

선박기본개념

2018. 3

류재문

2.1 주요치수와 선형 계수

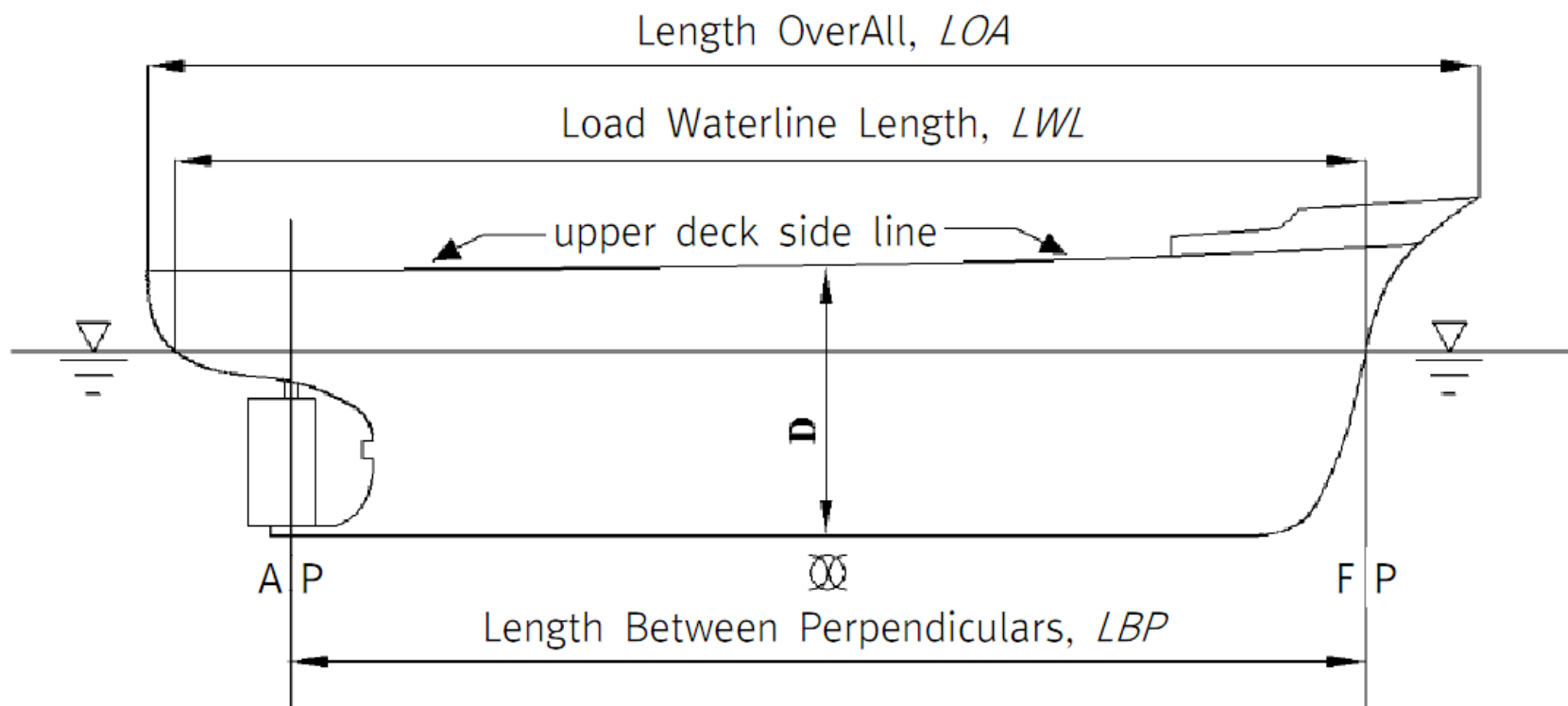


그림 2.1 선체 길이의 정의

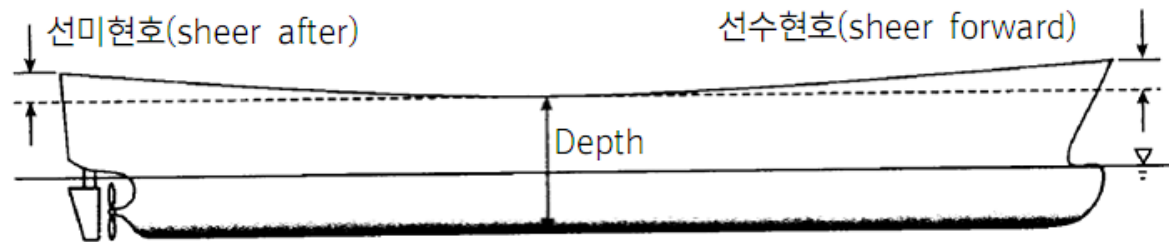
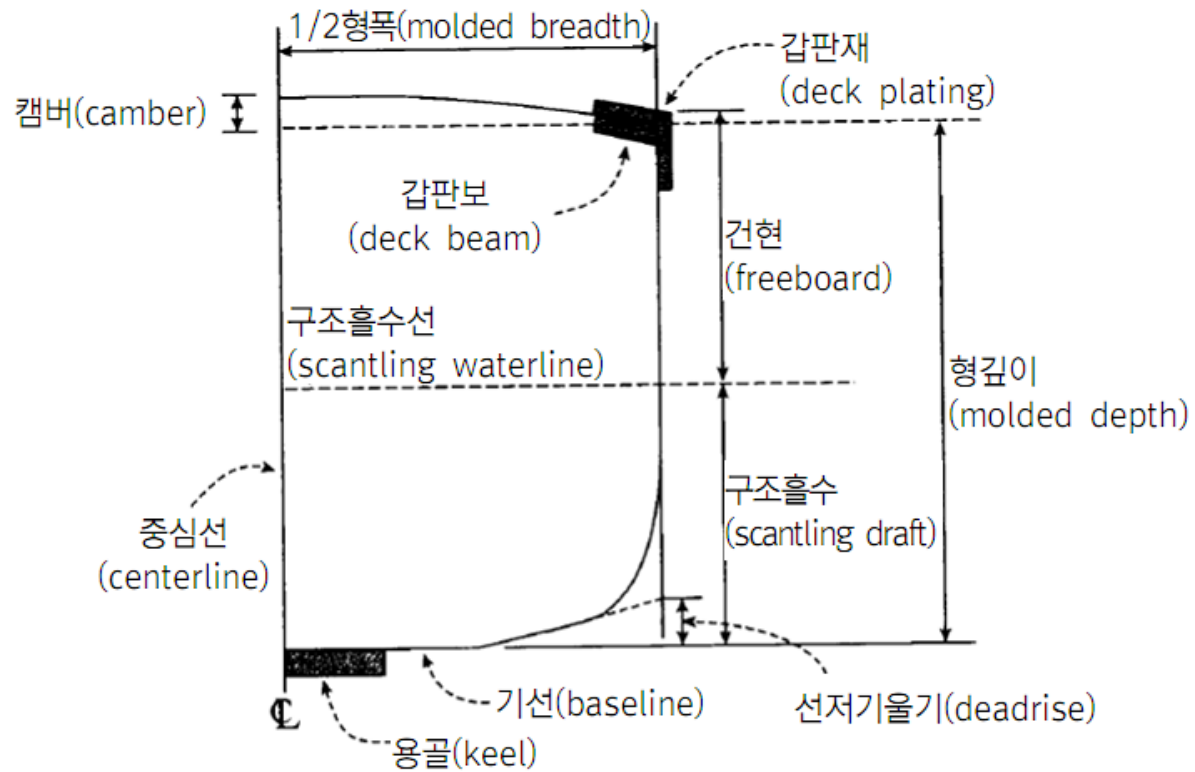


