

# **STABILITY DATA REFERENCE BOOK**

**CONTAINING**

**TRIM AND STABILITY BOOKS FOR THE**

## **S.S. AMERICAN MARINER AND S.S. NORTHLAND**

**ALONG WITH SELECTED STABILITY CURVES**

**National Maritime Center Reproduction Created 06/2021**

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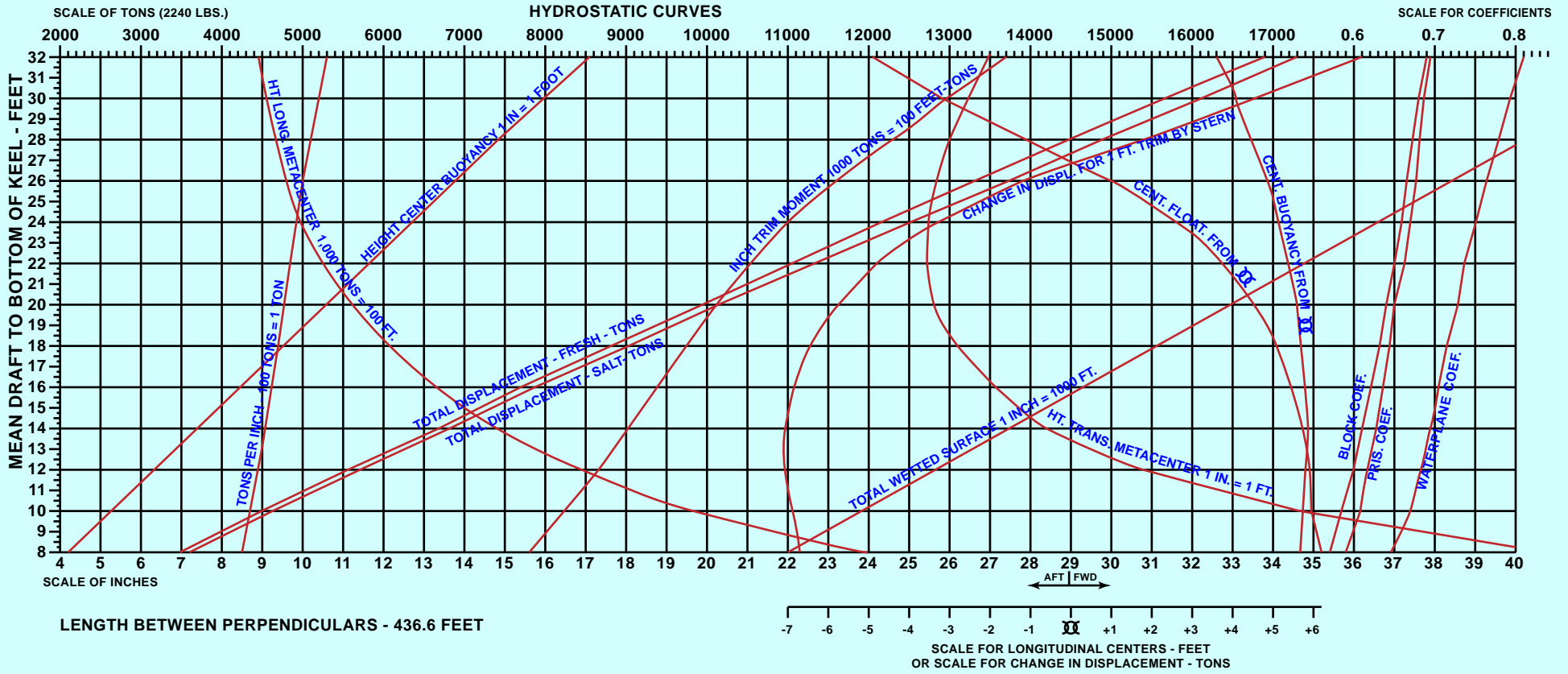
FREEBOARD DRAFT 28 - 06 3/4

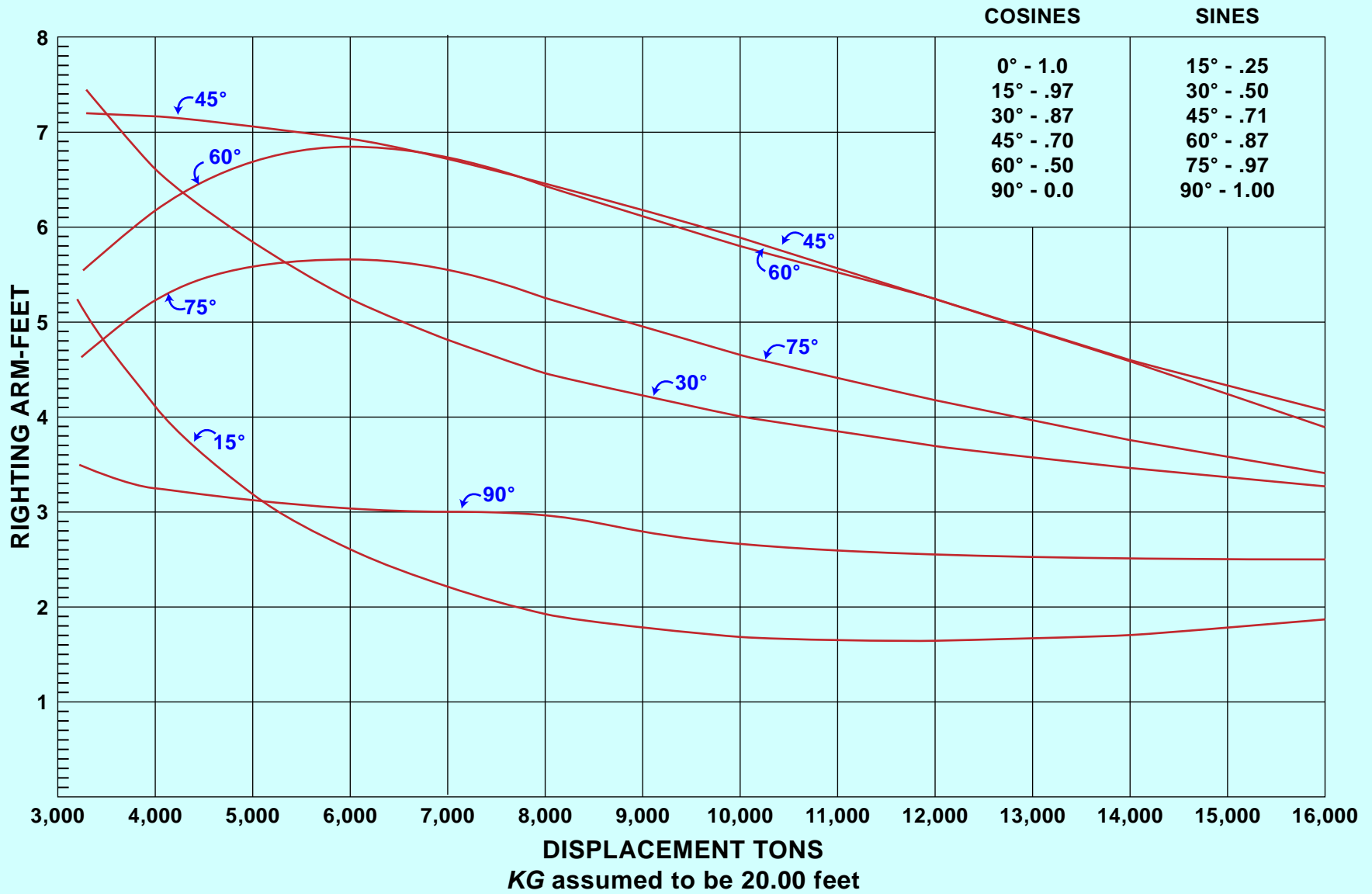
DEADWEIGHT SCALE				
MTI	DEAD WEIGHT	DRAFT	DISPLACEMENT S.W.	TPI
1250	10678	28	15199	51.0
1225	10500		15000	
1200	10000	27	14500	50.5
1175	9500		14000	
1150	9000	26	13500	50.0
1125	8500		13000	
1100	8000	24	12500	49.0
1075	7500		12000	
1050	7000	22	11500	48.5
1025	6500		11000	
1000	6000	20	10500	48.0
975	5500		10000	
950	5000	19	9500	47.5
925	4500		9000	
900	4000	17	8500	46.5
875	3500		8000	
850	3000	16	7500	46.0
825	2500		7000	
803	2000	15	6500	45.5
	1500		6000	
	1000	14	5500	45.0
	500		5000	
	0	13	4500	44.5
			4000	
		12	3500	44.0
			3000	
		11	2500	43.5
			2000	
		10	1500	43.0
			1000	
		9	500	42.5
			0	

