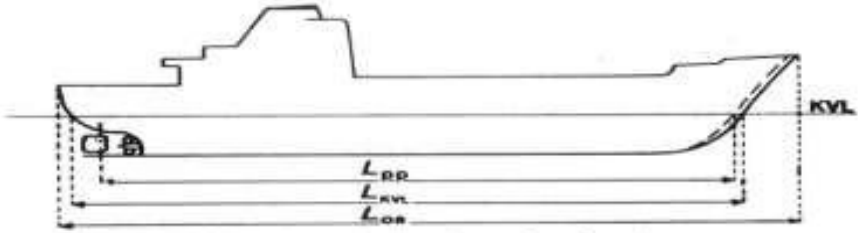
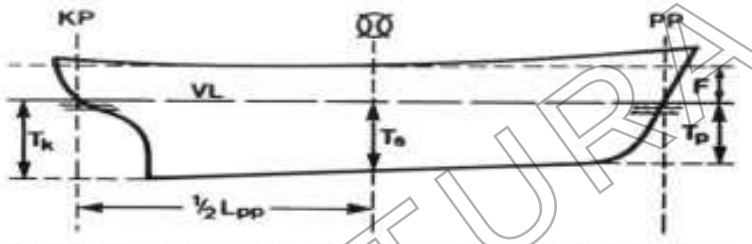
Rukovanje teretom 1

SADRŽAJ

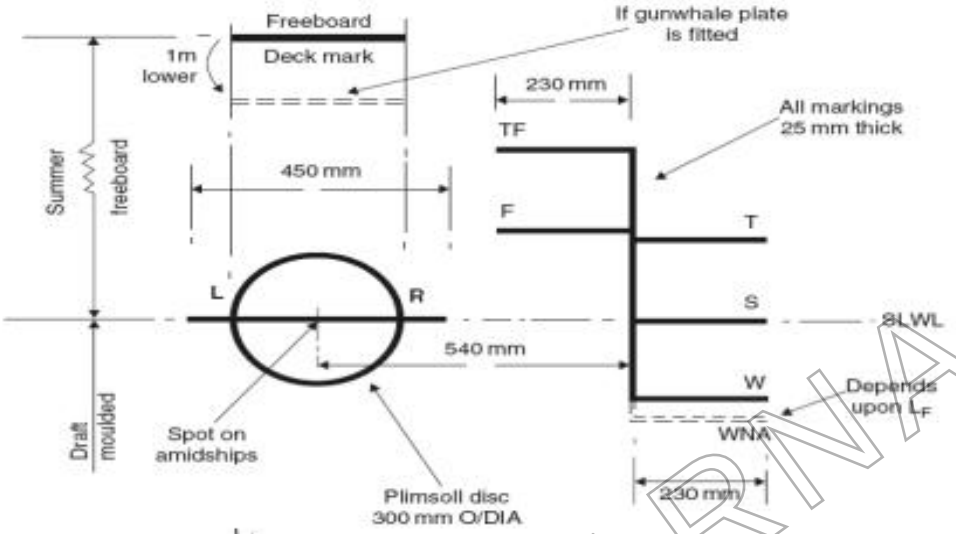
• 1. Mjera broda, Uzdužni i poprečni stabilitet broda - podsjetnik

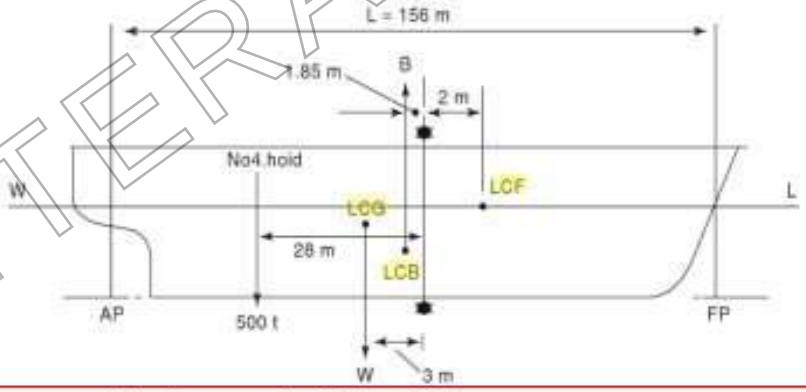


DULJINA BRODA: L_{pp} – duljina između okomica; L_{KVL} – duljina na konstrukcijskoj vodnoj liniji; L_{os} – duljina preko svega; KVL – konstrukcijska vodna linija



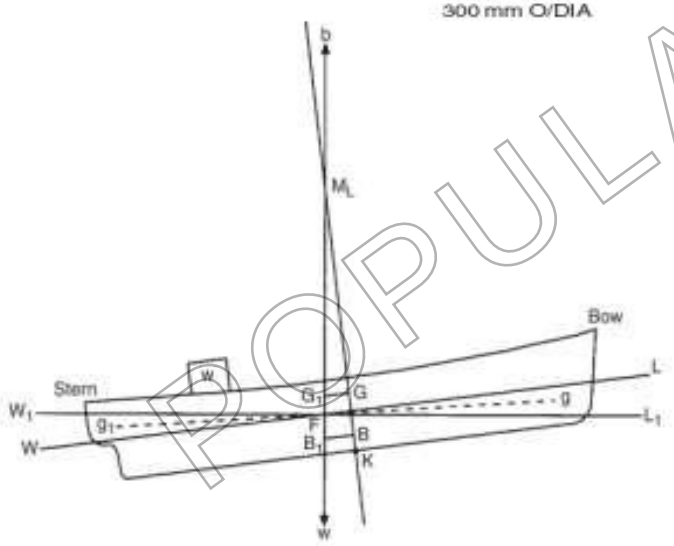
GAZ BRODA: PP i KP - pramčana odn. krmena okomica (perpendikular); T-gaz; F-nadvođe; VL-vodna linija

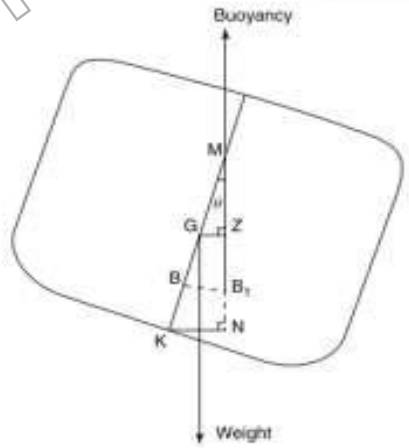


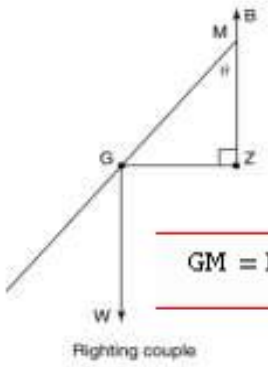


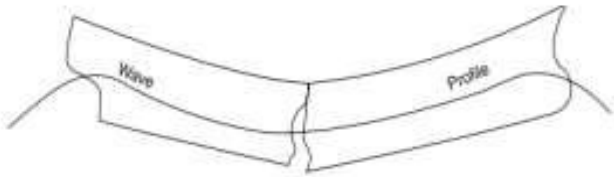
$$\text{promjena Trima} = \frac{\text{Displacement} + (\text{LCB} - \text{LCG})}{\text{MCTC}}; \quad \text{moment trima} = D \times (\text{LCB} - \text{LCG})$$

$$\text{promjena Trima} = \frac{w \times d}{\text{MCTC}}$$









$$GM = KM - KG; \quad \text{moment statičkog stabiliteta} = D \times GM \times \sin\theta$$

