112360-24 4-5234

The SS AMERICAN MARINER is ready to bunker with drafts of FWD 15'-05", AFT 21'-03". After all bunkers are on board, soundings indicate the tonnages shown. Use the white pages of The Stability Data Reference Book to determine the free surface correction.

DB 1 CL	48.2	DB 6 P	87.0
DB 1A CL	81.9	DB 6 S	87.0
DB 2 P	71.2	DB 7 P	94.6
DB 2 S	71.2	DB 7 S	94.6
DB 3 CL	227.6	DT 1 CL	125.3
DB 3 P	55.6	DT 1A CL	235.6
DB 3 S	55.6	DT 3 P	86.1
DB 4 CL	208.6	DT 3 S	86.1
DB 4 P	128.1	DT 6 P	201.2
DB 4 S	128.1	DT 6 S	201.2
DB 5 CL	180.4	DT 7 P	128.8
DB 6 CL	212.0	DT 7 S	128.8

A. 1.05 feet
Incorrect.

B. 1.15 feet
Correct.

C. 1.25 feet
Incorrect.

D. 1.31 feet
Incorrect.

Step 1:

Calculate Mean Draft.

15’-05”fwd + 21’-03” aft = 36’08”

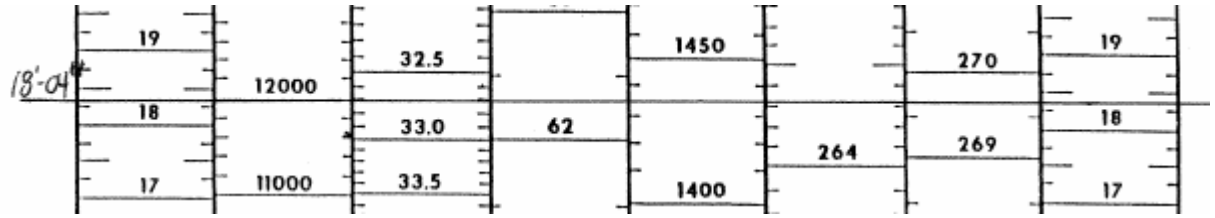
Mean Draft: 36’-08”/2

Mean Draft = **18’04”**

Step 2:

Using the *Hydrostatic Properties* table (Sheet 3) for the SS American Mariner (White Pages), calculate the Total Displacement (S.W. Tons) for the vessel before loading bunkers with a mean draft of 18'04".

The table yields **12,000 tons** as the displacement of the vessel at 18'04" mean draft.



Step 3:

Add up all the bunker totals for each tank. The sum of all bunkers equals **3024.8 tons**.

Step 4:

Add the displacement of the vessel before loading the bunkers and the sum of all the bunkers to find the ship's final displacement.

12,000 tons + 3024.8 tons = **15024.8 tons**

Step 5:

Refer to the *Table for Free Surface Correction and Tank Capacities* (Sheet 4) to calculate the free surface moment for each tank.

On the S.S. Mariner , a tank is considered FULL if the tank is at least 97% full. Any quantity less than 97% full or an empty tank is considered SLACK.

In the column *F.O. Tons* under *Tank Capacity*, the table gives you the capacity of each tank at 97% full. This is the column you will compare your loaded bunkers in each tank with to verify if a tank is considered FULL or SLACK. For example, DB 1 CL is loaded with 48.2 tons of bunkers. The tank capacity at 97% for D.B. 1 CL is 48.2 tons. Therefore, the tank is considered FULL and its free surface correction is 67. Conversely, D.B. 4 CL is loaded with 208.6 tons of bunkers. The tank capacity at 97% for D.B. 4 CL is 224.1 tons. Since 208.6 tons is less than 224.1 tons then D.B. 4 CL is considered SLACK.

Now find the free surface moment for each tank.

			TANK CAPACITY		FREE SURFACE CORRECTION			
			97%	100%	COL A	COL B		
TANK		FRAMES	F.O. TONS	S.W. TONS	i SLACK	i 97%	Bunker Loaded	Free Surface Corr
D.B.1	℄	14-24	48.2	52.8	106	67	48.2	67
D.B.1A	℄	24-36	81.9	89.8	464	204	81.9	204
D.B.2	P	36-57	71.2	78.1	428	158	71.2	158
	S	36-57	71.2	78.1	428	158	71.2	158
D.B.3	℄	57-82	227.6	249.5	3777	944	227.6	944
	P	57-82	55.6	61.0	300	120	55.6	120
	S	57-82	55.6	61.0	300	120	55.6	120
D.B.4	℄	82-106	224.1	245.7	3626	943	208.6	3626
	P	82-106	128.1	140.5	1138	364	128.1	364
	S	82-106	128.1	140.5	1138	364	128.1	364
D.B.5	℄	106-127	196.2	215.1	3173	825	180.4	3173
	P	106-134	178.0	195.2	2048	676	—	—
	S	106-134	180.0	197.4	2048	676	—	—
D.B.6	℄	134-160	242.3	265.7	3928	1021	212.0	3928
	P	134-160	87.0	95.4	615	221	87.0	221
	S	134-160	87.0	95.4	615	221	87.0	221
D.B.7	P	160-184	94.6	103.7	768	269	94.6	269
	S	160-184	94.6	103.7	768	269	94.6	269
D.T.1	℄	14-24	125.3	137.4	134	130	125.3	130
D.T.1A	℄	24-36	257.6	282.5	945	680	235.6	945
D.T.2	P	106-113	100.7		20	20	—	—
	S	106-113	100.7		20	20	—	—
D.T.3	P	113-119	86.1		17	17	86.1	17
	S	113-119	86.1		17	17	86.1	17
D.T.6	P	160-172	201.2	220.7	1242	634	201.2	634
	S	160-172	201.2	220.7	1242	634	201.2	634
D.T.7	P	172-184	128.8	141.2	618	358	128.8	358
	S	172-184	128.8	141.2	618	358	128.8	358
D.T.8	P	184-190	50.5	55.4	68	58	—	—
	S	184-190	50.5	55.4	68	58	—	—
					TOTALS:		3,024.8	17,309

Next, find the total sum of free surface moment which equals **17,309 foot tons**.

Step 6:

Find the free surface correction in feet by dividing the total free surface moment by the final displacement of the vessel.

FS(corr) = 17,309 foot tons/15,024.8 tons

FS(corr) = **1.15 feet**