



Technical Report

ISO 12215-Part5 Scantling Calculation

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Software Information:

Software Component	Release / Build Number
CompoSIDE	2.5.0.24966
ISO Calculation Engine	1.0

Vessel Scantling Results Status:

Vessel **Passes** ISO 12215-Part5 Requirements

1. Introduction



Vessel:	45 ft Sail Vessel- final
Classification Society:	ISO 12215-Part5
Circulation:	
Keywords:	ISO 12215-Part5

This report summarizes the scantling of the 45 ft Sail Vessel- final . The yacht has been engineered according to ISO 12215-Part5 guidelines.

2. Vessel

2.1 Vessel Details

Parameter	Unit	Value
Name	[-]	45 ft Sail Vessel- final
Craft Type	[-]	Sail Boat
Design Category	[-]	A - Ocean (Wave Height > 4m, Wind speeds > 8B)
L_{WL}	[m]	13.4
L_H	[m]	14.3
D	[m]	1.944
$\beta_{0.4}$	[°]	22.473
B_C	[m]	3.735
B_{WL}	[m]	2.778
V	[kt]	0
$G_{zmax<60^\circ}$	[m]	1.86
m_{LDC}	[kg]	7400

3. Materials Properties Summary

3.1 Ply Properties

Name	t_{pp}	$E_{11 \text{ avg}}$	$E_{22 \text{ avg}}$	ϵ_{11t}	ϵ_{11c}	ϵ_{22t}	ϵ_{22c}	ν_{12}
	[mm]	[MPa]	[MPa]	[%]	[%]	[%]	[%]	[-]
XC-300-E-PP	0.33	63200	63200	0.96	-0.79	0.96	-0.79	0.037
UC-HEC150-E-PP	0.16	125000	7200	1.14	-0.79	0.45	-1.5	0.3456
UC-HEC200-E-PP	0.2	125000	7200	1.14	-0.79	0.45	-1.5	0.3456
UC-HEC300-E-PP	0.3	125000	7200	1.14	-0.79	0.45	-1.5	0.3456
UC-HEC300-E-V_1	0.35	107500	6300	1.02	-0.65	0.4	-1.5	0.33
UC-IMC200-E-PP	0.2	154000	6700	1.05	-0.66	0.45	-1.5	0.3456
WC-200-E-PP	0.22	61500	61500	0.96	-0.79	0.96	-0.79	0.037
WC-400-E-PP	0.45	61500	61500	0.96	-0.79	0.96	-0.79	0.037
XC-300-E-V	0.375	55500	55500	0.96	-0.64	0.96	-0.64	0.037
XC-400-E-V	0.5	55500	55500	0.96	-0.64	0.96	-0.64	0.037
XC-HEC200-E-PP	0.227	61502.937559	61502.937559	0.95	-0.8	0.95	-0.8	0.031219

3.2 Shear Ply Properties

Name	t_{pp}	$E_{xx}(\alpha_{\text{shear}})$	$G_{xy}(\alpha_{\text{shear}})$	$\nu_{xy}(\alpha_{\text{shear}})_{\text{ult}}$	$\nu_{xy}(\alpha_{\text{shear}})_{\text{lim}}$	$\nu_{xy}(\alpha_{\text{shear}})$
	[mm]	[MPa]	[MPa]	[%]	[%]	[-]
XC-300-E-PP @ $\pm 45^\circ$	0.33	13622.466633	30472.516876	1.582	0.91	0.79243
2 x UC-HEC150-E-PP @ $\pm 45^\circ$	0.32	14978.237757	32026.170675	1.578	0.934	0.783124
2 x UC-HEC200-E-PP @ $\pm 45^\circ$	0.4	14978.237757	32026.170675	1.578	0.934	0.783124
2 x UC-HEC300-E-PP @ $\pm 45^\circ$	0.6	14339.031156	32026.170675	1.578	0.934	0.792379
2 x UC-HEC300-E-V_1 @ $\pm 45^\circ$	0.7	12040.887725	27586.558701	1.311	0.818	0.797147
2 x UC-IMC200-E-PP @ $\pm 45^\circ$	0.4	15257.659843	39221.047772	1.33	0.84	0.816388
WC-200-E-PP @ $\pm 45^\circ$	0.22	14218.831281	29652.844744	1.587	0.907	0.777354
WC-400-E-PP @ $\pm 45^\circ$	0.45	14218.831281	29652.844744	1.587	0.907	0.777354
XC-300-E-V @ $\pm 45^\circ$	0.375	11520.647647	26759.884282	1.288	0.908	0.800101
XC-400-E-V @ $\pm 45^\circ$	0.5	11520.647647	26759.884282	1.288	0.908	0.800101
XC-HEC200-E-PP @ $\pm 45^\circ$	0.227	9321.112054	29820.493713	1.6	0.9	0.853176

3.3 Core Material Properties

Name	t_{pp}	Core Type	G_{13}	G_{23}	E_{33c}	ν_{13}	ν_{23}	$\epsilon_{33 \text{ ult}}$
	[mm]	[-]	[MPa]	[MPa]	[MPa]	[%]	[%]	[%]
CKO64-4.8-(1.8)-A	25	Honey Comb, Kevlar HC	46	77	254	2.978	1.87	0
CKX40-3.2-(1.4)-A	20	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0
CKX40-3.2-(1.4)-A	25	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0
CKX40-3.2-(1.4)-A	14.68	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0

Name	t_{pp}	Core Type	G_{13}	G_{23}	E_{33c}	ν_{13}	ν_{23}	$\epsilon_{33 \text{ ult}}$
	[mm]		[-]	[MPa]	[MPa]	[MPa]	[%]	[%]
CKX40-3.2-(1.4)-A	14	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0
CKX40-3.2-(1.4)-A	14.56	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0
CKX40-3.2-(1.4)-A	15	Honey Comb, Kevlar HC	80	40	189	1.562	1.75	0
CKX48-3.2-(1.8)-A	20	Honey Comb, Kevlar HC	110	65	225	1.545	1.461	0
CKX48-3.2-(1.8)-A	15	Honey Comb, Kevlar HC	110	65	225	1.545	1.461	0
CNX48-4.0-(2)-A	15	Honey Comb, Nomex	34	22	133	3.117	2.545	0
CNX48-4.0-(2)-A	20	Honey Comb, Nomex	34	22	133	3.117	2.545	0
CNX64-3.2-(2)-A	20	Honey Comb, Nomex	50	30	193	2.96	2.733	0
CNX64-3.2-(3)-A	25	Honey Comb, Nomex	60	38	210	2.666	2.473	0
FC60	20	Foams, Other-foams	16	16	21	3.24	3.24	-0.185
M200	20	Foams, SAN	81	81	168	3.259	3.259	-0.575

4. Laminates

Deck and Hull Laminates details are summarized below.

4.1 1001 HULL Laminates

4.1.1 Stacking

Hull Final/Hull Final

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x AF_250g	0
6	1 x 25mm CNX64-3.2-(3)-A	90
7	1 x AF_250g	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/aft_bottom_CKO

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm CKO64-4.8-(1.8)-A	90
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/aft_bottom_CKX

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm CKX48-3.2-(1.8)-A	90
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

4.1.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Hull Final/Hull Final	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	27.06
Hull_bottom/aft_bottom_CKO	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	27
Hull_bottom/aft_bottom_CKX	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	22

Laminate Properties				Longitudinal (X)		
Name	Ex total	Ey total	Elxtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Hull Final/Hull Final	2352.5	3311.5	1.1125e+07	1.5260e+07	5801.45	4806.64
Hull_bottom/aft_bottom_CKO	3446.7	4306.5	1.5848e+07	1.9432e+07	8777.08	7272.01
Hull_bottom/aft_bottom_CKX	4232.1	5287.1	1.0365e+07	1.2650e+07	7061.62	5850.71

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.1.3 Single Skin Laminates Specific Properties

Currently no single skin laminate is being used in 1001 HULL

4.1.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tos	Fibre Mass wos	Ex outer	Ey outer	ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull Final/Hull Final	0.857	900	47171.1	42461.6	0.958	0.683	0.958	0.793
Hull_bottom/aft_bottom_CKO	0.827	1100	59454.9	54562.8	0.958	0.68	0.958	0.793
Hull_bottom/aft_bottom_CKX	0.827	1100	59454.9	54562.8	0.958	0.684	0.958	0.793

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tis	Fibre Mass wis	Ex inner	Ey inner	ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull Final/Hull Final	1.2	550	25693.8	46500.2	0.958	0.793	0.958	0.793
Hull_bottom/aft_bottom_CKO	1.17	750	42155.8	64364	0.958	0.793	0.958	0.793
Hull_bottom/aft_bottom_CKX	1.17	750	42155.8	64364	0.958	0.793	0.958	0.793

Core Properties							
Name	Core Material	tc	Gco, Gxz	Gyz	Eco	τ_{xz_u}	τ_{yz_u}
		[mm]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
Hull Final/Hull Final	CNX64-3.2-(3)-A	25	38, 38	60	210	0.94	1.6
Hull_bottom/aft_bottom_CKO	CKO64-4.8-(1.8)-A	25	64.1666666666667, 64.17	38.33	254	1.44	1.37
Hull_bottom/aft_bottom_CKX	CKX48-3.2-(1.8)-A	20	54.1666666666666, 54.17	91.67	225	0.95	1.7

4.2 1003 DECK Laminates

4.2.1 Stacking

Deck Final/Deck Final

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC150-E-PP	90
3	1 x WC-200-E-PP	45
4-5	2 x AF_150g	0
6	1 x WC-200-E-PP	45
7	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Deck laminate/cockpit

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC200-E-PP	0
3	1 x UC-HEC150-E-PP	90
4	1 x WC-200-E-PP	45
5	1 x 25mm CKX40-3.2-(1.4)-A	0
6	1 x WC-200-E-PP	45
7	1 x UC-HEC150-E-PP	90
8	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Deck laminate/foredeck_1

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x UC-HEC150-E-PP	90
4	1 x WC-200-E-PP	45
5	1 x 20mm CKX40-3.2-(1.4)-A	90
6	1 x WC-200-E-PP	45
7	1 x UC-IMC200-E-PP	0
8	1 x WC-200-E-PP	0
BOTTOM = I.S.		

4.2.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Deck Final/Deck Final	Single Skin	Carbon (HEC, IMC, HSC) / Aramid	Prepreg		-	0.5	1.34
Deck laminate/cockpit	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	26.4
Deck laminate/foredeck_1	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	21.44

Laminate Properties					Longitudinal (X)	
Name	Ex total	Ey total	Elxtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Deck Final/Deck Final	1959.1	2499.4	9.8342e+03	1.1774e+04	115.33	121.54
Deck laminate/cockpit	2226.5	3075.2	9.8037e+06	1.3464e+07	5441.17	4508.13
Deck laminate/foredeck_1	4777.1	2689.5	1.1130e+07	6.2100e+06	7325.71	7192.5

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.2.3 Single Skin Laminates Specific Properties

Name	Fibre mass ws [kg/m ²]	Longitudinal (X)		Transverse (Y)	
		ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
		[%]	[%]	[%]	[%]
Deck Final/Deck Final	950	0.958	0.793	0.958	0.787

4.2.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tos [mm]	Fibre Mass wos [kg/m ²]	Ex outer [MPa]	Ey outer [MPa]	ε _{uxt} [%]	ε _{uxc} [%]	ε _{uyt} [%]	ε _{uyc} [%]
Deck laminate/cockpit	0.6	750	58078.6	52312.1	0.958	0.793	0.958	0.793
Deck laminate/foredeck_1	0.64	750	65324.9	52356.9	0.958	0.678	0.958	0.793

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tis [mm]	Fibre Mass wis [kg/m ²]	Ex inner [MPa]	Ey inner [MPa]	ε _{uxt} [%]	ε _{uxc} [%]	ε _{uyt} [%]	ε _{uyc} [%]
Deck laminate/cockpit	0.8	550	35699	65659.8	0.958	0.793	0.958	0.793
Deck laminate/foredeck_1	0.8	600	78431.4	34118	0.958	0.677	0.958	0.793

Core Properties								
Name	Core Material	t _c	G _{co} , G _{xz}	G _{yz}	E _{co}	τ _{xz_u}	τ _{yz_u}	
		[mm]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
Deck laminate/cockpit	CKX40-3.2-(1.4)-A	25	66.66666666666667, 66.67	33.33	189	1.25	0.7	
Deck laminate/foredeck_1	CKX40-3.2-(1.4)-A	20	33.33333333333333, 33.33	66.67	189	0.7	1.25	

4.3 1008 HULL BEAMS Laminates

4.3.1 Stacking

Hull Final/Below DWL

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC200-E-PP	0

#	Material Name	Orientation [°]
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x AF_250g	0
7	1 x 25mm M100	90
8	1 x AF_250g	0
9	1 x WC-200-E-PP	0
10	1 x UC-HEC150-E-PP	90
11	1 x XC-HEC200-E-PP	45
12	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/aft_bottom_CKO

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm CKO64-4.8-(1.8)-A	90
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/aft_bottom_CKX

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm CKX48-3.2-(1.8)-A	90
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/fwd_bottom_M100

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm M100	0

#	Material Name	Orientation [°]
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x UC-HEC150-E-PP	0
11	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/mid_topsides_CKO

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	45
2	1 x UC-HEC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	45
6	1 x 25mm CKO64-4.8-(1.8)-A	90
7	1 x WC-200-E-PP	45
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x UC-HEC150-E-PP	0
BOTTOM = I.S.		

