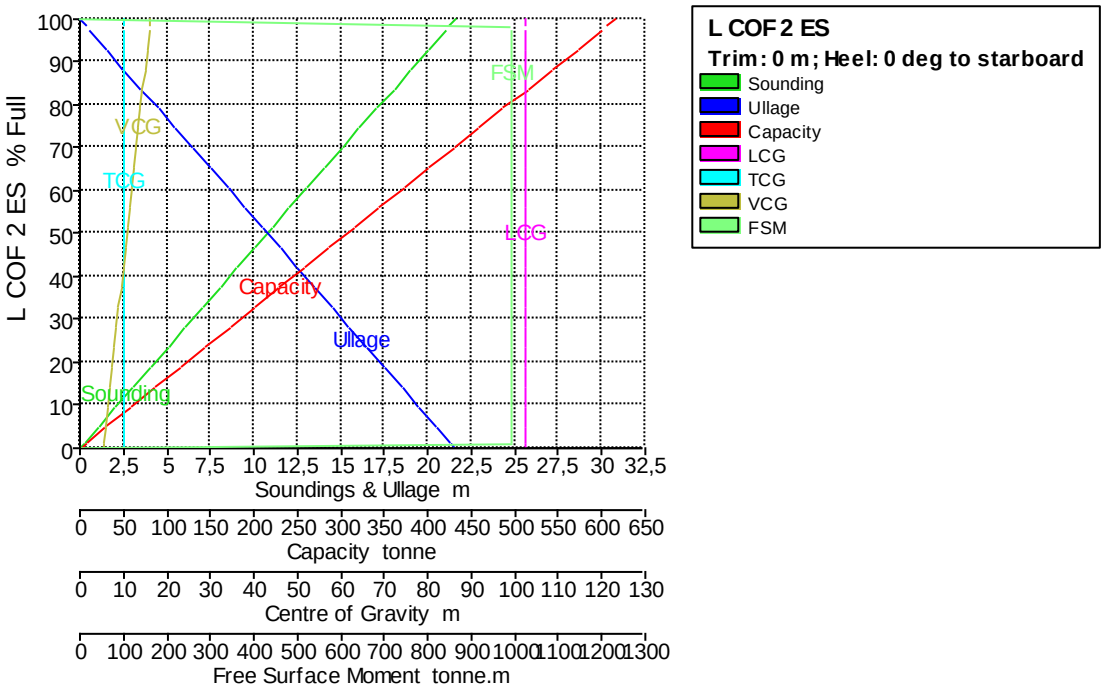
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,159	314,159	102,600	-10,200	10,940	990,459
	10,000	11,560	46,382	285,600	285,600	102,600	-10,200	10,440	990,459
	9,000	12,560	41,744	257,040	257,040	102,600	-10,200	9,940	990,459
	8,000	13,560	37,106	228,480	228,480	102,600	-10,200	9,440	990,459
	7,000	14,560	32,468	199,920	199,920	102,600	-10,200	8,940	990,459
	6,000	15,560	27,829	171,360	171,360	102,600	-10,200	8,440	990,459
	5,000	16,560	23,191	142,800	142,800	102,600	-10,200	7,940	990,459
	4,000	17,560	18,553	114,240	114,240	102,600	-10,200	7,440	990,459
	3,000	18,560	13,915	85,680	85,680	102,600	-10,200	6,940	990,459
	2,000	19,560	9,276	57,120	57,120	102,600	-10,200	6,440	990,459
	1,000	20,560	4,638	28,560	28,560	102,600	-10,200	5,940	990,459
	0,216	21,344	1,000	6,158	6,158	102,600	-10,200	5,548	990,459
	0,000	21,560	0,000	0,000	0,000	102,600	-10,200	5,440	0,000

6.1.1.13 **Tank Calibrations - L COF 2 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 2 ES	21,560	0,000	100,000	615,753	615,753	102,600	10,200	16,220	0,000
	21,129	0,431	98,000	603,438	603,438	102,600	10,200	16,004	990,459
	21,107	0,453	97,900	602,822	602,822	102,600	10,200	15,994	990,459
	21,000	0,560	97,403	599,759	599,759	102,600	10,200	15,940	990,459
	20,000	1,560	92,764	571,199	571,199	102,600	10,200	15,440	990,459
	19,000	2,560	88,126	542,639	542,639	102,600	10,200	14,940	990,459
	18,000	3,560	83,488	514,079	514,079	102,600	10,200	14,440	990,459
	17,000	4,560	78,850	485,519	485,519	102,600	10,200	13,940	990,459
	16,000	5,560	74,212	456,959	456,959	102,600	10,200	13,440	990,459
	15,000	6,560	69,573	428,399	428,399	102,600	10,200	12,940	990,459
	14,000	7,560	64,935	399,839	399,839	102,600	10,200	12,440	990,459
	13,000	8,560	60,297	371,279	371,279	102,600	10,200	11,940	990,459
	12,000	9,560	55,659	342,719	342,719	102,600	10,200	11,440	990,459

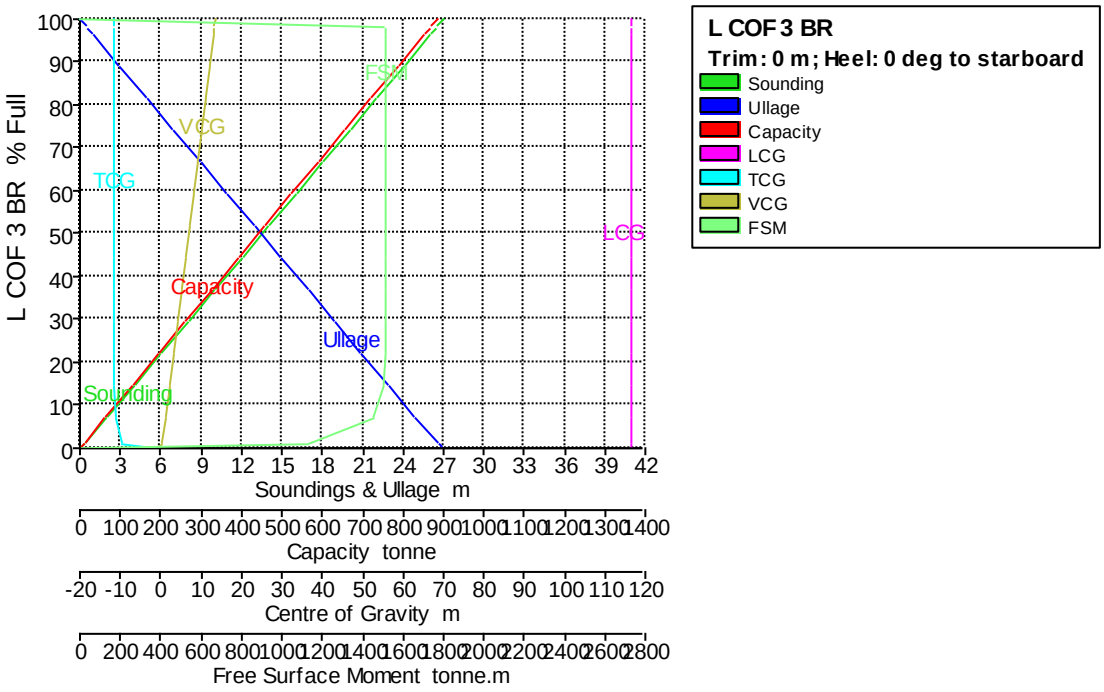
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,159	314,159	102,600	10,200	10,940	990,459
	10,000	11,560	46,382	285,600	285,600	102,600	10,200	10,440	990,459
	9,000	12,560	41,744	257,040	257,040	102,600	10,200	9,940	990,459
	8,000	13,560	37,106	228,480	228,480	102,600	10,200	9,440	990,459
	7,000	14,560	32,468	199,920	199,920	102,600	10,200	8,940	990,459
	6,000	15,560	27,829	171,360	171,360	102,600	10,200	8,440	990,459
	5,000	16,560	23,191	142,800	142,800	102,600	10,200	7,940	990,459
	4,000	17,560	18,553	114,240	114,240	102,600	10,200	7,440	990,459
	3,000	18,560	13,915	85,680	85,680	102,600	10,200	6,940	990,459
	2,000	19,560	9,276	57,120	57,120	102,600	10,200	6,440	990,459
	1,000	20,560	4,638	28,560	28,560	102,600	10,200	5,940	990,459
	0,216	21,344	1,000	6,158	6,158	102,600	10,200	5,548	990,459
	0,000	21,560	0,000	0,000	0,000	102,600	10,200	5,440	0,000

6.1.1.14 **Tank Calibrations - L COF 3 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 3 BR	27,000	0,000	100,000	883,545	883,545	116,600	-11,695	13,567	0,000
	26,463	0,537	98,000	865,874	865,874	116,600	-11,693	13,299	1514,087
	26,436	0,564	97,900	864,990	864,990	116,600	-11,693	13,285	1514,086
	26,000	1,000	96,276	850,645	850,645	116,600	-11,692	13,067	1514,086
	24,000	3,000	88,829	784,845	784,845	116,600	-11,688	12,067	1514,082
	22,000	5,000	81,382	719,045	719,045	116,600	-11,682	11,066	1514,069
	20,000	7,000	73,935	653,245	653,245	116,600	-11,675	10,065	1514,037
	18,000	9,000	66,487	587,447	587,447	116,600	-11,667	9,065	1513,960
	16,000	11,000	59,040	521,649	521,649	116,600	-11,656	8,064	1513,805
	14,000	13,000	51,594	455,855	455,855	116,600	-11,643	7,063	1513,520
	12,000	15,000	44,148	390,066	390,066	116,600	-11,625	6,061	1513,090
	10,000	17,000	36,703	324,285	324,285	116,600	-11,600	5,059	1512,518
	8,000	19,000	29,259	258,513	258,513	116,600	-11,564	4,057	1511,706

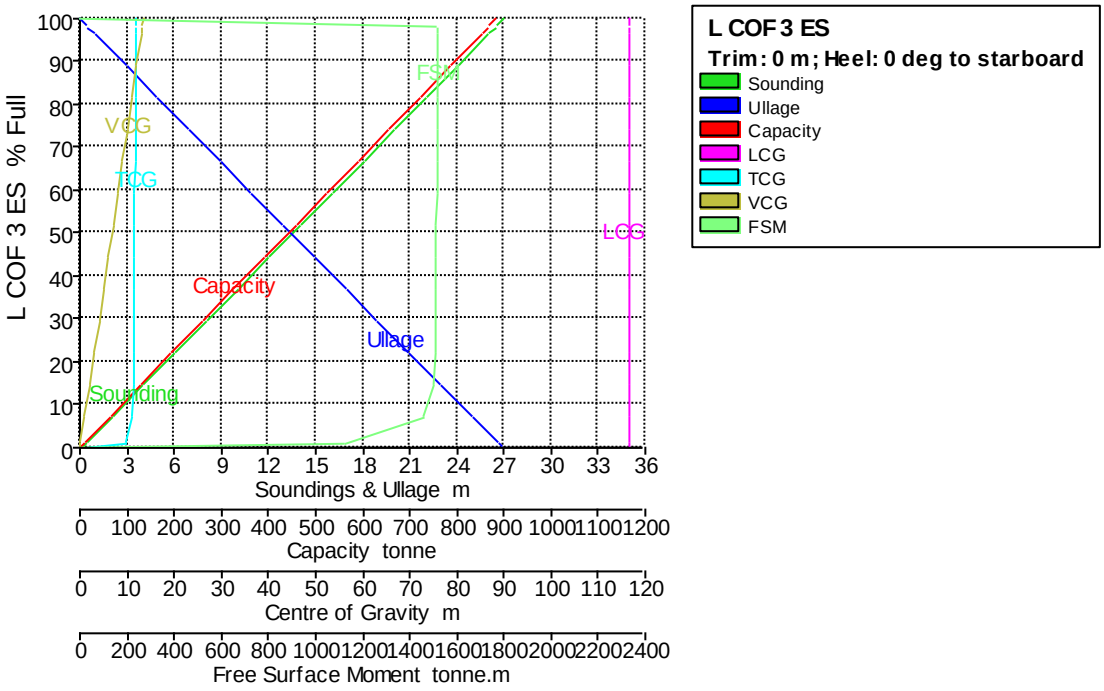
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	21,816	192,758	192,758	116,600	-11,503	3,053	1509,992
	4,000	23,000	14,380	127,051	127,051	116,600	-11,384	2,046	1503,817
	2,000	25,000	6,974	61,615	61,615	116,600	-11,064	1,031	1456,054
	0,327	26,673	1,000	8,836	8,836	116,600	-9,802	0,173	1121,177
	0,000	27,000	0,000	0,000	0,000	116,603	-1,279	0,000	0,000

6.1.1.15 **Tank Calibrations - L COF 3 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 3 ES	27,000	0,000	100,000	883,545	883,545	116,600	11,695	13,567	0,000

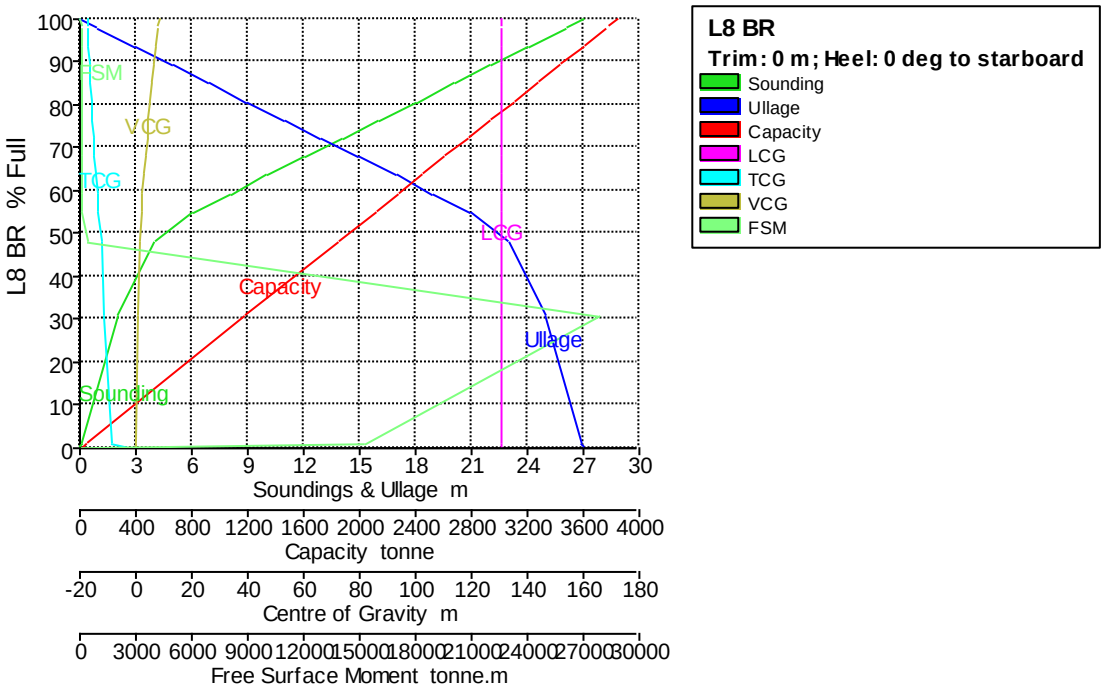
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,463	0,537	98,000	865,874	865,874	116,600	11,693	13,299	1514,087
	26,436	0,564	97,900	864,990	864,990	116,600	11,693	13,285	1514,086
	26,000	1,000	96,276	850,645	850,645	116,600	11,692	13,067	1514,086
	24,000	3,000	88,829	784,845	784,845	116,600	11,688	12,067	1514,082
	22,000	5,000	81,382	719,045	719,045	116,600	11,682	11,066	1514,069
	20,000	7,000	73,935	653,245	653,245	116,600	11,675	10,065	1514,037
	18,000	9,000	66,487	587,447	587,447	116,600	11,667	9,065	1513,960
	16,000	11,000	59,040	521,649	521,649	116,600	11,656	8,064	1513,805
	14,000	13,000	51,594	455,855	455,855	116,600	11,643	7,063	1513,520
	12,000	15,000	44,148	390,066	390,066	116,600	11,625	6,061	1513,090
	10,000	17,000	36,703	324,285	324,285	116,600	11,600	5,059	1512,518
	8,000	19,000	29,259	258,513	258,513	116,600	11,564	4,057	1511,706
	6,000	21,000	21,816	192,758	192,758	116,600	11,503	3,053	1509,992
	4,000	23,000	14,380	127,051	127,051	116,600	11,384	2,046	1503,817
	2,000	25,000	6,974	61,615	61,615	116,600	11,064	1,031	1456,054
	0,327	26,673	1,000	8,836	8,836	116,600	9,802	0,173	1121,177
	0,000	27,000	0,000	0,000	0,000	116,603	1,279	0,000	0,000

6.1.1.16 **Tank Calibrations - L8 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L8 BR	27,000	0,000	100,000	3842,451	3842,451	130,603	-17,171	8,552	0,000
	26,068	0,932	98,000	3765,602	3765,602	130,603	-17,074	8,185	66,035
	26,021	0,979	97,900	3761,760	3761,760	130,603	-17,069	8,167	66,035
	26,000	1,000	97,854	3759,991	3759,991	130,603	-17,067	8,158	66,035
	24,000	3,000	93,562	3595,073	3595,073	130,603	-16,843	7,386	66,034
	22,000	5,000	89,270	3430,156	3430,156	130,603	-16,597	6,635	66,032
	20,000	7,000	84,978	3265,242	3265,242	130,603	-16,327	5,909	66,029
	18,000	9,000	80,686	3100,331	3100,331	130,603	-16,028	5,213	66,024
	16,000	11,000	76,395	2935,425	2935,425	130,603	-15,695	4,551	66,015
	14,000	13,000	72,103	2770,528	2770,528	130,604	-15,323	3,929	66,001
	12,000	15,000	67,812	2605,647	2605,647	130,604	-14,903	3,355	65,980
	10,000	17,000	63,522	2440,784	2440,784	130,604	-14,427	2,839	65,953
	8,000	19,000	59,232	2275,952	2275,952	130,604	-13,883	2,392	65,900

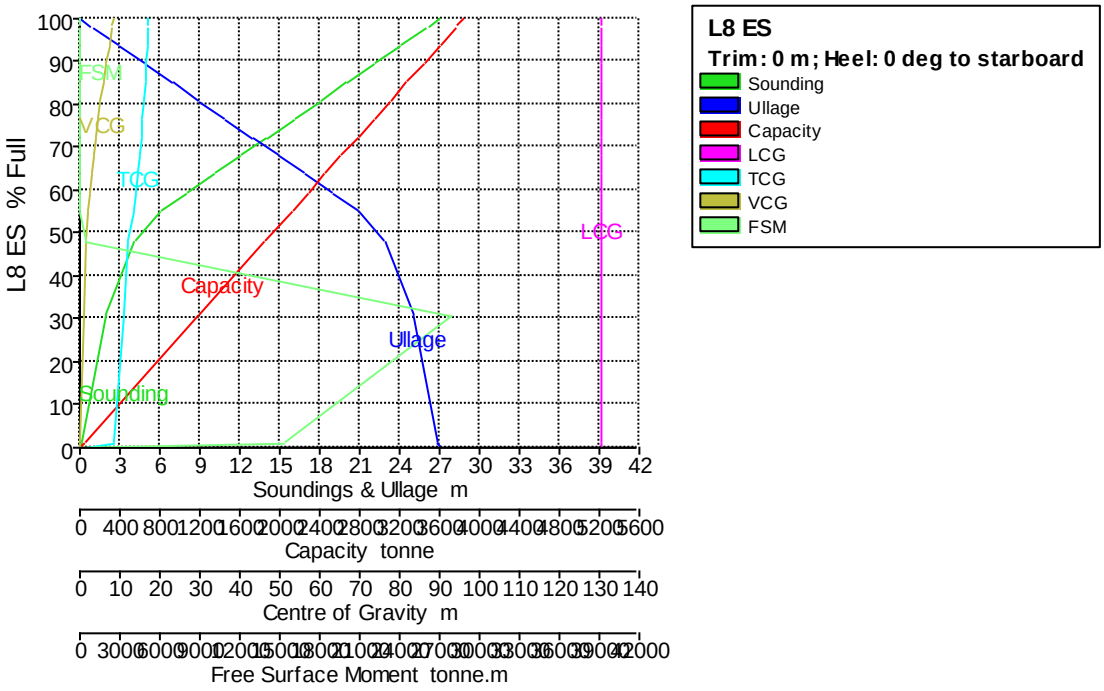
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	54,945	2111,227	2111,227	130,604	-13,253	2,033	65,637
	4,000	23,000	48,131	1849,402	1849,402	130,603	-12,172	1,627	393,628
	2,000	25,000	30,553	1174,000	1174,000	130,603	-11,094	1,031	27854,609
	0,089	26,911	1,000	38,425	38,425	130,600	-8,369	0,048	15232,656
	0,000	27,000	0,000	0,000	0,000	130,651	-1,354	0,000	0,000

6.1.1.17 **Tank Calibrations - L8 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L8 ES	27,000	0,000	100,000	3842,451	3842,451	130,603	17,171	8,552	0,000

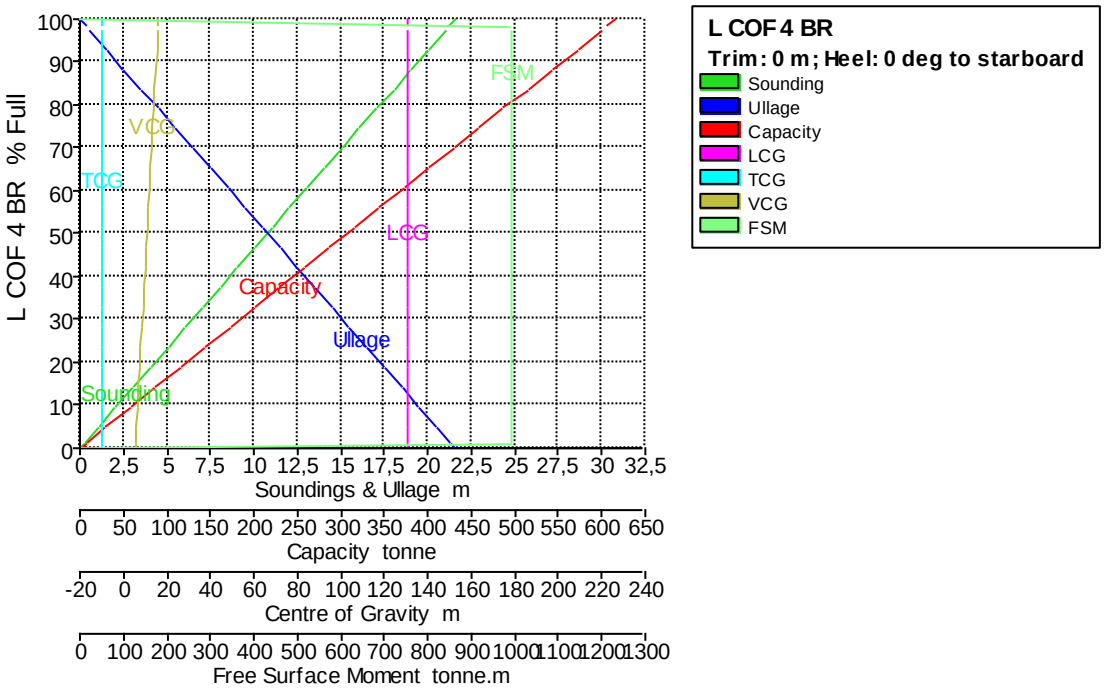
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,068	0,932	98,000	3765,602	3765,602	130,603	17,074	8,185	66,035
	26,021	0,979	97,900	3761,760	3761,760	130,603	17,069	8,167	66,035
	26,000	1,000	97,854	3759,991	3759,991	130,603	17,067	8,158	66,035
	24,000	3,000	93,562	3595,073	3595,073	130,603	16,843	7,386	66,034
	22,000	5,000	89,270	3430,156	3430,156	130,603	16,597	6,635	66,032
	20,000	7,000	84,978	3265,242	3265,242	130,603	16,327	5,909	66,029
	18,000	9,000	80,686	3100,331	3100,331	130,603	16,028	5,213	66,024
	16,000	11,000	76,395	2935,425	2935,425	130,603	15,695	4,551	66,015
	14,000	13,000	72,103	2770,528	2770,528	130,604	15,323	3,929	66,001
	12,000	15,000	67,812	2605,647	2605,647	130,604	14,903	3,355	65,980
	10,000	17,000	63,522	2440,784	2440,784	130,604	14,427	2,839	65,953
	8,000	19,000	59,232	2275,952	2275,952	130,604	13,883	2,392	65,900
	6,000	21,000	54,945	2111,227	2111,227	130,604	13,253	2,033	65,637
	4,000	23,000	48,131	1849,402	1849,402	130,603	12,172	1,627	393,628
	2,000	25,000	30,553	1174,000	1174,000	130,603	11,094	1,031	27854,609
	0,089	26,911	1,000	38,425	38,425	130,600	8,369	0,048	15232,656
	0,000	27,000	0,000	0,000	0,000	130,651	1,354	0,000	0,000

6.1.1.18 **Tank Calibrations - L COF 4 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 4 BR	21,560	0,000	100,000	615,754	615,754	130,600	-10,200	16,220	0,000
	21,129	0,431	98,000	603,439	603,439	130,600	-10,200	16,004	990,462
	21,107	0,453	97,900	602,823	602,823	130,600	-10,200	15,994	990,462
	21,000	0,560	97,403	599,761	599,761	130,600	-10,200	15,940	990,462
	20,000	1,560	92,764	571,201	571,201	130,600	-10,200	15,440	990,462
	19,000	2,560	88,126	542,641	542,641	130,600	-10,200	14,940	990,462
	18,000	3,560	83,488	514,081	514,081	130,600	-10,200	14,440	990,462
	17,000	4,560	78,850	485,521	485,521	130,600	-10,200	13,940	990,462
	16,000	5,560	74,212	456,960	456,960	130,600	-10,200	13,440	990,462
	15,000	6,560	69,573	428,400	428,400	130,600	-10,200	12,940	990,462
	14,000	7,560	64,935	399,840	399,840	130,600	-10,200	12,440	990,462
	13,000	8,560	60,297	371,280	371,280	130,600	-10,200	11,940	990,462
	12,000	9,560	55,659	342,720	342,720	130,600	-10,200	11,440	990,462

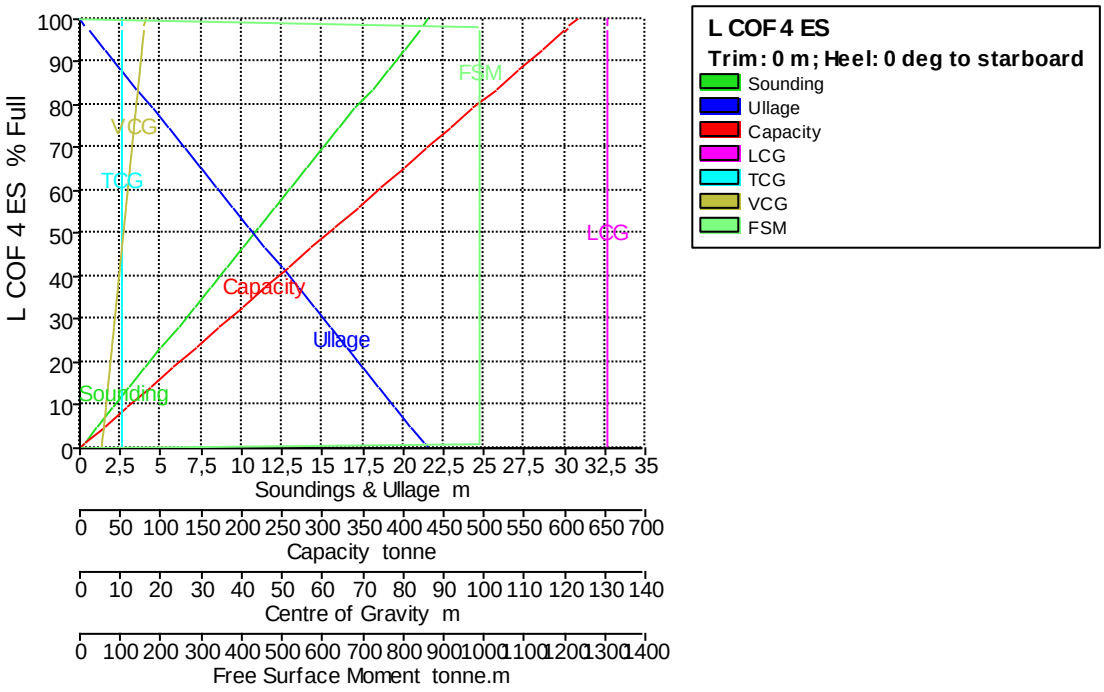
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,160	314,160	130,600	-10,200	10,940	990,462
	10,000	11,560	46,382	285,600	285,600	130,600	-10,200	10,440	990,462
	9,000	12,560	41,744	257,040	257,040	130,600	-10,200	9,940	990,462
	8,000	13,560	37,106	228,480	228,480	130,600	-10,200	9,440	990,462
	7,000	14,560	32,468	199,920	199,920	130,600	-10,200	8,940	990,462
	6,000	15,560	27,829	171,360	171,360	130,600	-10,200	8,440	990,462
	5,000	16,560	23,191	142,800	142,800	130,600	-10,200	7,940	990,462
	4,000	17,560	18,553	114,240	114,240	130,600	-10,200	7,440	990,462
	3,000	18,560	13,915	85,680	85,680	130,600	-10,200	6,940	990,462
	2,000	19,560	9,276	57,120	57,120	130,600	-10,200	6,440	990,462
	1,000	20,560	4,638	28,560	28,560	130,600	-10,200	5,940	990,462
	0,216	21,344	1,000	6,158	6,158	130,600	-10,200	5,548	990,462
	0,000	21,560	0,000	0,000	0,000	130,600	-10,200	5,440	0,000