그림 2.2 선체 종앙 단면 및 측면 형상

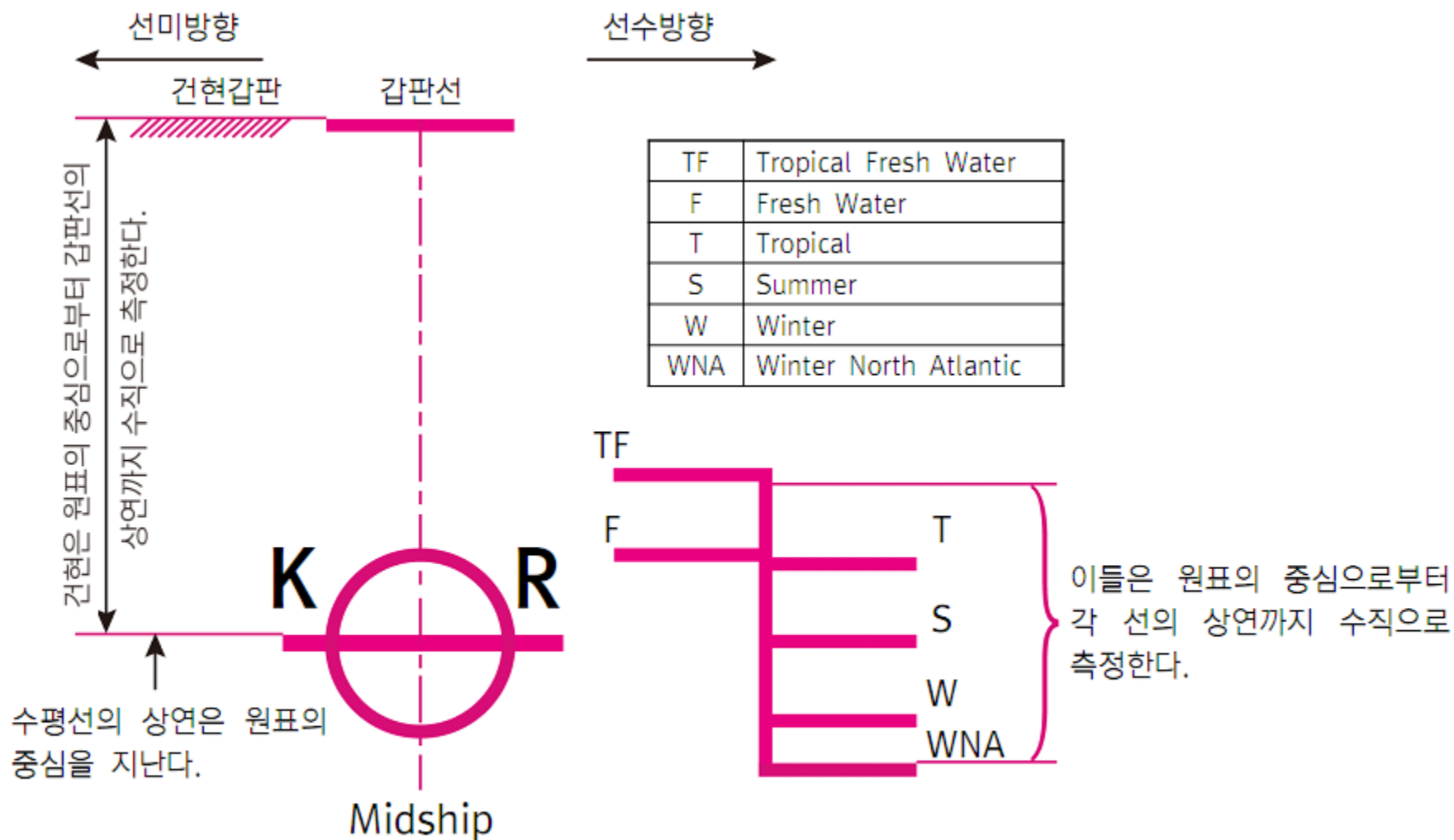


그림 2.3 계획만재흘수선 표시

선형계수

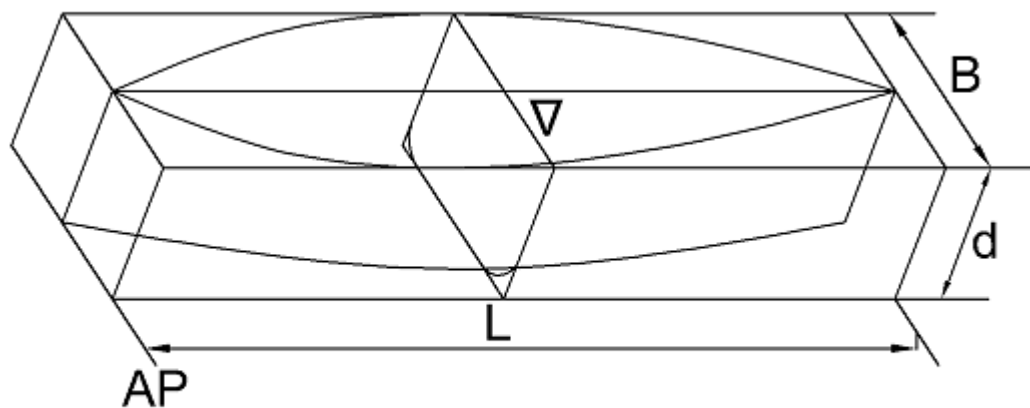


그림 2.4 방형계수의 정의

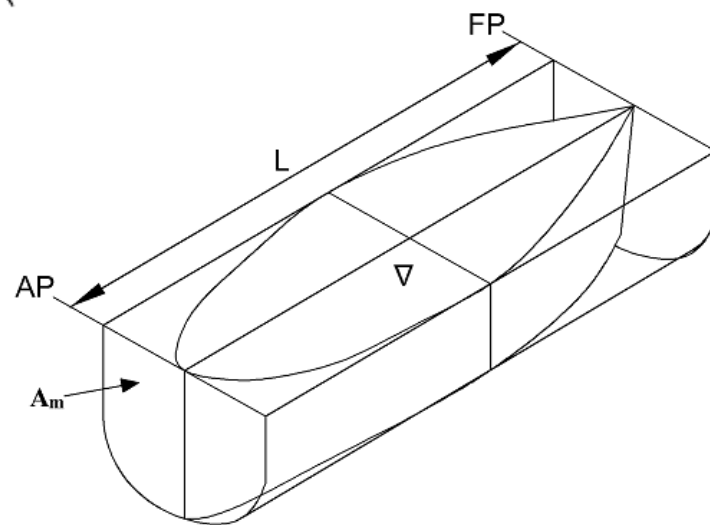


그림 2.5 주형계수의 정의

C_p 곡선

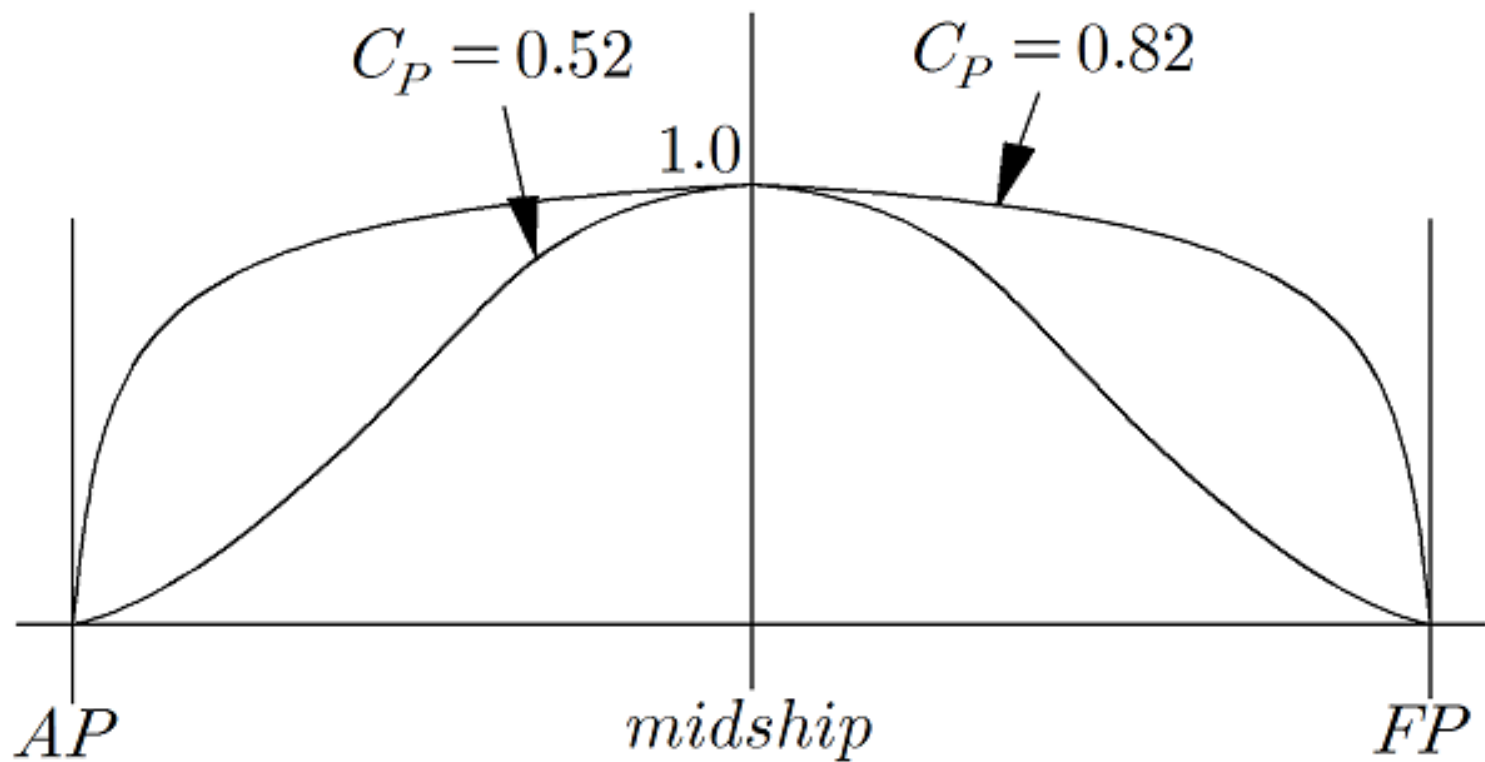


그림 2.6 C_p 곡선

선박의 톤수

- 배수량
 - molded displacement
 - full load displacement
 - light weight
 - DWT = full load – light weight

용적 톤수

- Gross Tonnage (GT)
- Net Tonnage (NT)
- Compensated Gross Tonnage (CGT)
- Canal Tonnage

2.3 선박의 동력과 속력

- 주기관 동력 (Main E/G Power)
 - 1 HP(HorsePower) = 0.746kw = 1.014 PS
 - 1 PS = 0.735kw = 0.986 HP
- 1 hp → 1초동안 75kg중량을 1m 움직이는 일의 크기 (Work = F S) = 75kg m/sec