- **2. Određivanje težine ukrcanog / iskrcanog tereta (draft survey)**

  - Preduvjet (ako je moguće):
    - da je brod uspravan, odnosno nije nagnut na jednu stranu
    - trim je čim manji
    - tankovi balasta su ili potpuno puni ili potpuno prazni
    - balastno skladište bez balasta
  - 1. Očitati gaz na svim zagaznicama (6), u slučaju nemogućnosti očitavnja zagaznica s vanjske strane broda koristi manometar (vodena vaga), inklinometar

  - 2. Izmjeriti gustoću vode / mora u kojoj brod pluta, preporuka na 3 mjesta uzduž broda, ovisno o duljini / širini broda
  - 3. Ustanoviti količinu tekućine u tankovima balasta i vode:
    - izmjeriti razinu u tankovima pomoću sonde - ako je potrebno izmjeriti gustoću tekućine u tankovima
    - u tablicama kapaciteta tankova ustanoviti težinu u svakom tanku
  - 4. Ustanoviti količinu tekućine u tankovima goriva:
    - izmjeriti razinu / slobodan prostor u tankovima pomoću sonde
    - ako je potrebno izmjeriti / odrediti gustoću goriva u tankovima
    - u tablicama kapaciteta tankova ustanoviti težinu u svakom tanku

RG – relativna gustoća goriva (u vrijeme DS)

RG = (Stari volumen goriva * stari RG + Novi volumen goriva * novi RG) / ukupni volumen goriva u tanku u vrijeme DS

- 5. Proračun i ispravke deplasmana broda iz očitanog gaza:
  - određivanje deplasmana
  - određivanje ukrcanog / iskrcanog tereta preko neto deplasmana u početnom i završnom DS
  - provjeriti mrtve težine broda (neto deplasman – težina praznog broda)
- 6. Kumulativne pogreške:
  - očitavanje gaza i ispravke. QM gaz bi trebao biti u granicama +/-10 mm pravog srednjeg gaza
  - netočna pozicija LCF u odnosu na LBP/2
  - gustoća vode u kojoj brod pluta
  - sondiranje tankova i određivanje težine po tankovima
  - u uobičajenim uvjetima, rezultat DS bi trebao biti u granicama absolutne točnosti od +/-0.5 %
- 7. Neke oznake:
  - Loa – length overall
  - Lbp ili Lpp – length between perpendiculars
  - Lbm – length between draft marks
  - Dft – draft
  - QM – qvarter mean ili 3/4 mean draft
  - Tpc - tonnes per centimetre
  - Lcf - longitudinal centre of flotation
  - Mctc - moment to change trim 1 centimetre

- 8. Ispravka perpendikulara (na očitani gaz u metrima):

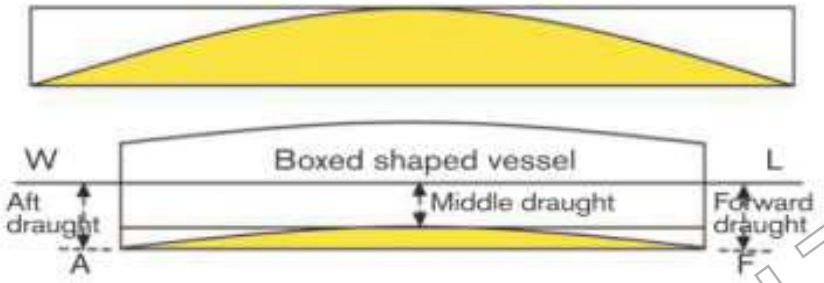
Forward Corr'n = $\frac{\text{Apparent Trim x Fd}}{\text{LBM}}$

Where:

Apparent trim = trim at the draught marks.
Fd = distance of forward draught marks from Perpendicular
LBM = length between draught marks

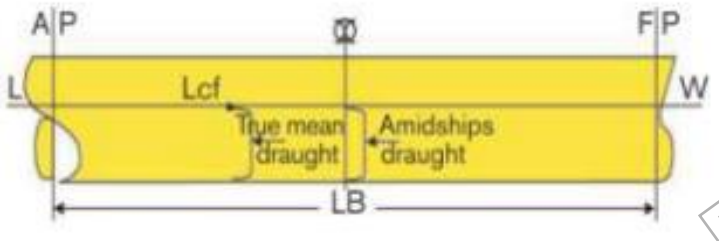
- na krmi i sredini broda ispravke na sličan način
- PRAVILO: ako je položaj određene zagaznice u odnosu na pripadajući perpendikular u istom smjeru kao i trim, ispravka je negativna. U suprotnom je pozitivna.

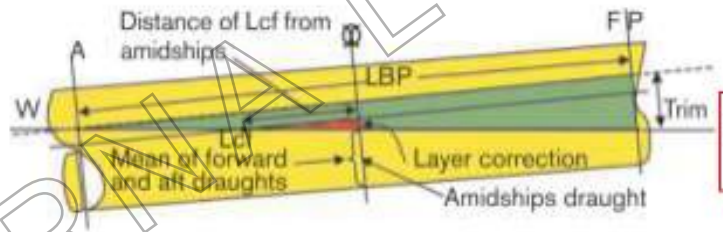
- 9. QM gaz:



3/4 mean draught = $\frac{(6 \times \text{Middle}) + \text{Forward} + \text{Aft}}{8}$

- 10. Prva trim ispravka (na deplasman u tonama):





First trim correction = $\frac{\text{Trim (in centimetres) x Lcf x Tpc}}{\text{LBP}}$

  - PRAVILO: ako su Lcf i trim u istom smjeru u odnosu na Lbp/2, ispravka je pozitivna. Ako su u suprotnim smjerovima ispravka je negativna
  - paziti na to od kuda se mjeri udaljenost Lcf u hidrostatskim tablicama (može biti od sredine broda LBP/2 ili od zadnjeg perpendikulara

- 11. Druga trim ispravka (na deplasman u tonama):

Second trim correction = $\frac{\text{Trim2 x 50 x (dm~dz)}}{\text{LBP}}$

  - ova korekcija je uvjek pozitivna
  - dm-dz označava stopu promjene Mctc u rasponu od 1m gaza (50cm iznad i 50cm ispod gaza).

