

MEC-E1004 Principles of Naval Architecture

Scantling

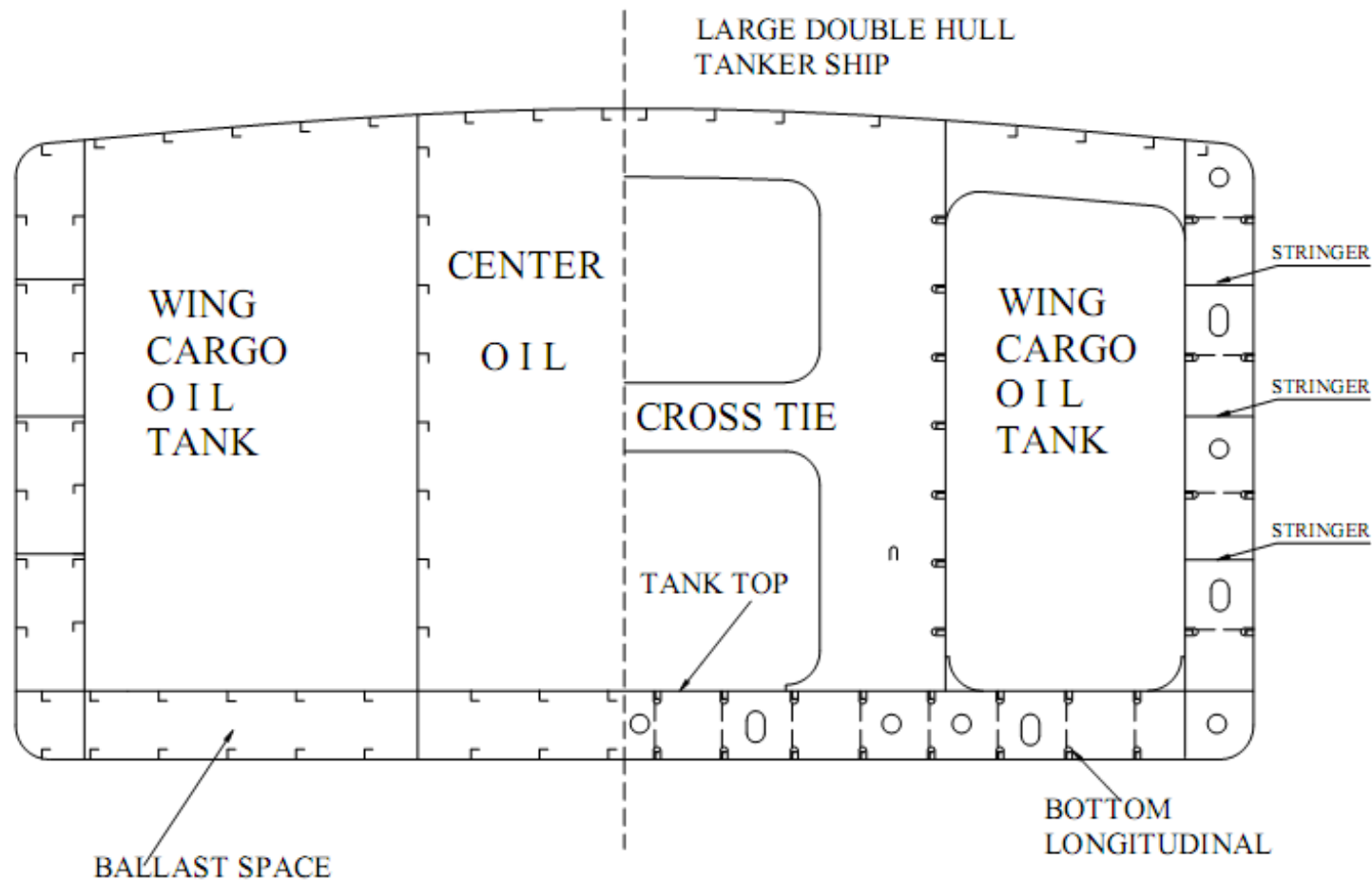


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Scantlings in Class Society Rules