4.3.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Hull Final/Below DWL	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	High Elongation (>35%)	0.65	27.5
Hull_bottom/aft_bottom_CKO	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	27
Hull_bottom/aft_bottom_CKX	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	22
Hull_bottom/fwd_bottom_M100	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	High Elongation (>35%)	0.65	27.16
Hull_bottom/mid_topsides_CKO	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	26.94

Laminate Properties					Longitudinal (X)	
Name	Ex total	Ey total	Elxtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Hull Final/Below DWL	3441.7	4373.6	1.6433e+07	2.0589e+07	9309.26	7712.93
Hull_bottom/aft_bottom_CKO	3446.7	4306.5	1.5848e+07	1.9432e+07	8777.08	7272.01
Hull_bottom/aft_bottom_CKX	4232.1	5287.1	1.0365e+07	1.2650e+07	7061.62	5850.71
Hull_bottom/fwd_bottom_M100	4605.7	4434.9	2.1286e+07	1.9960e+07	12243.81	11480.43
Hull_bottom/mid_topsides_CKO	2782.6	2784.2	1.2871e+07	1.2450e+07	10830	7577.5

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.3.3 Single Skin Laminates Specific Properties

Currently no single skin laminate is being used in 1008 HULL BEAMS

4.3.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
	tos	Fibre Mass wos	Ex outer	Ey outer	ε _{xt}	ε _{xc}	ε _{yt}	ε _{yc}
Name	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull Final/Below DWL	1.077	1100	45542.6	45542.6	0.958	0.793	0.958	0.793
Hull_bottom/aft_bottom_CKO	0.827	1100	59454.9	54562.8	0.958	0.68	0.958	0.793
Hull_bottom/aft_bottom_CKX	0.827	1100	59454.9	54562.8	0.958	0.684	0.958	0.793
Hull_bottom/fwd_bottom_M100	0.987	1100	59454.9	54562.8	0.958	0.676	0.958	0.793
Hull_bottom/mid_topsides_CKO	0.767	1100	38396.7	38396.7	1.167	0.803	1.225	0.843

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
	tis	Fibre Mass wis	Ex inner	Ey inner	ε _{xt}	ε _{xc}	ε _{yt}	ε _{yc}
Name	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull Final/Below DWL	1.42	750	33213.4	50256.5	0.958	0.793	0.958	0.793
Hull_bottom/aft_bottom_CKO	1.17	750	42155.8	64364	0.958	0.793	0.958	0.793
Hull_bottom/aft_bottom_CKX	1.17	750	42155.8	64364	0.958	0.793	0.958	0.793
Hull_bottom/fwd_bottom_M100	1.17	900	55634.6	55634.6	0.958	0.793	0.958	0.793
Hull_bottom/mid_topsides_CKO	1.17	700	41718.2	41718.2	1.144	0.787	1.173	0.807

Core Properties							
Name	Core Material	tc	Gco, Gxz	Gyz	Eco	τ _{xz_u}	τ _{yz_u}
		[mm]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
Hull Final/Below DWL	M100	25	34, 34	34	85.5	1.26	1.26
Hull_bottom/aft_bottom_CKO	CKO64-4.8-(1.8)-A	25	64.1666666666667, 64.17	38.33	254	1.44	1.37
Hull_bottom/aft_bottom_CKX	CKX48-3.2-(1.8)-A	20	54.1666666666666, 54.17	91.67	225	0.95	1.7
Hull_bottom/fwd_bottom_M100	M100	25	28.3333333333333, 28.33	28.33	85.5	1.26	1.26
Hull_bottom/mid_topsides_CKO	CKO64-4.8-(1.8)-A	25	64.1666666666667, 64.17	38.33	254	1.44	1.37

4.4 1201 DECK BEAMS Laminates

4.4.1 Stacking

Deck laminate/foredeck_1

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x UC-HEC150-E-PP	90
4	1 x WC-200-E-PP	45
5	1 x 20mm CKX40-3.2-(1.4)-A	90
6	1 x WC-200-E-PP	45
7	1 x UC-IMC200-E-PP	0
8	1 x WC-200-E-PP	0
BOTTOM = I.S.		

4.4.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Deck laminate/foredeck_1	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	21.44

Laminate Properties					Longitudinal (X)	
Name	Ex total	Ey total	Elxtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Deck laminate/foredeck_1	4777.1	2689.5	1.1130e+07	6.2100e+06	7325.71	7192.5

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.4.3 Single Skin Laminates Specific Properties

Currently no single skin laminate is being used in 1201 DECK BEAMS

4.4.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tos	Fibre Mass wos	Ex outer	Ey outer	εuxt	εuxc	εuyt	εuyc
	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Deck laminate/foredeck_1	0.64	750	65324.9	52356.9	0.958	0.678	0.958	0.793

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tis	Fibre Mass wis	Ex inner	Ey inner	εuxt	εuxc	εuyt	εuyc
	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Deck laminate/foredeck_1	0.8	600	78431.4	34118	0.958	0.677	0.958	0.793

Core Properties									
Name	Core Material	tc	Gco, Gxz		Gyz	Eco	τxz_u	τyz_u	
		[mm]	[MPa]		[MPa]	[MPa]	[MPa]	[MPa]	
Deck laminate/foredeck_1	CKX40-3.2-(1.4)-A	20	33.33333333333333, 33.33		66.67	189	0.7	1.25	

4.5 INTERNAL Laminates

4.5.1 Stacking

Hull_bottom/aft_bottom_CKO

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm CKO64-4.8-(1.8)-A	90
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/Hull_bottom

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x UC-IMC200-E-PP	0
2	1 x XC-300-E-PP	45
3	1 x UC-HEC200-E-PP	90
4-5	2 x WC-200-E-PP	0

#	Material Name	Orientation [°]
6	1 x UC-HEC150-E-PP	90
7	1 x XC-HEC200-E-PP	45
8	1 x UC-HEC150-E-PP	0
9	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/mid_topsides_CKO

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	45
2	1 x UC-HEC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	45
6	1 x 25mm CKO64-4.8-(1.8)-A	90
7	1 x WC-200-E-PP	45
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x UC-HEC150-E-PP	0
BOTTOM = I.S.		

4.5.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Hull_bottom/aft_bottom_CKO	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	27
Hull_bottom/Hull_bottom	Single Skin	Carbon (HEC, IMC, HSC) / Aramid	Prepreg		-	0.65	1.94
Hull_bottom/mid_topsides_CKO	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	26.94

Name	Laminate Properties				Longitudinal (X)	
	Ex total	Ey total	Elxtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Hull_bottom/aft_bottom_CKO	3446.7	4306.5	1.5848e+07	1.9432e+07	8777.08	7272.01
Hull_bottom/Hull_bottom	4194.6	4067.8	4.7583e+04	2.1922e+04	355.8	383
Hull_bottom/mid_topsides_CKO	2782.6	2784.2	1.2871e+07	1.2450e+07	10830	7577.5

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.5.3 Single Skin Laminates Specific Properties

Name	Fibre mass ws		Longitudinal (X)		Transverse (Y)	
			ε _{xt}	ε _{xc}	ε _{yt}	ε _{yc}
	[kg/m ²]		[%]	[%]	[%]	[%]
Hull_bottom/Hull_bottom	1800		0.958	0.664	0.958	0.787

4.5.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
	tos	Fibre Mass wos	Ex outer	Ey outer	ϵ_{xt}	ϵ_{xc}	ϵ_{yt}	ϵ_{yc}
Name	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull_bottom/aft_bottom_CKO	0.827	1100	59454.9	54562.8	0.958	0.68	0.958	0.793
Hull_bottom/mid_topsides_CKO	0.767	1100	38396.7	38396.7	1.167	0.803	1.225	0.843

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
	tis	Fibre Mass wis	Ex inner	Ey inner	ϵ_{xt}	ϵ_{xc}	ϵ_{yt}	ϵ_{yc}
Name	[mm]	[kg/m ²]	[MPa]	[MPa]	[%]	[%]	[%]	[%]
Hull_bottom/aft_bottom_CKO	1.17	750	42155.8	64364	0.958	0.793	0.958	0.793
Hull_bottom/mid_topsides_CKO	1.17	700	41718.2	41718.2	1.144	0.787	1.173	0.807

Core Properties								
Name	Core Material	tc	Gco, Gxz	Gyz	Eco	τ_{xz_u}	τ_{yz_u}	
		[mm]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]
Hull_bottom/aft_bottom_CKO	CKO64-4.8-(1.8)-A	25	64.1666666666667, 64.17	38.33	254	1.44	1.37	
Hull_bottom/mid_topsides_CKO	CKO64-4.8-(1.8)-A	25	64.1666666666667, 64.17	38.33	254	1.44	1.37	

4.6 INTERNALS (PRIMARY) Laminates

4.6.1 Stacking

Bhd F Rev.2/Bhd F Rev.2

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC200-E-PP	0
3	1 x UC-HEC300-E-PP	45
4	1 x UC-HEC300-E-PP	-45
5	1 x AF_200g	0
6	1 x 20mm CNX48-4.0-(2)-A	0
7	1 x AF_200g	0
8	1 x UC-HEC300-E-PP	-45
9	1 x UC-HEC300-E-PP	45
10	1 x UC-HEC200-E-PP	0
11	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Bhd F/Bhd F

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x XC-300-E-PP	45
3	1 x UC-HEC300-E-PP	0
4	1 x WC-400-E-PP	0
5	1 x WC-200-E-PP	0
6	1 x UC-HEC300-E-PP	45
7	1 x UC-HEC300-E-PP	-45
8	1 x AF_200g	0
9	1 x 20mm CKX40-3.2-(1.4)-A	0
10	1 x AF_200g	0
11	1 x UC-HEC300-E-PP	-45
12	1 x UC-HEC300-E-PP	45
13	1 x WC-200-E-PP	0

#	Material Name	Orientation [°]
14	1 x WC-400-E-PP	0
15	1 x UC-HEC300-E-PP	0
16	1 x XC-300-E-PP	45
17	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Bulkhead C D/Bulkhead C D

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC300-E-PP	35
3	1 x UC-HEC300-E-PP	45
4	1 x UC-HEC300-E-PP	-45
5	1 x UC-HEC300-E-PP	0
6	1 x UC-HEC300-E-PP	90
7	1 x UC-HEC300-E-PP	-85
8	1 x WC-400-E-PP	0
9	1 x UC-HEC300-E-PP	45
10	1 x UC-HEC300-E-PP	-45
11	1 x AF_250g	0
12	1 x 20mm CNX64-3.2-(2)-A	0
13	1 x 20mm M200	0
14	1 x AF_250g	0
15	1 x UC-HEC300-E-PP	-45
16	1 x UC-HEC300-E-PP	45
17	1 x WC-400-E-PP	0
18	1 x UC-HEC300-E-PP	-85
19	1 x UC-HEC300-E-PP	90
20	1 x UC-HEC300-E-PP	0
21	1 x UC-HEC300-E-PP	-45
22	1 x UC-HEC300-E-PP	45
23	1 x UC-HEC300-E-PP	35
24	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Bulkheads A B E/Additional Patches

#	Material Name	Orientation [°]
TOP = O.S.		
1- 2	2 x WC-200-E-PP	0
3	1 x UC-HEC200-E-PP	0
4	1 x UC-HEC200-E-PP	45
5	1 x UC-HEC200-E-PP	-45
6	1 x AF_150g	0
7	1 x 15mm CNX48-4.0-(2)-A	0
8	1 x AF_150g	0
9	1 x UC-HEC200-E-PP	-45
10	1 x UC-HEC200-E-PP	45
11	1 x UC-HEC200-E-PP	0
12	1 x WC-200-E-PP	45
13	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Bulkheads A B E/Bulkheads A B E

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC200-E-PP	45
3	1 x UC-HEC200-E-PP	-45
4	1 x AF_150g	0
5	1 x 15mm CNX48-4.0-(2)-A	0
6	1 x AF_150g	0
7	1 x UC-HEC200-E-PP	-45
8	1 x UC-HEC200-E-PP	45
9	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Deck laminate c45/Flat Deck

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x UC-HEC150-E-PP	90
4	1 x WC-200-E-PP	45
5	1 x 20mm CKX40-3.2-(1.4)-A	90
6	1 x WC-200-E-PP	45
7	1 x UC-IMC200-E-PP	0
8	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/fwd_bottom_M100

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-IMC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	0
6	1 x 25mm M100	0
7	1 x WC-200-E-PP	0
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x UC-HEC150-E-PP	0
11	1 x WC-200-E-PP	0
BOTTOM = I.S.		