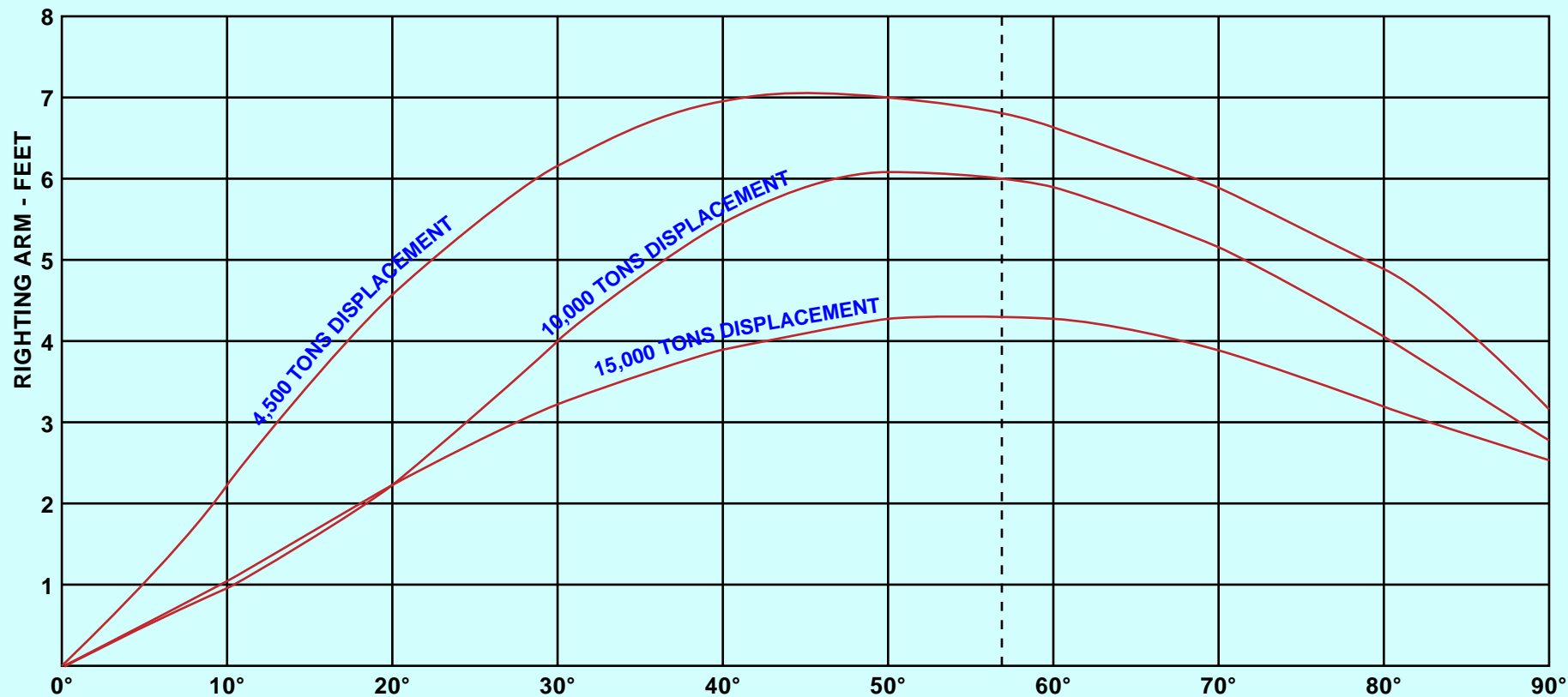
Waterplane coef. *k*  
 .70  
 .75  
 .80  
 .85

Block coef. *k*  
 .65  
 .75  
 .85

LIGHT DRAFT 9 - 10  
 DISPLACEMENT 4521







**TABLE OF SINES**

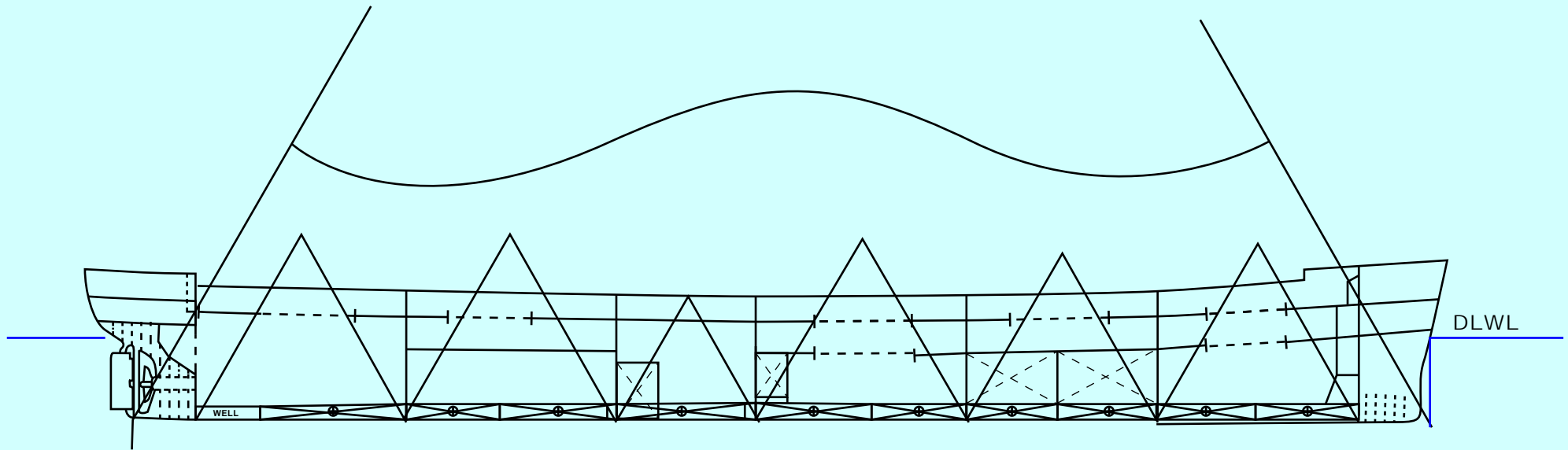
10°	- .17
15°	- .25
30°	- .50
45°	- .71
60°	- .87
75°	- .97
90°	- 1.00

**ANGLE OF INCLINATION**  
**KG assumed to be 20.00 feet**

**STATIC STABILITY CURVES**

**TABLE OF COSINES**

0°	- 1.00
15°	- .97
30°	- .87
45°	- .70
60°	- .50
90°	- 0.00



TRIM  
AND  
STABILITY BOOKLET  
FOR  
SINGLE SCREW CARGO VESSEL  
**S.S. AMERICAN MARINER**  
C4-S-1a

**NAME -**

**OFFICIAL NO.**

PREPARED BY  
DIVISION OF PRELIMINARY DESIGN  
OFFICE OF SHIP CONSTRUCTION  
MARITIME ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE  
APPROVED BY