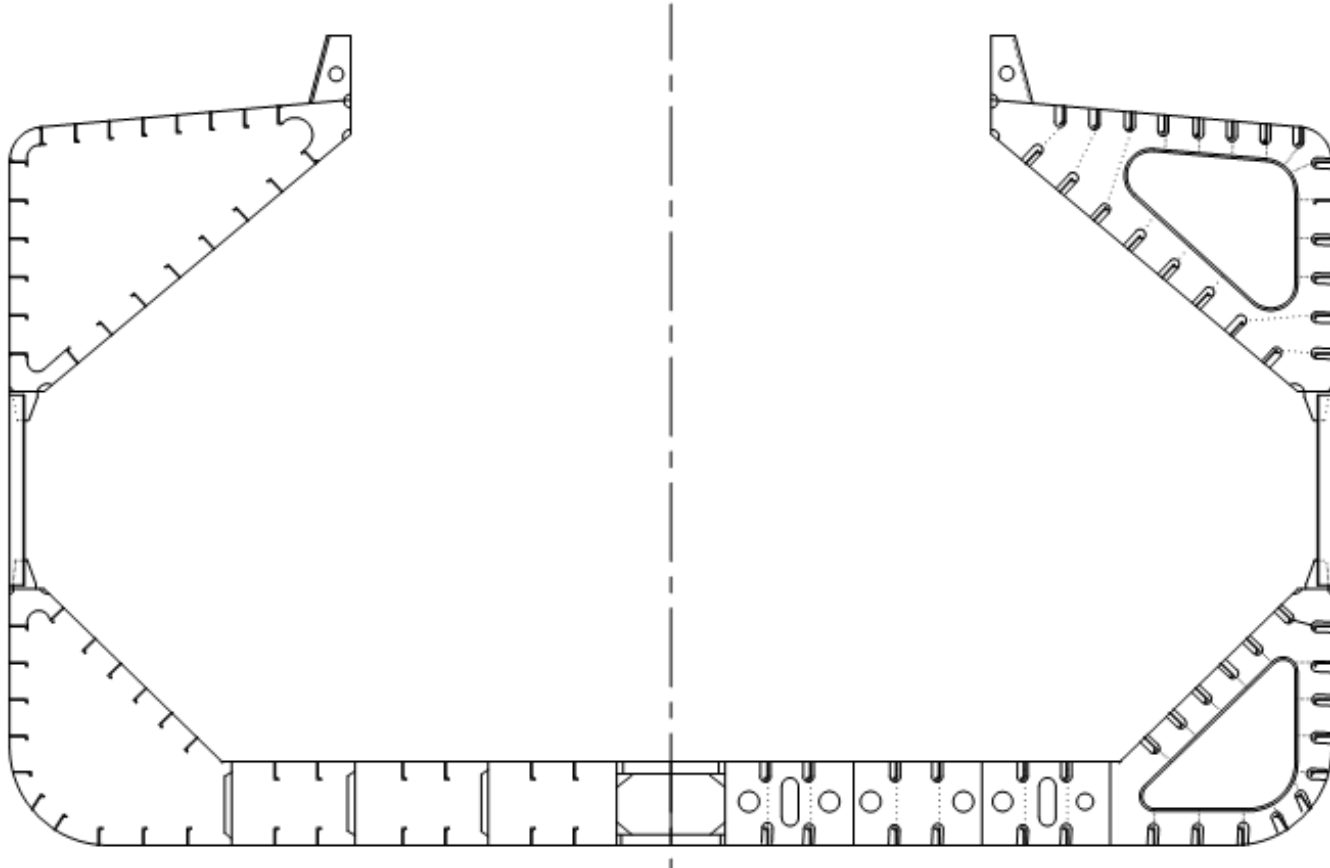
- ❑ Scantling should be obtained based on the rules of the corresponding potential classification society.
- ❑ Here DNVGL rules “Hull Structural Design, Ships with Length 100 meters and above” is used only as an example.
- ❑ Before calculating scantling you should have the ship main particulars, subdivisions and the shape of the amidship section including frame spacing and web frame spacing.