6.1.1.19 **Tank Calibrations - L COF 4 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 4 ES	21,560	0,000	100,000	615,754	615,754	130,600	10,200	16,220	0,000
	21,129	0,431	98,000	603,439	603,439	130,600	10,200	16,004	990,462
	21,107	0,453	97,900	602,823	602,823	130,600	10,200	15,994	990,462
	21,000	0,560	97,403	599,761	599,761	130,600	10,200	15,940	990,462
	20,000	1,560	92,764	571,201	571,201	130,600	10,200	15,440	990,462
	19,000	2,560	88,126	542,641	542,641	130,600	10,200	14,940	990,462
	18,000	3,560	83,488	514,081	514,081	130,600	10,200	14,440	990,462
	17,000	4,560	78,850	485,521	485,521	130,600	10,200	13,940	990,462
	16,000	5,560	74,212	456,960	456,960	130,600	10,200	13,440	990,462
	15,000	6,560	69,573	428,400	428,400	130,600	10,200	12,940	990,462
	14,000	7,560	64,935	399,840	399,840	130,600	10,200	12,440	990,462
	13,000	8,560	60,297	371,280	371,280	130,600	10,200	11,940	990,462
	12,000	9,560	55,659	342,720	342,720	130,600	10,200	11,440	990,462

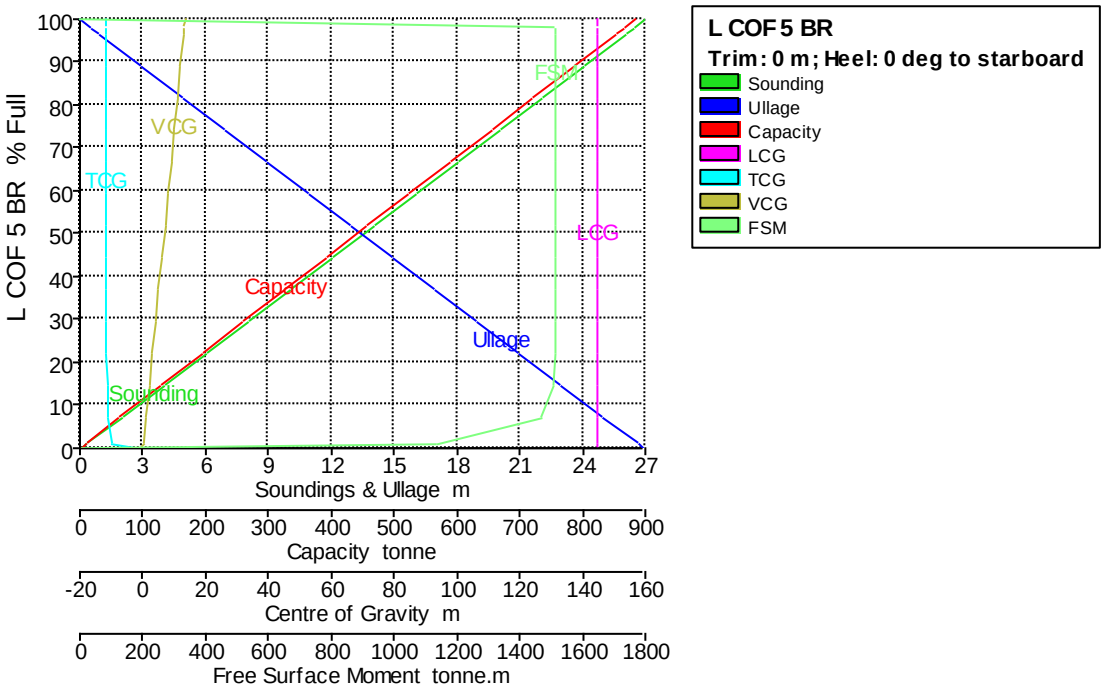
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,160	314,160	130,600	10,200	10,940	990,462
	10,000	11,560	46,382	285,600	285,600	130,600	10,200	10,440	990,462
	9,000	12,560	41,744	257,040	257,040	130,600	10,200	9,940	990,462
	8,000	13,560	37,106	228,480	228,480	130,600	10,200	9,440	990,462
	7,000	14,560	32,468	199,920	199,920	130,600	10,200	8,940	990,462
	6,000	15,560	27,829	171,360	171,360	130,600	10,200	8,440	990,462
	5,000	16,560	23,191	142,800	142,800	130,600	10,200	7,940	990,462
	4,000	17,560	18,553	114,240	114,240	130,600	10,200	7,440	990,462
	3,000	18,560	13,915	85,680	85,680	130,600	10,200	6,940	990,462
	2,000	19,560	9,276	57,120	57,120	130,600	10,200	6,440	990,462
	1,000	20,560	4,638	28,560	28,560	130,600	10,200	5,940	990,462
	0,216	21,344	1,000	6,158	6,158	130,600	10,200	5,548	990,462
	0,000	21,560	0,000	0,000	0,000	130,600	10,200	5,440	0,000

6.1.1.20 **Tank Calibrations - L COF 5 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 5 BR	27,000	0,000	100,000	883,912	883,912	144,600	-11,699	13,563	0,000
	26,463	0,537	98,000	866,233	866,233	144,600	-11,698	13,294	1514,037
	26,436	0,564	97,900	865,349	865,349	144,600	-11,698	13,281	1514,036
	26,000	1,000	96,278	851,012	851,012	144,600	-11,697	13,063	1514,022
	24,000	3,000	88,834	785,213	785,213	144,600	-11,693	12,062	1513,955
	22,000	5,000	81,390	719,416	719,416	144,600	-11,688	11,062	1513,884
	20,000	7,000	73,946	653,619	653,619	144,600	-11,681	10,061	1513,811
	18,000	9,000	66,503	587,823	587,823	144,600	-11,674	9,061	1513,733
	16,000	11,000	59,059	522,029	522,029	144,600	-11,664	8,060	1513,654
	14,000	13,000	51,616	456,236	456,236	144,600	-11,652	7,060	1513,576
	12,000	15,000	44,172	390,444	390,444	144,600	-11,636	6,059	1513,505
	10,000	17,000	36,729	324,653	324,653	144,600	-11,613	5,057	1513,440
	8,000	19,000	29,286	258,863	258,863	144,600	-11,579	4,055	1513,327

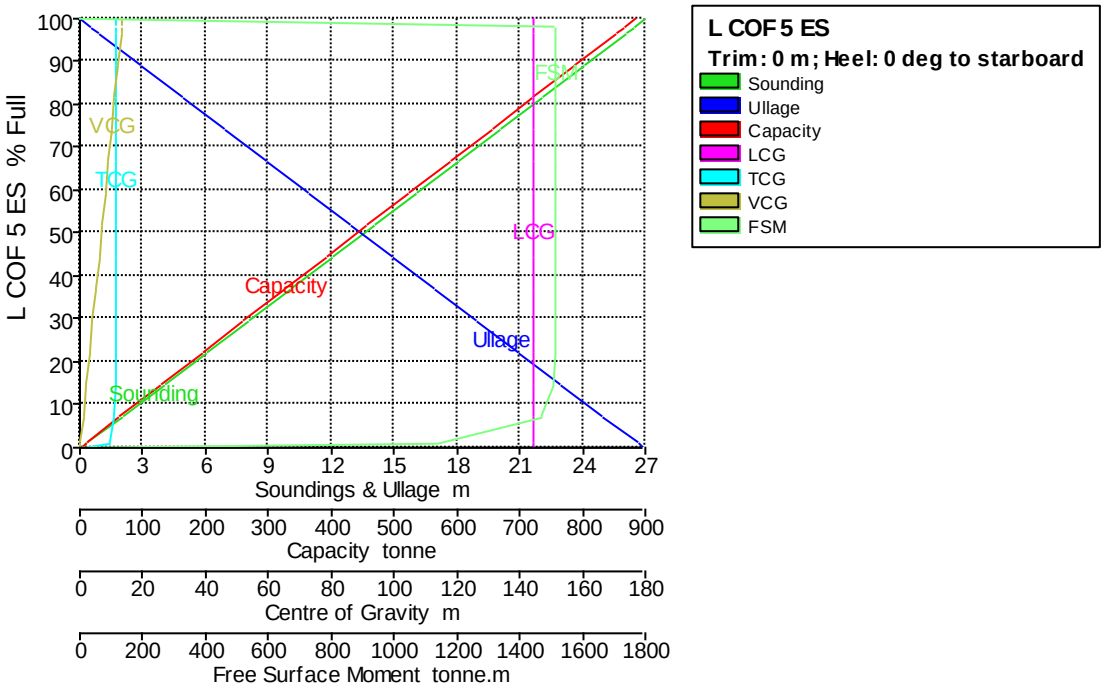
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	21,843	193,077	193,077	144,600	-11,521	3,052	1512,641
	4,000	23,000	14,404	127,319	127,319	144,600	-11,407	2,045	1508,564
	2,000	25,000	6,989	61,773	61,773	144,600	-11,092	1,031	1467,288
	0,327	26,673	1,000	8,839	8,839	144,600	-9,826	0,173	1129,545
	0,000	27,000	0,000	0,000	0,000	144,599	-1,327	0,000	0,000

6.1.1.21 **Tank Calibrations - L COF 5 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 5 ES	27,000	0,000	100,000	883,912	883,912	144,600	11,699	13,563	0,000

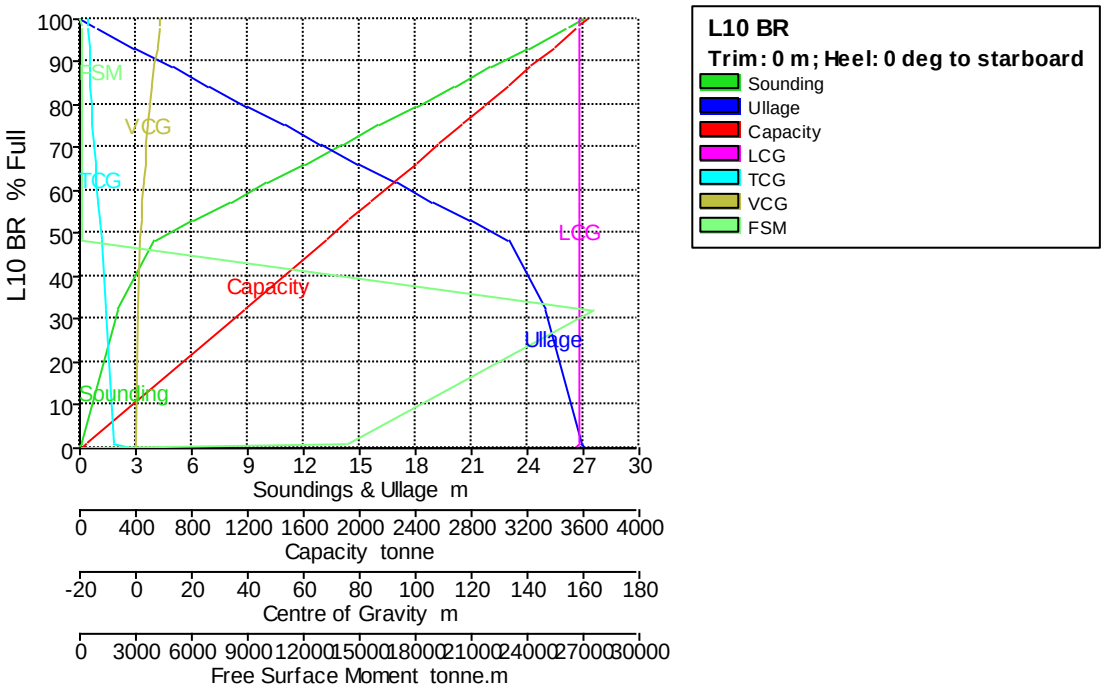
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,463	0,537	98,000	866,233	866,233	144,600	11,698	13,294	1514,037
	26,436	0,564	97,900	865,349	865,349	144,600	11,698	13,281	1514,036
	26,000	1,000	96,278	851,012	851,012	144,600	11,697	13,063	1514,022
	24,000	3,000	88,834	785,213	785,213	144,600	11,693	12,062	1513,955
	22,000	5,000	81,390	719,416	719,416	144,600	11,688	11,062	1513,884
	20,000	7,000	73,946	653,619	653,619	144,600	11,681	10,061	1513,811
	18,000	9,000	66,503	587,823	587,823	144,600	11,674	9,061	1513,733
	16,000	11,000	59,059	522,029	522,029	144,600	11,664	8,060	1513,654
	14,000	13,000	51,616	456,236	456,236	144,600	11,652	7,060	1513,576
	12,000	15,000	44,172	390,444	390,444	144,600	11,636	6,059	1513,505
	10,000	17,000	36,729	324,653	324,653	144,600	11,613	5,057	1513,440
	8,000	19,000	29,286	258,863	258,863	144,600	11,579	4,055	1513,327
	6,000	21,000	21,843	193,077	193,077	144,600	11,521	3,052	1512,641
	4,000	23,000	14,404	127,319	127,319	144,600	11,407	2,045	1508,564
	2,000	25,000	6,989	61,773	61,773	144,600	11,092	1,031	1467,288
	0,327	26,673	1,000	8,839	8,839	144,600	9,826	0,173	1129,545
	0,000	27,000	0,000	0,000	0,000	144,599	1,327	0,000	0,000

6.1.1.22 **Tank Calibrations - L10 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L10 BR	27,000	0,000	100,000	3626,792	3626,792	158,540	-17,018	8,770	0,000
	26,119	0,881	98,000	3554,256	3554,256	158,539	-16,917	8,407	65,663
	26,075	0,925	97,900	3550,629	3550,629	158,539	-16,912	8,388	65,655
	26,000	1,000	97,730	3544,456	3544,456	158,538	-16,904	8,358	65,640
	24,000	3,000	93,196	3380,038	3380,038	158,536	-16,658	7,548	65,234
	22,000	5,000	88,673	3215,969	3215,969	158,535	-16,389	6,760	64,816
	20,000	7,000	84,159	3052,264	3052,264	158,533	-16,091	5,996	64,383
	18,000	9,000	79,656	2888,942	2888,942	158,533	-15,761	5,261	63,936
	16,000	11,000	75,163	2726,012	2726,012	158,533	-15,392	4,559	63,486
	14,000	13,000	70,682	2563,473	2563,473	158,534	-14,978	3,897	63,058
	12,000	15,000	66,210	2401,296	2401,296	158,537	-14,508	3,282	62,677
	10,000	17,000	61,747	2239,441	2239,441	158,540	-13,973	2,725	62,345
	8,000	19,000	57,292	2077,874	2077,874	158,545	-13,355	2,237	62,030

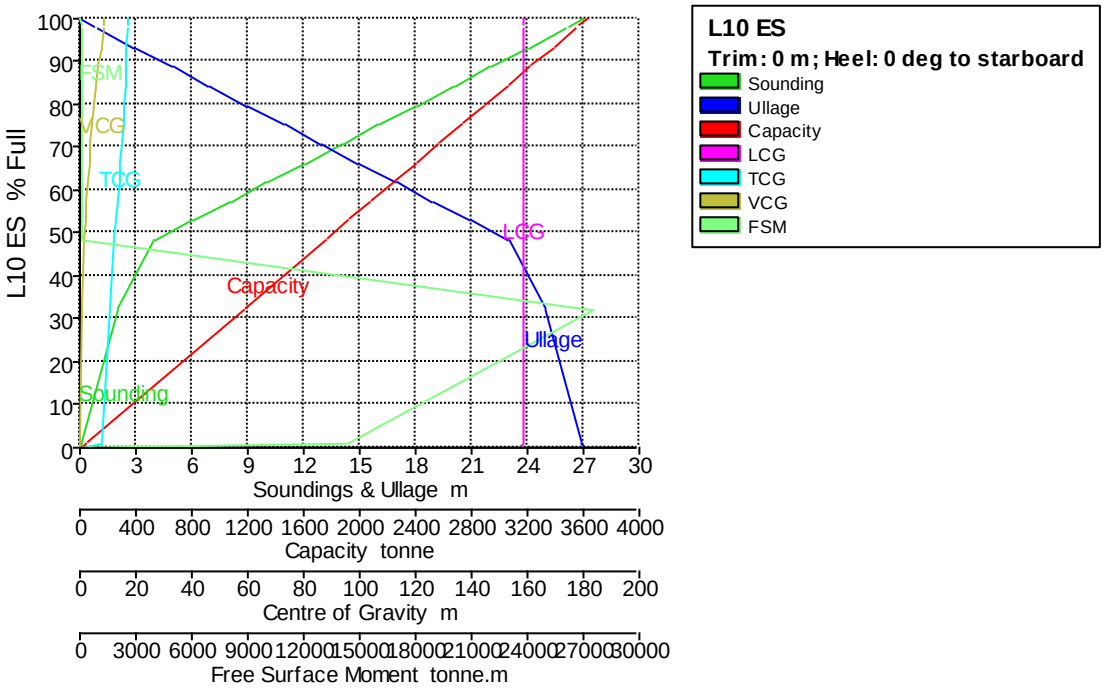
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	52,847	1916,641	1916,641	158,551	-12,634	1,836	61,554
	4,000	23,000	48,422	1756,164	1756,164	158,559	-11,787	1,547	60,013
	2,000	25,000	32,149	1165,986	1165,986	158,560	-11,029	1,033	27574,497
	0,088	26,912	1,000	36,268	36,268	158,377	-8,073	0,048	14215,973
	0,000	27,000	0,000	0,000	0,000	157,057	-1,067	0,000	0,000

6.1.1.23 **Tank Calibrations - L10 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L10 ES	27,000	0,000	100,000	3626,792	3626,792	158,540	17,018	8,770	0,000

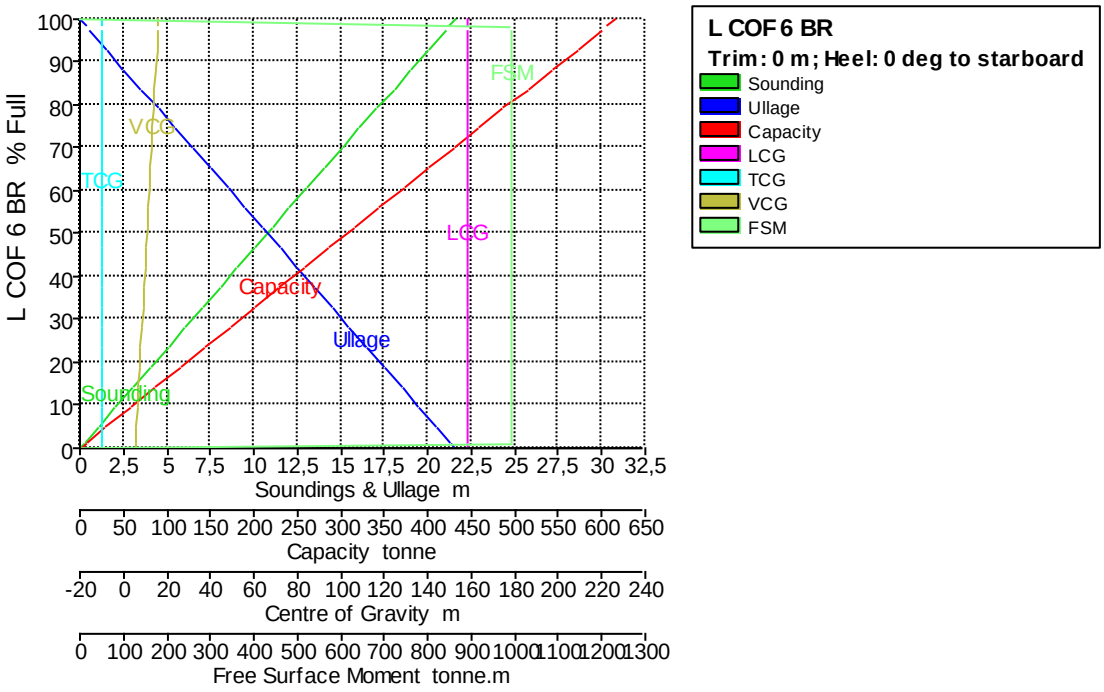
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,119	0,881	98,000	3554,256	3554,256	158,539	16,917	8,407	65,663
	26,075	0,925	97,900	3550,629	3550,629	158,539	16,912	8,388	65,655
	26,000	1,000	97,730	3544,456	3544,456	158,538	16,904	8,358	65,640
	24,000	3,000	93,196	3380,038	3380,038	158,536	16,658	7,548	65,234
	22,000	5,000	88,673	3215,969	3215,969	158,535	16,389	6,760	64,816
	20,000	7,000	84,159	3052,264	3052,264	158,533	16,091	5,996	64,383
	18,000	9,000	79,656	2888,942	2888,942	158,533	15,761	5,261	63,936
	16,000	11,000	75,163	2726,012	2726,012	158,533	15,392	4,559	63,486
	14,000	13,000	70,682	2563,473	2563,473	158,534	14,978	3,897	63,058
	12,000	15,000	66,210	2401,296	2401,296	158,537	14,508	3,282	62,677
	10,000	17,000	61,747	2239,441	2239,441	158,540	13,973	2,725	62,345
	8,000	19,000	57,292	2077,874	2077,874	158,545	13,355	2,237	62,030
	6,000	21,000	52,847	1916,641	1916,641	158,551	12,634	1,836	61,554
	4,000	23,000	48,422	1756,164	1756,164	158,559	11,787	1,547	60,013
	2,000	25,000	32,149	1165,986	1165,986	158,560	11,029	1,033	27574,497
	0,088	26,912	1,000	36,268	36,268	158,377	8,073	0,048	14215,973
	0,000	27,000	0,000	0,000	0,000	157,057	1,067	0,000	0,000

6.1.1.24 **Tank Calibrations - L COF 6 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 6 BR	21,560	0,000	100,000	615,754	615,754	158,600	-10,200	16,220	0,000
	21,129	0,431	98,000	603,439	603,439	158,600	-10,200	16,004	990,462
	21,107	0,453	97,900	602,823	602,823	158,600	-10,200	15,994	990,462
	21,000	0,560	97,403	599,761	599,761	158,600	-10,200	15,940	990,462
	20,000	1,560	92,764	571,201	571,201	158,600	-10,200	15,440	990,462
	19,000	2,560	88,126	542,641	542,641	158,600	-10,200	14,940	990,462
	18,000	3,560	83,488	514,081	514,081	158,600	-10,200	14,440	990,462
	17,000	4,560	78,850	485,521	485,521	158,600	-10,200	13,940	990,462
	16,000	5,560	74,212	456,960	456,960	158,600	-10,200	13,440	990,462
	15,000	6,560	69,573	428,400	428,400	158,600	-10,200	12,940	990,462
	14,000	7,560	64,935	399,840	399,840	158,600	-10,200	12,440	990,462
	13,000	8,560	60,297	371,280	371,280	158,600	-10,200	11,940	990,462
	12,000	9,560	55,659	342,720	342,720	158,600	-10,200	11,440	990,462

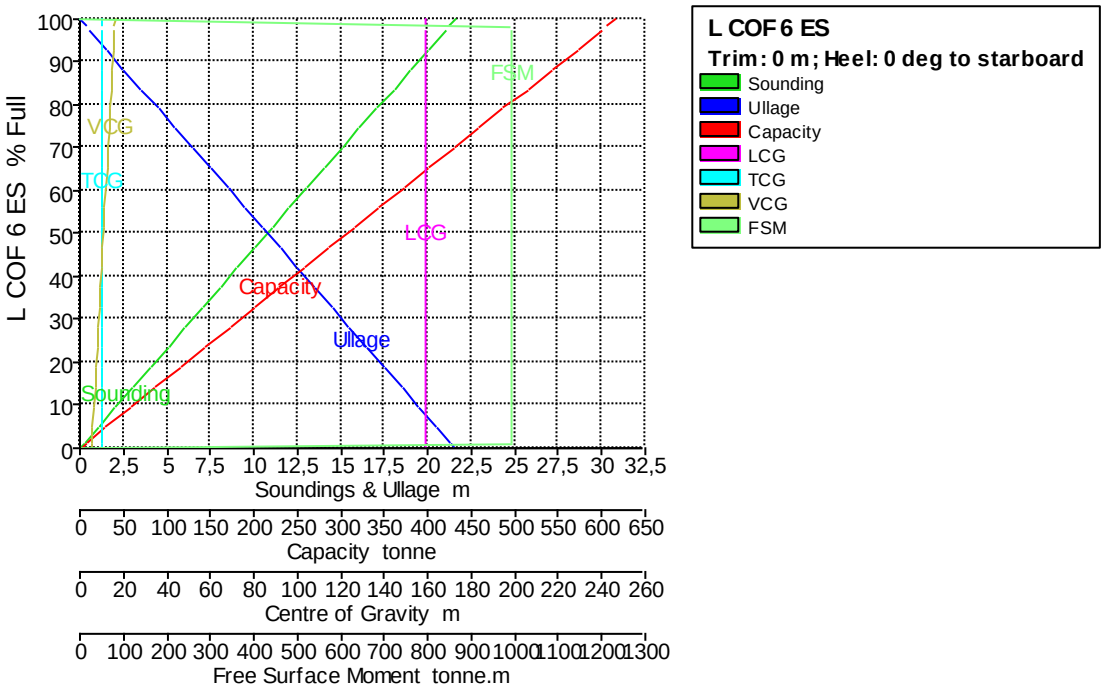
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,160	314,160	158,600	-10,200	10,940	990,462
	10,000	11,560	46,382	285,600	285,600	158,600	-10,200	10,440	990,462
	9,000	12,560	41,744	257,040	257,040	158,600	-10,200	9,940	990,462
	8,000	13,560	37,106	228,480	228,480	158,600	-10,200	9,440	990,462
	7,000	14,560	32,468	199,920	199,920	158,600	-10,200	8,940	990,462
	6,000	15,560	27,829	171,360	171,360	158,600	-10,200	8,440	990,462
	5,000	16,560	23,191	142,800	142,800	158,600	-10,200	7,940	990,462
	4,000	17,560	18,553	114,240	114,240	158,600	-10,200	7,440	990,462
	3,000	18,560	13,915	85,680	85,680	158,600	-10,200	6,940	990,462
	2,000	19,560	9,276	57,120	57,120	158,600	-10,200	6,440	990,462
	1,000	20,560	4,638	28,560	28,560	158,600	-10,200	5,940	990,462
	0,216	21,344	1,000	6,158	6,158	158,600	-10,200	5,548	990,462
	0,000	21,560	0,000	0,000	0,000	158,600	-10,200	5,440	0,000

6.1.1.25 **Tank Calibrations - L COF 6 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 6 ES	21,560	0,000	100,000	615,754	615,754	158,600	10,200	16,220	0,000
	21,129	0,431	98,000	603,439	603,439	158,600	10,200	16,004	990,462
	21,107	0,453	97,900	602,823	602,823	158,600	10,200	15,994	990,462
	21,000	0,560	97,403	599,761	599,761	158,600	10,200	15,940	990,462
	20,000	1,560	92,764	571,201	571,201	158,600	10,200	15,440	990,462
	19,000	2,560	88,126	542,641	542,641	158,600	10,200	14,940	990,462
	18,000	3,560	83,488	514,081	514,081	158,600	10,200	14,440	990,462
	17,000	4,560	78,850	485,521	485,521	158,600	10,200	13,940	990,462
	16,000	5,560	74,212	456,960	456,960	158,600	10,200	13,440	990,462
	15,000	6,560	69,573	428,400	428,400	158,600	10,200	12,940	990,462
	14,000	7,560	64,935	399,840	399,840	158,600	10,200	12,440	990,462
	13,000	8,560	60,297	371,280	371,280	158,600	10,200	11,940	990,462
	12,000	9,560	55,659	342,720	342,720	158,600	10,200	11,440	990,462

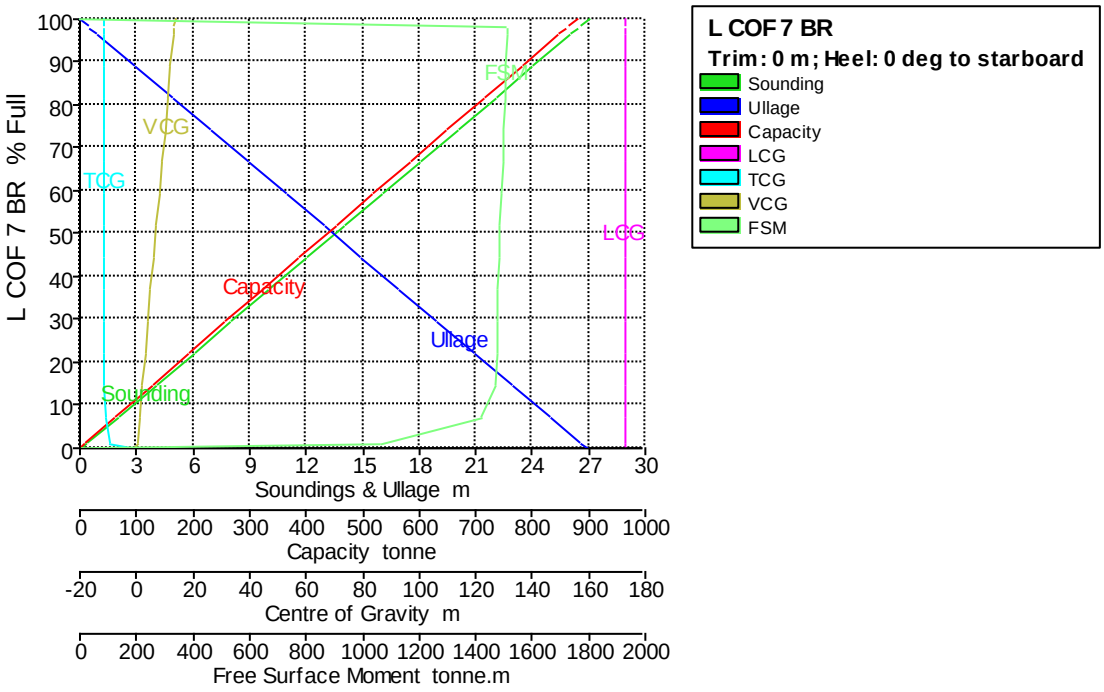
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	11,000	10,560	51,020	314,160	314,160	158,600	10,200	10,940	990,462
	10,000	11,560	46,382	285,600	285,600	158,600	10,200	10,440	990,462
	9,000	12,560	41,744	257,040	257,040	158,600	10,200	9,940	990,462
	8,000	13,560	37,106	228,480	228,480	158,600	10,200	9,440	990,462
	7,000	14,560	32,468	199,920	199,920	158,600	10,200	8,940	990,462
	6,000	15,560	27,829	171,360	171,360	158,600	10,200	8,440	990,462
	5,000	16,560	23,191	142,800	142,800	158,600	10,200	7,940	990,462
	4,000	17,560	18,553	114,240	114,240	158,600	10,200	7,440	990,462
	3,000	18,560	13,915	85,680	85,680	158,600	10,200	6,940	990,462
	2,000	19,560	9,276	57,120	57,120	158,600	10,200	6,440	990,462
	1,000	20,560	4,638	28,560	28,560	158,600	10,200	5,940	990,462
	0,216	21,344	1,000	6,158	6,158	158,600	10,200	5,548	990,462
	0,000	21,560	0,000	0,000	0,000	158,600	10,200	5,440	0,000