- 12. Ispravka za nagib broda (na deplasman u tonama), u slučaju postojanja većeg nagiba broda povećava se površina vodene linije, brodu se smanjuje gaz, te je potrebno napraviti i ovu ispravku:

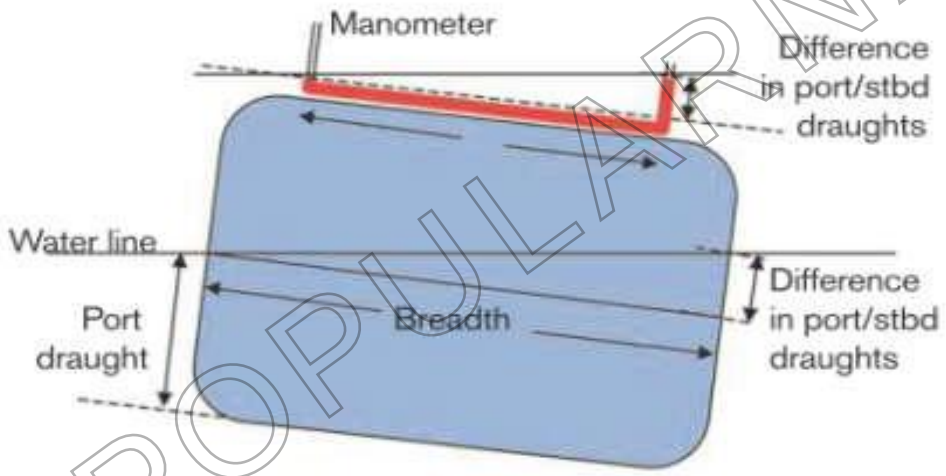
$$\text{Heel Correction} = 6x(TPC1 - TPC2)x(DFT1 - DFT2) \ldots \text{gdje je } 1 - \text{lijeva strana}, 2 - \text{desna strana broda}$$

  - ova je korekcija uvijek pozitivna
-

- 13. Ispravka za gustoću tekućine u kojoj brod pluta (na deplasman u tonama):

$$\text{Density Correction} = \frac{\text{Displacement in salt water x Density of the dock water}}{\text{Density used to compile the ships tables (i.e. 1.025)}}$$

- Dodatak: u slučaju većih valova i nemogućnosti očitavanja gaza na zagaznicama s vanjske strane korisiti se manometar (vodena vaga)



$$\frac{\text{Difference in port/stbd draughts}}{\text{Breadth}} = \frac{\text{Difference in port/stbd readings}}{d}$$

Therefore:

$$\text{Difference in port/stbd draughts} = \frac{\text{Breadth x Difference in readings}}{d}$$

3. DRAFT SURVEY - ISPUNJEN OBRAZAC 1

M/V		
Voyage Number		
Loading Port		
Discharging Port		
Type of Cargo		
	Initial	**Final**
Draft Readings		
DF Reading Port	10.7	4.61
DF Reading Stbr	10.7	4.58
DF Mean	10.7	4.6
Stem Correction	-0.0005	-0.0306
DF Mean Corrected	**10.7**	**4.564**
DA Reading Port	10.75	6.60
DA Reading Stbr	10.71	6.60
DA Mean	10.73	6.60
Stern Correction	0.0014	0.0962
DA Mean Corrected	**10.732**	**6.696**
DM Reading Port	10.75	5.62
DM Reading Stbr	10.71	5.40
DM Mean	10.73	5.51
Mid Correction	0.000	0.000
DM Mean Corrected	**10.730**	**5.510**
Mean Fore & Aft	**10.716**	**5.630**
Qvarter Mean Draft	**10.7264**	**5.5401**
Displacement	48550.96	24130.94
Actual Trim	-0.0319	-2.1318
1st Trim Correction	1.933	120.698
2nd Trim Correction	0.008	6.646
Disp.corr.for trim	48552.9	24258.28
Sea Water SG	1.022	1.023
Corr. Displacement	**48410.8**	**24210.95**

	Initial	**Final**
Consumables		
Fuel Oil	393.9	714
Diesel Oil	45.5	83.6
Lub. Oil	0	0
Ballast Water	88	14090
Fresh Water	120	94
Light Ship	**8965**	**8965**
Others	**0**	**0**
Total Deductibles	9612	23947
Results		
Corr. Displacement	48410.8	24210.95
Total Deductibles	9612	23947
Constants ('1)		264
Cargo+Constants ('2)	38798	
Cargo Load/Disch	Disch:	**38534**
Shore Figures		*38502*
Differences		*+32*
Remarks		

'1 – kod iskrcaja tereta računa se samo za final survey = corr.displ. – total deductibles
– kod ukrcaja tereta računa se samo za initial survey (formula ista), dok se za final survey samo prepiše vrijednost
2' – računa se samo kod iskrcaja tereta za initial survey (formula ista)

– All Values are Metric

Date and Time of Initial Survey :

Date and Time of Final Survey :

capt. J. Fox
Inspector

Master, capt. S. Sinbad
Chief Officer / Master

4. DRAFT SURVEY – PRAZAN OBRAZAC 1

M/V		
Voyage Number		
Loading Port		
Discharging Port		
Type of Cargo		
	Initial	**Final**
Draft Readings		
DF Reading Port		
DF Reading Stbr		
DF Mean		
Stem Correction		
DF Mean Corrected		
DA Reading Port		
DA Reading Stbr		
DA Mean		
Stern Correction		
DA Mean Corrected		
DM Reading Port		
DM Reading Stbr		
DM Mean		
Mid Correction		
DM Mean Corrected		
Mean Fore & Aft		
Qvarter Mean Draft		
Displacement		
Actual Trim		
1st Trim Correction		
2nd Trim Correction		
Disp.corr.for trim		
Sea Water SG		
Corr. Displacement		

	Initial	**Final**
Consumables		
Fuel Oil		
Diesel Oil		
Lub. Oil		
Ballast Water		
Fresh Water		
Light Ship		
Others		
Total Deductibles		
Results		
Corr. Displacement		
Total Deductibles		
Constants ('1)		
Cargo+Constants ('2)		
Cargo Load/Disch		
Shore Figures		
Differences		
Remarks		

'1 – kod iskrcaja tereta računa se samo za final survey = corr.displ. – total deductibles
– kod ukrcaja tereta računa se samo za initial survey (formula ista), dok se za final survey samo prepiše vrijednost
2' – računa se samo kod iskrcaja tereta za initial survey (formula ista)

– All Values are Metric

Date and Time of Initial Survey :

Date and Time of Final Survey :

Inspector

Chief Officer / Master

5. DRAFT SURVEY – ISPUNJEN OBRAZAC 2 – STRANA 1

Vessels Name :		Sirius	Gross Tonnage :	
Cargo Description :		Iron Ore	Net Tonnage :	
Port of Loading :		Tubarao	LOA :	204
Port of Discharging :		Antwerp	Light Ship Displacement :	8501
B/L Quantity :		38,400 MT	Flag :	Panama
Tolerance ON B/L :	± 0.5%	+43598 / - 43164	IMO Number :	
			LBP : 192.4	192.4
Sea condition :			Sea condition :	