- $\text{동력} = \text{일} / \text{시간} = \text{힘} \times \text{거리} / \text{시간}$
- $1 \text{ Watt} = 1\text{초에 } 1\text{Joule 의 일을 하는 일률}$
- $1\text{W} = 1\text{J/sec}$
- $1 \text{ Joule} = 1\text{N의 힘이 } 1\text{m 이동할 때의 일}$
- $\text{Force의 단위} = [\text{kg 중}] = [\text{N}]$

엔진의 출력/Speed

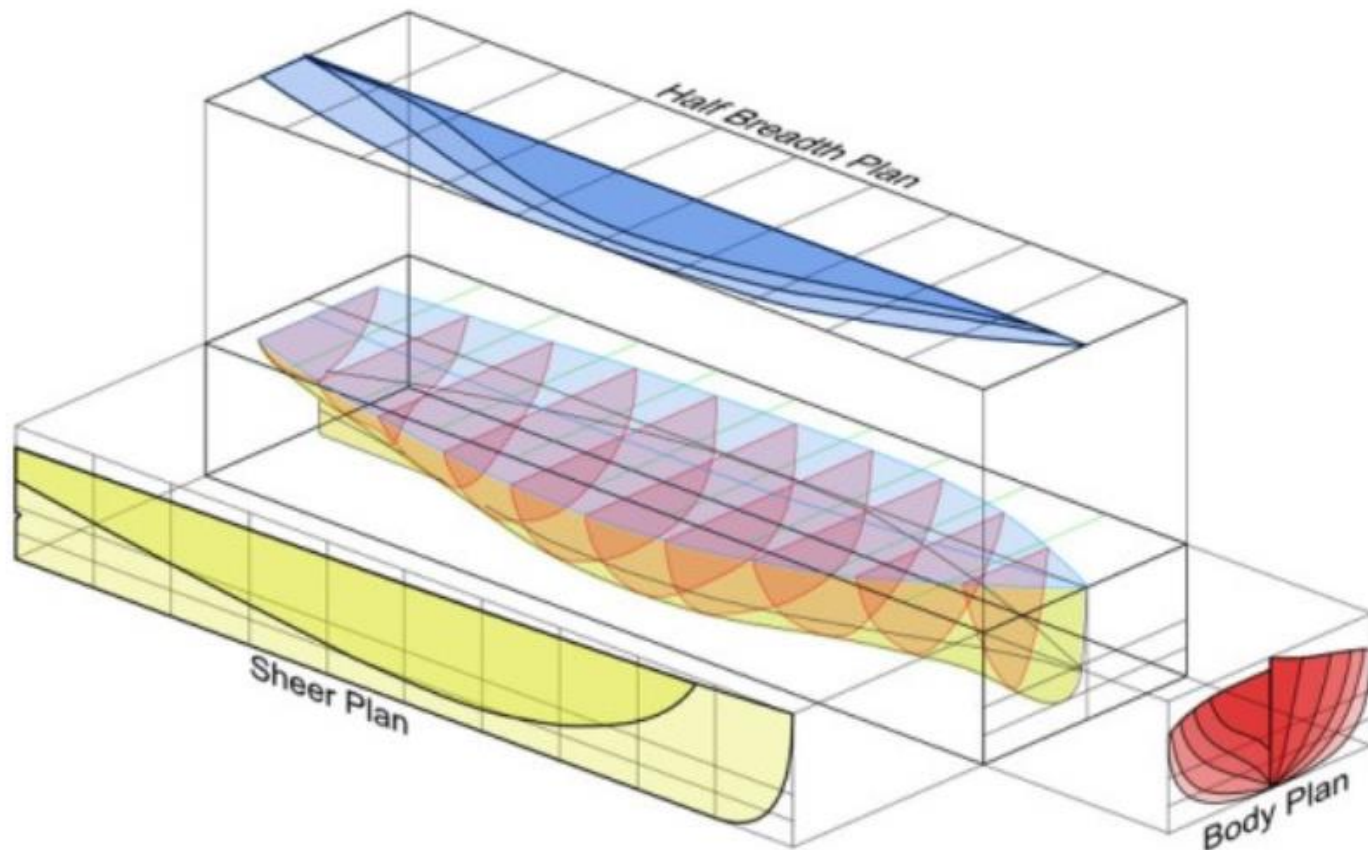
- MCR (Maximum Continuous Rating)
- Service Power/NOR(Normal Operating Rating)
- 1 Knots (kts) ➔ 1시간에 1 nautical mile 이동 (1852m) = 0.5144m/sec
- Froude Number = 관성력/중력 = $Fn = \frac{V}{\sqrt{gL}}$

Speed

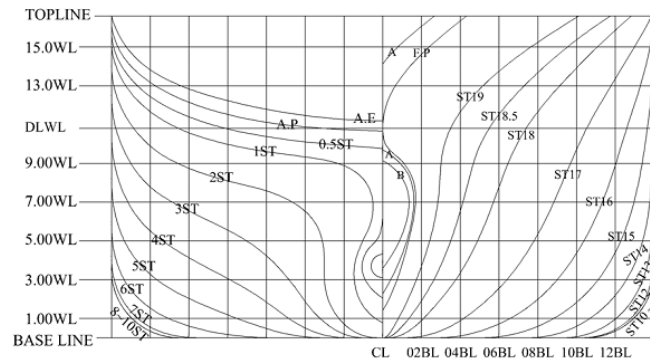
- 1 Knots (kts) → 1시간에 1 nautical mile 이동 (1852m) = 0.5144m/sec
- Froude Number = 관성력/중력 =

선형 기하학

- Lines (선도)