Hull_bottom/fwd_topsides_CKX@0

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	45
2	1 x UC-HEC200-E-PP	0
3	1 x XC-300-E-PP	45
4	1 x UC-HEC200-E-PP	90
5	1 x WC-200-E-PP	45

#	Material Name	Orientation [°]
6	1 x 25mm CNX64-3.2-(3)-A	0
7	1 x WC-200-E-PP	45
8	1 x UC-HEC150-E-PP	90
9	1 x XC-HEC200-E-PP	45
10	1 x WC-200-E-PP	45
BOTTOM = I.S.		

t=3.0 C-Plate/t=3.0 C-Plate

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x XC-400-E-V	0
2	1 x XC-400-E-V	90
3	1 x XC-400-E-V	45
4	1 x XC-400-E-V	-45
5	1 x XC-400-E-V	90
6	1 x XC-400-E-V	0
BOTTOM = I.S.		

Transom/Transom

#	Material Name	Orientation [°]
TOP = O.S.		
1	1 x WC-200-E-PP	0
2	1 x UC-HEC300-E-PP	0
3	1 x UC-HEC300-E-PP	45
4	1 x UC-HEC300-E-PP	-45
5	1 x AF_150g	0
6	1 x 20mm CKX40-3.2-(1.4)-A	0
7	1 x AF_150g	0
8	1 x UC-HEC300-E-PP	-45
9	1 x UC-HEC300-E-PP	45
10	1 x UC-HEC300-E-PP	0
11	1 x WC-200-E-PP	0
BOTTOM = I.S.		

4.6.2 General Data

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
Bhd F Rev.2/Bhd F Rev.2	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	22.44
Bhd F/Bhd F	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	24.64
Bulkhead C D/Bulkhead C D	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	46.64
Bulkheads A B E/Additional Patches	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	17.38
Bulkheads A B E/Bulkheads A B E	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	16.54
Deck laminate c45/Flat Deck	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg		Honeycomb	0.5	21.44
Hull_bottom/fwd_bottom_M100	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	High Elongation	0.65	27.16

General Data							
Name	Laminate Type	Fibre Type	Manufacturing Technology	Fibre Factor k5	Core Type	Shear Factor	t _{total} [mm]
					(>35%)		
Hull_bottom/fwd_topsides_CKX@0	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	27
t=3.0 C-Plate/t=3.0 C-Plate	Single Skin	Carbon (HEC, IMC, HSC) / Aramid	Hand Layup Vacuum		-		3
Transom/Transom	Sandwich	Carbon (HEC, IMC, HSC) / Aramid	Prepreg	0.7	Honeycomb	0.5	22.54

Laminate Properties					Longitudinal (X)	
Name	Ex total	Ey total	Eixtotal	Ely total	+Mx*	-Mx*
	[MPa]	[MPa]	[Nmm ² /mm]	[Nmm ² /mm]	[Nmm/mm]	[Nmm/mm]
Bhd F Rev.2/Bhd F Rev.2	4707.4	2923.7	1.2493e+07	7.6626e+06	10311.02	10311.02
Bhd F/Bhd F	9601.5	6943.4	3.0758e+07	2.1846e+07	21363.29	21363.29
Bulkhead C D/Bulkhead C D	5826	6794.5	1.2824e+08	1.4733e+08	47684.35	48502.13
Bulkheads A B E/Additional Patches	6676.3	4241.9	7.9017e+06	5.0557e+06	8539.91	7506.92
Bulkheads A B E/Bulkheads A B E	2914.7	2914.7	3.1206e+06	3.1206e+06	3626.38	3626.38
Deck laminate c45/Flat Deck	4777.1	2689.5	1.1130e+07	6.2100e+06	7325.71	7192.5
Hull_bottom/fwd_bottom_M100	4605.7	4434.9	2.1286e+07	1.9960e+07	12243.81	11480.43
Hull_bottom/fwd_topsides_CKX@0	1767	2597.6	8.1133e+06	1.1664e+07	12228.25	10307.07
t=3.0 C-Plate/t=3.0 C-Plate			1.2273e+05	1.2273e+05	528.55	528.55
Transom/Transom	5780.1	3037.8	1.5441e+07	7.9851e+06	12330.51	12330.51

* Positive moment (+) = O.S. in compression; Negative Moment (-) = I.S. in compression

4.6.3 Single Skin Laminates Specific Properties

Name	Fibre mass ws [kg/m ²]	Longitudinal (X)		Transverse (Y)	
		ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
		[%]	[%]	[%]	[%]
t=3.0 C-Plate/t=3.0 C-Plate	2400	0.959	0.644	0.959	0.644

4.6.4 Sandwich Laminates Specific Properties

Outer Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tos [mm]	Fibre Mass wos [kg/m ²]	Ex outer [MPa]	Ey outer [MPa]	ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
					[%]	[%]	[%]	[%]
Bhd F Rev.2/Bhd F Rev.2	1.22	1000	43292.3	26888.3	0.958	0.793	0.958	0.793
Bhd F/Bhd F	2.32	2000	50987.4	36872.1	0.958	0.793	0.958	0.793
Bulkhead C D/Bulkhead C D	3.32	3000	40145.9	46964.5	0.958	0.793	0.958	0.793
Bulkheads A B E/Additional Patches	1.19	1000	53851	35157.1	0.958	0.793	0.958	0.793
Bulkheads A B E/Bulkheads A B E	0.77	600	31304.3	31304.3	0.958	0.793	0.958	0.793
Deck laminate c45/Flat Deck	0.64	750	65324.9	52356.9	0.958	0.678	0.958	0.793
Hull_bottom/fwd_bottom_M100	0.987	1100	59454.9	54562.8	0.958	0.676	0.958	0.793
Hull_bottom/fwd_topsides_CKX@0	0.827	1100	38396.7	38396.7	1.179	0.811	1.22	0.839
Transom/Transom	1.27	1100	51292.9	26957.4	0.958	0.793	0.958	0.793

Inner Skins Properties					Longitudinal (X)		Transverse (Y)	
Name	tis [mm]	Fibre Mass wis [kg/m ²]	Ex inner [MPa]	Ey inner [MPa]	ε _{uxt}	ε _{uxc}	ε _{uyt}	ε _{uyc}
					[%]	[%]	[%]	[%]
Bhd F Rev.2/Bhd F Rev.2	1.22	1000	43292.3	26888.3	0.958	0.793	0.958	0.793
Bhd F/Bhd F	2.32	2000	50987.4	36872.1	0.958	0.793	0.958	0.793
Bulkhead C D/Bulkhead C D	3.32	3000	40145.9	46964.5	0.958	0.793	0.958	0.793

Bulkheads A B E/Additional Patches	1.19	1000	44549.8	27692.7	0.958	0.793	0.958	0.793
Bulkheads A B E/Bulkheads A B E	0.77	600	31304.3	31304.3	0.958	0.793	0.958	0.793
Deck laminate c45/Flat Deck	0.8	600	78431.4	34118	0.958	0.677	0.958	0.793
Hull_bottom/fwd_bottom_M100	1.17	900	55634.6	55634.6	0.958	0.793	0.958	0.793
Hull_bottom/fwd_topsides_CKX@0	1.17	750	19596.1	34629.9	2.153	1.784	1.179	0.812
Transom/Transom	1.27	1100	51292.9	26957.4	0.958	0.793	0.958	0.793

Core Properties								
Name	Core Material	tc	Gco, Gxz	Gyz	Eco	τxz_u	τyz_u	
		[mm]	[MPa]	[MPa]	[MPa]	[MPa]	[MPa]	
Bhd F Rev.2/Bhd F Rev.2	CNX48-4.0-(2)-A	20	34, 34	22	133	1.06	0.56	
Bhd F/Bhd F	CKX40-3.2-(1.4)-A	20	80, 80	40	189	1.25	0.7	
Bulkhead C D/Bulkhead C D	CNX64-3.2-(2)-A	40	65.5, 65.5	55.5	222.5	1.829	0.928	
Bulkheads A B E/Additional Patches	CNX48-4.0-(2)-A	15	34, 34	22	133	1.06	0.56	
Bulkheads A B E/Bulkheads A B E	CNX48-4.0-(2)-A	15	34, 34	22	133	1.06	0.56	
Deck laminate c45/Flat Deck	CKX40-3.2-(1.4)-A	20	40, 40	80	189	0.7	1.25	
Hull_bottom/fwd_bottom_M100	M100	25	28.33333333333333, 28.33	28.33	85.5	1.26	1.26	
Hull_bottom/fwd_topsides_CKX@0	CNX64-3.2-(3)-A	25	50, 50	31.67	210	1.6	0.94	
Transom/Transom	CKX40-3.2-(1.4)-A	20	80, 80	40	189	1.25	0.7	

4.7 KEEL BOX Laminates

Currently no laminates used in KEEL BOX

4.8 MISC Laminates

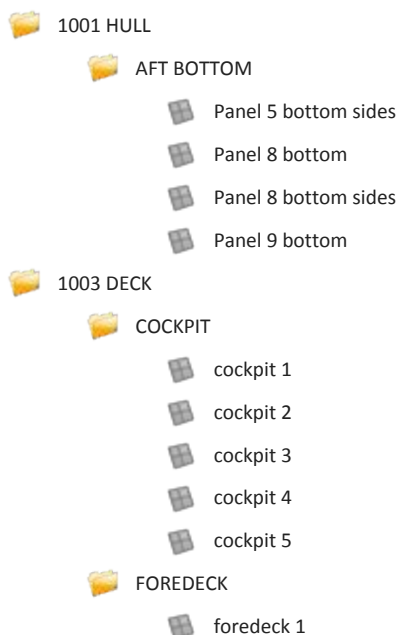
Currently no laminates used in MISC

4.9 RUDDER Laminates




Currently no laminates used in RUDDER

5. Panels & Beams Definition





































5.1 Panels Topology

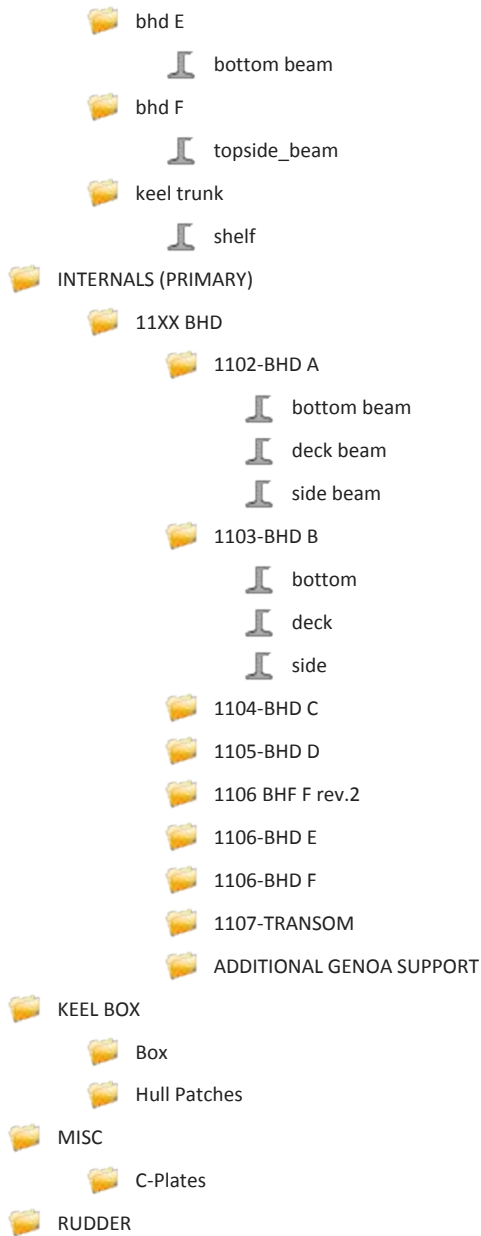


- foredeck 10
- foredeck 11
- foredeck 2
- foredeck 3
- foredeck 4
- foredeck 5
- foredeck 6
- foredeck 7
- foredeck 8
- foredeck 9
- 1008 HULL BEAMS
 - Aft Bottom panel EF
 - Aft Bottom Panel F-Transom
 - Aft Bottom Stringer DE
 - Aft Topside Stringer DE
 - Aft Topside Stringer EF
 - Fwd Bottom Stringer AB
 - Fwd Bottom Stringer BC
 - Fwd Topside Stringer AB
 - Fwd Topside Stringer BC
- 1201 DECK BEAMS
 - Deck beam AB
 - Deck beam BC
 - Deck beam Coachroof
 - Jib Track Beams
- INTERNAL
 - bhd E
 - bhd F
 - keel trunk
- INTERNALS (PRIMARY)
 - 11XX BHD
 - 1102-BHD A
 - 1103-BHD B
 - 1104-BHD C
 - 1105-BHD D
 - 1106 BHF F rev.2
 - 1106-BHD E
 - 1106-BHD F
 - 1107-TRANSOM
 - ADDITIONAL GENOA SUPPORT
- KEEL BOX
 - Box
 - Hull Patches