Initial Survey

Date / Time : 04 Apr '07 - 14:45

10.70 mts	10.70 mts	Sag	
	10.70 mts	-0.02 mts	
10.75 mts	10.71 mts		
	10.73 mts	Hog	
10.75 mts	10.71 mts	0.09 mts	
	10.73 mts		

Observed Density :	1.022	
Ballast :	88.0 MT	(~ 14,002 MT)
(Ballast Density) :	(@ 1.000)	
H.F.O :	393.9 MT	(~ 320 MT)
M.D.O :	45.5 MT	(~ 38 MT)
Lube Oil :	00 MT	(~ 00 MT)
Fresh Water :	120.0 MT	-(~ 26 MT)
Light Ship :	8,965 MT	
Others :	00 MT	(~ 00 MT)
Total :	9,612 MT	(~ 14,334 MT)

Final Survey

Date / Time : 07 Apr '07 - 06:00

4.61 mts	4.58 mts		
	4.60 mts		
5.62 mts	5.40 mts		
	5.51 mts		
6.60 mts	6.60 mts		
	6.60 mts		

Observed Density :	1.023
Ballast	14,090.0 MT
(Ballast Density) :	(@ 1.000)
H.F.O :	714.0 MT
M.D.O :	83.6 MT
Lube Oil :	00 MT
Fresh Water :	94.0 MT
Light Ship :	8,965 MT
Others :	00 MT
Total :	23,947 MT

5. DRAFT SURVEY – ISPUNJEN OBRAZAC 2 – STRANA 2

Calculations	Calculations	Calculations	Calculations	Calculations
Mean F'ord Draught :	10.70 mts		Mean F'ord Draught :	4.60 mts
Stem Correction :	-0.0005		Stem Correction :	-0.0306
Mean F'ord Corrected :	10.700 mts		Mean F'ord Corrected :	4.564 mts
Mean Aft Draught :	10.73 mts		Mean Aft Draught :	6.60 mts
Stern Correction :	0.0014		Stern Correction :	0.0962
Mean Aft Corrected :	10.731 mts		Mean Aft Corrected :	6.696 mts
Mean Draught F & Aft:	10.715 mts		Mean Draught F & Aft:	5.630 mts
Corrected Trim F - Aft :	-0.0319		Corrected Trim F - Aft :	-2.1318
Mean Midships Draught :	10.73 mts		Mean Midships Draught :	5.51 mts
Midships Corrected :	0.0000		Midships Corrected :	0.0000
Midships Mean Corrected :	10.730 mts		Midships Mean Corrected :	5.510 mts
Qvarter Mean Draft :	10.7264 mts		Mean Of Means Corrected :	5.5401 mts
Lf :	2.76		Lf :	2.76
La :	8.68		La :	8.68
Lm :	0		Lm :	0
TPC :	49.026		TPC :	45.800
LCF :	93.8215		LCF :	99.8094
MCTC :	30.4795		MCTC :	5.6279
I Trim :	1.933		I Trim :	120.698
II Trim :	0.008		II Trim :	6.646
Total Trim :	1.941		Total Trim :	127.344
Displacement :	48,550.96		Displacement :	24,130.94
Trim Correction :	1.941		Trim Correction :	127.344
Displacement Corrected for Trim :	48,552.90		Displacement Corrected for Trim :	24,258.28
Observed Density :	1.022		Observed Density :	1.023
Displacement corrected for Density :	48,410.80		Displacement corrected for Density :	24,210.95
Deductibles :	9,612 MT		Deductibles :	23,947 MT
Cargo + Constants :	38,798 MT		Constants :	264 MT
			Cargo Discharged :	38,534 MT

Master Capt. K.H. Doctor

6. DRAFT SURVEY – PRAZAN OBRAZAC 2 – STRANA 1

Vessels Name :

Cargo Description :

Port of Loading :

Port of Discharging :

B/L Quantity : MT

Tolerance on B/L : ± 0.5% +/ -

LOA :

Sea condition :

Gross Tonnage :

Net Tonnage :

L B P :

Light Ship Displacement :

Flag :

IMO Number :

LBP :

Sea condition :

I n i t i a l S u r v e y

Date / Time :

m	m	FORE	m
m	m	MID	m
m	m	AFT	m

Sag -0.00m

Hog 0.00 m

Observed Density :

Ballast : MT

(Ballast Density) : (@)

H.F.O : MT

M.D.O : MT

Lube Oil : MT

Fresh Water : MT

Light Ship : MT

Others : MT

Total : MT

F i n a l S u r v e y

Date / Time

m	m	m
m	m	m
m	m	m

Observed Density :

Ballast : MT

(Ballast Density) : (@)

H.F.O : MT

M.D.O : MT

Lube Oil : MT

Fresh Water : MT

Light Ship : MT

Others : MT

Total : MT

6. DRAFT SURVEY – PRAZAN OBRAZAC 2 – STRANA 2

Calculations	Calculations	Calculations	Calculations	Calculations
Mean F'ord Draught :	m		Mean F'ord Draught :	m
Fwd Correction :	m		Fwd Correction :	m
Mean F'ord Corrected :	m		Mean F'ord Corrected :	m
Mean Aft Draught :	m		Mean Aft Draught :	m
Stern Correction :	m		Stern Correction :	m
Mean Aft Corrected :	m		Mean Aft Corrected :	m
Mean Draught F & Aft:	m		Mean Draught F & Aft:	m
Corrected Trim F - Aft :	m		Corrected Trim F - Aft :	m
Mean Midships Draught :	m		Mean Midships Draught :	m
Midships Corrected :	m		Midships Corrected :	m
Midships Mean Corrected :	m		Midships Mean Corrected :	m
Mean Of Means :	m		Mean Of Means :	m
Mean Of Means Corrected :	m		Mean Of Means Corrected :	m
Lf :			Lf :	
La :			La :	
Lm :			Lm :	
TPC :			TPC :	
LCF :			LCF :	
MCTC :			MCTC :	
I Trim :	MT		I Trim :	MT
II Trim :	MT		II Trim :	MT
Total Trim :	MT		Total Trim :	MT
Displacement :	MT		Displacement :	MT
Trim Correction :	MT		Trim Correction :	MT
Displacement Corrected for Trim :	MT		Displacement Corrected for Trim:	MT
Observed Density :			Observed Density :	
Displacement corrected for Density :	MT		Displacement corrected for Density :	MT
Deductibles :	MT		Deductibles :	MT
Cargo + Constants :	MT		Constants :	MT
			Cargo Discharged :	MT

Master Capt.