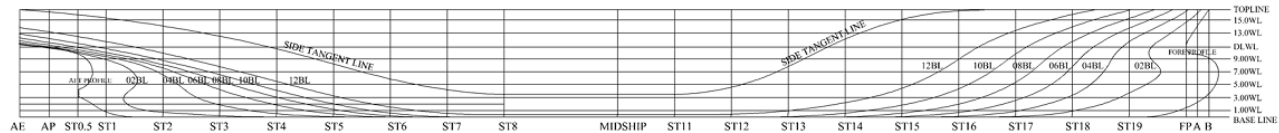
Lines



BODY PLAN

PRINCIPAL PARTICULARS

LENGTH	O.	A.	184.60	m
LENGTH	B.	P.	176.00	m
BREADTH		(M.L.D.)	28.00	m
DEPTH		(M.L.D.)	16.60	m
DRAFT DESIGN		(M.L.D.)	10.80	m
DRAFT SCANTLING		(M.L.D.)	11.40	m
DEADWEIGHT (at S. L. W. L)			abt. 31,500	Ton
MAIN ENGINE				
SPEED SERVICE			abt. 17.0	Kts
CAMBER			0.56	m
CLASSIFICATION			KRUKOREAN REGISTER	

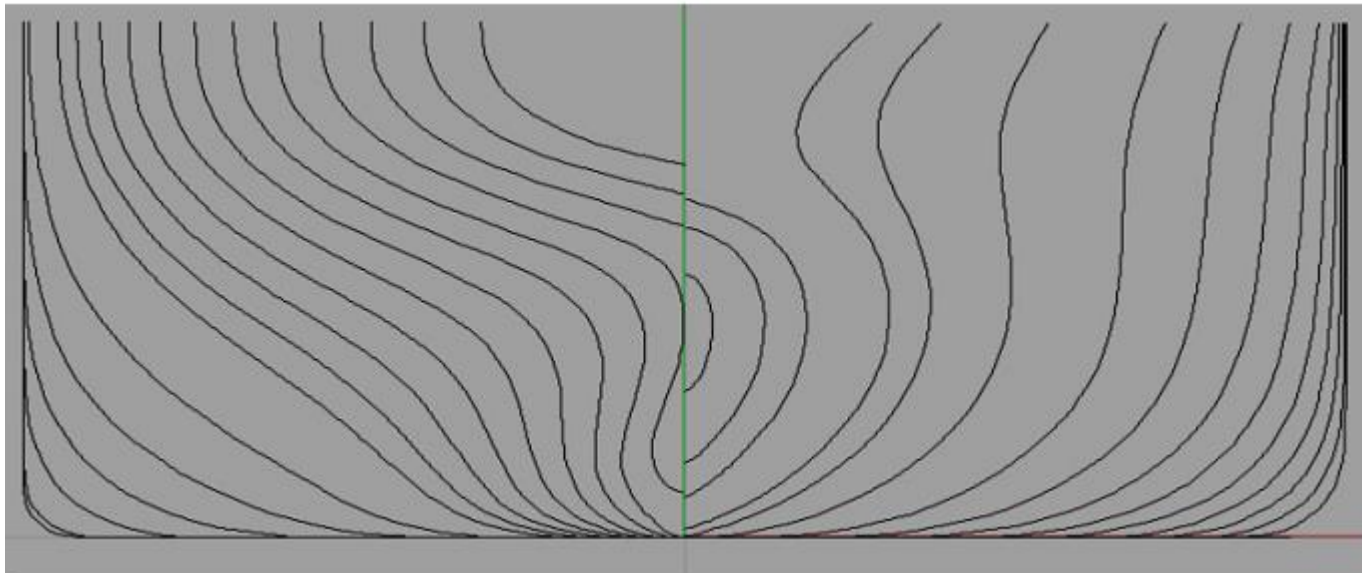
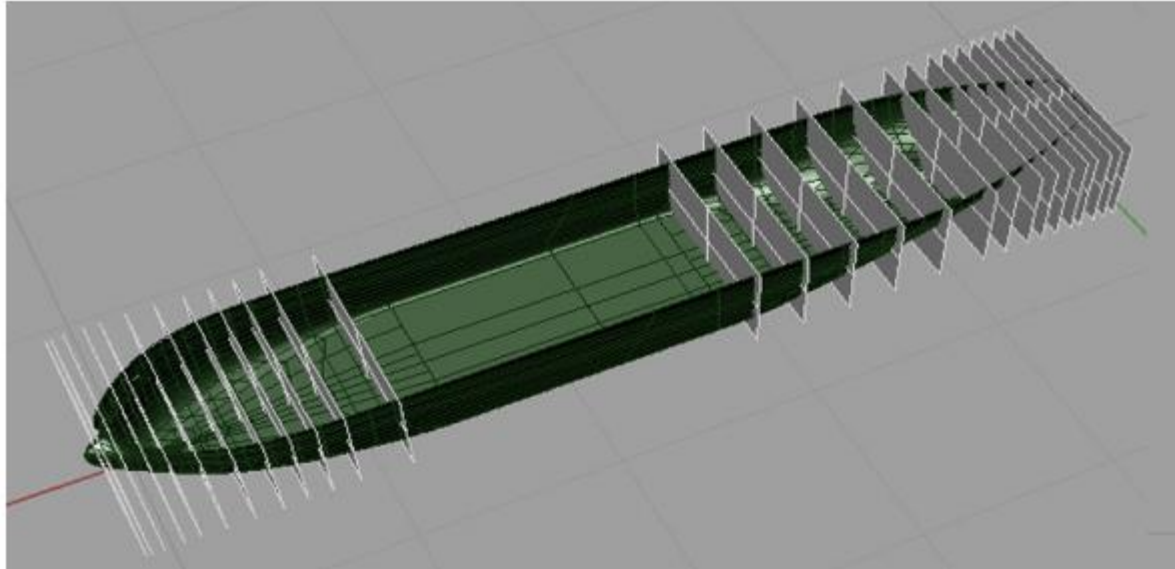