6.1.1.26 **Tank Calibrations - L COF 7 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 7 BR	27,000	0,000	100,000	878,241	878,241	172,600	-11,627	13,595	0,000
	26,466	0,534	98,000	860,676	860,676	172,600	-11,625	13,327	1511,378
	26,439	0,561	97,900	859,798	859,798	172,600	-11,625	13,313	1511,331
	26,000	1,000	96,256	845,360	845,360	172,600	-11,623	13,093	1510,556
	24,000	3,000	88,773	779,637	779,637	172,600	-11,613	12,089	1506,917
	22,000	5,000	81,295	713,968	713,968	172,600	-11,603	11,085	1503,135
	20,000	7,000	73,824	648,356	648,356	172,600	-11,592	10,082	1499,192
	18,000	9,000	66,360	582,802	582,802	172,600	-11,579	9,079	1495,087
	16,000	11,000	58,903	517,309	517,309	172,600	-11,564	8,076	1490,926
	14,000	13,000	51,452	451,875	451,875	172,600	-11,546	7,073	1486,943
	12,000	15,000	44,008	386,498	386,498	172,600	-11,525	6,071	1483,377
	10,000	17,000	36,570	321,169	321,169	172,600	-11,496	5,068	1480,253
	8,000	19,000	29,136	255,884	255,884	172,600	-11,455	4,065	1477,391

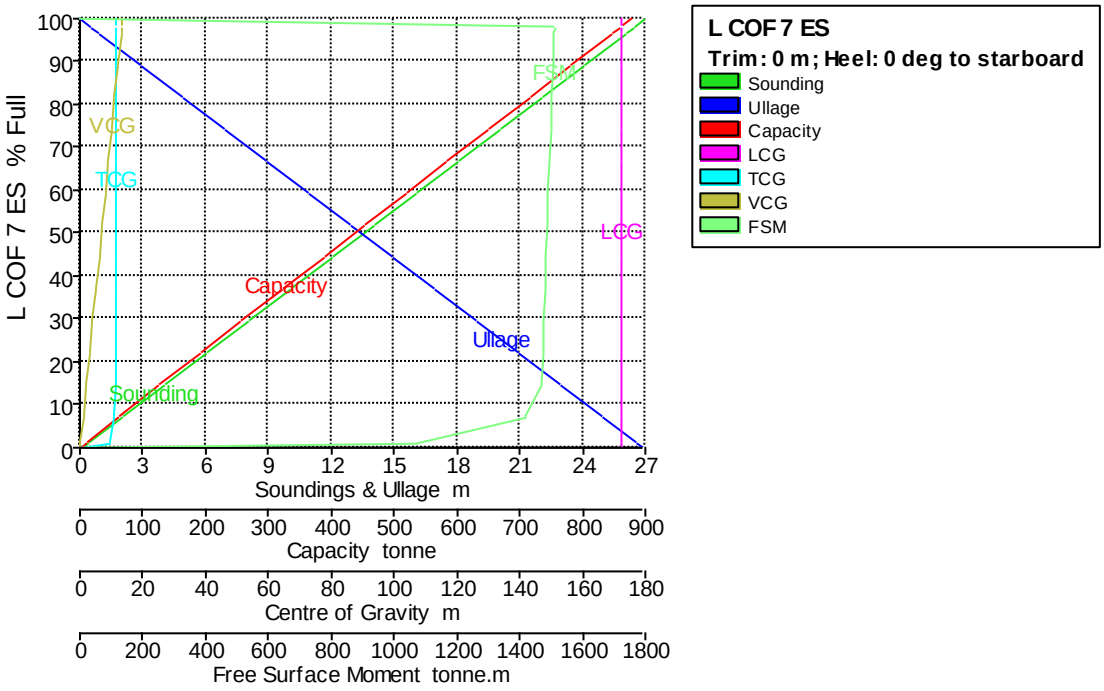
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	21,707	190,643	190,643	172,600	-11,388	3,061	1474,132
	4,000	23,000	14,286	125,467	125,467	172,600	-11,258	2,053	1467,366
	2,000	25,000	6,896	60,567	60,567	172,600	-10,902	1,037	1418,131
	0,340	26,660	1,000	8,782	8,782	172,599	-9,467	0,183	1062,898
	0,000	27,000	0,000	0,000	0,000	172,595	-0,699	0,000	0,000

6.1.1.27 **Tank Calibrations - L COF 7 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 7 ES	27,000	0,000	100,000	878,241	878,241	172,600	11,627	13,595	0,000

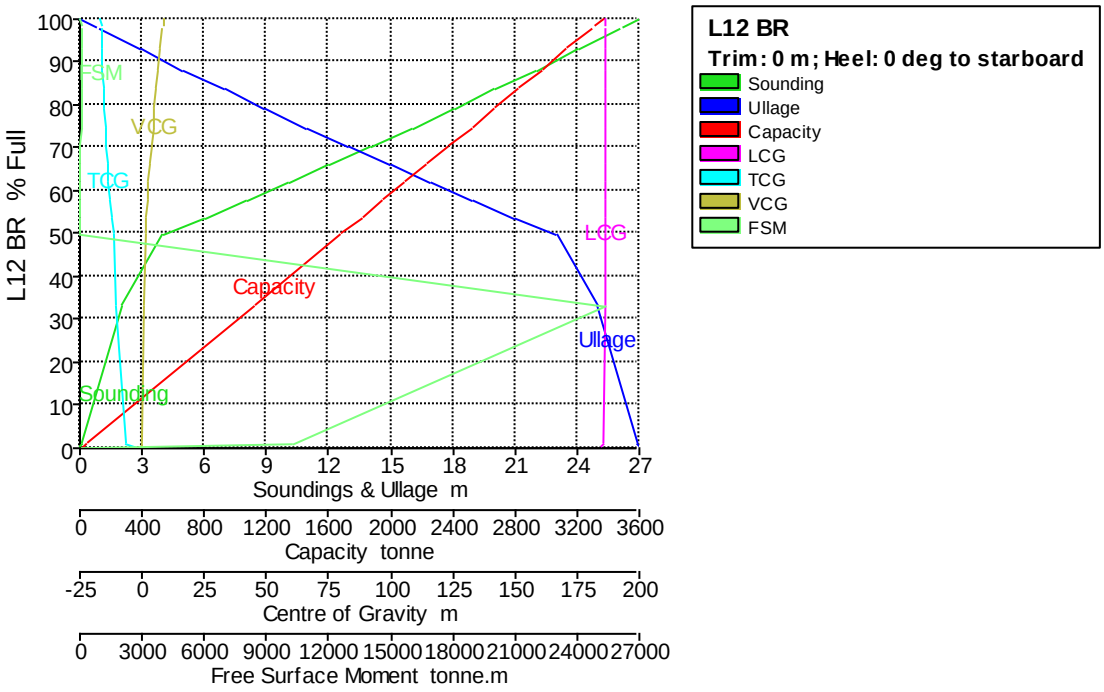
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,466	0,534	98,000	860,676	860,676	172,600	11,625	13,327	1511,378
	26,439	0,561	97,900	859,798	859,798	172,600	11,625	13,313	1511,331
	26,000	1,000	96,256	845,360	845,360	172,600	11,623	13,093	1510,556
	24,000	3,000	88,773	779,637	779,637	172,600	11,613	12,089	1506,917
	22,000	5,000	81,295	713,968	713,968	172,600	11,603	11,085	1503,135
	20,000	7,000	73,824	648,356	648,356	172,600	11,592	10,082	1499,192
	18,000	9,000	66,360	582,802	582,802	172,600	11,579	9,079	1495,087
	16,000	11,000	58,903	517,309	517,309	172,600	11,564	8,076	1490,926
	14,000	13,000	51,452	451,875	451,875	172,600	11,546	7,073	1486,943
	12,000	15,000	44,008	386,498	386,498	172,600	11,525	6,071	1483,377
	10,000	17,000	36,570	321,169	321,169	172,600	11,496	5,068	1480,253
	8,000	19,000	29,136	255,884	255,884	172,600	11,455	4,065	1477,391
	6,000	21,000	21,707	190,643	190,643	172,600	11,388	3,061	1474,132
	4,000	23,000	14,286	125,467	125,467	172,600	11,258	2,053	1467,366
	2,000	25,000	6,896	60,567	60,567	172,600	10,902	1,037	1418,131
	0,340	26,660	1,000	8,782	8,782	172,599	9,467	0,183	1062,898
	0,000	27,000	0,000	0,000	0,000	172,595	0,699	0,000	0,000

6.1.1.28 **Tank Calibrations - L12 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L12 BR	27,000	0,000	100,000	3372,664	3372,664	186,322	-16,599	8,778	0,000
	26,173	0,827	98,000	3305,211	3305,211	186,317	-16,490	8,414	63,237
	26,131	0,869	97,900	3301,838	3301,838	186,317	-16,485	8,396	63,174
	26,000	1,000	97,584	3291,180	3291,180	186,316	-16,467	8,339	62,978
	24,000	3,000	92,811	3130,193	3130,193	186,305	-16,187	7,482	59,959
	22,000	5,000	88,119	2971,944	2971,944	186,297	-15,884	6,655	56,962
	20,000	7,000	83,511	2816,553	2816,553	186,291	-15,554	5,864	53,986
	18,000	9,000	78,992	2664,147	2664,147	186,289	-15,194	5,112	51,044
	16,000	11,000	74,565	2514,815	2514,815	186,290	-14,802	4,406	48,223
	14,000	13,000	70,227	2368,520	2368,520	186,296	-14,371	3,751	45,670
	12,000	15,000	65,973	2225,031	2225,031	186,308	-13,895	3,154	43,503
	10,000	17,000	61,791	2084,016	2084,016	186,325	-13,364	2,623	41,693
	8,000	19,000	57,675	1945,192	1945,192	186,349	-12,769	2,168	40,120

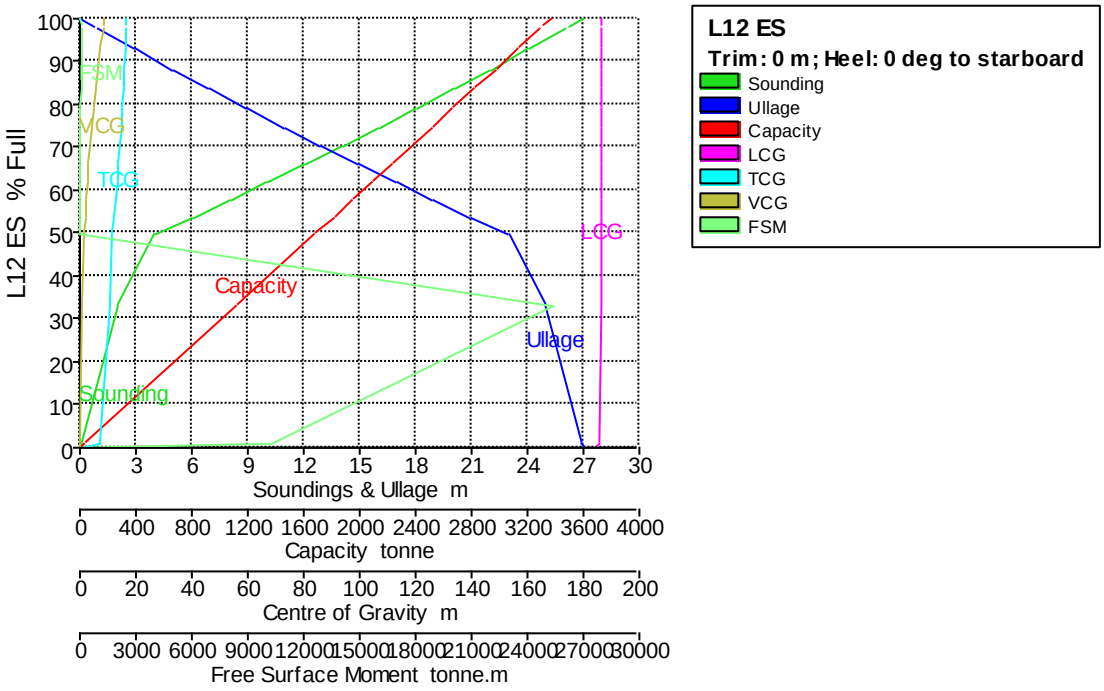
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	53,621	1808,454	1808,454	186,380	-12,094	1,803	38,561
	4,000	23,000	49,641	1674,238	1674,238	186,421	-11,326	1,546	36,196
	2,000	25,000	33,016	1113,528	1113,528	186,429	-10,596	1,045	25383,977
	0,098	26,902	1,000	33,726	33,726	185,901	-6,898	0,056	10176,239
	0,000	27,000	0,000	0,000	0,000	184,606	-0,538	0,000	0,000

6.1.1.29 **Tank Calibrations - L12 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L12 ES	27,000	0,000	100,000	3372,664	3372,664	186,322	16,599	8,778	0,000

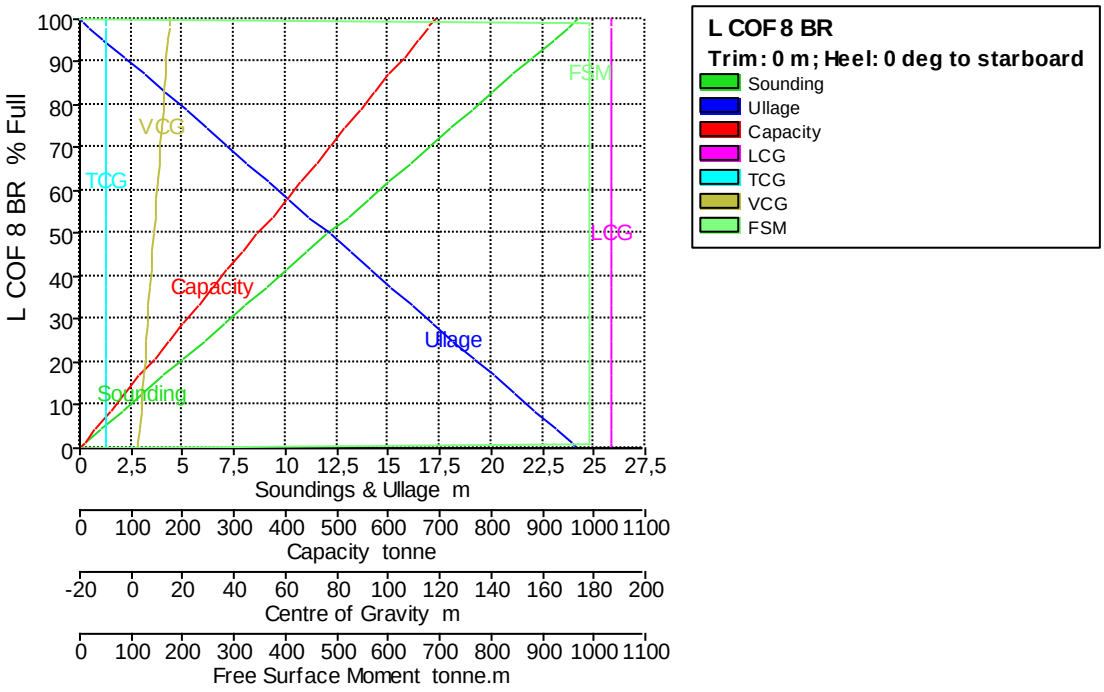
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,173	0,827	98,000	3305,211	3305,211	186,317	16,490	8,414	63,237
	26,131	0,869	97,900	3301,838	3301,838	186,317	16,485	8,396	63,174
	26,000	1,000	97,584	3291,180	3291,180	186,316	16,467	8,339	62,978
	24,000	3,000	92,811	3130,193	3130,193	186,305	16,187	7,482	59,959
	22,000	5,000	88,119	2971,944	2971,944	186,297	15,884	6,655	56,962
	20,000	7,000	83,511	2816,553	2816,553	186,291	15,554	5,864	53,986
	18,000	9,000	78,992	2664,147	2664,147	186,289	15,194	5,112	51,044
	16,000	11,000	74,565	2514,815	2514,815	186,290	14,802	4,406	48,223
	14,000	13,000	70,227	2368,520	2368,520	186,296	14,371	3,751	45,670
	12,000	15,000	65,973	2225,031	2225,031	186,308	13,895	3,154	43,503
	10,000	17,000	61,791	2084,016	2084,016	186,325	13,364	2,623	41,693
	8,000	19,000	57,675	1945,192	1945,192	186,349	12,769	2,168	40,120
	6,000	21,000	53,621	1808,454	1808,454	186,380	12,094	1,803	38,561
	4,000	23,000	49,641	1674,238	1674,238	186,421	11,326	1,546	36,196
	2,000	25,000	33,016	1113,528	1113,528	186,429	10,596	1,045	25383,977
	0,098	26,902	1,000	33,726	33,726	185,901	6,898	0,056	10176,239
	0,000	27,000	0,000	0,000	0,000	184,606	0,538	0,000	0,000

6.1.1.30 **Tank Calibrations - L COF 8 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 8 BR	24,200	0,000	100,000	691,157	691,157	186,600	-10,200	14,900	0,000
	24,000	0,200	99,174	685,444	685,444	186,600	-10,200	14,800	990,467
	23,716	0,484	98,000	677,333	677,333	186,600	-10,200	14,658	990,467
	23,692	0,508	97,900	676,642	676,642	186,600	-10,200	14,646	990,467
	23,000	1,200	95,041	656,884	656,884	186,600	-10,200	14,300	990,467
	22,000	2,200	90,909	628,324	628,324	186,600	-10,200	13,800	990,467
	21,000	3,200	86,777	599,764	599,764	186,600	-10,200	13,300	990,467
	20,000	4,200	82,645	571,204	571,204	186,600	-10,200	12,800	990,467
	19,000	5,200	78,512	542,644	542,644	186,600	-10,200	12,300	990,467
	18,000	6,200	74,380	514,083	514,083	186,600	-10,200	11,800	990,467
	17,000	7,200	70,248	485,523	485,523	186,600	-10,200	11,300	990,467
	16,000	8,200	66,116	456,963	456,963	186,600	-10,200	10,800	990,467
	15,000	9,200	61,983	428,403	428,403	186,600	-10,200	10,300	990,467

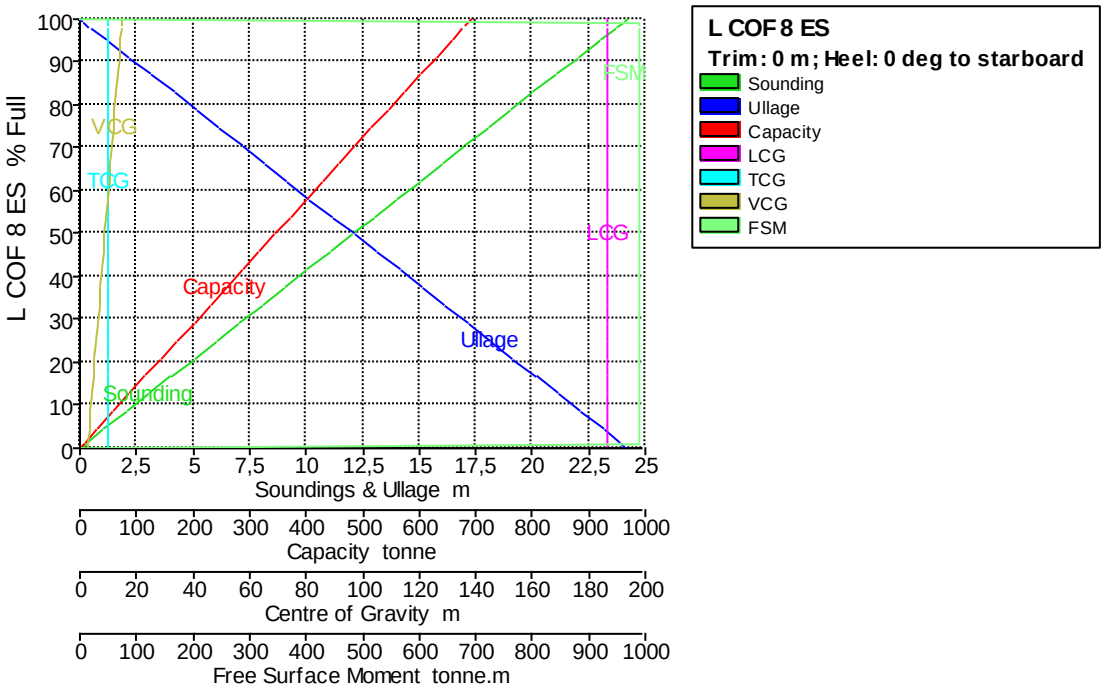
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	14,000	10,200	57,851	399,843	399,843	186,600	-10,200	9,800	990,467
	13,000	11,200	53,719	371,282	371,282	186,600	-10,200	9,300	990,467
	12,000	12,200	49,587	342,722	342,722	186,600	-10,200	8,800	990,467
	11,000	13,200	45,455	314,162	314,162	186,600	-10,200	8,300	990,467
	10,000	14,200	41,322	285,602	285,602	186,600	-10,200	7,800	990,467
	9,000	15,200	37,190	257,042	257,042	186,600	-10,200	7,300	990,467
	8,000	16,200	33,058	228,481	228,481	186,600	-10,200	6,800	990,467
	7,000	17,200	28,926	199,921	199,921	186,600	-10,200	6,300	990,467
	6,000	18,200	24,793	171,361	171,361	186,600	-10,200	5,800	990,467
	5,000	19,200	20,661	142,801	142,801	186,600	-10,200	5,300	990,467
	4,000	20,200	16,529	114,241	114,241	186,600	-10,200	4,800	990,467
	3,000	21,200	12,397	85,681	85,681	186,600	-10,200	4,300	990,467
	2,000	22,200	8,264	57,120	57,120	186,600	-10,200	3,800	990,467
	1,000	23,200	4,132	28,560	28,560	186,600	-10,200	3,300	990,467
	0,242	23,958	1,000	6,912	6,912	186,600	-10,200	2,921	990,467
	0,000	24,200	0,000	0,000	0,000	186,600	-10,200	2,800	0,000

6.1.1.31 **Tank Calibrations - L COF 8 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L COF 8 ES	24,200	0,000	100,000	691,157	691,157	186,600	10,200	14,900	0,000
	24,000	0,200	99,174	685,444	685,444	186,600	10,200	14,800	990,467
	23,716	0,484	98,000	677,333	677,333	186,600	10,200	14,658	990,467
	23,692	0,508	97,900	676,642	676,642	186,600	10,200	14,646	990,467
	23,000	1,200	95,041	656,884	656,884	186,600	10,200	14,300	990,467
	22,000	2,200	90,909	628,324	628,324	186,600	10,200	13,800	990,467
	21,000	3,200	86,777	599,764	599,764	186,600	10,200	13,300	990,467
	20,000	4,200	82,645	571,204	571,204	186,600	10,200	12,800	990,467
	19,000	5,200	78,512	542,644	542,644	186,600	10,200	12,300	990,467
	18,000	6,200	74,380	514,083	514,083	186,600	10,200	11,800	990,467
	17,000	7,200	70,248	485,523	485,523	186,600	10,200	11,300	990,467
	16,000	8,200	66,116	456,963	456,963	186,600	10,200	10,800	990,467
	15,000	9,200	61,983	428,403	428,403	186,600	10,200	10,300	990,467

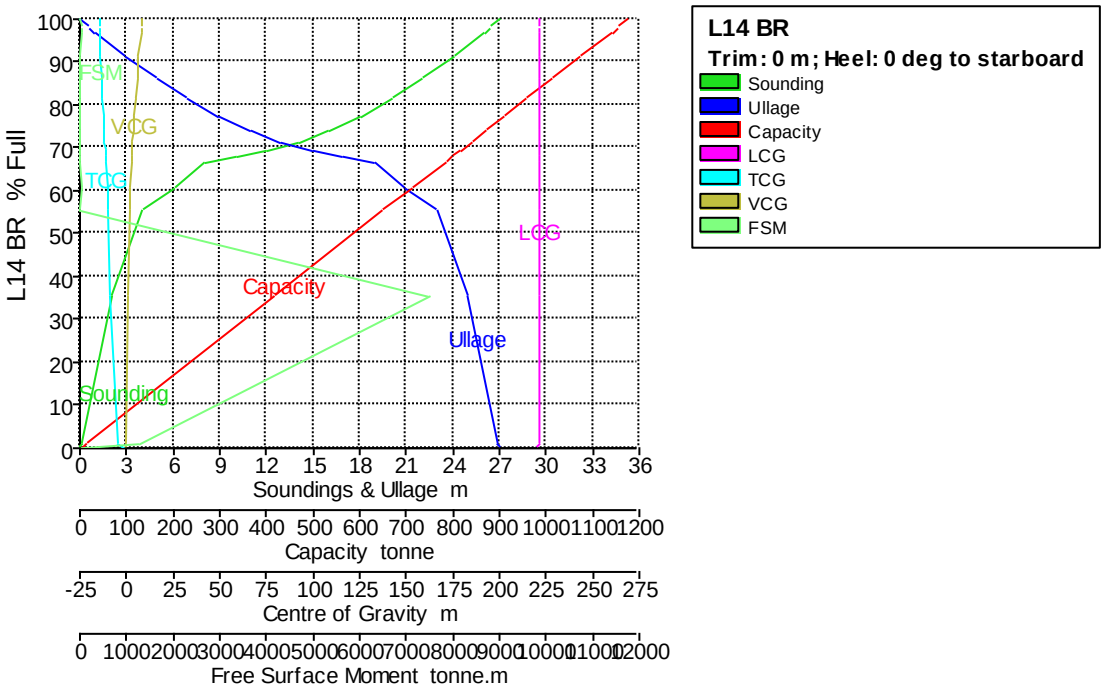
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	14,000	10,200	57,851	399,843	399,843	186,600	10,200	9,800	990,467
	13,000	11,200	53,719	371,282	371,282	186,600	10,200	9,300	990,467
	12,000	12,200	49,587	342,722	342,722	186,600	10,200	8,800	990,467
	11,000	13,200	45,455	314,162	314,162	186,600	10,200	8,300	990,467
	10,000	14,200	41,322	285,602	285,602	186,600	10,200	7,800	990,467
	9,000	15,200	37,190	257,042	257,042	186,600	10,200	7,300	990,467
	8,000	16,200	33,058	228,481	228,481	186,600	10,200	6,800	990,467
	7,000	17,200	28,926	199,921	199,921	186,600	10,200	6,300	990,467
	6,000	18,200	24,793	171,361	171,361	186,600	10,200	5,800	990,467
	5,000	19,200	20,661	142,801	142,801	186,600	10,200	5,300	990,467
	4,000	20,200	16,529	114,241	114,241	186,600	10,200	4,800	990,467
	3,000	21,200	12,397	85,681	85,681	186,600	10,200	4,300	990,467
	2,000	22,200	8,264	57,120	57,120	186,600	10,200	3,800	990,467
	1,000	23,200	4,132	28,560	28,560	186,600	10,200	3,300	990,467
	0,242	23,958	1,000	6,912	6,912	186,600	10,200	2,921	990,467
	0,000	24,200	0,000	0,000	0,000	186,600	10,200	2,800	0,000

6.1.1.32 **Tank Calibrations - L14 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L14 BR	27,000	0,000	100,000	1175,749	1175,749	221,241	-14,598	8,280	0,000
	26,362	0,638	98,000	1152,234	1152,234	221,234	-14,450	7,905	25,241
	26,330	0,670	97,900	1151,058	1151,058	221,234	-14,442	7,886	25,132
	26,000	1,000	96,889	1139,171	1139,171	221,230	-14,365	7,695	24,036
	24,000	3,000	91,092	1071,008	1071,008	221,212	-13,895	6,593	17,940
	22,000	5,000	85,881	1009,740	1009,740	221,199	-13,426	5,596	12,876
	20,000	7,000	81,281	955,661	955,661	221,191	-12,970	4,723	8,804
	18,000	9,000	77,320	909,089	909,089	221,191	-12,542	3,990	5,677
	16,000	11,000	74,017	870,249	870,249	221,199	-12,155	3,408	3,472
	14,000	13,000	71,364	839,064	839,064	221,217	-11,824	2,975	2,061
	12,000	15,000	69,317	814,998	814,998	221,245	-11,555	2,677	1,209
	10,000	17,000	67,804	797,203	797,203	221,282	-11,347	2,490	0,679
	8,000	19,000	66,708	784,318	784,318	221,322	-11,192	2,382	0,370

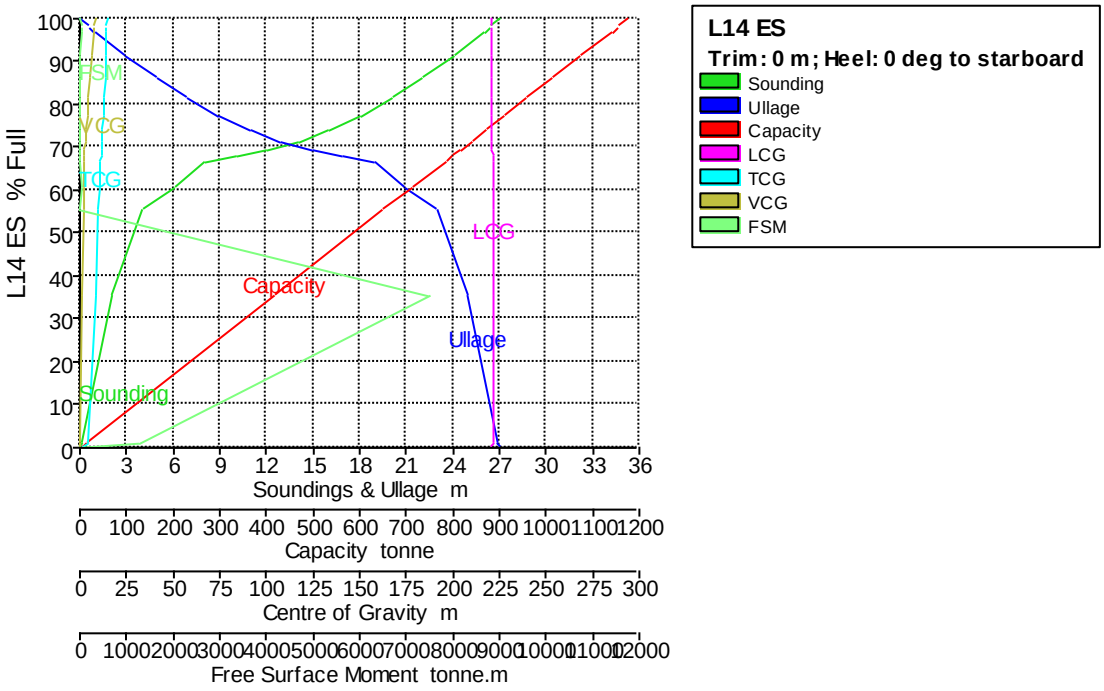
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	60,671	713,344	713,344	221,354	-10,386	1,922	24,878
	4,000	23,000	55,136	648,259	648,259	221,402	-9,501	1,611	19,309
	2,000	25,000	35,512	417,529	417,529	221,425	-8,597	1,091	7511,794
	0,124	26,876	1,000	11,758	11,758	221,271	-4,118	0,072	1225,924
	0,000	27,000	0,000	0,000	0,000	220,773	-0,104	0,000	0,000