- **7. UKRCAJ TERETA**
  - 1. Odrediti poznate težine na brodu i njihove parametre, npr.:

TANK	TYPE	WEIGHT	V.C.G.	V.MOM	L.C.G.	H.MOM	F.S. MOM
FP	BALL	0	8.589	0	183.272	0	0
DB1P/S	BALL	0	5.44	0	168.095	0	0

- na ovo dodati mrtve težine i prazan brod, te se zbrajanjem dobe ukupne poznate težine

  - 2. Odrediti pomoću salinometra (ili na neki drugi način) gustoću vode u kojoj brod pluta
  - 3. Odrediti "željeni"gaz i trim
    - iz hidrostatskih tablica odrediti:

DESIRED DRAFT	DISP."	CORR.DISP	T.P.C.	M.C.T.C.	L.C.B.	L.C.F.	K.M.
11.45	52116	**51404.17**	49.55	613.325	98.5185	92.87	11.787

- 4. Odrediti težinu tereta za ukrcaj
  - od ispravljenog deplasmana za salinitet odbiju se ukupne poznate težine
- 5. Odrediti s kojim skladištima ćemo na kraju trimovati brod
  - a zatim ostala skladišta ispuniti u potpunosti (ili ravnomjerno) s teretom, npr.:

HOLD	CAPAC. CBM	S.G. OF CARGO	WEIGHT MT	V.C.G.	V.MOM	L.C.G.	H.MOM
1							
2	7096.04	0.797	5655.54	9.191905	51985.2	150.614	851804
3	8466.38	0.797	6747.7	8.924745	60221.5	130.036	877445
4	9733.73	0.797	7757.78	9.193456	71320.8	106.186	823768
5							
Ukupno:							

- 6. Odrediti koliko tereta ukupno ide u puna skladišta (ili skladišta koja nisu za trimovanje)

FOR DESIRED TRIM: 1m			
	MT	L.C.G.	H.MOM
CORR.DISP	51404.17	97.34165	5003767 (iz tablice 3)
FULL HOLDS	32646.3		3462410 (iz tablice 5)
POZNATE TEŽINE UKUPNO	10111	80.75254	816489 (iz tablice 1)
DIFF:	8646.85	83.8304 (724868 / 8646.85)	724868

LCB-Trim*MCTC*100/Disp

- 7. Ostatak tereta rasporediti u skladišta za trimovanje
  - postaviti dvije jednadžbe s dvije nepoznanice

HOLD	CAPAC.	S.G. OF	WEIGHT	L.C.G.	H.MOM
	CBM	CARGO	MT		
1	5285.56		?	168.656	?
7	7990.04		?	41.337	?
			8646.85	83.830	724868 (iz tablice 6)

$$LCGa*Wa + LCGb*Wb = H.MOM$$

$$Wa + Wb = WEIGHT$$

- **8. STABILITET**

$$F.S.M.corr = F.S.\ MOM / Disp$$

$$GM = KM-KG- F.S.M.corr$$

F.S. MOM Corr	0.244836
KG	9.6033
KM	11.787
GM<0.30m	1.93886

TANK	TYPE	CAPAC. CBM	FLUID S.G.	WEIGHT	V.C.G.	V.MOM	L.C.G.	H.MOM	F.S.MOM	F.S.MOM REAL
FP	BALL	1652.5		0	8.589	0	183.272	0	542	0
DB1P/S	BALL	787.28		0	5.44	0	168.095	0	255.2	0
DB2P/S	BALL	1393.36		0	6.63	0	150.78	0	823	0
DB3P/S	BALL	3248.12		0	7.52	0	122.501	0	2277.4	0
DB6P/S	BALL	2298.10		0	8.852	0	67.566	0	1973.8	0
DB7P/S	BALL	1415.27		0	8.177	0	41.826	0	113.2	0
HOLD 3	BALL	8116.79		0	8.94	0	130.036	0	4597.3	0
HOLD 5	BALL	8116.79		0	8.94	0	82.336	0	4597.3	0
FW P/S	FW	207.5		114	14.845	1692.33	5.449	621.186	447.4	447.4
AP	FW	280.81		1	11.757	11.757	2.376	2.376	2105.2	0
STER.TU	FW	72.14		72	9.463	681.336	5.159	371.448	499.8	0
FO4P/S	FO	1031.8		14	1.543	21.602	101.408	1419.712	5095	5095
FO5P/S	FO	1256.12		149	1.543	229.907	81.135	12089.11	6202	6202
SERV.10	FO	56.97		36	14.589	525.204	23.53	847.08	69.2	69.2
SETL.11	FO	60.7		37	14.564	538.868	27.481	1016.797	77	77
OV.FLOW	FO	36.7		6	1.421	8.526	11.785	70.71	37.8	37.8
DO22P/S	DO	339.63		124	1.504	186.496	25.628	3177.872	545.1	545.1
DO12/13	DO	23.52		15	14.85	222.75	19.928	298.92	3.9	3.9
GO 26	GO	49.22		20	15.159	303.18	1.065	21.3	40.9	40.9
LO	LO	146		28	14.9	417.2	18.72	524.16	67.3	67.3
CONSTA.				530	12	6360	87.5	46375		
LIGHT SHIP				8965	10.555	94625.575	83.62	749653.3		
TOTAL 1				10111		105824.73		816488.9		12585.6

DENSITY OF SEA W.:		1.011	Hidrostatic table data prepared for density:			1.025	
DESIRED DRAFT	DISP."	CORR.DISP	T.P.C.	M.C.T.C.	L.C.B.	L.C.F.	K.M.
11.45	52116	**51404.17**	49.55	613.325	98.5185	92.87	11.787

CARGO TO BE LOADED:	**41293.17**		MT	L.C.G.	H.MOM		
	CORR.DISP		51404.17	97.34165	5003767		
FOR DESIRED TRIM:	1	FULL HOLDS	32646.3		3462410		
	TOTAL 1		10111	80.75254	816489		
	DIFF:		8646.85	83.8304	724868		

HOLD		CAPAC. CBM	CARGO S.G.	WEIGHT	V.C.G	V.MOM	L.C.G.	H.MOM
1		5285.56	0.797	~~4212.6~~	9.64985	~~40650.87~~	168.656	~~710478.80~~
2		7096.04	0.797	5655.5	9.19190	51985.22	150.614	851804.08
3		8466.38	0.797	6747.7	8.92474	60221.54	130.036	877444.54
4		9733.73	0.797	7757.7	9.19345	71320.83	106.186	823767.92
5		8466.38	0.797	6747.7	9.12342	61562.17	82.336	555579.02
6		7198.98	0.797	5737.5	8.61014	49401.42	61.666	353814.04
7		7990.04	0.797	~~6368.0~~	8.27301	~~52683.07~~	41.337	~~263236.57~~
TOTAL2:				32646.3				3462410
TRIMMING	**WITH**	**HOLDS:**	1	7				
CARGO	**TO BE**	**LOADED:**	2885.93	5760.92				

STABILITET	
F.S.M.corr	0.244836
KG	9.6033
KM	11.787
GM <0.30m	1.93886

10. UKRCAJ TERETA – PRAZAN OBRAZAC

TANK	TYPE	CAPAC. CBM	FLUID S.G.	WEIGHT	V.C.G.	V.MOM	L.C.G.	H.MOM	F.S.MOM	F.S.MOM REAL
TOTAL 1										

DENSITY OF SEA W.:			Hidrostatic table data prepared for density:					
DESIRED DRAFT	DISP."	CORR.DISP	T.P.C.	M.C.T.C.	L.C.B.	L.C.F.	K.M.	