SHEER PLAN

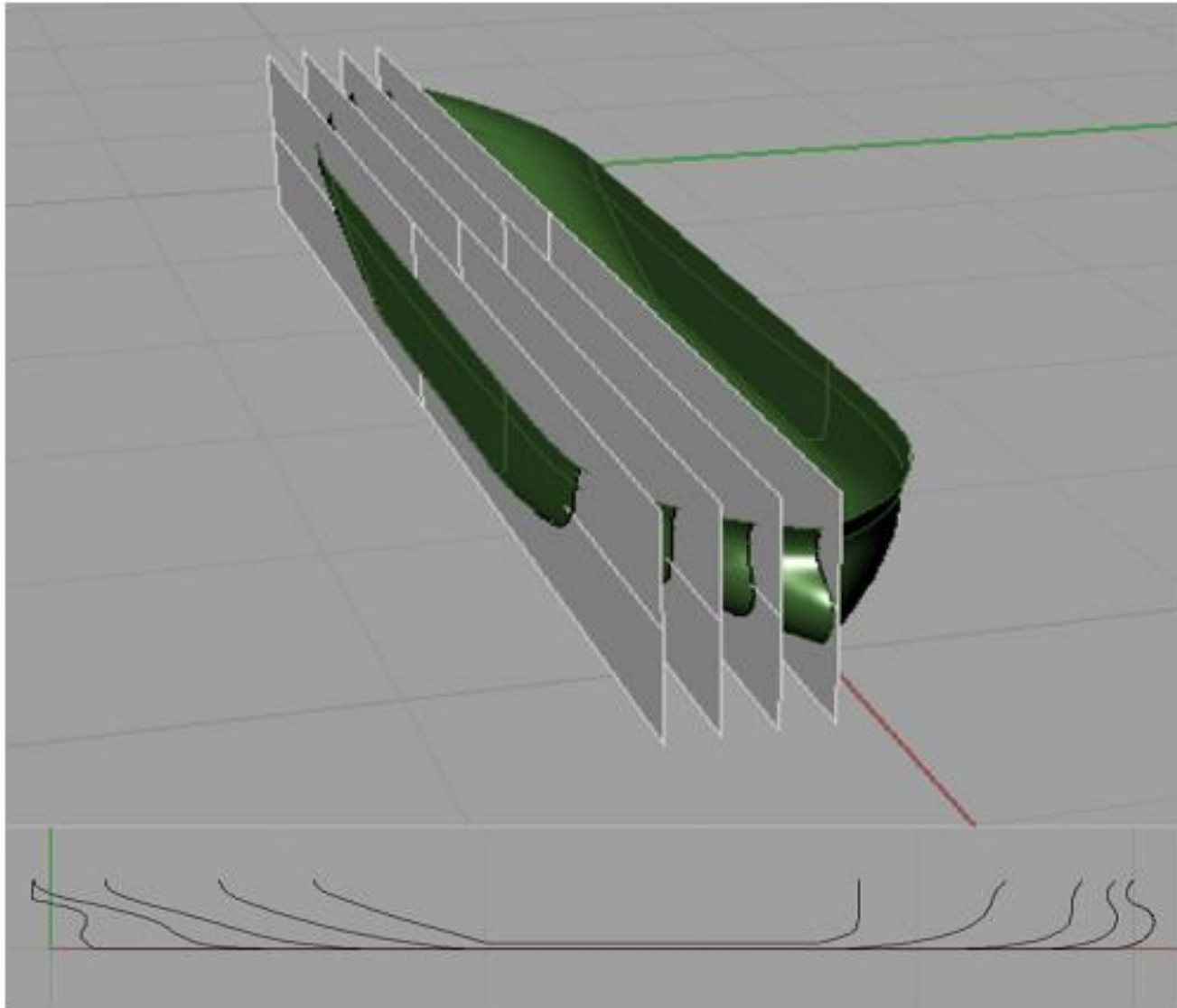


HALF-BREADTH PLAN

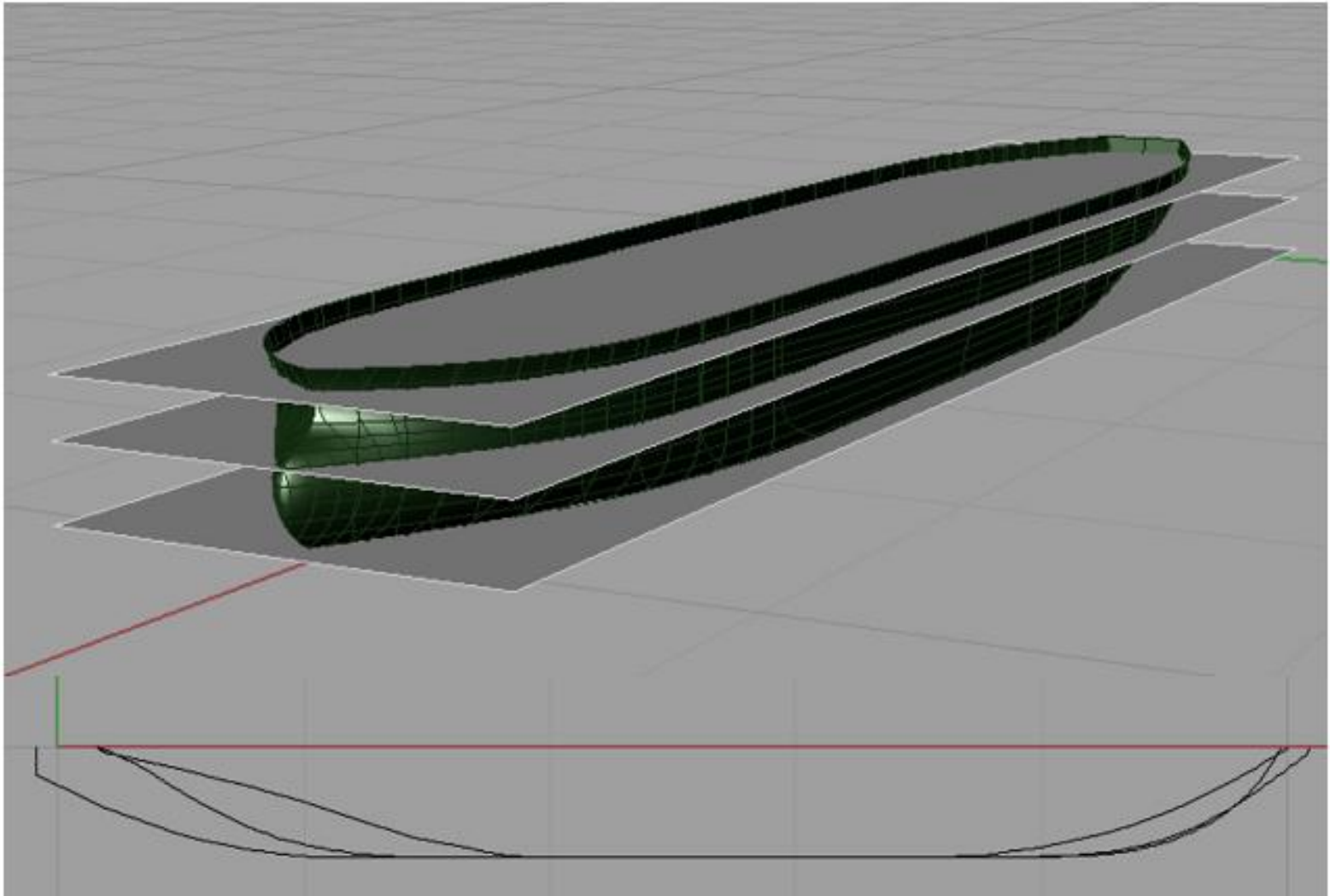
Body Plan (정면도)



Sheer Plan



Half-Breadth Plan



Offset Table

표 2.1 오프셋표

no. of ord	Water line																		
	base line	0.5	1	2	3	4	5	6	7	8	9	10	10.8	12	13	14	15	16	upper deck
A														9.587	11.192	12.674	13.500	13.927	14.000
AP													2.918	9.595	11.722	12.643	13.000	13.981	14.000
01			0.383	1.215	1.472	1.694	1.934	0.602	0.511	0.862	2.329	8.669	10.529	12.395	13.254	13.762	13.986	14.000	"
02	0.238	1.749	2.268	2.826	3.005	3.016	3.119	3.541	4.666	7.619	10.580	12.118	12.842	13.551	13.800	13.999	14.000	"	"
03	0.979	2.603	3.241	4.091	4.841	5.768	7.023	8.888	10.863	12.226	12.996	13.495	13.771	13.980	14.000	"	"	"	"
04	1.860	4.001	4.851	6.233	7.897	9.770	11.397	12.475	13.154	13.585	13.853	13.982	14.000	"	"	"	"	"	"
05	3.074	6.089	7.525	9.848	11.660	12.792	13.231	13.709	13.916	13.998	14.000	"	"	"	"	"	"	"	"
06	5.671	9.646	11.065	12.574	13.245	13.754	13.953	14.000	"	"	"	"	"	"	"	"	"	"	"
07	9.477	11.900	12.639	13.457	13.856	13.996	14.000	"	"	"	"	"	"	"	"	"	"	"	"
08	10.500	12.303	12.950	13.662	13.964	14.000	"	"	"	"	"	"	"	"	"	"	"	"	"
09	10.500	12.303	12.950	13.662	13.964	14.000	"	"	"	"	"	"	"	"	"	"	"	"	"
10	10.500	12.303	12.950	13.662	13.964	14.000	"	"	"	"	"	"	"	"	"	"	"	"	"
11	10.500	12.303	12.950	13.662	13.964	14.000	"	"	"	"	"	"	"	"	"	"	"	"	"
12	10.334	12.139	12.795	13.527	13.872	13.989	14.000	"	"	"	"	"	"	"	"	"	"	"	"
13	9.399	11.516	12.040	12.914	13.419	13.719	13.884	13.965	13.996	14.000	"	"	"	"	"	"	"	"	"
14	7.550	9.819	10.702	11.836	12.569	13.073	13.411	13.636	13.783	13.877	13.936	13.973	13.990	14.000	"	"	"	"	"
15	5.188	7.787	8.839	10.202	11.113	11.775	12.278	12.662	12.960	13.194	13.383	13.541	13.654	13.806	13.906	13.973	14.000	"	"
16	5.188	7.787	8.839	10.202	11.113	11.775	12.278	12.662	12.960	13.194	13.383	13.541	13.654	13.806	13.906	13.973	14.000	"	"
17	1.164	3.321	4.187	5.439	6.402	7.168	7.801	8.346	8.823	9.256	9.680	10.126	10.513	11.174	11.776	12.380	12.973	13.556	3.8500
18	0.326	1.597	2.103	3.000	3.766	4.382	4.888	5.322	5.709	6.076	6.404	6.924	7.389	8.260	9.121	10.066	11.070	12.142	12.838
19	0.046	0.824	0.808	1.306	1.731	2.105	2.419	2.667	2.843	2.938	3.007	3.109	3.491	4.255	5.170	6.305	7.643	9.156	10.125
FP				0.315	0.740	1.059	1.326	1.559	1.689	1.604	1.687	0.135	0.000	0.175	0.648	1.397	2.393	3.560	4.324