6.1.1.33 **Tank Calibrations - L14 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L14 ES	27,000	0,000	100,000	1175,749	1175,749	221,241	14,598	8,280	0,000

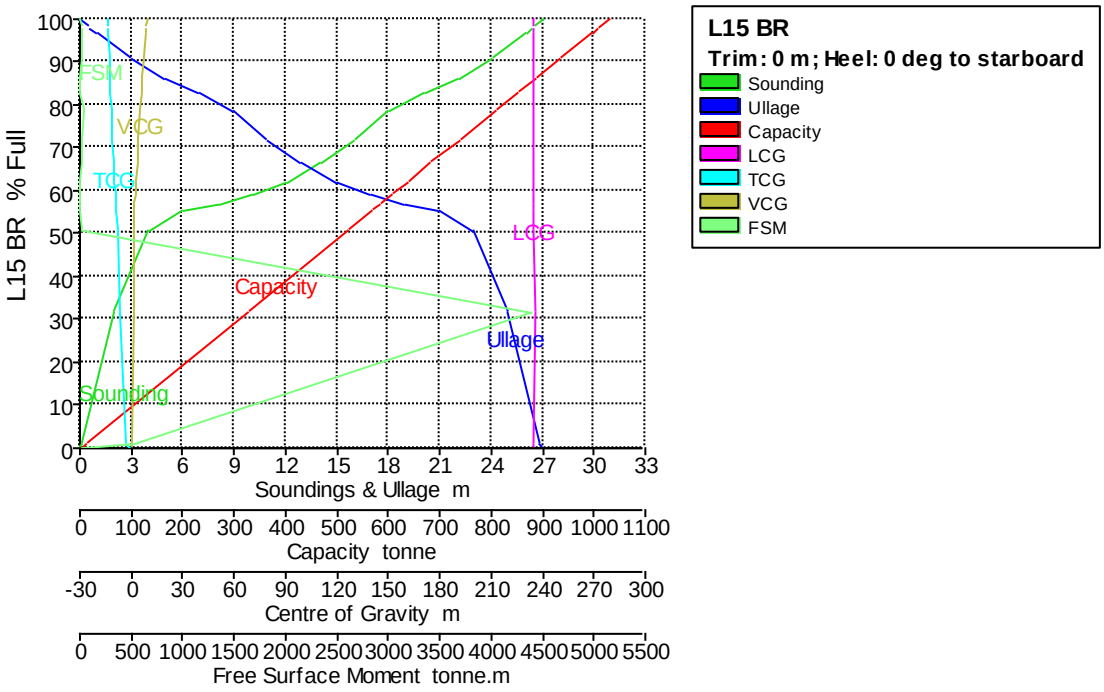
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,362	0,638	98,000	1152,234	1152,234	221,234	14,450	7,905	25,241
	26,330	0,670	97,900	1151,058	1151,058	221,234	14,442	7,886	25,132
	26,000	1,000	96,889	1139,171	1139,171	221,230	14,365	7,695	24,036
	24,000	3,000	91,092	1071,008	1071,008	221,212	13,895	6,593	17,940
	22,000	5,000	85,881	1009,740	1009,740	221,199	13,426	5,596	12,876
	20,000	7,000	81,281	955,661	955,661	221,191	12,970	4,723	8,804
	18,000	9,000	77,320	909,089	909,089	221,191	12,542	3,990	5,677
	16,000	11,000	74,017	870,249	870,249	221,199	12,155	3,408	3,472
	14,000	13,000	71,364	839,064	839,064	221,217	11,824	2,975	2,061
	12,000	15,000	69,317	814,998	814,998	221,245	11,555	2,677	1,209
	10,000	17,000	67,804	797,203	797,203	221,282	11,347	2,490	0,679
	8,000	19,000	66,708	784,318	784,318	221,322	11,192	2,382	0,370
	6,000	21,000	60,671	713,344	713,344	221,354	10,386	1,922	24,878
	4,000	23,000	55,136	648,259	648,259	221,402	9,501	1,611	19,309
	2,000	25,000	35,512	417,529	417,529	221,425	8,597	1,091	7511,794
	0,124	26,876	1,000	11,758	11,758	221,271	4,118	0,072	1225,924
	0,000	27,000	0,000	0,000	0,000	220,773	0,104	0,000	0,000

6.1.1.34 **Tank Calibrations - L15 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L15 BR	27,000	0,000	100,000	1028,488	1028,488	234,975	-13,694	9,164	0,000
	26,412	0,588	98,000	1007,918	1007,918	234,964	-13,529	8,806	20,939
	26,382	0,618	97,900	1006,890	1006,890	234,963	-13,521	8,788	20,777
	26,000	1,000	96,656	994,096	994,096	234,956	-13,415	8,564	18,801
	24,000	3,000	90,849	934,371	934,371	234,926	-12,892	7,511	10,371
	22,000	5,000	86,256	887,133	887,133	234,909	-12,442	6,684	4,961
	20,000	7,000	82,927	852,898	852,898	234,909	-12,094	6,107	1,951
	18,000	9,000	78,730	809,731	809,731	234,910	-11,674	5,435	33,879
	16,000	11,000	71,830	738,766	738,766	234,895	-10,942	4,320	20,430
	14,000	13,000	66,283	681,709	681,709	234,903	-10,264	3,423	11,814
	12,000	15,000	62,006	637,721	637,721	234,937	-9,673	2,758	6,731
	10,000	17,000	58,875	605,518	605,518	234,999	-9,195	2,316	3,599
	8,000	19,000	56,687	583,021	583,021	235,077	-8,835	2,055	1,822

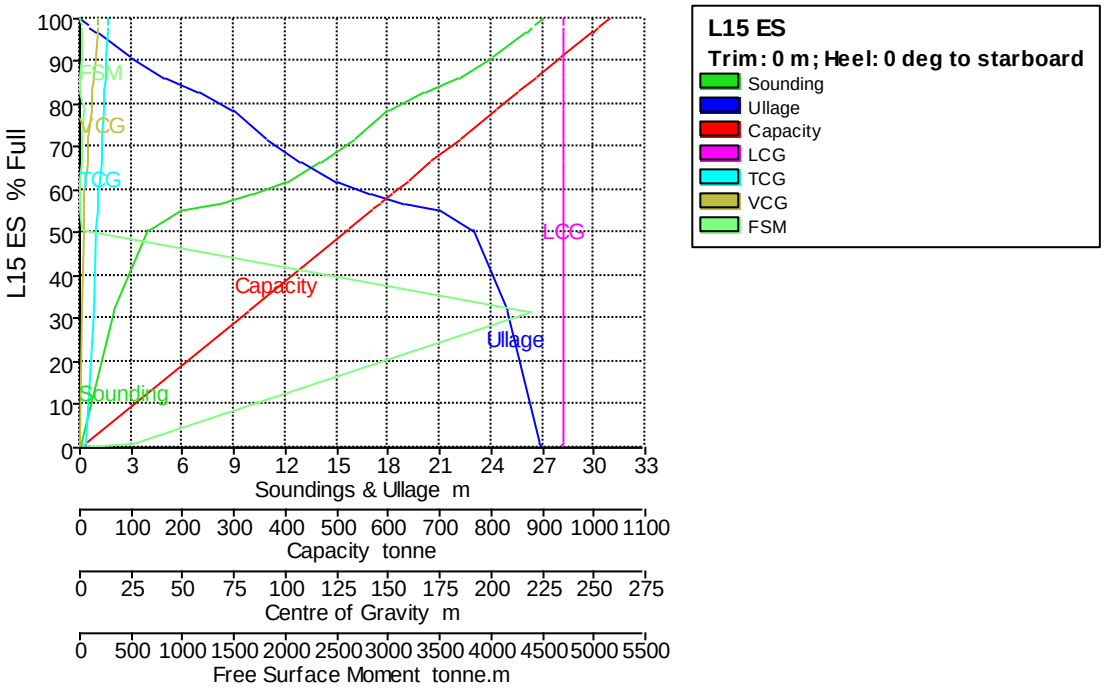
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	55,197	567,698	567,698	235,154	-8,575	1,920	0,849
	4,000	23,000	50,551	519,908	519,908	235,245	-7,820	1,654	21,313
	2,000	25,000	31,726	326,299	326,299	235,303	-6,861	1,120	4390,720
	0,150	26,850	1,000	10,285	10,285	235,184	-3,017	0,087	501,505
	0,000	27,000	0,000	0,000	0,000	234,553	-0,039	0,000	0,000

6.1.1.35 **Tank Calibrations - L15 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L15 ES	27,000	0,000	100,000	1028,488	1028,488	234,975	13,694	9,164	0,000

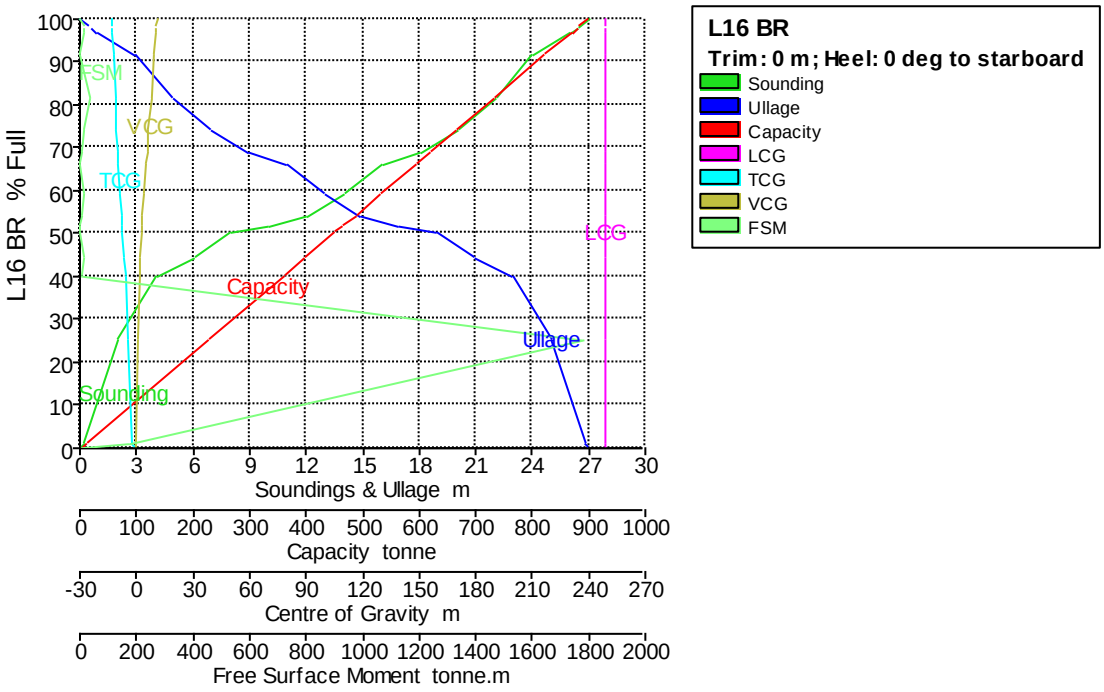
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,412	0,588	98,000	1007,918	1007,918	234,964	13,529	8,806	20,939
	26,382	0,618	97,900	1006,890	1006,890	234,963	13,521	8,788	20,777
	26,000	1,000	96,656	994,096	994,096	234,956	13,415	8,564	18,801
	24,000	3,000	90,849	934,371	934,371	234,926	12,892	7,511	10,371
	22,000	5,000	86,256	887,133	887,133	234,909	12,442	6,684	4,961
	20,000	7,000	82,927	852,898	852,898	234,909	12,094	6,107	1,951
	18,000	9,000	78,730	809,731	809,731	234,910	11,674	5,435	33,879
	16,000	11,000	71,830	738,766	738,766	234,895	10,942	4,320	20,430
	14,000	13,000	66,283	681,709	681,709	234,903	10,264	3,423	11,814
	12,000	15,000	62,006	637,721	637,721	234,937	9,673	2,758	6,731
	10,000	17,000	58,875	605,518	605,518	234,999	9,195	2,316	3,599
	8,000	19,000	56,687	583,021	583,021	235,077	8,835	2,055	1,822
	6,000	21,000	55,197	567,698	567,698	235,154	8,575	1,920	0,849
	4,000	23,000	50,551	519,908	519,908	235,245	7,820	1,654	21,313
	2,000	25,000	31,726	326,299	326,299	235,303	6,861	1,120	4390,720
	0,150	26,850	1,000	10,285	10,285	235,184	3,017	0,087	501,505
	0,000	27,000	0,000	0,000	0,000	234,553	0,039	0,000	0,000

6.1.1.36 **Tank Calibrations - L16 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L16 BR	27,000	0,000	100,000	898,279	898,279	248,760	-12,967	10,947	0,000
	26,435	0,565	98,000	880,314	880,314	248,745	-12,790	10,625	14,867
	26,405	0,595	97,900	879,416	879,416	248,745	-12,781	10,609	14,658
	26,000	1,000	96,582	867,572	867,572	248,735	-12,661	10,396	12,004
	24,000	3,000	91,425	821,251	821,251	248,705	-12,171	9,568	3,485
	22,000	5,000	81,420	731,377	731,377	248,627	-11,252	7,913	34,609
	20,000	7,000	73,805	662,975	662,975	248,576	-10,427	6,557	14,748
	18,000	9,000	68,671	616,860	616,860	248,567	-9,798	5,621	4,834
	16,000	11,000	66,045	593,272	593,272	248,608	-9,452	5,162	0,872
	14,000	13,000	58,869	528,811	528,811	248,601	-8,572	3,955	16,320
	12,000	15,000	54,127	486,213	486,213	248,657	-7,891	3,155	6,452
	10,000	17,000	51,421	461,901	461,901	248,756	-7,459	2,736	2,089
	8,000	19,000	50,011	449,238	449,238	248,841	-7,222	2,556	0,543

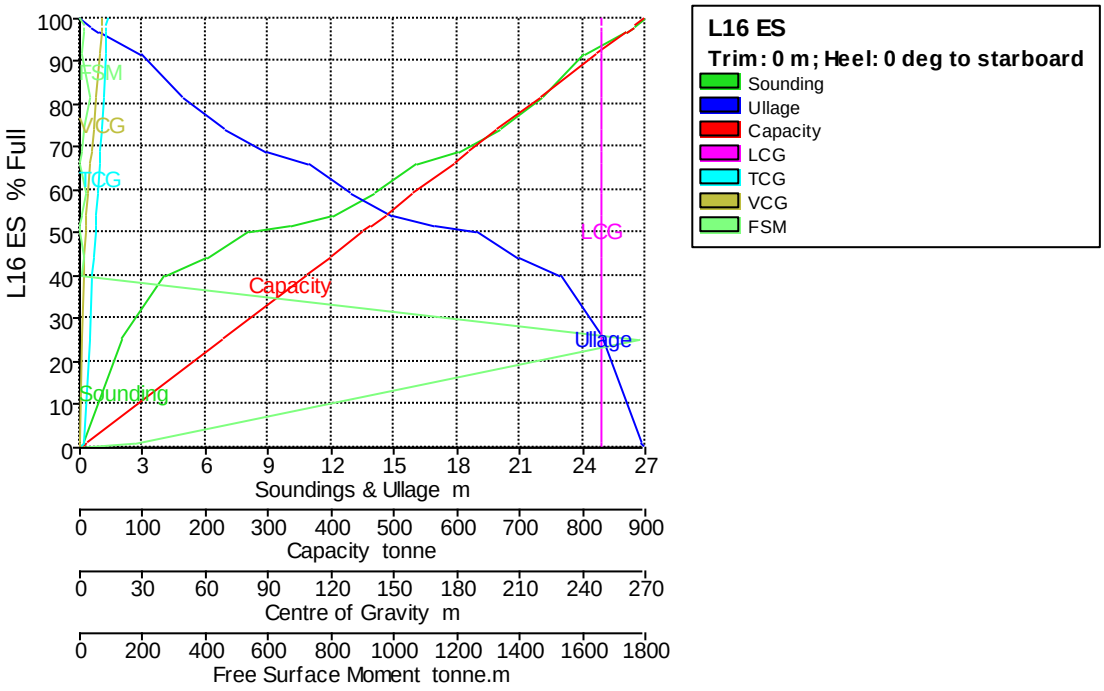
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	44,184	396,897	396,897	248,965	-6,325	1,963	15,315
	4,000	23,000	40,152	360,674	360,674	249,142	-5,574	1,649	5,402
	2,000	25,000	25,140	225,826	225,826	249,220	-4,844	1,143	1784,058
	0,190	26,810	1,000	8,983	8,983	249,152	-2,092	0,111	169,978
	0,000	27,000	0,000	0,000	0,000	248,568	-0,012	0,000	0,000

6.1.1.37 **Tank Calibrations - L16 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L16 ES	27,000	0,000	100,000	898,279	898,279	248,760	12,967	10,947	0,000

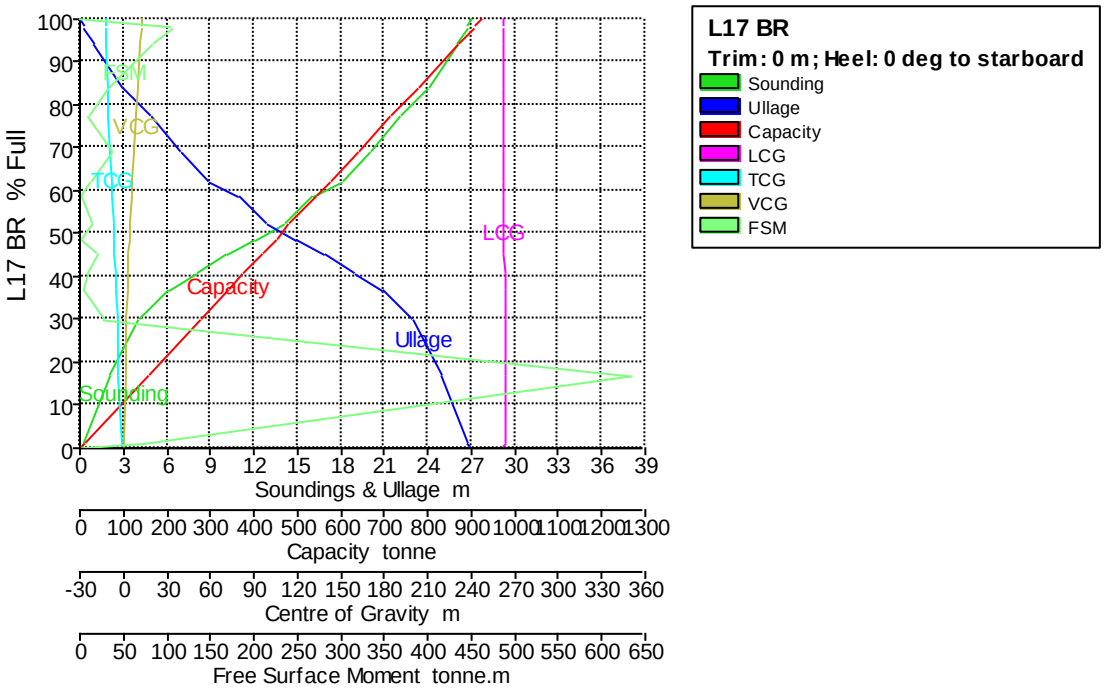
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,435	0,565	98,000	880,314	880,314	248,745	12,790	10,625	14,867
	26,405	0,595	97,900	879,416	879,416	248,745	12,781	10,609	14,658
	26,000	1,000	96,582	867,572	867,572	248,735	12,661	10,396	12,004
	24,000	3,000	91,425	821,251	821,251	248,705	12,171	9,568	3,485
	22,000	5,000	81,420	731,377	731,377	248,627	11,252	7,913	34,609
	20,000	7,000	73,805	662,975	662,975	248,576	10,427	6,557	14,748
	18,000	9,000	68,671	616,860	616,860	248,567	9,798	5,621	4,834
	16,000	11,000	66,045	593,272	593,272	248,608	9,452	5,162	0,872
	14,000	13,000	58,869	528,811	528,811	248,601	8,572	3,955	16,320
	12,000	15,000	54,127	486,213	486,213	248,657	7,891	3,155	6,452
	10,000	17,000	51,421	461,901	461,901	248,756	7,459	2,736	2,089
	8,000	19,000	50,011	449,238	449,238	248,841	7,222	2,556	0,543
	6,000	21,000	44,184	396,897	396,897	248,965	6,325	1,963	15,315
	4,000	23,000	40,152	360,674	360,674	249,142	5,574	1,649	5,402
	2,000	25,000	25,140	225,826	225,826	249,220	4,844	1,143	1784,058
	0,190	26,810	1,000	8,983	8,983	249,152	2,092	0,111	169,978
	0,000	27,000	0,000	0,000	0,000	248,568	0,012	0,000	0,000

6.1.1.38 **Tank Calibrations - L17 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L17 BR	27,000	0,000	100,000	923,845	923,845	262,820	-12,323	12,687	0,000
	26,691	0,309	98,000	905,368	905,368	262,806	-12,162	12,398	106,325
	26,675	0,325	97,900	904,444	904,444	262,806	-12,154	12,384	105,712
	26,000	1,000	93,804	866,602	866,602	262,776	-11,808	11,774	81,676
	24,000	3,000	83,801	774,190	774,190	262,704	-10,865	10,189	31,964
	22,000	5,000	77,056	711,873	711,873	262,666	-10,141	9,061	8,346
	20,000	7,000	68,936	636,860	636,860	262,615	-9,284	7,668	37,552
	18,000	9,000	62,051	573,250	573,250	262,588	-8,468	6,401	10,555
	16,000	11,000	58,687	542,179	542,179	262,630	-8,030	5,784	1,314
	14,000	13,000	51,952	479,954	479,954	262,641	-7,241	4,577	12,651
	12,000	15,000	48,532	448,361	448,361	262,730	-6,788	3,973	2,384
	10,000	17,000	45,182	417,410	417,410	262,815	-6,399	3,475	20,518
	8,000	19,000	40,311	372,411	372,411	262,927	-5,807	2,800	8,828

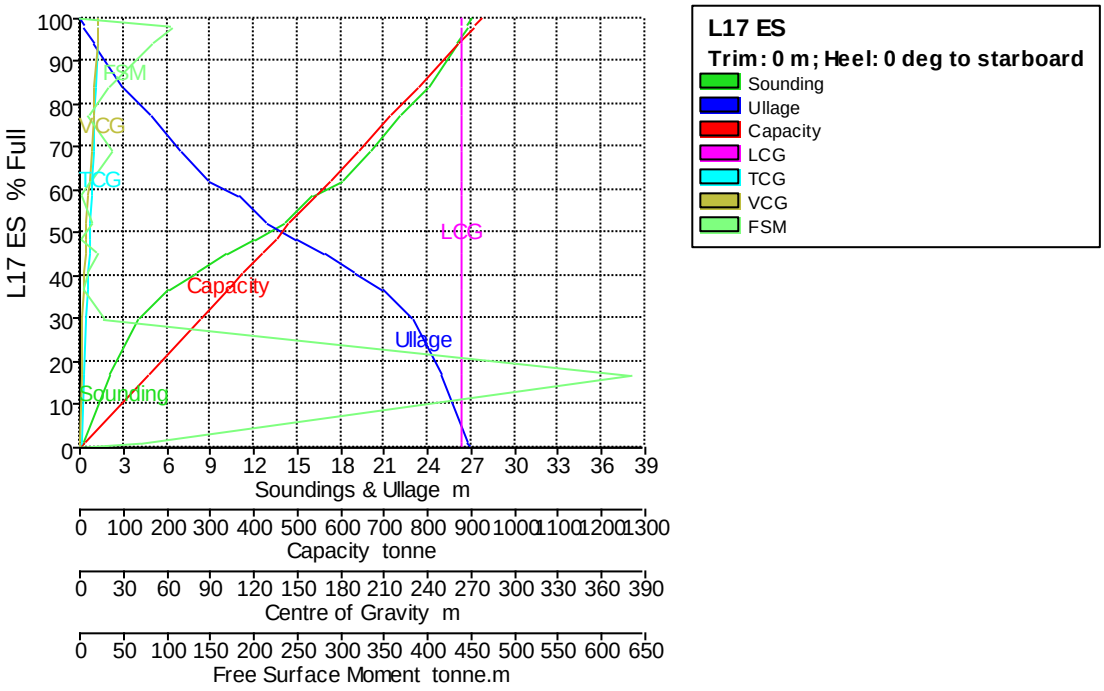
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	36,767	339,667	339,667	263,062	-5,299	2,389	4,247
	4,000	23,000	29,975	276,920	276,920	263,182	-4,357	1,829	28,426
	2,000	25,000	16,795	155,159	155,159	263,281	-3,350	1,156	634,730
	0,262	26,738	1,000	9,238	9,238	263,249	-1,556	0,154	69,039
	0,000	27,000	0,000	0,000	0,000	262,844	-0,005	0,000	0,000

6.1.1.39 **Tank Calibrations - L17 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L17 ES	27,000	0,000	100,000	923,845	923,845	262,820	12,323	12,687	0,000

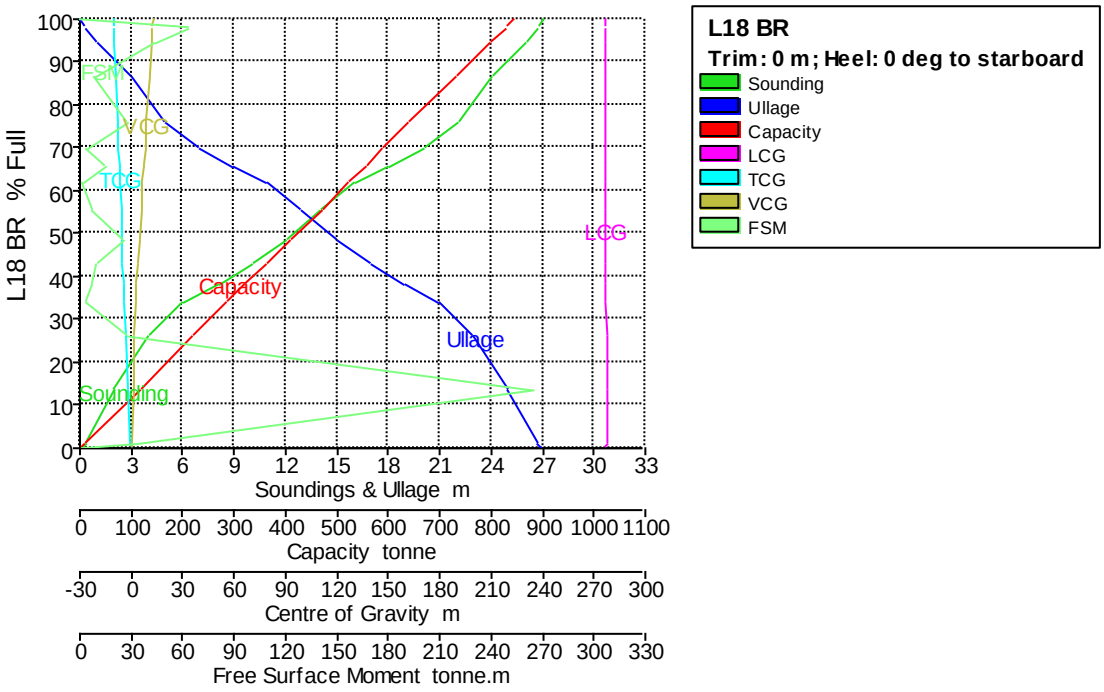
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,691	0,309	98,000	905,368	905,368	262,806	12,162	12,398	106,325
	26,675	0,325	97,900	904,444	904,444	262,806	12,154	12,384	105,712
	26,000	1,000	93,804	866,602	866,602	262,776	11,808	11,774	81,676
	24,000	3,000	83,801	774,190	774,190	262,704	10,865	10,189	31,964
	22,000	5,000	77,056	711,873	711,873	262,666	10,141	9,061	8,346
	20,000	7,000	68,936	636,860	636,860	262,615	9,284	7,668	37,552
	18,000	9,000	62,051	573,250	573,250	262,588	8,468	6,401	10,555
	16,000	11,000	58,687	542,179	542,179	262,630	8,030	5,784	1,314
	14,000	13,000	51,952	479,954	479,954	262,641	7,241	4,577	12,651
	12,000	15,000	48,532	448,361	448,361	262,730	6,788	3,973	2,384
	10,000	17,000	45,182	417,410	417,410	262,815	6,399	3,475	20,518
	8,000	19,000	40,311	372,411	372,411	262,927	5,807	2,800	8,828
	6,000	21,000	36,767	339,667	339,667	263,062	5,299	2,389	4,247
	4,000	23,000	29,975	276,920	276,920	263,182	4,357	1,829	28,426
	2,000	25,000	16,795	155,159	155,159	263,281	3,350	1,156	634,730
	0,262	26,738	1,000	9,238	9,238	263,249	1,556	0,154	69,039
	0,000	27,000	0,000	0,000	0,000	262,844	0,005	0,000	0,000

6.1.1.40 **Tank Calibrations - L18 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L18 BR	27,000	0,000	100,000	844,526	844,526	276,789	-10,675	12,759	0,000
	26,667	0,333	98,000	827,635	827,635	276,777	-10,487	12,471	64,078
	26,650	0,350	97,900	826,791	826,791	276,776	-10,478	12,457	63,462
	26,000	1,000	94,364	796,930	796,930	276,755	-10,133	11,937	43,050
	24,000	3,000	86,505	730,554	730,554	276,720	-9,306	10,741	8,418
	22,000	5,000	75,675	639,091	639,091	276,654	-8,181	8,977	27,842
	20,000	7,000	69,605	587,835	587,835	276,651	-7,462	7,917	4,034
	18,000	9,000	65,666	554,563	554,563	276,685	-7,027	7,265	15,191
	16,000	11,000	61,835	522,214	522,214	276,745	-6,616	6,649	1,147
	14,000	13,000	55,477	468,513	468,513	276,801	-6,061	5,677	7,093
	12,000	15,000	48,407	408,808	408,808	276,873	-5,558	4,625	26,065
	10,000	17,000	42,582	359,613	359,613	276,977	-5,114	3,744	9,214
	8,000	19,000	37,953	320,522	320,522	277,075	-4,696	3,102	6,584