-  MISC
 -  C-Plates
-  RUDDER

5.2 Beams Topology

-  1001 HULL
 -  AFT BOTTOM
-  1003 DECK
 -  COCKPIT
 -  FOREDECK
-  1008 HULL BEAMS
 -  Aft Bottom panel EF
 -  aft panel EF aft & fwd part
 -  aft panel EF aft & fwd part on deck
 -  Aft Bottom Panel F-Transom
 -  aft bottom stringer F-transom
 -  aft bottom stringer F-transom Deck
 -  Aft Bottom Stringer DE
 -  mid bottom stringer DE
 -  mid bottom stringer DE side tapes- for capping joint
 -  Aft Topside Stringer DE
 -  mid topsides stringer DE
 -  Aft Topside Stringer EF
 -  aft topsides stringer EF
 -  Fwd Bottom Stringer AB
 -  fwd bottom stringer AB
 -  Fwd Bottom Stringer BC
 -  fwd bottom stringer BC mast step
 -  Fwd Topside Stringer AB
 -  fwd topsides stringer AB
 -  Fwd Topside Stringer BC
 -  fwd topsides stringer BC
-  1201 DECK BEAMS
 -  Deck beam AB
 -  Fortedeck beam Duplicate
 -  Deck beam BC
 -  Fortedeck beam
 -  Deck beam Coachroof
 -  Coachroof support beam
 -  Jib Track Beams
-  INTERNAL



5.3 Definition

* Internal Structure

5.3.1 1001 HULL

5.3.1.1 1001 HULL Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		
1001 HULL » AFT BOTTOM									
Panel 5 bottom sides	5.2	-0.22	1.21	2009.41	984.49	50.02	14.5	Hull_bottom/aft_bottom_CKO	Hull Bottom
Panel 8 bottom	2.43	-0.19	1.15	3881.28	693.71	6.38	0	Hull_bottom/aft_bottom_CKX	Hull Bottom
Panel 8 bottom	2.21	-0.07	1.15	3879.66	931.42	44.98	12.17	Hull_bottom/aft_bottom_CKO	Hull

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		
sides									Side
Panel 9 bottom	0.22	0.5	1.1	1480	2030	0	0	Hull_bottom/aft_bottom_CKO	Hull Side

5.3.1.2 1001 HULL Beams

5.3.2 1003 DECK

5.3.2.1 1003 DECK Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		
1003 DECK » COCKPIT									
cockpit 1	4.6	0.95	1.2	896.78	1960.22	0	0.36	Deck laminate/cockpit	Deck
cockpit 2	2.09	0.88	1.15	3545.98	592.02	0	0.36	Deck laminate/cockpit	Deck
cockpit 3	2.37	0.89	1.15	3521.35	740	0	0.36	Deck laminate/cockpit	Deck
cockpit 4	0.1	0.82	1.11	1476.37	1033.5	0	0.36	Deck laminate/cockpit	Deck
cockpit 5	0.13	0.82	1.11	1475.57	740	0	0.36	Deck laminate/cockpit	Deck
1003 DECK » FOREDECK									
foredeck 1	12.52	1.44	1.44	2310.54	1009.86	52.18	0.86	Deck laminate/foredeck_1	Deck
foredeck 10	1.84	1.19	1.14	3534.16	698.5	6.92	171.08	Deck laminate/foredeck_1	Deck
foredeck 11	0.23	1.13	1.11	1476.61	431.92	1.61	173.45	Deck laminate/foredeck_1	Deck
foredeck 2	9.86	1.39	1.34	2303.48	616.5	9.05	170.77	Deck laminate/foredeck_1	Deck
foredeck 3	7.73	1.35	1.27	1487.36	887.11	13.69	170.59	Deck laminate/foredeck_1	Deck
foredeck 4	9.76	1.43	1.34	2275.19	1114.97	29.39	0.19	Deck laminate/foredeck_1	Deck
foredeck 5	7.73	1.42	1.27	1462.29	1521.9	0	0.2	Deck laminate/foredeck_1	Deck
foredeck 6	6.55	1.41	1.24	795.76	1767.76	0	0.21	Deck laminate/foredeck_1	Deck
foredeck 7	5.63	1.4	1.22	1088.91	1972.95	0	0.23	Deck laminate/foredeck_1	Deck
foredeck 8	6.54	1.33	1.24	799.07	995.01	0	170.31	Deck laminate/foredeck_1	Deck
foredeck 9	5.08	1.29	1.21	2022.8	963.44	13.67	169.89	Deck laminate/foredeck_1	Deck

5.3.2.2 1003 DECK Beams

5.3.3 1008 HULL BEAMS

5.3.3.1 1008 HULL BEAMS Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.3.2 1008 HULL BEAMS Beams

Topology Group										
1008 HULL BEAMS » Aft Bottom panel EF										
Name	Property	Unit	aft panel EF aft & fwd part				aft panel EF aft & fwd part on deck			
	H _b	[mm]	200				110			

General	B_w	[mm]	20	20
	T_w	[mm]	20	20
	X	[m]	2.28	2.28
	h / H_b^*	[m]	-0.17	-0.17
	Z	[m]	1.15	1.15
	I_u	[mm]	1800	1650
	S	[mm]	800	800
	c_u	[mm]	29.2	0
	β	[°]	2.04	0
	Type	[]	L-Flange	L-Flange
Capping	Width	[mm]	30	30
	Number of Plies	[-]	6	5
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP
Side tapes	Width	[mm]		
	Number of Plies	[-]		
	Material	[-]	-	-
Shear web	Total Number of Plies	[-]	2	2
	Material	[-]	2 x UC-HEC150-E-PP @ $\pm 45^\circ$	2 x UC-HEC150-E-PP @ $\pm 45^\circ$
Panel	Laminate	[-]	Hull_bottom/aft_bottom_CKX	Hull_bottom/aft_bottom_CKX
	Effective Width For ISO	[mm]	59.9	59.9
Inner Skin reinforcement	Tape Width	[mm]	200	
	Number Of Plies	[-]	1	
	Material	[-]	UC-HEC200-E-PP	-
Outer Skin reinforcement	Tape Width	[mm]		
	Number Of Plies	[-]		
	Material	[-]	-	-

Topology Group 1008 HULL BEAMS » Aft Bottom Panel F-Transom				
Name	Property	Unit	aft bottom stringer F-transom	aft bottom stringer F-transom Deck
General	H_b	[mm]	150	150
	B_w	[mm]	20	20
	T_w	[mm]	20	20
	X	[m]	0.22	0.22
	h / H_b^*	[m]	0.03	0.03
	Z	[m]	1.1	1.1
	I_u	[mm]	1300	1300
	S	[mm]	1400	1400
	c_u	[mm]	0.19	0.19
	β	[°]	2.13	2.13
	Type	[]	L-Flange	L-Flange
Capping	Width	[mm]	30	30
	Number of Plies	[-]	6	6
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP
Side tapes	Width	[mm]		
	Number of Plies	[-]		
	Material	[-]	-	-
Shear web	Total Number of Plies	[-]	2	2

	Material	[-]	2 x UC-HEC150-E-PP @ ±45°	2 x UC-HEC150-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/aft_bottom_CKX	Hull_bottom/aft_bottom_CKX
	Effective Width For ISO	[mm]	59.9	59.9
Inner Skin reinforcement	Tape Width	[mm]		
	Number Of Plies	[-]		
	Material	[-]	-	-
Outer Skin reinforcement	Tape Width	[mm]		
	Number Of Plies	[-]		
	Material	[-]	-	-

Topology Group			1008 HULL BEAMS » Aft Bottom Stringer DE	
Name	Property	Unit	mid bottom stringer DE	mid bottom stringer DE side tapes- for capping joint
General	H _b	[mm]	150	150
	B _w	[mm]	15	15
	T _w	[mm]	15	15
	X	[m]	5.22	5.22
	h / H _b *	[m]	-0.34	-0.34
	Z	[m]	1.21	1.21
	I _u	[mm]	2009.82	2009.82
	S	[mm]	796.34	796.34
	c _u	[mm]	9.26	9.26
	β	[°]	0	0
	Type	[]	L-Flange	L-Flange
Capping	Width	[mm]	30	30
	Number of Plies	[-]	10	10
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP
Side tapes	Width	[mm]		30
	Number of Plies	[-]		16
	Material	[-]	-	UC-HEC300-E-PP
Shear web	Total Number of Plies	[-]	3	3
	Material	[-]	XC-300-E-PP @ ±45°	XC-300-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/mid_topsides_CKO	Hull_bottom/mid_topsides_CKO
	Effective Width For ISO	[mm]	113.7	53.7
Inner Skin reinforcement	Tape Width	[mm]	100	100
	Number Of Plies	[-]	3	3
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]		
	Number Of Plies	[-]		
	Material	[-]	-	-

Topology Group			1008 HULL BEAMS » Aft Topside Stringer DE	
Name	Property	Unit	mid topsides stringer DE	
	H _b	[mm]	150	
	B _w	[mm]	12	
	T _w	[mm]	12	
	X	[m]	5.22	

General	h / H _b *	[m]	-0.1
	Z	[m]	1.21
	l _u	[mm]	2009.01
	S	[mm]	1236.56
	c _u	[mm]	15.38
	β	[°]	25.73
	Type	[]	L-Flange
Capping	Width	[mm]	50
	Number of Plies	[-]	15
	Material	[-]	UC-HEC300-E-V_1
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/aft_bottom_CKO
	Effective Width For ISO	[mm]	111.9
Inner Skin reinforcement	Tape Width	[mm]	200
	Number Of Plies	[-]	6
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group		1008 HULL BEAMS » Aft Topside Stringer EF	
Name	Property	Unit	aft topsides stringer EF
General	H _b	[mm]	170
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	2.28
	h / H _b *	[m]	0.02
	Z	[m]	1.15
	l _u	[mm]	3510
	S	[mm]	1161.83
	c _u	[mm]	32.78
	β	[°]	23.14
	Type	[]	L-Flange
Capping	Width	[mm]	50
	Number of Plies	[-]	22
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	4
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
	Laminate	[-]	Hull_bottom/aft_bottom_CKO

Panel	Effective Width For ISO	[mm]	104.9
Inner Skin reinforcement	Tape Width	[mm]	200
	Number Of Plies	[-]	6
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	200
	Number Of Plies	[-]	6
	Material	[-]	UC-HEC300-E-PP

Topology Group			1008 HULL BEAMS » Fwd Bottom Stringer AB
Name	Property	Unit	fwd bottom stringer AB
General	H _b	[mm]	160
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	9.86
	h / H _b *	[m]	-0.29
	Z	[m]	1.34
	l _u	[mm]	2174.39
	S	[mm]	843.77
	c _u	[mm]	5.96
	β	[°]	0.09
Type	[]	L-Flange	
Capping	Width	[mm]	30
	Number of Plies	[-]	15
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100
	Effective Width For ISO	[mm]	118.1
Inner Skin reinforcement	Tape Width	[mm]	100
	Number Of Plies	[-]	3
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			1008 HULL BEAMS » Fwd Bottom Stringer BC
Name	Property	Unit	fwd bottom stringer BC mast step
General	H _b	[mm]	180
	B _w	[mm]	20
	T _w	[mm]	20
	X	[m]	7.89
	h / H _b *	[m]	-0.36
	Z	[m]	1.28
	l _u	[mm]	1764.75

	S	[mm]	1201.72
	c _u	[mm]	5.3
	β	[°]	0.02
	Type	[]	L-Flange
Capping	Width	[mm]	30
	Number of Plies	[-]	12
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100
	Effective Width For ISO	[mm]	63.5
Inner Skin reinforcement	Tape Width	[mm]	100
	Number Of Plies	[-]	3
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			1008 HULL BEAMS » Fwd Topside Stringer AB
Name	Property	Unit	fwd topsides stringer AB
General	H _b	[mm]	200
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	9.82
	h / H _b *	[m]	-0.02
	Z	[m]	1.5
	l _u	[mm]	2233.89
	S	[mm]	1065.88
	c _u	[mm]	6.94
	β	[°]	45.39
	Type	[]	L-Flange
Capping	Width	[mm]	30
	Number of Plies	[-]	14
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100
	Effective Width For ISO	[mm]	118.1
	Tape Width	[mm]	100

Inner Skin reinforcement	Number Of Plies	[-]	3
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			1008 HULL BEAMS » Fwd Topside Stringer BC
Name	Property	Unit	fwd topsides stringer BC
General	H _b	[mm]	200
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	7.87
	h / H _b *	[m]	-0.02
	Z	[m]	1.28
	l _u	[mm]	1734.73
	S	[mm]	1249.02
	c _u	[mm]	7.38
	β	[°]	38.33
Type	[]	L-Flange	
Capping	Width	[mm]	30
	Number of Plies	[-]	10
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	XC-300-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100
	Effective Width For ISO	[mm]	118.1
Inner Skin reinforcement	Tape Width	[mm]	100
	Number Of Plies	[-]	1
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