2.4.3 근사적분법

- 사다리꼴공식 (Trapezoidal Rule)

$$A = \frac{h}{2}(y_0 + 2y_1 + y_2) \quad (2.12)$$

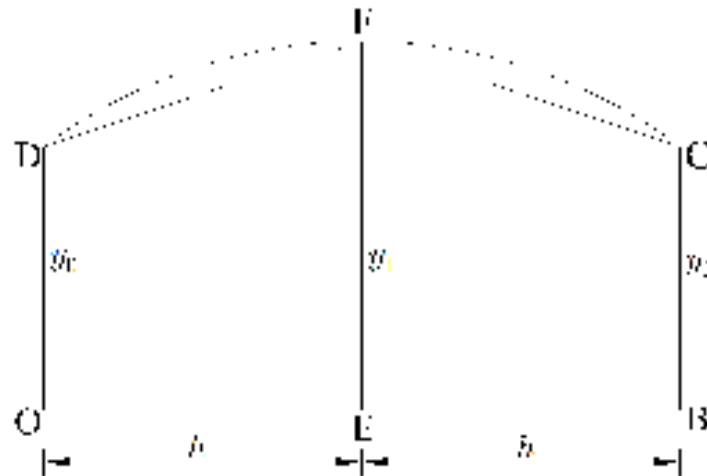


그림 2.9 사다리꼴 공식

Simpson's 1st Rule

- 1st Rule : $S = h/3(y_0 + 4y_1 + y_2)$

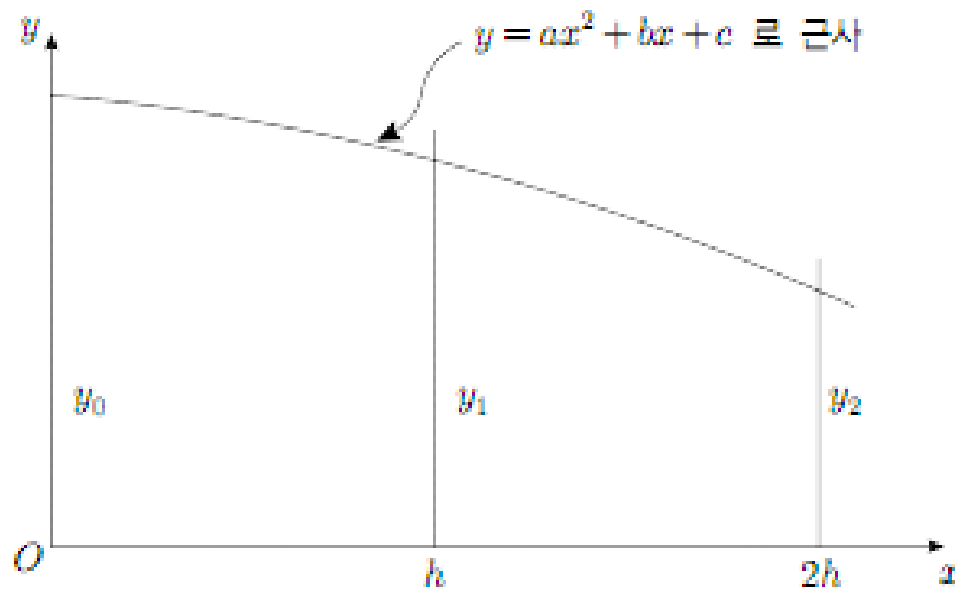


그림 2.10 심프슨의 공식

Simpson's 2nd Rule

- 2nd Rule : 네 점을 3차식으로 근사

$$S = 3h/8 (1y_0 + 3y_1 + 3y_2 + 1y_3)$$

도심 (centroid)