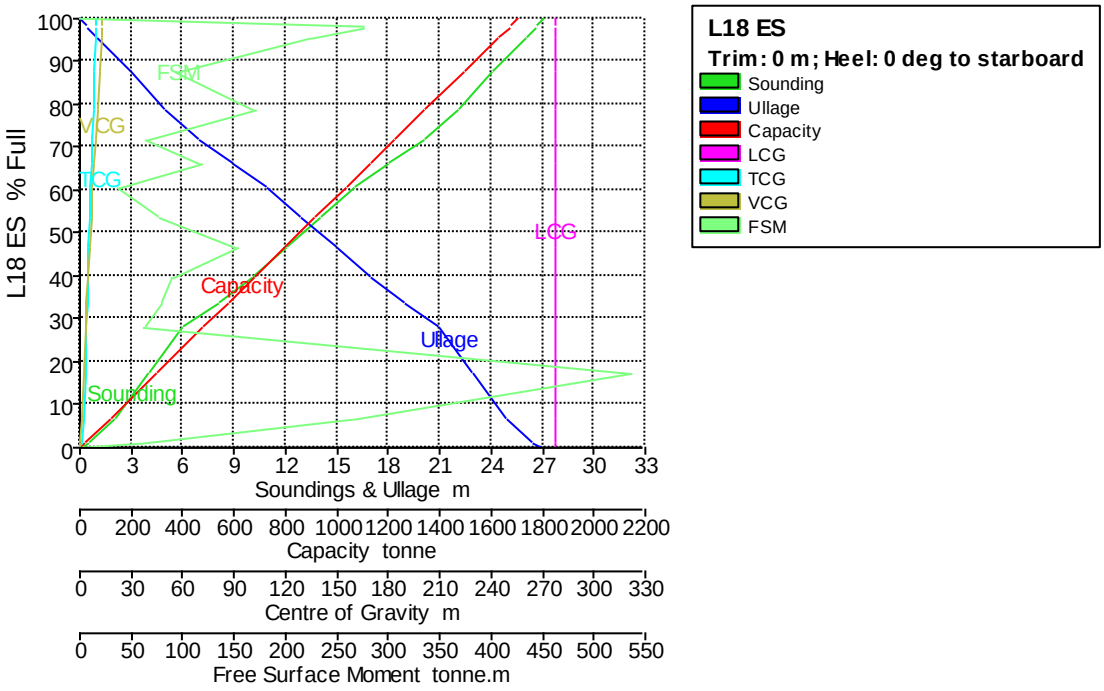
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	33,758	285,093	285,093	277,183	-4,228	2,613	3,837
	4,000	23,000	25,869	218,474	218,474	277,272	-3,401	1,926	28,369
	2,000	25,000	13,582	114,704	114,704	277,345	-2,483	1,162	265,012
	0,311	26,689	1,000	8,445	8,445	277,317	-1,202	0,183	31,924
	0,000	27,000	0,000	0,000	0,000	277,050	-0,002	0,000	0,000

6.1.1.41 **Tank Calibrations - L18 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L18 ES	27,000	0,000	100,000	1705,401	1705,401	277,193	9,839	13,299	0,000

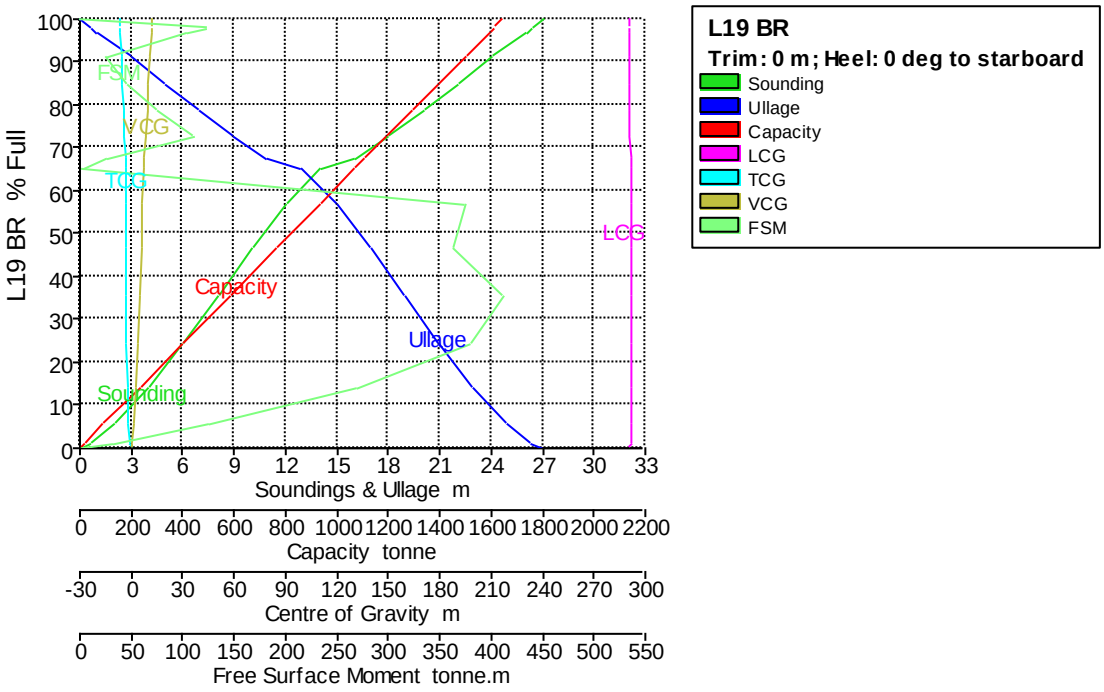
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,587	0,413	98,000	1671,293	1671,293	277,187	9,661	13,023	277,062
	26,565	0,435	97,900	1669,587	1669,587	277,187	9,652	13,010	275,023
	26,000	1,000	95,325	1625,675	1625,675	277,180	9,416	12,651	224,350
	24,000	3,000	87,665	1495,039	1495,039	277,164	8,673	11,568	94,249
	22,000	5,000	78,534	1339,316	1339,316	277,142	7,836	10,233	171,658
	20,000	7,000	71,760	1223,800	1223,800	277,136	7,151	9,212	63,685
	18,000	9,000	66,095	1127,186	1127,186	277,146	6,593	8,379	118,398
	16,000	11,000	60,469	1031,241	1031,241	277,166	6,071	7,570	37,477
	14,000	13,000	53,552	913,284	913,284	277,189	5,553	6,603	77,672
	12,000	15,000	46,297	789,548	789,548	277,224	5,127	5,610	153,547
	10,000	17,000	39,644	676,093	676,093	277,268	4,741	4,701	89,213
	8,000	19,000	33,584	572,742	572,742	277,306	4,298	3,924	78,955
	6,000	21,000	27,739	473,054	473,054	277,349	3,704	3,273	62,185
	4,000	23,000	17,332	295,586	295,586	277,357	3,179	2,310	536,909
	2,000	25,000	6,726	114,704	114,704	277,345	2,483	1,162	265,012
	0,509	26,491	1,000	17,054	17,054	277,325	1,470	0,299	57,367
	0,000	27,000	0,000	0,000	0,000	277,050	0,002	0,000	0,000

6.1.1.42 **Tank Calibrations - L19 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L19 BR	27,000	0,000	100,000	1643,032	1643,032	291,176	-6,847	12,219	0,000
	26,327	0,673	98,000	1610,172	1610,172	291,176	-6,613	11,926	124,157
	26,300	0,700	97,900	1608,529	1608,529	291,176	-6,601	11,911	122,364
	26,000	1,000	96,826	1590,876	1590,876	291,175	-6,479	11,753	103,650
	24,000	3,000	91,294	1499,990	1499,990	291,180	-5,831	10,945	24,979
	22,000	5,000	84,720	1391,976	1391,976	291,185	-5,122	10,004	46,722
	20,000	7,000	78,435	1288,708	1288,708	291,198	-4,492	9,127	75,654
	18,000	9,000	72,553	1192,065	1192,065	291,222	-3,953	8,332	110,568
	16,000	11,000	67,265	1105,179	1105,179	291,259	-3,515	7,643	25,690
	14,000	13,000	64,968	1067,450	1067,450	291,319	-3,332	7,375	2,189
	12,000	15,000	56,853	934,115	934,115	291,353	-3,260	6,609	375,504
	10,000	17,000	46,357	761,665	761,665	291,374	-3,217	5,614	363,595
	8,000	19,000	35,426	582,059	582,059	291,380	-3,105	4,572	411,474

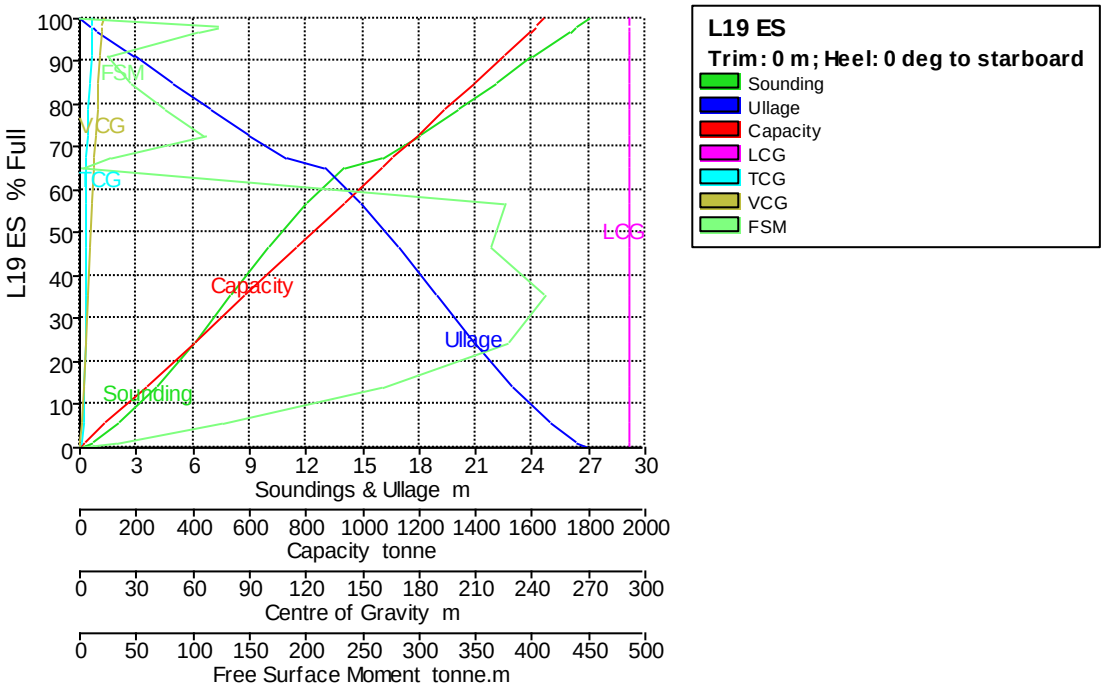
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	6,000	21,000	24,358	400,206	400,206	291,378	-2,870	3,467	378,563
	4,000	23,000	14,036	230,615	230,615	291,368	-2,495	2,326	267,465
	2,000	25,000	5,364	88,138	88,138	291,350	-1,919	1,169	125,283
	0,608	26,392	1,000	16,430	16,430	291,323	-1,192	0,359	31,091
	0,000	27,000	0,000	0,000	0,000	291,125	-0,001	0,000	0,000

6.1.1.43 **Tank Calibrations - L19 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
L19 ES	27,000	0,000	100,000	1643,032	1643,032	291,176	6,847	12,219	0,000

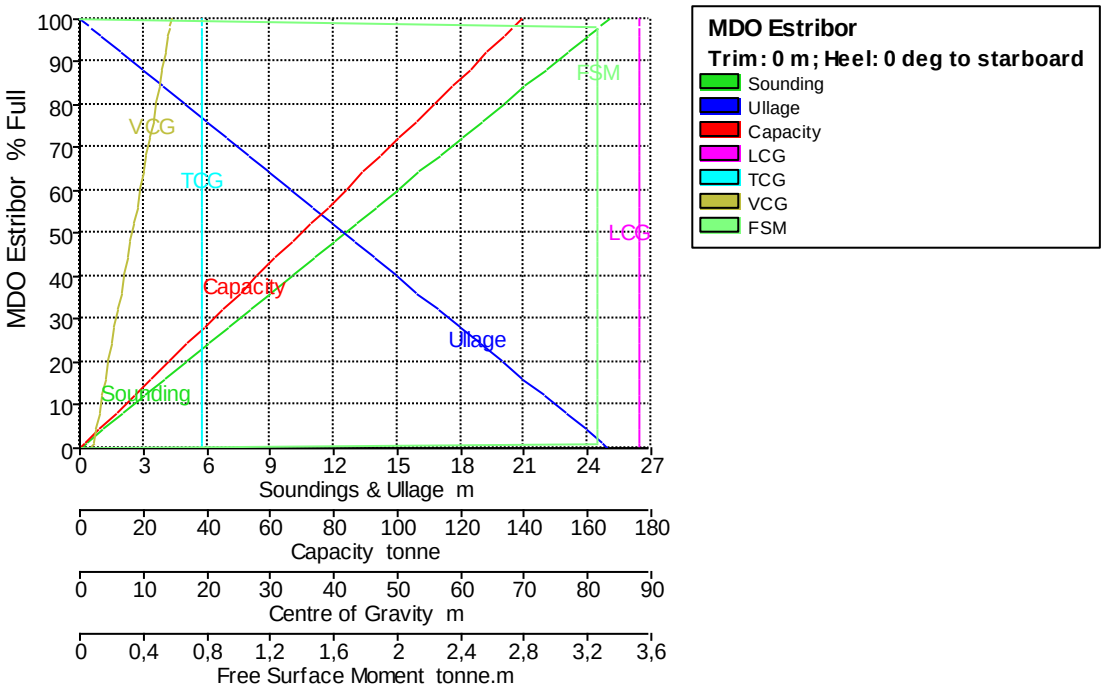
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	26,327	0,673	98,000	1610,172	1610,172	291,176	6,613	11,926	124,157
	26,300	0,700	97,900	1608,529	1608,529	291,176	6,601	11,911	122,364
	26,000	1,000	96,826	1590,876	1590,876	291,175	6,479	11,753	103,650
	24,000	3,000	91,294	1499,990	1499,990	291,180	5,831	10,945	24,979
	22,000	5,000	84,720	1391,976	1391,976	291,185	5,122	10,004	46,722
	20,000	7,000	78,435	1288,708	1288,708	291,198	4,492	9,127	75,654
	18,000	9,000	72,553	1192,065	1192,065	291,222	3,953	8,332	110,568
	16,000	11,000	67,265	1105,179	1105,179	291,259	3,515	7,643	25,690
	14,000	13,000	64,968	1067,450	1067,450	291,319	3,332	7,375	2,189
	12,000	15,000	56,853	934,115	934,115	291,353	3,260	6,609	375,504
	10,000	17,000	46,357	761,665	761,665	291,374	3,217	5,614	363,595
	8,000	19,000	35,426	582,059	582,059	291,380	3,105	4,572	411,474
	6,000	21,000	24,358	400,206	400,206	291,378	2,870	3,467	378,563
	4,000	23,000	14,036	230,615	230,615	291,368	2,495	2,326	267,465
	2,000	25,000	5,364	88,138	88,138	291,350	1,919	1,169	125,283
	0,608	26,392	1,000	16,430	16,430	291,323	1,192	0,359	31,091
	0,000	27,000	0,000	0,000	0,000	291,125	0,001	0,000	0,000

6.1.1.44 **Tank Calibrations - MDO Estribor**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
MDO Estribor	25,000	0,000	100,000	139,124	139,124	88,250	19,175	14,500	0,000
	24,500	0,500	98,000	136,342	136,342	88,250	19,175	14,250	3,257
	24,475	0,525	97,900	136,203	136,203	88,250	19,175	14,238	3,257
	24,000	1,000	96,000	133,559	133,559	88,250	19,175	14,000	3,257
	23,000	2,000	92,000	127,994	127,994	88,250	19,175	13,500	3,257
	22,000	3,000	88,000	122,429	122,429	88,250	19,175	13,000	3,257
	21,000	4,000	84,000	116,864	116,864	88,250	19,175	12,500	3,257
	20,000	5,000	80,000	111,299	111,299	88,250	19,175	12,000	3,257
	19,000	6,000	76,000	105,734	105,734	88,250	19,175	11,500	3,257
	18,000	7,000	72,000	100,169	100,169	88,250	19,175	11,000	3,257
	17,000	8,000	68,000	94,604	94,604	88,250	19,175	10,500	3,257
	16,000	9,000	64,000	89,039	89,039	88,250	19,175	10,000	3,257
	15,000	10,000	60,000	83,474	83,474	88,250	19,175	9,500	3,257

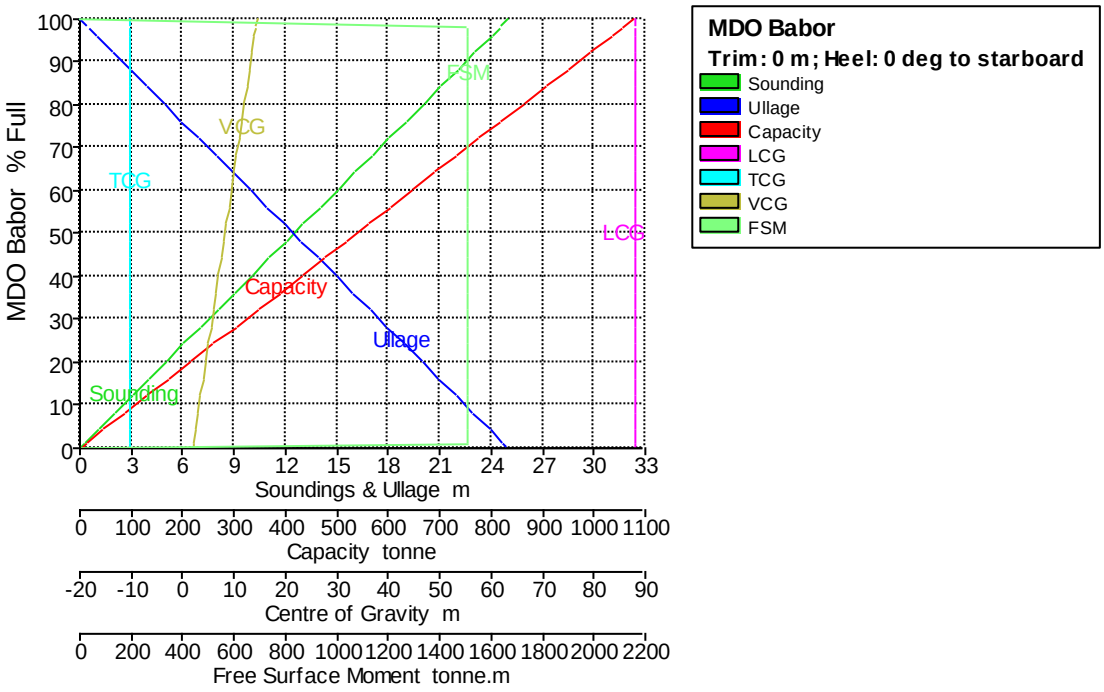
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	14,000	11,000	56,000	77,909	77,909	88,250	19,175	9,000	3,257
	13,000	12,000	52,000	72,344	72,344	88,250	19,175	8,500	3,257
	12,000	13,000	48,000	66,779	66,779	88,250	19,175	8,000	3,257
	11,000	14,000	44,000	61,214	61,214	88,250	19,175	7,500	3,257
	10,000	15,000	40,000	55,649	55,649	88,250	19,175	7,000	3,257
	9,000	16,000	36,000	50,084	50,084	88,250	19,175	6,500	3,257
	8,000	17,000	32,000	44,519	44,519	88,250	19,175	6,000	3,257
	7,000	18,000	28,000	38,954	38,954	88,250	19,175	5,500	3,257
	6,000	19,000	24,000	33,389	33,389	88,250	19,175	5,000	3,257
	5,000	20,000	20,000	27,824	27,824	88,250	19,175	4,500	3,257
	4,000	21,000	16,000	22,259	22,259	88,250	19,175	4,000	3,257
	3,000	22,000	12,000	16,694	16,694	88,250	19,175	3,500	3,257
	2,000	23,000	8,000	11,129	11,129	88,250	19,175	3,000	3,257
	1,000	24,000	4,000	5,564	5,564	88,250	19,175	2,500	3,257
	0,250	24,750	1,000	1,391	1,391	88,250	19,174	2,125	3,257
	0,000	25,000	0,000	0,000	0,000	88,254	19,169	2,000	0,000

6.1.1.45 **Tank Calibrations - MDO Babor**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
MDO Babor	25,000	0,000	100,000	1076,249	1076,249	88,250	-10,250	14,500	0,000
	24,500	0,500	98,000	1054,724	1054,724	88,250	-10,250	14,250	1507,646
	24,475	0,525	97,900	1053,647	1053,647	88,250	-10,250	14,238	1507,646
	24,000	1,000	96,000	1033,199	1033,199	88,250	-10,250	14,000	1507,646
	23,000	2,000	92,000	990,149	990,149	88,250	-10,250	13,500	1507,646
	22,000	3,000	88,000	947,099	947,099	88,250	-10,250	13,000	1507,646
	21,000	4,000	84,000	904,049	904,049	88,250	-10,250	12,500	1507,646
	20,000	5,000	80,000	860,999	860,999	88,250	-10,250	12,000	1507,646
	19,000	6,000	76,000	817,949	817,949	88,250	-10,250	11,500	1507,646
	18,000	7,000	72,000	774,899	774,899	88,250	-10,250	11,000	1507,646
	17,000	8,000	68,000	731,849	731,849	88,250	-10,250	10,500	1507,646
	16,000	9,000	64,000	688,799	688,799	88,250	-10,250	10,000	1507,646
	15,000	10,000	60,000	645,749	645,749	88,250	-10,250	9,500	1507,646

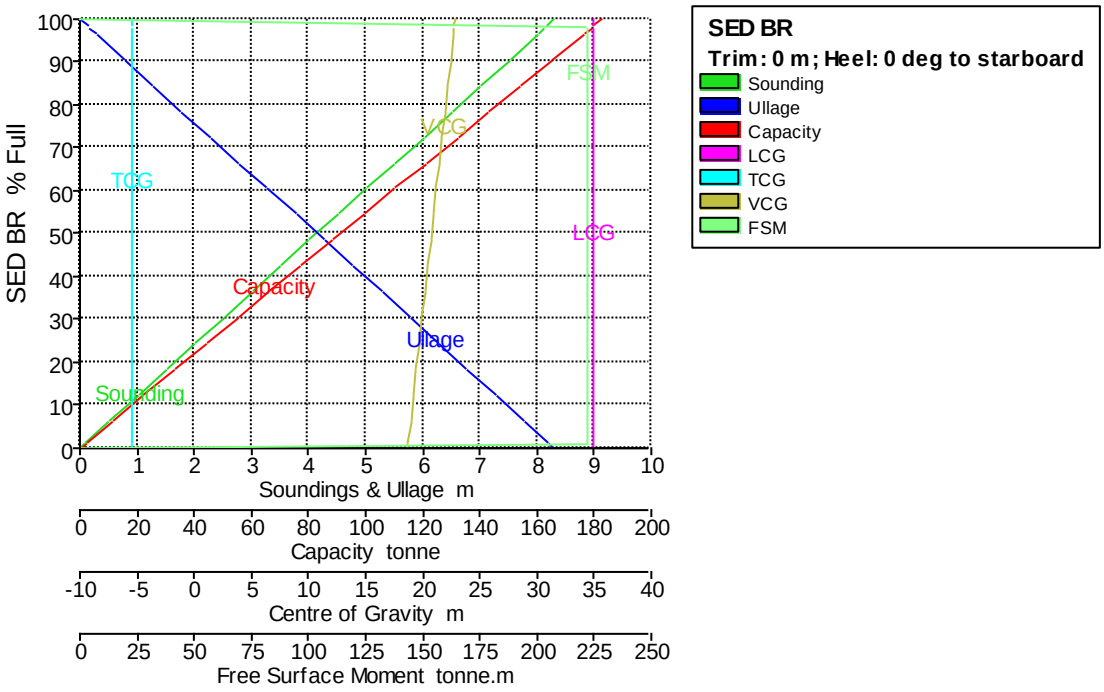
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	14,000	11,000	56,000	602,699	602,699	88,250	-10,250	9,000	1507,646
	13,000	12,000	52,000	559,649	559,649	88,250	-10,250	8,500	1507,646
	12,000	13,000	48,000	516,599	516,599	88,250	-10,250	8,000	1507,646
	11,000	14,000	44,000	473,549	473,549	88,250	-10,250	7,500	1507,646
	10,000	15,000	40,000	430,499	430,499	88,250	-10,250	7,000	1507,646
	9,000	16,000	36,000	387,449	387,449	88,250	-10,250	6,500	1507,646
	8,000	17,000	32,000	344,399	344,399	88,250	-10,250	6,000	1507,646
	7,000	18,000	28,000	301,349	301,349	88,250	-10,250	5,500	1507,646
	6,000	19,000	24,000	258,299	258,299	88,250	-10,250	5,000	1507,646
	5,000	20,000	20,000	215,249	215,249	88,250	-10,250	4,500	1507,646
	4,000	21,000	16,000	172,199	172,199	88,250	-10,250	4,000	1507,646
	3,000	22,000	12,000	129,149	129,149	88,250	-10,250	3,500	1507,646
	2,000	23,000	8,000	86,099	86,099	88,250	-10,250	3,000	1507,646
	1,000	24,000	4,000	43,049	43,049	88,250	-10,250	2,500	1507,646
	0,250	24,750	1,000	10,762	10,762	88,250	-10,249	2,125	1507,646
	0,000	25,000	0,000	0,000	0,000	88,250	-10,244	2,000	0,000

6.1.1.46 **Tank Calibrations - SED BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
SED BR	8,300	0,000	100,000	182,600	182,600	35,000	-5,500	22,850	0,000
	8,134	0,166	98,000	178,948	178,948	35,000	-5,500	22,767	221,833
	8,126	0,174	97,900	178,765	178,765	35,000	-5,500	22,763	221,833
	8,000	0,300	96,386	176,000	176,000	35,000	-5,500	22,700	221,833
	7,500	0,800	90,361	165,000	165,000	35,000	-5,500	22,450	221,833
	7,000	1,300	84,337	154,000	154,000	35,000	-5,500	22,200	221,833
	6,500	1,800	78,313	143,000	143,000	35,000	-5,500	21,950	221,833
	6,000	2,300	72,289	132,000	132,000	35,000	-5,500	21,700	221,833
	5,500	2,800	66,265	121,000	121,000	35,000	-5,500	21,450	221,833
	5,000	3,300	60,241	110,000	110,000	35,000	-5,500	21,200	221,833
	4,500	3,800	54,217	99,000	99,000	35,000	-5,500	20,950	221,833
	4,000	4,300	48,193	88,000	88,000	35,000	-5,500	20,700	221,833
	3,500	4,800	42,169	77,000	77,000	35,000	-5,500	20,450	221,833

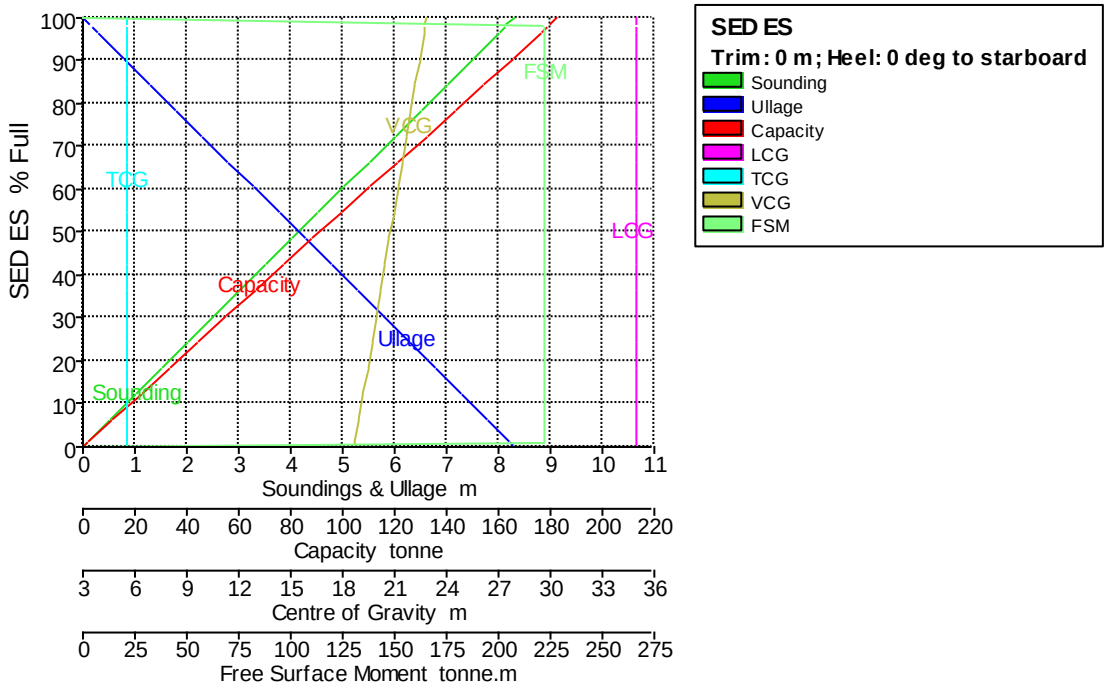
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	3,000	5,300	36,145	66,000	66,000	35,000	-5,500	20,200	221,833
	2,500	5,800	30,120	55,000	55,000	35,000	-5,500	19,950	221,833
	2,000	6,300	24,096	44,000	44,000	35,000	-5,500	19,700	221,833
	1,500	6,800	18,072	33,000	33,000	35,000	-5,500	19,450	221,833
	1,000	7,300	12,048	22,000	22,000	35,000	-5,500	19,200	221,833
	0,500	7,800	6,024	11,000	11,000	35,000	-5,500	18,950	221,833
	0,083	8,217	1,000	1,826	1,826	35,000	-5,500	18,741	221,833
	0,000	8,300	0,000	0,000	0,000	35,000	-5,500	18,700	0,000