\_\_\_\_\_  
CHIEF, DIVISION OF PRELIMINARY DESIGN

\_\_\_\_\_  
DATE



### TABLE OF PRINCIPAL CHARACTERISTICS

LENGTH, OVERALL	563'-7¾"	PASSENGERS	12
LENGTH, B.P.	528'-0"	CREW	58
LENGTH, 20 STATIONS	520'-0"	GRAIN CUBIC	837,305 CU. FT.
BEAM, MOLDED	76'-0"	BALE CUBIC	736,723 CU. FT.
DEPTH TO MAIN DK., MLD. AT SIDE	44'-6"	REEFER CUBIC	30,254 CU. FT.
DEPTH TO 2ND. DK., MLD. AT SIDE	35'-6"	FUEL OIL (D.B.'S + SETTLERS)	2652 TONS
BULKHEAD DK.	2ND. DK	FUEL OIL (DEEP TANKS)	1156 TONS
MACHINERY	TURBINE	FUEL OIL, TOTAL	3808 TONS
DESIGNED SEA SPEED	20 KNOTS	FRESH WATER	257 TONS
SHAFT HORSEPOWER, NORMAL	17,500	NO. OF HOLDS	7
SHAFT HORSEPOWER, MAXIMUM	19,250	GROSS TONNAGE	9215
FULL LOAD DRAFT, MLD.	29'-9"	NET TONNAGE	5367
FULL LOAD DISPLACEMENT	21,093 TONS		
LIGHTSHIP	7,675 TONS		
LIGHTSHIP VCG	31.5'		
LIGHTSHIP LCG AFT F. P.	276.5'		



# HYDROSTATIC PROPERTIES

## C4-S-1a

MEAN DRAFT BOTTOM OF KEEL	TOTAL DISP. S.W. TONS	TRANSVERSE KM-MLD. FEET	TONS PER INCH IMMERSION	MOMENT TO TRIM 1" FT. TONS	L.C.B. AFT F.P. FEET	L.C.F. AFT F.P. FEET	MEAN DRAFT BOTTOM OF KEEL
30		31.4		1950		282	30
29	21000	31.3	70	1900	269	281	29
28	20000	31.2	69	1850		280	28
27	19000	31.1	68	1800	268	279	27
26	18000	31.05	67	1750		278	26
25	17000	31.1	66	1700	267	277	25
24	16000	31.2	65	1650		276	24
23	15000	31.3	64	1600	266	275	23
22	14000	31.4	63	1550		274	22
21	13000	31.5	62	1500	265	273	21
20	12000	31.6	61	1450		272	20
19	11000	31.8	60	1400	264	271	19
18	10000	32.0	59	1350		270	18
17	9000	32.5	58	1300	263	269	17
16	8000	33.0	57			268	16
15		33.5	56			267	15
14		34.0	55			266	14
13		34.5	54			265	13
12		35.0	53			265	12
		35.5	52				
		36.0	51				
		37.0	50				
		38.0	49				

**TABLE FOR FREE SURFACE CORRECTION AND TANK CAPACITIES  
C4-S-1a**

		TANK CAPACITY		FREE SURFACE CORRECTION			
		97%	100%	COL A	COL B		
TANK	FRAMES	F.O. TONS	S.W. TONS	i SLACK	i 97%	V.C.G.	L.C.G. F.P.
D.B.1	☒ 14-24	48.2	52.8	106	67	4.5	39.9
D.B.1A	☒ 24-36	81.9	89.8	464	204	4.8	64.9
D.B.2	P 36-57	71.2	78.1	428	158	2.7	106.6
	S 36-57	71.2	78.1	428	158	2.7	106.6
D.B.3	☒ 57-82	227.6	249.5	3777	944	2.5	161.6
	P 57-82	55.6	61.0	300	120	3.0	169.2
	S 57-82	55.6	61.0	300	120	3.0	169.2
D.B.4	☒ 82-106	224.1	245.7	3626	943	2.5	222.0
	P 82-106	128.1	140.5	1138	364	2.6	223.8
	S 82-106	128.1	140.5	1138	364	2.6	223.8
D.B.5	☒ 106-127	196.2	215.1	3173	825	2.5	278.3
	P 106-134	178.0	195.2	2048	676	2.6	288.3
	S 106-134	180.0	197.4	2048	676	2.6	288.3
D.B.6	☒ 134-160	242.3	265.7	3928	1021	2.5	354.4
	P 134-160	87.0	95.4	615	221	2.8	348.2
	S 134-160	87.0	95.4	615	221	2.8	348.2
D.B.7	P 160-184	94.6	103.7	768	269	2.7	412.4
	S 160-184	94.6	103.7	768	269	2.7	412.4
D.T.1	☒ 14-24	125.3	137.4	134	130	16.5	40.3
D.T.1A	☒ 24-36	257.6	282.5	945	680	16.8	65.1
D.T.2	P 106-113	100.7		20	20	19.1	260.8
	S 106-113	100.7		20	20	19.1	260.8
D.T.3	P 113-119	86.1		17	17	19.1	277.0
	S 113-119	86.1		17	17	19.1	277.0
D.T.6	P 160-172	201.2	220.7	1242	634	11.4	401.2
	S 160-172	201.2	220.7	1242	634	11.4	401.2
D.T.7	P 172-184	128.8	141.2	618	358	11.7	430.7
	S 172-184	128.8	141.2	618	358	11.7	430.7
D.T.8	P 184-190	50.5	55.4	68	58	9.6	454.0
	S 184-190	50.5	55.4	68	58	9.6	454.0

		TANK CAPACITY		F.S. CORR.		
		100%	100%	COL C		
TANK	FRAMES	F.W. TONS	S.W. TONS	i SLACK	V.C.G.	L.C.G. F.P.
FORE PEAK	☒ STEM-14		110.8		11.7	17.1
AFT PEAK	☒ 204-218		93.0		24.9	506.8
D.T.4	P / S 120-127	123.7		5575	21.3	296.0
D.T.5	P / S 127-133	108.4		4789	20.9	312.0
DIST. WATER	☒ 106-109	24.9		59	39.5	255.8

**NOTES:**

FUEL OIL AT 37.23 CU. FT./TON-97% FULL  
 FRESH WATER AT 36.0 CU. FT./TON-100% FULL  
 SALT WATER AT 35.0 CU. FT./TON-100% FULL

**FREE SURFACE CORRECTION PROCEDURE**

ADD QUANTITY IN COLUMN A FOR TANKS SLACK  
 ADD QUANTITY IN COLUMN B FOR TANKS 97% FULL  
 ADD QUANTITY IN COLUMN C FOR F.W. TANKS  
 IF ANY TANK IS EMPTY, OR PRESSED UP WITH WATER, USE ZERO FOR THAT TANK.

DIVIDE SUM TOTAL BY THE SHIP DISPLACEMENT IN TONS TO OBTAIN FREE SURFACE CORRECTION IN FEET.