$$M_x = \int_A y dA, \quad M_y = \int_A x dA. \quad (2.17)$$

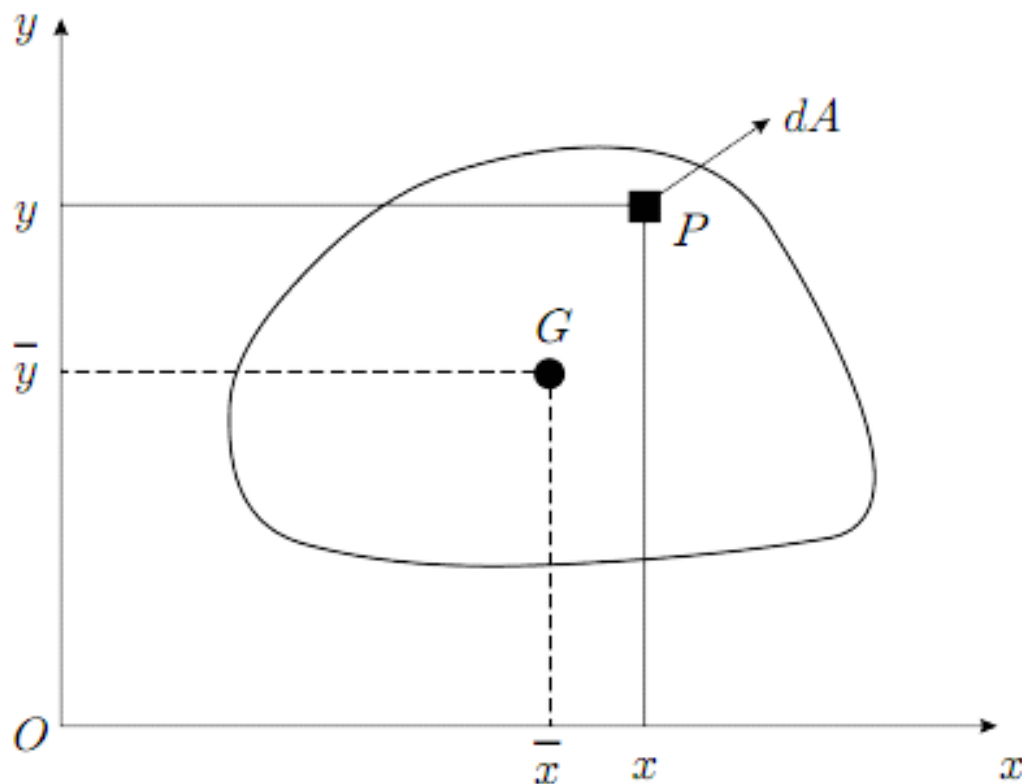


그림 2.11 평면 상의 도형의 면적과 도심

$$\bar{x} = \frac{M_y}{A} = \frac{1}{A} \int_A x dA.$$

$$\bar{y} = \frac{M_x}{A} = \frac{1}{A} \int_A y dA.$$

- 도심을 지나는 축에 대한 모멘트는 0

$$M_{\eta} = \int_A (x - \bar{x}) dA = M_y - \bar{x} A = 0.$$

Hydrostatic and Other Curves

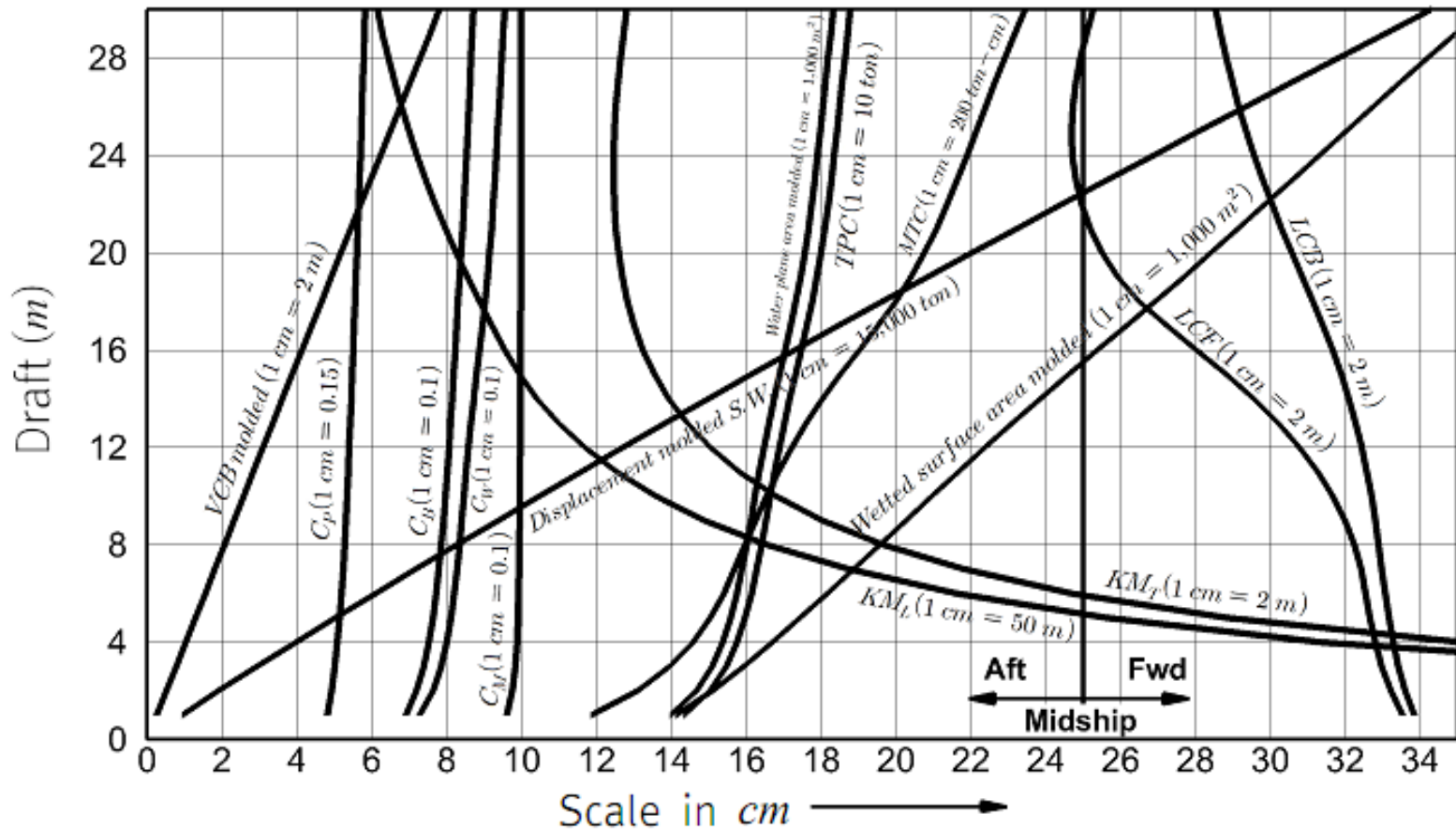


그림 2.12 배수량등곡선도

- Displacement – F.W, S.W, Molded, Total
- LCB (Longitudinal Center of Buoyancy)
- VCB (Vertical Center of Buoyancy) = KB
- LCF (Longitudinal Center of Flotation)
- Metacenter (KM)
- TPC (Tons Per 1cm Immersion)
- MTC (Moment to change 1cm trim)
- Wetted Surface Area
- 선형계수 (CB, CM, CP, CW, CVP)