6.1.1.47 **Tank Calibrations - SED ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



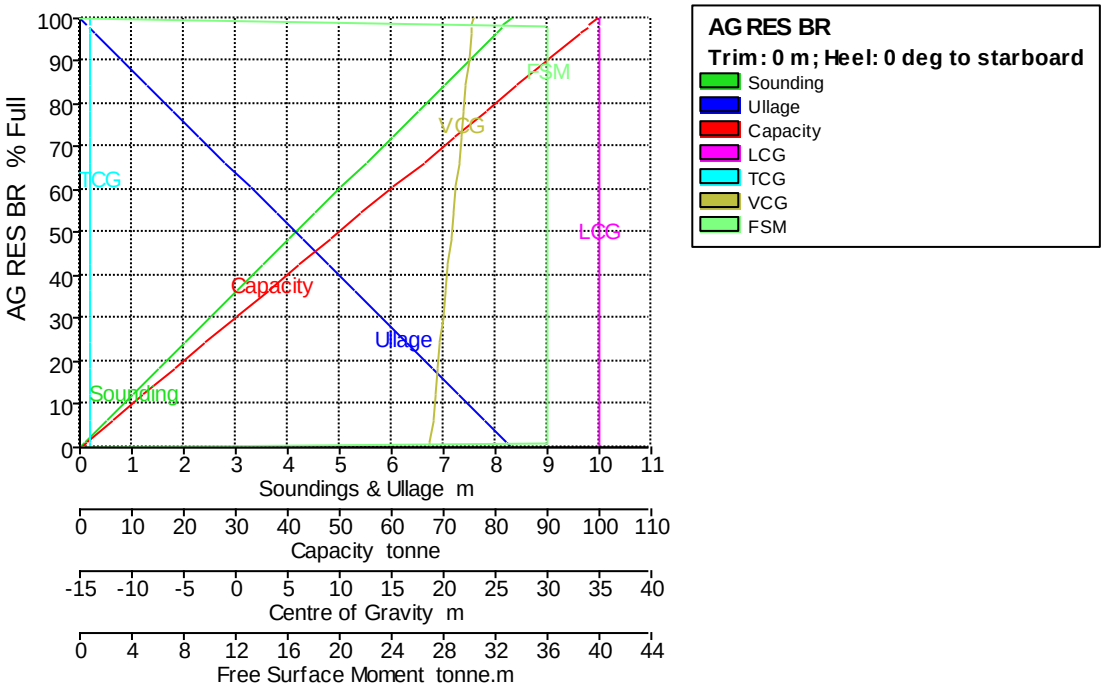
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
SEDES	8,300	0,000	100,000	182,600	182,600	35,000	5,500	22,850	0,000
	8,134	0,166	98,000	178,948	178,948	35,000	5,500	22,767	221,833
	8,126	0,174	97,900	178,765	178,765	35,000	5,500	22,763	221,833
	8,000	0,300	96,386	176,000	176,000	35,000	5,500	22,700	221,833
	7,500	0,800	90,361	165,000	165,000	35,000	5,500	22,450	221,833
	7,000	1,300	84,337	154,000	154,000	35,000	5,500	22,200	221,833
	6,500	1,800	78,313	143,000	143,000	35,000	5,500	21,950	221,833
	6,000	2,300	72,289	132,000	132,000	35,000	5,500	21,700	221,833
	5,500	2,800	66,265	121,000	121,000	35,000	5,500	21,450	221,833
	5,000	3,300	60,241	110,000	110,000	35,000	5,500	21,200	221,833
	4,500	3,800	54,217	99,000	99,000	35,000	5,500	20,950	221,833
	4,000	4,300	48,193	88,000	88,000	35,000	5,500	20,700	221,833
	3,500	4,800	42,169	77,000	77,000	35,000	5,500	20,450	221,833
	3,000	5,300	36,145	66,000	66,000	35,000	5,500	20,200	221,833
	2,500	5,800	30,120	55,000	55,000	35,000	5,500	19,950	221,833
	2,000	6,300	24,096	44,000	44,000	35,000	5,500	19,700	221,833
	1,500	6,800	18,072	33,000	33,000	35,000	5,500	19,450	221,833
	1,000	7,300	12,048	22,000	22,000	35,000	5,500	19,200	221,833
	0,500	7,800	6,024	11,000	11,000	35,000	5,500	18,950	221,833
	0,083	8,217	1,000	1,826	1,826	35,000	5,500	18,741	221,833
	0,000	8,300	0,000	0,000	0,000	35,000	5,500	18,700	0,000

6.1.1.48 **Tank Calibrations - AG RES BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AG RES BR	8,300	0,000	100,000	99,600	99,600	35,000	-14,000	22,850	0,000
	8,134	0,166	98,000	97,608	97,608	35,000	-14,000	22,767	36,000
	8,126	0,174	97,900	97,508	97,508	35,000	-14,000	22,763	36,000
	8,000	0,300	96,386	96,000	96,000	35,000	-14,000	22,700	36,000
	7,500	0,800	90,361	90,000	90,000	35,000	-14,000	22,450	36,000
	7,000	1,300	84,337	84,000	84,000	35,000	-14,000	22,200	36,000
	6,500	1,800	78,313	78,000	78,000	35,000	-14,000	21,950	36,000
	6,000	2,300	72,289	72,000	72,000	35,000	-14,000	21,700	36,000
	5,500	2,800	66,265	66,000	66,000	35,000	-14,000	21,450	36,000
	5,000	3,300	60,241	60,000	60,000	35,000	-14,000	21,200	36,000
	4,500	3,800	54,217	54,000	54,000	35,000	-14,000	20,950	36,000
	4,00	4,	48,	48,0	48,0	35	-	20	36,

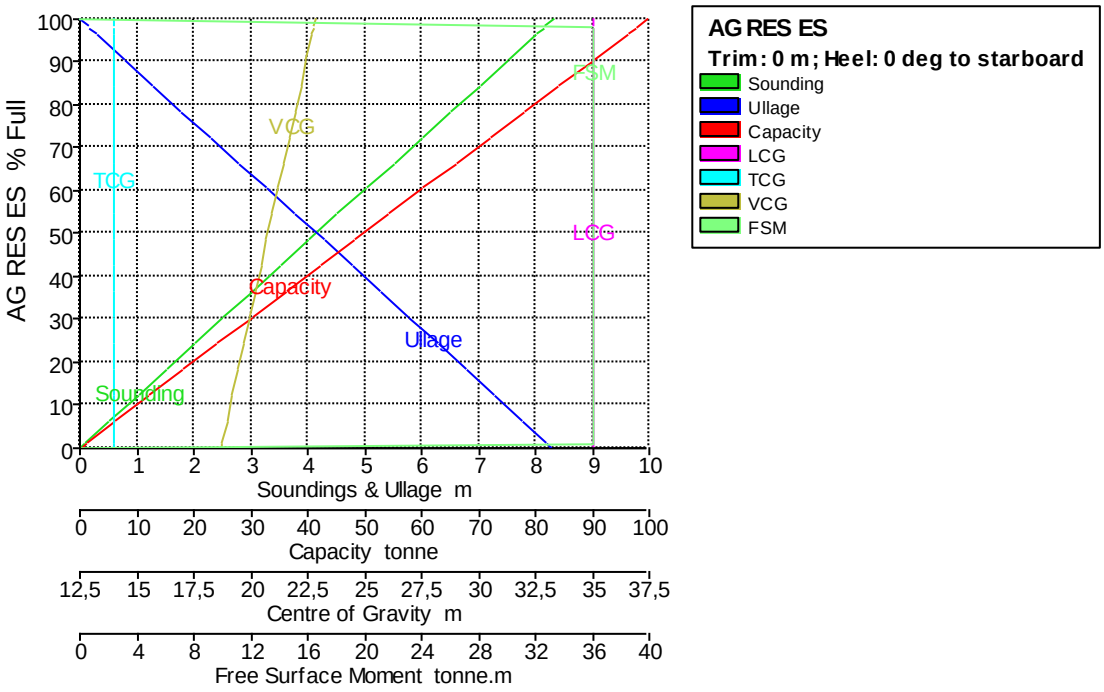
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	0	300	193	00	00	,000	14,000	,700	000
	3,500	4,800	42,169	42,000	42,000	35,000	-14,000	20,450	36,000
	3,000	5,300	36,145	36,000	36,000	35,000	-14,000	20,200	36,000
	2,500	5,800	30,120	30,000	30,000	35,000	-14,000	19,950	36,000
	2,000	6,300	24,096	24,000	24,000	35,000	-14,000	19,700	36,000
	1,500	6,800	18,072	18,000	18,000	35,000	-14,000	19,450	36,000
	1,000	7,300	12,048	12,000	12,000	35,000	-14,000	19,200	36,000
	0,500	7,800	6,024	6,000	6,000	35,000	-14,000	18,950	36,000
	0,083	8,217	1,000	0,996	0,996	35,000	-14,000	18,741	36,000
	0,000	8,300	0,000	0,000	0,000	35,000	-14,000	18,700	0,000

6.1.1.49 **Tank Calibrations - AG RES ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AG RES ES	8,300	0,000	100,000	99,600	99,600	35,000	14,000	22,850	0,000
	8,134	0,166	98,000	97,608	97,608	35,000	14,000	22,767	36,000
	8,126	0,174	97,900	97,508	97,508	35,000	14,000	22,763	36,000
	8,000	0,300	96,386	96,000	96,000	35,000	14,000	22,700	36,000
	7,500	0,800	90,361	90,000	90,000	35,000	14,000	22,450	36,000
	7,000	1,300	84,337	84,000	84,000	35,000	14,000	22,200	36,000
	6,500	1,800	78,313	78,000	78,000	35,000	14,000	21,950	36,000
	6,000	2,300	72,289	72,000	72,000	35,000	14,000	21,700	36,000
	5,500	2,800	66,265	66,000	66,000	35,000	14,000	21,450	36,000
	5,000	3,300	60,241	60,000	60,000	35,000	14,000	21,200	36,000
	4,500	3,800	54,217	54,000	54,000	35,000	14,000	20,950	36,000
	4,000	4,300	48,193	48,000	48,000	35,000	14,000	20,700	36,000
	3,500	4,800	42,169	42,000	42,000	35,000	14,000	20,450	36,000

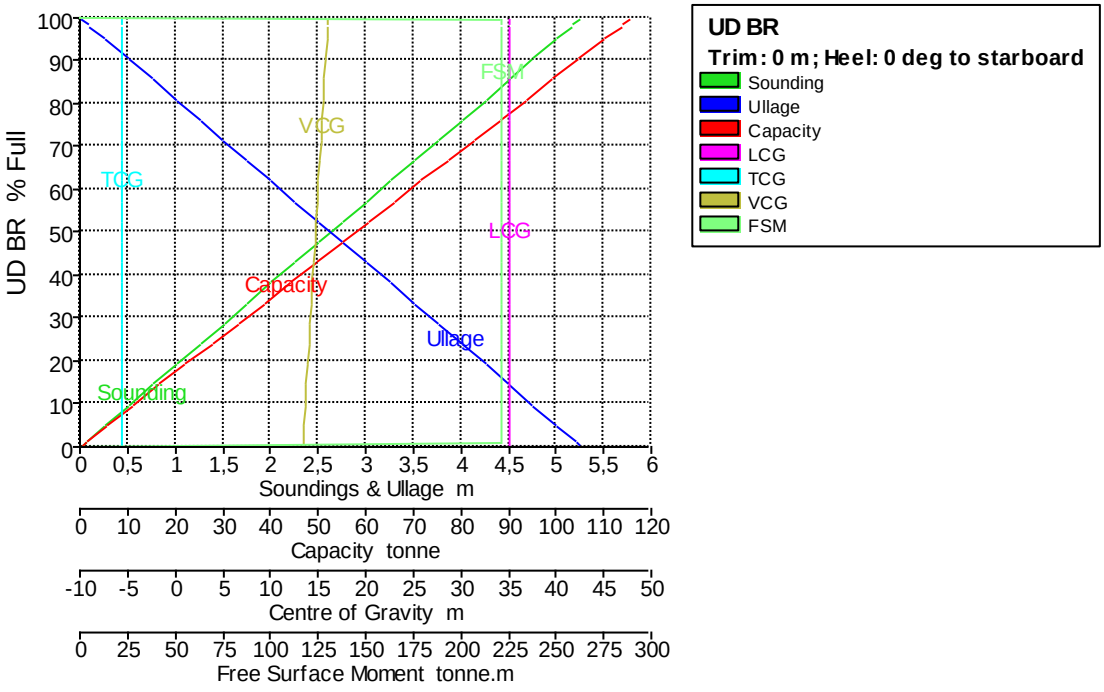
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	3,000	5,300	36,145	36,000	36,000	35,000	14,000	20,200	36,000
	2,500	5,800	30,120	30,000	30,000	35,000	14,000	19,950	36,000
	2,000	6,300	24,096	24,000	24,000	35,000	14,000	19,700	36,000
	1,500	6,800	18,072	18,000	18,000	35,000	14,000	19,450	36,000
	1,000	7,300	12,048	12,000	12,000	35,000	14,000	19,200	36,000
	0,500	7,800	6,024	6,000	6,000	35,000	14,000	18,950	36,000
	0,083	8,217	1,000	0,996	0,996	35,000	14,000	18,741	36,000
	0,000	8,300	0,000	0,000	0,000	35,000	14,000	18,700	0,000

6.1.1.50 **Tank Calibrations - UD BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
UD BR	5,270	0,000	100,000	115,940	115,940	35,000	-5,500	16,065	0,000
	5,250	0,020	99,620	115,500	115,500	35,000	-5,500	16,055	221,833
	5,165	0,105	98,000	113,621	113,621	35,000	-5,500	16,012	221,833
	5,159	0,111	97,900	113,505	113,505	35,000	-5,500	16,010	221,833
	5,000	0,270	94,877	110,000	110,000	35,000	-5,500	15,930	221,833
	4,750	0,520	90,133	104,500	104,500	35,000	-5,500	15,805	221,833
	4,500	0,770	85,389	99,000	99,000	35,000	-5,500	15,680	221,833
	4,250	1,020	80,645	93,500	93,500	35,000	-5,500	15,555	221,833
	4,000	1,270	75,901	88,000	88,000	35,000	-5,500	15,430	221,833
	3,750	1,520	71,157	82,500	82,500	35,000	-5,500	15,305	221,833
	3,500	1,770	66,414	77,000	77,000	35,000	-5,500	15,180	221,833
	3,250	2,020	61,670	71,500	71,500	35,000	-5,500	15,055	221,833
	3,000	2,270	56,926	66,000	66,000	35,000	-5,500	14,930	221,833
	2,750	2,520	52,182	60,500	60,500	35,000	-5,500	14,805	221,833
	2,500	2,770	47,438	55,000	55,000	35,000	-5,500	14,680	221,833
	2,250	3,020	42,694	49,500	49,500	35,000	-5,500	14,555	221,833
	2,000	3,270	37,951	44,000	44,000	35,000	-5,500	14,430	221,833
	1,750	3,520	33,207	38,500	38,500	35,000	-5,500	14,305	221,833
	1,500	3,770	28,463	33,000	33,000	35,000	-5,500	14,180	221,833
	1,250	4,020	23,719	27,500	27,500	35,000	-5,500	14,055	221,833
	1,000	4,270	18,975	22,000	22,000	35,000	-5,500	13,930	221,833
	0,750	4,520	14,231	16,500	16,500	35,000	-5,500	13,805	221,833
	0,500	4,770	9,488	11,000	11,000	35,000	-5,500	13,680	221,833
	0,250	5,020	4,744	5,500	5,500	35,000	-5,500	13,555	221,833
	0,05	5,	1,0	1,15	1,15	35	-	13	221

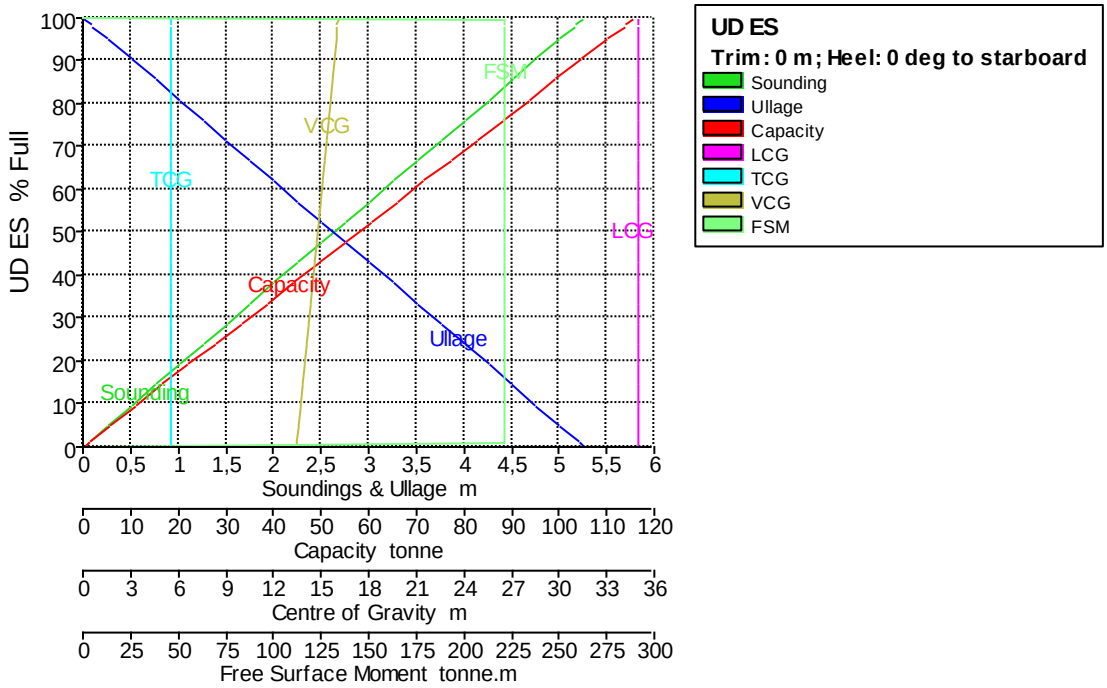
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	3	217	00	9	9	,000	5,500	,456	,833
	0,000	5,270	0,000	0,000	0,000	35,000	-5,500	13,430	0,000

6.1.1.51 **Tank Calibrations - UD ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
UD ES	5,270	0,000	100,000	115,940	115,940	35,000	5,500	16,065	0,000
	5,250	0,020	99,620	115,500	115,500	35,000	5,500	16,055	221,833
	5,165	0,105	98,000	113,621	113,621	35,000	5,500	16,012	221,833
	5,159	0,111	97,900	113,505	113,505	35,000	5,500	16,010	221,833
	5,00	0,	94,	110,	110,	35	5	15	221

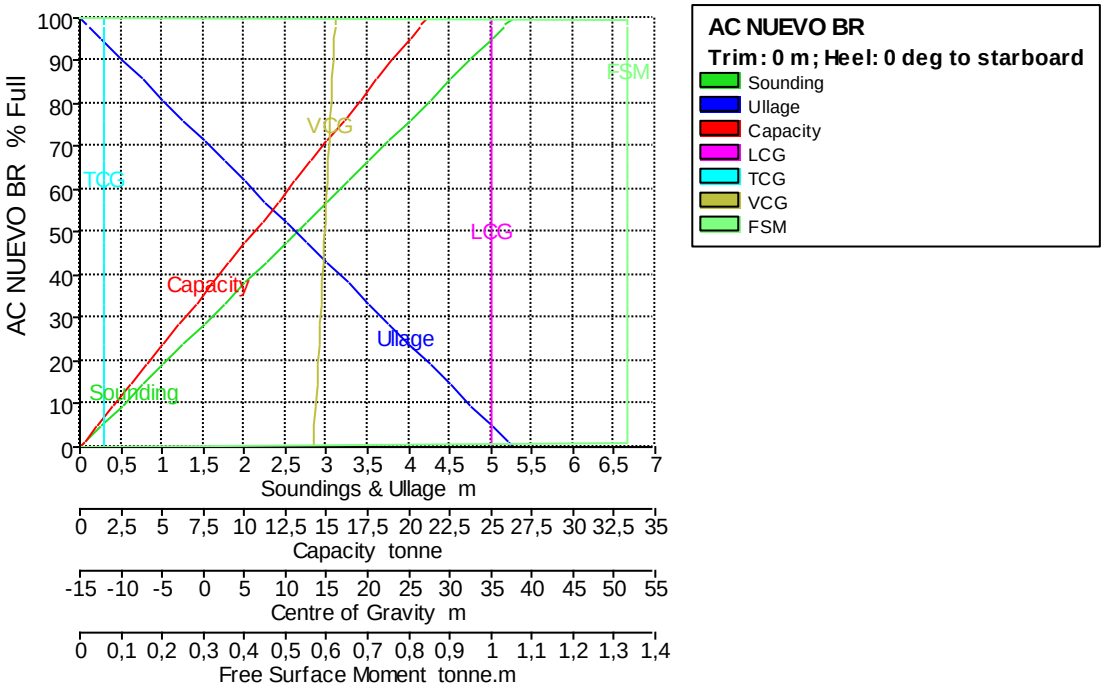
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	0	270	877	000	000	,000	,500	,930	,833
	4,750	0,520	90,133	104,500	104,500	35,000	5,500	15,805	221,833
	4,500	0,770	85,389	99,000	99,000	35,000	5,500	15,680	221,833
	4,250	1,020	80,645	93,500	93,500	35,000	5,500	15,555	221,833
	4,000	1,270	75,901	88,000	88,000	35,000	5,500	15,430	221,833
	3,750	1,520	71,157	82,500	82,500	35,000	5,500	15,305	221,833
	3,500	1,770	66,414	77,000	77,000	35,000	5,500	15,180	221,833
	3,250	2,020	61,670	71,500	71,500	35,000	5,500	15,055	221,833
	3,000	2,270	56,926	66,000	66,000	35,000	5,500	14,930	221,833
	2,750	2,520	52,182	60,500	60,500	35,000	5,500	14,805	221,833
	2,500	2,770	47,438	55,000	55,000	35,000	5,500	14,680	221,833
	2,250	3,020	42,694	49,500	49,500	35,000	5,500	14,555	221,833
	2,000	3,270	37,951	44,000	44,000	35,000	5,500	14,430	221,833
	1,750	3,520	33,207	38,500	38,500	35,000	5,500	14,305	221,833
	1,500	3,770	28,463	33,000	33,000	35,000	5,500	14,180	221,833
	1,250	4,020	23,719	27,500	27,500	35,000	5,500	14,055	221,833
	1,000	4,270	18,975	22,000	22,000	35,000	5,500	13,930	221,833
	0,750	4,520	14,231	16,500	16,500	35,000	5,500	13,805	221,833
	0,500	4,770	9,488	11,000	11,000	35,000	5,500	13,680	221,833
	0,250	5,020	4,744	5,500	5,500	35,000	5,500	13,555	221,833
	0,053	5,217	1,000	1,159	1,159	35,000	5,500	13,456	221,833
	0,000	5,270	0,000	0,000	0,000	35,000	5,500	13,430	0,000

6.1.1.52 **Tank Calibrations - AC NUEVO BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AC NUEVO BR	5,270	0,000	100,000	21,080	21,080	35,000	-12,000	16,065	0,000
	5,250	0,020	99,620	21,000	21,000	35,000	-12,000	16,055	1,333
	5,165	0,105	98,000	20,658	20,658	35,000	-12,000	16,012	1,333
	5,159	0,111	97,900	20,637	20,637	35,000	-12,000	16,010	1,333
	5,000	0,270	94,877	20,000	20,000	35,000	-12,000	15,930	1,333
	4,750	0,520	90,133	19,000	19,000	35,000	-12,000	15,805	1,333
	4,500	0,770	85,389	18,000	18,000	35,000	-12,000	15,680	1,333
	4,250	1,020	80,645	17,000	17,000	35,000	-12,000	15,555	1,333
	4,000	1,270	75,901	16,000	16,000	35,000	-12,000	15,430	1,333
	3,750	1,520	71,157	15,000	15,000	35,000	-12,000	15,305	1,333
	3,500	1,770	66,414	14,000	14,000	35,000	-12,000	15,180	1,333

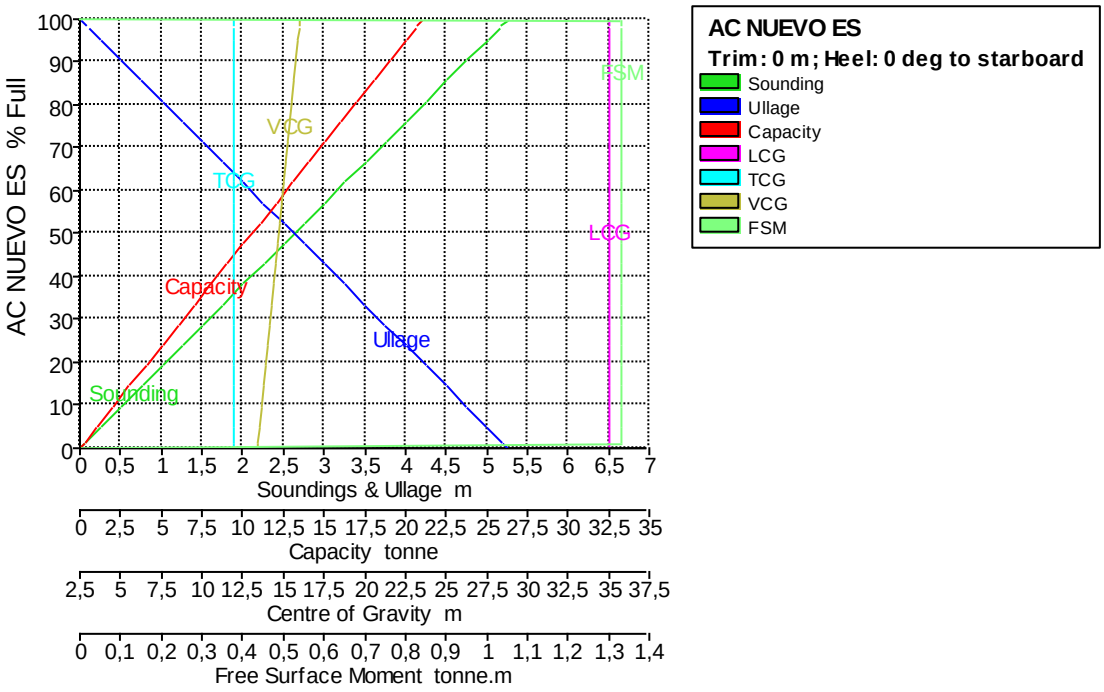
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	3,250	2,020	61,670	13,000	13,000	35,000	-12,000	15,055	1,333
	3,000	2,270	56,926	12,000	12,000	35,000	-12,000	14,930	1,333
	2,750	2,520	52,182	11,000	11,000	35,000	-12,000	14,805	1,333
	2,500	2,770	47,438	10,000	10,000	35,000	-12,000	14,680	1,333
	2,250	3,020	42,694	9,000	9,000	35,000	-12,000	14,555	1,333
	2,000	3,270	37,951	8,000	8,000	35,000	-12,000	14,430	1,333
	1,750	3,520	33,207	7,000	7,000	35,000	-12,000	14,305	1,333
	1,500	3,770	28,463	6,000	6,000	35,000	-12,000	14,180	1,333
	1,250	4,020	23,719	5,000	5,000	35,000	-12,000	14,055	1,333
	1,000	4,270	18,975	4,000	4,000	35,000	-12,000	13,930	1,333
	0,750	4,520	14,231	3,000	3,000	35,000	-12,000	13,805	1,333
	0,500	4,770	9,488	2,000	2,000	35,000	-12,000	13,680	1,333
	0,250	5,020	4,744	1,000	1,000	35,000	-12,000	13,555	1,333
	0,053	5,217	1,000	0,211	0,211	35,000	-12,000	13,456	1,333
	0,000	5,270	0,000	0,000	0,000	35,000	-12,000	13,430	0,000

6.1.1.53 **Tank Calibrations - AC NUEVO ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AC NUEVO ES	5,270	0,000	100,000	21,080	21,080	35,000	12,000	16,065	0,000
	5,250	0,020	99,620	21,000	21,000	35,000	12,000	16,055	1,333
	5,165	0,105	98,000	20,658	20,658	35,000	12,000	16,012	1,333
	5,159	0,111	97,900	20,637	20,637	35,000	12,000	16,010	1,333
	5,000	0,270	94,877	20,000	20,000	35,000	12,000	15,930	1,333
	4,750	0,520	90,133	19,000	19,000	35,000	12,000	15,805	1,333
	4,500	0,770	85,389	18,000	18,000	35,000	12,000	15,680	1,333
	4,250	1,020	80,645	17,000	17,000	35,000	12,000	15,555	1,333
	4,000	1,270	75,901	16,000	16,000	35,000	12,000	15,430	1,333
	3,750	1,520	71,157	15,000	15,000	35,000	12,000	15,305	1,333
	3,500	1,770	66,414	14,000	14,000	35,000	12,000	15,180	1,333
	3,250	2,020	61,670	13,000	13,000	35,000	12,000	15,055	1,333
	3,000	2,270	56,926	12,000	12,000	35,000	12,000	14,930	1,333