5.3.4 1201 DECK BEAMS

5.3.4.1 1201 DECK BEAMS Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.4.2 1201 DECK BEAMS Beams

Topology Group			1201 DECK BEAMS » Deck beam AB
Name	Property	Unit	Fortedeck beam Duplicate
	H _b	[mm]	100

General	B_W	[mm]	15
	T_W	[mm]	15
	X	[m]	4.5
	h / H_b^*	[m]	1.3
	Z	[m]	1.3
	I_u	[mm]	2300
	S	[mm]	900
	c_u	[mm]	5
	β	[°]	13
	Type	[]	L-Flange
Capping	Width	[mm]	25
	Number of Plies	[-]	5
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC150-E-PP @ $\pm 45^\circ$
Panel	Laminate	[-]	Deck laminate/foredeck_1
	Effective Width For ISO	[mm]	103.8
Inner Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			1201 DECK BEAMS » Deck beam BC
Name	Property	Unit	Fortedeck beam
General	H_b	[mm]	100
	B_W	[mm]	15
	T_W	[mm]	15
	X	[m]	8
	h / H_b^*	[m]	1.3
	Z	[m]	1.3
	I_u	[mm]	1500
	S	[mm]	1200
	c_u	[mm]	5
	β	[°]	13
	Type	[]	L-Flange
Capping	Width	[mm]	25
	Number of Plies	[-]	5
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2

	Material	[-]	2 x UC-HEC150-E-PP @ ±45°
Panel	Laminate	[-]	Deck laminate/foredeck_1
	Effective Width For ISO	[mm]	103.8
Inner Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			1201 DECK BEAMS » Deck beam Coachroof
Name	Property	Unit	Coachroof support beam
General	H _b	[mm]	80
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	6.1
	h / H _b *	[m]	1.3
	Z	[m]	1.3
	l _u	[mm]	1950
	S	[mm]	1000
	c _u	[mm]	5
	β	[°]	13
	Type	[]	L-Flange
Capping	Width	[mm]	25
	Number of Plies	[-]	5
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC150-E-PP @ ±45°
Panel	Laminate	[-]	Deck laminate/foredeck_1
	Effective Width For ISO	[mm]	103.8
Inner Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

5.3.5 INTERNAL

5.3.5.1 INTERNAL Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.5.2 INTERNAL Beams

Topology Group			INTERNAL » bhd E
Name	Property	Unit	bottom beam
General	H _b	[mm]	200
	B _w	[mm]	15
	T _w	[mm]	15
	X	[m]	4.3
	h / H _b *	[m]	0
	Z	[m]	1.15
	l _u	[mm]	1391
	S	[mm]	2750
	c _u	[mm]	150
	β	[°]	30
	Type	[]	L-Flange
Capping	Width	[mm]	30
	Number of Plies	[-]	10
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/mid_topsides_CKO
	Effective Width For ISO	[mm]	113.7
Inner Skin reinforcement	Tape Width	[mm]	100
	Number Of Plies	[-]	2
	Material	[-]	UC-HEC300-E-PP
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			INTERNAL » bhd F
Name	Property	Unit	topside_beam
General	H _b	[mm]	100
	B _w	[mm]	20
	T _w	[mm]	20
	X	[m]	3
	h / H _b *	[m]	0.5
	Z	[m]	1.2
	l _u	[mm]	700
	S	[mm]	2500
	c _u	[mm]	80
	β	[°]	50
	Type	[]	L-Flange
Capping	Width	[mm]	30
	Number of Plies	[-]	5
	Material	[-]	UC-HEC300-E-PP

Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	2
	Material	[-]	2 x UC-HEC300-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/aft_bottom_CKO
	Effective Width For ISO	[mm]	59.9
Inner Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

Topology Group			INTERNAL » keel trunk
Name	Property	Unit	
General	H _b	[mm]	shelf 200
	B _w	[mm]	1
	T _w	[mm]	1
	X	[m]	-
	h / H _b *	[m]	1
	Z	[m]	-
	l _u	[mm]	700
	S	[mm]	500
	c _u	[mm]	1
	β	[°]	-
	Type	[]	L-Flange
Capping	Width	[mm]	50
	Number of Plies	[-]	15
	Material	[-]	UC-HEC300-E-PP
Side tapes	Width	[mm]	
	Number of Plies	[-]	
	Material	[-]	-
Shear web	Total Number of Plies	[-]	14
	Material	[-]	2 x UC-HEC300-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/Hull_bottom
	Effective Width For ISO	[mm]	100.1
Inner Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-
Outer Skin reinforcement	Tape Width	[mm]	
	Number Of Plies	[-]	
	Material	[-]	-

5.3.6 INTERNALS (PRIMARY)

5.3.6.1 INTERNALS (PRIMARY) Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.6.2 INTERNALS (PRIMARY) Beams

Topology Group			INTERNALS (PRIMARY) » 11XX BHD » 1102-BHD A		
Name	Property	Unit	bottom beam	deck beam	side beam
General	H _b	[mm]	200	150	200
	B _w	[mm]	15	15	15
	T _w	[mm]	15	15	15
	X	[m]	10.7	10.7	10.7
	h / H _b *	[m]	0	0.3	0.3
	Z	[m]	1.5	1.5	1.5
	l _u	[mm]	700	1250	1200
	S	[mm]	2400	2400	2400
	c _u	[mm]	30	30	120
	β	[°]	0	0	65
Type	[]		L-Flange	L-Flange	L-Flange
Capping	Width	[mm]	30	30	30
	Number of Plies	[-]	5	5	5
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP	UC-HEC300-E-PP
Side tapes	Width	[mm]			
	Number of Plies	[-]			
	Material	[-]	-	-	-
Shear web	Total Number of Plies	[-]	2	2	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°	2 x UC-HEC200-E-PP @ ±45°	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100	deck/foredeck	Hull_bottom/fwd_topsides_CKX@0
	Effective Width For ISO	[mm]	118.1	103.8	114.9
Inner Skin reinforcement	Tape Width	[mm]			
	Number Of Plies	[-]			
	Material	[-]	-	-	-
Outer Skin reinforcement	Tape Width	[mm]			
	Number Of Plies	[-]			
	Material	[-]	-	-	-

Topology Group			INTERNALS (PRIMARY) » 11XX BHD » 1103-BHD B		
Name	Property	Unit	bottom	deck	side
General	H _b	[mm]	225	150	200
	B _w	[mm]	15	15	15
	T _w	[mm]	15	15	15
	X	[m]	8.5	8.5	8.5
	h / H _b *	[m]	0	0.53	0.53
	Z	[m]	1.5	1.5	1.5
	l _u	[mm]	1200	2100	1400
	S	[mm]	2100	2100	2100

	c_u	[mm]	85	50	120
	β	[°]	0	60	60
	Type	[]	L-Flange	L-Flange	L-Flange
Capping	Width	[mm]	30	30	30
	Number of Plies	[-]	6	6	6
	Material	[-]	UC-HEC300-E-PP	UC-HEC300-E-PP	UC-HEC300-E-PP
Side tapes	Width	[mm]			
	Number of Plies	[-]			
	Material	[-]	-	-	-
Shear web	Total Number of Plies	[-]	2	2	2
	Material	[-]	2 x UC-HEC200-E-PP @ ±45°	2 x UC-HEC200-E-PP @ ±45°	2 x UC-HEC200-E-PP @ ±45°
Panel	Laminate	[-]	Hull_bottom/fwd_bottom_M100	Hull_bottom/fwd_bottom_M100	Hull_bottom/fwd_bottom_M100
	Effective Width For ISO	[mm]	118.1	118.1	118.1
Inner Skin reinforcement	Tape Width	[mm]			
	Number Of Plies	[-]			
	Material	[-]	-	-	-
Outer Skin reinforcement	Tape Width	[mm]			
	Number Of Plies	[-]			
	Material	[-]	-	-	-

5.3.7 KEEL BOX

5.3.7.1 KEEL BOX Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.7.2 KEEL BOX Beams

5.3.8 MISC

5.3.8.1 MISC Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.8.2 MISC Beams

5.3.9 RUDDER

5.3.9.1 RUDDER Panels

Name	X	h / H _b *	Z / D _b *	Fore&Aft Dimension	Transverse Dimension	c _p	β	Laminate	Panel Position
Unit	[m]	[m]	[m]	[mm]	[mm]	[mm]	[°]		

5.3.9.2 RUDDER Beams

6. Detail Results

Below is the summary of the detail results for Hull and Deck beams and panels

6.1 1001 HULL

6.1.1 1001 HULL Panels

Topology Group			1001 HULL » AFT BOTTOM			
Name	Property	Unit	Panel 5 bottom sides	Panel 8 bottom	Panel 8 bottom sides	Panel 9 bottom
Design Loads	P_d	[kN/m ²]	34.90	32.11	26.86	18.76
	M_{db}	[Nmm/mm]	2426.02	1287.20	1711.99	3037.17
	M_{dl}	[Nmm/mm]	1612.34	667.84	1034.71	2482.62
	F_{db}	[N/mm]	12.33	08.46	09.19	09.97
	F_{dl}	[N/mm]	15.42	11.14	12.12	12.91
Min Requirements	$E_{l_{min}}$	[Nmm ² /mm]	3.686e+06	1.471e+06	2.468e+06	6.68e+06
	$W_{is_{min}}$	[kg/m ²]	-	-	-	-
	$W_{os_{min}}$	[kg/m ²]	-	-	-	-
	$t_{s_{min}}$	[mm]	21.41	23.46	16.84	17.93
	$W_{s_{min}}$	[kg/m ²]	-	-	-	-
Calculated Properties	E_l	[Nmm ² /mm]	1.585e+07	1.036e+07	1.585e+07	1.585e+07
	W_{is}	[kg/m ²]	7.5e-01	7.5e-01	7.5e-01	7.5e-01
	W_{os}	[kg/m ²]	1.1e+00	1.1e+00	1.1e+00	1.1e+00
	t_s	[mm]	26.00	21.00	26.00	26.00
	W_s	[kg/m ²]	-	-	-	-
Bending RF (with wrinkling)	short span	[-]	2.68	3.68	3.80	1.88
	long span	[-]	3.55	6.25	5.52	2.62
Bending RF (without wrinkling)	short span	[-]	2.26	3.42	3.21	1.20
	long span	[-]	2.26	4.38	3.51	2.21
Shear RF	short span	[-]	1.44	2.11	1.94	1.88
	long span	[-]	1.21	0.90	1.54	1.38
Stiffness RF	bending	[-]	4.30	7.04	6.42	2.37
	deflection	[-]	4.28	8.47	6.43	2.39
Thickness RF	single/outer skin	[-]	1.05	1.05	1.17	1.17
	inner skin	[-]	1.03	1.03	1.14	1.14
	thickness RF	[-]	-	-	-	-
Critical	name	[-]	Inner Skin Minimum Fibre	Core Shear Long Span	Inner Skin Minimum Fibre	Inner Skin Minimum Fibre
	value	[-]	1.03	0.9	1.14	1.14

6.1.2 1001 HULL Beams

6.2 1003 DECK

6.2.1 1003 DECK Panels

Topology Group			1003 DECK » COCKPIT				
Name	Property	Unit	cockpit 1	cockpit 2	cockpit 3	cockpit 4	cockpit 5
Design Loads	P_d	[kN/m ²]	6.67	7.09	6.16	5.00	5.17
	M_{db}	[Nmm/mm]	443.07	206.87	280.75	425.49	234.57
	M_{dl}	[Nmm/mm]	333.96	100.20	139.15	247.38	127.54

	F _{db}	[N/mm]	02.23	01.59	01.73	01.86	01.42
	F _{dI}	[N/mm]	02.80	02.10	02.28	02.40	01.78
Min Requirements	EI _{min}	[Nmm ² /mm]	6.607e+05	2.018e+05	3.423e+05	6.305e+05	2.871e+05
	W _{is_min}	[kg/m ²]	-	-	-	-	-
	W _{os_min}	[kg/m ²]	-	-	-	-	-
	t _{s_min}	[mm]	4.49	3.36	3.64	3.85	2.85
	W _{s_min}	[kg/m ²]	-	-	-	-	-
Calculated Properties	EI	[Nmm ² /mm]	9.804e+06	9.804e+06	9.804e+06	9.804e+06	9.804e+06
	W _{IS}	[kg/m ²]	5.5e-01	5.5e-01	5.5e-01	5.5e-01	5.5e-01
	W _{OS}	[kg/m ²]	7.5e-01	7.5e-01	7.5e-01	7.5e-01	7.5e-01
	t _s	[mm]	25.70	25.70	25.70	25.70	25.70
	W _s	[kg/m ²]	-	-	-	-	-
Bending RF (with wrinkling)	short span	[-]	8.20	21.59	15.91	10.50	19.04
	long span	[-]	13.38	36.27	26.12	14.69	28.49
Bending RF (without wrinkling)	short span	[-]	5.09	20.11	14.82	9.78	17.74
	long span	[-]	12.46	22.50	16.20	9.11	17.67
Shear RF	short span	[-]	7.19	5.64	5.20	4.82	6.33
	long span	[-]	3.21	7.66	7.05	6.68	9.02
Stiffness RF	bending	[-]	14.84	48.58	28.64	15.55	34.15
	deflection	[-]	15.07	65.69	38.73	19.59	47.10
Thickness RF	single/outer skin	[-]	1.03	1.03	1.03	1.03	1.03
	inner skin	[-]	1.08	1.08	1.08	1.08	1.08
	thickness RF	[-]	-	-	-	-	-
Critical	name	[-]	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre
	value	[-]	1.03	1.03	1.03	1.03	1.03