Amidships section of an Oil tanker

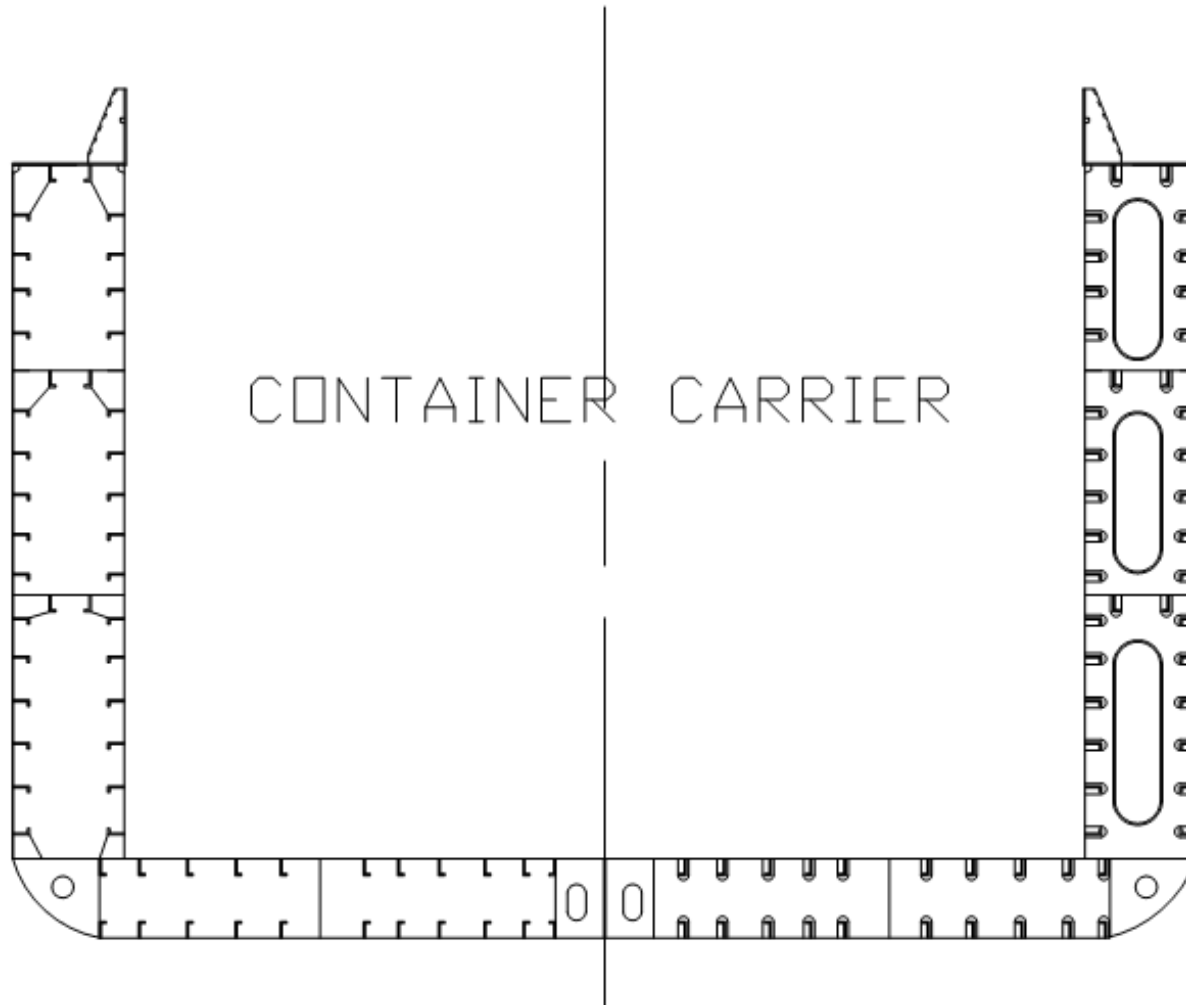


A?