DISPLACEMENT 100 TONS	GAIN IN GM BY BALLASTING (FEET) C4-S-1a													
	TANK	D.B.1	D.B.1A	D.B.2	D.B.3	D.B.4	D.B.5	D.B.6	D.B.7	D.T.1	D.T.1A	D.T.6	D.T.7	D.T.8
	TONS	52	89	156	371	526	607	456	207	137	282	441	282	110
85		.05	.05	.20	.40	.60	.65	.55	.20	-.10	-.15	.05	0	0
90		"	"	"	.45	"	.70	"	"	-.05	-.10	.10	.05	"
95		"	.10	"	"	.65	"	"	.25	"	"	.15	"	"
100		"	"	"	"	"	.75	.60	"	.0	-.05	"	.10	.05
105		"	"	"	.50	.70	"	"	"	"	0	.20	"	"
110		"	"	"	"	"	.80	"	"	"	"	.25	.15	"
115		"	"	"	"	"	"	"	"	.05	.05	.30	"	.10
120		"	"	"	"	"	.85	"	"	"	"	"	.20	"
125		"	"	"	"	"	"	.65	.30	"	.10	.35	"	"
130		"	"	"	"	"	"	"	"	"	"	"	"	"
135		"	"	"	"	"	"	"	"	"	"	"	"	"
140		"	"	"	"	"	"	"	"	"	.15	"	"	"
145		"	"	.25	"	"	"	"	"	"	"	"	.25	"
150		"	"	"	"	"	"	"	"	.10	"	.40	"	"
155		"	"	"	"	"	"	"	"	"	"	"	"	"
160		"	"	"	"	"	"	"	"	"	"	"	"	"
165		"	"	"	"	"	"	"	"	"	"	"	"	"
170		"	"	"	"	"	"	"	"	"	"	"	"	"
175		"	"	"	"	"	"	"	"	"	.20	"	"	"
180		.10	"	"	"	"	"	"	"	"	"	"	"	"
185		"	"	"	"	"	"	"	"	"	"	"	"	"
190		"	"	"	"	"	"	"	"	"	"	"	"	"
195		"	"	"	"	"	"	"	"	"	"	"	"	"
200		"	"	"	"	"	"	"	"	"	"	"	"	"
205		"	"	"	"	"	"	"	"	"	"	"	"	.15
210		"	"	"	"	"	"	"	"	"	"	"	.30	"
213		"	"	"	"	"	"	"	"	"	"	"	"	"
215		"	"	"	"	"	"	"	"	"	"	"	"	"

# REQUIRED GM CURVE



THE REQUIRED GM VALUES GIVEN IN THIS DIAGRAM MUST BE MAINTAINED IN ORDER TO ENABLE THE SHIP UNDER AVERAGE OPERATING CONDITIONS, TO SUSTAIN DAMAGE IN ANY ONE COMPARTMENT WITHOUT REACHING A CONDITION OF NEGATIVE STABILITY AFTER DAMAGE, AND WITHOUT HEELING WHICH MIGHT RESULT IN FLOODING AN UNDAMAGED COMPARTMENT.

VOYAGE NO.

## LOADING TABLE

C4-S-1a

### DRY CARGO

HOLD	BALE CUBIC	TONS	KG	MOMENT	LCG F.P.	MOMENT
NO. 1 - MAIN DK.	16085		55.6		59.2	
NO. 1 - 2ND DK.	18140		45.2		54.8	
NO. 1 - 3RD DK.	12210		31.9		56.6	
NO. 2 - 2ND DK.	29255		43.0		104.4	
NO. 2 - 3RD DK.	34592		29.1		105.3	
NO. 2 - TANKTOP	25476		13.1		106.2	
NO. 3 - 2ND DK.	42000		41.3		161.3	
NO. 3 - 3RD DK.	58150		28.3		161.6	
NO. 3 - TANKTOP	51375		12.7		162.7	
NO. 4 - 2ND DK.	40255		40.3		221.5	
NO. 4 - 3RD DK.	60020		27.7		221.9	
NO. 4 - TANKTOP	61140		12.5		223.1	
NO. 5 - 2ND DK.	41775		40.5		356.5	
NO. 5 - 26'-6" FLAT ☉	16388		30.8		350.2	
NO. 5 - 3RD DK. ☉	16022		21.4		351.0	
NO. 5 - TANKTOP	38135		10.9		353.6	
NO. 6 - 2ND DK.	38610		41.0		416.5	
NO. 6 - 3RD DK.	65850		26.9		415.5	
NO. 6 - DEEP TANK P/S	11930		11.2		402.6	
NO. 7 - 2ND DK.	25095		41.8		469.6	
NO. 7 - 3RD DK.	34220		28.4		469.4	
TOTAL	736723					

### REEFER CARGO

HOLD	REEFER CUBIC	TONS	KG	MOMENT	LCG F.P.	MOMENT
NO. 5 - 26'-6" FLAT P/S	16256		30.7		354.4	
NO. 5 - 3RD DK. P/S	13998		21.8		353.4	
TOTAL	30254					

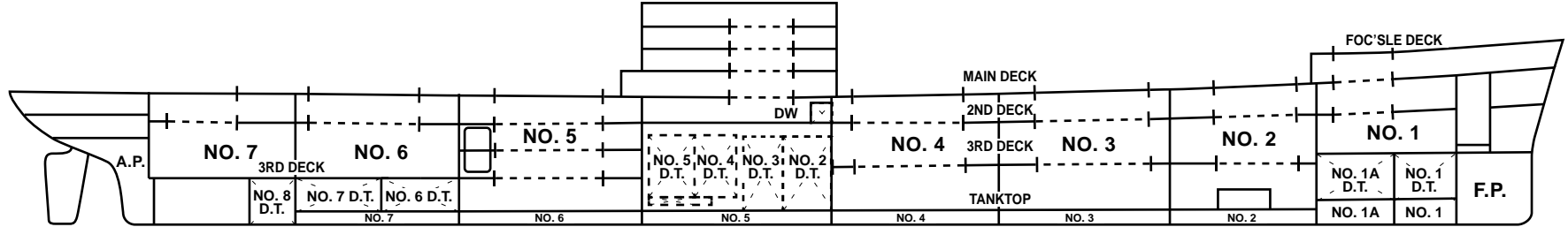
### FUEL OIL OR BALLAST

TANK	F.S.	TONS F.O.-S.W.	KG	MOMENT	LCG F.P.	MOMENT
NO. 1 - D.B. ☉			4.5		39.9	
NO.1A - D.B. ☉			4.8		64.9	
NO.2 - D.B. P/S			2.7		106.6	
NO.3 - D.B. ☉			2.5		161.6	
NO.3 - D.B. P/S			3.0		169.2	
NO.4 - D.B. ☉			2.5		222.0	
NO.4 - D.B. P/S			2.6		223.8	
NO.5 - D.B. ☉			2.5		278.3	
NO.5 - D.B. P/S			2.6		288.3	
NO.6 - D.B. ☉			2.5		354.4	
NO.6 - D.B. P/S			2.8		348.2	
NO.7 - D.B. P/S			2.7		412.4	
NO.1 - D.T. ☉			16.5		40.3	
NO1A - D.T. ☉			16.8		65.1	
NO.2 - D.T. P/S			19.1		260.8	
NO.3 - D.T. P/S			19.1		277.0	
NO.6 - D.T. P/S			11.4		401.2	
NO.7 - D.T. P/S			11.7		430.7	
NO.8 - D.T. P/S			9.6		454.0	
FORE PEAK			11.7		17.1	
AFTER PEAK			24.9		506.8	
TOTAL						

### FRESH WATER

TANK	F.S.	TONS F.W.	KG	MOMENT	LCG F.P.	MOMENT
NO. 4 - D.T. P/S			21.3		296.0	
NO. 5 - D.T. P/S			20.9		312.0	
DIST. WATER			39.5		255.8	
TOTAL						

VOYAGE NO.