CARGO TO BE LOADED:				MT	L.C.G.	H.MOM		
		CORR.DISP						
FOR DESIRED TRIM:		1	FULL HOLDS					
		TOTAL 1						
		DIFF:						

HOLD		CAPAC. CBM	CARGO S.G.	WEIGHT	V.C.G	V.MOM	L.C.G.	H.MOM		
1										
2										
3										
4										
5										
6										
7										
TOTAL2:										
TRIMMING	**WITH**	**HOLDS:**								
CARGO	**TO BE**	**LOADED:**								

- **11. PRORAČUN GAZA NA ZAGAZNICAMA BRODA NAKON RAČUNA UKRCAJA TERETA**
- 1. Nastavak na prethodni primjer ukrcaja tereta (poznati su željeni gaz i trim)
- 2. S željenim gazom izvući LCF iz hidrostatskih tablica
- 2. Izračunati QMD

$$QMD=DFT-(dDFT+ddDFT)=DFT-(T*(Lbp/2-LCF)/Lbp+T^2/(2Lbp))$$

Ispravka gaza za trim:
DFT=QMD+dDFT+ddDFT
- gdje je QMD quarter mean draft ispravljen za hog i sag,
- dDFT (prva trim korekcija na gaz) = $T*(Lbp/2-LCF)/Lbp$
- ddDFT (druga trim korekcija na gaz) = $T^2/2Lbp$

- 3. Izračunati gazove na perpendikularima

DF Mean corr=QMD-T/2
DA Mean corr=QMD+T/2
DM Mean corr=QMD

- 4. Izračunati gazove na zagaznicama

DF Mean read=DF Mean corr+(T/Lbp)*Fd
DA Mean read=DA Mean corr+(T/Lbp)*Fa
DM Mean read=DM Mean corr+(T/Lbp)*Fm

gdje su Fd, Fa i Fm udaljenosti zagaznica od određenih perpendikulara

- Primjer

DESIRED DRAFT	DISP."	CORR.DISP	TPC	MCTC	LCB	LCF	KM
11.45	52116	51404.17	49.55	613.325	98.5185	92.87	11.787
CARGO TO BE LOADED:		41293.17					
FOR DESIRED TRIM:		1					
	MT	LCG	H.MOM				
CORR.DISP	51404.17	97.34165	5003767				
FULL HOLDS	32646.3		3462410				
TOTAL 1	10111	80.75254	816489				
DIFF:	8646.85	83.8304	724868				
TRIMMING WITH HOLDS:			1	7			
CARGO TO BE LOADED:			2885.93	5760.92			
Lbp	192.4		Fd	Ad	Md		
QMD	11.43009		2.76	-8.68	0		
DF Mean corr	10.93009						
DA Mean corr	11.93009						
DM Mean corr	11.43009						
DF Mean read	10.94444						
DA Mean read	11.88498						
DM Mean read	11.43009						

Ovo je iz prethodnog zadatka (br.7)

- **12. ISKCAJ/UKRCAJ DODATNIH TEŽINA TIJEKOM PUTOVANJA I PRORAČUN GAZA BRODA**
  - dodati težine na postojeći realni deplasman
  - novi realni deplasman ispraviti za s.g. morske vode u zadanoj luci da bi dobili DISP"
  - koristeći dobiveni DISP" izvaditi podatke iz hidrostatske tablice, kao što je prikazano u tablici dole
  - izračunati trim

Trim=(LCB-LCG)*DISP"/(MCTC*100)

T=MomTrima/MCTC*100

  - dalje je postupak isti kako u prethodnom poglavlju 10. (izračunati QMD, gazove na perpednikularima, gazove na zagaznicama)

- Primjer

Ovo je iz prethodnog zadatka (br.7)

RAČUN GAZA NAKON UKRCAJA/ISKRCAJA DODATNIH TEŽINA:							UKRCAJ / POTROŠNJA TEKUĆINE:					
	WEIGHT	VCG	V.MOM	LCG	H.MOM			WEIGHT	VCG	V.MOM	LCG	H.MOM
LUKA 1	51404.2	9.25654	475825	97.3417	5003767		AP	200	11.757	2351.4	2.376	475.2
LUKA 2	950		3508.65		76531.2		FO4P/S	750	1.543	1157.25	101.408	76056
TOTAL 4	52354.2	9.15559	479334	97.0371	5080298		TOTAL 3	950		3508.65		76531.2
	DENSITY OF SEA W.:		1.021		DISP."	DRAFT	TPC	MCTC	LCB	LCF	KM	
					52559.28	11.54	49.63945	615.6418	98.48845	92.77655	11.79455	
TRIM	1.239041											
QMD	11.51341											
DF Mean corr	10.89389											
DA Mean corr	12.13294											
DM Mean corr	11.51341											
DF Mean read	10.89389											
DA Mean read	12.13294											
DM Mean read	11.51341											

- **13. ZAVRŠNO TRIMOVANJE ILI UKRCAJ DODATNOG TERETA**

1. Pročitati gazove na svim zagaznicama, te izmjeriti S.G. morske vode
2. Ispraviti ih na perpendikulare, izračunati QMD1 i TRIM1
3. s QMD izvući iz hidrostatskih tablica DISP1, TPC1 i MCTC1
4. izračunati DISP1" (deplasman ispravljen za S.G.1 morske vode)
5. izračunati LCG1 i H.MOM1 broda

LCG=LCB-T*MCTC*100/DISP"
H.MOM=DISP1"*LCG

6. Željeni gaz na zagaznicama svesti na perpendikulare, izračunati QMD2 i TRIM2
7. s ovim (željenim) QMD2 ponovo izvući iz hidrostatskih tablica DISP2, TPC2 i MCTC2
8. ponovo izračunati DISP2" (deplasman ispravljen za S.G.2 morske vode)
9. izračunati LCG2 i H.MOM2 broda prema istim gore navedenim formulama
10. odrediti:
    1. koliko još tereta/težine možemo ukrcati CARGO =DISP2"-DISP1"
    2. razliku H.MOM = H.MOM2- H.MOM1)
    3. izračunati LCG = H.MOM /CARGO
11. s vrijednostima dobivenih u gornjoj točki 10. izračunati raspodjelu tereta za ukrcaj u skladišta za završno trimovanje prema postupku objašnjenom u Poglavlju 7. Ukrcaj tereta, 7.7. Ostatak tereta rasporediti u skladišta za trimovanje:

LCGa*Wa + LCGb*Wb = H.MOM

Wa + Wb = WEIGHT

- Primjer ZAVRŠNO TRIMOVANJE:

POSTOJEĆE:														
DF Mean corr	10.89		POSTOJEĆE	DISP	TPC	MCTC	LCB	LCF	KM			MT	LCG	H.MOM
DA Mean corr	12.13		DISP"	52413.5	49.61	614.879	98.4911	92.806	11.7919		CORR.DISP	52208.96	97.03072	5065873
DM Mean corr	11.51		DISP	52208.96										
QMD	11.51													
TRIM	1.24		ŽELJENO:	DISP	TPC	MCTC	LCB	LCF	KM			MT	LCG	H.MOM
S.G.SEA W.	1.021		DISP"	53606	49.75	621.255	98.357	92.5845	11.8155		CORR.DISP	53501.4	98.00864	5243600
ŽELJENO:			DISP	53501.4										
DF Mean corr	11.6											MT	LCG	H.MOM
DA Mean corr	11.9								DIFF.		CARGO	1292.443	137.5124	177727
DM Mean corr	11.75													
QMD	11.75									TRIMMING WITH HOLDS:			1	7
TRIM	0.3									CARGO TO BE LOADED:			976.2977	316.146
S.G.SEA W.	1.023													

- **14. UKRCAJ TEŠKOG TERETA BRODSKOM DIZALICOM**
- podizanje tereta s obale i smještanje na brod na nekoj udaljenosti od uzdužnice
- treba izračunati:
  - GM1 i kut nagiba broda fi u trenutku podizanja tereta
  - GM2 i kut nagiba broda fi nakon spuštanja tereta na brod
- poznate vrijednosti:
  - gazovi na zagaznicama
  - W (teret)
  - KGt (KG tereta)
  - d1 (teret složen lijevo od uzdužnice)
  - hs (hvatišite dizalice od kobilice)
  - d2 (otklon samarice od uzdužnice)
- POSTUPAK IZRAČUNA
  - sa srednjim ispravljenim gazom izvaditi

  iz hidrostatskih tablica vrijednosti DISP

  (ispraviti ga za S.G. sea water ako je potrebno)

  i KM.

- izračunati vrijednosti:

GMcorr= KM-KG-FSCorr

h1 = hs -KG

GG1=p*h1/(D+p)

GM1=Gmcorr-GG1

fi1(rad) =atan(p*d1/(D+p)*GM1)*57.3

h2 = KGt - KG

GG2=p*h2/(D+p)

GM2=Gmcorr-GG2

fi2(rad)=atan(p*d2/(D+p)*GM2)*57.3

- Primjer UKRCAJA TEŠKOG TERETA BRODSKOM DIZALICOM

Ukrcaj tereta dizalicom			podizanje s obale i smještanje na brod na nekoj udaljenosti od uzdužnice			
	treba izračunati:		MoG1 i fi u trenutku podizanja tereta			
			MoG2 i fi nakon spuštanja tereta na brod			
DF	DA	DFT	D	KM		
5.8	6.52	6.16	12920	8.5		
W (teret)				140		
KGt (KG tereta)				5.0		
d (teret složen lijevo od uzdužnice)				5.00		
hs (hvatište dizalice od kobilice)				25.00		
d (otklon samarice od uzdužnice)				16.00		
IZRAČUN:						
KM=	8.50		h1=	17.50		
KG=	7.50		GG1=	0.19		
GM=	1.00		tg (fi1)=	0.2800700		
FSC=	0.20		fi1=	15.6		
GMcorr=	0.80					
			h2=	-2.50		
GMcorr=	0.80		GG2=	-0.03		
GG1=	0.19					
GM1=	0.61					
			tg (fi2)=	0.0648268		
GMcorr=	0.80		fi2=	3.7		
GG2=	-0.03					
GM2=	0.83					

Flag: Cipar, Net tonnage: 15597, Year built: 2011

Daily consumtion - fuel: 27MT, diesel: 1.8MT, water: 8MT

	DISPLACEMENT		DEADWEIGHT		DRAFT		FREEBOARD
*WINTER	52195 m/t		43230 m/t		11.466 m		4.559 m
SUMMER	53406 m/t		44441 m/t		11.710 m		4.315 m
*TROPICAL	54625 m/t		45660 m/t		11.954 m		4.071 m
FRESH WATER ALLOWANCE		26.86 cm	TPI/TPC (AT SUMMER DRAFT)				

Light ship: 8965MT	LOA: 204M	Draft marks from corresp. perpendikulars: fwd: 2.76m, aft: -8.68m, mid
Constant: about 350MT	LBP: 192.4m	

TANK	TYPE	CAPAC.	V.C.G.	L.C.G.	F.S. MOM
		CBM			
FP	BALL	1652.5	8.589	183.272	542
DB1P/S	BALL	787.28	5.44	168.095	255.2
DB2P/S	BALL	1393.36	6.63	150.78	823
DB3P/S	BALL	3248.12	7.52	122.501	2277.4
DB6P/S	BALL	2298.10	8.852	67.566	1973.8
DB7P/S	BALL	1415.27	8.177	41.826	1113.2
HOLD 3	BALL	8116.79	8.94	130.036	4597.3
HOLD 5	BALL	8116.79	8.94	82.336	4597.3
FW P/S	FW	207.5	14.845	5.449	447.4
AP	FW	280.81	11.757	2.376	2105.2
STER.TU	FW	72.14	9.463	5.159	499.8
FO4P/S	FO	1031.8	1.543	101.408	5095
FO5P/S	FO	1256.12	1.543	81.135	6202
SERV.10	FO	56.97	14.589	23.53	69.2
SETL.11	FO	60.7	14.564	27.481	77
OV.FLOW	FO	36.7	1.421	11.785	37.8
DO22P/S	DO	339.63	1.504	25.628	545.1
DO12/13	DO	23.52	14.85	19.928	3.9
GO 26	GO	49.22	15.159	1.065	40.9
LO	LO	146	14.9	18.72	67.3
CONSTANTS			12	87.5	
LIGHT SHIP			10.555	83.62	

HOLD	TYPE	CAPAC. CBM	V.C.G	L.C.G.
1	CARGO	5285.56	9.64985	168.656
2	CARGO	7096.04	9.19190	150.614
3	CARGO	8466.38	8.92474	130.036
4	CARGO	9733.73	9.19345	106.186
5	CARGO	8466.38	9.12342	82.336
6	CARGO	7198.98	8.61014	61.666
7	CARGO	7990.04	8.27301	41.337