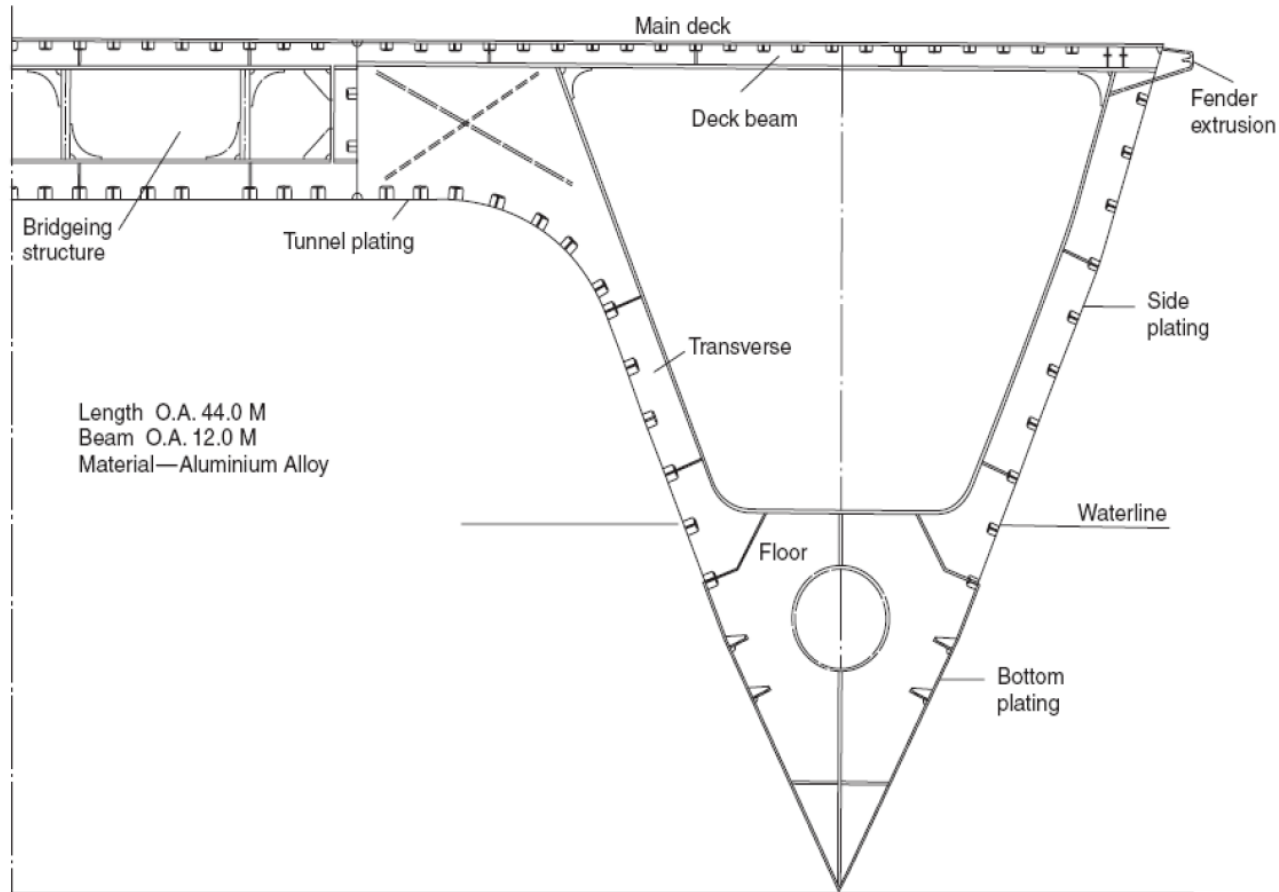
Amidship section of a Bulk carrier



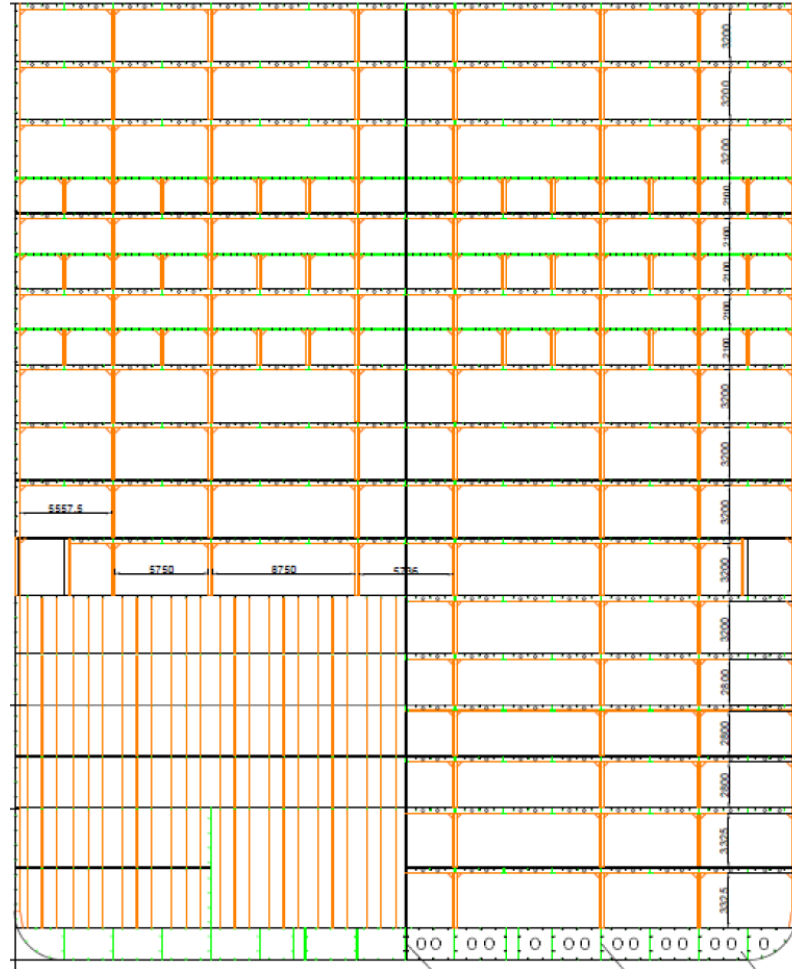
Amidships section of a container ship



Amidships section of a catamaran



Amidships section of a cruise ship



Material

- ❑ Go to the material section in the corresponding rules and define the hull structural material (Section 2 In DNVGL Rules)

Sec. 2	Materials	18
A.	General.....	18
A 100	Introduction.....	18
A 200	Material certificates	18
B.	Hull structure steel.....	18
B 100	General.....	18
B 200	Material designations and classes	18
B 300	Basic requirements.....	19
B 400	Requirements for low air temperatures.....	20
B 500	Material at cross-joints.....	20
C.	Alternative structural materials	21
C 100	Aluminium	21
C 200	Stainless steel.....	21
C 300	Steel sandwich panel construction	22
C 400	Concrete Barge	22

Plating and stiffeners

- ❑ Define the min thickness of the plates and the stiffeners and girder section modulus (sec 6 in DNVGL)