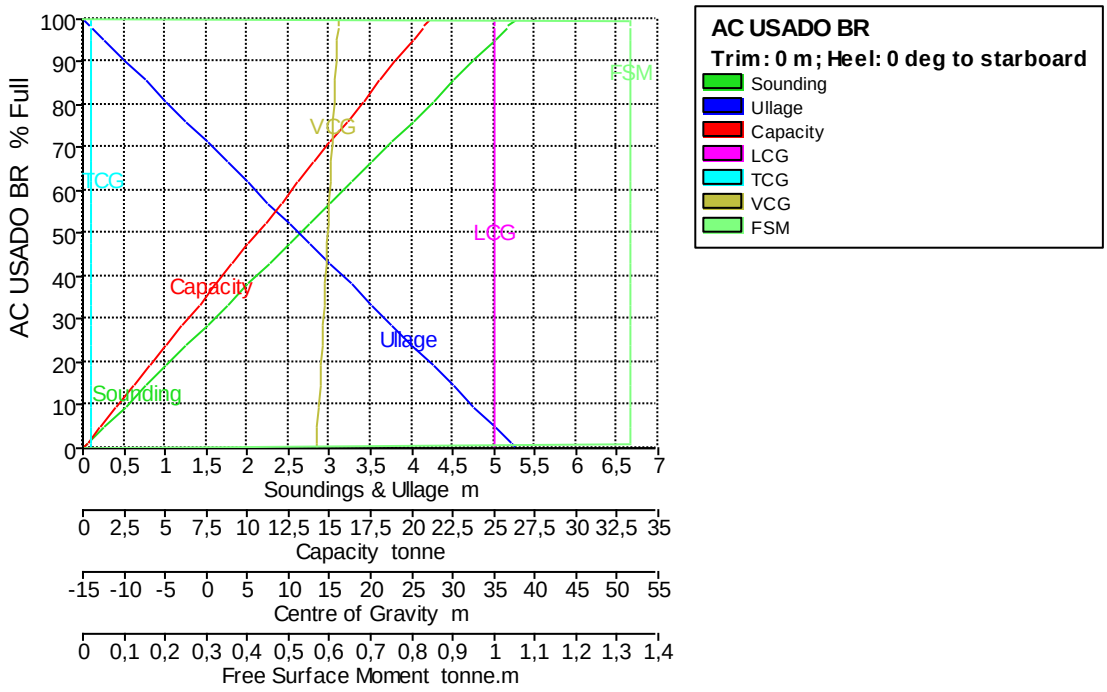
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	2,750	2,520	52,182	11,000	11,000	35,000	12,000	14,805	1,333
	2,500	2,770	47,438	10,000	10,000	35,000	12,000	14,680	1,333
	2,250	3,020	42,694	9,000	9,000	35,000	12,000	14,555	1,333
	2,000	3,270	37,951	8,000	8,000	35,000	12,000	14,430	1,333
	1,750	3,520	33,207	7,000	7,000	35,000	12,000	14,305	1,333
	1,500	3,770	28,463	6,000	6,000	35,000	12,000	14,180	1,333
	1,250	4,020	23,719	5,000	5,000	35,000	12,000	14,055	1,333
	1,000	4,270	18,975	4,000	4,000	35,000	12,000	13,930	1,333
	0,750	4,520	14,231	3,000	3,000	35,000	12,000	13,805	1,333
	0,500	4,770	9,488	2,000	2,000	35,000	12,000	13,680	1,333
	0,250	5,020	4,744	1,000	1,000	35,000	12,000	13,555	1,333
	0,053	5,217	1,000	0,211	0,211	35,000	12,000	13,456	1,333
	0,000	5,270	0,000	0,000	0,000	35,000	12,000	13,430	0,000

6.1.1.54 **Tank Calibrations - AC USADO BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AC USADO BR	5,270	0,000	100,000	21,080	21,080	35,000	-14,000	16,065	0,000
	5,250	0,020	99,620	21,000	21,000	35,000	-14,000	16,055	1,333
	5,165	0,105	98,000	20,658	20,658	35,000	-14,000	16,012	1,333
	5,159	0,111	97,900	20,637	20,637	35,000	-14,000	16,010	1,333
	5,000	0,270	94,877	20,000	20,000	35,000	-14,000	15,930	1,333
	4,750	0,520	90,133	19,000	19,000	35,000	-14,000	15,805	1,333
	4,500	0,770	85,389	18,000	18,000	35,000	-14,000	15,680	1,333
	4,250	1,020	80,645	17,000	17,000	35,000	-14,000	15,555	1,333
	4,000	1,270	75,901	16,000	16,000	35,000	-14,000	15,430	1,333
	3,750	1,520	71,157	15,000	15,000	35,000	-14,000	15,305	1,333
	3,500	1,770	66,414	14,000	14,000	35,000	-14,000	15,180	1,333
	3,250	2,020	61,670	13,000	13,000	35,000	-14,000	15,055	1,333
	3,000	2,270	56,926	12,000	12,000	35,000	-14,000	14,930	1,333

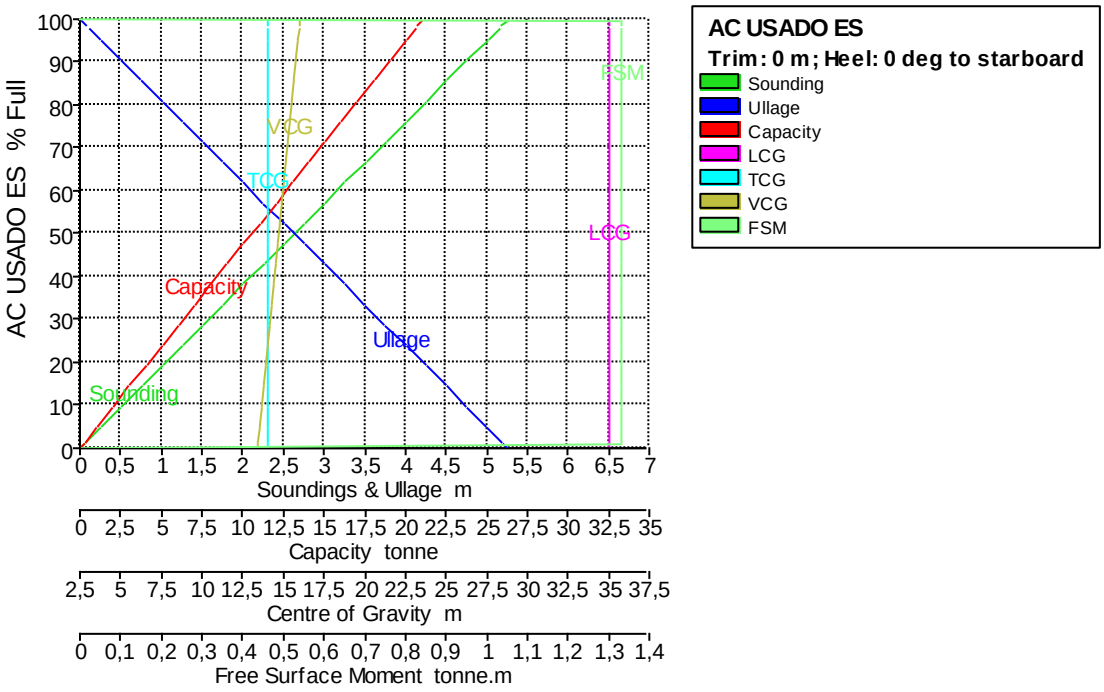
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	2,750	2,520	52,182	11,000	11,000	35,000	-14,000	14,805	1,333
	2,500	2,770	47,438	10,000	10,000	35,000	-14,000	14,680	1,333
	2,250	3,020	42,694	9,000	9,000	35,000	-14,000	14,555	1,333
	2,000	3,270	37,951	8,000	8,000	35,000	-14,000	14,430	1,333
	1,750	3,520	33,207	7,000	7,000	35,000	-14,000	14,305	1,333
	1,500	3,770	28,463	6,000	6,000	35,000	-14,000	14,180	1,333
	1,250	4,020	23,719	5,000	5,000	35,000	-14,000	14,055	1,333
	1,000	4,270	18,975	4,000	4,000	35,000	-14,000	13,930	1,333
	0,750	4,520	14,231	3,000	3,000	35,000	-14,000	13,805	1,333
	0,500	4,770	9,488	2,000	2,000	35,000	-14,000	13,680	1,333
	0,250	5,020	4,744	1,000	1,000	35,000	-14,000	13,555	1,333
	0,053	5,217	1,000	0,211	0,211	35,000	-14,000	13,456	1,333
	0,000	5,270	0,000	0,000	0,000	35,000	-14,000	13,430	0,000

6.1.1.55 **Tank Calibrations - AC USADO ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AC USADO ES	5,270	0,000	100,000	21,080	21,080	35,000	14,000	16,065	0,000
	5,250	0,020	99,620	21,000	21,000	35,000	14,000	16,055	1,333
	5,165	0,105	98,000	20,658	20,658	35,000	14,000	16,012	1,333
	5,159	0,111	97,900	20,637	20,637	35,000	14,000	16,010	1,333
	5,000	0,270	94,877	20,000	20,000	35,000	14,000	15,930	1,333
	4,750	0,520	90,133	19,000	19,000	35,000	14,000	15,805	1,333
	4,500	0,770	85,389	18,000	18,000	35,000	14,000	15,680	1,333
	4,250	1,020	80,645	17,000	17,000	35,000	14,000	15,555	1,333
	4,000	1,270	75,901	16,000	16,000	35,000	14,000	15,430	1,333
	3,750	1,520	71,157	15,000	15,000	35,000	14,000	15,305	1,333
	3,500	1,770	66,414	14,000	14,000	35,000	14,000	15,180	1,333
	3,250	2,020	61,670	13,000	13,000	35,000	14,000	15,055	1,333
	3,000	2,270	56,926	12,000	12,000	35,000	14,000	14,930	1,333

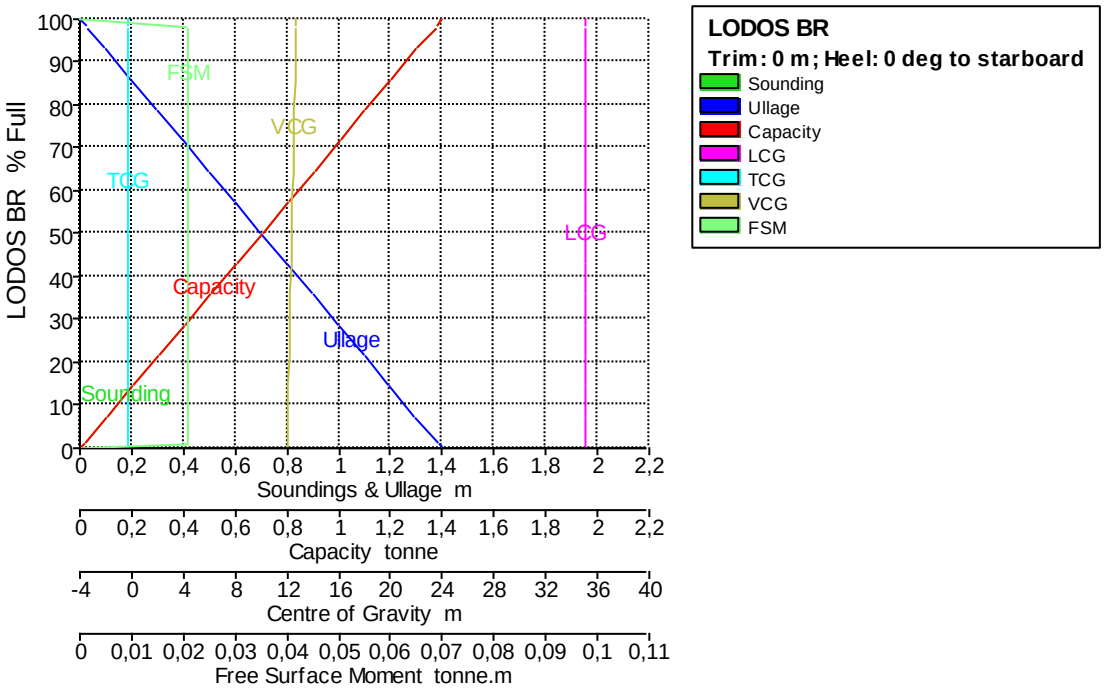
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	2,750	2,520	52,182	11,000	11,000	35,000	14,000	14,805	1,333
	2,500	2,770	47,438	10,000	10,000	35,000	14,000	14,680	1,333
	2,250	3,020	42,694	9,000	9,000	35,000	14,000	14,555	1,333
	2,000	3,270	37,951	8,000	8,000	35,000	14,000	14,430	1,333
	1,750	3,520	33,207	7,000	7,000	35,000	14,000	14,305	1,333
	1,500	3,770	28,463	6,000	6,000	35,000	14,000	14,180	1,333
	1,250	4,020	23,719	5,000	5,000	35,000	14,000	14,055	1,333
	1,000	4,270	18,975	4,000	4,000	35,000	14,000	13,930	1,333
	0,750	4,520	14,231	3,000	3,000	35,000	14,000	13,805	1,333
	0,500	4,770	9,488	2,000	2,000	35,000	14,000	13,680	1,333
	0,250	5,020	4,744	1,000	1,000	35,000	14,000	13,555	1,333
	0,053	5,217	1,000	0,211	0,211	35,000	14,000	13,456	1,333
	0,000	5,270	0,000	0,000	0,000	35,000	14,000	13,430	0,000

6.1.1.56 **Tank Calibrations - LODOS BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
LODOS BR	1,400	0,000	100,000	1,400	1,400	35,000	-0,250	12,700	0,000
	1,372	0,028	98,000	1,372	1,372	35,000	-0,250	12,686	0,021
	1,371	0,029	97,900	1,371	1,371	35,000	-0,250	12,685	0,021
	1,300	0,100	92,857	1,300	1,300	35,000	-0,250	12,650	0,021
	1,200	0,200	85,714	1,200	1,200	35,000	-0,250	12,600	0,021
	1,100	0,300	78,571	1,100	1,100	35,000	-0,250	12,550	0,021
	1,000	0,400	71,429	1,000	1,000	35,000	-0,250	12,500	0,021
	0,900	0,500	64,286	0,900	0,900	35,000	-0,250	12,450	0,021
	0,800	0,600	57,143	0,800	0,800	35,000	-0,250	12,400	0,021
	0,700	0,700	50,000	0,700	0,700	35,000	-0,250	12,350	0,021
	0,600	0,800	42,857	0,600	0,600	35,000	-0,250	12,300	0,021
	0,500	0,900	35,714	0,500	0,500	35,000	-0,250	12,250	0,021
	0,400	1,000	28,571	0,400	0,400	35,000	-0,250	12,200	0,021

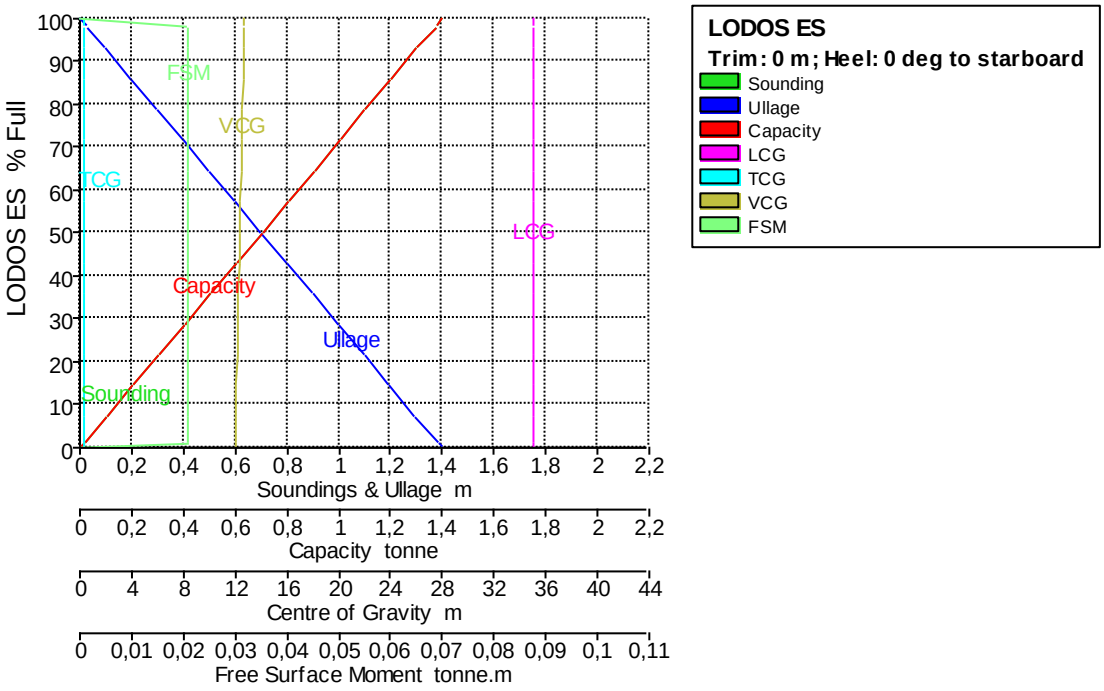
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	0,300	1,100	21,429	0,300	0,300	35,000	-0,250	12,150	0,021
	0,200	1,200	14,286	0,200	0,200	35,000	-0,250	12,100	0,021
	0,100	1,300	7,143	0,100	0,100	35,000	-0,250	12,050	0,021
	0,014	1,386	1,000	0,014	0,014	35,000	-0,250	12,007	0,021
	0,000	1,400	0,000	0,000	0,000	35,000	-0,250	12,000	0,000

6.1.1.57 **Tank Calibrations - LODOS ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
LODOS ES	1,400	0,000	100,000	1,400	1,400	35,000	0,250	12,700	0,000

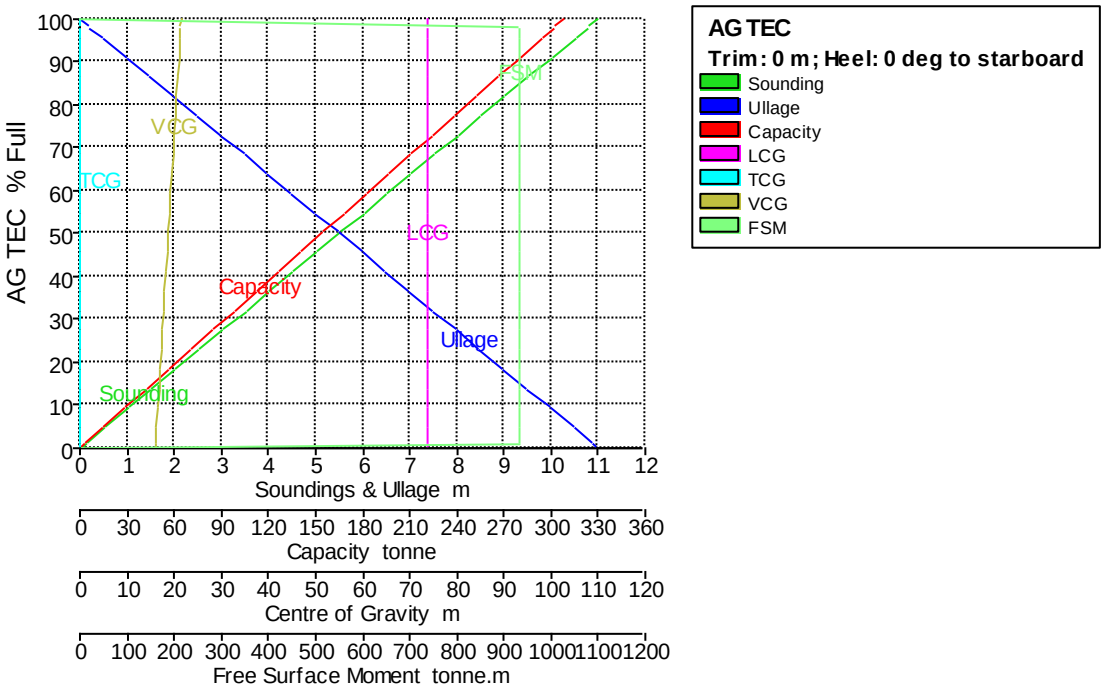
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	1,372	0,028	98,000	1,372	1,372	35,000	0,250	12,686	0,021
	1,371	0,029	97,900	1,371	1,371	35,000	0,250	12,685	0,021
	1,300	0,100	92,857	1,300	1,300	35,000	0,250	12,650	0,021
	1,200	0,200	85,714	1,200	1,200	35,000	0,250	12,600	0,021
	1,100	0,300	78,571	1,100	1,100	35,000	0,250	12,550	0,021
	1,000	0,400	71,429	1,000	1,000	35,000	0,250	12,500	0,021
	0,900	0,500	64,286	0,900	0,900	35,000	0,250	12,450	0,021
	0,800	0,600	57,143	0,800	0,800	35,000	0,250	12,400	0,021
	0,700	0,700	50,000	0,700	0,700	35,000	0,250	12,350	0,021
	0,600	0,800	42,857	0,600	0,600	35,000	0,250	12,300	0,021
	0,500	0,900	35,714	0,500	0,500	35,000	0,250	12,250	0,021
	0,400	1,000	28,571	0,400	0,400	35,000	0,250	12,200	0,021
	0,300	1,100	21,429	0,300	0,300	35,000	0,250	12,150	0,021
	0,200	1,200	14,286	0,200	0,200	35,000	0,250	12,100	0,021
	0,100	1,300	7,143	0,100	0,100	35,000	0,250	12,050	0,021
	0,014	1,386	1,000	0,014	0,014	35,000	0,250	12,007	0,021
	0,000	1,400	0,000	0,000	0,000	35,000	0,250	12,000	0,000

6.1.1.58 **Tank Calibrations - AG TEC**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AG TEC	11,000	0,000	100,000	308,000	308,000	73,900	0,000	21,500	0,000
	10,780	0,220	98,000	301,840	301,840	73,900	0,000	21,390	933,333
	10,769	0,231	97,900	301,532	301,532	73,900	0,000	21,384	933,333
	10,500	0,500	95,455	294,000	294,000	73,900	0,000	21,250	933,333
	10,000	1,000	90,909	280,000	280,000	73,900	0,000	21,000	933,333
	9,500	1,500	86,364	266,000	266,000	73,900	0,000	20,750	933,333
	9,000	2,000	81,818	252,000	252,000	73,900	0,000	20,500	933,333
	8,500	2,500	77,273	238,000	238,000	73,900	0,000	20,250	933,333
	8,000	3,000	72,727	224,000	224,000	73,900	0,000	20,000	933,333
	7,500	3,500	68,182	210,000	210,000	73,900	0,000	19,750	933,333
	7,000	4,000	63,636	196,000	196,000	73,900	0,000	19,500	933,333
	6,500	4,500	59,091	182,000	182,000	73,900	0,000	19,250	933,333
	6,000	5,000	54,545	168,000	168,000	73,900	0,000	19,000	933,333

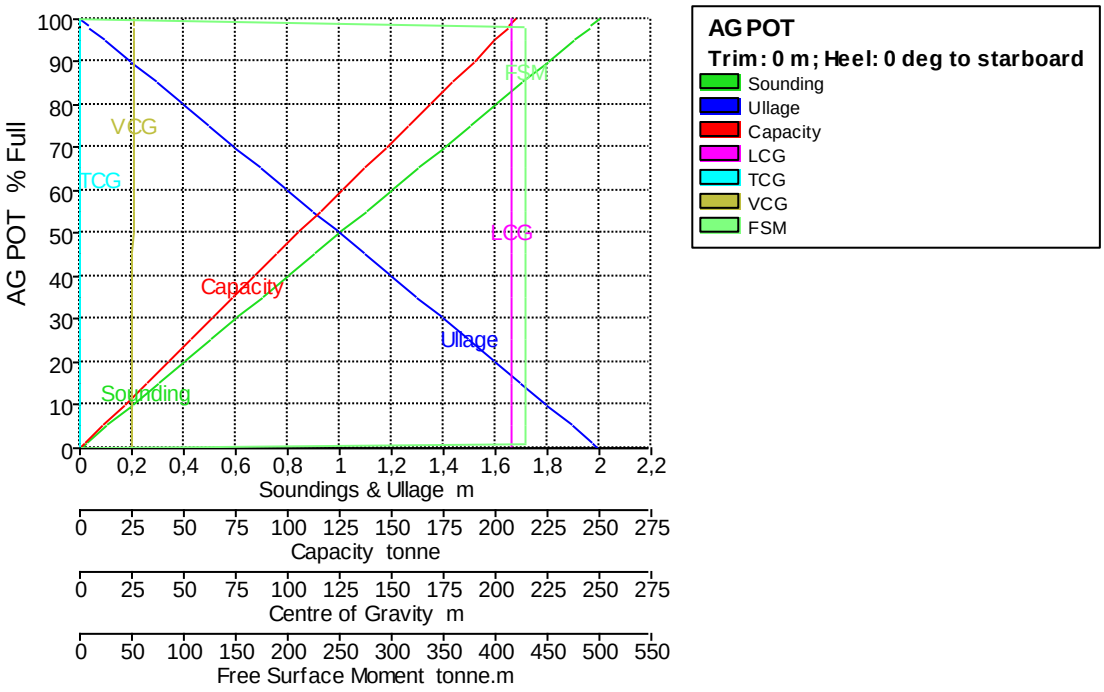
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	5,500	5,500	50,000	154,000	154,000	73,900	0,000	18,750	933,333
	5,000	6,000	45,455	140,000	140,000	73,900	0,000	18,500	933,333
	4,500	6,500	40,909	126,000	126,000	73,900	0,000	18,250	933,333
	4,000	7,000	36,364	112,000	112,000	73,900	0,000	18,000	933,333
	3,500	7,500	31,818	98,000	98,000	73,900	0,000	17,750	933,333
	3,000	8,000	27,273	84,000	84,000	73,900	0,000	17,500	933,333
	2,500	8,500	22,727	70,000	70,000	73,900	0,000	17,250	933,333
	2,000	9,000	18,182	56,000	56,000	73,900	0,000	17,000	933,333
	1,500	9,500	13,636	42,000	42,000	73,900	0,000	16,750	933,333
	1,000	10,000	9,091	28,000	28,000	73,900	0,000	16,500	933,333
	0,500	10,500	4,545	14,000	14,000	73,900	0,000	16,250	933,333
	0,110	10,890	1,000	3,080	3,080	73,900	0,000	16,055	933,333
	0,000	11,000	0,000	0,000	0,000	73,900	0,000	16,000	0,000

6.1.1.59 **Tank Calibrations - AG POT**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
AG POT	2,000	0,000	100,000	210,000	210,000	207,500	0,000	26,000	0,000
	1,960	0,040	98,000	205,800	205,800	207,500	0,000	25,980	428,750
	1,958	0,042	97,900	205,590	205,590	207,500	0,000	25,979	428,750
	1,900	0,100	95,000	199,500	199,500	207,500	0,000	25,950	428,750
	1,800	0,200	90,000	189,000	189,000	207,500	0,000	25,900	428,750
	1,700	0,300	85,000	178,500	178,500	207,500	0,000	25,850	428,750
	1,600	0,400	80,000	168,000	168,000	207,500	0,000	25,800	428,750
	1,500	0,500	75,000	157,500	157,500	207,500	0,000	25,750	428,750
	1,400	0,600	70,000	147,000	147,000	207,500	0,000	25,700	428,750
	1,300	0,700	65,000	136,500	136,500	207,500	0,000	25,650	428,750
	1,200	0,800	60,000	126,000	126,000	207,500	0,000	25,600	428,750
	1,100	0,900	55,000	115,500	115,500	207,500	0,000	25,550	428,750
	1,000	1,000	50,000	105,000	105,000	207,500	0,000	25,500	428,750

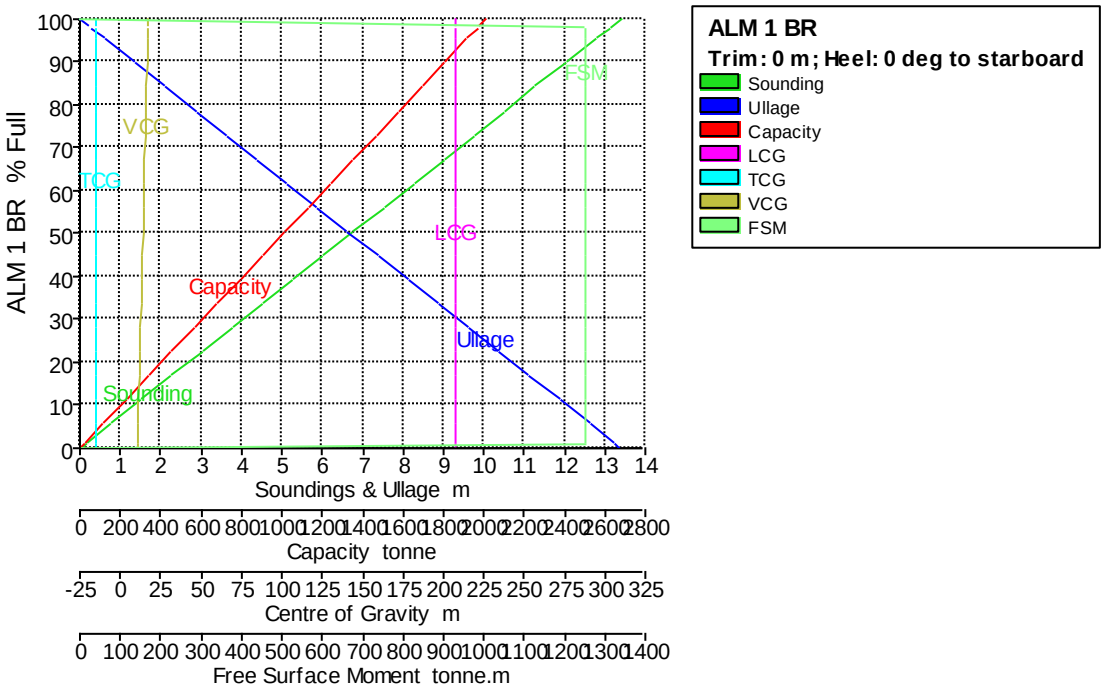
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	0,900	1,100	45,000	94,500	94,500	207,500	0,000	25,450	428,750
	0,800	1,200	40,000	84,000	84,000	207,500	0,000	25,400	428,750
	0,700	1,300	35,000	73,500	73,500	207,500	0,000	25,350	428,750
	0,600	1,400	30,000	63,000	63,000	207,500	0,000	25,300	428,750
	0,500	1,500	25,000	52,500	52,500	207,500	0,000	25,250	428,750
	0,400	1,600	20,000	42,000	42,000	207,500	0,000	25,200	428,750
	0,300	1,700	15,000	31,500	31,500	207,500	0,000	25,150	428,750
	0,200	1,800	10,000	21,000	21,000	207,500	0,000	25,100	428,750
	0,100	1,900	5,000	10,500	10,500	207,500	0,000	25,050	428,750
	0,020	1,980	1,000	2,100	2,100	207,500	0,000	25,010	428,750
	0,000	2,000	0,000	0,000	0,000	207,500	0,000	25,000	0,000