ITEM	TONS	KG	MOMENT	L.C.G. F.P.	MOMENT	F.S.
LIGHTSHIP	7675	31.5	241763	276.5	2122138	X
CREW & STORES	50	43.7	2185	276.5	13825	
LUBE OIL	13	25.8	335	317.5	4128	9
FUEL OIL & SALT WATER						
FRESH WATER						
DRY CARGO						
REEFER CARGO						
DECK CARGO						
TOTAL						

- DRY OR REEFER CARGO
- FRESH WATER
- FUEL OIL
- SALT WATER

MEAN S.W. DRAFT (SEE SHEET 3) \_\_\_\_\_  
 KM 9 (SEE SHEET 3) \_\_\_\_\_  
 KG \_\_\_\_\_  
 GM \_\_\_\_\_  
 CORR. FOR F.S. \_\_\_\_\_  
 GM AVAILABLE \_\_\_\_\_  
 GM REQUIRED (SEE SHEET 6) \_\_\_\_\_

LCG -FP \_\_\_\_\_  
 LCB (SEE SHEET 3) \_\_\_\_\_  
 TRIM LEVER FWD, AFT \_\_\_\_\_  
 MOMENT TO TRIM 1" \_\_\_\_\_  
 TRIM IN INCHES FWD, AFT \_\_\_\_\_

LCG -FP(SHEET 3) \_\_\_\_\_  
 DRAFT FWD. \_\_\_\_\_  
 DRAFT AFT \_\_\_\_\_



## DOUBLE BOTTOM TANKAGE REQUIREMENTS IN TONS TO MEET ONE COMPARTMENT DAMAGE FOR NORMAL CONDITIONS OF LOADING

TOTAL CARGO PLUS D.T.1, 1A, 6, 7, 8.8 (COL. 1+2+3)	EXCESS OF HOLD WEIGHT OVER UPPER TWEEN DECK WEIGHT IN TONS (COL. 3 - COL. 1)						ADDITIONAL D.B. TANKAGE PER 100 TONS OF DECK CARGO
	+1500	+1000	+500	0	-500	-1000	
1000		0	0	75	475	850	150
2000	0	0	0	800	1225	1600	140
3000	0	150	550	950	1350	1750	130
4000	0	325	675	1050	1400	1775	120
5000	50	400	750	1100	1425	1775	110
6000	100	400	725	1050	1350	1650	100
7000	50	350	650	950	1275	1600	90
8000	0	200	500	800	1100	1400	80
9000	0	0	325	650	1000	1600	70
10000	0	250	500	800	1050	1325	60
11000	0	50	325	575	825	1100	50
12000	0	0	0	275	625		

THE FOLLOWING FORMS MAY BE USED TO DETERMINE THE REQUIRED DOUBLE BOTTOM TANKAGE FROM THE ABOVE TABLE.

COL. 1		COL. 2		COL. 3	
UPPER TWEEN DK LAYER	TONS	LOWER TWEEN DK. LAYER	TONS	HOLD LAYER	TONS
NO. 1 MAIN DK.		NO. 1 3RD DK.		NO. 1 DEEP TANK ☒	
NO. 1 2ND DK.		NO. 2 3RD DK.		NO. 1A DEEP TANK ☒	
NO. 2 2ND DK.		NO. 3 3RD DK.		NO. 2 TANKTOP	
NO. 3 2ND DK.		NO. 4 3RD DK.		NO. 3 TANKTOP	
NO. 4 2ND DK.		NO. 5 26'-6" FLAT <small>DRY &amp; REEFER</small>		NO. 4 TANKTOP	
NO. 5 2ND DK.		NO. 5 3RD DK. <small>DRY &amp; REEFER</small>		NO. 5 TANKTOP	
NO. 6 2ND DK.		NO. 6 3RD DK.		NO. 6 DEEP TANK P/S	
NO. 7 2ND DK.		NO. 7 3RD DK.		NO. 7 DEEP TANK P/S	
				NO. 8 DEEP TANK P/S	
TOTAL		TOTAL		TOTAL	

SUMMARY	
ITEM	TONS
TOTAL COL. 1	
TOTAL COL. 2	
TOTAL COL. 3	
TOTAL COL. 1 + 2 + 3	
TOTAL COL. 3 - COL. 1	
REQUIRED TANKAGE (FROM TABLE)	
DECK CARGO IN TONS =	TONS
REQUIRED D.B. TANKAGE FOR DK CARGO	<input type="checkbox"/>
TOTAL REQUIRED D.B. TANKAGE	

# **S/S NORTHLAND**

**LOADING, TRIM & STABILITY BOOKLET**

**DEDICATED CLEAN BALLAST TANK CONFIGURATION**

**IN ACCORDANCE WITH IMCO REGULATION 13A OF 1978 PROTOCOL TO MARPOL 1973**

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**PRODUCTS LOADING CONDITIONS**

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**CRUDE OIL LOADING CONDITIONS**

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BLANK FORMS - SUMMARY, SHIP'S DEADWEIGHT, CARGO DETAILS, BALLAST DETAILS, STRENGTH .....	81A-81E

## NOTES TO MASTER AND PRINCIPAL PARTICULARS

1. The following cargo tanks are piped for either crude oil or clean sea water ballast (after crude oil washing):
  - Cargo Tank No. 6 P, S, & CL
  - Cargo Tank No. 7 P & S
  - Cargo Tank No. 8 CL
  - Cargo Tank No. 9 CL
  
2. The above-noted tanks are NOT to be used for either products cargo or sea water ballast when carrying products.
  
3. A light ship plus clean sea water ballast condition is included herein to demonstrate compliance with the requirements of Regulation 13A of the International Conference on Tanker Safety and Pollution Prevention. 1978.
  
4. The Products Loading Conditions herein are predicated on a maximum draft at bow or stern of 38.50' for transit of the Panama Canal.

5. Principal Particulars:

Length Overall	-----	736'	-	3- <sup>3</sup> / <sub>4</sub> "
Length Between Perpendiculars	-----	705'	-	0"
Breadth Moulded	-----	102'	-	0"
Depth Moulded	-----	50'	-	0"
Full Load Draft Summer Freeboard	-----	39'	-	9- <sup>3</sup> / <sub>4</sub> "
Full Loaded Displacement	-----	62,160		
Deadweight	-----	49,339		

## INSTRUCTIONS FOR COMPLETION OF TRIM AND STABILITY LOADING CONDITION FORMS

1. Blank forms for calculation of trim and stability for conditions not covered by this booklet are:

Sheet 81A Summary Sheet  
81B Details of Ship's Deadweight  
81C Details of Cargo Loading  
81D Details of Sea Water Ballast

2. Enter weights and free surface on Sheets 81B, 81C and 81D as applicable. Compute moments and totals and enter on Summary Form, Sheet 81A, and compute summary totals. Take care to enter longitudinal moments as + for Aft, - for Forward.

3. For the displacement, Sheet 81A, read mean draft from sheet 7, Curves of Form. At this draft, read Curves of Form data for KM, LCB, MT 1" and LCF. Enter these data on Sheet 81A.

4. Transverse Stability

Subtract the total VCG (=KG) from KM to obtain the GM uncorrected for free surface. Divide the total free surface by the displacement to obtain the free surface correction and subtract this value from the uncorrected GM. The final result is the GM corrected for free surface, which must be at least 1.2 FT (to suit max req'd weather criteria GM at IMCO Ballast Draft per superseded Stability Booklet).

5. Trim

Subtract the total LCG from the LCB to obtain the trimming lever. Trim is by stern if LCG is aft of LCB and by bow otherwise. Compute trim by multiplying displacement by trimming lever and dividing by product (MT1 x 12") For drafts of 32 FT or greater and/or small trim, the effect of LCF on trim is small and forward and aft drafts can be computed by adding or subtracting (to suit trim by bow or stern) half the trim from the mean draft. For large trim at drafts less than 32 feet compute draft at bow = mean draft - trim x (352.5 - LCF)/705. The draft & LCF values are treated algebraically; i.e., the minus signs in the expression change to plus for trim by bow and/or LCF aft of amidships. Drafts at stern is draft at bow - trim.