C. Plating and stiffeners	90
C 100 General.....	90
C 200 Keel plate	90
C 300 Bottom and bilge plating.....	90
C 400 Inner bottom plating.....	91
C 500 Plating in double bottom floors and longitudinal girders	92
C 600 Transverse frames	92
C 700 Bottom longitudinals.....	93
C 800 Inner bottom longitudinals.....	94
C 900 Stiffening of double bottom floors and girders.....	94

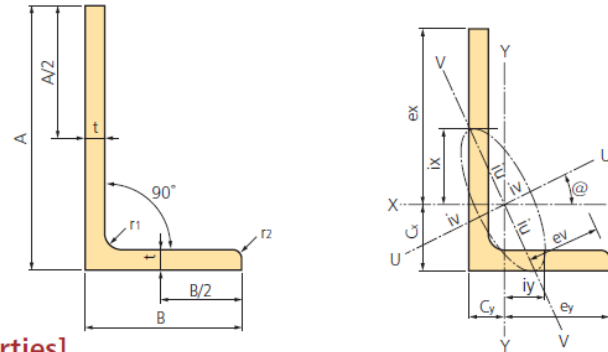
Stiffeners and girder selection

- ❑ **Minimum thickness of side shell, deck plate, keel plate, bilge plate etc. can be calculated from the rules**
- ❑ **Rules give the minimum section modulus of the stiffeners and girders**
 - ✓ For stiffeners, you can select the appropriate angles from the shipbuilding steel suppliers' catalogue (available on the internet)
 - ✓ For girders, you can use the excel file (Section Modulus calculator) to get the shape of the girder that gives the minimum required section modulus.