Topology Group			1003 DECK » FOREDECK				
Name	Property	Unit	foredeck 1	foredeck 10	foredeck 11	foredeck 2	foredeck 3
Design Loads	P _d	[kN/m ²]	7.58	6.11	7.25	10.90	9.09
	M _{db}	[Nmm/mm]	548.78	248.20	112.54	345.03	558.48
	M _{dI}	[Nmm/mm]	550.54	196.20	92.59	281.26	521.85
	F _{db}	[N/mm]	02.76	01.62	01.18	02.54	02.96
	F _{dI}	[N/mm]	03.48	02.13	01.55	03.35	03.75
Min Requirements	EI _{min}	[Nmm ² /mm]	8.562e+05	2.857e+05	8.017e+04	3.507e+05	8.124e+05
	W _{is_min}	[kg/m ²]	-	-	-	-	-
	W _{os_min}	[kg/m ²]	-	-	-	-	-
	t _{s_min}	[mm]	9.94	6.09	4.44	9.57	10.72
	W _{s_min}	[kg/m ²]	-	-	-	-	-
Calculated Properties	EI	[Nmm ² /mm]	6.21e+06	6.21e+06	6.21e+06	6.21e+06	6.21e+06
	W _{IS}	[kg/m ²]	6.0e-01	6.0e-01	6.0e-01	6.0e-01	6.0e-01
	W _{OS}	[kg/m ²]	7.5e-01	7.5e-01	7.5e-01	7.5e-01	7.5e-01
	t _s	[mm]	20.72	20.72	20.72	20.72	20.72
	W _s	[kg/m ²]	-	-	-	-	-
Bending RF (with wrinkling)	short span	[-]	4.39	9.70	21.40	6.98	4.31
	long span	[-]	5.79	16.26	34.45	11.34	6.11
Bending RF	short span	[-]	3.33	7.36	16.22	5.29	3.27

(without wrinkling)	long span	[-]	6.53	18.33	38.84	12.79	6.89
Shear RF	short span	[-]	4.69	7.99	10.94	5.09	4.37
	long span	[-]	2.09	3.40	4.67	2.17	1.93
Stiffness RF	bending	[-]	7.25	21.74	77.46	17.71	7.64
	deflection	[-]	5.90	21.42	76.62	17.49	8.18
Thickness RF	single/outer skin	[-]	1.03	1.03	1.03	1.03	1.03
	inner skin	[-]	1.17	1.17	1.17	1.17	1.17
	thickness RF	[-]	-	-	-	-	-
Critical	name	[-]	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre
	value	[-]	1.03	1.03	1.03	1.03	1.03

Topology Group			1003 DECK » FOREDECK				
Name	Property	Unit	foredeck 4	foredeck 5	foredeck 6	foredeck 7	foredeck 8
Design Loads	P _d	[kN/m ²]	7.20	6.69	8.44	6.48	10.00
	M _{db}	[Nmm/mm]	730.27	988.88	444.08	635.12	497.12
	M _{dl}	[Nmm/mm]	643.83	579.95	206.94	303.48	259.80
	F _{db}	[N/mm]	02.98	03.34	02.51	02.60	02.83
	F _{dl}	[N/mm]	03.73	04.55	03.15	03.28	03.71
Min Requirements	EI _{min}	[Nmm ² /mm]	1.369e+06	1.543e+06	5.835e+05	1.11e+06	5.006e+05
	W _{is_min}	[kg/m ²]	-	-	-	-	-
	W _{os_min}	[kg/m ²]	-	-	-	-	-
	t _{s_min}	[mm]	10.66	12.99	9.01	9.37	10.61
	W _{s_min}	[kg/m ²]	-	-	-	-	-
Calculated Properties	EI	[Nmm ² /mm]	6.21e+06	6.21e+06	6.21e+06	6.21e+06	6.21e+06
	W _{is}	[kg/m ²]	6.0e-01	6.0e-01	6.0e-01	6.0e-01	6.0e-01
	W _{os}	[kg/m ²]	7.5e-01	7.5e-01	7.5e-01	7.5e-01	7.5e-01
	t _s	[mm]	20.72	20.72	20.72	20.72	20.72
	W _s	[kg/m ²]	-	-	-	-	-
Bending RF (with wrinkling)	short span	[-]	3.30	3.23	7.18	5.02	6.42
	long span	[-]	4.95	4.15	11.64	7.94	9.27
Bending RF (without wrinkling)	short span	[-]	2.50	3.64	8.10	5.66	7.23
	long span	[-]	5.59	3.15	8.82	6.02	7.03
Shear RF	short span	[-]	4.34	2.17	2.89	2.79	2.57
	long span	[-]	1.94	2.85	4.11	3.95	3.49
Stiffness RF	bending	[-]	4.53	4.03	10.64	5.60	12.40
	deflection	[-]	4.74	5.41	18.96	9.80	18.31
Thickness RF	single/outer skin	[-]	1.03	1.03	1.03	1.03	1.03
	inner skin	[-]	1.17	1.17	1.17	1.17	1.17
	thickness RF	[-]	-	-	-	-	-
Critical	name	[-]	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre	Outer Skin Minimum Fibre
	value	[-]	1.03	1.03	1.03	1.03	1.03

Topology Group			1003 DECK » FOREDECK
Name	Property	Unit	foredeck 9
Design Loads	P _d	[kN/m ²]	6.61
	M _{db}	[Nmm/mm]	502.12
	M _{dl}	[Nmm/mm]	440.19

	F_{db}	[N/mm]	02.37
	F_{dl}	[N/mm]	02.97
Min Requirements	EI_{min}	[Nmm ² /mm]	8.11e+05
	W_{is_min}	[kg/m ²]	-
	W_{os_min}	[kg/m ²]	-
	t_s	[mm]	8.48
	W_s	[kg/m ²]	-
Calculated Properties	EI	[Nmm ² /mm]	6.21e+06
	W_{is}	[kg/m ²]	6.0e-01
	W_{os}	[kg/m ²]	7.5e-01
	t_s	[mm]	20.72
	W_s	[kg/m ²]	-
Bending RF (with wrinkling)	short span	[-]	4.80
	long span	[-]	7.25
Bending RF (without wrinkling)	short span	[-]	3.64
	long span	[-]	8.17
Shear RF	short span	[-]	5.46
	long span	[-]	2.44
Stiffness RF	bending	[-]	7.66
	deflection	[-]	7.94
Thickness RF	single/outer skin	[-]	1.03
	inner skin	[-]	1.17
	thickness RF	[-]	-
Critical	name	[-]	Outer Skin Minimum Fibre
	value	[-]	1.03

6.2.2 1003 DECK Beams

6.3 1008 HULL BEAMS

6.3.1 1008 HULL BEAMS Panels

6.3.2 1008 HULL BEAMS Beams

Topology Group			1008 HULL BEAMS » Aft Bottom panel EF	
Name	Property	Unit	aft panel EF aft & fwd part	aft panel EF aft & fwd part on deck
Design Loads	P_d	[kN/m ²]	25.38	5.00
	M_d	[Nmm]	5482046.82	907463.70
	F_{dl}	[N]	18274.22	3300.00
Min Requirements	EI_{min}	[Nmm ²]	6.158e+09	9.344e+08
	W_e	[mm]	59.9	59.9
Calculated Properties	EI_{prov}	[Nmm ²]	1.442e+11	4.323e+10
	W_e	[mm]	5.994e+01	5.994e+01
Bending RF	Capping in compression	[-]	1.06	3.08
Shear RF	Shear web	[-]	1.77	5.39
Stiffness RF	Bending	[-]	23.42	46.26
Buckling BLF	L-Flange	[-]	2.34	1.95
Critical	name	[-]	O.S. / O.S. Reinforcement Bending	Flange Buckling
	value	[-]	1	1.95

Topology Group			1008 HULL BEAMS » Aft Bottom Panel F-Transom	
Name	Property	Unit	aft bottom stringer F-transom	aft bottom stringer F-transom Deck
Design Loads	P_d	[kN/m ²]	18.76	5.00
	M_d	[Nmm]	3698698.71	985793.90
	F_{dl}	[N]	17071.60	4550.00
Min Requirements	EI_{min}	[Nmm ²]	3.001e+09	7.997e+08
	W_e	[mm]	59.9	59.9
Calculated Properties	EI_{prov}	[Nmm ²]	8.339e+10	8.339e+10
	W_e	[mm]	5.994e+01	5.994e+01
Bending RF	Capping in compression	[-]	1.19	4.47
Shear RF	Shear web	[-]	1.42	5.33
Stiffness RF	Bending	[-]	27.79	104.28
Buckling BLF	L-Flange	[-]	2.34	2.34
Critical	name	[-]	O.S. / O.S. Reinforcement Bending	Flange Buckling
	value	[-]	1.09	2.34

Topology Group			1008 HULL BEAMS » Aft Bottom Stringer DE	
Name	Property	Unit	mid bottom stringer DE	mid bottom stringer DE side tapes- for capping joint
Design Loads	P_d	[kN/m ²]	25.38	25.38
	M_d	[Nmm]	6803315.34	6803315.34
	F_{dl}	[N]	20311.04	20311.04
Min Requirements	EI_{min}	[Nmm ²]	8.533e+09	8.533e+09
	W_e	[mm]	53.7	53.7
Calculated Properties	EI_{prov}	[Nmm ²]	1.368e+11	1.349e+11
	W_e	[mm]	5.374e+01	5.374e+01
Bending RF	Capping in compression	[-]	1.04	Capping not defined
Shear RF	Shear web	[-]	1.76	1.76
Stiffness RF	Bending	[-]	16.04	15.81
Buckling BLF	L-Flange	[-]	2.60	-
Critical	name	[-]	Capping	O.S. / O.S. Reinforcement Bending
	value	[-]	1.04	1.04

Topology Group			1008 HULL BEAMS » Aft Topside Stringer DE	
Name	Property	Unit	mid topsides stringer DE	
Design Loads	P_d	[kN/m ²]	23.40	
	M_d	[Nmm]	9730220.18	
	F_{dl}	[N]	29060.91	
Min Requirements	EI_{min}	[Nmm ²]	1.22e+10	
	W_e	[mm]	51.9	
Calculated Properties	EI_{prov}	[Nmm ²]	2.649e+11	
	W_e	[mm]	5.194e+01	
Bending RF	Capping in compression	[-]	1.45	
Shear RF	Shear web	[-]	1.04	
Stiffness RF	Bending	[-]	21.71	
Buckling BLF	L-Flange	[-]	1.80	
Critical	name	[-]	Shear	
	value	[-]	1.04	

Topology Group			1008 HULL BEAMS » Aft Topside Stringer EF
Name	Property	Unit	aft topsides stringer EF
Design Loads	P _d	[kN/m ²]	21.78
	M _d	[Nmm]	25979106.43
	F _{dl}	[N]	44410.51
Min Requirements	EI _{min}	[Nmm ²]	5.69e+10
	W _e	[mm]	150.0
Calculated Properties	EI _{prov}	[Nmm ²]	7.188e+11
	W _e	[mm]	5.494e+01
Bending RF	Capping in compression	[-]	1.10
Shear RF	Shear web	[-]	1.55
Stiffness RF	Bending	[-]	12.63
Buckling BLF	L-Flange	[-]	2.45
Critical	name	[-]	Capping
	value	[-]	1.1

Topology Group			1008 HULL BEAMS » Fwd Bottom Stringer AB
Name	Property	Unit	fwd bottom stringer AB
Design Loads	P _d	[kN/m ²]	26.48
	M _d	[Nmm]	8803281.86
	F _{dl}	[N]	24292.70
Min Requirements	EI _{min}	[Nmm ²]	1.194e+10
	W _e	[mm]	58.1
Calculated Properties	EI _{prov}	[Nmm ²]	2.258e+11
	W _e	[mm]	5.814e+01
Bending RF	Capping in compression	[-]	1.28
Shear RF	Shear web	[-]	1.33
Stiffness RF	Bending	[-]	18.90
Buckling BLF	L-Flange	[-]	3.90
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.08