## INSTRUCTIONS FOR COMPLETION OF FORMS TO DETERMINE HOGGING AND SAGGING NUMERALS

1. Sheet 81E is the form for computing longitudinal bending stress numerals. The resulting numeral should not exceed 100.
2. The weights entered on Sheets 81B, 81C, and 81D, divided by 100 and as applicable, are entered in the "Tons/100" column of Sheet 81E for departure and arrival conditions. Multiply the "Tons/100" by the Hogging and Sagging Factors for all weights entered in lines 1-27 and enter totals on line 28, "Total Deadweight."
3. Line 29 gives the light ship value for "Tons/100" and the associated hogging and sagging numerals. The light ship value includes weights for spare tailshaft and stowage as given on Sheet 81B ( $[12821 + 29]/100 = 128.50$ ). Add lines 28 and 29 to obtain line 30 displacement and hogging and sagging numerals for departure and arrival conditions.
4. Enter the "Tons/100" deadweight from line 28 in line 31 "Numeral" columns for both hogging and sagging, and subtract from line 30. the resulting values in line 32 must not exceed 100.

## TANK CAPACITIES AND CENTERS OF GRAVITY

CARGO TANKS	FRS	BBLs	VCG ABV.	LCG	FUEL OIL TANKS	FRS	CAPACITY CUBIC FT	F.O. - TONS	VCG ABV.	LCG
		98% FULL	MLD BL	FROM ☒				37.23 CU. FT./LT 98% FULL	MLD BL	FROM ☒
NO. 1 CL	102-107	15,878	26.13	227.5F	SETTLER (P)	58-60	8459	222.5	37.83	205.3A
NO. 1 P/S	102-107	15,460	27.53	226.4F	SETTLER (S)	58-60	8441	222.5	37.83	205.3A
NO. 2 CL	97-102	15,878	26.13	187.5F	DEEP TANK (P)	58-60	17436	459.0	29.83	203.8A
NO. 2 P/S	97-102	18,944	26.33	187.1F	DEEP TANK (S)	58-60	17436	459.0	29.83	203.8A
NO. 3 CL	93-97	15,878	26.13	147.5F	DEEP TANK (P)	108-120	52426	1354.0	29.53	267.6F
NO. 3 P/S	93-97	20,094	25.93	147.5F	DEEP TANK (S)	108-120	<u>57457</u>	<u>1513.0</u>	<u>28.13</u>	<u>265.1F</u>
NO. 4 CL	89-93	15,878	26.13	107.5F			161655	4230.0	29.7	114.6F
NO. 4 P/S	89-93	20,254	25.93	107.5F						
NO. 5 CL	85-89	15,866	26.13	67.5F						
NO. 5 P/S	85-89	20,254	25.93	67.5F						
NO. 6 CL	81-85	15,855	26.13	27.5F	<u>FRESH WATER TANKS</u>	<u>FRS</u>	<u>CAPACITY CUBIC FT</u>	<u>TONS 100% FULL</u>	<u>VCG ABV. MLD BL</u>	<u>LCG FROM ☒</u>
NO. 6 P/S	81-85	20,254	25.93	27.5F	POTABLE (P)	13-17	1569.5	43.60	48.53	322.4A
NO. 7 CL	77-81	15,867	26.13	12.5A	POTABLE (S)	13-17	1118.9	31.08	48.53	321.5A
NO. 7 P/S	77-81	20,254	25.93	12.5A	POTABLE CL	88-90	1089.0	30.25	57.43	90.0F
NO. 8 CL	73-77	15,867	26.13	52.5A	DISTILLED (P)	39-45	<u>2160.0</u>	<u>60.00</u>	42.73	258.5A
NO. 8 P/S	73-77	20,254	25.93	52.5A			5937.4	164.93		
NO. 9 CL	69-73	15,850	26.13	92.5A	<u>BALLAST TANKS</u>					
NO. 9 P/S	69-73	20,066	25.95	92.5A	FORE PEAK	STEM-130	26198	748.5	22.03	323.0F
NO. 10 CL	65-69	15,857	26.13	132.5A	AFT PEAK	STERN-17	13801	394.3	36.53	333.8A
NO. 10 P/S	65-69	19,364	26.23	132.5A	DEEP TANK (P)	120-130	30623	874.9	29.13	295.1F
NO. 11 CL	61-65	15,850	26.13	172.5A	DEEP TANK (S)	120-130	30521	872.0	29.13	295.1F
NO. 11 P/S	61-65	<u>17,244</u>	<u>26.93</u>	<u>171.9A</u>	<u>COFFERDAMS</u>					
		386,956	26.2	26.4F	FWD (P)	107-108	4703	134.4	27.93	249.0F
					FWD (S)	107-108	7134	203.8	27.93	249.0F
					AFT (P)	60-61	4190	119.7	31.13	194.0A
					AFT (S)	60-61	4190	119.7	31.13	194.0A

NOTES: VCG's of slack cargo & deep tanks are obtained by multiplying the VCG's shown by % fullness of tank.

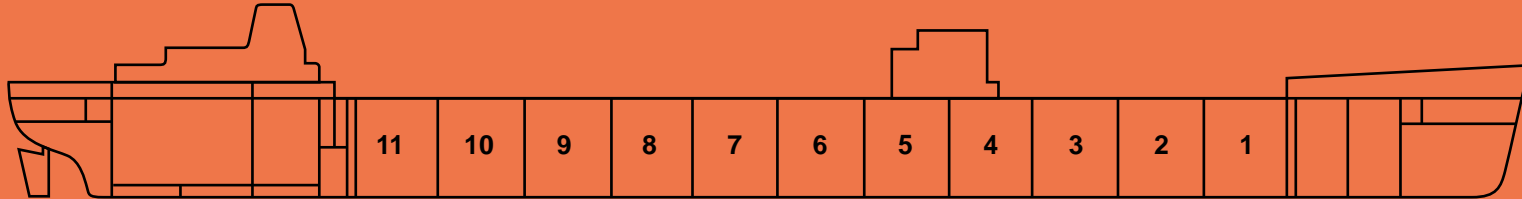
## VERTICAL MOMENTS OF FREE SURFACE OF LIQUIDS - FT TONS

CARGO TANKS							FUEL, FRESH WATER, BALLAST & WASH WATER			
NO.	I (FT <sup>4</sup> )	61° API (48.93) (CF/T) I/δ	40° API (43.58) (CF/T) I/δ	30° API (41.04) (CF/T) I/δ	14° API (36.97) (CF/T) I/δ	S.W. (35.00) (CF/T) I/δ	FUEL OIL	I(FT <sup>4</sup> )	I/δ	
1 CL	283,940	5804	6515	6920	7682	8114	SETTLER (P) OR (S)	FR. 58-60	11,450	308
1 (P) OR (S)	52,000	1060	1190	1264	1403	1482	AFT BUNKER (P) OR (S)	FR. 58-60	30,500	819
2 CL	283,940	5804	6517	6920	7682	8114	FWD BUNKER (P)	FR. 108-120	160,051	4299
2 (P) OR (S)	77,000	1588	1783	1893	2102	2220	FWD BUNKER (S)	FR. 108-120	160,051	4299
3 CL	283,940	5804	6517	6920	7682	8114	<b>FRESH WATER</b>			
3 (P) OR (S)	81,100	1658	1862	1977	2195	2318	STEERING RM (P)	FR. 13-17	15,768	438
4 CL	283,940	5804	6517	6920	7682	8114	STEERING RM (S)	FR. 13-17	10,728	298
4 (P) OR (S)	81,290	1662	1866	1982	2200	2323	DISTILLED (P)	FR. 37-45	9,324	259
5 CL	283,940	5804	6517	6920	7682	8114	UNDER BRIDGE	FR. 88½-90½	2,160	60
5 (P) OR (S)	81,290	1662	1866	1982	2200	2323	<b>S.W. BALLAST</b>			
6 CL	283,940	5804	6517	6920	7682	8114	FORE PEAK	STEM FR. -130	109,060	3,116
6 (P) OR (S)	81,290	1662	1866	1982	2200	2323	AFT PEAK	FR. 17-STERN	160,335	4,581
7 CL	283,940	5804	6517	6920	7682	8114	BALLAST (P) OR (S)	FR. 120-130	55,510	1,586
7 (P) OR (S)	81,290	1662	1866	1982	2200	2323				
8 CL	283,940	5804	6517	6920	7682	8114				
8 (P) OR (S)	81,290	1662	1866	1982	2200	2323				
9 CL	283,940	5804	6517	6920	7682	8114				
9 (P) OR (S)	81,290	1662	1866	1982	2200	2323				
10 CL	283,940	5804	6517	6920	7682	8114				
10 (P) OR (S)	81,100	1658	1862	1977	2195	2318				
11 CL	283,940	5804	6517	6920	7682	8114				
11 (P) OR (S)	77,930	1593	1789	1900	2109	2227				

1. To obtain the free surface correction to GM in any condition of loading, add the I/δ values of all slack tanks and divide by the displacement of vessel.
2. Values of I/δ for different API cargo may be obtained by either dividing tabular values of I(FT<sup>4</sup>) by corresponding density of cargo in tank, or by interpolation.