6.1.1.60 **Tank Calibrations - ALM 1 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
ALM 1 BR	13,400	0,000	100,000	2010,000	2010,000	207,500	-15,000	17,300	0,000
	13,132	0,268	98,000	1969,800	1969,800	207,500	-15,000	17,166	1250,000
	13,119	0,281	97,900	1967,790	1967,790	207,500	-15,000	17,159	1250,000
	12,750	0,650	95,149	1912,500	1912,500	207,500	-15,000	16,975	1250,000
	12,000	1,400	89,552	1800,000	1800,000	207,500	-15,000	16,600	1250,000
	11,250	2,150	83,955	1687,500	1687,500	207,500	-15,000	16,225	1250,000
	10,500	2,900	78,358	1575,000	1575,000	207,500	-15,000	15,850	1250,000
	9,750	3,650	72,761	1462,500	1462,500	207,500	-15,000	15,475	1250,000
	9,000	4,400	67,164	1350,000	1350,000	207,500	-15,000	15,100	1250,000
	8,250	5,150	61,567	1237,500	1237,500	207,500	-15,000	14,725	1250,000
	7,500	5,900	55,970	1125,000	1125,000	207,500	-15,000	14,350	1250,000
	6,750	6,650	50,373	1012,500	1012,500	207,500	-15,000	13,975	1250,000
	6,000	7,400	44,776	900,000	900,000	207,500	-15,000	13,600	1250,000

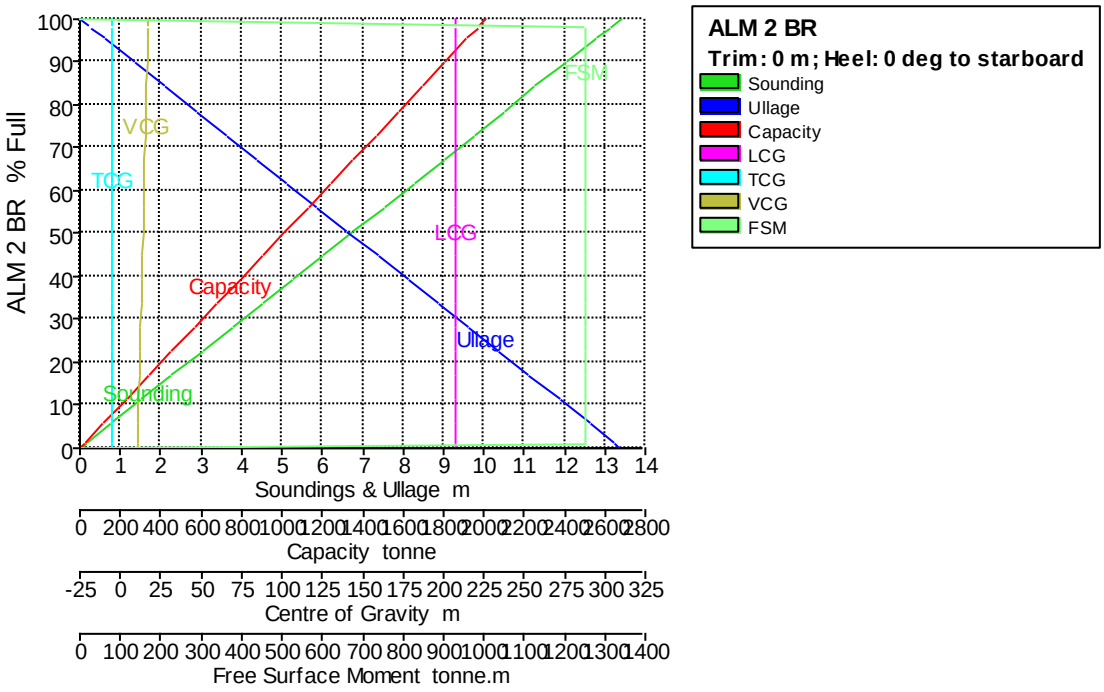
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	5,250	8,150	39,179	787,500	787,500	207,500	-15,000	13,225	1250,000
	4,500	8,900	33,582	675,000	675,000	207,500	-15,000	12,850	1250,000
	3,750	9,650	27,985	562,500	562,500	207,500	-15,000	12,475	1250,000
	3,000	10,400	22,388	450,000	450,000	207,500	-15,000	12,100	1250,000
	2,250	11,150	16,791	337,500	337,500	207,500	-15,000	11,725	1250,000
	1,500	11,900	11,194	225,000	225,000	207,500	-15,000	11,350	1250,000
	0,750	12,650	5,597	112,500	112,500	207,500	-15,000	10,975	1250,000
	0,134	13,266	1,000	20,100	20,100	207,500	-15,000	10,667	1250,000
	0,000	13,400	0,000	0,000	0,000	207,500	-15,000	10,600	0,000

6.1.1.61 **Tank Calibrations - ALM 2 BR**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
ALM 2 BR	13,400	0,000	100,000	2010,000	2010,000	207,500	-5,000	17,300	0,000
	13,132	0,268	98,000	1969,800	1969,800	207,500	-5,000	17,166	1250,000
	13,119	0,281	97,900	1967,790	1967,790	207,500	-5,000	17,159	1250,000
	12,750	0,650	95,149	1912,500	1912,500	207,500	-5,000	16,975	1250,000
	12,000	1,400	89,552	1800,000	1800,000	207,500	-5,000	16,600	1250,000
	11,250	2,150	83,955	1687,500	1687,500	207,500	-5,000	16,225	1250,000
	10,500	2,900	78,358	1575,000	1575,000	207,500	-5,000	15,850	1250,000
	9,750	3,650	72,761	1462,500	1462,500	207,500	-5,000	15,475	1250,000
	9,000	4,400	67,164	1350,000	1350,000	207,500	-5,000	15,100	1250,000
	8,250	5,150	61,567	1237,500	1237,500	207,500	-5,000	14,725	1250,000
	7,500	5,900	55,970	1125,000	1125,000	207,500	-5,000	14,350	1250,000
	6,750	6,650	50,373	1012,500	1012,500	207,500	-5,000	13,975	1250,000
	6,000	7,400	44,776	900,000	900,000	207,500	-5,000	13,600	1250,000

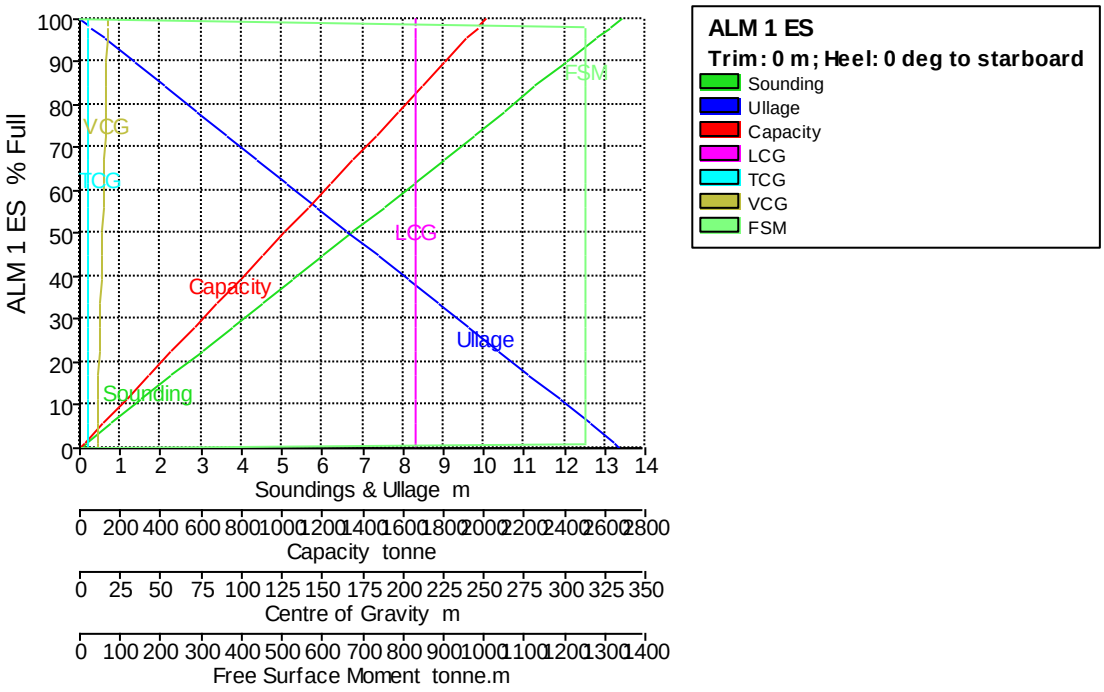
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	5,250	8,150	39,179	787,500	787,500	207,500	-5,000	13,225	1250,000
	4,500	8,900	33,582	675,000	675,000	207,500	-5,000	12,850	1250,000
	3,750	9,650	27,985	562,500	562,500	207,500	-5,000	12,475	1250,000
	3,000	10,400	22,388	450,000	450,000	207,500	-5,000	12,100	1250,000
	2,250	11,150	16,791	337,500	337,500	207,500	-5,000	11,725	1250,000
	1,500	11,900	11,194	225,000	225,000	207,500	-5,000	11,350	1250,000
	0,750	12,650	5,597	112,500	112,500	207,500	-5,000	10,975	1250,000
	0,134	13,266	1,000	20,100	20,100	207,500	-5,000	10,667	1250,000
	0,000	13,400	0,000	0,000	0,000	207,500	-5,000	10,600	0,000

6.1.1.62 **Tank Calibrations - ALM 1 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
ALM 1 ES	13,400	0,000	100,000	2010,000	2010,000	207,500	5,000	17,300	0,000
	13,132	0,268	98,000	1969,800	1969,800	207,500	5,000	17,166	1250,000
	13,119	0,281	97,900	1967,790	1967,790	207,500	5,000	17,159	1250,000
	12,750	0,650	95,149	1912,500	1912,500	207,500	5,000	16,975	1250,000
	12,000	1,400	89,552	1800,000	1800,000	207,500	5,000	16,600	1250,000
	11,250	2,150	83,955	1687,500	1687,500	207,500	5,000	16,225	1250,000
	10,500	2,900	78,358	1575,000	1575,000	207,500	5,000	15,850	1250,000
	9,750	3,650	72,761	1462,500	1462,500	207,500	5,000	15,475	1250,000
	9,000	4,400	67,164	1350,000	1350,000	207,500	5,000	15,100	1250,000
	8,250	5,150	61,567	1237,500	1237,500	207,500	5,000	14,725	1250,000
	7,500	5,900	55,970	1125,000	1125,000	207,500	5,000	14,350	1250,000
	6,750	6,650	50,373	1012,500	1012,500	207,500	5,000	13,975	1250,000
	6,000	7,400	44,776	900,000	900,000	207,500	5,000	13,600	1250,000

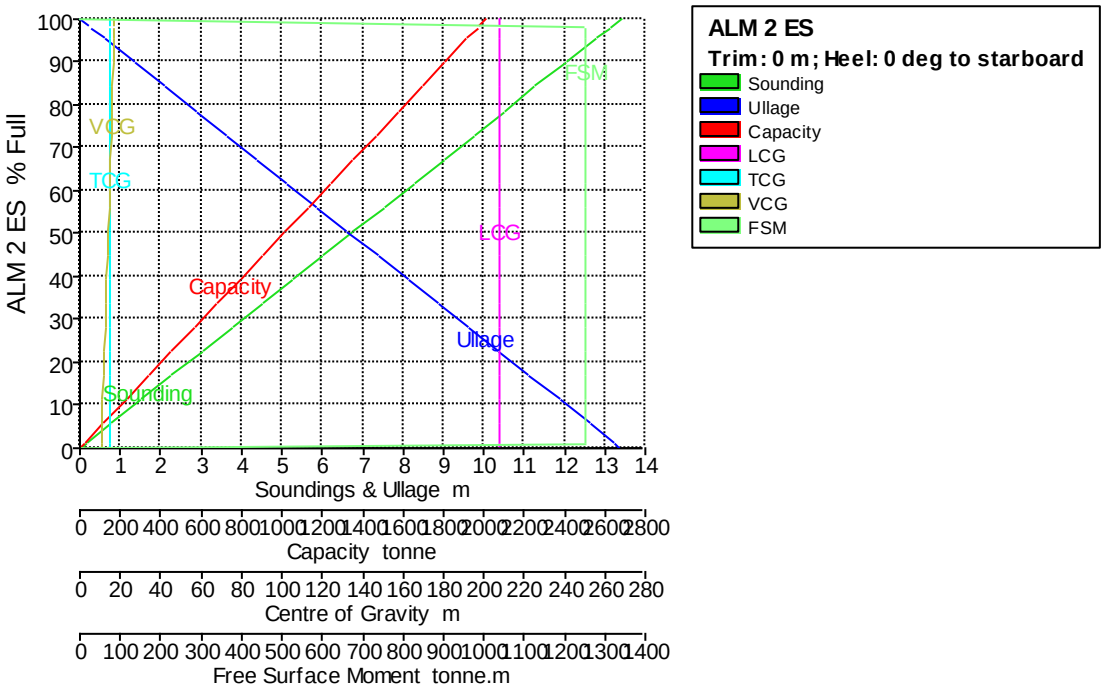
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	5,250	8,150	39,179	787,500	787,500	207,500	5,000	13,225	1250,000
	4,500	8,900	33,582	675,000	675,000	207,500	5,000	12,850	1250,000
	3,750	9,650	27,985	562,500	562,500	207,500	5,000	12,475	1250,000
	3,000	10,400	22,388	450,000	450,000	207,500	5,000	12,100	1250,000
	2,250	11,150	16,791	337,500	337,500	207,500	5,000	11,725	1250,000
	1,500	11,900	11,194	225,000	225,000	207,500	5,000	11,350	1250,000
	0,750	12,650	5,597	112,500	112,500	207,500	5,000	10,975	1250,000
	0,134	13,266	1,000	20,100	20,100	207,500	5,000	10,667	1250,000
	0,000	13,400	0,000	0,000	0,000	207,500	5,000	10,600	0,000

6.1.1.63 **Tank Calibrations - ALM 2 ES**

Fluid Type = Specific gravity = 1

Permeability = 100 %

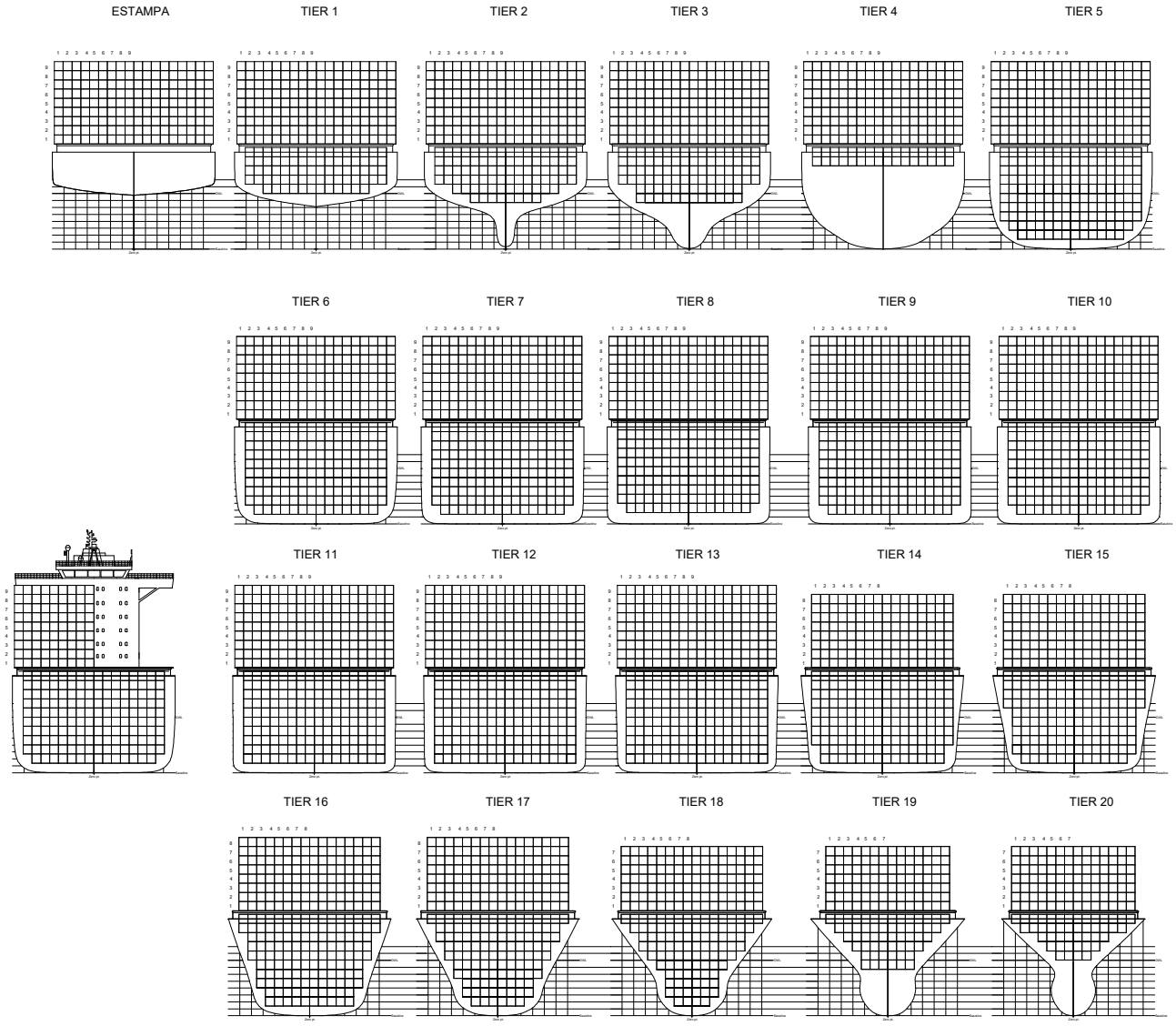
Trim = 0 m (+ve by stern); Heel = 0 deg to starboard



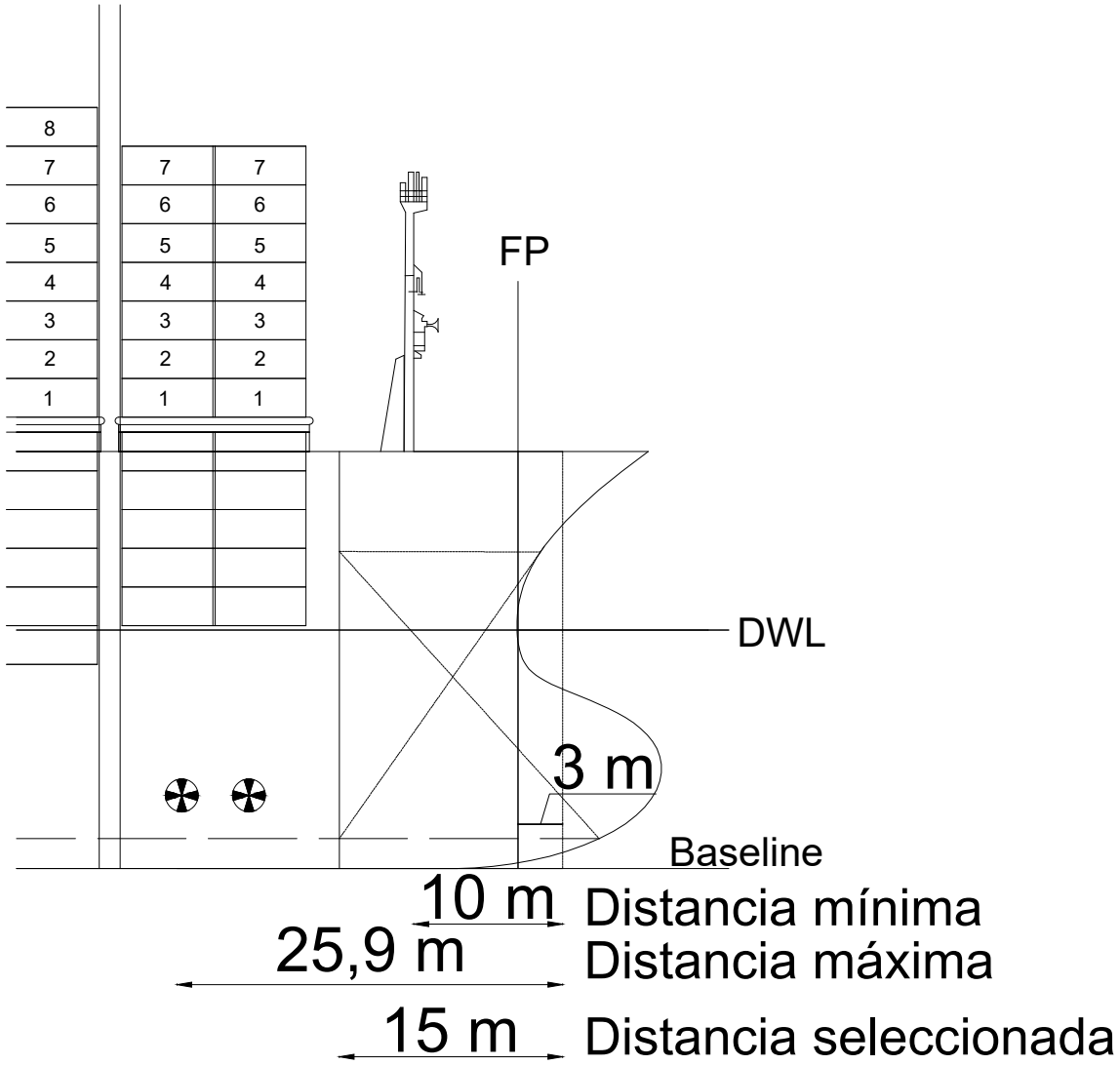
Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
ALM 2 ES	13,400	0,000	100,000	2010,000	2010,000	207,500	15,000	17,300	0,000
	13,132	0,268	98,000	1969,800	1969,800	207,500	15,000	17,166	1250,000
	13,119	0,281	97,900	1967,790	1967,790	207,500	15,000	17,159	1250,000
	12,750	0,650	95,149	1912,500	1912,500	207,500	15,000	16,975	1250,000
	12,000	1,400	89,552	1800,000	1800,000	207,500	15,000	16,600	1250,000
	11,250	2,150	83,955	1687,500	1687,500	207,500	15,000	16,225	1250,000
	10,500	2,900	78,358	1575,000	1575,000	207,500	15,000	15,850	1250,000
	9,750	3,650	72,761	1462,500	1462,500	207,500	15,000	15,475	1250,000
	9,000	4,400	67,164	1350,000	1350,000	207,500	15,000	15,100	1250,000
	8,250	5,150	61,567	1237,500	1237,500	207,500	15,000	14,725	1250,000
	7,500	5,900	55,970	1125,000	1125,000	207,500	15,000	14,350	1250,000
	6,750	6,650	50,373	1012,500	1012,500	207,500	15,000	13,975	1250,000
	6,000	7,400	44,776	900,000	900,000	207,500	15,000	13,600	1250,000

Tank Name	Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
	5,250	8,150	39,179	787,500	787,500	207,500	15,000	13,225	1250,000
	4,500	8,900	33,582	675,000	675,000	207,500	15,000	12,850	1250,000
	3,750	9,650	27,985	562,500	562,500	207,500	15,000	12,475	1250,000
	3,000	10,400	22,388	450,000	450,000	207,500	15,000	12,100	1250,000
	2,250	11,150	16,791	337,500	337,500	207,500	15,000	11,725	1250,000
	1,500	11,900	11,194	225,000	225,000	207,500	15,000	11,350	1250,000
	0,750	12,650	5,597	112,500	112,500	207,500	15,000	10,975	1250,000
	0,134	13,266	1,000	20,100	20,100	207,500	15,000	10,667	1250,000
	0,000	13,400	0,000	0,000	0,000	207,500	15,000	10,600	0,000

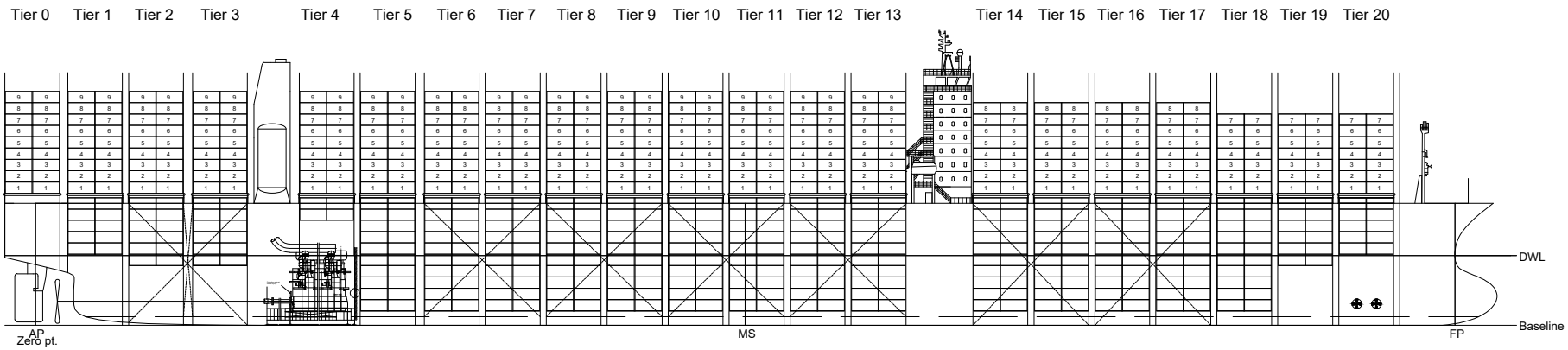
7 ANEXO II: DISPOSICIÓN DE LA CARGA



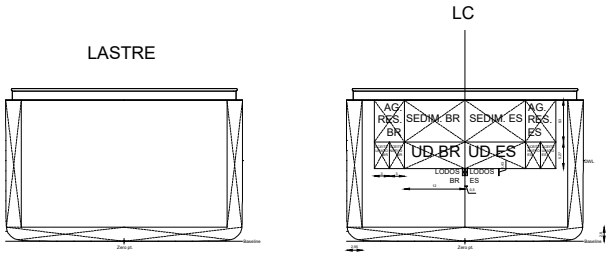
TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: DISPOSICIÓN DE TEUS		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:500

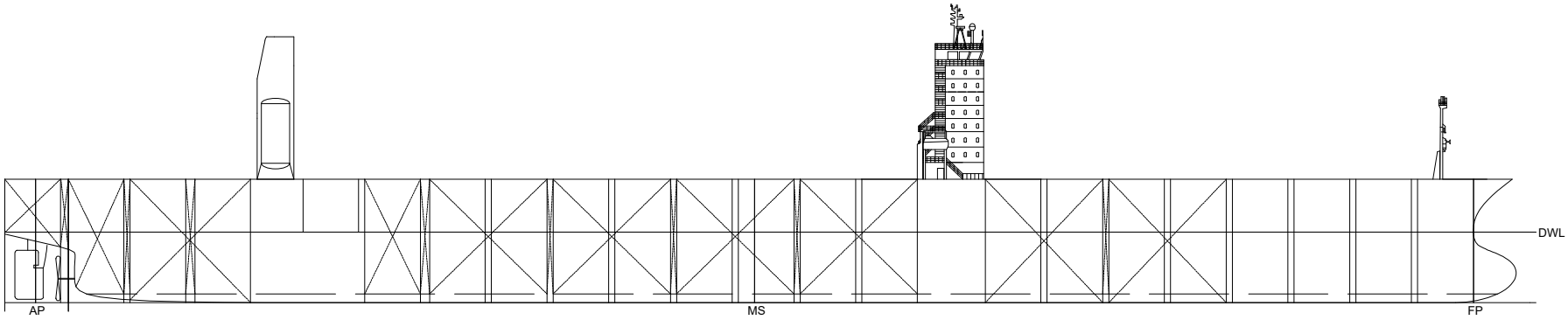


TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: MAMPARO DE COLISIÓN		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:20



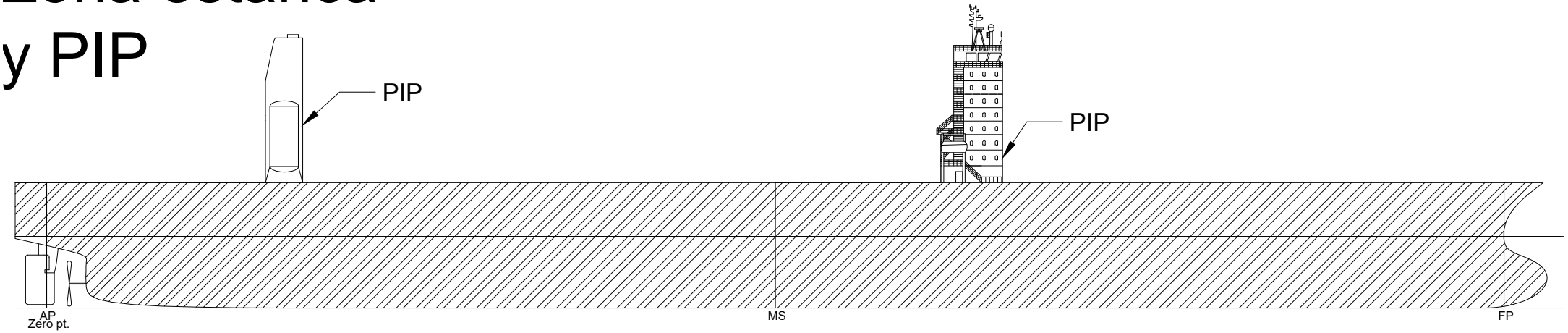
TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: PERFIL DEL BUQUE		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:1500



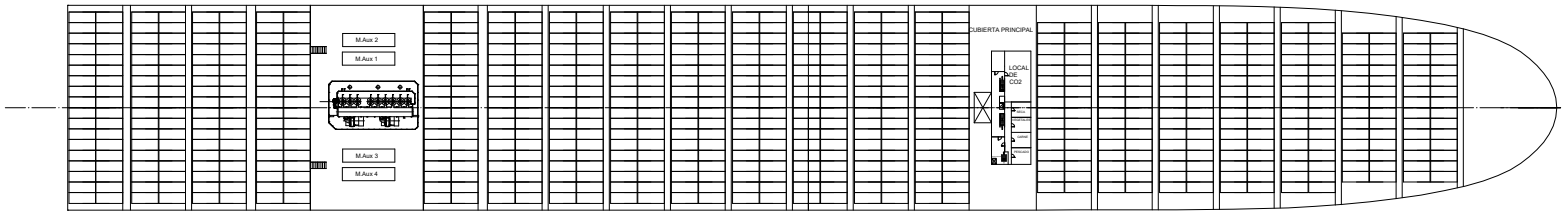


TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: TANQUES		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:1500

Zona estanca y PIP



TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: ZONA ESTANCA Y PIP		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:800



TÍTULO: BUQUE PORTACONTENEDORES POSTPANAMAX DE 1100 TEUS		
PLANO: VISTA EN PLANTA DEL BUQUE		CUADERNO: 4
UNIVERSIDADE DA CORUÑA	AUTOR: MANUEL GARCÍA PENSADO	ESCALA: 1:550