Topology Group			1008 HULL BEAMS » Fwd Bottom Stringer BC
Name	Property	Unit	fwd bottom stringer BC mast step
Design Loads	P _d	[kN/m ²]	26.24
	M _d	[Nmm]	8181882.22
	F _{dl}	[N]	27818.82
Min Requirements	EI _{min}	[Nmm ²]	9.01e+09
	W _e	[mm]	63.1
Calculated Properties	EI _{prov}	[Nmm ²]	2.636e+11
	W _e	[mm]	6.314e+01
Bending RF	Capping in compression	[-]	1.25
Shear RF	Shear web	[-]	1.31
Stiffness RF	Bending	[-]	29.25
Buckling BLF	L-Flange	[-]	4.68
Critical	name	[-]	Capping
	value	[-]	1.25

Topology Group			1008 HULL BEAMS » Fwd Topside Stringer AB
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Name	Property	Unit	fwd topsides stringer AB
Design Loads	P_d	[kN/m ²]	24.80
	M_d	[Nmm]	10991525.01
	F_{dl}	[N]	29523.29
Min Requirements	EI_{min}	[Nmm ²]	1.532e+10
	W_e	[mm]	58.1
Calculated Properties	EI_{prov}	[Nmm ²]	3.343e+11
	W_e	[mm]	5.814e+01
Bending RF	Capping in compression	[-]	1.19
Shear RF	Shear web	[-]	1.37
Stiffness RF	Bending	[-]	21.82
Buckling BLF	L-Flange	[-]	3.64
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.11

Topology Group			1008 HULL BEAMS » Fwd Topside Stringer BC
Name	Property	Unit	fwd topsides stringer BC
Design Loads	P_d	[kN/m ²]	23.91
	M_d	[Nmm]	7488845.38
	F_{dl}	[N]	25903.09
Min Requirements	EI_{min}	[Nmm ²]	8.107e+09
	W_e	[mm]	58.1
Calculated Properties	EI_{prov}	[Nmm ²]	2.389e+11
	W_e	[mm]	5.814e+01
Bending RF	Capping in compression	[-]	1.27
Shear RF	Shear web	[-]	1.23
Stiffness RF	Bending	[-]	29.47
Buckling BLF	L-Flange	[-]	2.60
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.16

6.4 1201 DECK BEAMS

6.4.1 1201 DECK BEAMS Panels

6.4.2 1201 DECK BEAMS Beams

Topology Group			1201 DECK BEAMS » Deck beam AB
Name	Property	Unit	Fortedeck beam Duplicate
Design Loads	P_d	[kN/m ²]	5.00
	M_d	[Nmm]	1983670.65
	F_{dl}	[N]	5175.00
Min Requirements	EI_{min}	[Nmm ²]	2.847e+09
	W_e	[mm]	43.8
Calculated Properties	EI_{prov}	[Nmm ²]	2.978e+10
	W_e	[mm]	4.38e+01
Bending RF	Capping in compression	[-]	1.08
Shear RF	Shear web	[-]	3.12
Stiffness RF	Bending	[-]	10.46

Buckling BLF	L-Flange	[-]	1.95
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.06

Topology Group			1201 DECK BEAMS » Deck beam BC
Name	Property	Unit	Fortedeck beam
Design Loads	P_d	[kN/m ²]	5.35
	M_d	[Nmm]	1203988.80
	F_{dl}	[N]	4816.15
Min Requirements	EI_{min}	[Nmm ²]	1.127e+09
	W_e	[mm]	43.8
Calculated Properties	EI_{prov}	[Nmm ²]	2.978e+10
	W_e	[mm]	4.38e+01
Bending RF	Capping in compression	[-]	1.77
Shear RF	Shear web	[-]	3.36
Stiffness RF	Bending	[-]	26.43
Buckling BLF	L-Flange	[-]	1.95
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.74

Topology Group			1201 DECK BEAMS » Deck beam Coachroof
Name	Property	Unit	Coachroof support beam
Design Loads	P_d	[kN/m ²]	5.00
	M_d	[Nmm]	1584311.63
	F_{dl}	[N]	4875.00
Min Requirements	EI_{min}	[Nmm ²]	1.928e+09
	W_e	[mm]	43.8
Calculated Properties	EI_{prov}	[Nmm ²]	2.009e+10
	W_e	[mm]	4.38e+01
Bending RF	Capping in compression	[-]	1.10
Shear RF	Shear web	[-]	2.65
Stiffness RF	Bending	[-]	10.42
Buckling BLF	L-Flange	[-]	1.95
Critical	name	[-]	O.S. / O.S. Reinforcement Bending
	value	[-]	1.05

6.5 INTERNAL

6.5.1 INTERNAL Panels

6.5.2 INTERNAL Beams

Topology Group			INTERNAL » bhd E
Name	Property	Unit	bottom beam
Design Loads	P_d	[kN/m ²]	22.07
	M_d	[Nmm]	7250403.13
	F_{dl}	[N]	42212.46
Min Requirements	EI_{min}	[Nmm ²]	5.417e+09
	W_e	[mm]	53.7
Calculated	EI_{prov}	[Nmm ²]	2.14e+11

Properties	W_e	[mm]	5.374e+01
Bending RF	Capping in compression	[-]	1.29
Shear RF	Shear web	[-]	0.96
Stiffness RF	Bending	[-]	39.50
Buckling BLF	L-Flange	[-]	2.60
Critical	name	[-]	Shear
	value	[-]	0.96

Topology Group			INTERNAL » bhd F
Name	Property	Unit	topside_beam
Design Loads	P_d	[kN/m ²]	20.34
	M_d	[Nmm]	1493879.36
	F_{dl}	[N]	17799.12
Min Requirements	EI_{min}	[Nmm ²]	5.535e+08
	W_e	[mm]	59.9
Calculated Properties	EI_{prov}	[Nmm ²]	4.346e+10
	W_e	[mm]	5.994e+01
Bending RF	Capping in compression	[-]	1.83
Shear RF	Shear web	[-]	1.70
Stiffness RF	Bending	[-]	78.52
Buckling BLF	L-Flange	[-]	1.95
Critical	name	[-]	Shear
	value	[-]	1.7

Topology Group			INTERNAL » keel trunk
Name	Property	Unit	shelf
Design Loads	P_d	[kN/m ²]	7.00
	M_d	[Nmm]	142910.95
	F_{dl}	[N]	1225.00
Min Requirements	EI_{min}	[Nmm ²]	6.243e+07
	W_e	[mm]	39.7
Calculated Properties	EI_{prov}	[Nmm ²]	3.14e+11
	W_e	[mm]	3.974e+01
Bending RF	Capping in compression	[-]	140.74
Shear RF	Shear web	[-]	346.54
Stiffness RF	Bending	[-]	5030.63
Buckling BLF	L-Flange	[-]	1.19
Critical	name	[-]	Flange Buckling
	value	[-]	1.19

6.6 INTERNALS (PRIMARY)

6.6.1 INTERNALS (PRIMARY) Panels

6.6.2 INTERNALS (PRIMARY) Beams

Topology Group			INTERNALS (PRIMARY) » 11XX BHD » 1102-BHD A		
Name	Property	Unit	bottom beam	deck beam	side beam
Design Loads	P_d	[kN/m ²]	24.94	5.36	21.56
	M_d	[Nmm]	2339326.01	1676368.39	4761404.06

	F_{dl}	[N]	20946.90	8046.89	31040.38
Min Requirements	EI_{min}	[Nmm ²]	9.998e+08	1.308e+09	3.123e+09
	W_e	[mm]	58.1	43.8	54.9
Calculated Properties	EI_{prov}	[Nmm ²]	1.531e+11	5.006e+10	1.139e+11
	W_e	[mm]	5.814e+01	4.38e+01	5.494e+01
Bending RF	Capping in compression	[-]	2.21	2.12	1.04
Shear RF	Shear web	[-]	1.93	3.77	1.30
Stiffness RF	Bending	[-]	153.12	38.28	36.49
Buckling BLF	L-Flange	[-]	1.30	1.30	1.30
Critical	name	[-]	Flange Buckling	O.S. / O.S. Reinforcement Bending	Capping
	value	[-]	1.3	1.22	1.04

Topology Group			INTERNALS (PRIMARY) » 11XX BHD » 1103-BHD B		
Name	Property	Unit	bottom	deck	side
Design Loads	P_d	[kN/m ²]	22.79	5.36	20.37
	M_d	[Nmm]	4961696.90	4139959.38	5691259.83
	F_{dl}	[N]	28710.52	11828.93	29944.69
Min Requirements	EI_{min}	[Nmm ²]	3.454e+09	5.425e+09	4.487e+09
	W_e	[mm]	58.1	58.1	58.1
Calculated Properties	EI_{prov}	[Nmm ²]	2.098e+11	9.761e+10	1.674e+11
	W_e	[mm]	5.814e+01	5.814e+01	5.814e+01
Bending RF	Capping in compression	[-]	1.37	1.11	1.06
Shear RF	Shear web	[-]	1.58	2.56	1.35
Stiffness RF	Bending	[-]	60.74	17.99	37.30
Buckling BLF	L-Flange	[-]	1.56	1.56	1.56
Critical	name	[-]	Capping	Capping	Capping
	value	[-]	1.37	1.11	1.06

6.7 KEEL BOX

6.7.1 KEEL BOX Panels

6.7.2 KEEL BOX Beams

6.8 MISC

6.8.1 MISC Panels

6.8.2 MISC Beams

6.9 RUDDER

6.9.1 RUDDER Panels

6.9.2 RUDDER Beams

7. Results Summary

7.1 Vessel Critical Panels and Beams

No Critical Panels in current vessel.

No Critical Beams in current vessel.

7.2 Panels and Beams with min. RF by Topology

Topology	Beam / Panel	Laminate / Type	Critical Name	RF Value
1001 HULL » AFT BOTTOM	Panel 8 bottom	Hull_bottom/aft_bottom_CKX	Core Shear Long Span	0.9
1003 DECK » COCKPIT	cockpit 1	Deck laminate/cockpit	Outer Skin Minimum Fibre	1.03
	cockpit 2	Deck laminate/cockpit	Outer Skin Minimum Fibre	1.03
	cockpit 3	Deck laminate/cockpit	Outer Skin Minimum Fibre	1.03
	cockpit 4	Deck laminate/cockpit	Outer Skin Minimum Fibre	1.03
	cockpit 5	Deck laminate/cockpit	Outer Skin Minimum Fibre	1.03
1003 DECK » FOREDECK	foredeck 1	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 10	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 11	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 2	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 3	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 4	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 5	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 6	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 7	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
	foredeck 8	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03
foredeck 9	Deck laminate/foredeck_1	Outer Skin Minimum Fibre	1.03	
1008 HULL BEAMS » Aft Bottom panel EF	aft panel EF aft & fwd part	L-Flange	O.S. / O.S. Reinforcement Bending	1
1008 HULL BEAMS » Aft Bottom Panel F-Transom	aft bottom stringer F-transom	L-Flange	O.S. / O.S. Reinforcement Bending	1.09
1008 HULL BEAMS » Aft Bottom Stringer DE	mid bottom stringer DE	L-Flange	Capping	1.04
	mid bottom stringer DE side tapes-for capping joint	L-Flange	O.S. / O.S. Reinforcement Bending	1.04
1008 HULL BEAMS » Aft Topside Stringer DE	mid topsides stringer DE	L-Flange	Shear	1.04

Topology	Beam / Panel	Laminate / Type	Critical Name	RF Value
1008 HULL BEAMS » Aft Topside Stringer EF	aft topsides stringer EF	L-Flange	Capping	1.1
1008 HULL BEAMS » Fwd Bottom Stringer AB	fwd bottom stringer AB	L-Flange	O.S. / O.S. Reinforcement Bending	1.08
1008 HULL BEAMS » Fwd Bottom Stringer BC	fwd bottom stringer BC mast step	L-Flange	Capping	1.25
1008 HULL BEAMS » Fwd Topside Stringer AB	fwd topsides stringer AB	L-Flange	O.S. / O.S. Reinforcement Bending	1.11
1008 HULL BEAMS » Fwd Topside Stringer BC	fwd topsides stringer BC	L-Flange	O.S. / O.S. Reinforcement Bending	1.16
1201 DECK BEAMS » Deck beam AB	Fortedeck beam Duplicate	L-Flange	O.S. / O.S. Reinforcement Bending	1.06
1201 DECK BEAMS » Deck beam BC	Fortedeck beam	L-Flange	O.S. / O.S. Reinforcement Bending	1.74
1201 DECK BEAMS » Deck beam Coachroof	Coachroof support beam	L-Flange	O.S. / O.S. Reinforcement Bending	1.05
INTERNAL » bhd E	bottom beam	L-Flange	Shear	0.96
INTERNAL » bhd F	topside_beam	L-Flange	Shear	1.7
INTERNAL » keel trunk	shelf	L-Flange	Flange Buckling	1.19
INTERNALS (PRIMARY) » 11XX BHD » 1102-BHD A	side beam	L-Flange	Capping	1.04
INTERNALS (PRIMARY) » 11XX BHD » 1103-BHD B	side	L-Flange	Capping	1.06

8. Conclusion

According to the analysis the yacht **Passes** the required criteria.