37' -0" DRAFT

FWD	-2.0	-1.7	-1.4	-1.1	-0.9	-0.7	-0.3	0	+0.3	+0.6	+1.0	+1.3	+1.6	+1.9	+2.2	+2.6	+2.9	+3.1	+3.3	FWD
AFT	+3.4	+3.1	+2.8	+2.5	+2.3	+2.1	+1.8	+1.4	+1.1	+0.8	+0.5	+0.2	-0.2	-0.5	-0.8	-1.1	-1.4	-1.7	-1.9	AFT

27' -0" DRAFT

FWD	-2.4	-2.1	-1.7	-1.4	-1.2	-0.9	-0.6	-0.2	+0.2	+0.5	+0.9	+1.3	+1.6	+2.0	+2.4	+2.7	+3.1	+3.3	+3.6	FWD
AFT	+4.0	+3.7	+3.4	+3.0	+2.8	+2.5	+2.1	+1.7	+1.3	+1.0	+0.6	+0.2	-0.2	-0.6	-1.0	-1.3	-1.7	-2.0	-2.3	AFT

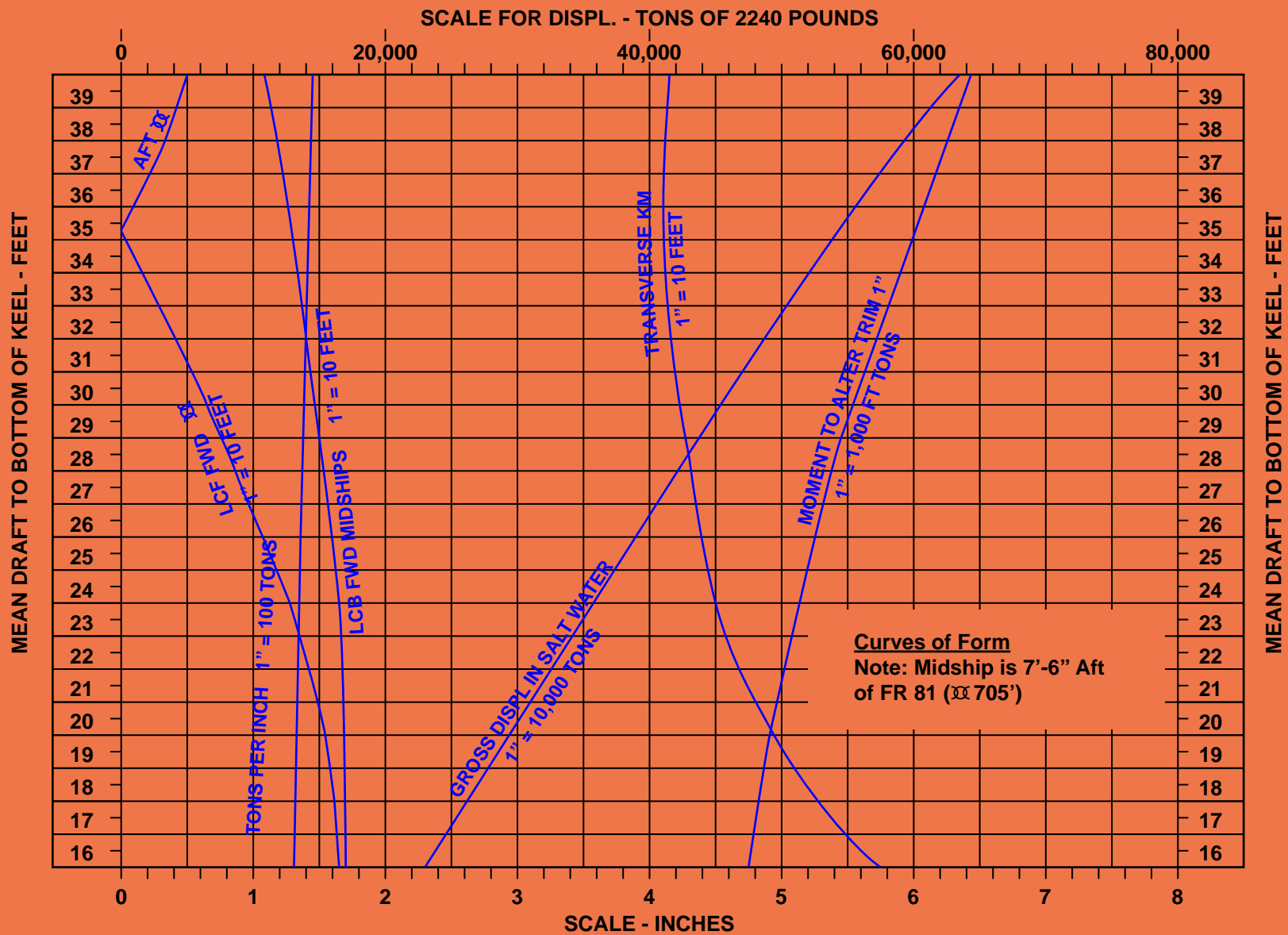
CHANGE IN DRAFTS IN INCHES FOR EACH 100 TONS ADDED

EXAMPLE: Add 500 Tons in No. 11 Tank

Original Drafts	FWD	34'-6"	AFT	33'-6"
Correction	5(-0.7)=	-3½"	5(+2.1)=	+10½"
New Drafts	FWD	34'-2½"	AFT	34'-4½"

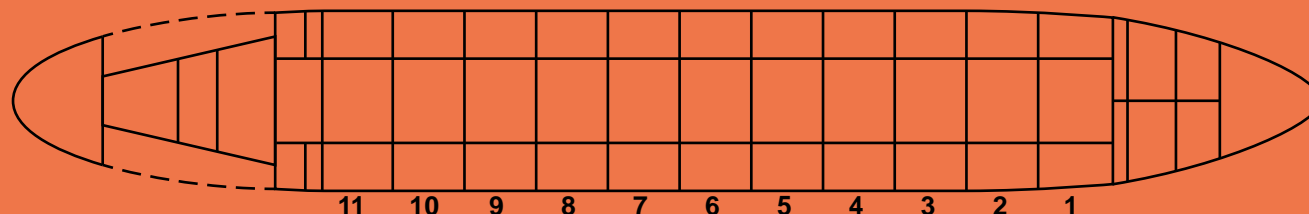
NOTE:

1. For discharging, reverse + and - signs in the table.
2. Corrections for intermediate drafts may be interpreted from the table.