Stiffeners and girder selection

- Stiffener selection from the shipbuilding steel suppliers' catalogue



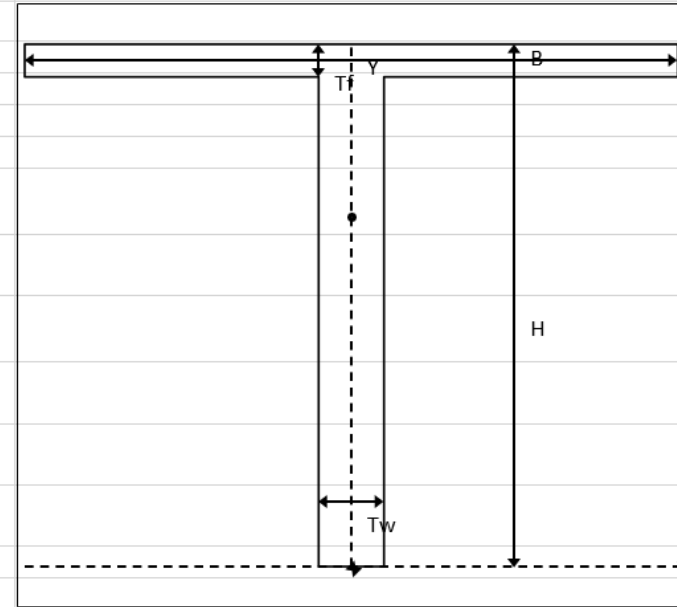
[Product shapes, dimensions and sectional properties]

Dimension (mm)				Sectional area (cm ²)	Unit mass (kg/m)	Position of center of gravity (cm)		Geometrical moment of inertia (cm ⁴)				Radius of gyration of area (cm)				tan α	Modulus of section (cm ³)	
A	t	r ₁	r ₂			C _x	C _y	I _x	I _y	max. I _u	min. I _v	i _x	i _y	max. i _u	min. i _v		Z _x	Z _y
100×75	7	10	5	11.87	9.32	3.06	1.83	118	56.9	144	30.8	3.15	2.19	3.49	1.61	0.548	17.0	10.0
	10	10	7	16.50	13.0	3.17	1.94	159	76.1	194	41.3	3.11	2.15	3.43	1.58	0.443	23.3	13.7
125×75	7	10	5	13.62	10.7	4.10	1.64	219	60.4	243	36.4	4.0	2.0	3.2	1.6	0.357	26.1	10.3
	10	10	7	19.00	14.9	4.22	1.75	299	80.8	330	49.0	3.96	2.06	4.17	1.61	0.357	36.1	14.1
150×90	9	12	6	20.94	16.4	4.95	1.99	485	133	537	80.4	4.81	2.52	5.06	1.96	0.361	48.2	19.0
	12	12	8.5	27.36	21.5	5.07	2.10	619	167	685	102	4.76	2.47	5.00	1.93	0.357	62.3	24.3

Stiffeners and girder selection

- ❑ Girder definition based on the excel sheet

		Index	Section Type	
		28	T section	
Dimensions		Property	Formula	Value
B	10	A	$=B \cdot T_f + T_w \cdot H - T_w \cdot T_f$	12.500
H	8	Xc	0	0.000
Tw	1	Yc	$=H - (T_w \cdot H^2 + B \cdot T_f^2 - T_w \cdot T_f^2) / (2 \cdot A)$	5.350
Tf	0.5	Ix	$=B \cdot H^3 / 3 - (B - T_w) \cdot (H - T_f)^3 / 3$	441.042
		Iy	$=(B^3 \cdot T_f + (H - T_f) \cdot T_w^3) / 12$	42.292
		Ixc	$=I_x - A \cdot Y_c^2$	83.260
		Iyc	$=I_y$	42.292
		J	0	0.000



Thank you



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