9. Appendix

9.1 Appendix 1 - Analysis Settings

	Unit	Value
ISO - RF Pass Flag Level	[-]	0.89
ISO Factors		
ISO Factor	Unit	Value
	k ₆ [-]	1
ISO Core Design Shear Strength Factors - ISO12215-5:2008, 10.5.4 Table 11		
Core Type (Ultimate Shear Elongation Strain)	Unit	Value
High elongation core i.e. Linear PVC, SAN (> 35%)	[-]	0.65
Standard foam core i.e. cross-linked PVC etc. (< 35%)	[-]	0.55
End Grain Balsa	[-]	0.5
Honeycomb	[-]	0.5
ISO Design Category Factor (Kdc) - ISO12215-5:2008, 7.2 Table 2		
Category	Unit	Value
A - Ocean - Wave height >4m (calculations assume 7m), Wind speeds > Force 8	[-]	1
B - Offshore - Wave height <4m, Wind speeds < Force 8	[-]	0.8
C - Inshore - Wave height <2m, Wind speeds < Force 6	[-]	0.6
D - Sheltered Waters - Wave height typically < 0.3m, occasionally 0.5m. Wind speed < Force 4	[-]	0.4

9.2 Appendix 2 - Definitions

Vessel

Symbol	Unit	Description
LWL	[m]	Length of the fully loaded waterline / Length between perpendiculars
LH	[m]	Hull length
D	[m]	Total hull depth
β _{0.4}	[°]	Deadrise angle at 0.4 LWL forward of aft end of LWL
BC	[m]	Breadth from chine to chine at 0.4 LWL
BWL	[m]	Breadth of the fully loaded waterline at full displacement at 0.4 LWL
V	[kts]	Maximum speed at full mass of the craft
G _{zmax<60}	[m]	Maximum righting moment
mLDC	[kg]	Displacement / Mass of the fully loaded craft

Ply properties

Symbol	Unit	Description
t _{pp}	[mm]	thickness per ply
E _{11 avg}	[MPa]	Young modulus (average of tensile and compressive)
E _{22 avg}	[MPa]	Young modulus (average of tensile and compressive)
ε _{11 tu}	[%]	Longitudinal Ultimate Tensile Strain
ε _{11 cu}	[%]	Longitudinal Ultimate Compressive Strain
ε _{22 tu}	[%]	Transverse Ultimate Compressive Strain
ε _{22 cu}	[%]	Transverse Ultimate Tensile Strain
ν ₁₂		Major Poisson ratio

Shear Ply Properties

Properties derived for balanced biaxial laminates for ply at ± 45° to the laminate coordinate system (xy)

Symbol	Unit	Description
t _{sh}	[mm]	shear thickness per ply

Symbol	Unit	Description
Ex@45	[MPa]	Young modulus @ 45
Ey@45	[MPa]	Young modulus @ 45
Gxy @45	[MPa]	Kirchoff modulus @ 45
$\gamma_{xy@45ult}$	[%]	Allowable Ultimate Shear Strain
exytu@45	[%]	Ultimate tensile Strain
exycu@45	[%]	Ultimate Compressive Strain
vxy @45		Major Poisson ratio @45

Core properties

Symbol	Unit	Description
tc	[mm]	core thickness
G13	[MPa]	Shear modulus in 13 plane
G23	[MPa]	Shear modulus in 23 plane
E33c	[MPa]	Young modulus (compressive)
γ_{13ult}	[%]	Allowable Ultimate Shear Strain in 13 plane
γ_{23ult}	[%]	Allowable Ultimate Shear Strain in 23 plane
ϵ_{33ult}	[%]	Allowable Ultimate Through-thickness Compressive Strain

Laminate properties

Symbol	Unit	Description
ttotal	[mm]	Laminate thickness
Ex total	[MPa]	Young modulus
Ey total	[MPa]	Young modulus
Elx total	[Nmm ² /mm]	Bending Stiffness in direction x
Ely total	[Nmm ² /mm]	Bending Stiffness in direction y
-Mx	[Nmm/mm]	longitudinal allowable bending moments (inner skin in compression)
+Mx	[Nmm/mm]	longitudinal allowable bending moments (outer skin in compression)

Single skin laminate specific properties

Symbol	Unit	Description
Fibre mass ws	[kg/m ²]	Laminate total fibre mass
ϵ_{uxt}	[%]	Ultimate tensile strain in direction x
ϵ_{uxc}	[%]	Ultimate compressive strain in direction x
ϵ_{uyt}	[%]	Ultimate tensile strain in direction y
ϵ_{uyc}	[%]	Ultimate compressive strain in direction y

Sandwich laminate specific properties

Skin:

Symbol	Unit	Description
t(os/is)	[mm]	Skin thickness
Fibre mass w(os/is)	[kg/m ²]	Laminate total fibre mass
ϵ_{uxt}	[%]	Ultimate tensile strain in direction x
ϵ_{uxc}	[%]	Ultimate compressive strain in direction x
ϵ_{uyt}	[%]	Ultimate tensile strain in direction y
ϵ_{uyc}	[%]	Ultimate compressive strain in direction y
Ex	[MPa]	Young modulus
Ey	[MPa]	Young modulus

Core:

Symbol	Unit	Description
tc	[mm]	core thickness
Gco Gxz	[MPa]	Shear modulus in plane
Gyz	[MPa]	Shear modulus in plane
Eco	[MPa]	Young modulus
txz-u	[MPa]	Ultimate shear strain
tyz-u	[MPa]	Ultimate shear strain

Panel Definition:

Symbol	Unit	Description
X	[m]	Position of the panel's centroid from the origin
H	[m]	Position of the panel's centroid in respect of the DWL
Z	[m]	Local height of deck above DWL
Fore & Aft Dimension	[mm]	Span of the panel in the LWL direction
Transverse Dimension	[mm]	Span of the panel in the transverse to the LWL direction
cp	[mm]	Curvature (short span)
β	[°]	Angle to Horizontal - Used to calculate the percentage of panel above or below WL

Beam Definition:

Symbol	Unit	Description
Hb	[mm]	Beam height
BW	[mm]	Base width
TW	[mm]	Top width
X	[m]	Position of the panel's centroid from the origin
h	[m]	Position of the panel's centroid in respect of the DWL, Negative value (-) = Under DWL
Z	[m]	Local height of deck above DWL (m)
lu	[mm]	Unsupported length. Long dimension of panel between stiffeners
S	[mm]	Stiffener spacing, width of shell supported
cu	[mm]	Curvature
β	[°]	Angle To Horizontal
Type		Beam type (see appendix)
#		number of plies

Panel Results:

Symbol	Unit	Description
Pd	[kN/m ²]	Design pressure
Mdb	[Nmm/mm]	Design Bending Moment in short direction
Mdl	[Nmm/mm]	Design bending moment in long direction
Fdb	[N/mm]	Design shear force at the midspan of the short edge
Fdl	[N/mm]	Design shear Force at the midspan of the long edge
EI min	[Nmm ² /mm]	Minimum requirement bending stiffness
Wis min	[kg/m ²]	Minimum requirement fibre mass inner skin
Wos min	[kg/m ²]	Minimum requirement fibre mass outer skin
ts min	[mm]	Minimum panel thickness
EI	[Nmm ² /mm]	Panel bending stiffness
Wis	[kg/m ²]	fibre mass inner skin
Wos	[kg/m ²]	fibre mass outer skin
ts	[mm]	panel thickness

Bending RF	short span	Bending reserve factor in the short span direction
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	long span	Bending reserve factor in the long span direction
Shear RF	short edge	Reserve factor for short Span Shear (at the mid-point of short edge)
	long edge	Reserve factor for long Span Shear (at the mid-point of long edge)
Stiffness RF	bending	Reserve factor for the bending stiffness (EI)
	deflection	Reserve factor for the panel lateral deflection
Thickness RF	outer skin	Reserve factor for the outer skin weight of reinforcement
	inner skin	Reserve factor for the inner skin weight of reinforcement

Beam Results:

Symbol	Unit	Description
Pd	[kN/m ²]	Design pressure (kPa)
Md	[Nmm]	Design bending moment (Nmm)
Fdl	[N]	Design shear Force (N)
EI min	[Nmm ²]	Minimum requirement bending stiffness
We	[mm]	minimum supported panel effective width
EI	[Nmm ²]	bending stiffness
We input	[mm]	Supported panel effective width

Bending RF	Capping in compression	Bending reserve factor for capping in compression
Shear RF	Shear web	Shear reserve factor for the beam web
Stiffness RF	Bending	Reserve factor for the bending stiffness (EI)
Buckling BLF	Shear web	Buckling reserve factor for the shear web
	Flange	Buckling reserve factor for the flange

9.3 Appendix 3 - Beam Type Definition

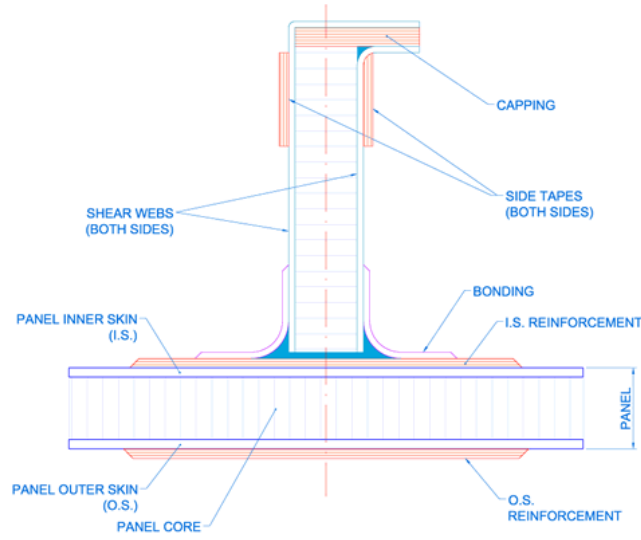


Figure 1: L Flange

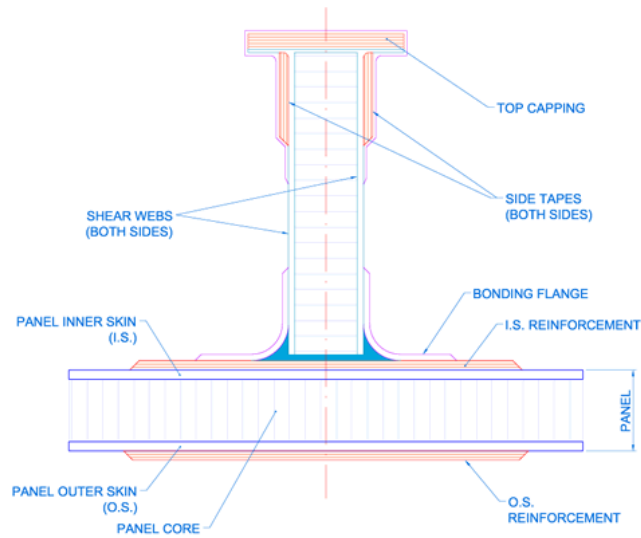


Figure 2: T flange

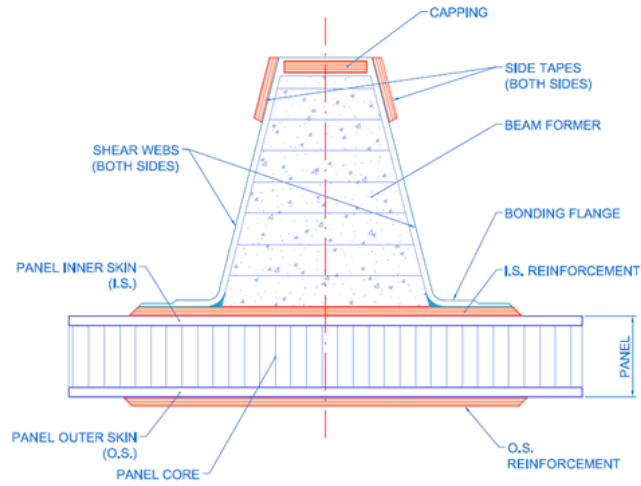


Figure 3: Top Hat (with foam former)

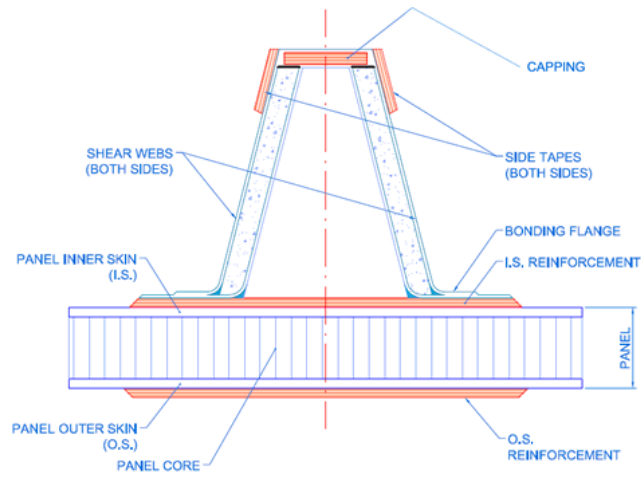


Figure 4: Top Hat Hollow (without former)