**LOADING SUMMARY**

**CONDITION:**



- LEGEND**
-  CARGO
  -  BALLAST WATER
  -  FRESH WATER
  -  FUEL OIL

DESCRIPTION	L. TONS	VCG ABOVE BL (FT)	VERTICAL MOMENT (FT TONS)	LCG FROM $\square$ FT (+ = AFT)	LONGITUDINAL MOMENT (FT TONS)	FREE SURFACE (FT TONS)
LIGHT SHIP	12821	32.23	413,221	23.06 A	295,652	-
SHIP'S DEADWEIGHT - SHEET 81B						
CARGO - SHEET 81C						
CLEAN S.W. BALLAST - SHEET 81D						
<b>TOTALS</b>						

**STABILITY**

MEAN DRAFT AT LFC FT =  
 KM FT =  
 KG FT =  
 GM (UNCORR) FT =  
 F.S. CORRECTION FT =  
 GM AVAILABLE FT =

**TRIM**

LFC =  
 LCB =  
 LCG =  
 TRIM LVR =  
 MT 1" FT TONS =  
 TRIM =  
 DRAFT - FP =  
 DRAFT - AP =

**DETAILS OF SHIP'S DEADWEIGHT - CONDITION \_\_\_\_\_**

DESCRIPTION	L. TONS	VCG ABOVE BL (FT)	VERTICAL MOMENT (FT TONS)	LCG FROM $\bar{x}$ FT (+ = AFT)	LONGITUDINAL MOMENT (FT TONS)	FREE SURFACE (FT TONS)
CREW & EFFECTS - DECK HOUSE	3	68.23	205	90.0 F	- 270	-
CREW & EFFECTS - AFT HOUSE	7	56.23	394	256.0 A	1792	-
SPARE TAIL SHAFT & STOWAGE	29	8.23	239	298.5 A	8656	-
<b>TOTAL CONSTANTS</b>	<b>(39)</b>	<b>21.5</b>	<b>(838)</b>	<b>261.0 A</b>	<b>(10178)</b>	<b>-</b>
STORES - FORWARD		54.23		307.0 F		-
STORES - DECK HOUSE		54.23		90.0 F		-
STORES - AFT HOUSE		54.23		276.3 A		-
FRESH WATER - UNDER BRIDGE		57.43		90.0 F		
FRESH WATER - DISTILLED		42.73		258.5 A		
FRESH WATER - STEERG GR RM (P)		48.53		322.4 A		
FRESH WATER - STEERG GR RM (S)		48.53		321.5 A		
FUEL OIL - AFT BUNKER (P)		29.83		203.8 A		
FUEL OIL - AFT BUNKER (S)		29.83		203.8 A		
FUEL OIL - SETTLER (P)		37.83		205.3 A		
FUEL OIL - SETTLER (S)		37.83		205.3 A		
FUEL OIL - FWD BUNKER (P)		29.53		267.6 F		
FUEL OIL - FWD BUNKER (S)		28.13		265.1 F		
<b>TOTALS</b>						

CARGO - @ \_\_\_\_\_ ° API (0. \_\_\_\_\_ SP.GR.)

DESCRIPTION	L. TONS	VCG ABOVE BL (FT)	VERTICAL MOMENT (FT TONS)	LCG FROM ☒ FT (+ = AFT)	LONGITUDINAL MOMENT (FT TONS)	FREE SURFACE (FT TONS)
NO. 1 CL		26.13		227.5 F		
NO. 1 P/S		27.53		226.4 F		
NO. 2 CL		26.13		187.5 F		
NO. 2 P/S		26.33		187.1 F		
NO. 3 CL		26.13		147.5 F		
NO. 3 P/S		25.93		147.5 F		
NO. 4 CL		26.13		107.5 F		
NO. 4 P/S		25.93		107.5 F		
NO. 5 CL		26.13		67.5 F		
NO. 5 P/S		25.93		67.5 F		
NO. 6 CL		26.13		27.5 F		
NO. 6 P/S		25.93		27.5F		
NO. 7 CL		26.13		12.5 A		
NO. 7 P/S		25.93		12.5 A		
NO. 8 CL		26.13		52.5 A		
NO. 8 P/S		25.93		52.5 A		
NO. 9 CL		26.13		92.5 A		
NO. 9 P/S		25.93		92.5 A		
NO. 10 CL		26.13		132.5 A		
NO. 10 P/S		26.23		132.3 A		
NO. 11 CL		26.13		172.5 A		
NO. 11 P/S		26.93		172.9 A		
TOTALS						

CONDITION:

**DETAILS OF CLEAN SEA WATER BALLAST**

DESCRIPTION	L. TONS	VCG ABOVE BL (FT)	VERTICAL MOMENT (FT TONS)	LCG FROM $\bowtie$ FT (+ = AFT)	LONGITUDINAL MOMENT (FT TONS)	FREE SURFACE (FT TONS)
<b>ORIGINAL CLEAN BALLAST TANKS:</b>						
FORE PEAK		22.03		323.0 F		
AFT PEAK		36.53		333.8 A		
DEEP TANK, P/S		29.13		295.1 F		
NO. 6 SIDE TANK P/S		25.93		27.5 F		
<b>TANKS CONVERTED TO CLEAN BALLAST:</b>						
NO. 6 TANK, CL		26.13		27.5 F		
NO. 7 SIDE TANK, P/S		25.93		12.5 A		
NO. 8 TANK, CL		26.13		52.5 A		
NO. 9 TANK, CL		26.13		92.5 A		
FORWARD COFFERDAM		27.93		249.0 F		
AFT COFFERDAM		31.13		194.0 A		
<b>TOTALS</b>						

**LONGITUDINAL BENDING STRESSES (PSI)**

CONDITION:

DESCRIPTION	DEPARTURE					ARRIVAL				
	TONS/100	HOGGING		SAGGING		TONS/100	HOGGING		SAGGING	
		FACTOR	NUMERAL	FACTOR	NUMERAL		FACTOR	NUMERAL	FACTOR	NUMERAL
1. FORE PEAK		1.64		0.30			1.64		0.30	
2. DEEP TANK P/S		1.53		0.42			1.53		0.42	
3. FWD STORES		1.51		0.44			1.51		0.44	
4. FWD BUNKERS		1.43		0.54			1.43		0.54	
5. FWD COFFERDAM		1.36		0.61			1.36		0.61	
6. #1 CARGO TANK		1.28		0.70			1.28		0.70	
7. #2 CARGO TANK		1.14		0.86			1.14		0.86	
8. #3 CARGO TANK		1.00		1.02			1.00		1.02	
9. #4 CARGO TANK		0.85		1.18			0.85		1.18	
10. BRIDGE CREW		0.78		1.25			0.78		1.25	
11. BRIDGE STORES		0.78		1.25			0.78		1.25	
12. BRIDGE F/W		0.78		1.25			0.78		1.25	
13. #5 CARGO TANK		0.70		1.35			0.70		1.35	
14. #6 BALLAST TANK		0.56		1.51			0.56		1.51	
15. #7 CARGO/BALLAST TANK		0.51		1.57			0.51		1.57	
16. #8 CARGO/BALLAST TANK		0.67		1.43			0.67		1.43	
17. #9 CARGO/BALLAST TANK		0.83		1.28			0.83		1.28	
18. #10 CARGO TANK		1.00		1.14			1.00		1.14	
19. #11 CARGO TANK		1.16		0.99			1.16		0.99	
20. AFT COFFERDAM		1.26		0.90			1.26		0.90	
21. AFT BUNKERS		1.28		0.88			1.28		0.88	
22. AFT SETTLERS		1.29		0.87			1.29		0.87	
23. DISTILLED WATER		1.51		0.67			1.51		0.67	
24. AFT STORES		1.56		0.61			1.56		0.61	
25. AFT CREW		1.50		0.68			1.50		0.68	
26. F.W. AFT		1.77		0.44			1.77		0.44	
27. AFT PEAK		1.82		0.40			1.82		0.40	
28. TOTAL DEADWEIGHT										
29. LIGHT SHIP	128.50		83.63		14.01	128.50		83.63		14.01
30. DISPLACEMENT										
31. DEADWEIGHT CORRECTION - LINE 28 WEIGHT										
32. NUMERAL (MAY NOT EXCEED 100)										