Metacenter

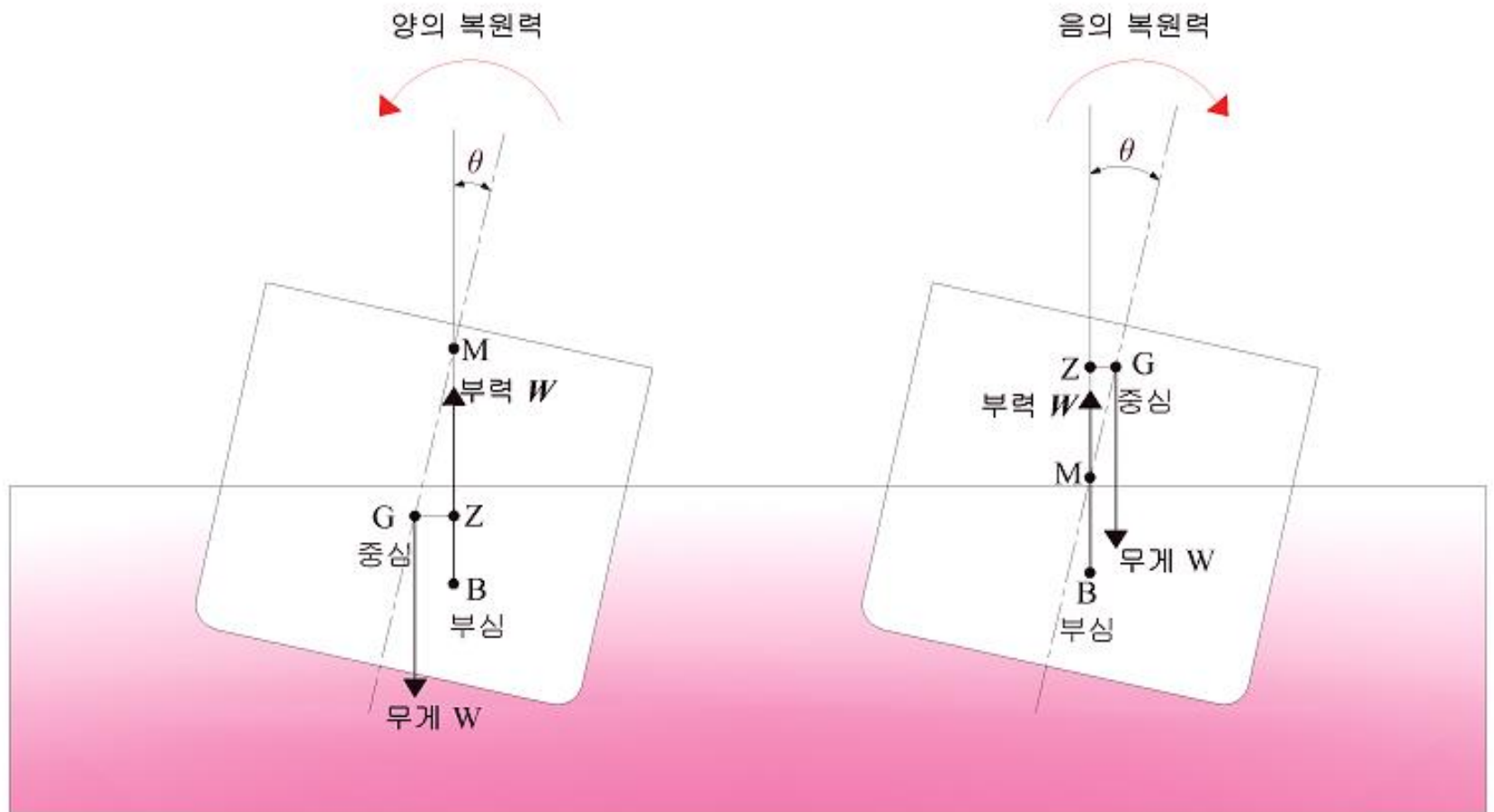


그림 2.13 메타센터의 개념

복원성

- Metacenter and Restoring Moment

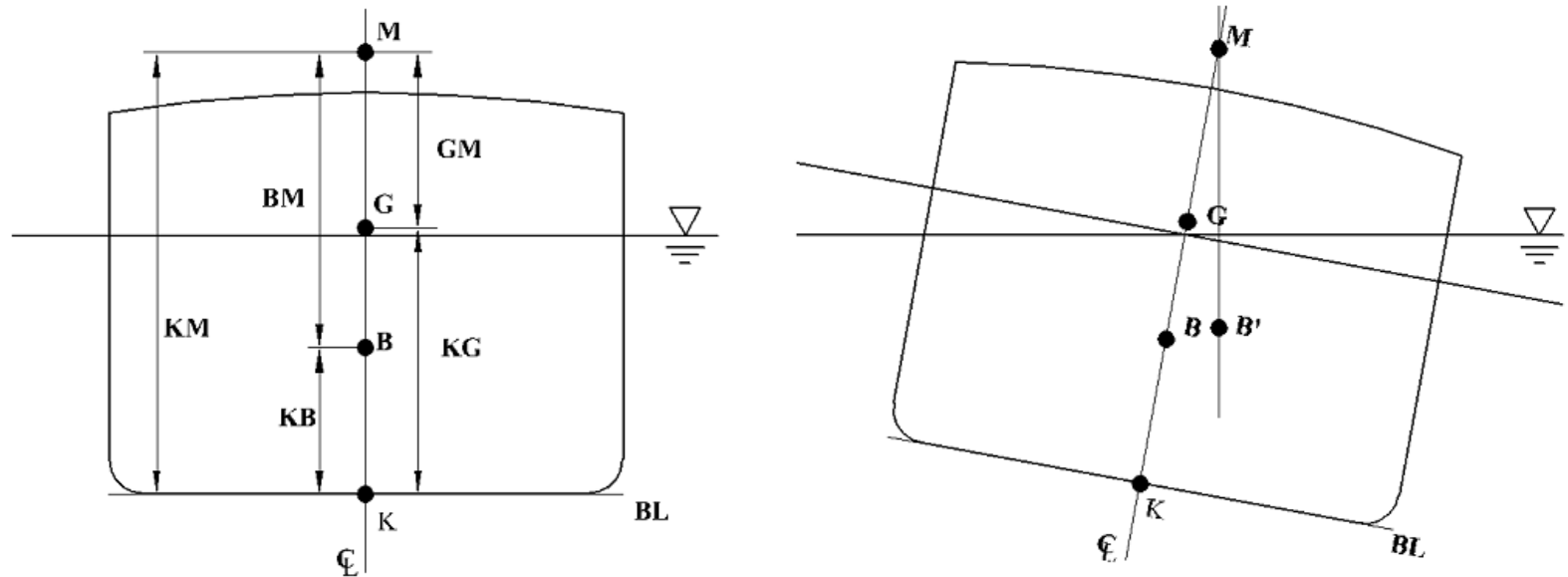


그림 2-17 메타센터의 개념

$$M_r = \Delta GZ = \Delta GM \sin \theta .$$

경사시험 (Inclining Test)

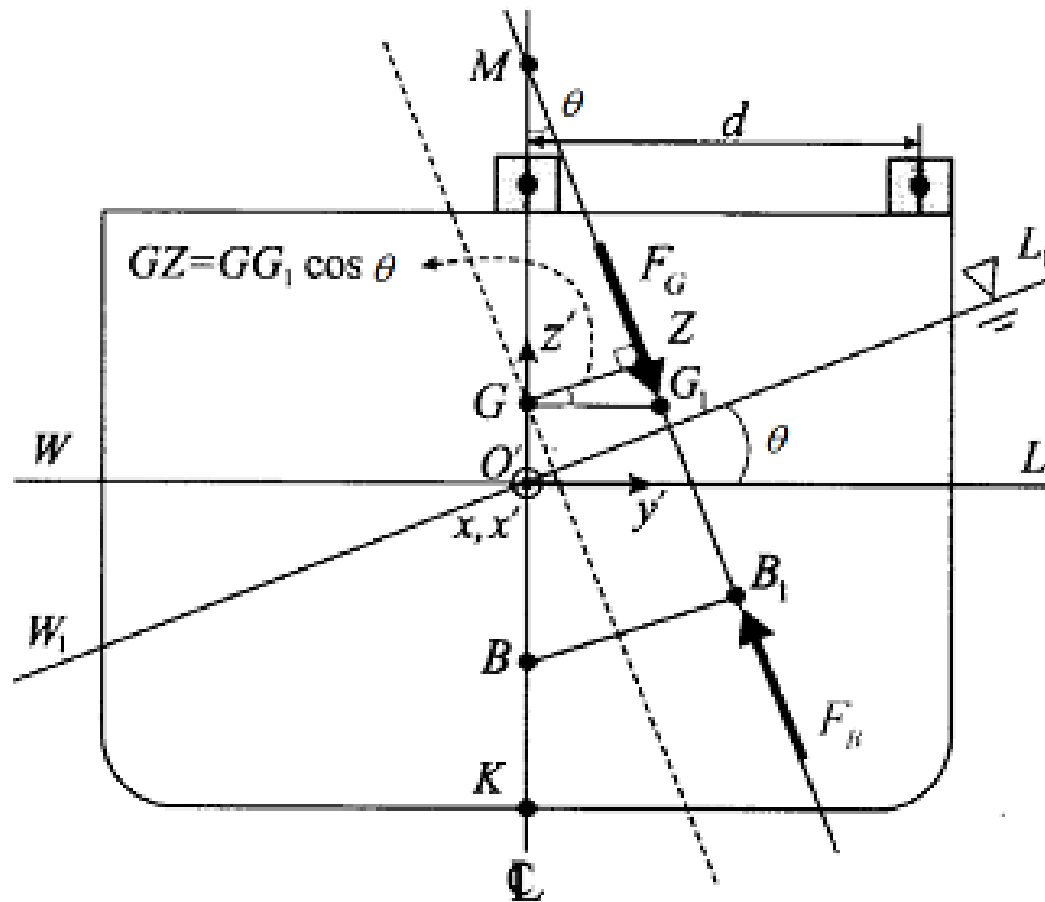


그림 2.15 경사시험

정 복원성

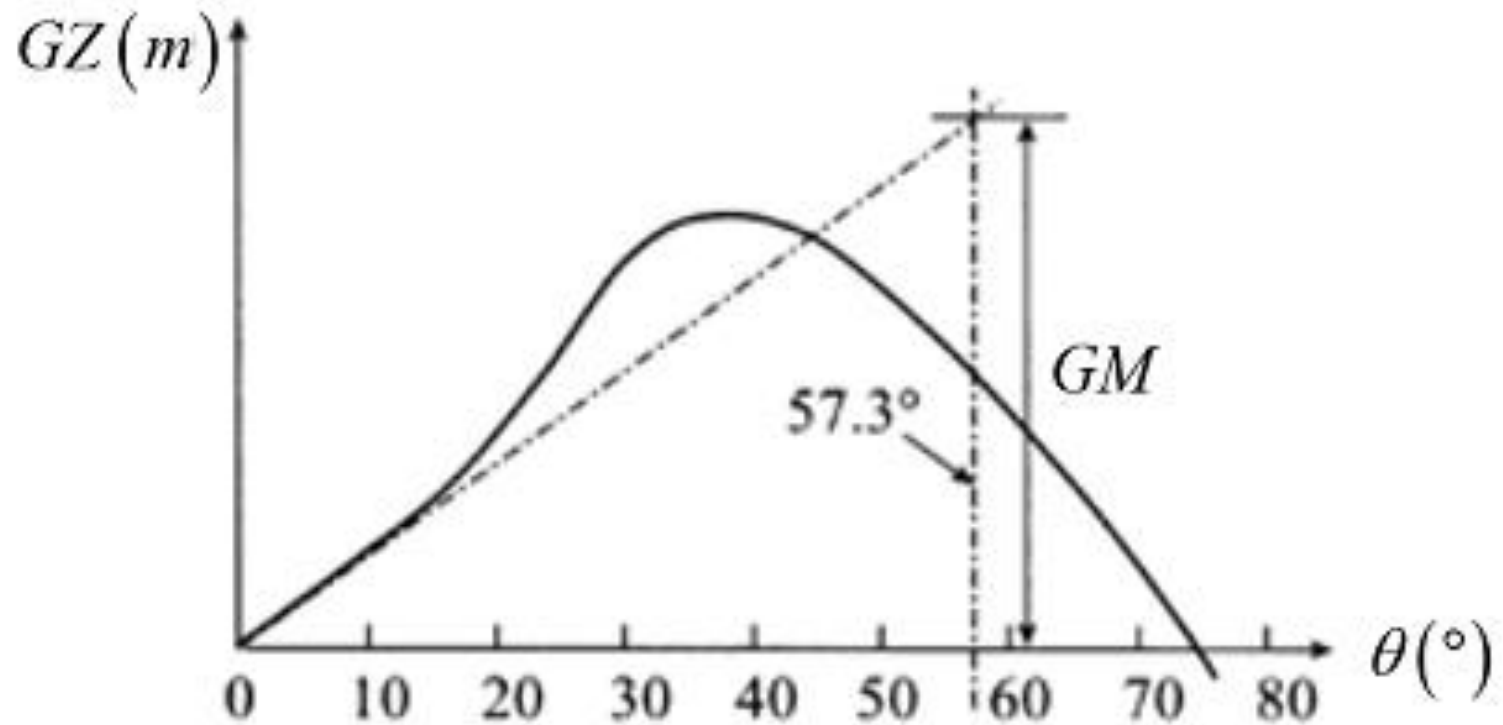


그림 2.16 정적복원성 곡선