16. M/V "Sirius" HYDROSTATOC TABLE

Dft	Displ.	TPC	MCTC	LCB	LCF	KM
2.5	10398.00	44.1	453.79	100.613	100.664	26.844
2.6	10840.00	44.2	455.95	100.614	100.662	25.892
2.7	11281.00	44.3	458.03	100.614	100.661	24.993
2.8	11723.00	44.4	460.03	100.614	100.659	24.144
2.9	12165.00	44.4	461.96	100.613	100.657	23.346
3.0	12607.00	44.5	463.82	100.612	100.655	22.599
3.1	13055.00	44.6	465.5	100.61	100.637	22.019
3.2	13504.00	44.7	467.11	100.607	100.61	21.49
3.3	13954.00	44.7	468.66	100.603	100.591	20.981
3.4	14404.00	44.8	470.17	100.6	100.566	20.492
3.5	14854.00	44.9	471.64	100.597	100.541	20.022
3.6	15303.00	44.9	473.05	100.593	100.515	19.573
3.7	15753.00	45.0	474.41	100.59	100.489	19.143
3.8	16203.00	45.1	475.73	100.586	100.461	18.733
3.9	16652.00	45.1	477	100.582	100.433	18.343
4.0	17102.00	45.2	478.22	100.578	100.404	17.973
4.1	17556.00	45.2	479.36	100.572	100.379	17.659
4.2	18011.00	45.3	480.45	100.566	100.353	17.365
4.3	18467.00	45.3	481.5	100.559	100.325	17.081
4.4	18922.00	45.4	482.51	100.552	100.295	16.807
4.5	19377.00	45.4	483.48	100.544	100.263	16.542
4.6	19832.00	45.5	484.41	100.536	100.229	16.288
4.7	20287.00	45.5	485.31	100.527	100.193	16.044
4.8	20743.00	45.6	486.17	100.518	100.155	15.81
4.9	21198.00	45.6	486.99	100.508	100.115	15.585
5.0	21653.00	45.6	487.77	100.498	100.074	15.371
5.1	22111.00	45.7	488.36	100.488	100.029	15.18
5.2	22570.00	45.7	488.92	100.476	99.982	14.999
5.3	23029.00	45.7	489.48	100.465	99.933	14.825
5.4	23488.00	45.7	490.03	100.453	99.883	14.657
5.5	23947.00	45.8	490.6	100.44	99.831	14.495
5.6	24406.00	45.8	491.16	100.427	99.777	14.339
5.7	24865.00	45.8	491.72	100.413	99.722	14.189
5.8	25323.00	45.9	492.29	100.339	99.665	14.045
5.9	25782.00	45.9	492.86	100.384	99.607	13.908
6.0	26241.00	45.9	493.43	100.369	99.546	13.777
6.1	26702.00	45.9	493.94	100.353	99.483	13.66
6.2	27164.00	46.0	494.45	100.337	99.418	13.55
6.3	27625.00	46.0	494.98	100.32	99.352	13.444
6.4	28087.00	46.0	495.52	100.303	99.284	13.341
6.5	28549.00	46.1	496.08	100.285	99.215	13.242
6.6	29010.00	46.1	496.66	100.267	99.145	13.147
6.7	29472.00	46.1	497.26	100.248	99.074	13.056
6.8	29933.00	46.1	497.88	100.229	99.001	12.968
6.9	30395.00	46.2	498.53	100.209	98.927	12.885
7.0	30857.00	46.2	499.2	100.188	98.851	12.805
7.1	31321.00	46.2	500.19	100.168	98.788	12.732
7.2	31786.00	46.3	501.27	100.147	98.724	12.663
7.3	32251.00	46.3	502.38	100.125	98.655	12.597
7.4	32716.00	46.3	503.52	100.103	98.581	12.534
7.5	33181.00	46.4	504.7	100.08	98.501	12.474
7.6	33647.00	46.4	505.92	100.057	98.417	12.416
7.7	34112.00	46.5	507.18	100.032	98.327	12.36
7.8	34577.00	46.5	508.49	100.007	98.233	12.308
7.9	35042.00	46.6	509.85	99.982	98.133	12.258
8.0	35507.00	46.6	511.27	99.955	98.028	12.211
8.1	35977.00	46.7	513.2	99.929	97.911	12.17
8.2	36447.00	46.8	515.33	99.903	97.79	12.131
8.3	36918.00	46.8	517.55	99.88	97.665	12.094
8.4	37389.00	46.9	519.86	99.846	97.537	12.059
8.5	37860.00	47.0	522.26	99.82	97.405	12.026
8.6	38331.00	47.1	524.75	99.786	97.27	11.995
8.7	38801.00	47.1	527.32	99.755	97.131	11.966
8.8	39272.00	47.2	529.99	99.722	96.989	11.938
8.9	39743.00	47.3	532.74	99.689	96.843	11.913
9.0	40214.00	47.4	535.58	99.654	96.694	11.889
9.1	40691.00	47.5	538.87	99.618	96.525	11.87
9.2	41170.00	47.6	542.24	99.582	96.352	11.853
9.3	41649.00	47.7	545.61	99.544	96.18	11.837
9.4	42128.00	47.8	548.97	99.506	96.009	11.822
9.5	42607.00	47.8	552.33	99.467	95.84	11.808
9.6	43086.00	47.9	555.67	99.426	95.672	11.796
9.7	43565.00	48.0	559.01	99.385	95.505	11.785
9.8	44044.00	48.1	562.34	99.343	95.339	11.775
9.9	44523.00	48.2	565.66	99.299	95.174	11.767
10.0	45002.00	48.3	568.98	99.255	95.011	11.759
10.1	45489.00	48.4	572.58	99.208	94.835	11.755
10.2	45978.00	48.5	576.18	99.16	94.661	11.751
10.3	46467.00	48.6	579.68	99.111	94.491	11.749
10.4	46955.00	48.7	583.1	99.062	94.326	11.747
10.5	47444.00	48.8	586.44	99.013	94.166	11.747
10.6	47933.00	48.9	589.68	98.963	94.011	11.747
10.7	48422.00	49.0	592.84	98.912	93.86	11.748
10.8	48911.00	49.1	595.9	98.862	93.714	11.75
10.9	49399.00	49.1	598.88	98.81	93.573	11.753
11.0	49888.00	49.2	601.77	98.758	93.437	11.757
11.1	50382.00	49.3	604.37	98.705	93.298	11.762
11.2	50878.00	49.4	606.91	98.652	93.165	11.768
11.3	51373.00	49.4	609.46	98.599	93.04	11.775
11.4	51868.00	49.5	612.03	98.545	92.924	11.783
11.5	52364.00	49.6	614.62	98.492	92.816	11.791
11.6	52859.00	49.7	617.21	98.483	92.716	11.8
11.7	53356.00	49.7	619.81	98.384	92.624	11.81
11.8	53856.00	49.8	622.7	98.33	92.545	11.821
11.9	54355.00	49.9	625.62	98.276	92.468	11.832
12.0	54855.00	50.0	628.53	98.223	92.395	11.844
12.1	55357.00	50.1	631.42	98.17	92.323	11.857
12.2	55860.00	50.1	634.28	98.117	92.253	11.87
12.3	56363.00	50.2	637.12	98.064	92.186	11.884
12.4	56866.00	50.3	639.94	98.012	92.121	11.899
12.5	57369.00	50.4	642.75	97.96	92.058	11.915
12.6	57872.00	50.4	645.53	97.908	91.997	11.931
12.7	58378.00	50.5	648.29	97.857	91.938	11.948
12.8	58885.00	50.6	651.02	97.805	91.882	11.965
12.9	59392.00	50.7	653.74	97.755	91.827	11.984